Volume II - Appendix K and L

ORANGE COUNTY WATER DISTRICT APPLICATION TO APPROPRIATE SANTA ANA RIVER WATER

Recirculated Draft Program Environmental Impact Report
SCH # 2002081024

Prepared for:
Orange County Water District

March 2006

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March 2006

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Volume II
Technical Appendices

Volume II contains new technical appendices for Hydrology Resources and Biological Resources. Documents included in Volume II contain information about existing and future conditions in the lower SAR watershed and previous mitigation commitments by OCWD and USACE.

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Appendix K
Hydrology Resources

This appendix contains copies of reports by USACE and SAWPA that include each entity's estimate of future flows in the SAR. These projections are the basis for the assessment of water availability in Volume I, Appendix D. The contents of this appendix are listed below:

- Appendix K-1. U.S. Army Corp of Engineers (USACE); Prado Basin Water Conservation Feasibility Study, Main Report and Draft EIS/EIR – Hydrology Appendix; July 2004
- Appendix K-2. Santa Ana Watershed Project Authority (SAWPA); Santa Ana River Projected Flow Impacts Report; March 2004

Appendix K-1

U.S. Army Corp of Engineers (USACE)

Prado Basin Water Conservation Feasibility Study, Main Report and Draft EIS/EIR – Hydrology Appendix

July 2004

The USACE Santa Ana River Mainstem Project (SARP) is a flood control project designed to provide protection to the Santa Ana River watershed against a 190-year flood event. Two dams on the Santa Ana River provide the primary flood protection—Prado Dam and Seven Oaks Dam. In addition to flood control, Prado Dam is operated for water conservation purposes, allowing additional storm flows to collect behind the dam for later release and capture downstream by OCWD. OCWD diverts this water from the Santa Ana River and recharges it to the Orange County groundwater basin for beneficial use as water supply. The Feasibility Study investigates the potential for additional water conservation opportunities at Prado Dam by further raising the level of the conservation pool behind the dam. Included in this study is an evaluation of the hydrologic conditions in the Santa Ana River and an estimation of future river flow volumes. These USACE flow projections are used in **Appendix D**, *Assessment of Future Santa Ana River Flows Below Prado Dam*, to calculate future water availability at OCWD's operations area.

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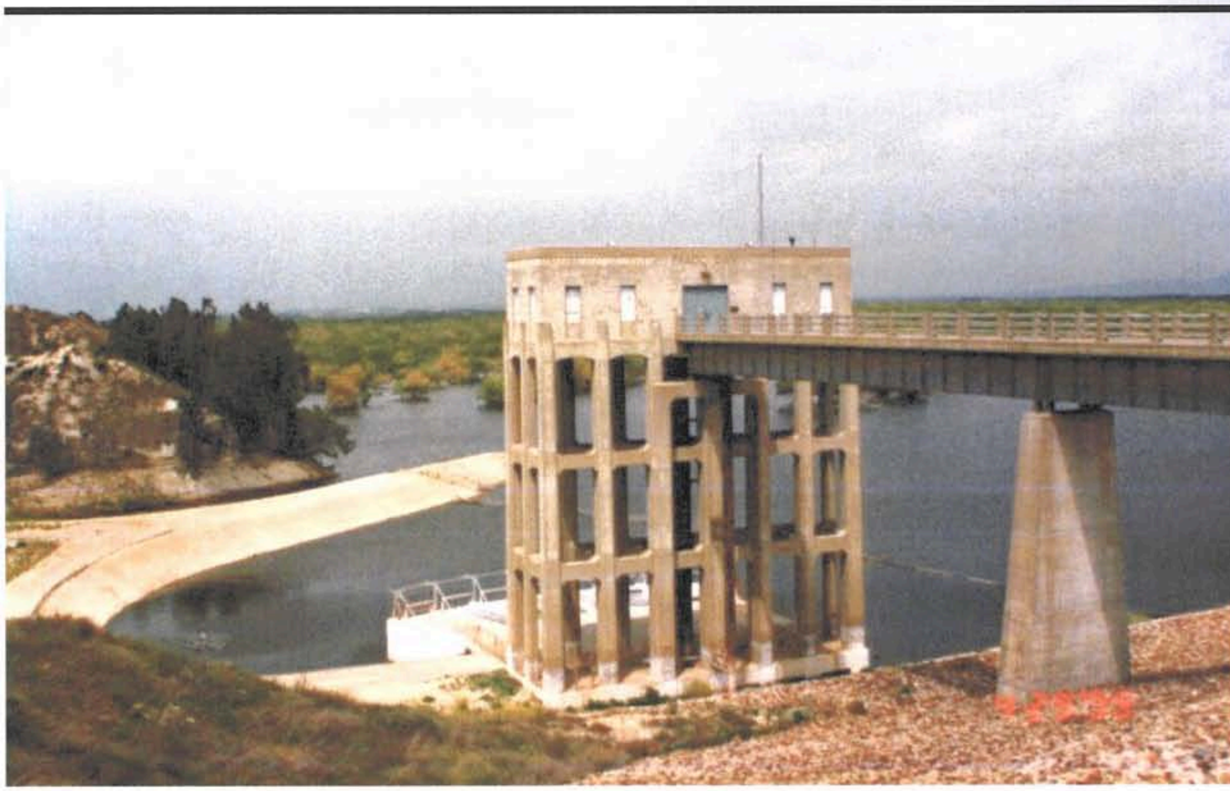
US Army Corps
Of Engineers
Los Angeles District

Draft Feasibility Report



PRADO BASIN WATER CONSERVATION FEASIBILITY STUDY

MAIN REPORT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

DRAFT F5 DOCUMENT -- REVISED

JULY 2004

US Army Corps
of Engineers
Los Angeles District

Prado Basin Water Conservation Feasibility Study,

Prado Dam

Riverside and San Bernardino Counties, California

MAIN REPORT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

DRAFT F5 DOCUMENT

JULY 2004

Los Angeles District, Corps of Engineers
Planning Division, Plan Formulation Branch
P.O. Box 532711
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4 PLAN FORMULATION

Plan formulation is the process by which alternative plans are created to address specific planning objectives. Plan formulation typically begins with the identification of measures, the building blocks from which alternative plans are created. After alternative plans are created, they might be "reformulated to make them more effective, efficient, reliable, or acceptable.

4.1 Planning Objectives

The National Objective (Section 2.1) is a general statement and not specific enough for direct use in plan formulation. Planning objectives are directly related to identifying the problems and opportunities, and represent desired positive changes in the Without-Project Condition.

The general planning objective for the Prado Basin Water Conservation Feasibility Study is to increase the amount of water that is delivered to OCWD's groundwater basins. This can be accomplished by storing the local storm runoff and releasing the water at a slower rate depending on the inflow capability of the recharge facilities. Water conservation practices such as this would reduce the amount of water that is lost to the ocean, and increase the local water supplies. Impacts to existing environmental resources must be considered, and when impacts are unavoidable, mitigation measures must be proposed.

4.2 Alternative Plans

4.2.1 Alternatives from Reconnaissance Study

The reconnaissance phase of the present water conservation study commenced in 1994 and culminated in a 1996 Reconnaissance Report. The Report included 15 alternatives, some of which had maximum permissible non-flood season water surface elevations up to 512 ft NGVD (156.1 m), since the Corps, from the previous study, had the authority to consider a 514 ft (153.9 m) NGVD maximum water surface elevation. The alternatives considered in the 1996 Reconnaissance Report are listed in Table 4-1.

Table 4-1 Alternatives Contained in 1996 Reconnaissance Report

Maximum Flood Season Water Surface Elevation (feet)	Maximum Non-Flood Season Water Surface Elevation (feet)
498	498
494	505
498	505
499	505
500	505
501	505
502	505
503	505
504	505
505	505
508	508
498	512
508	512
Santa Ana River Polishing Ponds	
Peripheral Water Conservation Holding Ponds between Elevations 556 and 566 feet.	

4.2.2 Alternatives Selected for Feasibility Study

During the course of the feasibility study, 10 of the original 15 alternatives were eliminated from further consideration because they were not feasible due to having prohibitively low benefit/cost ratios, leaving five stand alone alternatives. These five alternatives were selected principally on the basis that, for each, the reservoir water surface elevation could be drawn down to 490 feet (Debris Pool) within 24 hours without significant damage downstream and resultant environmental mitigation.

4.3 Screening Alternatives

The previous draft feasibility report contained ten proposed alternatives (Nos. 1, 1a,2, 3, 4, 5, 6, 7, 8, and 9). Five of these alternatives (Nos. 1a, 6, 7, 8, and 9) were designated as "pre-construction" alternatives because they could all be implemented prior to completion of the new outlet works and improved downstream channel. Some of the "post-construction" alternatives could be implemented prior to construction, however, because economic analysis of alternatives requires the same 50-year time frame, it was necessary to consider these as commencing at the same date as those alternatives that could not be implemented prior to construction. Due to changes in the timing of construction versus completion of the feasibility study, the pre-construction alternatives have turned out to be unnecessary, as construction of the outlet works will be completed prior to the feasibility study plan implementation. The pre-construction alternatives have thus been eliminated from further analysis.

4.4 Reformulation of Alternatives

The final array of alternatives is described in the following paragraphs.

4.4.1 Alternative 1: Flood Season Water Conservation to Elevation 494.0 ft, plus Non-flood Season Water Conservation to Elevation 505.0 ft (Without-Project Condition).
This is the existing operation at Prado Dam. When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elevation 490.0 ft) is utilized for water conservation anytime during the year. The existing operation schedule calls for controlled releases up to 600 cfs until the reservoir reaches elevation 490.0 ft.

During the flood season, encroachment into the Flood Control Pool up to elevation 494.0 ft (top of Buffer Pool) is allowed for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down to the Debris Pool (if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. Beginning March 1, the maximum allowable water surface elevation for conservation is linearly increased from elevation 494.0 ft to elevation 505.0 ft on March 10. The pool may be maintained as high as elevation 505.0 ft until September 30. However, if maintenance is required, the reservoir must be evacuated before September 1. If summer flood runoff occurs in September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment does not interfere with maintenance requirements.

Releases from Prado Dam during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, water control personnel at the Corps' Reservoir Operations Center (ROC) will match inflow with outflow. Above elevation 505.0 ft, the reservoir is put in full flood-control mode; and outflows can be made up to the downstream channel capacity of the Santa Ana River .

4.4.2 Alternative 2: Flood Season Water Conservation to Elevation 498.0 ft, plus Non-flood Season Water Conservation to Elevation 505.0 ft.

When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elevation 490.0 ft) is utilized for water conservation anytime during the year. The existing operation schedule calls for controlled releases up to 600 cfs until the reservoir reaches elevation 490.0 ft.

During the flood season, encroachment into the Flood Control Pool up to elevation 498.0 ft (top of Buffer Pool) is allowed for water conservation purposes when weather conditions are favorable. When the threat of unfavo`rable weather is forecast, the reservoir will be drawn down to the Debris Pool (if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. Beginning March 1, the maximum allowable water surface elevation for conservation is linearly increased from elevation 498.0 ft to elevation 505.0 ft on March 10. The pool may be maintained as high as elevation 505.0 ft until September 30. However, if maintenance is required, the reservoir must be evacuated before September 1. If summer flood runoff occurs in September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment does not interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, the water control personnel at the ROC will match inflow with outflow. Above elevation 505.0 ft, the reservoir is put in full flood-control mode; and outflows can be made up to the downstream channel capacity of the Santa Ana River.

4.4.3 Alternative 3: Flood Season Water Conservation to Elevation 500.0 ft, plus Non-flood Season Water Conservation to Elevation 505.0 ft.

When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elevation 490.0 ft) for water conservation is utilized anytime during the year. The existing operation schedule calls for controlled releases up to 600 cfs until the reservoir reaches elevation 490.0 ft.

During the flood season, encroachment into the flood-control pool up to elevation 500.0 ft (top of Buffer Pool) is allowed for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down to the Debris Pool (if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. Beginning March 1, the maximum allowable water surface elevation for conservation is linearly increased from elevation 500.0 ft to elevation 505.0 ft on March 10. The pool may be maintained as high as elevation 505.0 ft until September 30. However, if maintenance is required, the reservoir must be evacuated before September 1. If summer flood runoff occurs in September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment does not interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, the water control personnel at the ROC will match inflow with outflow. Above elevation 505.0 ft, the reservoir is put in full flood-control mode; and outflows can be made up to the downstream channel capacity of the Santa Ana River (approximately 30,000 cfs).

4.4.4 Alternative 4: Water Conservation to Elevation 505.0 ft Year-Round.
When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elevation 490.0 ft) is utilized for water conservation anytime during the year. The existing operation schedule calls for controlled releases up to 600 cfs until the reservoir reaches elevation 490.0 ft.

During the flood season, encroachment into the flood-control pool up to elevation 505.0 ft (top of Buffer Pool) is allowed for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down to the Debris Pool (if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can also be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. The pool may be maintained as high as elevation 505.0 ft until September 30. However, if maintenance is required, the reservoir must be evacuated before September 1. If summer flood runoff occurs in September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment does not interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, the water control personnel at the ROC will match inflow with outflow. Above elevation 505.0 ft, the reservoir is put in full flood-control mode; and outflows can be made up to the downstream channel capacity of the Santa Ana River.

4.4.5 Alternative 5: Water Conservation to Elevation 508.0 ft Year-Round.

When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elevation 490.0 ft) for water conservation is utilized anytime during the year. The existing operation schedule calls for controlled releases up to 600 cfs until the reservoir reaches elevation 490.0 ft.

During the flood season, encroachment into the flood-control Pool up to elevation 508.0 ft (top of Buffer Pool) for water conservation purposes is allowed when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down to the Debris Pool (if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.
During the non-flood season, water can also be held up to elevation 508.0 ft (top of Seasonal Pool) for water conservation purposes. The pool may be maintained as high as elevation 508.0 ft until September 30. However, if maintenance is required, the reservoir must be evacuated before September 1. If summer flood runoff occurs in September, the dam can be operated for water conservation up to elevation 508.0 ft, provided that the impoundment does not interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 508.0 ft, the water control personnel at the ROC will match inflow with outflow. Above elevation 508.0 ft, the reservoir is put in full flood-control mode; and outflows can be made up to the downstream channel capacity of the Santa Ana River.

4.5 Evaluation of Final Array of Alternatives

The alternatives described in section 4.4 are evaluated on how well they meet the following criteria:
(1) Feasibility of implementing the required modifications to the dam,
(2) Demonstration of Federal interest based on economic and environmental criteria,
(3) Support of the non-Federal sponsor, and
(4) Consistency with policies and budgetary priorities.

Detailed engineering, economic, environmental, and real estate analyses were performed in order to identify the required dam modifications, costs of modifications, real estate requirements, and the benefits resulting from water conservation yields of the various alternatives. The following sections summarize information from the technical reports and the draft EIS.

4.5.1 Hydrology

4.5.1.1 Flood Control

Formal incorporation of water conservation into the water control plan for Prado Dam must address the impact on level of flood protection afforded by a proposed change in project operation. In this instance, all the alternatives can be implemented without a significant reduction of flood protection downstream. The reasons are as follows:

- From a design storm standpoint, Prado Dam can pass the reservoir design flood (RDF) under present conditions without exceeding the spillway crest for all five alternatives.

- For future conditions, the RDF does not induce spillway flow; however, the maximum water surface elevation is about 2.5 to 3 ft higher than under present post-construction conditions.

- Even with no advanced warning of an RDF at Prado Dam, the reservoir can still provide RDF protection for all five post-construction alternatives under present and future post-construction conditions. The Phase II design for Prado Dam includes 70,000 AF for sediment allowance.

From a discharge-frequency standpoint, the level of protection under present, interim, and future post-construction conditions does not change significantly from Alternative 1 (without-project condition) to Alternative 5 (highest elevation of Buffer Pool). The difference in maximum water surface elevation between Alternative 1 and Alternative 5 is only about 1 to 1.5 ft for floods in the 100- to 500-year range for both present and future conditions.
More detailed descriptions of how flood control impacts were evaluated are provided in the Hydrology and Hydraulics Report. Table 66 of the Hydrology and Hydraulics Report provides the frequency of spill at Prado Dam for all alternatives.

4.5.1.2 Duration and Frequency of Inundation

Duration of inundation is an important hydrologic parameter in this study. Each water conservation alternative will increase the duration of inundation at any given elevation. As the probability of a storm decreases (less frequent, larger storm event) the duration of inundation increases. Both duration and frequency of inundation are important parameters that help assess environmental and recreation impacts. Detailed inundation duration tables and inundation-duration-frequency curves for all alternatives are in the Hydrology and Hydraulics Report. Table 4-2 shows the increase in inundation duration for a 100-year storm for all the alternatives as compared to without-project alternatives under present conditions.

Table 4-2. Inundation Duration Increase for a 100-Year Storm as Compared to the Without-Project Alternatives under Present Conditions

Alternative	Highest Increase in Number of Days from Without-Project Alternative	Elevation at which Highest Increase Occurs
2	30 Days	494 ft
3	30 Days	494 ft, 498 ft
4	60 Days	498 ft
5	70 Days	500 ft

4.5.1.3 Water Conservation Yields

Water conservation yield is calculated by the amount of water that OCWD can use in its spreading basins. Under present conditions, the release rate from Prado Dam up to approximately 500 cfs can be utilized by OCWD in its spreading grounds. The average annual inflow to Prado Dam for the representative period of record, present pre- and post-construction conditions, including base flow and storm flows, is about 278,000 AF. The average annual flow from the local area between Prado Dam and the spreading facilities is about 7,900 AF. Of the total flow of 286,000 AF, OCWD can save about 83 percent of that runoff under present pre- and post-construction conditions, with 48,000 AF of water being lost to the Pacific Ocean.
Yields determined for the various alternatives at Prado Dam are presented in Table 4-3. The water yields were obtained from a hydrologic evaluation of the watershed and hydraulic evaluation of the facilities. For a description of how the data in Table 4-3 was obtained, refer to the Hydrology and Hydraulics Report.

Table 4-3 Water Conservation Yields at Prado Dam

Alternative	**Condition**	**Yield (Acre-Feet)**	**Increase over Present Conditions (Acre-Feet)**	**Water "Lost" (Acre-Feet)**
Alternative 1	Present	238000	0	48000
	Future	314000	76000	68000
Alternative 2	Present	240000	2000	46000
	Future	318000	80000	64000
Alternative 3	Present	241000	3000	45000
	Future	319000	81000	63000
Alternative 4	Present	242000	4000	44000
	Future	322000	84000	60000
Alternative 5	Present	244000	6000	42000
	Future	324000	86000	58000

• Yield is the total volume of water delivered to the OCWD spreading grounds annually.
• Water "Lost" is the difference between the average annual flow in the Santa Ana River above the OCWD spreading facilities minus the yield for the downstream spreading grounds.
• Present Conditions for Alternatives 1 to 5 are conditions for water year 2002 in the watershed with the Phase II GDM design for Prado Dam in place.

• Future Conditions Alternatives 1 to 5 are for the year 2052. Urbanization adjustments were made to the daily inflows to represent changes over the 50-year period of analysis. Future Conditions yields presented in this report include the effects of sedimentation.
• Presented interim yields are at the beginning of the Interim Condition.
• For complete description of alternatives, see Section 4.7.

4.5.1.4 Impacts of Seven Oaks Dam on Prado Dam Yields

Runoff held at Seven Oaks Dam will not significantly affect the yields in Prado Reservoir. Flows generated in the Seven Oaks sub-watershed and routed to Prado Dam are subject mainly to channel percolation and evaporation losses. Based on estimated flow widths and wetted acres for the average daily discharges between Seven Oaks Dam and E Street in San Bernardino during the primary conservation period (March through May), and in conjunction with an estimated percolation loss of 1 cfs/day/wetted acre, flows reaching E Street are effectively reduced by 50 percent. From E Street to Prado Dam, discharges generated from sewage effluent continuously flow in the Santa Ana River commingling with the upper Santa Ana River discharges. Discharges are again reduced by 50 percent for losses.

At the OCWD spreading facilities downstream from Prado Dam under present pre- and post-construction conditions, the conservation operation at Prado Dam saves approximately 83 percent (238,000 AF out of 286,000 AF) of the flows with 17 percent (48,000 AF) “lost” to the ocean. Consequently, if conservation operations are conducted at Seven Oaks Dam, the yield at Prado Dam will be reduced by about 20 percent of the yield at Seven Oaks Dam for a given alternative. This reduction in the yield would probably be made up out of the 17 percent “lost” to the ocean. Estimates for water conservation yields at Seven Oaks are on the order of 2,500 to 5,000 AF per year. Twenty percent would be about 500 to 1,000 AF per year, which is less than 1 percent of the yield at the OCWD spreading facilities. These estimates indicate no significant impacts to yields at Prado Dam.

4.5.1.5 Downstream Impacts

The original premise of this study was that water conservation would have no adverse impact on the flood control function of the reservoir. To achieve this, the Buffer Pool must be evacuated prior to any major flood event or partially evacuated for lesser events. Water that is being held in the Buffer Pool awaiting recharge at the downstream spreading grounds is strictly a part of the proposed water conservation operation. Mitigation for damages to the downstream channel caused by evacuation of the Buffer Pool was determined to be the responsibility of the local sponsor (OCWD).

During and after the January and February 1969 floods, Prado Dam was operated to limit the discharges to a maximum of about 5,000 cfs after it was discovered that greater flows cause damages downstream. There are no significant damages for releases less than 5,000 cfs in the Santa Ana Canyon reach. There are some erosional damages to the Riverview Golf Course, located about 21 miles downstream from Prado Dam, with releases from Prado less than 5,000 cfs.

The Santa Ana River Project (SARP) Phase II GDM improvements to Prado Dam and the lower Santa Ana River are supposed to allow flood control releases up to 30,000 cfs without significant damages. The Phase II channel improvements in the lower Santa Ana River have been completed in Reaches 1 through 8 (Pacific Ocean to Weir Canyon Road). Reach 9 (Prado Dam to Weir Canyon Road) is scheduled to be constructed in two phases. Phase I construction was initiated in February 2003. Phase II construction is scheduled to commence in February 2004, depending on funding and real estate acquisition.

Most of the damages in the downstream channel from releases exceeding 5,000 cfs occur in the Santa Ana Canyon reach of the Santa Ana River (Reach 9). This reach is about 7 miles long and runs from Prado Dam to Weir Canyon Road. Reach 9 is mostly unimproved and even after Phase II modifications, will still sustain some damages, especially with higher releases. The Green River Golf Course is located within the Santa Ana Canyon reach and is subject to inundation and erosional damages.

As presented in Section 6.5 of the Hydrology and Hydraulics Report, the maximum discharge required to evacuate the Buffer Pool in 24 hours for each alternative is listed below.

Alternative 1	2,500 cfs
Alternative 2	5,000 cfs
Alternative 3	7,400 cfs
Alternative 4	14,900 cfs
Alternative 5	25,900 cfs

Since the maximum release required to evacuate the Buffer Pool for alternatives 1 and 2 is 5,000 cfs or less, there would be no significant damages in the Santa Ana Canyon reach for these alternatives. The total area of inundation for a flow of 5,000 cfs is 260 acres in the canyon area. For flows of 7,400 cfs, 14,900 cfs, and 25,900 cfs, the total areas of inundation are 361 acres, 770 acres, and 915 acres, respectively. Average velocities though the canyon area range from 6.5 fps for a release of 5,000 cfs to 7.4 fps for a release of 7,400 cfs to 8.5 fps for a release of

14,900 cfs and to 9.9 fps for a release of 25,900 cfs. Damages for alternatives 2, 3, 4, and 5 are presented in the Economics Report.

The potentially large releases required to evacuate the Buffer Pool can impact the downstream channel in two ways: an increase in frequency of inundation and an increase in frequency of erosion. Since releases of the same magnitude required for flood control purposes would cause the same damages, an effort was made to differentiate large releases attributed to water conservation operation from those which would happen under flood control operations. Average daily inflows for the representative period of record for Prado Dam were plotted on time series graphs and evaluated on a water year-by-water year basis to determine if the Buffer Pool for each water conservation alternative would have been evacuated ("dumped") assuming the Buffer Pool had been approved and in place for the entire period. Consideration was given to the status of the Buffer Pool (i.e., did it have water in it at the time of the event). The maximum discharge for each alternative required to evacuate the Buffer Pool listed above was assigned for each evacuation. Using this method does not completely account for false alarms or releases based on partially full pools. This approach is highly subjective, but the results are based on the best engineering judgement of Corps engineers experienced with the flood season operation of Prado Dam and is considered a "worst case" scenario that is used as a basis for determining environmental impacts. This subjective evaluation was performed with the Buffer Pool for all five Alternatives. The number of "dumps" per water year and a summary for each alternative are summarized in Table 67 of the Hydrology and Hydraulics Report. Since the Buffer Pools for Alternatives 1 and 2 can be evacuated in less than 24 hours at maximum discharges less than 5,000 cfs, the estimated number of "dumps" is the same.

The frequency of releases attributed to flood control were determined using the outflow-frequency curves shown on Plate 33 of the Hydrology and Hydraulics Report. The With-Existing Outlets curve is from the 1994 Water Control Manual for Prado Dam. The With-Phase II GDM Outlets curve is from Table 7-9 of DM No. 1, Volume 7, Phase II GDM on the Santa Ana River; for Post-Construction Present Conditions. Results are shown in Table 68 of the Hydrology and Hydraulics Report.

The frequency of releases attributed to both water conservation and flood control were converted to frequency of occurrence in the 50-year period of economic analysis by dividing the outflow-frequency by 50 for each alternative. These results are shown in Table 69 of the Hydrology and Hydraulics Report. Finally, the maximum releases in each of the 50 years are summarized in Table 70 of the Hydrology and Hydraulics Report.

4.5.1.6 Operation and Maintenance

As per the recommended plan, the current operation plan for Prado Dam will be modified to allow the outlet gates to be set to maximize water conservation at the downstream spreading facilities when the water surface behind the dam is below the designated Buffer Pool or Seasonal Pool elevation. A conceptual plan has been developed and is described in Appendix A, Hydrology and Hydraulics Report, Sections 6 and 8. A detailed operation plan will be determined at a later phase in this study. Under the conceptual plan, the Corps ROC, will have full discretion over when the reservoir will be placed in water conservation mode. The determination will be made based on water surface elevation, inflow to the dam, and meteorological forecasts. Gate changes will be performed by the Corps dam tender. When favorable conditions exist, personnel from OCWD will estimate the current infiltration capacity at the spreading grounds and request a release rate from Prado Dam. If weather conditions change or the water surface exceeds a certain elevation, the operation will switch to Debris Pool, Buffer Pool, Flood Control, or Seasonal Pool operation depending on impending weather forecasts and anticipated runoff. Releases from Prado Dam during the non-flood season while the reservoir is in Seasonal Pool operation will be made so as to maintain a 500 cfs running average to minimize environmental impacts.

Several factors may affect the water conservation operation at Prado Dam including: maintenance of the outlet gates or downstream channel; any other required maintenance; condition of the water itself (turbidity, debris); and condition of the downstream spreading facilities.

Maintenance of the operations area is performed by the Corps of Engineers. Maintenance of the recreational facilities is performed by San Bernardino and Riverside Counties under supervision and approval of the Corps of Engineers. Accumulated sediment and debris within the basin area is removed by the Corps (or Corps contractor) to assure the proper flood control function of the dam.

Presently the trap efficiency of sediment at Prado Dam is over 97%. With the addition of an increased Buffer and/or Seasonal Pools at Prado Dam, sediment accumulation would be insignificantly increased. Nevertheless the new operation plans must include a formal written agreement for removing sediment and debris from the reservoir that is directly attributable to water conservation operations. Coordination with OCWD is a requisite for water conservation operations. This coordination in the reservoir operation will allow for the highest volume of captured flows for recharge. It should be noted that if multiple daily adjustments of gate settings are required, after-hour adjustments, or weekend and/or holiday gate changes are requested, additional Corps manpower will be needed and funding will be required.

4.5.2 Hydraulics

Hydraulic Analysis included the potential for additional sediment to deposit behind Prado Dam. Evaluation of existing sediment deposition behind Prado Dam indicates that the deposition rate of 700 AF per year used in this report for existing condition is conservative. Historical data for the last 48 years indicates that the average deposition was about 580 AF per year.

SANTA ANA RIVER DRAINAGE AREA
WATER CONSERVATION FEASIBILITY STUDY

PRADO DAM

WATER CONSERVATION

HYDROLOGY APPENDIX
FINAL

Hydrology & Hydraulics Section
Hydrology & Hydraulics Branch
U.S. Army Corps of Engineers
Los Angeles District

July 2004

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ABBREVIATIONS AND ACRONYMS USED IN THIS APPENDIX

ALERT	Automated Local Evaluation in Real Time
API	Antecedent Precipitation Index
BLM	Bureau of Land Management
CBMWD	Chino Basin Municipal Water District
COE	Corps of Engineers
CRWQCB	California Regional Water Quality Control Board
DWR	Department of Water Resources
ER	Engineering Regulation
FCBOR	Flood Control Basin Operation Report
GDM	General Design memorandum
HEC	Hydrologic Engineering Center
LAD	Los Angeles District
Lat	Latitude
LATS	Los Angeles Telemetry System
Long	Longitude
MWD	Metropolitan Water District
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
OCEMA	Orange County Emergency Management Agency
OCPF&RD	Orange County Public Facilities and Resources Department
OCWD	Orange County Water District
PMF	Probable Maximum Flood
QPF	Quantitative Precipitation Forecast
RDF	Reservoir Design Flood
RFC	River Forecast Center (NWS)
ROC	Reservoir Operation Center
SARRT	Santa Ana River Real-Time (Model)
SAWPA	Santa Ana Watershed Project Authority
SPF	Standard Project Flood
TDS	total dissolved solids
TFR	total filterable residue
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDIS	Water Data Information System
WY	Water Year

UNITS

ac	acre	ft^3/s	cubic feet per second
af/yr	acre-feet per year	in	inch
af	acre-feet	mi^2	square miles
ft/mi	feet per mile	V	volume
ft	feet		

PRADO DAM

WATER CONSERVATION FEASIBILITY STUDY

1. INTRODUCTION.

1.1. **Purpose**. The purpose of this report is to present Feasibility level results of the analysis for enhanced water conservation at Prado Dam. The Hydrologic Appendix is limited to a presentation of the surface water yields, groundwater conditions, and water quality for Present and Future Conditions. For this study, five alternative water conservation operations, including the existing operation, at the reservoir were evaluated and the resulting average annual yields for the various alternatives are presented. The hydrologic models used are not intended to simulate historical operations at the reservoirs, but to establish a "Base Condition" which serves as a criterion for comparing the alternative pool levels for water conservation.

The main purpose of Prado Dam is to provide flood protection for the residents of Orange County downstream of the dam to the Pacific Ocean. The protection of the downstream floodplain takes priority over protection from inundation of reservoir lands and leaseholders. Notifications to reservoir land leaseholders are made whenever pre-determined water surface elevations are reached (or are expected to be reached).

Between storms, and after the flood season, the dam can be used to temporarily store water for conservation, with outflow from the dam no greater than the capacity of the Orange County Water District (OCWD) groundwater replenishment facilities located downstream from the dam. When the dam is regulated in this manner, Santa Ana River water along with reclaimed and imported water can be used to recharge the groundwater aquifers, one of the major sources of water supply for millions of people in Orange County. The alternative operation plans include: encroachment into the flood control pool at Prado Dam during the flood season when the outlook for flooding is minimal; plus, seasonal water conservation after the flood season.

One of the major premises of this study is that modifications to the operating plan for water conservation at Prado Dam will not have a significant impact on flood control, i.e., will not significantly decrease the level-of-protection afforded by the dam. To assure this, water being held for conservation must be evacuated prior to a major storm. Evacuation of the reservoir is based on estimates of inflow to Prado Dam. Reservoir Operation staff of the Los Angeles District will determine if an impending storm will bring significant inflow into the reservoir and how much the pool will need to be evacuated to account for the estimated inflow volume. This predicted inflow volume may require only partial evacuation of the pool or complete evacuation if the estimated inflow volume is substantial. The ROC staff will also determine when the gates should be closed at the tail end of storms in an effort to re-establish the pool to capture as much inflow as possible for recharge.

If large inflows are not forecasted, rapid evacuation of the reservoir for flood control purposes is not necessary or desired. This is particularly relevant for water conservation purposes as the end of the flood season approaches.

This report presents a comparison of the various alternatives and their effect on water conservation. The analyses were performed to determine the additional impacts that result from the water conservation alternatives, separate from the impacts that are associated with flood management efforts. Elevation-duration-frequency relationships for each alternative have been determined for Prado Dam. For use in environmental considerations, annual inundation durations for each alternative were developed and are presented in this appendix.

1.2. **Determination of Flood and Non-flood Seasons**. The "Flood Season" as defined in this study begins the 1st of October and concludes at the end of February. The"Non-Flood Season" runs from the 1st of March to the end of September. March is a transitional month when looking at the flood potential from a historical viewpoint. The threat of serious flooding diminishes around the 10th of March. From historic data, the remainder of the month has low flood potential. The basis for the March breakdown is the 2-day discharges which were determined in previous water conservation studies. The 2-day volume is the critical factor in implementing flood control releases at Prado Dam. The maximum 2-day discharge for inflow at Prado Dam for the period of record and the average of annual maximum 2-day discharges over the period of record show that after the 10th of March, a significant decrease of the 2-day discharges occurs. Currently, the maximum Seasonal Pool elevation can be expanded linearly from 494.0 ft to 505.0 ft from the 1st to the 10th of March.

Scheduling of dam maintenance operations has a high priority in relation to other project objectives. Routine maintenance of the dam and embankment usually takes place during July, August, and/or September (typically the lowest runoff months of the year). For maintenance activities requiring a dry reservoir area, such as servicing the gates, a release schedule which provides for outflow equal to inflow is implemented. The Memorandum of Agreement, signed by the Corps of Engineers and OCWD and approved in 1993, designates September as the month for this type of maintenance. Conversely, for maintenance of the downstream gage, outlet channel, or energy dissipater, it may be necessary to curtail reservoir releases, thereby creating an impoundment. The downstream maintenance may also take place in September if mutually agreed upon by the Los Angeles District (LAD) and OCWD. If the reservoir is operated for water conservation in September, an alternate maintenance period in October may be required, as determined by LAD, to ensure the capacity of the flood control pool will be available at the start of the flood season. Emergency or critical maintenance, as determined by LAD, may take place any time during the year and may require evacuation of the pool.

1.3. **Description of Water Conservation Terminology.**

1.3.1. **Yield** - Yield as used in this study is, the total volume of water delivered to the OCWD Spreading Grounds on an annual basis. This definition is consistent with Reservoir Yield as defined in the "Glossary of Hydrology", by Shuh-shiaw Lo, dated 1992 and distributed by the Water Resources Publications, which says "Reservoir Yield is the amount of water which can be supplied from the reservoir in a specified interval of time". The yield for Present Conditions is an estimate of the average annual volume of water presently diverted to the OCWD spreading grounds. The alternative operations evaluated in this study allow water to be held at Prado Dam (up to a certain elevation) until it can be accommodated by the downstream spreading grounds, which effectively increases the average annual yield. While the water surface is below the designated pool elevation, reservoir releases are limited to the intake capacity of the downstream spreading facilities[1].

1.3.2. **Water "Lost"** - Water "Lost" as presented in this Appendix is simply the difference between the average annual flow in the Santa Ana River above the Orange County spreading facilities minus the average annual yield for the downstream spreading grounds. In the hydrologic models, it is shown as the volume of water which passes by the spreading grounds diversion. The volume of water actually "lost" to the Pacific Ocean is affected by other factors en route such as evaporation, percolation, etc.

1.3.3. **Present Conditions** - Present Conditions are for water year 2003 in the watershed, which include urbanization estimated for the year 2003 and inflow from upstream reclamation plants. The elevation-area-capacity used in the models is based on the 1988 survey for Prado Reservoir. The Present Conditions long-term downstream capacity for daily spreading operations by OCWD is 500 ft^3/s.

1.3.4. **Future Conditions** - Future Conditions are for water year 2053. Urbanization adjustments were made to the daily inflows to represent changes over the 50-year project life. Future Conditions yields presented in this report include the effects of sedimentation. The sediment yield for Prado Dam was estimated to be 0.75 af per mi^2 per year. Thus for Future Conditions (WY 2053; 50 years) the sediment accumulation would be about 35,000 af. This volume was distributed throughout the reservoir up to spillway crest (el. 563.0 ft) and the elevation-area-capacity relationships were modified accordingly. The Future Conditions long-term downstream capacity for daily spreading operations by OCWD is 580 ft^3/s.

1.3.5. **Interim Conditions** - Interim Conditions are conditions for water years 2003 - 2008 in the watershed. At Prado Dam, only the outlets and the downstream channel components of the Phase II GDM design for Prado Dam are in place. Completion of the spillway crest raise from elevation 543.0 ft to 563.0 ft is scheduled to take place 5 years later. The elevation-area-capacity used in the models is based on the 1988 survey for Prado Reservoir. Interim Conditions are included to show the impact of not evacuating the pool prior to a major event.

1.3.6. **Debris Pool** - The debris pool (up to elevation 490.0 ft) is allowed to fill prior to flood control releases in order to prevent debris from entering and plugging the outlet works. There are no seasonal restrictions on inundation in the debris pool. Water can be released at a rate at which the downstream recharge facilities can accommodate (usually 0-600 ft^3/s).

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[1] During the non-flood season, the Reservoir Operation Center (ROC) in the Los Angeles District (LAD) main office tries to maintain a minimum average daily reservoir release of at least 500 ft^3/s to minimize environmental impacts.

1.3.7. **Buffer Pool** - Water can be stored behind the dam during the flood season up to a specific elevation (currently elevation 494.0 ft) over and above the designated Debris Pool when weather conditions are favorable. Releases from the reservoir are limited to the intake capacity of the downstream spreading facilities. If ROC personnel determine an impending storm will bring significant inflow into the reservoir, the Buffer Pool will be emptied enough to account for the estimated inflow volume. This predicted inflow volume may require the complete evacuation of the Buffer Pool, but does not require the entire Buffer Pool be evacuated every time a storm is forecast. The Buffer Pool is only meant for water to be held until it can be released for recharge. There is no intent to maintain a larger permanent pool at the reservoir.

1.3.8. **Seasonal Pool** - After the flood season is over, water can be stored behind the dam up to a specific elevation (currently elevation 505.0 ft) over and above the designated Debris Pool. Currently, releases from the reservoir are limited to the intake capacity of the downstream spreading facilities or 500 ft^3/s, whichever is larger. Under Future Conditions, the long-term spreading rate is approximately 580 ft^3/s. The Seasonal Pool maximum elevation is expanded linearly from the 1st to the 10th of March to the maximum Seasonal Pool elevation.

1.4. Description of Water Conservation Alternatives at Prado Dam.

The *Present Conditions* and *Future Conditions* results are based on all modifications from the Phase II GDM design for Prado Dam being in place (currently estimated for year 2008). Since, the water conservation alternatives are based on the Buffer Pool being evacuated prior to any major event, there will be no significant impact on flood control. Thus, the Recommended Alternative can be implemented as soon as the outlets are completed (as long as there is no impact on other Phase II construction activities). The *Interim Conditions* are based on completed modifications to the outlet structure and the downstream channel only. The Interim Condition applies from the time the outlet and downstream channel modifications are completed until the time when the interior dikes, dam embankment, and spillway modifications are completed. The Interim Conditions are only presented to show the impact on level-of-protection if the Buffer Pool is not evacuated prior to a major event.

The latest estimate for completion of the outlet and downstream channel improvements will be in water year 2003. The five alternatives (Alts. 1 to 5) listed below were evaluated under Present and Future Conditions. The average annual yields for Present and Interim Conditions are the same for each alternative; however, the risks associated for the same alternative, if the Buffer Pool is not evacuated, will be different (see Chapter 7 for more details).

The primary function under the operation plan for Prado Dam is to control the reservoir design flood. Gate changes are performed by the damtender upon instructions by the Los Angeles District Office, Reservoir Operation Center. Currently, the dam is operated in accordance with the September 1994 Prado Water Control Manual. For Alternatives 1 to 5, the current approved operation plan for the reservoir was modified to account for the improved outlet structure. Improvements to the downstream channel were assumed to have been completed for all alternatives.

1.4.1. **Alternative 1: Flood Season Water Conservation to Elevation 494.0 ft plus Non-Flood Season Water Conservation to Elevation 505.0 ft.** When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elev. 490.0 ft) can be used to provide incidental water conservation any time during the year. The existing operation schedule calls for controlled releases up to 600 ft^3/s until the reservoir reaches elevation 490.0 ft.

Also, during the flood season allow encroachment into the Flood-Control Pool up to elevation 494.0 ft (top of Buffer Pool) for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down enough (490.0 ft, if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. Beginning the 1st of March, the maximum allowable water surface elevation for conservation is linearly increased from elevation 494.0 ft to elevation 505.0 ft on the 10th of March. The pool may be maintained as high as elevation 505.0 ft until the 30th of September. However, if maintenance is required, the reservoir must be evacuated before the 1st of September. If summer flood runoff occurs in the month of September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment doesn't interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, the reservoir is put in full flood control mode and outflows can be made up to the downstream channel capacity of the Santa Ana River (approx. 30,000 ft^3/s).

1.4.2. **Alternative 2: Flood Season Water Conservation to Elevation 498.0 ft plus Non-Flood Season Water Conservation to Elevation 505.0 ft.** When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elev. 490.0 ft) can be used to provide incidental water conservation any time during the year. The existing operation schedule calls for controlled releases up to 600 ft^3/s until the reservoir reaches elevation 490.0 ft.

Also, during the flood season allow encroachment into the Flood-Control Pool up to elevation 498.0 ft (top of Buffer Pool) for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down enough (490.0 ft, if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. Beginning the 1st of March, the maximum allowable water surface elevation for conservation is linearly increased from elevation 498.0 ft to elevation 505.0 ft on the

10th of March. The pool may be maintained as high as elevation 505.0 ft until the 30th of September. However, if maintenance is required, the reservoir must be evacuated before the 1st of September. If summer flood runoff occurs in the month of September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment doesn't interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, the reservoir is put in full flood control mode and outflows can be made up to the downstream channel capacity of the Santa Ana River (approx. 30,000 ft^3/s).

1.4.3. **Alternative 3: Flood Season Water Conservation to Elevation 500.0 ft plus Non-Flood Season Water Conservation to Elevation 505.0 ft.** When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elev. 490.0 ft) can be used to provide incidental water conservation any time during the year. The existing operation schedule calls for controlled releases up to 600 ft^3/s until the reservoir reaches elevation 490.0 ft.

Also, during the flood season allow encroachment into the Flood-Control Pool up to elevation 500.0 ft (top of Buffer Pool) for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down enough (490.0 ft, if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. Beginning the 1st of March, the maximum allowable water surface elevation for conservation is linearly increased from elevation 500.0 ft to elevation 505.0 ft on the 10th of March. The pool may be maintained as high as elevation 505.0 ft until the 30th of September. However, if maintenance is required, the reservoir must be evacuated before the 1st of September. If summer flood runoff occurs in the month of September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment doesn't interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, the reservoir is put in full flood control mode and outflows can be made up to the downstream channel capacity of the Santa Ana River (approx. 30,000 ft^3/s).

1.4.4. **Alternative 4: Water Conservation to Elevation 505.0 ft Year-Round.** When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elev. 490.0 ft) can be used to provide incidental water conservation any time during the year. The existing operation schedule calls for controlled releases up to 600 ft^3/s until the reservoir reaches elevation 490.0 ft.

Also, during the flood season allow encroachment into the Flood-Control Pool up to elevation 505.0 ft (top of Buffer Pool) for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down enough (490.0 ft, if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can also be held up to elevation 505.0 ft (top of Seasonal Pool) for water conservation purposes. The pool may be maintained as high as elevation 505.0 ft until the 30th of September. However, if maintenance is required, the reservoir must be evacuated before the 1st of September. If summer flood runoff occurs in the month of September, the dam can be operated for water conservation up to elevation 505.0 ft, provided that the impoundment doesn't interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 505.0 ft, the reservoir is put in full flood control mode and outflows can be made up to the downstream channel capacity of the Santa Ana River (approx. 30,000 ft^3/s).

1.4.5. **Alternative 5: Water Conservation to Elevation 508.0 ft Year-Round.** When inflow to Prado Dam is greater than the percolation capacity of the downstream spreading grounds, the existing Debris Pool (elev. 490.0 ft) can be used to provide incidental water conservation any time during the year. The existing operation schedule calls for controlled releases up to 600 ft^3/s until the reservoir reaches elevation 490.0 ft.

Also, during the flood season allow encroachment into the Flood-Control Pool up to elevation 508.0 ft (top of Buffer Pool) for water conservation purposes when weather conditions are favorable. When the threat of unfavorable weather is forecast, the reservoir will be drawn down enough (490.0 ft, if necessary) to accommodate the anticipated inflow volume from the storm(s) to ensure there is storage available for flood control operations.

During the non-flood season, water can also be held up to elevation 508.0 ft (top of Seasonal Pool) for water conservation purposes. The pool may be maintained as high as elevation 508.0 ft until the 30th of September. However, if maintenance is required, the reservoir must be evacuated before the 1st of September. If summer flood runoff occurs in the month of September, the dam can be operated for water conservation up to elevation 508.0 ft, provided that the impoundment doesn't interfere with maintenance requirements.

Releases from Prado Dam, during water conservation operations, will be based on the estimated rate that the downstream spreading channel can percolate. If hydrologic forecasts and reservoir conditions indicate that the water surface elevation will exceed elevation 508.0 ft, the reservoir is put in full flood control mode and outflows can be made up to the downstream channel capacity of the Santa Ana River (approx. 30,000 ft^3/s).

1.5. **Analysis Overview**. The operation for Prado Dam was simulated using the HEC-5 computer program (Hydrologic Engineering Center's Simulation of Flood Control and Conservation Systems). The current approved operation plan for the reservoir was modeled and modified for Alternatives 1 to 5 to account for the improved outlets and downstream channel. The 1988 survey was used to estimate available storage and area. Inflows for a representative period of record were adjusted to account for urbanization and wastewater effluent. The HEC-5 models were used to estimate the water conservation yields at the downstream spreading facilities.

The models also include local inflow from the area between Prado Dam and the downstream spreading facilities. These flows were also established for the representative period. There were no adjustments to Present Conditions inflows, including the area downstream from Prado. The Future Conditions flows required adjustments for urbanization, effluent, and sediment deposition.

1.6. **Results**. The Present Conditions average annual yield for Prado Dam which is used for alternative comparison is 238,000 af. This is an estimate of the volume of surface water spread in the downstream OCWD spreading grounds. It includes releases from Prado Dam and local flow from the intervening area between Prado Dam and the downstream spreading facilities. The average volume of water "lost" to the Pacific Ocean for Present Conditions on an annual basis is approximately 48,000 af. The Future Conditions yield is 314,000 af with 68,000 af "lost" to the ocean. The final results for Alternatives 1 to5 at Prado Dam under Present and Future Conditions are summarized in Table 1.

2. DESCRIPTION OF WATERSHEDS.

2.1. Physiography and Topography.

2.1.1. **<u>Santa Ana River Basin</u>**. The Santa Ana River Basin drains approximately 2,450 mi^2, excluding a closed area of 32 mi^2 tributary to Baldwin Lake and 10 mi^2 tributary to Perris Reservoir. The Santa Ana River basin topography and drainage area map is shown on Plate 1. A schematic of the Santa Ana River watershed is presented on Plate 2. Of the total basin area, 2,255 mi^2 lie upstream of Prado Dam, the major flood control structure on the Santa Ana River. The recently completed Seven Oaks Dam controls runoff from the upper 177 mi^2 of the basin. Approximately 23% of the basin lies within the rugged San Gabriel and San Bernardino Mountains, 9% within the San Jacinto Mountains, and 5% within the Santa Ana Mountains. Most of the remaining area consists of lower-sloped valleys formed by a series of broad alluvial fan surfaces which abut the base of the mountain front. Numerous low foothills rise above the alluvial fan surfaces and include a range of hills north of San Bernardino; the Crafton Hills east of Redlands; the Jurupa Mountains north and west of Riverside; the Box Springs Mountains and the Badlands east of Riverside; and the Chino and Peralta Hills northeast of Anaheim.

In general, mountain ranges within the basin are steep and sharply dissected. Maximum elevations in the basin reach 10,080 ft at San Antonio Peak in the San Gabriel Mountains; 11,502 ft at San Gorgonio Mountain in the San Bernardino Mountains; and 10,804 ft at Mount San Jacinto in the San Jacinto Mountains. The San Bernardino Mountains contain the headwaters of the Santa Ana River and two of its principal tributaries, Bear and Mill Creeks. Lytle Creek, the largest tributary originating in the San Gabriel Mountains, is in the northwest portion of the watershed. The San Jacinto River has its origin in the San Jacinto Mountains southeast of Beaumont. The Santa Ana River has an average gradient of about 240 ft/mi in the mountains and about 20 ft/mi near Prado Dam. The average gradients of the principal tributaries are approximately 700 ft/mi in the mountains and 30 ft/mi in the valley areas.

The mountainous areas are expected to remain largely undeveloped during the entire project life. The valley areas above and below Prado Dam are presently partially urbanized and are expected to approach complete urbanization by the end of project life.

2.1.2. **Seven Oaks Dam (Upper Santa Ana River Basin)**. The Seven Oaks Dam watershed drains approximately 177 mi^2, excluding the closed area of 32 mi^2 tributary to Baldwin Lake. The headwaters lie within the rugged San Bernardino Mountains. Elevations vary from 10,664 ft at Anderson Peak and 11,502 ft at San Gorgonio Peak to 2,060 ft at the damsite, which is approximately 1 mile upstream from the canyon mouth. Generally trending southwesterly, the 27 miles of river upstream of the damsite have an average gradient of 300 ft/mi; however, some smaller tributaries originating in the high mountains have gradients that exceed 1,900 ft/mi. Bear Creek, the principal tributary within the Seven Oaks canyon area, comprises 55 mi^2 and possesses an average gradient of approximately 460 ft/mi. Well-developed growths of fir and pine occur above elevations of about 5,000 ft. Many steep slopes within the watershed are covered with a moderate to dense growth of chaparral and sage scrub. Lower slopes carry a heavy cover of grasses and forbs. The drainage area above the dam is expected to remain largely undeveloped during the project life.

2.1.3. **Lower Santa Ana River Basin from Prado Dam to The Pacific Ocean**. The Santa Ana River basin below Prado Dam comprises about 208 mi^2, excluding about 19 mi^2 tributary to Carbon Canyon Creek above Carbon Canyon Dam. The project reach of the lower Santa Ana River flows about 31 miles from Prado Dam through Santa Ana Canyon and the cities of Yorba Linda, Anaheim, Orange, Santa Ana, Fountain Valley, Costa Mesa, and Huntington Beach before emptying into the Pacific Ocean. Approximately 60% of the drainage area lies within the Santa Ana Mountains and the Chino Hills. Most of the remaining area lies within the broad coastal plain which extends southwestward to the Pacific Ocean. Numerous tributaries contribute to the Santa Ana River within this reach. The principal tributary is Santiago Creek which drains an area of approximately 102 mi^2. Other tributaries include Wardlow Canyon, Aliso Canyon, Gypsum Canyon, Blue Mud Canyon, Walnut Canyon, and Carbon Canyon Creek. The average gradient of these tributaries is about 300 ft/mi, while the average slope of the Santa Ana River from Prado Dam to the ocean is about 15 ft/mi.

2.2. **Geology and Vegetation**. The entire Santa Ana River Basin is underlain by a basement complex of crystalline metamorphic and igneous rocks, which appear on the surface only in the most mountainous parts of the watershed. In the foothills and valleys, the basement complex is overlain by a series of sandstones and shales. Unconsolidated alluvial deposits range in depth from a few feet within the mountains to more than 1,000 feet on the alluvial fans in the valleys. The existence of several precipitous mountain scarps along the upper boundaries of the watershed indicates that the area has been subjected to extensive folding and faulting. The soils in the mountains, which are derived mainly from metamorphic and igneous rocks, are shallow, poorly developed, and stony. On the lower slopes of the mountains and foothills, soils are mainly loams and sandy loams, ranging from less than 1 foot to over 6 feet deep. In the valleys, where soils are usually more than 6 feet deep, surface soils range from light, sandy alluvium to fine loams and silty clays with heavier subsoils.

The principal vegetal cover in the mountain and foothill areas consists of chaparral, sage, grasses, and scattered deciduous trees. Sycamores, alders, cottonwoods and willows encroach upon the stream channels at lower elevations. Large segments of the valleys and foothills have been cleared of most native vegetation due to extensive development, especially the area downstream of Weir Canyon Road. The remaining valley areas are mainly covered with orchards and field crops.

2.3. **Hydrometeorologic Characteristics**. In general, the Santa Ana River Basin has a mild climate with warm, dry summers and cool, wet winters. Both temperature and precipitation vary considerably with distance from the ocean, elevation, and topography. At the city of Corona, about 26 miles from the ocean and 710 feet above sea level, the average temperature is about 63° F, with extremes of 22° F and 118° F recorded. At Squirrel Inn, located in the San Bernardino Mountains at an elevation of 5,700 ft, the average temperature is about 53° F, with extremes of 0° F and 97° F recorded.

Precipitation characteristically occurs in the form of rainfall, although in the higher elevations some falls as snow. In general, the quantity of precipitation increases with elevation. The 97-year mean seasonal precipitation for the basin, which averages about 20 inches, varies from 10 inches south of the city of Riverside to about 45 inches in the higher mountain areas. Nearly all precipitation occurs during the months of December through March. Rainless periods of several months during the summer are common. A map of mean annual precipitation over the Prado drainage area is shown on Plate 3.

2.4. **Storm Types**. Three types of storms produce precipitation in the Santa Ana River Basin: general winter storms, local storms, and general summer storms. General winter storms usually occur from December through March. They originate over the Pacific Ocean as a result of the interaction between polar Pacific and tropical Pacific air masses and move eastward over the basin. These storms, which can last for several days, reflect orographic influences and are accompanied by widespread precipitation in the form of rain and, at higher elevations, some snow. Local storms can occur at any time of the year, either during general storms or as isolated phenomena. Those occurring in the winter are generally associated with frontal systems. These storms cover comparatively small areas, but result in high-intensity precipitation for durations of up to 6 hours. General summer storms in this area are usually associated with tropical cyclones and occur very infrequently. They are known to have occurred in the late summer and early fall months, but have not resulted in any major floods during the period of record.

2.5. **Runoff Characteristics**. Streamflow is perennial in the canyons of the Santa Ana River and in the headwaters of most of its tributaries. Due to year-round discharge from upstream sewage treatment plants, flow is also perennial in most valley segments of the Santa Ana River above Prado Dam. Streamflow increases rapidly in response to effective precipitation. High-intensity precipitation, in combination with the effects of steep gradients and possible denudation by wildfire, may result in intense sediment-laden floods, with some debris load in the form of shrubs and trees. Deposition of sediment occurs in the stream channels as they flow from the canyon mouths onto the lower-sloped valley floor surface. The urbanization taking place in the valley areas of the Santa Ana River Basin tends to make the basin more responsive to rainfall. Hence, the same rainfall occurring over an urbanized segment of the basin will result in higher peak discharges, with a shorter time to the peak and a greater volume than had it occurred over a natural basin without urbanization.

2.6. **Existing Structures**.

2.6.1. **Santa Ana River Basin above Prado Dam**. Big Bear Dam is the farthest upstream structure which would affect floodflows in this watershed. Big Bear Lake (shown on Plate 1) is a water-conservation reservoir, owned by the Big Bear Municipal Water District. The lake has a drainage area of about 38 mi^2 and has a surcharge storage of about 8,600 af between the top of the conservation pool and the top of the dam. Seven Oaks Dam, recently completed by the Corps of Engineers (COE), has a storage capacity of 145,600 af at spillway crest and has a drainage area of approximately 177 mi^2. San Antonio Dam, also built by the COE, is located on San Antonio Creek (see Plate 1), has a capacity of 8,535 af at spillway crest and controls approximately 26.7 mi^2.

Other existing flood control improvements, including those on Cucamonga, Deer, Lytle, and Cajon Creeks, have been constructed by the COE and local interests. These improvements include channelization, debris basins, storm drains, levees, stone and wire-mesh fencing, and stone walls along the banks of stream channels. The principal existing water conservation improvements are spreading grounds and reservoirs. The more than 100 water conservation and recreational reservoirs within the basin have storage capacities ranging in volume from less than 5 af to about 182,000 af in the case of Lake Mathews. Although most of the existing water-conservation improvements affect the regimen of the lesser floodflows, major floodflows are not appreciably affected. Lake Elsinore, the terminus for the San Jacinto River, has considerable potential influence on flood runoff, especially if its water-surface elevation is low at the beginning of a storm. Lake Elsinore has a dead storage capacity of about 123,000 af. When full, Lake Elsinore overflows into Temescal Wash, which joins the Santa Ana River near Prado Dam. A summary of these and other structures in the Santa Ana River Watershed is listed below.

2.6.2. **Lower Santa Ana River Basin From Prado Dam to The Pacific Ocean**. Two major flood control dams are located in the Santa Ana River Basin below Prado Dam. Carbon Canyon Dam, located on Carbon Canyon Creek, was built by the COE in 1961. Villa Park Dam was completed by the Orange County Flood Control District in January, 1963. Other existing flood control improvements have been constructed by local interests. These improvements include channelization, storm drains, levees, rip-rap and concrete side slope protection, and drop structures. The principal existing water conservation improvements are spreading grounds, recharge basins, and Irvine Lake (at Santiago Dam).

Location	Drainage Area (mi^2)	Storage (af)	Flood Control Capability
San Antonio Dam	27.6	8,535	Yes
Carbon Canyon Dam	19.3	6,614	Yes
Villa Park Dam	20.4	16,044	Yes
Big Bear Lake	38.0	63,381	No
Railroad Canyon Reservoir	641.0	11,459	No
Lake Elsinore	52.0	122,500	Overflow/Pumped*
Miller Basin	14.2	23	No
Santiago Dam	63.2	25,000	No
Santiago Creek Gravel Pits	9.1	13,299	No
Lake Mathews	40.0	182,804	No
Lake Hemet	67.0	14,000	No
Lake Perris	10.0	100,000	No

* Lake Elsinore acts as a natural sump for the San Jacinto River sub-basin. Flows from Lake Elsinore only occur during major flood events, when the lake is either pumped or actually overflows into Temescal Creek.

3. **BACKGROUND INFORMATION ON PRADO DAM.**

3.1. **General.** Prado Dam was authorized by Congress for "flood control and other purposes." The primary purpose is to provide flood protection to the metropolitan area of Orange County. During times of minimal flood threat the dam can be regulated to control runoff in order to supply water to the OCWD. The valley portion of the watershed above Prado Dam is rapidly urbanizing and consequently average annual runoff is increasing. Pertinent data for Prado Dam and Reservoir with Phase II GDM modifications in place are presented in Table 2. Pertinent data for Prado Dam and Reservoir prior to Phase II GDM modifications are presented in Table 3.

The current approved flood control criteria for Prado Dam acknowledges use of the reservoir for water supply up to elevation 490.0 ft. In addition, Prado Dam can be operated for water conservation during the flood season up to elevation 494.0 ft when weather conditions are favorable (Buffer Pool). After the flood season, Prado Dam can be operated for water conservation up to elevation

505.0 ft (Seasonal Pool). OCWD has requested the COE evaluate storing water at even higher elevations, up to elevation 514.0 ft, whenever possible. Historically, elevation 514.0 was the stage at which gated releases were initiated, and was the basis for the stipulated judgement that resulted from the water rights dispute of the Orange County Water District vs. City of Chino, et al, Riverside County Superior Court No. 117628, dated 17 April 1969. The stipulated judgement was reached between OCWD and the four major water users of the upper basin. All defendants and cross-defendants were dismissed except the four major public water districts within the SAR Basin, namely the; 1) San Bernardino Valley Municipal Water District (SBVMWD); 2) Western Municipal Water District (WMWD); 3) Chino Basin Municipal Water District (CBMWD; now called Inland Empire Utilities Agency - IEUA); and 4) OCWD. The judgement substantially settled all of the water rights issues of the SAR Basin. With regards to OCWD, the upper basins are responsible for assuring that 42,000 af of base flow reaches Prado Dam, and the OCWD is entitled to all flood waters which reach Prado Dam. It further stipulated that OCWD will be free to engage in any activity for water conservation or storage of the stormflow at or below Prado Reservoir. This study only evaluates alternative pools up to elevation 508.0 ft.

Reservoir storage that is not flood related can potentially impact on the other valid uses of the reservoir land, such as recreational facilities, protection of environmental resources, and others. Recent recreational development has been allowed in the reservoir at lower elevations, which conflicts with water supply storage above elevation 500.0 ft. Oil wells in the reservoir have been capped and abandoned and are located at elevations 492.0 ft and above. A listing of pertinent reservoir development and features is included in Table 4.

Recently discovered archaeological sites in the reservoir require LAD to avoid inundation of these low-lying areas until studies to determine National Register eligibility, and a data recovery program to mitigate for adverse effects are completed and implemented. In addition, the U.S. Fish and Wildlife Service proposed in 1985 that all Prado Reservoir land below 543.0 ft be listed as critical habitat for the Least Bell's vireo, an endangered species. Due to the many sensitive environmental concerns in the reservoir, any significant change to the water control plan for Prado Dam and Reservoir would most likely require an Environmental Impact Statement.

Based on the current approved operation schedule for Prado Dam, ROC personnel continue to operate Prado Dam in a manner that will provide as much water supply to OCWD as possible consistent within the many constraints of the reservoir's environmental resources and land uses. Often deviations from the flood control operations of Prado Dam, such as protecting downstream channel repair work, are also beneficial to OCWD's water supply operations.

3.2. **Pertinent Information on Prado Dam and Reservoir**. Construction of Prado Dam was completed in May 1941, as part of a general plan for the construction of flood control facilities in the Santa Ana River Basin. The dam is located on the Santa Ana River 31.2 miles upstream from the Pacific Ocean. Plate 1 is a drainage area map of the Santa Ana River system. The pertinent data for Prado Dam with the Phase II modifications in place are shown in Table 2. A reservoir storage allocation diagram for existing Prado Dam and Reservoir is presented on Plate 3. A reservoir storage allocation diagram for Phase II Prado Dam and Reservoir is presented on Plate 4a.

Prado Dam (prior to Phase II modifications) is an earthfill dam with a height above the original streambed of 106 feet. The dam crest is 2,280 feet long. The reservoir formed by the dam will hold approximately 186,700 af of water at spillway crest (1988 survey) and cover about 6,567 acres of land. Spillway crest is at elevation 543.0 ft. The reservoir outlet sill is at elevation 460.0 ft. The current outlets are made up of 6 gates, each 7 feet wide by 12 feet high flowing through two 13.5 feet wide by 13.5 feet high conduits. The current (1988 survey) elevation-area-capacity tables are presented in the Hydraulics Appendix.

Prado Dam subsequent to Phase II GDM modifications includes an earthfill embankment rising 124 feet above the streambed, with a crest length of 3,050 feet. The reservoir formed by the dam will hold about 351,700 af of water at spillway crest (1988 survey), covering about 10,280 acres of land. Spillway crest is at elevation 563.0 ft. The reservoir outlet sill is at elevation 470.0 ft. The proposed design has 6 gates, each 9.75 feet wide by 14.75 feet high. There will be two intake structures with trash racks. The design also includes two 3 feet diameter steel pipe conduits for releasing low flows each with knife gates valves. The low-flow valves can pass a total of 350-400 ft^3/s with the water surface at elevation 505.0 ft.

3.3. **Current Water Control Plan For Prado Reservoir**. Prado Dam is one element in the flood control system protecting downstream Orange County. Plate 1 illustrates the location of Prado Dam and other pertinent features of the Santa Ana River system. The downstream channel is managed by Riverside County for about the first 2.8 miles below the dam and then by Orange County Public Facilities and Resources Department (OC PF&RD), formerly the Orange County Environmental Management Agency (OCEMA), for the remaining distance to the Pacific Ocean. The dam achieves flood control by capturing large inflows and releasing lesser flows that are non-damaging. During the winter flood season extending from October 1st to the end of February, the reservoir should be lowered as rapidly as possible after each large inflow into the reservoir to create storage space for the control of any future inflow. However, if no large inflow is forecasted, rapid evacuation of the reservoir for flood control purposes is not necessary. This is particularly relevant for water conservation purposes as the end of the flood season approaches.

Prado Dam was originally constructed in 1941 with six gated and two ungated outlets. The design of the dam, outlet works and the water control plan were based on a Reservoir Design Flood (RDF) and a spillway design flood (Probable Maximum Flood - PMF) determined using the current hydrologic information and design standards at that time. The original water control plan was designed to control the reservoir design flood to a 9,200 ft^3/s outflow and consisted of gated releases commencing at elevation 507.0 ft. Due to the ungated outlets, there was no permanent or controllable debris pool as is operating today. In 1942, following the completion of the dam, a refined gate operation schedule was developed at the request of the Chief of Engineers. This schedule specified beginning gated releases at elevation 515.0 ft and controlled the reservoir design flood to a 9,700 ft^3/s maximum outflow.

In 1945, the water control plan was revised in anticipation of the closure of the west ungated outlet requested by OCWD in 1944. The new gate schedule consisted of initiating gated releases at elevation 514.0 ft and controlled the reservoir design flood to a 9,200 ft^3/s maximum outflow.

In June 1967, a study was initiated to review the design features of existing dams in the Los Angeles District. The hydrology of the Prado Dam drainage area was subsequently reviewed and revised based on the latest technical criteria, the determination of the size of the historical Agua Mansa flood of 1862, data from the U.S. Weather Bureau, data from stream and precipitation gages, and information on projected development in the upper basin. As shown in the following tabulation, the revised reservoir design and spillway design floods are significantly larger than the floods used in the original design (The revised design discharges will be reduced slightly upon completion of Seven Oaks Dam.)

	Original Design	Revised Design	
		present	future
Reservoir Design Flood			
Peak ft^3/s	193,000	282,000	317,000
Volume af	275,000	488,000	574,000
Spillway Design Flood (Probable Maximum Flood)			
Peak ft^3/s	289,000	670,000	700,000
Volume af	233,000	1,447,000	1,543,000

Reservoir routing of the revised Standard Project Flood (SPF) resulted in significant spillway flows and indicated that Prado Dam could control less than a 100-year flood. In February 1968, a new water plan was approved by the Chief of Engineers which provided the maximum flood control protection possible for Orange County. The new gate operation schedule specified gated releases beginning at elevation 490.0 ft. Elevation 490.0 ft is considered the lowest elevation that gated flood control releases could be made without the creation of vortices that could draw floating debris into the gates. This plan specified a maximum release of 9,200 ft^3/s but still could not control the 100-year flood without experiencing uncontrolled spillway flows; however, it maximized the utilization of reservoir storage to control floods.

During the January and February 1969 floods, Prado Dam was operated to limit the discharges to a maximum of about 5,000 ft^3/s after it was discovered that greater flows would cause downstream damage. Additionally, in May 1969, the Los Angeles District granted OCWD a temporary permit to close the east ungated outlet. Given these considerations, a water control plan was developed and approved by the Chief of Engineers in August 1969. This plan specifies building a debris pool to elevation 490.0 ft to avoid vortices which could draw floating debris into the gates. Gated releases are then initiated for flood control purposes at elevation 490.0 ft and maximum reservoir releases are ultimately limited to 5,000 ft^3/s. When the water surface elevation is near or below 490.0 ft, releases are coordinated with OCWD for water conservation purposes. This plan also cannot control the 100-year flood without uncontrolled spillway flow, however, it provided the maximum flood protection possible for Orange County.

The operating plan in the current Water Control Manual (dated September 1994) consists of winter flood forecasting to elevation 494.0 ft for water conservation and increasing the maximum allowable conservation pool elevation from 494.0 ft to 505.0 ft linearly from March 1st to March 10th. After March 10th, the pool is allowed to remain at 505.0 ft or rise to that level depending on the amount of runoff that occurs. All water in storage will be released prior to the 1st of September of each year if maintenance of the reservoir and facilities is required. Table 5 presents the current approved reservoir regulation schedule for Prado Dam. A similar schedule for the Recommended Alternative will be prepared during the next phase of this study.

3.4. **Regulating Agencies**. The Los Angeles District Corps of Engineers is solely responsible for the regulation of Prado Dam. The Los Angeles District coordinates its management efforts with other federal, state and local agencies which are affected by impoundments within the reservoir control basin or releases from Prado Dam. These include, but are not limited to:

a. U.S. Bureau of Land Management (BLM), which regulates the mineral rights of reservoir lands held in fee by the U.S. Government.

b. California State Department of Fish and Game, which has regulatory responsibility for fishing and hunting activities as well as for protecting habitat and fauna within the basin.

c. U.S. Fish and Wildlife Service (USFWS), which is responsible for the conservation, protection and enhancement of fish, wildlife, and their habitats.

d. San Bernardino County and Riverside County, which operate parks and recreational facilities within the basin.

e. City of Corona, which operates a park, a general aviation airport, and a wastewater reclamation plant and percolation ponds in the southeastern portion of the reservoir.

f. Orange County Water District (OCWD), which owns land within the basin and operates groundwater recharge facilities within and adjacent to the Santa Ana River, downstream of Prado Dam.

g. Orange County Public Facilities and Resource Department (OCPF&RD), which is responsible for maintenance of the Santa Ana River channel within Orange County.

h. Northwest Mosquito Abatement District. Mosquito abatement within the Prado reservoir area falls within the jurisdiction of this agency.

4. BACKGROUND INFORMATION ON ORANGE COUNTY WATER DISTRICT.

4.1. **General.** OCWD is an agency authorized by the State of California, created and existing for the specific purpose of managing, regulating, and protecting the quality and quantity of groundwater resources within Orange County. The boundaries of OCWD are in the County of Orange, State of California, and encompass approximately 206,819 acres of land.

OCWD serves as a vital function in the supply of water to Southern California. The Southern California region is semi-arid, and generally does not produce sufficient natural water supplies to meet the demands of the residents, industry, and agricultural users in the area. However, the boundaries of OCWD overlie a large, easily accessible groundwater basin. This basin is, in effect, a large natural underground reservoir which, when full, can store at least ten million af of water. The groundwater resources within OCWD are critical to the water needs of the residents and water users within Orange County, particularly due to the historical urbanization of lands within the OCWD boundaries. OCWD records indicate that in 1935, for example, approximately 110,000 persons resided within the boundaries of OCWD, with a corresponding beneficial water demand of 240,000 af per year. In 1984, by contrast, approximately 1.7 million persons resided within OCWD boundaries, and this increased urbanization has generated a current beneficial water demand of 430,000 af per year. The groundwater resources managed and protected by OCWD provide for the beneficial use of OCWD's residents and water users, of sufficient potable water to satisfy 60 to 70% of their beneficial water demand, or some 250,000 to 270,000 af per year.

Water demand within OCWD which cannot be satisfied through groundwater production must be met through the delivery of water "imported" from Northern California and the Colorado River by the Metropolitan Water District of Southern California (MWD). These imported water supplies provided by MWD are very expensive in relation to groundwater, because of the ever-escalating energy costs incurred in transporting imported water over and through mountain ranges and into southern California. Recent statements issued by MWD indicate that the cost of imported water will most likely increase dramatically in the next several years. The future supply of imported water is also undependable; for example, MWD's allocation of water from the Colorado River will be reduced by almost 50% as a result of a court ruling that allocated a quantity of Colorado River water to the State of Arizona.

4.2. **Operation of the OCWD Groundwater Recharge Facility.** OCWD regulates and protects the quantity of groundwater resources within its boundaries by replenishing the groundwater basin with waters flowing in the Santa Ana River. OCWD owns all rights, title and interest in any and all waters flowing in the Santa Ana River into Prado Dam. In addition, by virtue of the previously discussed judgement stipulating the rights to waters within the Santa Ana River basin entitled OCWD v. City of Chino, et al., OCWD has the annual right to receive 42,000 af of "base flow" waters at Prado Dam, together with the right to all stormflows reaching Prado Dam. OCWD utilizes these Santa Ana River flows to replenish its groundwater resources by causing the river flows to be diverted into L-levees in the river and adjacent spreading basins (large, porous ponds, lakes, and pits) owned by OCWD. The flow of these diverted waters is slowed to allow percolation into the groundwater basin. The average annual inflow to Prado Dam for the representative period of record, Present Conditions, including baseflow and stormflows, is about 278,000 af. The average annual flow from the local area between Prado Dam and the spreading facilities is about 8,000 af. Of the total flow of 286,000 af, OCWD can save about 83% of that runoff under Present Conditions.

OCWD diverts Santa Ana River flows into its in-channel and off-channel spreading basin facilities by means of a system of temporary earthen berms, rubber dams, and permanent gated facilities. A map of the OCWD spreading basins is shown on Plate 5. General characteristics of the facilities are shown in Table 6.

The earthen diversion structures are constructed from sand and earth in the bed of the Santa Ana River, both within, and adjacent to the flood control channel of the Santa Ana River. These berms, which are constructed with vehicular tractors and dozers, are constructed to a height of four to six feet, and are situated within the river bed both parallel and perpendicular to riverine flow. The earthen diversion structures are constructed in approximately six miles of the flood control channel of the river, from the headwater of the diversion system situated in the Santa Ana River channel between Imperial Highway and Lakeview Avenue in the City of Yorba Linda, to the railroad crossing downstream of Ball Road in the City of Anaheim. In total, approximately fifteen miles of earthen diversion facilities are constructed and utilized in conjunction with OCWD's permanent gated diversion facilities to divert the Santa Ana River flows into approximately 1,250 acres of spreading areas and basins acquired by OCWD for the specific purpose of groundwater replenishment.

In 1992, the OCWD completed the first of its two inflatable/deflatable rubber dam projects on the Santa Ana River. The completed rubber dam, which is located on the Santa Ana River near Imperial Highway, is designed to divert up to 500 ft^3/s of Santa Ana River flows into off-channel spreading grounds for underground basin replenishment, and by-pass an additional 500 ft^3/s around the rubber dam. In order to accommodate flood discharges, the rubber dam is designed to deflate automatically during large flows. According to OCWD, this rubber dam can remain inflated up to flows in the magnitude of 2,000 ft^3/s; however, OCWD's water conservation operation during such high flow rates requires an approval from the OC PF&RD. The second rubber dam which is located above the Santa Ana River confluence with Carbon Canyon diversion channel, was completed in the latter part of calendar year 1993. This rubber dam has a diversion capacity of 500 ft^3/s and can by-pass an additional 250 ft^3/s.

Since at least 1969, LAD has worked with OCWD to conserve baseflow and stormflow entering the Prado Dam basin, in order that these flows might be released from Prado Dam into the Santa Ana River at controlled rates, thereby permitting OCWD to divert the flows into its spreading basins to replenish OCWD's groundwater basin. In order to permit these flows to be diverted by OCWD into its spreading basins, the flows must be released at a rate up to approximately 500 ft^3/s (Future Conditions long-term rate is 580 ft^3/s). If the river waters flow through the channel at a rate greater than 500 ft^3/s, the earthen berms begin to wash out and water flows past OCWD's diversion structures and is lost to the Pacific Ocean. Without the cooperation of the LAD in operating Prado Dam conjunctively for flood control and water conservation, this otherwise usable water would be “lost” to the Pacific Ocean.

5. RESERVOIR SIMULATION.

5.1. **Representative Period of Record**. Runoff records for inflow into Prado Dam exist for the period 1920-present. Determining a representative period of record facilitated data management and presented a more reasonable picture of current conditions. Establishing the representative period of record required the examination of long-term records of annual totals for precipitation gages and annual volumes for stream gages located in various areas above Prado Dam.

Five precipitation gages with long-term records were selected for study, including Big Bear Lake, Santa Ana Powerhouse #3, San Antonio Heights, City of San Bernardino, and Lytle Creek Ranger Station. Four stream gages with long-term records were selected for their location in undeveloped drainages, and hence, were unaffected by urbanization. Pertinent information for the precipitation and stream gages used in determination of the representative period of record is presented in Tables 7 and 8, respectively. Gage locations are illustrated on Plate 6.

The mean of all of the gages was computed for the period of record. Yearly departures from the mean value were also computed along with their cumulative total for each gage. The cumulative departures were plotted for the entire period of record. Based on the criteria of the smallest departure from the mean, the period 1950-1988 was selected as representative. Justification for the selection of this period as representative is evident by the inclusion of an entire wet and dry cycle. Plates 7 and 8 present plots of cumulative departures for the precipitation and stream gages, respectively.

5.2. **Data Collection**. The raw inflow data used in this analysis was in irregular time series format. The inflow data was extracted from COE historical reservoir databases using the Data Storage System (DSS) utilities and re-written to new database files and average daily inflows for the representative period of record were calculated. The data was screened and missing values were interpolated from the existing data.

5.3. **Inflow Adjustments.**

5.3.1. <u>**General**</u>. The mean daily flows for the representative period of record required adjustments in order to properly simulate flows for Present (WY 2003) and Future (WY 2053) Conditions. The adjustments made for the analysis are summarized below. The complete documentation can be found in the "Hydrology Appendix for Prado Dam Water Conservation Study, Santa Ana River Basin, Orange County, California", dated June 1988.

The adjustments were performed on inflow discharges to Prado Dam and on discharges from the subarea between Prado Dam and Imperial Highway contributing to the total runoff reaching the OCWD spreading grounds. The first adjustment was to remove imported water from the mean daily flows. Imported water was not evaluated as part of this study. Imported water was determined from the Santa Ana River Watermaster annual reports. The inflow, less imported water, was then separated into its components of wastewater effluent, baseflow, and direct runoff from precipitation.

Wastewater effluent and direct runoff were then adjusted and recombined with baseflow to yield final adjusted mean daily flow for the representative period of record.

5.3.2. **Wastewater Effluent Adjustments**. Wastewater effluent was considered in determining the average annual yield for Prado Dam. According to the 28th Annual Report of the Santa Ana River Watermaster for Water Year October 1, 1997 - September 30, 1998, there are 14 wastewater treatment plants discharging to the Santa Ana River above Prado Reservoir. The plants are listed below.

Beaumont
Carbon Canyon Water Reclamation Facility (CCWRF)
Colton
Corona
Inland Empire Utility Agency (IEUA; formerly Chino Basin Municipal Water District) - 3 plants
Rapid Infiltration and Exchange Facility (RIX) for San Bernardino and Colton
Redlands
Rialto
Riverside
San Bernardino
Western Riverside County Regional Wastewater Treatment Plant (WRCR)
Yucaipa

The San Bernardino and Colton plants now send discharge to the RIX where it is percolated and pumped and eventually discharged to the Santa Ana River. Discharges from the Beaumont, Yucaipa, and Redlands plants were eliminated from consideration due to their considerable distance from Prado Dam, thereby contributing no direct runoff into the reservoir. The WRCR, RIX, and IEUA #4 plants have come on line only recently and were included for Future Conditions.

The Eastern Municipal Water District (EMWD) currently has 5 facilities in the San Jacinto watershed. One plant is currently off-line, and flow is diverted to one of the remaining four. In most years, 70-75% of the treated effluent is used (typically irrigation) with the remainder "lost" to evaporation or percolation. On rare occasions during very wet years, treated effluent is actually discharged to Temescal Wash. This volume is relatively small and along with the distance from Prado Dam, does not significantly impact inflow to the reservoir.

To determine the effluent discharge adjustment for the representative period of record for Present and Future Conditions, daily contributions of wastewater for each plant were compiled for the period 1950-1988; missing values were estimated using straight-line interpolation. An adjustment to Present Conditions was accomplished by taking the difference between the daily effluent discharge for the representative year in question and the water year 2003 estimate, then reducing that value by 10 percent to account for losses between the plants and Prado Dam. The 10 percent reduction was an estimate from the Santa Ana River Watermaster Reports. Finally, the resulting flows were added back into the adjusted daily flow record for that year. The adjustment to Future Conditions (WY 2053) was accomplished similarly using projected estimates of total daily effluent.

5.3.3. **Direct Runoff Determination**. Flow in the valley portion of the Santa Ana River above Prado Dam is perennial due to imported water and discharge from wastewater treatments plants along with the contribution of direct runoff from storm events. Baseflow into Prado Dam is primarily made up of wastewater effluent and imported water. In order to adjust for Future Conditions, baseflow needed to be separated from direct runoff to Prado Dam.

Baseflow, as a component of inflow into Prado Dam, was derived from observations of recorded flows. During periods with no storm activity, baseflow is equal to the total inflow. During periods with storm activity, baseflow was determined using a hydrograph separation technique. A comparison of the daily inflow record to Prado Dam with historical precipitation data was made to determine inflow events affected by rainfall. Baseflow fluctuates slightly due to changes in releases from upstream treatment plants or addition of imported water. It was noted from the comparison of historic flows and precipitation gage records that when the mean daily flow increased by about 29% (on average) from the previous day, there was storm activity recorded at the upstream precipitation gages.

A Fortran computer program was written to calculate each occurrence in the representative period of record inflow when the mean daily flow exceeded the previous day's mean flow by more than 29%. When the mean daily flow did not exceed the previous mean daily flow by more than 29%, the total inflow was set equal to the baseflow. When the mean daily flow exceeded the previous mean daily flow by more than 29%, the baseflow was computed as an average of the four previous mean daily values. Succeeding mean daily values of baseflow were increased linearly during the storm period. The rate of increase was estimated to be about 20% per day based on the length of the period of storm runoff. The computer program multiplied each succeeding mean daily flow value by 1.2 until the mean daily flow equaled the total inflow. When the current value of baseflow equaled or exceeded the current value of inflow, the storm hydrograph was assumed ended. The baseflow was then determined to be the current value of inflow until the next storm event.

Once baseflow was determined, it was subtracted from the total inflow for the representative period of record. The remaining flow (less the imported water) was considered direct runoff from storm events. Adjustments were made to the direct runoff to account for Future Conditions.

5.3.4. **Direct Runoff Adjustments**. The direct runoff adjustment was based solely on the increase due to urbanization. Accounting for Future Conditions required the tabulation of Riverside and San Bernardino County population projections for years 2003 and 2053. Percentages of impervious cover were assumed for each value, plotted, and yearly percentages were determined by straight line interpolation between the two. Mountain areas were assumed to be unaffected by urbanization, hence, mountain discharges over the period of record remained unchanged. A complete description of the direct runoff adjustments is documented in the "Hydrology Appendix for Prado Dam Water Conservation Study, Santa Ana River Basin, Orange County, California", dated June 1988.

5.4. Operation Criteria.

5.4.1. **General**. The September 1994 operation schedule for Prado Dam, with modifications to the release schedule to account for the improved downstream channel, were incorporated into HEC-5 computer models and releases from the dam were made according to the modified schedule. The September 1994 Reservoir Regulation Schedule for Prado Dam is shown on Table 5. The release schedule for Present and Future Conditions for the flood and non-flood seasons used in the HEC-5 models is presented in Table 9. The elevation-area-capacity relationship used to model Prado Dam is based on the 1988 survey. The Present and Future Conditions elevation-area-capacity relationships used in the HEC-5 models are presented in Tables 10 and 11, respectively.

The HEC-5 "Simulation of Flood Control and Conservation Systems" computer program was utilized to simulate the Prado Dam conservation operation for the representative 39 years of record. An HEC-5 data model schematic for Prado Dam is shown on Plate 9. Output data from the program included daily reservoir storages, releases, and elevations, as well as water diverted to the spreading facilities and water "lost" to the ocean. Inflow to the spreading grounds was simulated using a channel discharge versus diversion discharge relationship at a point downstream from the reservoir representing Imperial Highway. Present and future downstream capacities for spreading operations were coordinated with OCWD. The Present Conditions capacity was determined to be 500 ft^3/s year-round. The Future Conditions capacity was estimated to be 580 ft^3/s year-round. Average daily inflows were routed through the reservoir and a portion of the outflow (500 ft^3/s or 580 ft^3/s) was diverted to the spreading grounds. The total flow diverted over the representative period of record was then divided by the total number of days and converted to an annual value. This value represents the average annual yield. HEC-5 annual model results for Present Conditions are presented in Tables 12-16. Future Conditions results are shown in Tables 17-21.

5.4.2. **Gate Operation Schedule**. The flood control operation plan for Prado Dam is designed to provide protection to the metropolitan area of Orange County. Gate changes are performed by a COE damtender upon instructions from the Los Angeles District Office. Currently, the dam is operated in accordance with the September 1994 Prado Water Control Manual.

Based on the Water Control Plan, the Los Angeles District impounds water to form a debris pool up to elevation 490.0 ft at the start of significant inflow. During the flood season, the operation schedule calls for controlled releases for water conservation up to 600 ft^3/s until the reservoir reaches elevation 494.0 ft. The reservoir is put in flood control mode if water control personnel determine the water surface elevation will exceed elevation 494 ft. Releases are increased according to the gate operation schedule; which is based on the current water surface elevation. With the Phase II GDM outlet modifications completed and when the water surface reaches elevation 540.0 ft, releases are at the maximum of 30,000 ft^3/s. The water conservation pool can be expanded linearly from 494.0 ft to 505.0 ft from the 1st to the 10th of March. After the 10th of March, controlled releases up to 600 ft^3/s for water conservation can be continued until the water surface reaches elevation 505.0 ft. If the water surface exceeds elevation 505.0 ft, releases are increased according to the gate operation schedule. All water in storage may be required to be released prior to the 1st of September of each year to permit maintenance of the reservoir and facilities and to ensure the capacity of the flood pool will be available at the start of the flood season.

The gate operation schedules used in the HEC-5 simulation models were derived from the current approved operation plan. Releases were modified as appropriate to reflect the larger water conservation pool levels.

5.5. **Evaporation.** Evaporation was computed by compiling average monthly pan evaporation at Lake Mathews and the average monthly precipitation at Corona from Riverside County's "Hydrologic Data for 1979-80, 1980-81, 1981-82 Seasons". Each station was selected for its proximity to Prado Dam. Using the net evaporation equation for reservoirs:

Net Reservoir Evaporation = 0.70 (EVAP - PRECIP)

where;

0.70 = the Pan Coefficient for this region;
EVAP = Average Monthly Pan Evaporation; and,
PRECIP = Average Monthly Precipitation

All units presented are expressed in inches per month.

The average monthly evaporation rates for Prado Dam used in the HEC-5 models are presented in Table 22.

5.6. **Impact of Seven Oaks Dam on Prado Dam Yields**. During storm events when Prado and Seven Oaks Dams are operated in flood control mode, releases from Seven Oaks Dam are curtailed until the inflow hydrograph to Prado Dam is on the falling limb (under the GDM proposed operation for Seven Oaks Dam). From observation of recorded hydrographs from historic events and synthetic frequency hydrographs, the elevation at Prado Dam tends to start falling about 1 to 3 days after the start of inflow depending on the size of the event. This tandem operation has a significant impact on flood control, but little impact on water conservation yields except for a delay in the start of water conservation operations. The volume of flow reaching Prado does not change significantly and the average annual yields presented in this report, averaged over the project life, are not affected.

Previous feasibility level studies for water conservation at Seven Oaks Dam were conducted and a report entitled "Seven Oaks Dam Water Conservation, Santa Ana River Basin, California", by the Los Angeles District, U.S. Army Corps of Engineers was published in June 1997. This study investigated using the debris pool during the flood season and an expanded Seasonal Pool during the non-flood season for water conservation. The debris pool is filled in only about two-thirds of the years. This means no additional yield is available, beyond the incidental yield from the debris pool, in about one-third of the years. Estimates for water conservation yields at Seven Oaks for likely alternatives were on the order of 2,500 - 5,000 af per year.

A major percentage of the yield at Seven Oaks Dam is produced in years when water is "lost" at Prado Dam. Infiltration and evaporation losses between Seven Oaks And Prado Dams are not a factor in these years since these losses only reduce the amount of water "lost" at Prado Dam.

The remaining yield at Seven Oaks Dam is in years when water is not "lost" at Prado Dam. During these non-flood years, flows generated in the Seven Oaks watershed and routed to Prado Dam are subject mainly to channel percolation and evaporation losses. Based on estimated flow widths and wetted acres for the average daily discharges between Seven Oaks Dam and E Street in San Bernardino during the primary conservation period (March through May), and in conjunction with an estimated percolation loss of 1 ft^3/s/day/wetted acre, flows reaching E Street are effectively reduced by 50%. From E Street to Prado Dam, discharges generated from sewage effluent continuously flow into the Santa Ana River commingling with the upper Santa Ana River discharges. Based on measurements of treated effluent and amounts reaching Prado Dam, about 10% of the flow is lost between E Street in San Bernardino and Prado Dam. Hence, non-flood flows will be reduced by an estimated 60% between Seven Oaks and Prado Dams.

Consequently, if water conservation operations are conducted at Seven Oaks Dam, the yield at Prado Dam is reduced by about 20% of the yield at Seven Oaks Dam for any given alternative (take the percent of years when water is not "lost" at Prado Dam and multiply by the amount of non-flood flows actually reaching Prado Dam, 40%). Based on yields from 2,500 - 5,000 af per year, twenty percent would be about 500 - 1000 af per year, which is less than 1% of the total yield at the OCWD spreading facilities for any of the Prado alternatives.

At the OCWD spreading facilities downstream from Prado Dam under Present Conditions, the conservation operation at Prado Dam saves approximately 83% (238,000 af out of 286,000 af) of the flows with 17% (48,000 af) "lost" to the ocean. The reduction in the yield at Prado Dam from water conservation operations at Seven Oaks would normally be made up out of the 17% "lost" to the ocean. These estimates indicate no significant impacts to yields at Prado Dam.

5.7. **Elevation-Duration-Frequency Analysis**. Elevation-duration-frequency curves were developed for Present and Future Conditions in order to assess environmental and recreation impacts. The curves were derived by routing average-daily inflow data from October 1, 1949 to September 30, 1988 through Prado Dam using the HEC-5 computer models. The resulting simulated daily water surface elevations were ranked by magnitude for durations 1 to 365 days for each year. Each duration was then ranked by magnitude for the representative period of record and plotted using median plotting positions. The computer program ELEVSORT was modified for this analysis and used for ranking and ordering.

Elevation-duration-frequency curves for Present Conditions at Prado Dam for Alternatives 1 to 5 are presented on Plates 10 to 14. Corresponding inundation durations for Present Conditions for Alternatives 1 to 5 are presented on Tables 22 to 27. Elevation-duration-frequency curves for Future Conditions at Prado Dam for Alternatives 1 to 5 are presented on Plates 19 to 23. Corresponding inundation durations for Future Conditions for Alternatives 1 to 5 are presented on Tables 28 to 32. The expected average annual days of inundation for Prado Dam for Present and Future Conditions are shown on Tables 33 and 34. The annual maximum water surface elevations, along with annual maximum inflow and outflow, for Prado Dam as recorded in the reservoir operation database are presented in Table 35 for information.

Changes may occur in the future that can impact on the operation of Prado Dam. These include increased runoff due to urbanization, sediment deposition, either increased or possibly decreased treated effluent discharge, increased downstream recharge capability, increased channel capacity, changes in the Santa Ana Canyon, improvements in the Santa Ana River downstream channel, changes in upstream reservoir usage, etc. The sum total of all these changes will be somewhat compensated for by the reservoir operation and the average annual days of inundation will not change significantly. The differences in the elevation-duration-frequency curves for Present and Future Conditions for each alternative can be determined from the days of inundation tables.

6. **CONCEPTUAL PLAN FOR RESERVOIR OPERATION**.

6.1. **General**. This section presents a concept for the modified gate operation plan for Prado Dam. A detailed operation plan will be determined at a later phase in this study. The current operation plan for Prado Dam will be modified to allow the outlet gates to be set to maximize water conservation at the downstream spreading facilities when the water surface behind the dam is below the designated Buffer Pool or Seasonal Pool elevation (see Section 1.3 for description of pools). The modified plan for the Recommended Alternative (see Section 1.4 for description of the water conservation alternatives at Prado Dam) will not adversely impact the flood control function of the reservoir. Development within the basin may be impacted on a more frequent basis up to the Buffer and Seasonal Pool elevations. Plan view maps showing pertinent features, development, and elevations for Alternatives 1 to 5 are shown on Plates 28 to 32. Personnel from the ROC will have full discretion over when the reservoir will be placed in water conservation or flood control mode. Gate changes will be performed by COE damtenders.

Several factors may affect the water conservation operation at Prado Dam including: maintenance of the outlet gates or downstream channel, any other required maintenance, condition of the water itself (turbidity, debris), and condition of the downstream spreading facilities. The presence of endangered species may also impact the operation of the reservoir.

6.2. **Debris Pool Operation**. Prado Dam is, and will be, operated to build a debris pool up to elevation 490 ft. This is done to prevent debris from entering and plugging the outlet works. Incidental water conservation can be achieved by making releases up to 500 ft^3/s (or 580 ft^3/s Future Conditions) for spreading at the downstream spreading facilities while the water surface is below elevation 490.0 ft.. There are no seasonal restrictions on holding water in the debris pool. Personnel from OCWD will estimate the current infiltration capacity at the spreading grounds and request a release rate from Prado Dam. The gate settings at Prado Dam will be calculated by ROC personnel to correspond with the requested release rate. If the water surface exceeds 490.0 ft during the flood season, the operation will switch to Buffer Pool or Flood Control depending on impending weather forecasts and anticipated runoff. If the water surface exceeds elevation 490.0 ft during the non-flood season, the operation will switch to Seasonal Pool operation. Releases from Prado Dam during the non-flood season while the reservoir is in Seasonal Pool operation will be maintained[2] at approximately 500 ft^3/s to minimize environmental impacts.

6.3. **Buffer Pool Operation**. During the flood season (October through February), water can be stored behind the dam up to a specific elevation over and above the designated Debris Pool when weather conditions are favorable. For instance, Alternative 2 includes a Buffer Pool from elevation 490.0 ft up to elevation 498.0 ft. When weather conditions are favorable, personnel from OCWD will estimate the current infiltration capacity at the downstream spreading facilities and request a release rate for Prado Dam. The gate settings at Prado Dam will be calculated by ROC personnel to correspond with the requested release rate. If it is determined by ROC personnel an impending or existing storm will bring significant inflow into the reservoir, the Buffer Pool will be emptied enough to account for the estimated inflow volume, which may require the complete evacuation of the Buffer Pool. The concepts behind "flood forecasting" are discussed below.

6.4. **Seasonal Pool Operation**. After the flood season has passed, water can be stored behind the dam up to a specific elevation over and above the designated Debris Pool. For example, the Seasonal Pool elevation for the Alternatives 1, 2, & 3 is 505.0 ft. Between March and October when the water surface behind Prado Dam is below 505.0 ft, the reservoir can be operated to maximize water conservation at the downstream spreading facilities. Personnel from OCWD will determine the current infiltration capacity at the downstream spreading grounds and request a release rate for Prado Dam. The requested release rate will be at least 500 ft^3/s to minimize environmental impacts in the basin. ROC personnel will calculate the gate settings at Prado Dam to correspond with the requested release rate. Several factors may affect the water conservation operation at Prado Dam during the non-flood season including: maintenance of the outlet gates or downstream channel, any other required maintenance, condition of the water itself (turbidity, debris), and condition of the downstream spreading facilities. If the water surface exceeds 505.0 ft during the non-flood season, the reservoir will be put in full flood control mode until the water surface recedes below elevation 505.0 ft again and the threat of flooding diminishes.

6.5. **Flood Forecasting**. "Flood Forecasting" is a nebulous term, but is used here to mean the forecasting of inflow into Prado Reservoir. Inflow forecasts will be made by ROC staff and will utilize all the tools and services available. The information available to water control personnel includes, but is not limited to: stream gage readings, precipitation gage readings, upstream reservoir releases, reservoir water surface elevations, inflow and outflow estimates, channel observations, computer models, and weather forecasts from a variety of sources, including the COE's contract meteorologist who produces Quantitative Precipitation Forecasts (QPF) for the LAD.

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[2] Reservoir Operation Staff will calculate gate settings to achieve a release of 500 ft^3/s (or higher if the downstream spreading facilities can accommodate more). Releases are measured by the reading at the downstream stream gage. Currently, adjustments to the outlet gates to maintain a constant release of 500 ft^3/s are difficult because of the size of the gates and the mechanisms for opening and closing. The Phase II Prado Dam includes two low-flow gates which can pass a total of 350 - 400 ft^3/s and will allow for easier adjustments to the outflow rate. This means one or more of the main gates will have to be partially opened. During the non-flood season the COE damtender may report to the dam only once a day and not on weekends or holidays. There may still be minor fluctuations in the release rate due to fluctuations in inflow.

The following paragraphs are included to show what meteorologic and hydrologic conditions could potentially impact the water conservation operation at Prado Dam. It is not meant to imply the new operation plan for Prado Dam will rely exclusively on a QPFs or other weather forecasts. A detailed operation plan will be developed during the next phase of this study and will evaluate all of the information sources for "Flood Forecasting".

To determine what weather conditions might impose adverse conditions and what the estimated inflow volume would be at Prado Dam, an estimate was made to determine how much precipitation it would take to fill the Buffer Pool. The following values are based on the Buffer Pool for Alternative 3 up to elevation 500.0 ft; similar calculations could be made for the other alternative Buffer Pool elevations.

For Alternative 3, the storage in the Buffer Pool under Future Conditions is the difference between the storage at elevation 490.0 ft (48 af) and the storage at elevation 500.0 ft (8,764 af), which is 8,716 af. For estimating the inflow volume in this example, it was assumed there was a constant base flow of 500 ft^3/s (992 af/24 hrs). The volume available to store excess precipitation is 7,724 af (8,716 - 992) [3]. Divide 7,724 by 53.33 [4] and the result is 144.84 (the excess precipitation required to fill the Buffer Pool for one square mile of contributing drainage area) which can be expressed as 144.84 inches of excess precipitation over 1 square mile or 1 inch of excess precipitation over 144.84 square miles.

The drainage area contributing to Prado Dam is 2,255 mi^2. Of the total drainage area, 177 mi^2 is upstream from Seven Oaks Dam, 164 mi^2 is controlled by the Lytle Creek Diversion Structure, 26.7 mi^2 is controlled by San Antonio Dam, 36 mi^2 is upstream from Lake Mathews, and 768 mi^2 is upstream from Lake Elsinore. Thus, the "uncontrolled" drainage area above Prado Dam is about 1,083 mi^2. Divide 144.83 by 1,083 and the result is 0.13, which is an estimate of the amount of excess precipitation (in inches) over the uncontrolled drainage area above Prado Dam necessary to fill the Buffer Pool. Assuming a 66% loss rate, which is consistent with loss rates calculated for the Los Angeles drainage area[5], the total precipitation would be about 0.39 inches. The excess precipitation for any event will actually depend on the antecedent moisture conditions.

Since the drainage area is relatively large, it is not likely there will be continuous precipitation over the entire drainage at the same time. Generally, storms come in from over the Pacific Ocean and track westerly to easterly. It starts raining over the western portion of the drainage basin first and proceeds easterly with the rain stopping in the western portions before the far eastern portions

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[3] Based on Present and Future Conditions volume-frequency curves from the August 1988, "Santa Ana River, Design Memorandum No. 1 Phase II GDM on the Santa Ana River Mainstem including Santiago Creek, Volume 7, Hydrology" (Plates 7-36 & 7-37), 7724 af over 24 hours corresponds to about a 4-year event.

[4] Conversion factor to get square miles for 1 inch of excess precipitation: $V/mi^2 \cdot 1\ in = 1 ft/12\ in \cdot 640\ ac/1mi^2 \approx 53.33\ ac\text{-}ft/in \cdot mi^2$

[5] Los Angeles County Drainage Area, Final Feasibility Report, Hydrology Technical Report, U.S. Army Corps of Engineers, Los Angeles District, December 1991.

even start raining. Thus, the effective drainage area for determining the amount of rainfall necessary to fill the Buffer Pool is greatly reduced. If it is assumed that half the "uncontrolled" drainage area above Prado Dam is contributing, the estimate of excess precipitation is 0.27 inches (144.83 / 541). Assuming a 66% loss rate, the total precipitation would be about 0.79 inches.

It is reasonable to expect differences between the meteorologic forecasts and the actual amounts; ROC staff have varying levels of confidence in current weather forecasting techniques and models. Timing and precipitation amounts are challenging to predict for storms occurring over the Santa Ana River Basin. If one assumes a 25% contingency factor on the forecast 24-hour total precipitation amounts (0.79 in) over half the uncontrolled area upstream from Prado Dam gives a result of 0.98 inches (or a result of 0.49 inches for a storm over the total uncontrolled area). Evacuation of the Buffer Pool based on actual measured precipitation amounts at the gages is generally preferred than evacuation based on forecasted precipitation totals.

The lead time required to evacuate the Buffer Pool depends on the existing water surface elevation, inflow, outflow, and forecast lead time. The travel time during a 100-yr event is about 2.2 hours from Seven Oaks Dam to E Street in San Bernardino and about 4.3 hours from E Street to Prado Dam for a total of 6½ hours. Travel times for smaller events would be longer and depend on the size of the event, channel conditions, etc. Under Present Conditions, it would take approximately 6 hours to drain the reservoir from elevation 500.0 ft (16,520 af) to 490.0 ft (4,688 af) with the gates wide open (max. release of 30,000 ft^3/s)[6] and with a 500 ft^3/s constant inflow. As a cautionary note, evacuation of the pool based upon a forecast utilizing the maximum outlet capacity is a procedure which should be followed only for emergencies, and even under such conditions, with proper notification and care. Consequently, evacuation of the pool will take longer than 5 hours. It would take about 31 hours under Present Conditions (and 24 hours for Future Conditions), to evacuate the reservoir from 500.0 ft (16,520 af) to 490.0 ft (4,688 af) using maximum releases of 5,000 ft^3/s and no inflow[7]. A lead time of at least 31 hours would be necessary to evacuate the 500.0 ft Buffer Pool at Prado Dam. Note: with the upstream treatment plants contributing, it is unlikely to have zero inflow to Prado Dam.

Based on inflow history, historical storm patterns, and professional experience, a minimum lead time of 24 hours would be required to evacuate the Buffer Pool for any alternative. To achieve this, the maximum discharge would have to be increased from the current maximum of 5,000 ft^3/s for certain alternatives. Listed below is the maximum discharge required to evacuate the Buffer Pool in 24 hours for each alternative.

Alternative 1	2,500 ft^3/s
Alternative 2	5,000 ft^3/s

[6] The Phase II design outlets are capable of releasing 30,000 ft^3/s at WSE 502.0 ft but the proposed schedule does not call for releases of 30,000 ft^3/s until the reservoir reaches elevation 540.0 ft.

[7] The Phase II design outlets are capable of releasing 5,000 ft^3/s at WSE 474.0 ft but the proposed schedule does not call for releases of 5,000 ft^3/s until the reservoir reaches elevation 498.0 ft.

Alternative 3	7,400 ft^3/s
Alternative 4	14,900 ft^3/s
Alternative 5	25,900 ft^3/s

The detailed operation plan which will be produced later will further define the forecasted and measured precipitation amounts for time periods less than or greater than 24 hours. The detailed operation plan will include references to streamflow measurements, the current water surface elevation in the reservoir, as well as the other information cited previously. The operation plan will include rate-of-change criteria for reservoir releases necessary to minimize downstream impacts. It is anticipated corrections to the gate settings may be needed several times a day as new and updated forecasts are received to ensure the flood control capacity of the reservoir is maintained. Flexibility will be included in the modified operation plan to account for variations in the Seven Oaks Dam and San Antonio Dam releases. The procedures for evacuation of the Buffer Pool detailed in Exhibit E of the September 1994 Water Control Manual for Prado Dam will be updated to reflect conditions at Prado Dam with the Phase II design in place as well as the current reservoir survey information.

6.5.1. **Hydrologic Forecasts**. The COE Reservoir Operation Center (ROC) does not prepare formal published hydrologic forecasts for Prado Dam. Despite the lack of formal hydrologic forecasts, the ROC does carefully monitor the reservoir including the existing and anticipated hydrometeorologic conditions of the entire Santa Ana River watershed. Other agencies are notified of any significant changes or anticipated changes as soon as possible.

The models and methods mentioned below are not capable of producing all of the necessary information for a successful water conservation operation that would result from this study. These methods can be used as a starting point together or alone in developing a computer-based forecasting model that includes water conservation. The current method of using charts and tables can be expanded to include the expanded water conservation pools. The COE is currently developing models for the newly distributed Corps Water Management System (CWMS) software package.

The Sacramento RFC is now producing Prado inflow forecasts based on their QPFs and observed flows. The COE does not have control over the schedule of these forecasts, but they are issued at least once per day and more frequently during rainfall/runoff periods. The forecast is available from the District's Reservoir Regulation internet webpage.

Quantitative Precipitation Forecasts (QPF) for the Santa Ana River Basin are obtained from a private meteorological firm under contract with the LAD. These are used in determining the potential for significant runoff into Prado Reservoir and other reservoirs within the watershed. The Santa Ana River Real-Time (SARRT) model under development, integrates the QPF and telemetered precipitation and streamflow data to provide a real-time overview of the entire Santa Ana River basin as well as a runoff forecast for the watershed. The SARRT model will allow the ROC personnel to more efficiently regulate Prado Dam as a component of the Santa Ana River flood control system during significant runoff events.

In addition to the SARRT model, a simplified algorithm based on the QPF and the Antecedent Precipitation Index (API) and a Recession Limb Inflow Forecast Method have been developed which can be used to respectively determine an estimated inflow volume and a recession limb hydrograph for Prado Dam.

The SARRT is being developed by adapting computer software developed by the U.S. Army, Corps of Engineers, Hydrologic Engineering Center (HEC). The SARRT model accesses telemetered precipitation, streamflow, and reservoir elevation data as well as current QPFs for the Santa Ana River basin. Reservoir Operation Center personnel specify zonal hydrologic parameters for ungaged watersheds and future reservoir release schedules. With this information stored in the master database, ROC personnel can either view the existing conditions or prepare a forecast for the entire watershed. The SARRT model uses the computer programs HEC-1F and HEC-5 to generate forecast hydrographs for the various control points. The SARRT model was calibrated for significant flood events and is therefore best suited for use during such events. Details for application of the model are presented in Chapter 6 of the September 1994 Water Control Manual for Prado Dam.

The QPF/API algorithm was developed to aid water control personnel during flood events which impact water conservation regulation. Unlike the SARRT, the QPF/API algorithm does not produce a forecast inflow hydrograph for Prado Dam, but rather, it only determines a forecast inflow volume to Prado Dam. Details for application of the method are presented in Chapter 6 and Exhibit C of the September 1994 Water Control Manual for Prado Dam.

The recession limb inflow forecast model can be used as a secondary check of the SARRT water control system or to improve a forecast based on the QPF/API algorithm. As the name implies, this model can only be used after the inflow hydrograph has peaked. Also if substantial precipitation is still falling, water control personnel should expect a possible secondary peak, which would require reiteration of the recession limb inflow forecast model. Details for application of the model are presented in Chapter 6 and Exhibit D of the September 1994 Water Control Manual for Prado Dam.

6.5.2. **Precipitation Gages**. Precipitation records are available for almost 500 rainfall stations in or near the Santa Ana River Basin. The standard gaging station at San Bernardino County Hospital has the longest period of record, dating back to 1870. Automatic gage records are available for many stations in the drainage basin. The Claremont-Pomona College station, with records dating back to 1927, has automatic gage records covering the longest period of time. A complete listing of precipitation, stream, reservoir gages within and adjacent to the Santa Ana River Basin and accessible on the Los Angeles District Telemetry System (LATS) is shown on Table 36. Gages on the Automated Local Evaluation in Real Time (ALERT) system within and adjacent to the Santa Ana River Basin are listed in Table 37.

6.5.3. **Stream Gages**. Runoff records are available for about 65 stream gaging stations within the project drainage area. Many of the stations are on canals and diversion channels. The station at Santa Ana River near Mentone, where non-recording gages were used from 1896 to 1917 and recording gages from 1917 to the present, has the longest period of record for a stream gaging station on a natural stream in southern California. The San Antonio Creek station near Claremont, which has been in operation since 1901, used non-recording gages up until 1917, and recording gages from 1917 to the present. Ten stations have had recording gages in operation since 1919, and several of these stations had non-recording gages for a few years prior to that time. A complete listing of precipitation, stream, reservoir gages within and adjacent to the Santa Ana River Basin and accessible on the LATS is shown on Table 36. Gages on the ALERT system within and adjacent to the Santa Ana River Basin are listed in Table 37.

6.5.4. <u>**Data Collection and Communication**</u>.

6.5.4.1. **Hydrometeorological Instrumentation**. In order to ensure that water control personnel understand real-time conditions of the Santa Ana River Basin and to gather information necessary for runoff forecasting, a network of streamflow, precipitation, and reservoir water surface elevation gages have been installed and maintained. Many of these gages are currently in place to facilitate operation of existing projects. These gages are connected to radio telemetry equipment so that current readings can be transmitted to the ROC. The exact type of gage equipment for each reservoir project is discussed in the "Hydrologic Facilities" section of the volume for that project. Additional streamflow and precipitation stations with radio telemetry equipment may be installed in the basin to improve coverage of rainfall and streamflow data so that the watershed status can be better defined so the Santa Ana River runoff forecasting model will have sufficient information to produce runoff forecasts for Seven Oaks Dam, Prado Dam, and Santiago Creek Reservoir.

6.5.4.2. **Recording Hydrologic Data**. Each agency maintains records of its own data. The NWS Data are archived at the NOAA, National Climatic Data Center in Asheville, North Carolina. Precipitation and other data are published monthly by the National Climatic Data Center in <u>Climatological Data</u> and <u>Hourly Precipitation Data</u>.

The State of California, Department of Water Resources (DWR), publishes monthly data from the ALERT telemetry gage network. The Orange County Public Facilities and Resource Department, Riverside County Department of Public Works and the San Bernardino County Department of Public Works archive their recording and non-recording data and will furnish these data to other agencies upon request. The Los Angeles District maintains pertinent hydrologic data files from different sources.

The Los Angeles District maintains a file of data from its recording and telemetry gages and provides selected data to the NWS for publication. The Los Angeles District also enters data from its manual observations on various forms, which are maintained on file in the District. The reservoir information, reported to the ROC via radio or telephone is entered into the RESCAL computer program which stores the data in a computer database and generates a "Daily Reservoir Report" for internal distribution and is available via the Los Angeles District web page on the Internet.

The damtender maintains a record of the water surface elevation, downstream gage height, and the gate positions on SPL Form 19 - Flood Control Basin Operation Report (FCBOR). The Water Control Data Unit of the Los Angeles District calculates inflows from data collected on the

FCBORs. These calculations are made on SPL Form 30 - Reservoir Computations and are stored at the Baseyard Office, located in El Monte, 11 miles east of the downtown District office.

Data from the ALERT and LATS stations are stored in computer-data files at the Corps of Engineers Los Angeles District office.

7. RISKS AND UNCERTAINTIES.

7.1. **General**. The main purpose of Prado Dam is to provide flood protection for the residents of Orange County downstream from the dam. Between storms; however, the dam can be used to temporarily store water for recharge at the downstream groundwater replenishment facilities. Since the proposed water conservation alternatives require evacuation of the Buffer Pool prior to any flood event, there is no impact to the flood control function of the dam. However, there are some "risks" and "uncertainties" if the dam is not operated in this manner.

Risk, as used in this study, is defined as the risk to the flood control function of the reservoir when water conservation is included as a approved function. Several factors are involved in whether the dam still provides the same level-of-protection with a Buffer and/or Seasonal Pool in place.

Uncertainty includes factors related to the reservoir operation. Factors related to the determination of the yields are also included below. One important factor for an operation utilizing flood forecasting is the accuracy of the weather forecasts. This includes forecasts that underestimate the actual precipitation/runoff and forecasts that overestimate the actual precipitation/runoff. The timeliness of receiving data from precipitation and stream gages is also very important. Reservoir Operation Center staff are more confident in evacuating the Buffer Pool based on actual recorded amounts at precipitation and/or stream gages, than on precipitation or runoff forecasts.

7.2. **Risks**.

7.2.1. <u>**General**</u>. One of the major premises of this study is that modifications to the operating plan for water conservation at Prado Dam will not have any significant impact on flood control, i.e., will not significantly decrease the level-of-protection afforded by the dam. If the Buffer Pool is not evacuated prior to a major storm, there is some impact on flood control. To evaluate this, the reservoir design flood (RDF), which is based on the Standard Project Flood (SPF), was routed through the reservoir under several different scenarios. The RDF for Prado Dam is equal to 92% of the SPF and is based on a 4-day general storm with a runoff volume of 415,800 af. The 1988 survey was used to model the elevation-area-capacity relationship for the reservoir.

One of the worst and most remote scenarios which could impact on flood control would be to have no advanced warning (no forecast) of a RDF at Prado Dam when water is being held to the top of the Buffer Pool. This scenario was evaluated using the HEC-5 models and applied to all five alternatives. The starting water surface was set at the top of the Buffer Pool elevation. Flood control releases did not begin until inflow reached the reservoir and were only made only while the water surface exceeded the Buffer Pool elevation[8]. The current approved operation plan for the reservoir was modeled with modifications to the release schedule to account for the Phase II improved outlet structure and downstream channel (for Alts. 1 to 5).

The results of the RDF routing, plus the 2-yr to 1000-yr frequency floods routings, for Prado Dam under Present and Future Conditions, as well as Interim Conditions, are shown on Figures 1 to 23 and are summarized in Tables 38 to 42. The RDF and frequency flood routing results for Prado prior to Phase II GDM modifications is shown in Table 43 for comparison.

Under Present Conditions, Prado Dam provides RDF protection no matter which of the five alternative (Alts. 1 to 5) Buffer Pools is considered. Under Interim Conditions, the frequency of spill is only about 111-yr and the RDF exceeds spillway crest for Alternatives 1-5. For Future Conditions, the RDF does not induce spillway flow; however, the maximum water surface elevation is about 2½ to 3 feet higher than under Present Conditions (Alts. 1 to 5). Even with no advanced warning of a Reservoir Design Flood at Prado Dam, the reservoir can still provide RDF protection for Alternatives 1 to 5 under both Present and Future Conditions. The main reason for this is because the Phase II design for Prado Dam includes 70,000 af for sediment allowance (Future Conditions for this analysis was for 50 years and only included 35,000 af of sediment).

The frequency of spill for Prado Dam under Present and Future Conditions, as well as Interim Conditions, for the alternatives was determined from routing the n-year frequency floods through the reservoir. The term "frequency of spill" refers to frequency at which spillway flow commences. Since the channel capacity downstream of Prado will be improved to allow releases up to 30,000 ft^3/s, surcharge storage can be utilized to limit outlet releases plus spillway flow to the downstream channel capacity, which will effectively increase the level of protection.

The starting water surface elevation was set at the top of the Buffer Pool for each alternative. The frequency of spill for Prado Dam under Present Conditions for Alternative 1, is about 333-year. Under Present Conditions, the volume of the Buffer Pool (excluding 4,688 af in the Debris Pool) ranges from 3,747 af at elevation 494.0 ft (Alt. 1) to 27,892 af at elevation 508.0 ft (Alt. 5). The storage at spillway crest (elev. 563.0 ft) is 351,700 af. Thus, the Buffer Pool represents only 1.1% to 8.0% of the flood control storage. The difference in maximum water surface elevation between Alternative 1 and Alternative 5 is only about 1-1½ feet for floods in the 100- to 500-year range, which means the frequency of spill does not change significantly from Alternative 1 to Alternative 5.

For Interim Conditions, the frequency of spill for Alternative 1 is only about 111-year. Under Interim Conditions, the volume of the Buffer Pool (excluding 4,688 af in the Debris Pool) ranges from 3,747 af at elevation 494.0 ft (Alt. 1) to 27,892 af at elevation 508.0 ft (Alt. 5); the same as

[8] Drawdown releases starting when inflow actually reached the reservoir will lessen the impacts shown.

Present Conditions. The storage at spillway crest (elev. 543.0 ft) is 186,700 af. Thus, the Buffer Pool represents 1.4% to 11.2% of the flood control storage. The difference in maximum water surface elevation between Alternative 1 and Alternative 5 is about 2 feet for the 100-year event. The frequency of spill does not change significantly from Alternative 1 to Alternative 5.

The frequency of spill for Prado Dam under Future Conditions for Alternative 1, is approximately 210-year. Under Future Conditions, the volume of the Buffer Pool (excluding 48 af in the Debris Pool) ranges from 2,652 af at elevation 494.0 ft (Alt. 1) to 21,168 af at elevation 508.0 ft (Alt. 5). The storage at spillway crest (elev. 563.0 ft) is 316,700 af. Thus, the Buffer Pool represents only 0.8% to 6.7% of the flood control storage. The difference in maximum water surface elevation between Alternative 1 and Alternative 5 is only about 1-1½ feet for floods in the 100- to 500-year range. The frequency of spill does not change significantly from Alternative 1 to Alternative 5.

A summary of the frequency of spill at Prado Dam under Present and Future Conditions and Interim Conditions for Alternatives 1 to 5 is presented in Table 4. The frequency of spill shown is based on a worst-case scenario in which the flood forecast is completely missed. There was no evacuation of the Buffer Pool to account for forecasted inflow. The starting water surface was set at the top of the Buffer Pool and flood control releases did not begin until runoff reached the dam.

7.2.2. **Sediment**. One factor which would have an impact on the level-of-protection afforded by the dam would be an increase in sediment deposition in the reservoir due to water conservation activities. The top of the Debris, Buffer, and Seasonal Pools will be at a fixed elevation and will decrease in size (volume and area) over time if there is no clean-out. The level-of-protection will also decrease as the available flood control storage volume is also consumed by sediment. The Phase II design for Prado Dam included a sediment estimate based on 0.75 af per mi^2 per year. Thus, for Future Conditions (WY 2053; 50 years) the sediment accumulation would be about 35,000 af (the Phase II design for Prado Dam includes a 100-year sediment allowance of 70,000 af). The increases in sediment directly attributable to water conservation activities are documented in the Hydraulics Appendix. The new operation plan must include a formal written agreement with OCWD for removing sediment and debris from the reservoir (that is directly attributable to water conservation operations) on a event- or time-driven basis.

7.2.3. **Debris**. Debris is not major problem at Prado Dam. The large outlet size allows most of the debris that comes into the reservoirs, during flood events, to be flushed through and sent on downstream. The removal of incidental accumulation of sediment and debris, particularly around the outlet works, must be included in the written agreement with OCWD.

7.3. **Uncertainties.**

7.3.1. **General**. Uncertainties related to the proposed water conservation operations include those associated with forecast accuracy, antecedent conditions in the watershed, etc. Weather forecasts either underestimate the rainfall totals or overestimate the rainfall totals. From a flood control standpoint, it is not as important if the forecast overestimates the actual storm totals, because this will ensure the reservoir is evacuated to a level lower than is necessary to account for the ensuing runoff. This may have some political repercussions if the pool is "dumped" too often; however, it is more important to maintain the flood control function of the dam. There are also uncertainties associated with the methodology used in the study including estimates of the average annual yields and the long-term diversion rates.

Other possible uncertainties include measurements of the precipitation and stream gages, local inflow to the downstream channel, emergencies, and channel construction. The water control plan resulting from this study will be developed with built-in flexibilities to address all foreseeable circumstances. In addition, deviations from this plan will be made as necessary to address all other circumstances not described above.

7.3.2. **Forecast Accuracy**. The detailed operation plan for Prado Dam will rely heavily on actual precipitation and streamflow information measured at upstream gages as well as the current water surface elevation in the reservoir. If reservoir releases to evacuate the Buffer Pool are based on meteorologic forecasts, the accuracy of these forecasts comes into play. From a flood control viewpoint, it is more important if the forecast underestimates the rainfall amounts and not enough space is evacuated at Prado Dam to account for the inflow. As detailed above, even with no advanced warning of a Reservoir Design Flood at Prado Dam, the reservoir can still provide greater than RDF protection under Present and Future Conditions for Alternatives 1 to 5. Under Interim Conditions the reservoir would spill with RDF inflow to Prado Dam. At a maximum release of 5,000 ft^3/s, a Buffer Pool up to elevation 498.0 feet can be evacuated in about a day; the entire pool can be evacuated in about 2 weeks.

Forecasts for precipitation in the watersheds upstream of Prado Dam should be verified by the actual measured precipitation and inflow volumes and adjusted accordingly. There are numerous LATS and ALERT precipitation, stream, and reservoir gages within and near the Santa Ana River watershed. Precipitation and reservoir elevation gages are located directly at Prado Dam. There are a number of other precipitation gages owned and operated by other agencies in the watershed which can be used to supplement the precipitation and inflow estimates. Precipitation amounts for each of the gages should be weighted and an average value determined. A complete listing of precipitation, stream, reservoir gages within and adjacent to the Santa Ana River Basin and accessible on the LATS is shown on Table 36. Gages on the ALERT system within and adjacent to the Santa Ana River Basin are listed in Table 37.

It is important to note that QPFs are updated periodically, even in the middle of a storm event and more frequently during larger storm events. Inflow forecasts for Prado Dam should re-evaluated as new information becomes available and verified using precipitation and stream gage readings.

7.3.3. **Watershed Conditions**. The precipitation totals of 0.49 or 0.98 inches in 24 hours above Prado Dam cited in Section 6.5, are based on the upstream watershed being fairly saturated. If the antecedent conditions indicate the upstream watershed is fairly dry, the rainfall loss rates will be higher and inflow to Prado Dam may be significantly less. There is uncertainty in determining hydrologic parameters for any real-time rainfall-runoff model because of the variability of watershed conditions (e.g., AMC, etc). The real-time model for Prado Dam should be optimized as new data becomes available which will give a better representation of the watershed conditions.

7.3.4. **Diversion Rates**. There are also uncertainties associated with the methodology used in the study. For modeling purposes, the long-term infiltration rate for the spreading facilities downstream from Prado Dam was set to 500 ft^3/s for Present Conditions and 580 ft^3/s for Future Conditions. These values are based on records kept for the spreading facilities and projected improvements to the facilities to accommodate more water. The actual infiltration and diversion rates are dependent on day-to-day conditions in the channel and at the spreading grounds. Earlier in the flood season or when the channel or basins have been dry, the infiltration rate will be higher and will include enough volume to fill the basins in addition to the actual infiltration rate. If any of the basins are closed at the facilities, i.e., for maintenance, the diversion rate may be significantly less. The diversion rate used in the HEC-5 models is an estimate of the long-term infiltration rate and is used for modeling purposes only so alternative water conservation pools can be evaluated. This is appropriate for determining long-term average annual yields.

Actual water conservation releases from Prado Dams will need to be modified as needed to ensure use of the downstream spreading grounds is maximized and no water is "lost". Due to the decrease in manpower at LAD, during the year and especially during the non-flood season, most LAD Operations employees, including damtenders, are currently used for various maintenance projects at different locations which take them away from their respective dams for most of the workday. Reservoir readings are normally taken once a day (if there is water behind the dam), in the morning, before the damtenders are reassigned to other locations. OCWD officials will have to determine the intake capacity for their spreading facilities and request a release rate for the following day. If OCWD expresses a wish for LAD to make gate changes more often than once a day, then some kind of funding/reimbursement mechanism must be put in place to keep a damtender on-site full-time.

Based on meetings with OCWD staff, there are no plans in the (near) future to increase the area of the existing spreading grounds or acquire additional land for spreading. Obviously this would not increase the long-term infiltration capacity, but should be the same for all alternatives and would not significantly affect the incremental yield for each alternative pool level. The County may increase the volume of imported water spread at their facilities; however, this is normally done during drier periods when surface water is not available for spreading.

8. **DOWNSTREAM IMPACTS**.

8.1. **General**. The original premise of this study was that water conservation would have no adverse impact on the flood control function of the reservoir. To achieve this, the Buffer Pool must be evacuated prior to any major flood event or partially evacuated for lesser events. Water that is being held in the Buffer Pool awaiting recharge at the downstream spreading grounds is strictly considered a part of the proposed water conservation operation. Mitigation for damages to the downstream channel caused by evacuation of the Buffer Pool was determined to be the responsibility of the local sponsor (OCWD).

8.2. **Background**. During and after the January and February 1969 floods, Prado Dam was operated to limit the discharges to a maximum of about 5,000 ft^3/s after it was discovered that greater flows cause damages downstream. There are no significant damages for releases less than 5,000 ft^3/s in the Santa Ana Canyon reach. There are some erosional damages to the Riverview Golf Course, located about 21 miles downstream from Prado Dam, with sustained releases from Prado less than 5,000 ft^3/s.

The Santa Ana River Project (SARP) Phase II GDM improvements to Prado Dam and the lower Santa Ana River are supposed to allow flood control releases up to 30,000 ft^3/s without significant damages. The Phase II channel improvements in the lower Santa Ana River have been completed in Reaches 1 through 8 (Pacific Ocean to Weir Canyon Road). Reach 9 (Weir Canyon Road to Prado Dam) is currently under construction with completion prior to water year 2003.

Most of the damages in the downstream channel from releases exceeding 5,000 ft^3/s occur in the Santa Ana Canyon reach of the Santa Ana River (Reach 9). This reach is about 7½ miles long and runs from Prado Dam to Weir Canyon Road. Reach 9 is mostly unimproved and even after Phase II modifications, will still sustain some damages, especially with higher releases. The Green River Golf Course is located within the Santa Ana Canyon reach and is subject to inundation and erosional damages.

As presented in Section 6.5, the maximum discharge required to evacuate the Buffer Pool in 24 hours for each alternative is listed below.

Alternative 1	2,500 ft^3/s
Alternative 2	5,000 ft^3/s
Alternative 3	7,400 ft^3/s
Alternative 4	14,900 ft^3/s
Alternative 5	25,900 ft^3/s

Since the maximum release required to evacuate the Buffer Pool for alternatives 1 & 2 is 5,000 ft^3/s or less, there would be no significant damages in the Santa Ana Canyon reach for these alternatives. The total area of inundation for a flow of 5,000 ft^3/s is 260 acres in the canyon area. For flows of 7,400 ft^3/s, 14,900 ft^3/s, and 25,900 ft^3/s, the total areas of inundation are 361 acres, 770 acres, and 915 acres, respectively. Average velocities though the canyon area range from 6.5 ft/s for a release of 5,000 ft^3/s to 7.4 ft/s for a release of 7,400 ft^3/s to 8.5 ft/s for a release of 14,900 ft^3/s and to 9.9 ft/s for a release of 25,900 ft^3/s. Damages for alternatives, 3, 4, and 5 are presented in the Economics Appendix.

The potentially large releases required to evacuate the Buffer Pool can impact the downstream channel in two ways: an increase in frequency of inundation and an increase in frequency of erosion. Since releases of the same magnitude required for flood control purposes would cause the same damages, an effort was made to differentiate large releases attributed to water conservation operation from those which would happen under flood control operations.

8.3. **Frequency of Releases**. Average daily inflows for the representative period of record for Prado Dam were plotted on time series graphs and evaluated on a water year-by-water year basis to determine if the Buffer Pool for each water conservation operation schedule would have been evacuated ("dumped") assuming the Buffer Pool had been approved and in place for the entire period. Consideration was given to the status of the Buffer Pool (i.e., did it have water in it at the time of the event). The maximum discharge for each alternative required to evacuate the Buffer Pool listed above was assigned for each evacuation. Using this method does not completely account for false alarms or releases based on partially full pools. This approach is highly subjective, but the results are based on the best engineering judgement of COE engineers experienced with the flood season operation of Prado Dam and is considered a "worst case" scenario that is used as a basis for determining environmental impacts. This subjective evaluation was performed with the Buffer Pool for all five Alternatives. The number of "dumps" per water year and a summary for each alternative are summarized in Table 45. Since the Buffer Pools for Alternatives 1 & 2 can be evacuated in less than 24 hours with maximum discharges 5,000 ft^3/s or less, the estimated number of "dumps" came out the same.

The frequency of releases attributed to flood control were determined using the outflow-frequency curves shown on Plate 33. The With-Existing Outlets curve is from the 1994 Water Control Manual for Prado Dam. The With-Phase II GDM Outlets curve is from Table 7-9 of DM No. 1, Volume 7, Phase II GDM on the Santa Ana River; for Present Conditions. Results are shown in Table 46.

The frequency of releases attributed to both water conservation and flood control were converted to frequency of occurrence in the 50-year project life by dividing the outflow-frequency by 50 for each alternative. These results are shown in Table 47. Finally, the maximum releases in each of the 50 years are summarized in Table 48.

9. OPERATION AND MAINTENANCE.

Maintenance of the operations area is performed by the COE Operations staff or contractors. Maintenance of the recreational facilities is generally done by San Bernardino and Riverside Counties under supervision by the COE and subject to COE approval. Accumulated sediment and debris within the basin area near the outlet structure is removed by the COE (or COE contractor) to assure the proper flood control function of the dam.

With the addition of an increased Buffer and/or Seasonal Pools at Prado Dam, sediment accumulation could be increased[9]. Impounding of water to a higher elevation will allow more sediment to drop out when normally it would be flushed through the outlets. The new operation

[9] Refer to the Hydraulics Appendix for sediment estimates for each alternative.

plans must include a formal written agreement for removing sediment and debris from the reservoir that is directly attributable to water conservation operations.

Coordination with OCWD is a requisite for smooth water conservation operations. This coordination in the reservoir operation will allow for the highest volume of captured flows for recharge. The low-flow outlets included in the Phase II design for Prado Dam will allow easier adjustments to the outflow from the dam. The two low-flow outlets are capable of releasing a total of 350-400 ft^3/s. This means that one or more of the main gates will have to be slightly open to achieve a release rate of 500-600 ft^3/s. During the non-flood season, the COE damtender normally reports to the dam once a day during the normal work hours and is off on weekends and holidays. Release rates and gates settings will need to be predetermined to cover the time the damtender is away from the dam. If multiple daily adjustments are required, after-hour adjustments, or weekend and/or holiday gate changes are requested, additional COE manpower will be needed and funding will be required.

10. GROUNDWATER ANALYSIS.

10.1. **General**. Several studies have previously examined the groundwater conditions of the region. These studies provide a hydrologic and geologic basis for analysis of the groundwater conditions that have existed in the basin. The most detailed analysis was performed by the COE and documented in the "Hydrology Appendix for the Prado Dam Water Conservation Study, Santa Ana River Basin, Prado Dam and Reservoir, Orange County, California", dated June 1988. The study conclusions are still valid for Present and Future Conditions and excerpts are presented herein.

10.2. **Study Conclusions**. Generally, the area within Prado Reservoir would experience a rise in the groundwater table due to any proposed water conservation plan. Certain areas are subject to substantially greater rises in groundwater table for all runoff events. These are the lower regions that experience a greater degree of recharge because they are submerged for a greater length of time. Also, for any given plan, the rise would be greater for the rarer annual runoff events. For a given runoff event, the rise would be greater for the higher target water conservation pools (i.e., the higher the plan level, the higher the rise).

The differences between Present and Future Conditions results will be due to increased urbanization associated with Future Conditions; results in runoff volumes and peaks are greater than Present Conditions. The difference is greater for larger runoff events. The larger inflow volumes caused by future urbanization will raise the water surface of the reservoir and increase the groundwater recharge. The Future Conditions thus produce more recharge to the groundwater system for the 100-year runoff event.

11. WATER QUALITY.

11.1. **Introduction**. For a number of years, state and local water agencies have been concerned with the quality of waters within the Santa Ana River. The California Regional Water Quality Control Board (CRWQCB) has established water quality objectives for the Santa Ana River. For the reach immediately upstream from Prado Dam, including the reservoir, an objective of 700 mg/l total filterable residue (TFR) has been set for the baseflow, expressed as a 5-year moving average. TFR is another way of expressing TDS. For the reach immediately downstream of the dam, an objective of 650 mg/l TFR for the total flow has been set[10].

The Prado Settlement, a 1969 stipulated court judgment (Orange County Water District vs. City of Chino, et al.), which requires that a certain minimum amount of water be released each year from the upper basin, contains a provision giving additional credit to the Upper Basin obligation if the annual weighted water quality of the flow at Prado Dam is less than 700 mg/l in total dissolved solids (TDS). Alternately, a debit is assessed if the quality exceeds 800 mg/l.

Water released from storage at Prado Dam is used downstream for groundwater spreading at the Imperial Highway Diversion. In view of the salinity problem in the Santa Ana River, careful consideration of TDS is required in the planning and implementation of any Prado Dam water conservation alternative which may affect the quality of water reaching the spreading grounds.

11.2. **Characterization of Existing Water Quality**. The quality of the total flow in the Santa Ana River is a function of the quantity and quality of the various components of the flows. The two major components of total flow are stormflow and baseflow. Stormflow is the water which results directly from rainfall and baseflow is composed of wastewater discharges and rising groundwater. In recent years, the quality of baseflow below Prado Dam has remained relatively steady, in the range of 700-750 mg/l TDS. The first runoff event of the storm season has been observed to have much poorer quality than the baseflow. Following this initial event, the quality of storm runoff improves with each succeeding event. TDS concentrations of 200-250 mg/l have been measured for storm runoff. Plate 34 displays these observations from the data collected between 1950 and 1986.

Theoretically, mean daily TDS concentrations should decrease with an increasing conservation pool as a consequence of increasing dilution. For each successive alternative, mean daily values of TDS in the water available for groundwater spreading at Imperial Highway will most likely be decreased as the amount of water is increased. The increase in amount of water spread is illustrated as the mean daily flow at Imperial Highway.

11.3. **Water Quality Measurements**. The LAD does not maintain any water quality stations at Prado Dam. The USGS, San Bernardino Office, maintains a water quality gage below Prado Dam, and the CRWQCB, Santa Ana Region, regularly takes samples at Prado Reservoir. Other agencies which collect and monitor water quality on the Santa Ana River include, but are not limited to, the California Department of Water Resources, the Orange County Water District, the Riverside County Health Department, and the Santa Ana Watershed Project Authority (SAWPA).

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[10] Set by the California Regional Water Quality Control Board (CRWQCB).

11.4. **Reporting**. At present, water quality data is not available on a real-time basis at the Los Angeles District. No formal agreements exist between the above mentioned agencies and the COE to transmit water quality data directly to the LAD. The LAD does, however, collect water quality data on an annual basis in conjunction with the preparation of the annual Water Quality Management Report. The report is prepared in accordance with ER 1130-2-334, "Reporting of Water Quality Management Activities at Corps Civil Works Projects", dated 16 December 1977.

Many of the agencies which collect the above data publish annual summaries of their findings. Data collected by the DWR and the CRWQCB are published annually on microfilm by the State of California Water Data Information System (WDIS). The USGS data is published in Water Resources Data for California which is published each water year. The EPA's STORET database is also a source for water quality data.

TABLE 1: RESULTS - PRADO DAM

Alternative	Condition	Yield (af)	Increase over Present Conditions (af)	Water "Lost" (af)
Alternative 1	Present	238,000	--	48,000
	Future	314,000	76,000	68,000
Alternative 2	Present	240,000	2,000	46,000
	Future	318,000	80,000	64,000
Alternative 3	Present	241,000	3,000	45,000
	Future	319,000	81,000	63,000
Alternative 4	Present	242,000	4,000	44,000
	Future	322,000	84,000	60,000
Alternative 5	Present	244,000	6,000	42,000
	Future	324,000	86,000	58,000

• Yield is the total volume of water delivered to the OCWD spreading grounds annually.

• Water "Lost" is the difference between the average annual flow in the Santa Ana River above the OCWD spreading facilities minus the Yield for the downstream spreading grounds.

• Present Conditions are conditions for water year 2003 in the watershed with the Phase II GDM design for Prado Dam in place.

• Future Conditions are for the year 2052. Urbanization adjustments were made to the daily inflows to represent changes over the 50-year project life. Future Conditions yields presented in this report include the effects of sedimentation.

For complete description of alternatives, see section 1.4

TABLE 2: PERTINENT DATA - WITH PHASE II MODIFICATIONS PRADO DAM AND RESERVOIR

Drainage Area	2,255.0 mi^2
Reservoir Elevation	
Debris Pool	490.0 ft
Flood Control Pool (spillway crest)	563.0 ft
Top of Dam	594.4 ft
Reservoir Gross Capacity	
Debris Pool	4,688 af
Spillway Crest	351,700 af
Allowance for Sediment (50- year)	35,000 af
Allowance for Sediment (100- year)	70,000 af
Reservoir Area	
Debris Pool	768 ac
Spillway Crest	10,280 ac
Dam: - Type	Rolled Earthfill
Height above Original Streambed	134 ft
Top Length	3,050 ft
Top Width	30 ft
Freeboard	4.5 ft
Outlets:	
Type of Gates	Vertical lift
Number and Size of Gates	6 - 9.75' W x 14.75' H
Invert Elevation	470.0 ft
Regulated Outflow at Spillway Crest	30,000 ft^3/s
Spillway:	
Type	Overflow Concrete
Crest Length	1,000 ft
Design Discharge	481,000 ft^3/s

Includes Phase II GDM modifications to Prado Dam.
Areas and storages based on 1988 Survey.

TABLE 3: PERTINENT DATA - PRIOR TO PHASE II MODIFICATIONS PRADO DAM AND RESERVOIR

Drainage Area	2,255.0 mi^2
Reservoir Elevation	
Debris Pool	490.0 ft
Flood Control Pool (spillway crest)	543.0 ft
Top of Dam	566.0 ft
Reservoir Gross Capacity	
Debris Pool	4,688 af
Spillway Crest	186,700 af
Allowance for Sediment (50- year)	35,000 af
Allowance for Sediment (100- year)	70,000 af
Reservoir Area	
Debris Pool	768 ac
Spillway Crest	6,664 ac
Dam: - Type	Earthfill
Height above Original Streambed	106 ft
Top Length	2,280 ft
Top Width	30 ft
Design Freeboard (1941)	10 ft
Outlets:	
Type of Gates	Vertical lift
Number and Size of Gates	6 - 7' W x 12' H
Invert Elevation	460.0 ft
Regulated Outflow at Spillway Crest	17,000 ft^3/s
Spillway:	
Type	Ungated Ogee
Crest Length	1,000 ft
Design Discharge	181,000 ft^3/s

Does not include Phase II GDM modifications to Prado Dam.
Areas and storages based on 1988 Survey.

TABLE 4: RESERVOIR DEVELOPMENT
PRADO DAM

Elevation	Structure or Feature in Basin
460 - 566	Least Bell's vireo Nesting Habitat
480 - 566	Archeological and Historic Sites
485 - 525	Raahauge's Hunting Club
500	Club House
485 - 520	Splatter S Duck Club
556.4 & 611.0	Club Houses
490 - 504	Prado Recreation, Inc. (Dog Training Facility)
554	Kennel/Trailer
492 - 508	Oil Wells
510 - 567	El Prado Golf Course
554	Club House
514 - 534	City of Corona Municipal Airport
516 - 518	Tiro Shooting Range
520 - 560	Prado Regional Park (San Bernardino County)
550 - 552	Camping Area
520 - 560	Archery Range
525 - 573	Prado Basin Park (Developed Area) Riverside County
573	Interpretation Center
527 - 550	Butterfield Park (City of Corona)
534	Bandini Adobe
536	Kobe Power Fluid Station
537 - 546	Chino Basin Water District (Wastewater Treatment Plant #2)
540	City of Corona Wastewater Percolation Ponds (Perimeter Levee)
550 - 554	12 Unauthorized Dwellings
556	City of Corona Wastewater Treatment Plant #2)
560	Oil Treating Facilities
560 - 572	California Institution for Women (State Prison)
560.2	Yorba Slaughter Adobe
561 - 566	2 Dwellings within Corona National Tract
Elevations in feet NGVD; 1929 datum.	

TABLE 5: RESERVOIR REGULATION SCHEDULE [1] - PRADO DAM

(FALLING AND RISING STAGES)

NORMAL COMMUNICATION (BETWEEN ROC & DAM TENDER)				NO COMMUNICATION (BETWEEN ROC & DAM TENDER)								
Desired Discharge Range (cfs)		Recommended Gate Settings	Reservoir W.S. Elevation (ft)	Recommended Gate Settings (ft) #1	#2	#3	#4	#5	#6	Comp. Discharge Range (cfs)	D/S Gage Ht. (ft)	
Non-flood Season[3] Maintain WSE at or below 505.0 ft. Release greatest of: 1. Inflow (up to 2500 cfs 2. OCWD's capacity 3. 200 cfs	Flood Seas[4] 0 - 600	Gate settings are determined by Water Control Manager at the ROC. RESCAL and/or Gate Rating Curves are used to prepare the gate settings.	460.0 - 490.0	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**0.0**	0 - 540	1.60 - 3.87	During Non-flood Season[3]: Try to maintain WSE at or below 505.0 ft. Max. gate setting allowed: 1.2 ft on all gates[5]. During flood[4] season follow schedule to the left.
	200 - 2500		490.0 - 494.0	**0.0**	**0.0**	**1.0**	**0.9**	**0.0**	**0.0**	513 - 547	3.82 - 3.88	
	2500 - 5000[2]		494.0 - 497.0	**0.0**	**1.3**	**1.4**	**1.4**	**1.3**	**0.0**	1515 - 1582	4.87 - 4.92	
			497.0 - 500.0	**1.4**	**1.3**	**1.4**	**1.4**	**1.3**	**1.4**	2400 -2504	5.40 - 5.46	
			500.0 - 505.0	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.2**	2335 - 2480	5.37 - 5.44	
2500 - 5000[2]			505.0 - 508.0	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	3410 - 3525	5.86 - 5.91	
			508.0 - 512.0	**2.2**	**2.0**	**1.8**	**1.8**	**2.0**	**2.2**	3869 - 4052	6.04 - 6.11	
			512.0 - 516.0	**2.2**	**2.2**	**2.1**	**2.1**	**2.2**	**2.2**	4360 - 4531	6.22 - 6.28	
			516.0 - 520.0	**2.2**	**2.9**	**2.1**	**2.1**	**2.9**	**2.2**	4960 - 5139	6.42 - 6.47	
5000[2]		For a release of 5,000 cfs, use the NO COMMUNICATION schedule located to the right. If releases of greater than 5,000 cfs is desired, use RESCAL or Gate Rating Curves in order to determine gate settings.	520.0 - 525.0	**2.0**	**2.9**	**2.0**	**2.0**	**2.9**	**2.0**	4942 - 5155	6.41 - 6.48	
			525.0 - 533.0	**2.0**	**2.0**	**2.0**	**2.0**	**2.9**	**2.0**	4860 - 5150	6.39 - 6.48	
			533.0 - 543.0	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	4830 - 5150	6.39 - 6.48	
			Spillway Flow 543.0 - 543.6	**2.0**	**0.5**	**2.0**	**2.0**	**0.5**	**2.0**	3896 - 5806	6.05 - 6.67	
			543.6 - 544.0	**0.0**	**0.5**	**2.0**	**2.0**	**0.5**	**0.0**	4086 - 5355	6.12 - 6.54	
			544.0 - 544.3	**0.0**	**0.0**	**2.0**	**2.0**	**0.0**	**0.0**	4884 - 5187	6.39 - 6.49	
5000[2]			Above 544.3	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	4960 - above	6.40 - +	

TABLE 5 (cont.): RESERVOIR REGULATION SCHEDULE [1] - PRADO DAM

DAM TENDER INSTRUCTIONS

1. **NORMAL COMMUNICATION** between the ROC and Damtender.

    a. The Reservoir Operations Center will provide gate settings to the damtender in accordance with the **NORMAL COMMUNICATION** schedule.

    b. Notify the Reservoir Operations Center if unable to set the gates as instructed.

2. **NO COMMUNICATION** between the ROC and Damtender.

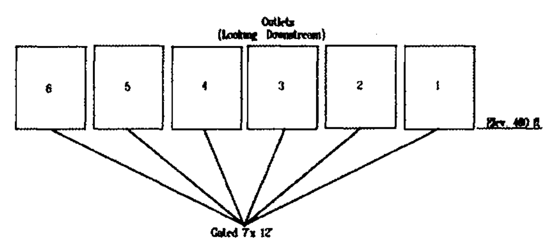
    a. Try to reestablish communication through the Orange County Environmental Management Agency's (OCEMA) Storm Operations Center via telephone at (714) 567-6300, and Corps radio.

    b. Attempt to reestablish communication with the District Office for a period of four (4) hours. If after four (4) hours, communication cannot be reestablished, follow the **"NO COMMUNICATION"** schedule.

    c. When making gate changes, make sure that the "Gate Change Restrictions" as described in the following table are not exceeded.

Maximum Permissible Rate of Release Change at Prado Dam

Current Release (cfs)	Maximum rate of Change per 1/2 hour (cfs)
0 - 300	100
300 - 1,000	250
1,000 - 2,500	400
2,500 - 5,000	625
> 5,000	625



Notes: 1.This schedulewill be updated for use during the construction of the Santa Ana River Project which includes the modification of the lower Santa Ana River (SAR).
2. As the lower Santa Ana River project progresses, the channel capacity increases; therefore, the maximum release from Prado Dam is not limited to 5000 cfs (if the lower SAR channel can safely convey higher flows as a result of construction).
3. Non-Flood Season: 1 March to 30 September. Beginning 1 March, WSE is increased at a rate of 1.1. ft/day (or greater) until WSE 505.0 ft is reached (10 March). Max. water conservation pool is up to WSE 505.0 ft. The month of September is designated as maintenance period (i.e., the dam may be required to empty). See chapter 7 of the Water Control Manual for details.
4. Flood Season: 1 October to 28 February. Water conservation pool is up to 494.0 ft only. October is also designated as alternate month for maintenance period. See chapter 7 of the Water Control Manual for details.
5. A setting of 1.2 ft on all gates will result in a discharge of approximately 2500 cfs at WSE 505.0 ft.

REVISED: MAY 1994

TABLE 6: GENERAL CHARACTERISTICS OF THE OCWD SANTA ANA RIVER INFILTRATION ENHANCEMENT FACILITY[1]

Basin	Invert Elevation (ft)	Maximum WSE (ft)	Maximum Surface Area (ft^2)	Maximum Storage (af)
Imperial Desilting Basins	---	260	33	200
Huckleberry	207	250	21	630
Con-Rock Basin	193	243	25	1,070
Warner Basin	187	239	71	2,690
Olive Pit	200	227	3	60
Glassel Basin	---	---	98	--
Fives Coves Basin	170	201	29	690
Lincoln Basin	183	190	10	60
Burris Pit	90	175	125	2,980
Ball Road Basin	155	160	11	53
Anaheim Lake	175	224	72	2,260
OCEMA Basins[2]				
Gilbert	91	106	463	770
Placentia	177	---	---	135
Miller	209	217	27	164
Crescent	112	123	8	80
Raymond	156	170	19	242
Kramer Basin	170	220	31	1,035
Santiago Basins	150	290	193	14,300

Footnotes:
1. As of May 1994.
2. OCEMA allows use for water conservation during non-flood season.

WSE = water surface elevation

TABLE 7: PRECIPITATION GAGES
USED TO DETERMINE REPRESENTATIVE PERIOD OF RECORD

Station	Location		Elevation (ft)	Period of Record	Observer
	Lat	Long			
Big Bear Lake	34° 14'	116° 58'	6,815	1883-Present	Bear Valley Municipal Water Company
Santa Ana PH3	34° 06'	116° 07'	1,950	1923-Present	Southern California Edison
San Antonio HT	34° 09'	117° 39'	1,901	1944-Present	---
City of San Bernardino	34° 06'	117° 17'	1,030	1930-Present	San Bernardino Water Department
Lytle Creek Ranger Station	34° 14'	117° 28'	2,730	1930-Present	National Weather Service

Lat = latitude
Long = longitude

TABLE 8: STREAM GAGES IN THE SANTA ANA RIVER BASIN USED TO DETERMINE REPRESENTATIVE PERIOD OF RECORD

Station	Drainage Area (mi^2)	Location		Period of Record	Maximum Discharge			
		Lat	Long		Peak		Mean	
					(ft^3/s)	Date	(ft^3/s)	Date
Streamgages Used to Determine Representative Period of Record								
Santa Ana R. near Mentone (11051500)	177.0	34° 07'	117° 06'	1917-Present	52,300	3/2/38	15,500	3/2/38
Plunge Creek near E.Highlands (11055500)	16.9	34° 07'	117° 08'	1919-Present	5,340	3/2/38	N/A	N/A
City Creek nr. Highland (11055800)	19.6	34° 09'	117° 11'	1919-Present	7,000	2/25/69	3,360	2/25/69
Lytle Creek nr. Fontana (11062000)	46.3	34° 13'	117° 27'	1918-Present	35,900	1/25/69	8,960	1/25/69
Streamgages Used in Runoff Adjustment Computations								
SAR below Prado Dam (11074000)	1,490	33° 53'	117° 39'	1941-Present	7,440	2/21/80	6,440	2/23/80
SAR at Imperial Highway (11075600) (OCEMA 122)	1,536	33° 52'	117° 47'	1934-Present	11,500	2/7/37	686	2/19/80
Lat = latitude Long = longitude (11074000) = USGS gage number								

TABLE 9: RELEASE SCHEDULE USED IN HEC-5 MODELS FOR PRESENT AND FUTURE CONDITIONS

Elevation (ft)	Flood Season Release[1] (ft^3/s)	Non-Flood Season Release[2] (ft^3/s)
470.0	0	0
471.0	500	500
490.0	500	500
494.0	500	500
494.4	1,000	500
494.8	2,000	500
495.0	2,500	500
495.2	3,000	500
496.0	5,000	500
498.0	5,000	500
500.0	5,000	500
505.0	5,000	500
510.0	5,000	2,500
512.0	5,600	3,000
515.0	8,000	5,000
520.0	12,000	12,000
525.0	16,000	16,000
530.0	20,000	20,000
540.0	30,000	30,000
563.0	30,000	30,000

[1] Flood season releases maintained at 500 ft^3/s until WSE reaches top of Buffer Pool; (Buffer Pool at 494 shown). When WSE exceeds Buffer Pool, evacuate per gate operation schedule; includes max. rate-of-change criteria.
[2] Non-flood season releases maintained at 500 ft^3/s until WSE reaches top of Seasonal Pool.
For Future Conditions use 580 ft^3/s instead of 500 ft^3/s for Buffer Pool and Seasonal Pool releases.

TABLE 10: ELEVATION-AREA-CAPACITY RELATIONSHIP
PRADO DAM - PRESENT CONDITIONS

Elevation (ft)	Area (ac)	Storage (af)	Elevation (ft)	Area (ac)	Storage (af)
470.0	4	7	507.0	2,326	30,190
471.0	7	13	508.0	2,426	32,580
475.0	28	70	509.0	2,585	35,080
490.0	768	4,688	510.0	2,660	37,710
491.0	872	5,508	511.0	2,812	40,440
494.0	1,081	8,435	512.0	2,884	43,290
494.4	1,117	8,875	513.0	3,043	46,250
494.8	1,154	9,329	514.0	3,126	49,340
495.0	1,173	9,562	515.0	3,268	52,530
495.2	1,182	9,797	516.0	3,346	55,840
495.6	1,201	10,270	517.0	3,467	59,250
496.0	1,220	10,760	518.0	3,540	62,750
498.0	1,433	13,640	519.0	3,710	66,370
499.0	1,500	15,080	520.0	3,782	70,120
500.0	1,593	16,520	525.0	4,323	94,690
502.0	1,783	19,940	530.0	4,897	99,160
503.0	1,897	21,780	540.0	6,138	171,700
504.0	1,961	23,710	550.0	7,615	237,164
505.0	2,123	25,750	560.0	9,463	322,100
506.0	2,189	27,910	563.0	10,280	351,700

Elevations in feet MSL; 1929 datum
Debris Pool = 490.0 ft
Spillway Crest = 563.0 ft
Top of Dam = 594.4 ft
Areas and storages based on1988 Survey

TABLE 11: ELEVATION-AREA-CAPACITY RELATIONSHIP
PRADO DAM - FUTURE CONDITIONS

Elevation (ft)	Area (ac)	Storage (af)	Elevation (ft)	Area (ac)	Storage (af)
470.0	0	0	507.0	1,898	19,292
471.0	1	3	508.0	1,959	21,216
475.0	10	15	509.0	2,114	23,247
490.0	23	48	510.0	2,186	25,404
491.0	329	630	511.0	2,335	27,659
494.0	686	2,700	512.0	2,404	30,030
494.4	720	3,044	513.0	2,561	32,509
494.8	754	3,397	514.0	2,641	35,116
495.0	771	3,571	515.0	2,781	37,820
495.2	779	3,794	516.0	2,857	40,462
495.6	796	4,239	517.0	2,977	43,562
496.0	812	4,685	518.0	3,048	46,571
498.0	987	6,725	519.0	3,217	49,699
499.0	907	4,739	520.0	3,288	52,955
500.0	1,161	8,764	525.0	3,827	70,952
502.0	1,341	11,309	530.0	4,405	91,185
503.0	1,450	12,705	540.0	5,675	141,685
504.0	1,509	14,185	550.0	7,219	205,949
505.0	1,667	15,772	560.0	9,230	287,563
506.0	1,729	17,474	563.0	10,280	316,700

Elevations in feet MSL; 1929 datum — Debris Pool = 490.0 ft
Spillway Crest = 563.0 ft — Top of Dam = 594.4 ft
1988 Survey with 35,000 af of sediment distributed up to spillway crest

TABLE 12: HEC-5 RESULTS - ALTERNATIVE 1 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1950	490.73	500	234,000	239,000	0
1951	475.92	500	214,000	216,000	0
1952	510.76	5,000	358,000	284,000	93,200
1953	480.83	500	234,000	238,000	0
1954	499.86	4,000	251,000	247,000	12,000
1955	490.83	500	246,000	251,000	2,470
1956	499.11	5,000	246,000	227,000	19,900
1957	489.50	500	209,000	213,000	20
1958	513.28	5,000	321,000	266,000	64,800
1959	486.69	500	202,000	202,000	0
1960	489.59	500	202,000	206,000	230
1961	483.96	500	188,000	197,000	120
1962	495.66	3,050	213,000	211,000	9,660
1963	491.30	500	200,000	204,000	0
1964	487.26	500	197,000	201,000	0
1965	495.62	500	210,000	214,000	0
1966	508.80	5,000	280,000	225,000	56,600
1967	515.48	7,360	294,000	223,000	81,900
1968	499.45	500	224,000	233,000	220
1969	532.81	21,300	699,000	282,000	435,900
1970	497.66	500	214,000	217,000	0

TABLE 12 (cont.): HEC-5 RESULTS - ALTERNATIVE 1 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1971	496.14	2,240	217,000	214,000	6,560
1972	495.97	2,880	208,000	202,000	9,600
1973	497.51	4,830	257,000	246,000	14,100
1974	498.04	5,000	240,000	230,000	19,100
1975	490.76	500	216,000	218,000	0
1976	494.29	550	214,000	217,000	500
1977	492.27	500	205,000	206,000	0
1978	521.60	11,900	493,000	268,000	254,900
1979	506.97	3,710	302,000	280,000	25,600
1980	524.19	14,900	707,000	298,000	427,100
1981	496.43	840	234,000	237,000	910
1982	507.41	1,470	276,000	270,000	11,000
1983	518.07	9,670	589,000	341,000	274,900
1984	498.90	5,000	284,000	265,000	27,200
1985	197.73	4,050	263,000	253,000	12,600
1986	503.53	5,000	281,000	269,000	23,400
1987	493.91	500	220,000	224,000	0
1988	493.97	500	247,000	251,000	980

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 13: HEC-5 RESULTS - ALTERNATIVE 2 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread	Water "Lost"
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)	(af)	(af)
1950	490.73	500	234,000	239,000	0
1951	475.92	500	214,000	216,000	0
1952	512.02	5,000	358,000	284,000	91,100
1953	480.83	500	234,000	238,000	0
1954	498.00	2,570	251,000	252,000	6,820
1955	490.79	500	246,000	251,000	2,470
1956	499.24	5,000	246,000	234,000	12,500
1957	489.50	500	209,000	213,000	20
1958	513.31	5,000	321,000	266,000	124,250
1959	486.69	500	202,000	202,000	0
1960	489.59	500	202,000	206,000	230
1961	483.96	500	188,000	197,000	120
1962	498.00	2,050	213,000	216,000	4,640
1963	491.30	500	200,000	204,000	0
1964	487.26	500	197,000	201,000	0
1965	495.62	500	210,000	214,000	0
1966	508.80	5,000	280,000	233,000	48,300
1967	515.48	7,360	294,000	234,000	71,000
1968	499.45	500	224,000	233,000	220
1969	533.06	21,500	699,000	282,000	436,000
1970	497.66	500	214,000	217,000	0

TABLE 13 (cont.): HEC-5 RESULTS - ALTERNATIVE 2 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1971	498.00	1,150	217,000	219,000	1,330
1972	498.00	1,690	208,000	207,000	4,400
1973	500.21	2,940	257,000	251,000	8,920
1974	498.04	4,480	240,000	235,000	13,800
1975	490.76	500	216,000	218,000	0
1976	494.45	500	214,000	217,000	0
1977	492.27	500	205,000	206,000	0
1978	521.66	12,000	493,000	268,000	255,000
1979	508.30	3,000	302,000	280,000	25,500
1980	524.04	14,800	707,000	298,000	427,000
1981	497.06	500	234,000	238,000	0
1982	507.41	1,470	276,000	270,000	11,000
1983	517.82	9,280	589,000	341,000	270,000
1984	498.00	3,710	284,000	270,000	27,000
1985	498.00	1,950	263,000	259,000	5,480
1986	505.90	4,540	281,000	273,000	19,900
1987	493.91	500	220,000	224,000	0
1988	493.97	500	247,000	251,000	980
WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows					

TABLE 14: HEC-5 RESULTS - ALTERNATIVE 3 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1950	490.73	500	234,000	239,000	0
1951	475.92	500	214,000	216,000	0
1952	512.63	5,000	358,000	286,000	91,100
1953	480.83	500	234,000	238,000	0
1954	500.00	1,240	251,000	255,000	3,930
1955	490.86	500	246,000	251,000	2,470
1956	500.00	4,390	246,000	237,000	9,590
1957	489.50	500	209,000	213,000	20
1958	513.31	3,880	321,000	266,000	64,700
1959	486.69	500	202,000	202,000	0
1960	489.59	500	202,000	206,000	230
1961	483.96	500	188,000	197,000	120
1962	500.00	1,230	213,000	218,000	1,760
1963	491.30	500	200,000	204,000	0
1964	487.26	500	197,000	201,000	0
1965	495.62	500	210,000	214,000	0
1966	508.80	5,000	280,000	236,000	45,400
1967	515.48	7,360	294,000	239,000	65,800
1968	499.45	500	224,000	233,000	220
1969	533.35	21,700	699,000	282,000	436,000
1970	497.66	500	214,000	217,000	0
1971	498.99	500	217,000	220,000	40

TABLE 14 (cont.): HEC-5 RESULTS - ALTERNATIVE 3 - PRESENT CONDITIONS

Water Year	Prado Dam Max. WSE (ft)	Prado Dam Max. Release (ft^3/s)	Prado Dam Inflow (af)	Total Water Spread (af)	Water "Lost" (af)
1972	500.00	1,210	208,000	210,000	1,520
1973	501.88	2,400	257,000	254,000	6,050
1974	500.00	3,530	240,000	238,000	10,900
1975	490.76	500	216,000	218,000	0
1976	494.45	500	214,000	217,000	0
1977	492.27	500	205,000	206,000	0
1978	521.69	12,100	493,000	268,000	255,000
1979	509.06	2,130	302,000	280,000	25,400
1980	524.16	14,900	707,000	298,000	427,000
1981	497.06	500	234,000	238,000	0
1982	507.41	1,470	276,000	270,000	11,000
1983	518.21	9,890	589,000	341,000	267,000
1984	500.00	3,700	284,000	273,000	26,900
1985	500.00	1,810	263,000	262,000	2,600
1986	506.88	3,570	281,000	273,000	19,600
1987	493.91	500	220,000	224,000	0
1988	493.97	500	247,000	251,000	980

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 15: HEC-5 RESULTS - ALTERNATIVE 4 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1950	490.73	500	234,000	239,000	0
1951	475.92	500	214,000	216,000	0
1952	510.94	5,050	358,000	285,000	92,900
1953	480.83	500	234,000	238,000	0
1954	502.28	500	251,000	258,000	0
1955	490.78	500	246,000	251,000	2,470
1956	505.00	610	246,000	246,000	360
1957	489.50	500	209,000	213,000	0
1958	505.97	5,000	321,000	265,000	65,800
1959	486.69	500	202,000	202,000	0
1960	489.59	500	202,000	206,000	230
1961	483.83	500	188,000	197,000	120
1962	501.03	500	213,000	220,000	50
1963	491.30	500	200,000	204,000	0
1964	487.26	500	197,000	201,000	0
1965	495.62	500	210,000	214,000	0
1966	507.46	5,000	280,000	245,000	36,100
1967	515.35	7,330	294,000	250,000	54,600
1968	499.45	500	224,000	233,000	220
1969	531.85	20,500	699,000	282,000	436,000
1970	497.66	500	214,000	217,000	0
1971	498.99	500	217,000	220,000	40

TABLE 15 (cont.): HEC-5 RESULTS - ALTERNATIVE 4 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1972	500.91	500	208,000	212,000	0
1973	504.99	500	257,000	260,000	0
1974	504.59	500	240,000	246,000	2,480
1975	490.76	500	216,000	218,000	0
1976	494.45	550	214,000	217,000	0
1977	492.27	500	205,000	206,000	0
1978	520.63	11,600	493,000	267,000	256,000
1979	505.00	4,740	302,000	279,000	25,900
1980	523.88	14,700	707,000	298,000	427,000
1981	497.06	500	234,000	238,000	0
1982	505.00	3,060	276,000	269,000	11,900
1983	518.13	10,300	589,000	341,000	266,000
1984	505.00	3,690	284,000	282,000	17,700
1985	501.53	500	263,000	265,000	0
1986	505.00	3,180	281,000	272,000	20,200
1987	493.91	500	220,000	224,000	0
1988	493.97	500	247,000	251,000	980

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 16: HEC-5 RESULTS - ALTERNATIVE 5 - PRESENT CONDITIONS

Water Year	Prado Dam			Total Water Spread	Water "Lost"
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)	(af)	(af)
1950	490.73	500	234,000	239,000	0
1951	475.92	500	214,000	214,000	0
1952	512.66	5,580	358,000	291,000	86,000
1953	480.83	500	234,000	238,000	0
1954	502.28	500	251,000	258,000	0
1955	490.78	500	246,000	251,000	2,470
1956	505.17	500	246,000	246,000	0
1957	489.50	500	209,000	213,000	0
1958	508.83	5,000	321,000	272,000	58,900
1959	486.69	500	202,000	202,000	0
1960	489.69	500	202,000	206,000	230
1961	483.83	500	188,000	197,000	120
1962	501.03	500	213,000	220,000	50
1963	491.30	500	200,000	204,000	0
1964	487.26	500	197,000	201,000	0
1965	495.62	500	210,000	214,000	0
1966	510.13	5,000	280,000	252,000	29,300
1967	515.35	7,330	294,000	257,000	47,900
1968	499.45	500	224,000	233,000	220
1969	532.51	21,000	699,000	288,000	429,000
1970	497.66	500	214,000	217,000	0
1971	498.99	500	217,000	220,000	40

TABLE 16 (cont.): HEC-5 RESULTS - ALTERNATIVE 5 - PRESENT CONDITIONS

Water Year	Prado Dam Max. WSE (ft)	Prado Dam Max. Release (ft^3/s)	Prado Dam Inflow (af)	Total Water Spread (af)	Water "Lost" (af)
1972	500.91	500	208,000	212,000	0
1973	504.99	500	257,000	260,000	0
1974	504.59	500	240,000	246,000	2,480
1975	490.76	500	216,000	218,000	0
1976	494.45	550	214,000	217,000	0
1977	492.27	500	205,000	206,000	0
1978	520.90	11,900	493,000	274,000	249,000
1979	508.00	4,740	302,000	286,000	18,900
1980	524.23	14,900	707,000	304,000	420,000
1981	497.06	500	234,000	238,000	0
1982	508.00	2,800	276,000	276,000	5,050
1983	518.70	10,900	589,000	341,000	259,000
1984	508.00	3,680	284,000	289,000	17,300
1985	501.53	500	263,000	265,000	0
1986	508.00	3,180	281,000	279,000	13,400
1987	493.91	500	220,000	224,000	0
1988	493.97	500	247,000	251,000	980
WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows					

TABLE 17: HEC-5 RESULTS - ALTERNATIVE 1 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1950	495.58	2,150	319,000	321,000	3,750
1951	490.82	580	299,000	301,000	0
1952	515.32	5,460	462,000	345,000	139,000
1953	493.41	580	320,000	324,000	0
1954	502.72	4,560	341,000	323,000	26,700
1955	496.64	2,290	334,000	329,000	12,500
1956	507.06	5,000	336,000	308,000	28,300
1957	496.72	1,690	295,000	297,000	2,740
1958	514.09	5,000	425,000	328,000	109,000
1959	495.39	1,520	288,000	285,000	2,520
1960	495.75	1,940	289,000	289,000	3,370
1961	494.57	780	273,000	281,000	1,070
1962	496.39	3,490	302,000	287,000	23,500
1963	496.50	2,700	288,000	286,000	4,640
1964	495.59	1,410	283,000	286,000	2,660
1965	503.88	1,340	298,000	300,000	2,130
1966	512.65	5,560	380,000	297,000	83,800
1967	519.72	11,000	395,000	299,000	109,000
1968	505.15	3,390	315,000	309,000	15,900
1969	538.95	26,600	846,000	348,000	520,000
1970	500.57	1,750	302,000	296,000	296,000
1971	500.83	4,220	306,000	288,000	21,200

TABLE 17 (cont.): HEC-5 RESULTS - ALTERNATIVE 1 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1972	500.26	4,520	296,000	281,000	19,700
1973	503.51	5,000	350,000	325,000	29,700
1974	498.95	5,000	333,000	312,000	30,800
1975	498.39	1,630	304,000	304,000	2,210
1976	497.61	2,850	302,000	296,000	8,980
1977	497.01	3,060	293,000	288,000	6,800
1978	525.01	14,400	624,000	332,000	325,000
1979	510.37	4,650	402,000	342,000	63,900
1980	528.24	17,900	847,000	363,000	505,000
1981	498.61	3,800	322,000	313,000	14,000
1982	512.42	5,000	372,000	334,000	43,900
1983	521.15	12,900	713,000	396,000	353,000
1984	500.50	4,600	374,000	335,000	42,300
1985	500.74	4,740	353,000	328,000	26,000
1986	507.65	5,000	376,000	337,000	51,300
1987	499.28	3,170	307,000	304,000	7,380
1988	499.38	2,780	339,000	326,000	19,200

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 18: HEC-5 RESULTS - ALTERNATIVE 2 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1950	497.72	580	319,000	325,000	0
1951	490.83	580	299,000	301,000	0
1952	515.57	5,750	462,000	355,000	129,000
1953	493.41	580	320,000	324,000	0
1954	502.46	3,010	341,000	328,000	20,900
1955	498.74	1,400	334,000	334,000	7,320
1956	507.18	5,000	336,000	312,000	24,100
1957	497.01	580	295,000	300,000	0
1958	515.64	5,650	425,000	334,000	103,000
1959	496.09	580	288,000	288,000	0
1960	497.37	580	289,000	293,000	170
1961	495.22	580	273,000	282,000	50
1962	499.08	2,590	302,000	292,000	17,400
1963	498.16	760	288,000	290,000	360
1964	495.96	580	283,000	288,000	0
1965	503.88	580	298,000	302,000	0
1966	513.51	5,910	380,000	308,000	73,400
1967	519.75	11,500	395,000	306,000	101,000
1968	505.15	1,360	315,000	316,000	9,570
1969	539.22	26,800	846,000	348,000	520,000
1970	502.12	1,870	302,000	300,000	4,920
1971	500.11	2,790	306,000	295,000	14,500

TABLE 18 (cont.): HEC-5 RESULTS - ALTERNATIVE 2 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1972	500.08	3,080	296,000	285,000	15,700
1973	504.87	5,000	350,000	331,000	23,100
1974	500.40	5,000	333,000	317,000	25,500
1975	498.39	580	304,000	307,000	0
1976	498.91	1,600	302,000	301,000	4,760
1977	498.75	1,410	293,000	293,000	2,270
1978	525.23	14,500	624,000	335,000	322,000
1979	511.73	3,370	402,000	346,000	60,000
1980	528.04	17,800	847,000	363,000	505,000
1981	500.60	2,080	322,000	317,000	9,850
1982	512.82	3,550	372,000	341,000	36,900
1983	521.63	13,200	713,000	401,000	344,000
1984	501.09	4,090	374,000	340,000	40,800
1985	500.74	3,670	353,000	333,000	21,100
1986	508.93	5,000	376,000	341,000	46,900
1987	499.28	1,380	307,000	308,000	3,370
1988	499.38	1,710	339,000	337,000	7,890

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 19: HEC-5 RESULTS - ALTERNATIVE 3 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1950	490.75	580	234,000	325,000	0
1951	475.87	580	214,000	301,000	0
1952	512.14	6,060	358,000	354,000	130,000
1953	481.17	580	234,000	324,000	0
1954	499.14	3,040	251,000	330,000	18,800
1955	491.50	1,010	246,000	336,000	5,200
1956	501.89	5,000	246,000	314,000	22,800
1957	490.06	580	209,000	300,000	0
1958	513.32	5,650	321,000	336,000	101,000
1959	487.30	580	202,000	288,000	0
1960	490.06	580	202,000	293,000	170
1961	484.03	580	188,000	282,000	50
1962	498.86	2,690	213,000	294,000	15,500
1963	491.35	580	200,000	291,000	0
1964	487.28	580	197,000	288,000	0
1965	495.72	580	210,000	302,000	0
1966	508.78	6,010	280,000	310,000	71,000
1967	515.47	11,800	294,000	310,000	97,110
1968	499.40	1,110	224,000	318,000	7,470
1969	542.15	27,000	699,000	344,000	524,000
1970	497.67	1,660	214,000	301,000	3,980
1971	498.39	2,660	217,000	297,000	12,400

TABLE 19 (cont.): HEC-5 RESULTS - ALTERNATIVE 3 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread (af)	Water "Lost" (af)
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)		
1972	498.67	2,570	208,000	287,000	13,600
1973	500.42	5,000	257,000	332,000	22,300
1974	500.28	5,000	240,000	318,000	24,200
1975	490.89	580	216,000	307,000	0
1976	494.51	1,170	214,000	303,000	2,760
1977	492.43	730	205,000	295,000	300
1978	521.59	14,500	493,000	333,000	324,000
1979	508.41	3,330	302,000	344,000	62,000
1980	523.62	17,800	707,000	359,000	509,000
1981	497.29	2,100	234,000	319,000	8,150
1982	507.42	3,700	276,000	339,000	38,300
1983	518.30	13,300	589,000	397,000	346,000
1984	499.75	4,230	284,000	342,000	40,500
1985	498.67	3,140	263,000	335,000	19,000
1986	506.01	5,000	281,000	343,000	44,800
1987	493.92	770	220,000	310,000	1,330
1988	494.20	1,480	247,000	340,000	4,460

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 20: HEC-5 RESULTS - ALTERNATIVE 4 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread	Water "Lost"
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)	(af)	(af)
1950	497.72	580	234,000	325,000	0
1951	490.82	580	214,000	301,000	0
1952	513.94	6,080	358,000	354,000	129,000
1953	493.29	580	234,000	324,000	0
1954	505.00	3,640	251,000	335,000	14,100
1955	502.26	580	246,000	339,000	2,470
1956	507.23	5,000	246,000	321,000	15,200
1957	496.76	580	209,000	300,000	0
1958	508.97	5,000	321,000	336,000	101,000
1959	495.92	580	202,000	288,000	0
1960	497.23	580	202,000	293,000	170
1961	495.22	580	188,000	282,000	50
1962	505.00	2,770	213,000	301,000	8,310
1963	498.52	580	200,000	291,000	0
1964	495.89	580	197,000	288,000	0
1965	503.76	580	210,000	302,000	0
1966	512.43	5,470	280,000	317,000	63,800
1967	519.07	10,700	294,000	323,000	83,700
1968	505.00	770	224,000	348,000	2,840
1969	536.48	24,500	699,000	305,000	520,000
1970	505.00	690	214,000	304,000	440
1971	505.00	2,040	217,000	294,000	5,310

TABLE 20 (cont.): HEC-5 RESULTS - ALTERNATIVE 4 - FUTURE CONDITIONS

Water Year	Prado Dam Max. WSE (ft)	Prado Dam Max. Release (ft^3/s)	Prado Dam Inflow (af)	Total Water Spread (af)	Water "Lost" (af)
1972	505.00	2,130	208,000	287,000	6,580
1973	505.00	5,000	257,000	332,000	22,400
1974	505.27	5,000	240,000	324,000	18,000
1975	498.30	580	216,000	307,000	0
1976	502.10	1,170	214,000	306,000	0
1977	500.23	730	205,000	295,000	0
1978	523.89	14,500	493,000	335,000	323,000
1979	505.67	3,330	302,000	346,000	59,800
1980	527.37	17,800	707,000	363,000	505,000
1981	505.00	2,100	234,000	323,000	3,480
1982	509.16	3,700	276,000	341,000	36,600
1983	521.00	13,300	589,000	403,000	340,000
1984	505.00	4,230	284,000	349,000	34,000
1985	505.00	3,140	263,000	342,000	12,000
1986	505.00	5,000	281,000	346,000	42,100
1987	501.08	770	220,000	312,000	0
1988	502.67	1,480	247,000	344,000	890

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 21: HEC-5 RESULTS - ALTERNATIVE 5 - FUTURE CONDITIONS

Water Year	Prado Dam			Total Water Spread	Water "Lost"
	Max. WSE (ft)	Max. Release (ft^3/s)	Inflow (af)	(af)	(af)
1950	497.72	580	234,000	325,000	0
1951	490.82	580	214,000	299,000	0
1952	514.59	6,510	358,000	359,000	124,000
1953	493.29	580	234,000	324,000	0
1954	508.00	2,740	251,000	340,000	8,610
1955	502.24	580	246,000	339,000	2,470
1956	508.00	4,250	246,000	326,000	9,760
1957	496.76	580	209,000	300,000	0
1958	511.32	5,100	321,000	341,000	95,400
1959	495.92	580	202,000	288,000	0
1960	497.23	580	202,000	293,000	170
1961	495.22	580	188,000	282,000	50
1962	508.00	1,500	213,000	307,000	2,870
1963	498.52	580	200,000	291,000	0
1964	495.89	580	197,000	288,000	0
1965	503.76	580	210,000	302,000	0
1966	512.60	5,540	280,000	322,000	58,300
1967	519.84	11,600	294,000	329,000	77,800
1968	506.54	580	224,000	325,000	160
1969	537.05	25,000	699,000	353,000	514,000
1970	505.26	580	214,000	305,000	0
1971	507.93	580	217,000	309,000	0

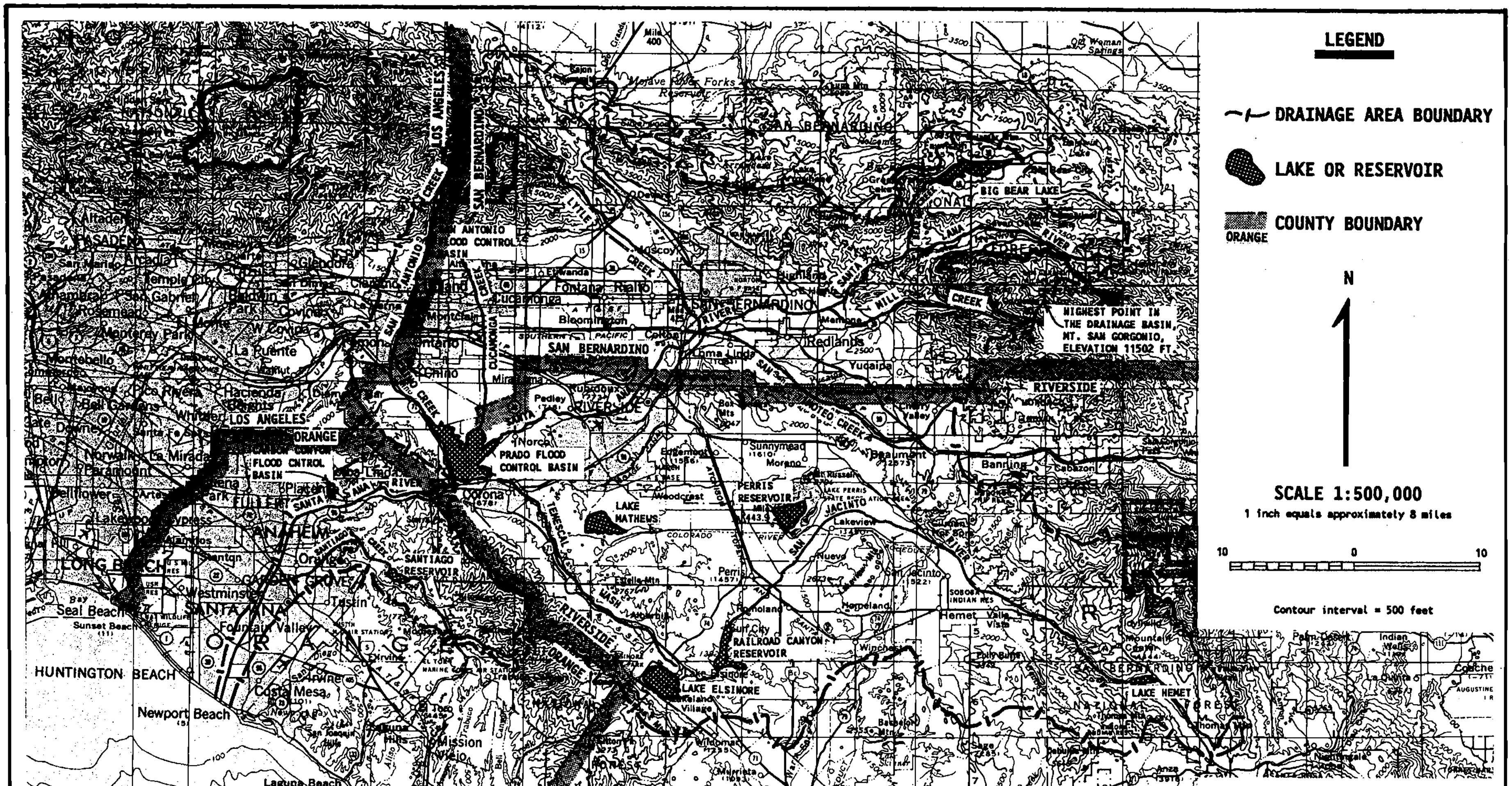
TABLE 21 (cont.): HEC-5 RESULTS - ALTERNATIVE 5 - FUTURE CONDITIONS

Water Year	Prado Dam Max. WSE (ft)	Prado Dam Max. Release (ft^3/s)	Prado Dam Inflow (af)	Total Water Spread (af)	Water "Lost" (af)
1972	508.00	1,020	208,000	299,000	1,130
1973	508.00	2,870	257,000	337,000	17,000
1974	508.00	3,490	240,000	329,000	12,500
1975	498.30	580	216,000	307,000	0
1976	502.10	580	214,000	306,000	0
1977	500.23	580	205,000	295,000	0
1978	523.95	14,200	493,000	340,000	317,000
1979	508.56	5,000	302,000	351,000	54,200
1980	527.53	17,400	707,000	368,000	499,000
1981	506.98	580	234,000	326,000	0
1982	511.04	5,010	276,000	346,000	31,100
1983	521.37	13,000	589,000	403,000	333,000
1984	508.00	4,610	284,000	354,000	33,700
1985	508.00	1,870	263,000	347,000	6,500
1986	508.00	4,210	281,000	351,000	36,600
1987	501.08	580	220,000	312,000	0
1988	502.67	580	247,000	344,000	890

WSE = Water Surface Elevation; Maximum WSE resulting from average daily inflows

TABLE 22: MONTHLY EVAPORATION RATES FOR PRADO DAM USED IN HEC-5 MODEL

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
4.00	2.00	1.06	0.30	0.64	1.93	3.28	4.96	6.03	7.48	7.48	5.41
Monthly evaporation in inches.											

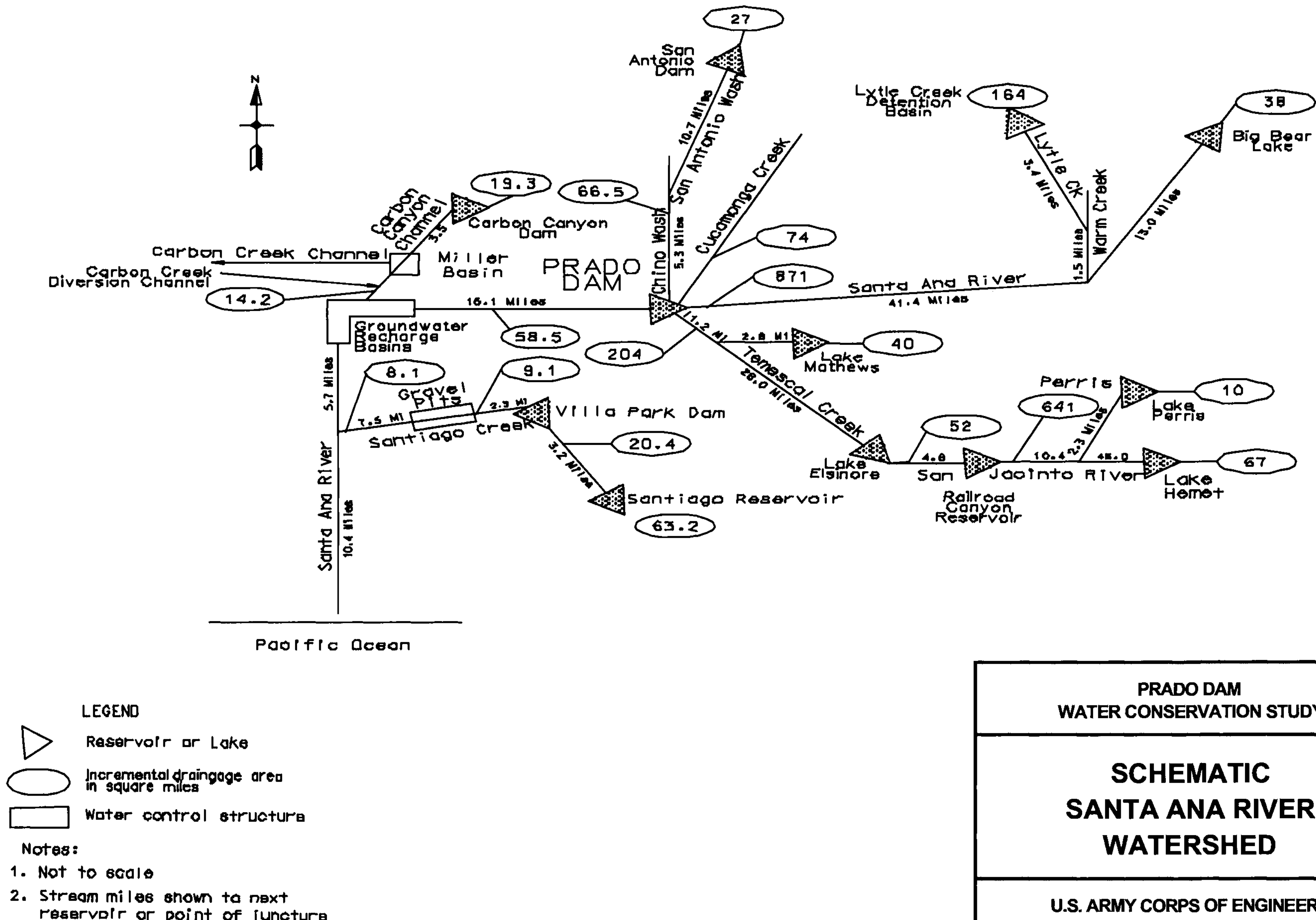


PRADO DAM
SANTA ANA RIVER, CALIFORNIA
WATER CONTROL MANUAL

SANTA ANA RIVER
BASIN TOPOGRAPHY

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 1



PRADO DAM
WATER CONSERVATION STUDY

SCHEMATIC
SANTA ANA RIVER
WATERSHED

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2

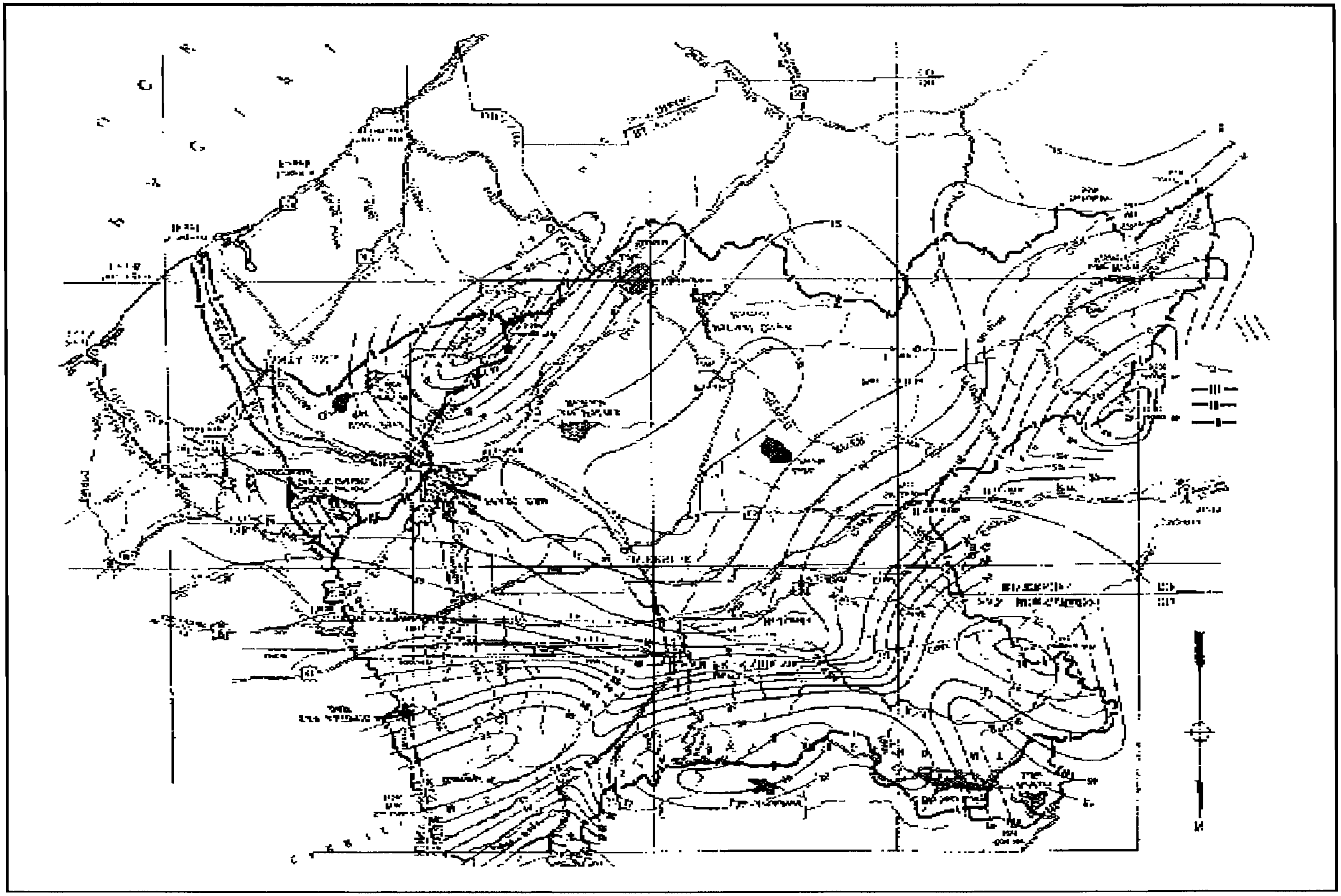
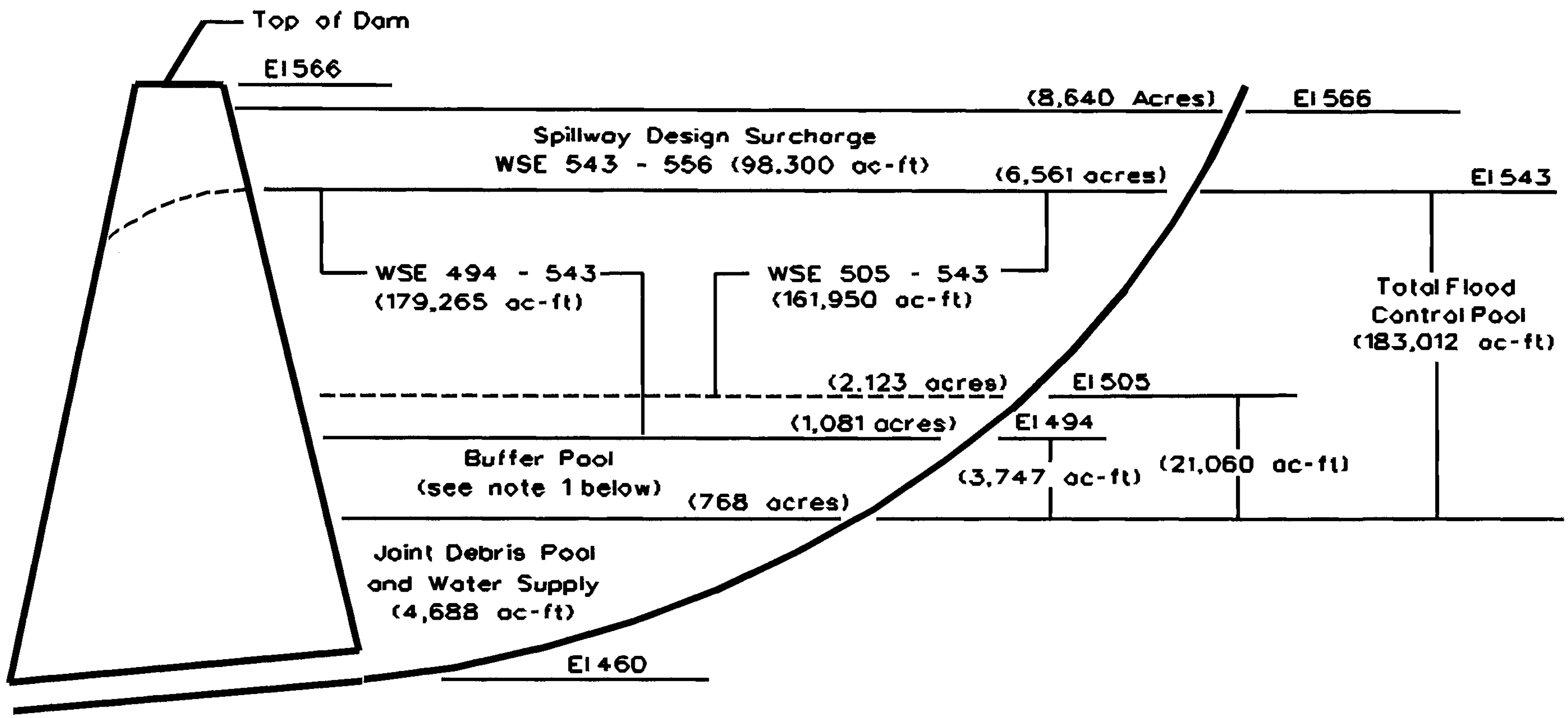


PLATE 3



NOTES:

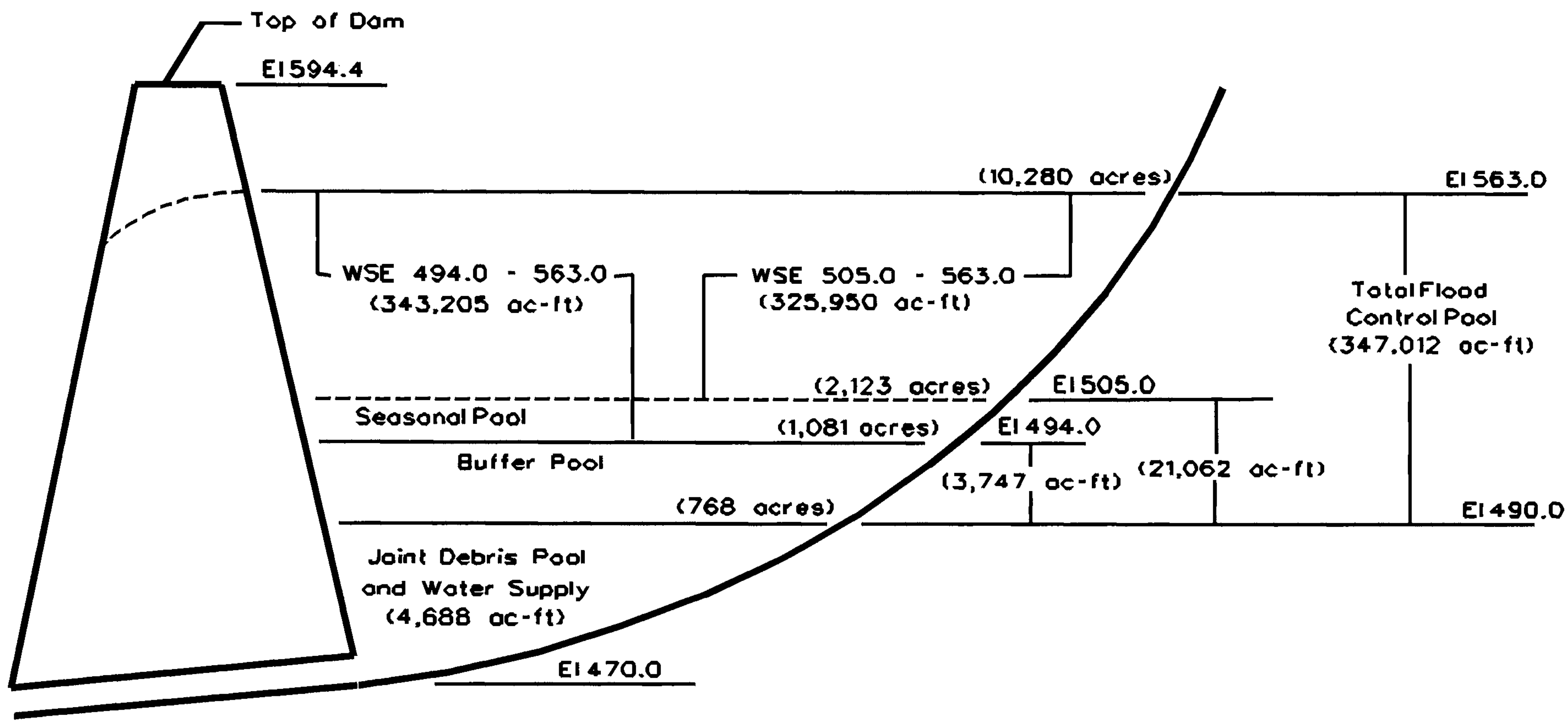
1. Buffer pool - El 494 during flood season (1 Oct - 28 Feb)
2. Seasonal pool - El 505.0 during non-flood season (1 Mar - 30 Sep)
3. Area and storage figures - Based on 1988 reservoir survey.
4. Elevations refer to existing Prado Dam configuration prior to Phase II GDM modifications.

PRADO DAM
WATER CONSERVATION STUDY

1998 PRADO DAM STORAGE ALLOCATION DIAGRAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4



NOTES:

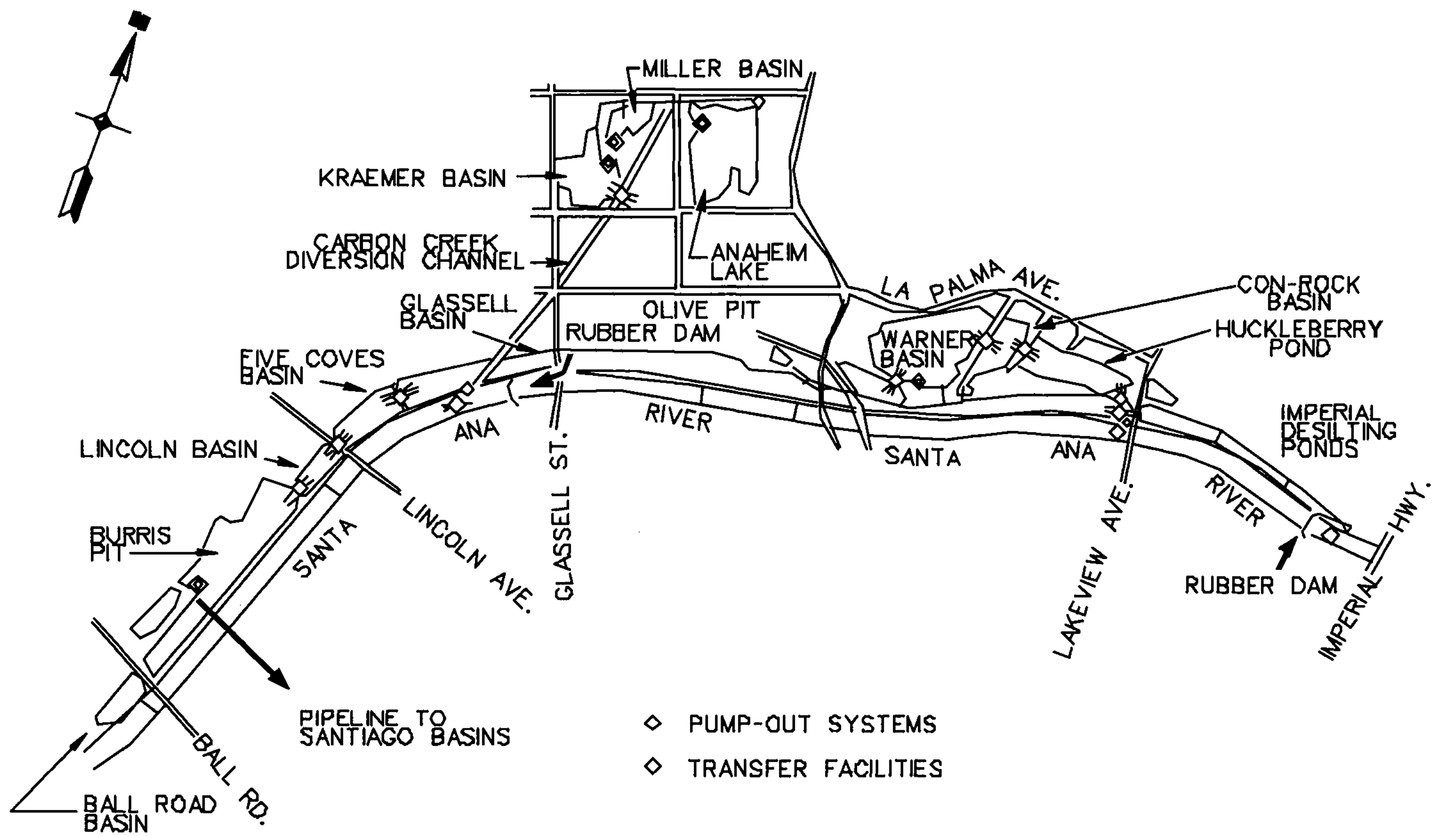
1. Buffer pool - El 494.0 during flood season (1 Oct - 28 Feb)
2. Seasonal pool - El 505.0 during non flood season (1 Mar - 30 Sep)
3. Area and storage values are based on 1988 reservoir survey.
4. Elevations refer to Prado Dam with Phase II GDM modifications.

PRADO DAM
WATER CONSERVATION STUDY

PHASE II PRADO DAM STORAGE ALLOCATION DIAGRAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5

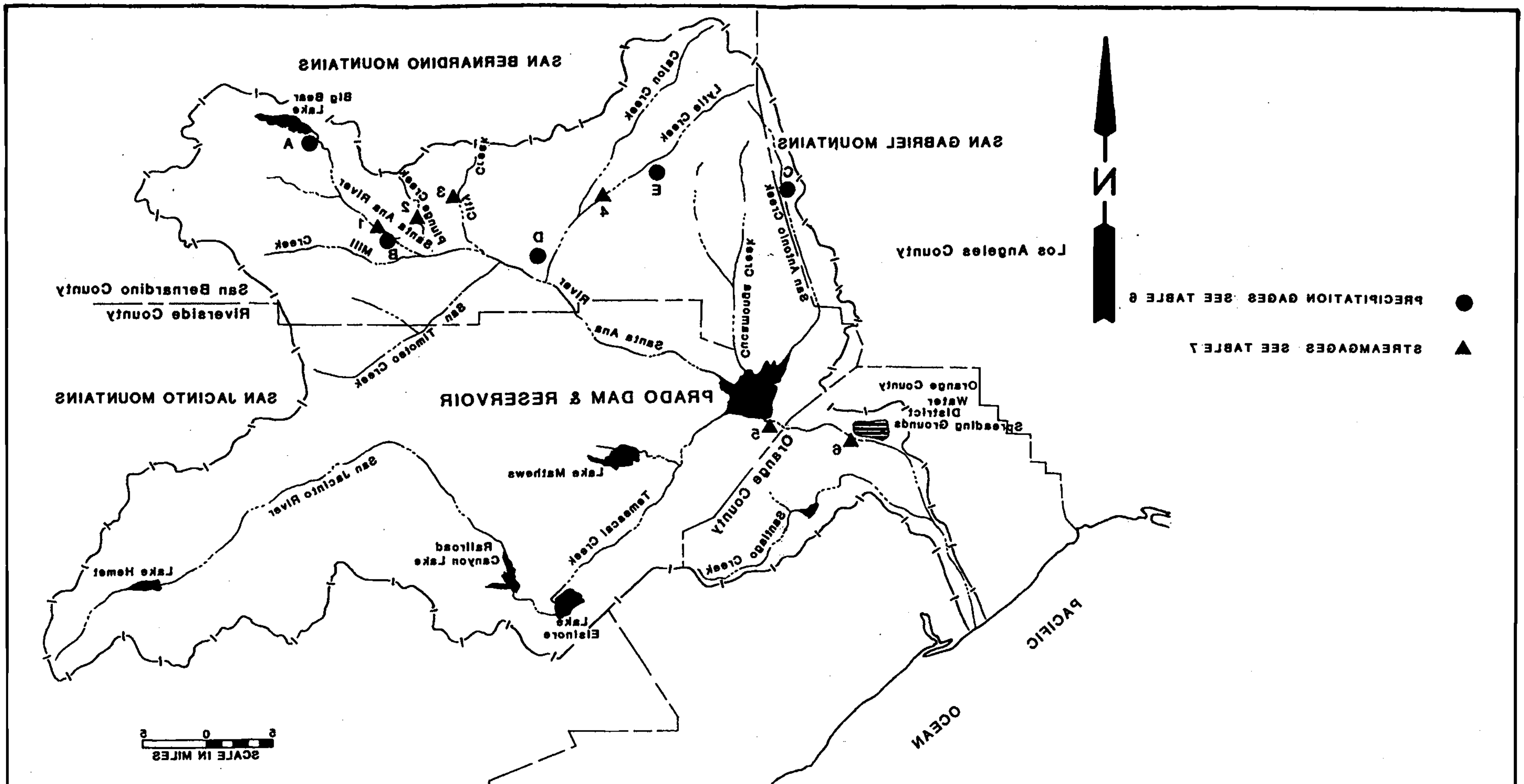


PRADO DAM
WATER CONSERVATION STUDY

**SANTA ANA RIVER
INFILTRATION ENHANCEMENT
FACILITY**

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 6

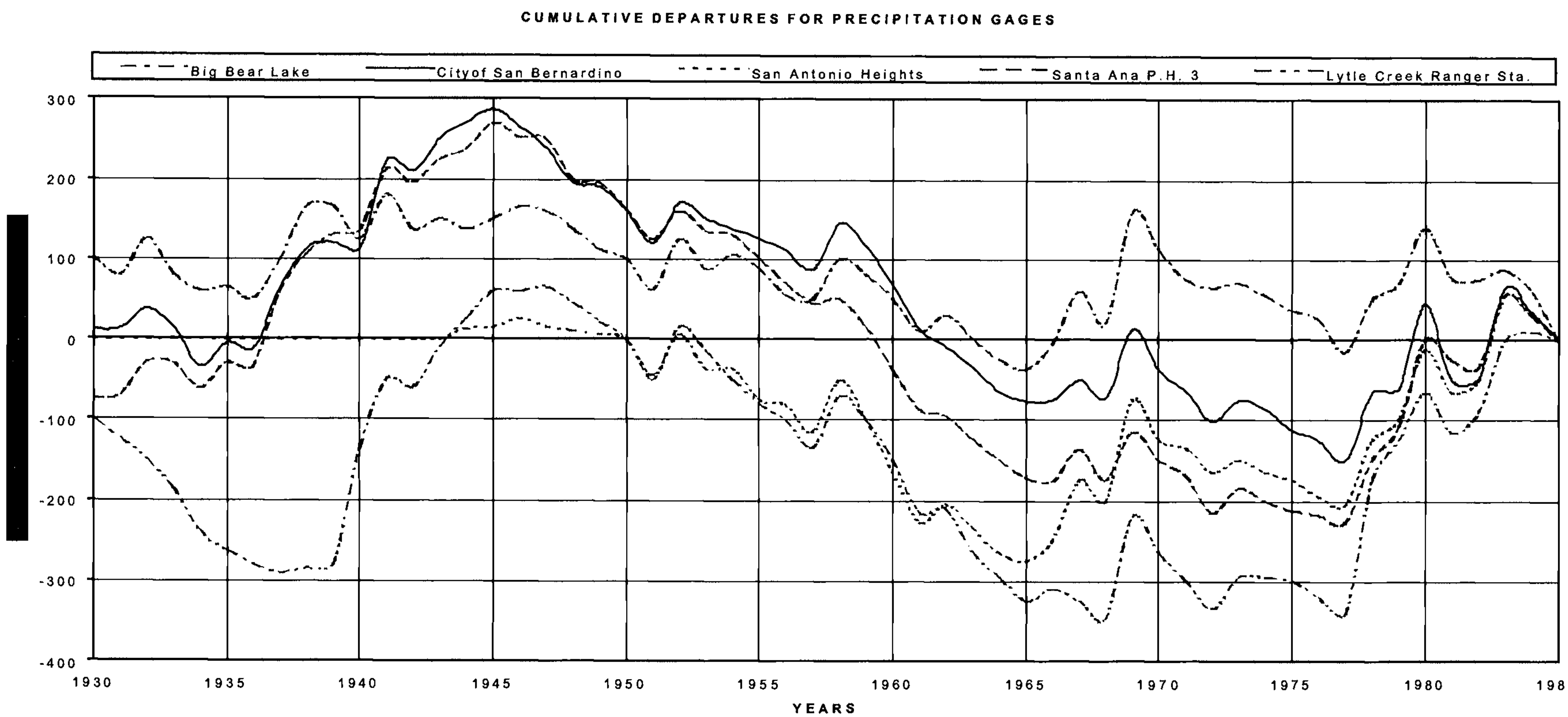


PRADO DAM
WATER CONSERVATION STUDY

SANTA ANA RIVER
PERTINENT FEATURES

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 7



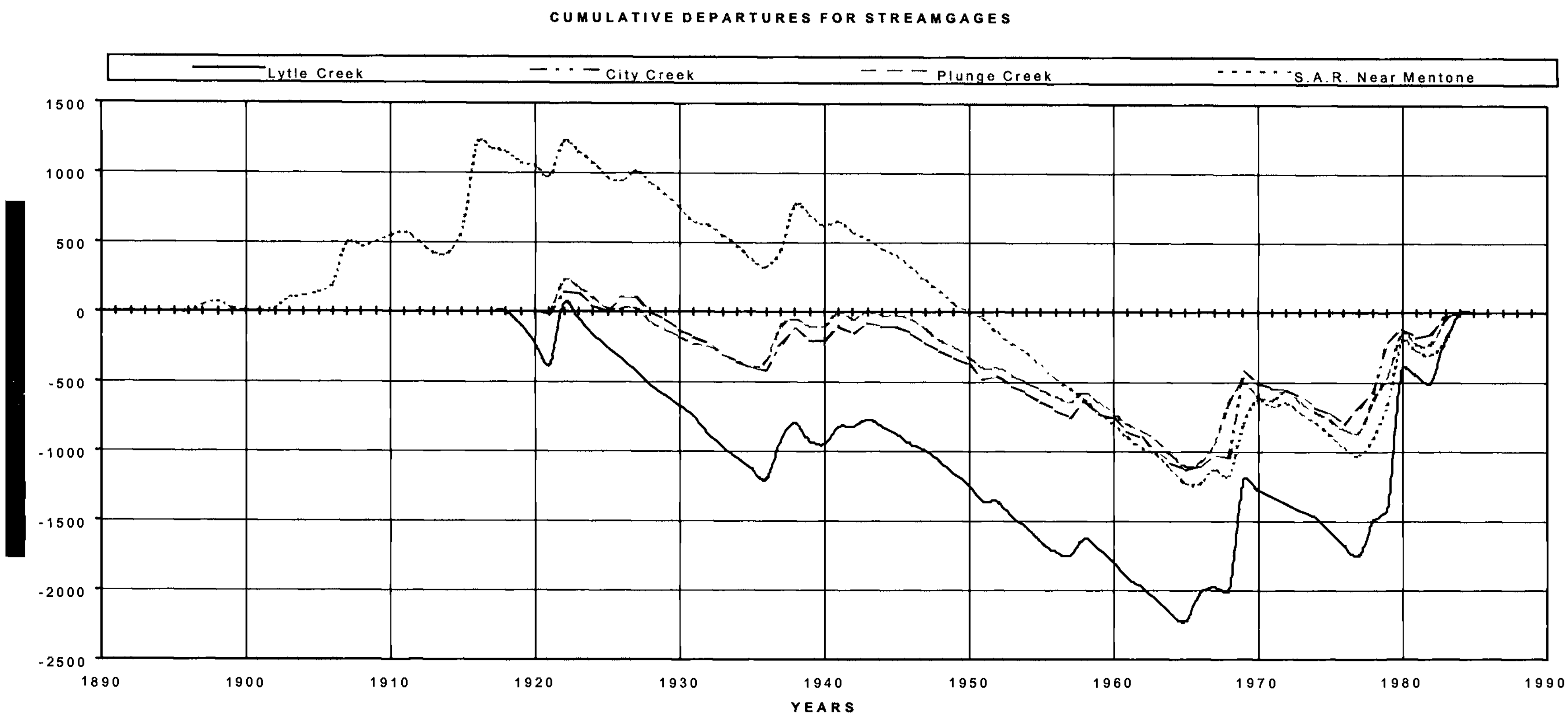
PRADO DAM
WATER CONSERVATION STUDY

CUMULATIVE DEPARTURES

FOR PRECIPITATION GAGES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8



PRADO DAM
WATER CONSERVATION STUDY

SAR BELOW PRADO DAM

TOTAL DISSOLVED SOLIDS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 9

Appendix K-2

Santa Ana Watershed Project Authority (SAWPA)

Santa Ana River Projected Flow Impacts Report

March 2004

The *Santa Ana River Projected Flow Impacts Report* is an update to SAWPA's *Integrated Water Resource Plan* from June 2002. The Impacts Report characterizes the flow conditions in the Santa Ana River for water year 2001-2002, and projects flow volumes at Prado Dam in 2010 and 2025. SAWPA's revised projections include planned increases in municipal wastewater discharges upstream of Prado Dam and other planned projects such as water recycling programs. SAWPA's future flow projections are used in **Appendix D**, *Assessment of Future Santa Ana River Flows Below Prado Dam*, to calculate future water availability at OCWD's operations area.

Santa Ana River Projected Flow Impacts Report

March 2004

Santa Ana Watershed Project Authority (SAWPA)
11615 Sterling Avenue
Riverside, CA 92503
(909) 354-4220
www.sawpa.org

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I. INTRODUCTION

This report characterizes 2001-02 flow conditions and updates projected 2010 and 2025 municipal wastewater discharges to the Santa Ana River (SAR) above Prado Dam, as described in SAWPA's Integrated Water Resources Plan (IWRP). Interest in this report was prompted by downstream agencies due to the development of water recycling, planned facility up-grades, as well as, contributions from water resource projects by agencies in the upper Santa Ana Watershed. The planning horizon for this update matches the SAWPA IWRP using the years of 2010 and 2025. Water resource projects examined include those projects that may impact river flow which were identified in the IWRP and have been constructed or are anticipated to be constructed from State Water Bond Prop 13 funding. Additionally, there are several other water resource projects that have arisen since the IWRP development that may have an impact on SAR flows have also been included in this update. The update provides various scenarios of flow dependent on alternative rainfall and storm runoff contributions to the SAR preformed through the analysis of historical rainfall and storm runoff data.

II. 1969 PRADO SETTLEMENT MINIMUM SAR MUNICIPAL DISCHARGES

The Prado 1969 Judgment set forth a comprehensive "physical solution" to assure that a certain average and minimum annual amount of non-storm flow (base flow) at Prado Dam. Through this settlement specific quantities of wastewater from wastewater treatments plants that discharge to the SAR are required to be maintained within the SAR. This includes the obligation of SBVMWD to assure an average annual adjusted base flow of 15,240 AFY at Riverside Narrows and IEUA and WMWD have a joint obligation to assure an average annual adjusted base flow of 42,000 AFY at Prado dam

III. CHARACTERIZATION OF 2001-02 SANTA ANA RIVER FLOW

One of the primary sources of information on the make up of SAR flows is the Santa Ana River Watermaster Report. Current flow conditions were summarized from data available from the Thirty-Second Annual report of the Santa Ana River Watermaster for the Water Year 2001-02 (Watermaster Report). This report provided documentation of historical storm runoff data, current effluent discharge from municipal wastewater treatment facilities, and other nontributary flows, see Figure 1.

The Watermaster Report includes historical records of annual rainfall and estimated storm flow runoff for the Upper Santa Ana River Watershed (down to Prado Dam) for the period of 1970 through 2002. Average annual precipitation for the upper watershed was reported to be approximately 18 inches, which was estimated to contribute roughly 65,400 acre feet of storm flow through Prado Dam annually. During the period of record annual rainfall in the upper watershed varied from 5.1 inches in 2001-02 to 33.4 inches in 1997-98. Over this same period annual storm flow runoff recorded at Prado Dam ranged from 10,600 acre feet in 2001-02 to 445,300 acre feet in 1979-80.

Annual total flow records for Prado Dam included in the Watermaster Report were provided by the USGS from its gauging station located on the SAR below Prado Dam. This flow was then allocated by the Watermaster to storm flow, base flow and other nontributary flow contributions including estimated water losses, using methods which are explained in detail in their report. Based on discussion with Watermaster committee members, irrigation return flow is not assumed to be a significant contribution to flow at Prado Dam, due to the overall water loss to evaporation and infiltration in the Santa Ana River Channel. Consequently, irrigation return flow is included in base flow estimates.

As defined in the Watermaster Report, base flow is "that portion of the total surface flow passing a point of measurement (either Riverside Narrows or Prado Dam) which remains after deduction of storm flow, nontributary flows, exchange water purchased by OCWD, and certain other flows as determined by the Watermaster." A major contributor to the base flow is the effluent discharge from municipal wastewater treatment facilities, which showed a general upward trend for the period of record. This upward trend depicted an increase from approximately 38,400 AFY in 1970-01 to 146,000 AFY in 2001-02. Included in the report were all municipal discharges to the SAR system, listed in Table 1. However, due to the percolation of flow prior to reaching the Santa Ana River channel at E Street in San Bernardino, effluent discharged from the Beaumont, Redlands and Yucaipa treatment facilities were not considered to contribute to the surface flows at Riverside Narrows and Prado Dam during the reporting period.

Table 1 – 2001-02 Upper Santa Ana Municipal Wastewater Dischargers

FACILITY NAME	Design capacity (AFY)	Total production (AFY)	Discharge to Santa Ana River (AFY)
Beaumont WWTP #1	1,700	1,400	--
Redlands WWTP	10,100	7,400	--
YVWD H.N. Wochholz WWTP	5,000	3,300	--
City of Corona WWTP #1& #2	16,200	12,400	12,400
IEUA Regional Water Recycling Plant #1 & #4	57,100	40,400	40,400
IEUA Carbon Canyon Water Recycling Facility	11,400	10,700	10,700
IEUA Regional Water Recycling Plant #2	5,600	4,100	4,100
San Bernardino/Colton RIX Facility	44,800	44,500	44,500
City of Rialto WWTP	13,100	8,000	8,000
Riverside Regional Water Quality Control Plant	44,800	35,600	35,600
Western Riverside County Regional WWTP	9,000	2,400	2,400
Eastern Municipal Water District*	56,000	42,600	--
Elsinore Valley Municipal Water District*	6,400	6,200	--
Total	**281,200**	**219,000**	**158,100**

* Reported from individual agencies

Although excluded from the base flow, further adding to the total flow of the SAR are "non-tributary" flows that are accounted for and reported in the Watermaster Report. These consisted of purchases by OCWD including State Water Project water released at the OC-59 connection to San Antonio Creek, treated water discharged to the river from the Arlington Desalter, WMWD Transfer Program water, and SBVMWD High Groundwater Mitigation Project water.

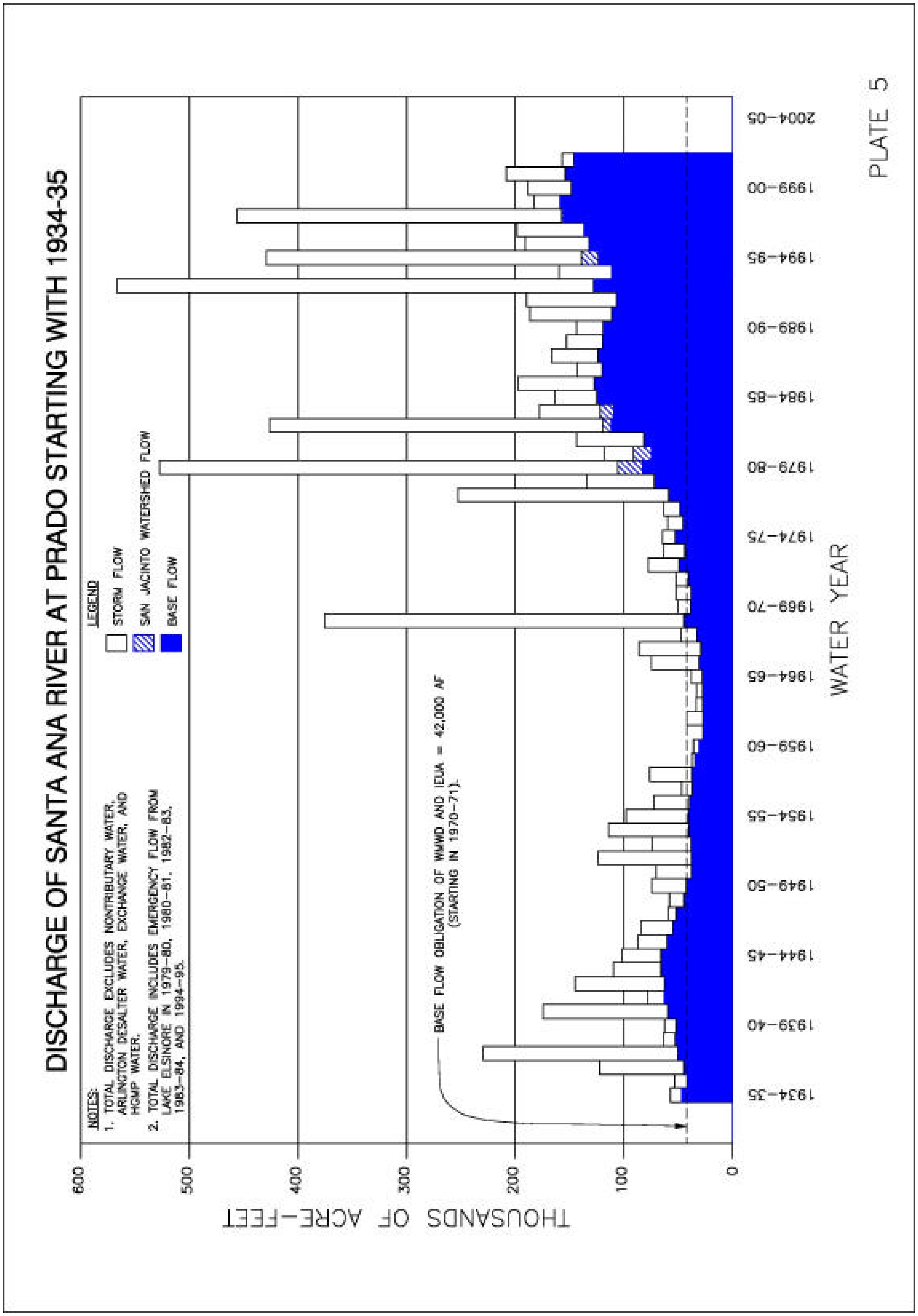
IV. 2001-02 WATERSHED FLOW AT PRADO DAM

In 2001-02 SAR flows as measured at the USGS gaging station, located below Prado Dam totaled 174,500 acre-feet. This included inflows of 10,600 acre-feet of storm flow, the lowest volume on record since the institution of the SAR Watermaster. Base flow from municipal dischargers and other sources including water losses from evaporation and infiltration was estimated at 145,500 acre-feet. Adding to total SAR flows are 2,900 acre-feet of State Water Project water released to San Antonio Creek, 6,200 acre-feet of Arlington Desalter discharge, 4,400 acre-feet of SBVMWD High Groundwater Mitigation Project (HGMP) water and 4,900 acre-feet of WMWD Transfer Program water, listed in Table 2.

Table 2 – Components of 2001-02 Santa Ana River Flow at Prado Dam

Components of Santa Ana River Flow	Contribution at Prado Dam (AFY)	Percent Contribution
Storm Flow	10,600	6.1
Base Flow	145,500	83.4
Releases to San Antonio Creek	2,900	1.7
Arlington Desalter	6,200	3.6
High Groundwater Mitigation Project	4,400	2.5
WMWD Transfer Program	4,900	2.8
Total	**174,500**	

Figure 1 – Discharge of Santa Ana River at Prado Dam 1934 – 2002



V. PROJECTED 2010 AND 2025 SANTA ANA RIVER FLOW IMPACTS

Future impacts to SAR flows were estimated using projections of 2010 and 2025 flows from municipal wastewater effluent dischargers and flow estimates from anticipated water resource projects in the upper Santa Ana River Watershed. This information was compiled from components of SAWPA's 2002 Integrated Watershed Plan (IWP), Integrated Water Resources Plan (IWRP), and municipal discharging agencies water recycling planning documents and updated through personal communication with numerous local water agency staff. The following section describes the various components of the projected impacts to SAR flow for 2010 and 2025.

Santa Ana River - Storm Flow

Storm runoff is determined from annual rainfall and snowmelt in the watershed. In the upper Santa Ana Watershed, annual runoff may vary greatly from year to year. Considering the extreme range of conditions that may exist in the watershed, annual rainfall records were examined for the period of record, 1970-2002 as a means of developing alternative rainfall vs. runoff scenarios to represent drought, average and heavy rainfall conditions. This was performed by identifying the five driest, most typical (based upon the long term average 18 in.) and wettest rainfall years, then estimating the average annual storm runoff during those periods. The results of the analysis were as follows:

- The driest rainfall period averaged 7.9 in. contributing 18,300 AFY of runoff
- The most typical rainfall period averaged 18.1 in. contributing 65,400 AFY of runoff
- The wettest rainfall period averaged 31.6 in. contributing 340,300 AFY of runoff

These data will be used to provide theoretical storm flow estimates for future 2010 and 2025 Santa Ana River flow scenarios.

Santa Ana River - Municipal Discharges

Projected 2010 and 2025 effluent discharges from municipal wastewater treatment facilities contributing to Santa Ana River flows at Prado Dam were estimated based upon the projected plant expansion, upgrades and water recycling goals of local agencies, as reported in SAWPA's IWRP and updated by agency staff. Updated agency projections show effluent discharges increasing for the 2010 and 2025 planning period. This is attributed to increasing demand for water treatment based upon population projections, as well as planned facility expansion. For this report, water loss attributed to evaporation and infiltration from municipal effluent discharged into the Santa Ana River channel was assumed to be four percent annually using estimates provided in the Watermaster Report.

An important factor to consider when evaluating the impacts of facility expansion on SAR flow is water recycling. The emphasis to "water-proof" the Santa Ana Watershed has many agencies planning for greater recycling and water recharge, which will have a direct impact on SAR flows. Initial planning projections, as reported in the IWRP, showed a decrease in municipal discharge to the SAR for 2010, based upon the ambitious water recycling goals of agencies in the upper watershed. The demand for recycled water, however, has not increased at the rate first anticipated and large capital costs, as well as the availability of funding have slowed the development of recycled water scheduled for 2010. Water recycling is still considered tremendously important by agencies in the watershed and for this report much of the planned increases for water recycling have been pushed out to the 2025 planning period.

Some important notes in regard to specific agency/facility upgrades or expansion are as follows:

Upstream Dischargers (Beaumont, Redlands & Yucaipa)

The Beaumont, Redlands and Yucaipa treatment facilities, as reported in the Watermaster Report are not projected to contribute surface flows to the SAR at Prado Dam. Discharge from these facilities is recharged in the higher reaches of the upper Santa Ana River watershed. Future water management plans for these up-stream dischargers include expansion for both the City of Beaumont and Yucaipa Valley Water District facilities. However, the greater part of these discharges are expected to be recharged in the upper watershed following the long-term water management goals to recycling as much water as feasible for local use or groundwater recharge.

City of Rialto – Wastewater Treatment Plant

The City of Rialto Wastewater treatment plant capacity is approximately 13,100 AFY. In 2001-2002, this facility produced approximately 8,000 AFY of tertiary treated effluent of which 70 AFY was recycled water.

The water management plans for the City of Rialto include both the expansion of its existing WWTP system and increased water recycling. Facility expansion includes construction up-grades to increase current treatment capacity by 4,500 AFY and the development of approximately 2,200 AFY of recycled water. The City is currently only in the preliminary discussion stages of developing these projects and it is not anticipated that these expansion projects will be underway by 2010. For the purposes of this report, all projected facility up-grades and expansion will be assumed to be completed by the 2025 planning horizon.

City of San Bernardino/Colton - RIX Facility

The Rapid Infiltration and Extraction System (RIX) was developed as a cost effective method for the cities of San Bernardino and Colton to meet the filtration and disinfection requirements of California Code of Regulations, Title 22, for discharge into the Santa Ana River. The facility is a 50-acre groundwater recharge and extraction system located adjacent to the Santa Ana River. RIX currently receives inflows of approximately 40,000 AFY; this is blended by the over-extraction of groundwater, estimated to be 10 percent, to ensure that secondary effluent recharged to the groundwater system is fully recovered. In 2001-2002 discharge to the Santa Ana River including over-extraction was approximately 44,500 AFY. Projected discharges from the RIX facility to the Santa Ana River based upon growth estimates for 2010 and 2025 are roughly 55,700 and 79,600 AFY respectively.

The City of San Bernardino is proposing the sale of 18,000 AFY of recycled water from the RIX facility. In accordance with the Stipulated Judgment of 1970 the City of San Bernardino is contractually obligated to deliver 16,000 AFY to the river. Over the past five years of operation, 1996-2002, discharge from the RIX facility, which is comprised of flows from both San Bernardino and Colton treatment plants including over-extraction, averaged approximately 47,250 AFY. The sale of 18,000 AFY of recycled water from the RIX facility will reduce surface flows into the river at the point of the RIX discharge which could directly affect recharge in those aquifers directly or indirectly receiving water downstream of the RIX outfall. However, the residual flow, currently estimated to be 31,000 AFY, is substantially more than required by the Stipulated Judgment. Additionally, with the projected increase in RIX discharge in the future the City of San Bernardino will not have a problem meeting the requirements of the Stipulated Judgment in the future. Based on discussions with City of San Bernardino staff and other parties, it is likely that the sale of RIX product water would be limited to the Santa Ana River Watershed and not impact flows in the Santa Ana River since any major water transfer or sale will likely result in the recycled water remaining in the river system for discharge.

City of Riverside – Regional Water Quality Control Plant

The City of Riverside operates the Riverside Regional Water Quality Control Plant, a 44,800 AFY capacity facility. In 2001-2002, this facility discharged approximately 35,600 AFY of tertiary treated effluent of which 130 AFY was recycled water.

The City's water management plans include the expansion of its water recycling capabilities to meet future demand projections. This calls for the development of approximately 9,800 AFY of recycled water by 2025. Currently the City is in the design phase for construction of a new pump station to develop 2,000 AFY of recycled water. This project is on schedule to be completed by 2005, and is anticipated to meet the City's demand expectations for 2010. To date, no further expansion of the City's water recycling capabilities is being explored. For the purposes of this report, all projected facility upgrades and expansion will be assumed to be completed by the 2025 planning horizon.

Additionally, the City of Riverside is exploring the option of expanding groundwater production in the Riverside South Basin to meet future demand expectations. This includes a potential increase in well production in the Riverside South Basin of 10,000 AFY by 2010 and 27,000 AFY by 2025. To achieve these goals, it is estimated that the increase of groundwater production could require the additional recharge of roughly 23,500 AFY in the basin. This report assumes that the additional water pumped will remain in the basin and not impact long-term flows in the SAR.

Inland Empire Utilities Agency (IEUA) – Regional Water Recycling Plants

Inland Empire Utilities Agency (IEUA) operates five wastewater water reclamation plants with a combined treatment capacity of 74,100 AFY, some of which discharges to the Santa Ana River. In 2001-2002 these facilities produced approximately 55,100 AFY of tertiary treated effluent of which approximately 5,700 AFY was recycled water.

IEUA's Wastewater Facilities Master Plan, August 2002 calls for the expansion of the existing WWTP system and increased water recycling. This work will be completed in multiple phases and include plans to interconnect IEUA tertiary wastewater water reclamation plants RP – No. 1, No. 2, No. 4, No. 5, and Carbon Canyon Water Recycling Facility (CC-WRF). Facility expansion includes construction up-grades to increase current treatment capacity by 60,300 AFY and the development of approximately 56,400 AFY of recycled water by 2025.

Phases I and II of this work anticipated to be completed by 2010 will develop approximately 19,000 AFY (5,600 AFY will be lost with the phasing out of RP No. 2) of new plant capacity and an additional 13,300 AFY of tertiary treated water. This includes the expansion of RP No. 4 to produce an additional 7,800 AFY of tertiary treated water and the construction of RP No. 5 (completed in 2002) with a capacity to produce 16,800 AFY of tertiary treated effluent.

Phase I of the plan is currently under construction with some segments completed and is expected to be completed by late 2004. Design for Phase II was initiated in January 2004 with completion scheduled for early 2006. Funding for the construction of Phase II estimated at $28 million has been applied for under the State's Proposition 50.

Phases III, IV and V of the plan are scheduled for 2005-06, 2006-08 and 2008-10 respectively. These phases of IEUA's plan call for the further development of approximately 41,200 AFY of new plant capacity and an additional 43,100 AFY of recycled water from all IEUA treatment plants. Funding for these phases of the plan estimated at $65 million has not yet been finalized, therefore this work in anticipated to be completed by 2025.

The projected increase in water recycling is significantly lower than what was reported to SAWPA for SAWPA's IWRP. This reduction is based on updated recycling information from IEUA which reveal that the initial estimates for water recycling for 2010 from IEUA may have been high due to the need to meet DHS requirements for blending of discharge water and the concern of availability of imported water for blending. Latest projections estimate an increase of IEUA recycling of less than 60 percent of the original values reported for 2010 in the IWRP.

Western Municipal Water District – Wastewater Treatment Plants

Western Municipal Water District (WMWD) operates the March Air Reserve Base WWTP (MARB-WWTP), an 840 AFY facility, which supplies non-potable water for irrigation and the Western Riverside Regional Wastewater Treatment Plant (WRR-WWTP), a 9,000 AFY facility, which discharges treated effluent to the Santa Ana River.

The MARB-WWTP currently discharges approximately 370 AFY of secondary treated effluent which is used locally for irrigation. This facility does not operate in the vicinity of the Santa Ana River nor does it contribute surface flows to the Santa Ana River under any flow scenarios. Therefore, this facility was excluded from the analysis.

In 2001-2002 WRR-WWTP discharged approximately 2,400 AFY of tertiary treated effluent to the Santa Ana River none of which were recycled. WMWD's water management plans for WRR-WWTP expansion include increasing plant capacity from 9,000 to 17,900 AFY along with the development of 5,200 AFY of recycled water by 2025. These plans, however, are only in the preliminary discussion stage and it is not anticipated that any expansion will be completed by 2010.

Additionally, agricultural customers in portions of the WMWD's service area are currently supplied imported Metropolitan Water District water due to the lack of an alternate non-potable water supply and/or lack of a separate conveyance system for agricultural deliveries. One WMWD project described in the SAWPA IWRP and funded by Water Bond Prop 13 funds would shift agricultural use from imported water supplies to a non-potable local water supply, which would free potable water supplies for other uses. This would be accomplished by extracting non-potable water from either the Riverside Canal or the Gage Canal.

The capacity to transfer water for this project is 6,000 acre-feet per year. This is based upon an anticipated reduction in the area devoted to agriculture in the future and conveyance restrictions presented by the existing March Air Force Base pipeline (non-potable conveyance facility). Additionally, in the future, should agricultural demand decrease below this level, it is expected that non-potable water service would be shifted to meet irrigation requirements at the Riverside National Cemetery, March Air Force Base Golf Course and future open space areas. The transfer of groundwater under this project is not expected to impact long term flows in the Santa Ana River because this water will eventually percolate back into the River system and remain in the river watershed.

City of Corona – Wastewater Treatment Plants

The City of Corona operates three wastewater treatment facilities WWTP Plant No.1, a 12,900 AFY facility, which discharges treated effluent to the Santa Ana River, WWTP No. 2, a 3,400 AFY facility which supplies non-potable water to treatment ponds and WWTP No. 3, a 1,100 AFY facility which supplies non-potable water for irrigation.

WWTP No. 3 currently discharges approximately 330 AFY of secondary treated effluent which is used locally for irrigation. This facility does not operate in the vicinity of the Santa Ana River nor does it contribute surface flows to the Santa Ana River under any flow scenarios. Therefore, this facility was excluded from the analysis.

In 2001-2002 WWTP Plant No.1 discharged approximately 10,100 AFY of tertiary treated effluent to the Santa Ana River of which approximately 330 AFY were recycled. WWTP Plant No.2 discharged approximately 2,200 AFY to treatment ponds which were assumed to infiltrate into the SAR.

The water management plans for the City of Corona include both the expansion of existing plant capacity and increased water recycling. The proposed expansion of the system includes upgrades to WWTP Plant No.1 and WWTP No. 2. These up-grades include an increase of the City's treatment capacity by 6,200 AFY and development of approximately 13,100 AFY of recycled water by 2025.

Work anticipated to be completed by 2010 includes the expansion of WWTP No. 1 treatment capacity by 3,400 AFY and the development of infrastructure to enable the recycling of all tertiary treated effluent, which is currently discharged to the Santa Ana River. Based upon the projected increase in production for 2010, WWTP No. 1 will be producing approximately 12,900 AFY of recycled water. The plan also calls for the expansion of WWTP No. 2, which produces secondary treated effluent discharged to local recharge ponds by 560 AFY.

The City is currently completing the design phase of this project and is expected to begin construction in 2005. Questions still remain in regard to the City's ability to achieve its recycling goals due to water quality concerns with its Title 22 permit and available demand for recycled water. However, the City remains committed to its goals to complete the project. Based upon current construction and permitting schedules, SAWPA staff projects that approximately 70% of the City's recycled water goal will be met by 2010 with the remainder of the project completed by the long term planning horizon of Year 2025.

EMWD & EVMWD – San Jacinto Watershed Discharge

Flow or other effluent discharges from the San Jacinto Watershed reaching Prado Dam are infrequent. Typically, past discharges have been the result of extremely heavy rainfall in the San Jacinto Watershed causing the overflow of Lake Elsinore into Temescal Wash. Since 1970, there have been only five years in which recorded flow at Prado Dam has included contributions form Temescal Wash. These include discharges which reached Prado Dam totaling approximately 16,100 acre-feet in 1980-81; 7,700 acre-feet in 1982-83; 12,600 acre-feet in 1983-84; 4,700 acre-feet in 1994-95; and 1,700 acre-feet in 1997-98.

Planned improvements and expansion by EMWD and EVMWD will have a significant impact on the discharge of flow from the San Jacinto Watershed. Projected expansion by EVMWD will supply an additional 12,000 AFY of tertiary treated effluent to the District, in excess to the 560 AFY required to be discharged to Temescal Wash. This discharge is projected to be used by the City of Lake Elsinore to maintain Lake Elsinore at a minimum elevation of 1,240 ft above sea level, the defined standard operation water level for Lake Elsinore. The maximum amount of water required to maintain this level for Lake Elsinore is estimated to be 14,500 AFY.

Excess effluent, if no other market has been established, will be available for discharge to Temescal Wash. Currently, to supply needed water to the Lake, water is purchased from EMWD and EVMWD through a pilot project to deliver tertiary treated effluent to the Lake when it is available. Over the first two years of the pilot study, EMWD and EVMWD have delivered roughly 4500 AFY of water to Lake Elsinore. As EVMWD recycled water supply increases due to increased growth, the need to purchase future EMWD surplus recycled water will diminish. The availability of this constant supply of water from EVMWD in the future will make purchases of EMWD water unnecessary.

Projected expansion by EMWD may result in an increased flow to the SAR, if no market for the water has been established, of as much as 7,100 AFY by 2010 and 12,000 by 2025 of water discharged into Temescal Wash. However, since the demand for the excess reclaimed water from EMWD to Lake Elsinore is expected to continue until EVMWD reclaimed water supply increases sufficiently to make up for the total Lake evaporation demand, no SAR flows are shown from EMWD reaching the SAR through the Year 2010. By 2025, the demand for lake makeup water is expected to be fully made up by reclaimed water delivered by EVMWD.

SBVMWD - High Groundwater Mitigation Project

The High Groundwater Mitigation Project developed and implemented by San Bernardino Valley Municipal Water District (SBVMWD) goal is to lower the groundwater within the Area of Historic High Groundwater while minimizing the effects of the dewatering on other parts of the Bunker Hill Basin. Lowering groundwater levels within the Bunker Hill Groundwater Basin reduces the threat to overlying development, particularly during earthquake when soil liquefaction may occur and increases the ability to control water levels of the entire basin for water banking and conjunctive use. Initially, the project called for the lowering of the groundwater to a minimum level of 15 feet within the active high groundwater area, this was achieved in 2003. Currently, this is being rethought, based upon the safety of lowering groundwater to a minimum level of 50 feet, as reported by SBVMWD staff. Product water produced from the high groundwater area is currently conveyed to the Santa Ana River (via the Rice-Thorne Pipeline and the Riverside Canal) where it flows to the Orange County Water District.

The ultimate goal, as stated by SBVMWD staff for the project includes the development of a pipeline system to convey water produced from dewatering program wells, as well as other existing City of Riverside and City of San Bernardino wells to locations throughout the watershed. This will enable product water to be used to serve the needs for conjunctive use, as well as during periods of drought. Water produced in excess of local capacity for conjunctive use will be delivered to points within the Bunker Hill Basin for use or discharge into the Santa Ana River via the Riverside Canal. As part of the plan to develop this pipeline system and maintain flows in the Santa Ana River, SBVMWD has projected a rolling maximum of 25,000 acre-feet of water, which can be discharged to the River within any 12-month period. Projected discharges to Santa Ana River flow for 2010 and 2025 can be assumed to vary based upon annual precipitation and storm runoff. The values used to represent water releases for these various conditions are 25,000 AFY for a wet year, 2,500 for an average rainfall year and 0 AFY for a dry year. Water loss between the release point and Prado Dam of two percent is calculated per the procedures described in the Watermaster Report to account for evaporation and infiltration.

Santa Ana River - Arundo Removal

SAWPA and other local agencies are working to remove Arundo dorax, a non-native bamboo-like plant species in the Santa Ana Watershed. This invasive species is a problem for numerous reasons, it uses large quantities of water, it is a fire hazard, it is a hazard to bridges and other facilities along to waterways, it exacerbates flood potential by choking waterways, and it destroys native habitats for threatened and endangered species. Arundo was introduced to the Santa Ana River basin after Europeans arrived in California and has been used extensively in recent times for bank stabilization. The plant grows along the washes and tributaries of the Santa Ana River, and in the year 2001, it was estimated that there were 10,000 acres of Arundo in the watershed. It is estimated that the Arundo in the watershed consumes 30,000 acre-feet (9.8 billion gallons) of water every year, three times the amount of native species.

The first round of the arundo removal program is expected to be complete by 2010. This round is estimated to remove approximately 3,000 acres of Arundo from the watershed, providing roughly 10,000 AFY of additional flow in the SAR watershed. This is to be followed by a second round of removal estimated to eradicate another 3,000 acres of Arundo by 2025. Based upon the current plan for Arundo removal, an estimated 60 percent of the Arundo removed in the initial effort and only an additional 25 percent of the Arundo removed by 2025 will actually impact SAR flow at Prado Dam. This is due to the location of most of the Arundo removal occurring in the upper reaches of the SAR watershed where SAR flows quickly percolate before reaching Prado Dam. Therefore, for the 2010 and 2025 report analyses new water additions to SAR flows at Prado dam from Arundo removal only amounted to 6,000 and 8,500 AFY respectively. These analyses assumed a 2 percent water loss due to evaporation and infiltration based upon the assumptions previously described for the High Groundwater Mitigation Project.

VI. PROJECTED 2010 WATERSHED FLOW AT PRADO DAM

Projected 2010 Santa Ana River flows were estimated to range from 205,300 and 551,800 AFY based upon the three storm runoff scenarios. This included inflows of 18,300 to 340,300 AFY of storm flow, and base flow from municipal dischargers (see breakdown in Table 3). Adding to these flows are base flow contributions from the High Groundwater Mitigation Project (HGMP) and the removal of Arundo from the SAR channel listed in Table 4.

Table 3 – 2010 Projected Municipal Discharges to the Santa Ana River

FACILITY NAME	Design capacity (AFY)	Total production (AFY)	Discharge to Santa Ana River (AFY)
Beaumont WWTP #1	2,800	2,800	--
Redlands WWTP	10,100	6,700	--
YVWD H.N. Wochholz WWTP	9,000	7,100	--
City of Corona WWTP #1	16,200	12,900	3,900
City of Corona WWTP #2**	3,900	3,400	3,400
IEUA Regional Water Recycling Plant #1 & #4	65,000	56,600	40,000
IEUA Carbon Canyon Water Recycling Facility & Plant #5	28,200	26,300	24,000
San Bernardino/Colton RIX Facility	55,700	55,700	55,700
City of Rialto WWTP	13,100	10,100	10,000
Riverside Regional Water Quality Control Plant	44,800	39,200	37,100
Western Riverside County Regional WWTP	9,000	7,400	7,400
Eastern Municipal Water District	84,000	49,600	7,100
Elsinore Valley Municipal Water District	18,100	16,400	--
Total	**359,900**	**294,200**	**188,600**

** Discharge to spreading basin or pond

Table 4 – Components of 2010 Santa Ana River Flow

Components of Santa Ana River Flow	Contribution at Prado Dam (AFY) Dry	Avg	Wet
Municipal Discharges (with evap. and infiltration losses)	181,100	181,100	181,100
SBVMWD - High Groundwater Mitigation Project	--	2,500	24,500
Arundo Removal	5,900	5,900	5,900
Total Base Flow Projection	**187,000**	**189,500**	**211,500**
Storm Flow	18,300	65,400	340,300
Total Base Flow and Storm Flow	**205,300**	**254,900**	**551,800**

VII. PROJECTED 2025 WATERSHED FLOW AT PRADO DAM

Projected 2025 Santa Ana River flows were estimated to range from 215,800 and 562,300 AFY based upon the three storm runoff scenarios. This included inflows of 18,300 to 340,300 AFY of storm flow, and base flow from municipal dischargers (see breakdown in Table 5). Adding to these flows are base flow contributions from the High Groundwater Mitigation Project (HGMP) and the removal of Arundo from the SAR channel listed in Table 6.

Table 5 – 2025 Projected Municipal Discharges to the Santa Ana River

FACILITY NAME	Design capacity (AFY)	Total production (AFY)	Discharge to Santa Ana River (AFY)
Beaumont WWTP #1	4,500	4,500	--
Redlands WWTP	10,100	6,700	--
YVWD H.N. Wochholz & Oak Valley WWTPs	14,600	9,200	--
City of Corona WWTP #1	16,200	13,600	100
City of Corona WWTP #2**	3,900	3,900	3,900
IEUA Regional Water Recycling Plant #1, #4 & Satellite Facilities	84,000	75,000	25,000
IEUA Regional Water Recycling Plant #5 & Carbon Canyon Water Recycling Facility	50,400	45,900	33,900
San Bernardino/Colton RIX Facility	79,600	79,600	79,600
City of Rialto WWTP	17,600	10,600	8,400
Riverside Regional Water Quality Control Plant	44,800	39,200	29,200
Western Riverside County Regional WWTP	17,900	10,200	5,000
Eastern Municipal Water District	99,700	62,700	12,000
Elsinore Valley Municipal Water District	33,800	28,500	--
Total	**477,100**	**376,600**	**197,100**

** Discharge to spreading basin or pond

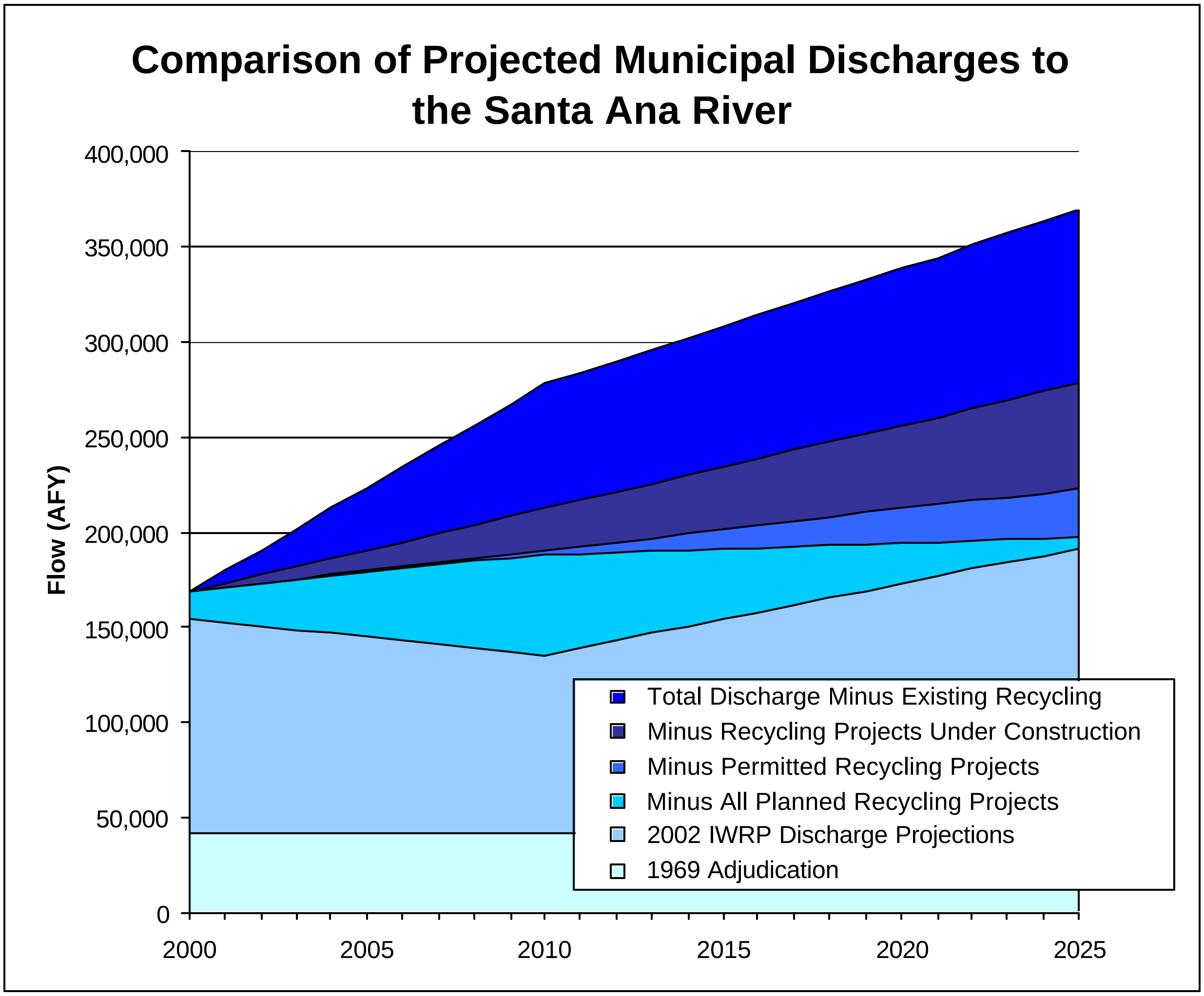
Table 6 – Components of 2025 Santa Ana River Flow

Components of Santa Ana River Flow	Contribution at Prado Dam (AFY)		
	Dry	Avg	Wet
Municipal Discharges (with evap. and infiltration losses)	189,200	189,200	189,200
SBVMWD - High Groundwater Mitigation Project	--	2,500	24,500
Arundo Removal	8,300	8,300	8,300
Total Base Flow Projection	**197,500**	**200,000**	**222,000**
Storm Flow	18,300	65,400	340,300
Total Base Flow and Storm Flow	**215,800**	**265,400**	**562,300**

VIII. PROJECTED SAR MUNICIPAL DISCHARGES

An evaluation of projected flow based upon municipal discharges and upper watershed water resource project discharges to the SAR for 2010 and 2025 was performed to show the contributions to SAR flow at Prado Dam. Figure 2 shows the range of possible flow contributions from municipal discharge based upon varying levels of water recycling planned by agencies in the watershed. Data shown in this figure includes the baseline minimum wastewater flows in accordance with the 1969 Prado Judgment, the original SAR wastewater flows projected in SAWPA's 2002 Integrated Watershed Plan (IWP), Integrated Water Resources Plan component, as well as, total projected municipal discharge to the SAR excluding existing water recycling projects. Additionally, the figure includes the resulting municipal discharges to the SAR after (a) recycling projects which are already under construction or completed as of 2004, (b) recycling projects which have only advanced to the permitted stage and (c) recycling projects only in the planning stage have been subtracted from the total projected municipal discharge to the SAR.

Figure 2 – Comparison of Projected Municipal Discharges to the Santa Ana River



IX. SUMMARY

The evaluation of projected flows in the SAR includes a variety of parameters which are not fully understood. Past modeling studies such as the Basin Planning Procedure Model prepared for the Santa Ana Regional Water Quality Control Board attempted to account for the interrelationship of groundwater to surface flows in the river through groundwater modeling. However, upon detailed review by the TIN TDS Task Force, many early assumptions used in this model were considered flawed which resulted in a reevaluation of groundwater basin boundaries and flow conditions. As part of the TIN TDS Study, the Task Force elected not to develop a new integrated groundwater and surface water model for the watershed due to its significant expense. Real time monitoring was recommended and accepted by the Task Force agencies to account for flow quality. Without the availability of an integrated model, projections of SAR flows that account for the groundwater rising into or percolating out of the SAR are unavailable. Basic assumptions have been made by the Watermaster Report to account for irrigation return or nuisance flows water loss evaporation, infiltration and plant uptake which have also been used by SAWPA in this analysis.

Natural surface runoff available to river flow and groundwater recharge is highly variable from year to year, due to the extreme range of precipitation that falls in the watershed. Annual rainfall can vary greatly from year to year, therefore the supply of natural surface flow for the river is considered intermittent at best. Base flow in the Santa Ana River, for the most part of the year, is comprised of discharge from municipal wastewater treatment facilities and output from various water resource projects in the watershed. Discharge from municipal wastewater treatment facilities, and therefore base flow has generally increased from year to year and is expected to continue this trend into the future. Projections of municipal discharge into the SAR show a gradual increase from 158,100 AFY in 2001-02 to 197,100 AFY by 2025. Impacting the availability of future discharge to the SAR from municipal wastewater treatment facilities is water recycling. In the future, agencies confronted with limited water resources and ever greater demands on these resources will be required to begin or expand water recycling capabilities.

Finally, an important component of SAR base flow projections are water resource projects planned in the watershed by various agencies. These projects include additions to base flow through expanded groundwater pumping and the removal of evasive plant species, each of which can have some impact on SAR base flow from year to year. Water resource projects in the upper watershed are expected on average to contribute by 2010, 14,900 AFY and by 2025 17,300 AFY of base flow to the SAR. An important consideration impacting the operation of these projects, regardless of the project objective is annual storm flow. The variation in annual storm runoff from extreme drought to heavy rainfall and depending on the length of these extreme periods can alter project operation from one year to the next. The result is a continued need to monitor these future water resource impacts and municipal discharges and regularly update the SAR flow projections over time.

X. REFERENCES

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Appendix L
Biological Resources

This appendix, which supports Chapter 4.3, contains copies of documents that describe the biological conditions in the lower SAR watershed, such as the status of plants, wildlife, fishes, sensitive species, and critical habitat designations. Also included are documents that explain some of the District's mitigation conservation programs (e.g., Arundo Removal) and U.S. Fish and Wildlife Service (USFWS) Biological Opinions for USACE flood control projects. The required mitigation measures in the Biological Opinions have been implemented by USACE and/or OCWD to compensate for flood control projects and activities both upstream and downstream of OCWD's Main River System. The contents of this appendix are listed below:

- Appendix L-1. Environmental Assessment of the Santa Ana Watershed Program, 2000-2002; Zembal and Hoffman, 2000
- Appendix L-2. Critical Habitat Designation for Santa Ana Sucker (70 FR 425)
- Appendix L-3. Critical Habitat Designation for Steelhead Trout (69 FR 71880)
- Appendix L-4. Range Extension for Steelhead Trout (67 FR 21586)
- Appendix L-5. Arundo Removal Protocol
- Appendix L-6. Santa Ana Sucker Conservation Program
- Appendix L-7. USFWS Biological Opinion (FWS-SB-909.6) for USACE Prado Basin, Reach 9, Norco Bluffs EIS/EIR, 2001
- Appendix L-8. USFWS Biological Opinion (FWS-OR-1304.8) for USACE Reach 2 Channel Excavation EA, 2002

Appendix L-1

Environmental Assessment of the Santa Ana Watershed Program, 2000-2002

Zembal and Hoffman, 2000

ENVIRONMENTAL ASSESSMENT
OF THE
SANTA ANA WATERSHED PROGRAM
2000-2002

U.S. ENVIRONMENTAL PROTECTION AGENCY

ORANGE COUNTY WATER DISTRICT
P.O. BOX 8300
FOUNTAIN VALLEY, CA 92728

SANTA ANA WATERSHED ASSOCIATION
OF
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25864-K BUSINESS CENTER DRIVE
REDLANDS, CA 92374

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DECEMBER 2000

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INTRODUCTION

The Santa Ana River (SAR) watershed encompasses about 3,200 square miles, comprising the largest river system in coastal southern California (Figure 1). The river originates in the San Bernardino and San Gabriel Mountains, flowing over 75 miles through San Bernardino, Riverside, Orange, and a small portion of Los Angeles Counties to the Pacific Ocean between the cities of Newport Beach and Huntington Beach. Human development and activities in the watershed have greatly reduced the floodplain and associated habitats and deleteriously affected the river's natural function and processes. The purpose of the Santa Ana River Watershed Program is to gradually restore as much of the natural function of the river as possible, thereby maximizing the natural resources supported by this river system. The purpose of this document is disclosure of the proposed activities for 2000 - 2002 and their potential effects on the environment.

The Watershed Program involves a multitude of agencies and private citizens. The principal action agencies are the Resource Conservation Districts (RCD) and the Orange County Water District (OCWD). There are five RCDs in the watershed including East Valley RCD, Riverside-Corona RCD, Inland Empire West RCD, San Jacinto Basin RCD, and Elsinore-Murietta-Anza RCD. To plan and implement the necessary coordinated activities in the watershed, the five independent RCDs combined as the Santa Ana Watershed Association of RCDs (SAWA)(Appendix 1). Proposed activities are organized in an annual work plan, that is partly fashioned and finally approved by SAWA, OCWD, and the U.S. Fish and Wildlife Service (Service).

The Watershed Program relies upon many other participants, permitting agencies, and landowners. Most of the key agencies are as follows. The U.S. Army Corps of Engineers (Corps) has provided major funding through mitigation requirements and permits the wetland activities under Section 404 of the Clean Water Act. EPA receives, administers, and distributes Congressional funds earmarked for this program through the efforts of Congressman Calvert and others. The California Department of Fish and Game permits the wetland activities under Section 1601 of the Fish and Game Code and contributes its expertise to deal with some of the resource issues. The Service oversees and must approve activities that could affect wetland resources and endangered species. The Regional Water Quality Control Board approves activities that could affect water quality and provides oversight of the recognized beneficial uses of the wetland resources. OCWD is responsible for managing water resources and providing water to over two million Orange County residents; helps administer the Watershed Program; has provided major funding and manages an endowment that pays for some of the restoration activities; provides personnel to manage wetlands and endangered species; and manages 2,400 acres near the middle of the river in the Prado Basin in an attempt to maximize wildlife resources. The County flood control agencies maintain sections of the river for flood conveyance; cooperate toward achieving mutual goals; and issue entry permits.

The current foci of the Santa Ana River Watershed Program are the control of invasive weeds, restoration of wetland habitat, management of endangered species, and public education. The specific activities proposed for the workplan covering the years 2000 - 2002 (Appendix 2) include:

1. Complete an exotic plant management report for the SAR Watershed;
2. Complete mapping of all tributaries within the SAR Watershed;
3. Continue the development of a GIS database to track and monitor treatment project for the SAR Watershed;
4. Perform 55 acres of exotic plant treatment in the East Valley RCD;
5. Develop a watershed management plan and seek funding for the San Jacinto River in the Elsinore-Murietta-Anza RCD;
6. Perform 25 acres of exotic plant treatment in the Inland Empire West RCD;
7. Perform 30 acres of exotic plant treatment in the Riverside-Corona RCD;
8. Develop a Santa Ana Sucker, Arroyo Chub, and Speckled Dace Fish Recovery Program in the Riverside-Corona RCD;
9. Perform 16.65 acres of exotic plant treatment in the San Jacinto Basin RCD;
10. Continue the development of outreach materials and educational programs, and supply information on exotic plant control to private landowners within the watershed;
11. Continue to work on a watershed team structure that will coordinate and implement tasks and seek and manage funds for those tasks into the future;
12. Continue the first and implement a second SAWA Field Biologist position to coordinate and monitor invasive plant removal, habitat restoration and endangered bird management within the watershed; the first biologist to work out of East Valley RCD, focusing upon the San Timoteo Creek; the second biologist to work out of the Riverside-Corona RCD, focusing upon the Santa Ana River from Prado Basin to above Hidden Valley.

This Environmental Assessment examines the natural resources of the SAR watershed and how they could be affected by these proposed activities.

AQUATIC ENVIRONMENT

The Santa Ana River and its tributaries have been largely channelized and dammed to provide flood protection for the growing human population. There are many lakes, reservoirs, and dams on the tributaries including Santiago Dam, Villa Park Reservoir, Brea Dam, Fullerton Dam, Prado Dam, Carbon Canyon Dam, San Antonio Dam, Lake Hemet, Railroad Canyon Lake, Lake Elsinore, Lake Mathews, Big Bear Lake, and Baldwin Lake. Seven Oaks Dam is situated on the mainstem, near its emergence from the San Bernardino Mountains and captures about 7.2% of the total watershed. Prado Dam is located near the middle of the mainstem, about 38.5 miles from the headwaters, capturing 52% of the watershed.

Flows in the upper Santa Ana River are perennial in an average year to the diversion for the Edison Power Plant near the canyon mouth. They are generally seasonal to the City of San Bernardino but become perennial again through the City of Riverside and below due to increased urbanization and runoff. Oceanic tidal influence extends about 1.5 miles up the river channel.

Water quality in the mountain portion of the watershed is excellent with low concentrations of total dissolved solids, nitrates, and other pollutants. Although elevated levels of total coliforms and silt have been identified with storm flows, water quality exceeds the state standards set for the identified beneficial uses of the water. The water quality generally decreases, and turbidity increases with distance from the mountains. Multiple water reuse becomes a more dominant factor. The river courses through a large dairy preserve. Treated municipal wastewater is discharged into the river at many points between Riverside and the Prado Basin.

Water from the upper tributaries contributes to municipal and domestic supplies, agriculture, groundwater recharge, hydropower generation, water-associated recreation, and wildlife resources. The primary human uses of the water along the entire course of the river are municipal and industrial. Flows that reach Prado Dam are used to recharge the groundwater basin and provide water to over two million residents along the 30 miles of river below the dam.

The combined average annual discharge in the mainstem at the canyon mouth below Seven Oaks Dam was 83.2 cubic feet per second (cfs), or 60,280 acre-feet for 86 years of record (excluding Warm Springs Canyon). The minimum and maximum records at this upper location were 7.4 cfs (1971) and 53,700 cfs (1891). River flows, near Riverside, were estimated by the U.S. Geological Survey (USGS) at 320,000 cfs during the 1862 flood. On the west side of the upper watershed, the flows in Lytle and Cajon Creeks are intermittent. The combined average discharge of the creek near Fontana (for 79 years of record) was 45 cfs, or 12,600 acre-feet per year. The maximum, recorded flow was 35,900 cfs (1969).

The base flow of the Santa Ana River continues to increase because of continuing urbanization. A minimum base flow of 42,000 acre-feet per year was adjudicated in 1969 as a result of litigation between OCWD and Chino. This flow rate is measured at Prado Dam and was based upon historical averages. However, rapid urbanization has resulted in increasing discharges of high quality tertiary treated water from the many treatment plants located along the river. In 1999, the base flow had increased to 140,000 acre-feet and is projected to rise to 230,000 acre-feet by 2020.

The Santa Ana River has an average gradient of about 240 ft/mile in the mountains, 20 ft/mile near Prado Dam, and 15 ft/mile downstream from Prado. The average gradient of the tributaries is about 700 ft/mile in the mountains and 30 ft/mile in the valleys. The upper river and tributaries course around large boulders and over sand and gravel bars. Riffles and shallow pools to about 6 ft deep occur regularly. The banks are generally vegetated in the upper, narrower portions of the waterways and intermittently so, in the wider, more active channels near the canyon mouths. Common bank cover and overhang in the canyons includes watercress (Rorippa nasturtium-aquaticum), bulrushes (Juncus spp.), nut-grasses (Cyperus spp.), white sweet clover (Melilotus alba), mule fat (Baccharis salicifolia), and occasional willows (Salix spp.), with local stands of white alder (Alnus rhombifolia) and cottonwood (both Fremont's, Populus fremontii and black, P. balsamifera).

Where the waterways emerge from the mountains, the floodplains are broad, boulder-strewn, sand, and gravel washes. The low flow channels are well defined and the dominant vegetational cover is comprised of low to medium density shrubs. This specialized shrubland habitat, known as alluvial scrub was historically scoured by sheet flows during floods, once every 2 - 20 years. There is little bank or overhang cover for fish on these huge deposits of alluvium. The scouring action of water and winds kept soil nutrients low and weeds scarce. This unique habitat is home to three endangered species, the San Bernardino kangaroo rat (Dipodomys merriami parvus), the Santa Ana River woolly star (Eriastrum densifolium sanctorum), and slender-horned spine-flower (Dodecahema leptoceras).

The flow through the alluvial scrub is seasonal. Somewhere between the cities of San Bernardino and Riverside, the river picks up enough urban discharge to support perennial flow and productive riparian habitat dominated by willows. The quality of the fish habitat also increases greatly and there are recent records for the occurrence of native fishes including the Federally listed, threatened Santa Ana River sucker (Catostomus santaanae). The other native species recorded from several, scattered localities are the arroyo chub (Gila orcutti) and more rarely, the speckled dace (Rhinichthys osculus). The common fish of the river system are nonnative species.

From the vicinity of the City of Riverside to the Prado Basin, there is lush riparian growth, overhanging willows, occasional floating and emergent vegetation along the edges, and perennial flow in an often broad, flat, sandy-bottomed channel. There is fair habitat for warm-water fishes but the plethora of introduced species has taken a heavy toll on the natives. Additionally, holes, overhang, backwater, and riffle have been greatly reduced by sedimentation greatly accelerated by urbanization. Furthermore, an introduced grass, giant reed (Arundo donax) has taken over many hundreds of acres of riparian habitat, significantly diminishing bank quality for fish and reducing shade.

Water flows through the Prado Basin during the dry season but is regularly impounded for flood control and water conservation. Prado Dam was built in 1941 at the confluence of the river, Chino, Mill, and Temescal Creeks to provide flood protection for Orange County. Prado Dam is located about 31 miles from the Pacific Ocean and the mouth of the river. About half of the flow of the river is diverted into 465 acres of constructed wetlands in the Basin. The wetlands remove nitrates, sediment, and improve the quality of the water.

The river runs through the Santa Ana Canyon below Prado Dam. It is partially channelized but supports good riparian habitat for about 7.4 miles. Below this stretch, from about Wier Canyon Road, the river is channelized and heavily manipulated for flood control and to spread and percolate water. Floodplain and bank vegetation is largely herbaceous and ephemeral. Plant cover that develops on deposited sediments at the river mouth regularly includes elements of the coastal salt marsh because of the tidal influence. The higher tides move about 1.5 miles inland and there is at least one record of a marine fish, the striped mullet (Mugil cephalus) reaching as far inland as the lower canyon.

PLANTS AND VEGETATION

Upper Santa Ana River

The uppermost tributaries of the watershed cut through chaparral, southern oak woodland, and pine forest. At the higher elevations, the willows are shrubby. The common conifers include white fir (Abies concolor), Jeffrey (Pinus jeffreyi), sugar (P. lambertiana), and lodgepole (P. contorta) pines, along with incense cedar (Calocedrus decurrens) and bigcone spruce (Pseudotsuga macrocarpa). Most of the work associated with the Watershed Program will occur below the pine belt, in the floodplain proper, and within a few miles of the upper tributary canyon mouths to the ocean.

A total of 290 species of vascular plants were identified from the upper Santa Ana Canyon and environs during studies of the environmental effects of the Seven Oaks Dam (Feldmeth et al. 1985, Zembal and Kramer 1984 and Zembal 1985, 1989). Of these, four were cultivated species and 48 species, or 16.8% of the flora is non-native. A total of 77 species (26.9% of the flora) were observed in riparian habitat, 24 of which (31.1%) were non-natives; 164 species (57.3% of the flora) were found on the floodplain terraces, of which 35 species (21.3%) were non-natives; 164 species (57.3%) were also found in chaparral, 20 (12.2%) were introduced; 145 species (50.7%) were found in the coastal sage scrub, 35 (24.1%) were introduced; and

61 species (21.3%) were present in ruderal habitat, of which 24 species (39.3%) were non-natives.

Two species of rare plants were identified from the upper Santa Ana Canyon, Santa Ana River woolly star (Eriastrum densiflorum sanctorum) and round-leaved boykinia (Boykinia rotundifolia). The woolly star, a California endemic, is on the Federal list of endangered species. The current known distribution of Santa Ana River woolly star is along the Santa Ana River in the terrace shrublands of the floodplain in San Bernardino County (Zembal and Kramer 1984). Small stands occur in the Lytle/Cajon drainage area but most of the plants known to exist today occur between the Santa Ana River canyon mouth and the former Norton Air Force Base. This covers a linear distance of only about 7.5 river-miles. The stand nearest the dam was comprised of 25 plants and at 1,900 ft. represents the known upper elevational limit of the species' current distribution.

The round-leaved boykinia is also endemic to California, but is considered common enough now to be in no immediate threat of extinction (Smith 1984). A small stand of the boykinia was found in a seep near Powerhouse No. 2.

The floodplain of the Santa Ana Canyon is open and sandy with scattered boulders, the meandering stream course, and a narrow but almost unbroken belt of riparian habitat. Shrubs also grow in the floodplain, comprising an open scrub over much of the area, with vestiges of more densely vegetated shrublands that more closely resemble the slope vegetation on a few small terraces. The side slopes in the canyon are steep and near vertical rock walls are regularly interspersed. In the floodplain scrub, 65%-91% of the surface was open ground, of which 33%-42% consisted of sand and 30%-49% consisted of granitic boulders. Total shrub cover varied from 9.8% to 25% with an average cover of 18.2%. The common perennials included California buckwheat (Eriogonum fasciculatum), scale broom (Lepidospartum squamatum), and sweetbush (Bebbia juncea) with conspicuous local abundance of golden-aster (Heterotheca villosa), yerba santa (Eriodictyon trichocalyx), white everlasting (Gnaphalium canescens ssp. microcephalum), mullein (Verbascum thapsus), brickellia (Brickellia desertorum), and western ragweed (Ambrosia psilostachya) (vegetational analyses are from Feldmeth et al. 1985, Zembal 1985; plant names were updated from Hickman, ed. 1993). Frequently encountered annuals in the boulder-strewn wash included brome grasses (Bromus tectorum, B. madritensis, and B. diandrus), wild oats (Avena barbata), black mustard (Brassica nigra), schismus (Schismus barbatus), Vulpia myuros, pigmy weed (Crassula connata), filaree (Erodium cicutarium), peppergrass (Lepidium lasiocarpum), and several species of Camissonia (particularly Camissonia californica, C. bistorta, and C. hirtella).

Riparian thickets in the Santa Ana Canyon were comprised mostly of shrubby to subarborescent plants with widely spaced smaller stands of much taller old trees. The habitats varied from herbaceous to subshrubby species in and along the immediate watercourse to very small marshy patches and occasional stands of woodland along old side channels. The emergent and near-bank annuals included speedwell (Veronica anagallis-aguatica), watercress (Rorippa palustris var occidentalis), bentgrass (Agrostis viridis), rabbits foot grass (Polypogon australis), and white sweet clover; the perennial herbs include white everlasting, scarlet monkeyflower (Mimulus cardinalis), umbrella sedge (Cyperus eragrostis), rushes (particularly Juncus xiphioides and Juncus effusus var. pacificus), curly dock (Rumex crispus), and very locally, dense cattails (Typha latifolia). Overhead canopy was contributed by mulefat and young willows (Salix laevigata, S. lasiolepis, and S. gooddingii, in order of decreasing abundance) over much of the riparian belt. Particularly along old side channels, taller trees were intermixed and included individuals of the willows, scattered cottonwoods (mostly Populus fremottii with a few P. trichocarpa), white alder, infrequent sycamores (Platanus racemosa), and occasional tamarisk (Tamarix ramosissima). Total plant cover in the riparian belt varied from 78.5% to 108% with a mean of 95% (Feldmeth et al. 1985, and Zembal 1985). Quantified vegetational cover data are displayed in Tables 1 and 2 below.

The vegetation of the uplands along the Santa Ana River Canyon consisted of plant associations ascribable to coastal sage scrub and chaparral. Coastal sage scrub constitutes a more open shorter statured shrubland that occurred mostly on drier slopes, particularly those with a southern exposure. Common species of the open shrublands included coastal sagebrush (Artemisia californica), California buckwheat, brittlebush (Encelia farinosa), deerweed (Lotus scoparius), croton (Croton californicus), and white sage (Salvia apiana). Brittlebush occurred locally in nearby monotypic stands on the driest slopes. Where coastal sage scrub graded into chaparral on more mesic slopes, chaparral species, particularly chamise (Adenostoma fasciculatum) and chaparral lilac (Ceanothus crassifolius), intermixed in the coastal sage scrub. Total plant cover in coastal sage scrub varied from 40.8 to 95% and averages 64.8% (Feldmeth et al. 1985).

Much of the upland vegetation in the Santa Ana Canyon was chaparral. From the driest to the most moist conditions, the chaparral graded from a low shrubby form dominated by chamise through a lilac-dominated (locally either Ceanothus crassifolius or C. leucodermis) form to a dense, tall tangle dominated by scrub oak (Quercus dumosa) and flowering ash (Fraxinus dipetala). In the shadier draws and on more north-facing slopes the vegetation was particularly tall and scattered. Canyon oaks (Quercus chrysolepis) occurred and, locally in such situations, interior live oak (Quercus wislizenii var. frutescens) was dominant. The common perennials in the chaparral included chaparral lilac, chamise, flowering ash, scrub oak, holly-leaf redberry (Rhamnus ilicifolia), bush snapdragon (Keckiella cordifolia), honeysuckle (Lonicera subspicata var. denudata), toyon (Heteromeles arbutifolia), poison oak (Toxicodendron diversilobum), with local importance of sugar bush (Rhus ovata), holly-leaved cherry (Prunus ilicifolia), mountain mahogany (Cercocarpus betuloides), black

Table 1. Composition of perennial plants in the floodplain of the upper Santa Ana River canyon.

Relative Abundance of General Habitats (%)

Riparian vegetation	42.2
Open water (overlapping riparian)	4.9
Boulder strewn floodplain/open shrublands	50.2
Terraced shrublands	7.6

Riparian Belt

	% Cover	Stem Count	Stems/acre
Baccharis salicifolia	34.8	556	7,979
Salix lasiolepis	28.5	172	2,468
Alnus rhombifolia	10.1	8	115
Salix gooddingii	9.3	28	402
Rorippa nasturtium-aquaticurn	2.8	-	-
Typha sp.	2.5	-	-
Populus fremontii	2.2	1	14
deadfall/dead shrub	1.8	1	14
Juncus effusus	1.2	-	-
Verbascum thapsus	0.9	-	-
Artemisia douglasiana	0.7	-	-
Cyperus alternifolius	0.7	-	-
mixed grasses	0.7	-	-
Juncus xiphioides	0.6	-	-
Rubus ursinus	0.5	-	-
Salix laevigata	0.5	1	14
Oryzopsis miliacea	0.5	-	-
Baccharis douglasii	0.4	117	1,679
Lepidospartum squamatum	0.4	1	14
Brickellia californica	0.4	1	14
Lotus heermannii	0.2	-	-
Mimulus guttatus	0.1	-	-
Sonchus oleraceus	0.1	-	-
Eriogouum fasciculatum	-	1	14
Nicotiana glauca	-	1	14
Galium nuttallii	-	1	14
Rhamnus sp.	-	1	14
Totals	99.9	890	12,772

Total Plant Cover (%) 57.8

Table 1. (continued)

Floodplain/Open Shrublands

	Relative Stems/ Cover (%)	Stem Count	Stems/ Acre
Bebbia juncea	27.3	19	229
deadfall	19.2		
dead shrub	3.1	1	12
Lepidospartum squamatum	17.0	26	313
Heterotheca villosa	10.0	145	1,746
Eriogonum fasciculatum	8.6	28	337
Brassica spp.	5.6		
Artemisia californica	2.8	2	24
Verbascum thapsus	1.4		
Yucca whipplei	1.1	2	24
Pennisetum setaceum	0.8		
Gnaphalium microcephalum	0.8		
Lotus scoparius	0.8	1	12
Nicotiana glauca	0.8		
Eriodictyon trichocalyx	0.6	10	120
Rhamnus sp.	0.1	1	12
Baccharis salicifolia		22	265
Lessingia filaginifolia		3	36
Baccharis douglasii		2	24
Melilotus albus		1	12
Ceanothus crassifolius		1	12
Totals	100	264	3,179
Total Plant Cover (%)		21.4	

Terraced Shrublands

	Relative Stems/ Cover (%)	Stem Count	Stems/Acre
Bebbia juncea	22.8	2	159
Salvia apiana	18.5	7	558
Lotus scoparius	16.3	3	239
Eriogonum fasciculatum	15.2	1	80
Croton californicus	9.8	15	1,195
Brassica spp.	6.5		
Artemisia californica	5.4	2	159
Eriodictyon trichocalyx	5.4	1	80
Lessingia filaginifolia		1	80
Adenostoma fasciculatum		1	80
Lepidospartuin squamatum		1	80
Totals	99.9	34	2,708
Total Plant Cover (%)		36.2	

[1]The data were taken from two transects run perpendicularly across the floodplain for a total length of 334.5m. Line intercept was used for cover estimates and a 2 m-wide belt totaling 669 square m was used for stem counts.

Table 2. Diameter at breast height (DBH) of trees encountered in the upper Santa Ana River Canyon.

	0-1.5 in.	1.5-3 in.	3-6 in.	Total
Salix lasiolepis	67	4	-	71
Salix gooddingii	10	3	3	16
Alnus rhombifolia	5	1	1	7
Salix laevigata	1	-	-	1
Standing dead	1	-	-	1
Total	84	8	4	96

*Data are from 2 m wide belt transects totaling 669 square m. Sprouts lower than breast height were not included in counts.

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sage (*Salvia mellifera*), and yerba mansa (*Anemopsis californica*). A variety of annuals occurred in the chaparral understory and along edges. Total plant cover varied widely in the chaparral from about 83% to 130.5% with a mean of 98.4% (Feldmeth et al. 1985).

Disturbed areas, particularly the road margins, were inhabited by a weedy element dominated by annual grasses and including such species as brome grasses (four species), Vulpia, filaree, Russian thistle (*Salsola tragus*), black mustard, western ragweed, tree tobacco (*Nicotiana glauca*), tarragon (*Artemisia dracunculus*), and horehound (*Marrubium vulgare*).

Alluvial scrub dominated the floodplain from the canyon mouth to about the City of San Bernardino. The shrubs were openly spaced with total cover ranging from 26% to 52%, and averaging about 35%. Much of the cover was low-growing but there were regularly spaced, conspicuous stands and individuals of overstory species including California juniper (*Juniperus californica*), holly-leaved cherry, sumac (*Rhus* spp.), elderberry (*Sambucus mexicana*), scrub oak, and local sycamores. Another endangered plant, slender-horned spineflower (*Centrostegia leptoceras*) is known from a small number of sites along this reach of the river.

More complete descriptions of the vegetation and checklists of plants of the upper river system are available in Zembal and Kramer (1984); Feldmeth et al.(1985); and Zembal (1989).

Upper Lytle Creek

A total of 283 species of vascular plants was identified from the eastern side of the watershed along Lytle and Cajon Creeks. Of these, 13 species were cultivated, occurring only near home sites, and 58 species or 21.5% of the flora are non-native. A total of 117 species (43.3% of the flora) was detected in the wash, and 36 (30.8%) of these were non–natives; 132 species (48.8% of the flora) were observed in the terrace scrub and 19 (14.3%) of these were introduced species; 167 species (61.9%) were found in coastal sage scrub, of which 32 (19.2%) were non–native; 121 species (44.8%) were detected in chaparral, of which 17 (14%) were introduced species; 57 species (21.1%) were found in the slope woodlands, of which 9 (15.8%) were naturalized species; 135 species (50%) were observed in grassland, of which 30 (22.7%) were introduced; and 71 species (26.3%) were documented in disturbed areas, of which 27 (38%) were non–natives (Feldmeth et al. 1985).

Round–leaved boykinia was also observed in the Lytle Creek canyon, as was the Santa Ana River woolly star. Boykinia was observed in a few seeps along the canyon edge near its emergence from the mountains.

The Lytle Creek floodplain is open, sandy, and boulder–strewn. A few higher floodplain terraces supported shrublands with moderate to extremely dense plant cover, whereas most of the floodplain was quite open. The side slopes were steep and densely vegetated. The open floodplain is periodically disturbed by earth–moving equipment; dikes are maintained for flood control and the watercourse is kept to the west side of the floodplain by an artificially maintained low earthen berm. The plant cover that did occur on the open wash ranged from 1% to 5.5% with an average cover of about 3% (Feldmeth et al. 1985). From 95% to 99% of the ground along transects was unvegetated; 31% to 51% was sand, and 48% to 64% was rock. The common perennials in the broad wash included golden aster, white everlasting, California buckwheat, scale broom, mulefat, brickellia, and tarragon.

Scour has been infrequent enough to allow the persistence of terrace shrublands on the fringe of the creek. The shrubs on the terraces closest to the canyon mouth were more widely spaced and lower growing with local dominance of species such as California buckwheat, scale broom, yerba mansa, and goldenbush (Ericameria linearifolia). These open shrublands gradually transitioned into densely vegetated chaparral further up the canyon. Locally the terrace chaparral consisted of patches of dense chamise. Other dominants included scrub oak, interior live oak, holly–leaved cherry, honeysuckle, and manzanita (Arctostaphylos glauca). Silk tassel bush (Garrya veatchii) and flannel bush (Fremontodendron californicum) were locally conspicuous, as were stands and intermixed arborescent individuals of mountain mahogany. Plant cover in the terrace chaparral averaged 67.2%. Open areas occurred amidst the dense shrublands and were heavily vegetated with low–growing grasses and annuals including species of Bromus, Festuca (Vulpia), Avena, Camissonia, Chaenactis, Cryptantha, Clarkia, Lotus, Lupinus, and Phacelia.

The high winter flows on Lytle Creek keep the riparian habitat in fairly young successional stage. Habitat persists along side drainages, particularly along two that come into Lytle Creek from the west near the canyon mouth, and the toe of the slope. A white alder stand along 600 feet of the channel was composed of 198 live and 22 dead alders. A slope grove of 49 young sycamores occurred just above the alders. Other plants common in the side canyons included mulefat and willows with a locally dense understory of poison oak. There were a few local seeps on the slopes with dense tangles of wild grape (Vitis girdiana).

Disturbed areas, as along the edge of Lytle Creek Road, were characterized by grasslands dominated by introduced weeds, intermixed with native annuals. Common genera of weedy species included Bromus, Festuca (Vulpia), Avena, Erodium, Brassica, Hypochoeris, Centaurea, Salsola, and Picris. Natives included Lupinus, Lotus, Rafinesguia, Phacelia, Mentzelia, Cryptantha, Camissonia, Chaenactis, Clarkia, and Amsinckia.

Species typical of coastal sage scrub were not as abundantly dominant along the edge of Lytle Creek as they were near the mouth of the Santa Ana Canyon. Important species that were present included California buckwheat, California sagebrush, white sage, yerba mansa, and deerweed. Plant cover varied from 80% to 120% with an average value of 101.8%.

Most of the vegetation on the slopes of Lytle Creek was dominated by species typical of chaparral. The chaparral varied from less to most dense and tall, from a chamise-dominated type on drier sites, through a lilac-scrub oak type to an oak-dominated form on the most mesic sites. The chamise chaparral varied from nearly pure stands of chamise, to an association with species characteristic of coastal sage scrub, and the occurrence of other chaparral elements including honeysuckle, lilac, silk tassel bush, and poison oak. Total plant cover ranged from 83.5% to 94% with chamise contributing 33% to 62% of the cover. As the chaparral became woodier, species diversity increased greatly and local dominance by scrub oak and California lilac (both Ceanothus leucodermis and C. integerrimus) became apparent. Scrub oak and lilac associates included poison oak, bush snapdragon, interior live oak, elderberry, mountain mahogany, honeysuckle, buckthorn, coffeeberry (Rhamnus californica), bedstraw (Galium angustifolium), and wild cucumber (Marah macrocarpus). Plant cover in the scrub oak-lilac type chaparral varied from 68% to 127%. On the most mesic slopes, the chaparral graded to a type locally dominated by interior live oak, and there was an additional increase in species diversity. Common species included those mentioned above, as well as toyon, holly-leaved cherry, silk tassel bush, virgin's bower (Clematis lasiantha), snowberry (Symphoricarpos mollis), California walnut (Juglans californica), sycamore, and ash trees (Fraxinus velutina). Plant cover in this most diverse of the chaparral types varied from 86.8% to 103.5%, and averages 98.6%.

Slope woodlands occurred along Lytle Creek on the most mesic of north-facing slopes. The two dominant species were canyon oak and big-cone spruce. Other associates included California bay (Umbellularia californica, a local dominant), big-leaf maple (Acer macrophyllum), poison oak, interior live oak, lilac, bush snapdragon, mountain mahogany, brickellia, toyon, holly-leaved cherry, gooseberry (Ribes amarum), and bush monkey-flower (Mimulus longiflorus). A variety of annuals occurred in the understory. Total plant cover varied only slightly from 105% to 105.8%.

Prado Basin

The riparian habitat along the Santa Ana River has been examined most intensively near mid-river, in the Prado Basin and environs including a 7.5-mile reach of the river through the lower canyon, below Prado Dam (Zembal et al. 1985).

About 4,400 acres of the 11,000 acres in the Prado Basin were comprised of various, vegetated riparian habitats, mostly willow woodland (Zembal et al. 1985). The quality, age, and coverage of the aerial photos available for analysis allowed only approximations of the extent of each habitat type. Of the approximately 1,800 acres in the canyon below Prado Dam, there was an estimated additional total of 340 acres of riparian habitat, assuming an average width of 400 feet of habitat for 7 miles. Most of the canyon riparian was willow and mixed woodland, with about 40% of the acreage in shrubby riparian and more scattered willows.

In examining the vegetation, a total of 311 species, belonging to 65 families of vascular plants, were identified from the project area. Species are listed along with annotations in the plant checklist in Zembal et al. (1985). Approximately 99 species, or 31.8% of the observed species, are most typically associated with floodplain and riparian habitats; 200 species, or 64.3%, are usually found on slopes and in upland habitats; and the remaining 12 species, or 3.9%, are often found in both upland and riparian situations. About 99 species, or 31.8% of the total, are introduced members of the flora and a small number of these are obvious escapes from cultivation.

Specimens of rare plants known from the general area (Smith et al. 1980) were examined from collection data at the herbaria at the University of California, Riverside, and the Rancho Santa Ana Botanic Garden. None of the 67 localities obtained from those specimens led to additional sightings of rare species in the project area. One rare species, many-stemmed dudleya (Dudleya multicaulis), had already been found in three small and widely separated stands. The first was comprised of about 25 plants, located on the rock and earthen wall just above and to the north of the west end of the dam-top road; the other totaled about 10 plants located on a vertical earthen bank along a foot trail just below the Raadhauge Pheasant Club. Many-stemmed dudleya is an endangered species and was most abundant on the northwest side of the spillway, where several hundred plants were found. The Santa Ana River woolly star was also looked for in the vicinity but was not found; neither was suitable habitat. The species was endemic to the Santa Ana River Canyon (Lathrop and Thorne 1978), but has apparently been extirpated there (Zembal and Kramer 1984).

The vegetated riparian habitat within the reservoir was mostly woodland and almost entirely willow woodland. Black willows (Salix gooddingii) were quite dominant with an occasional stand of arroyo willow (Salix lasiolepis) or an infrequent Fremont's cottonwood, mostly along the past reservoir margins or on higher, less frequently inundated ground in the interior of the basin (Table 3). The data for the basin woodland are skewed toward a higher occurrence of arroyo willows because the sampling necessarily was accomplished near the basin edge. The percent of bare ground was relatively high for riparian habitat, and most of the low cover in the woodlands was from deadfall and litter. This and the local dominance of pure stands of cocklebur (Xanthium strumarium var. canadense) was apparently attributable to the periodically prolonged inundation of the habitat. There was only one small stand of sycamores found in the basin proper and but one general locality for coast live oaks (Quercus agrifolia). The sycamores, numbering about 30, were along the mid-south margin of the past reservoir and about 50 oaks grew in the draw bottoms above the west shore just north of the dam. The most extensive stand of cottonwoods observed in the basin was located near the oil pumping operation just south of the duck ponds. The low ground cover contributed by living plants increased in these higher elevation mixed woodlands (Table 4). Like the sycamores and cottonwoods, scattered patches of shrubby riparian growth were widely spaced only along higher ground along the nearshore band. The openings in the woodlands were devoid of vegetation, covered with open water, or densely vegetated with very low growing herbaceous species, particularly the fast growing and locally dominant cocklebur. This was in contrast with the habitat along the river and creeks at just slightly higher elevations, where shrubby riparian growth was a regular component. Some of this shrubby riparian habitat was artificially maintained by periodic mowing of certain areas along the river; giant reed was proliferating in such areas. The only other locally extensive habitats in the basin bottom were snag fields and fresh or brackish water marsh. The snag fields usually occurred in low sumps and are open areas of standing dead tree trunks that varied from one to several acres in extent. The marsh habitat was locally dominated by cattails (Typha spp.) or reeds (Scirpus spp.), with scattered willows that became increasingly abundant locally, toward the nearshore margins and closer to the creek mouths (Table 5).

The regularity of a diverse species composition in the woodlands increased away from the area of regular inundation along the watercourses, particularly along the Santa Ana River (Table 6). Similar woodlands can be found along Temescal and Chino Creeks (Table 7), although the area sampled on Temescal Creek was a uniformly, younger woodland (Table 8). In contrast, extremely heavy grazing and trampling along Mill Creek has kept species diversity, ground cover, and recruitment through establishment of young willows to a minimum (Table 9). A belt of eucalyptus groves occurred interruptedly along the shore of the reservoir. Many of the groves comprised the tallest tree stands around, with some individuals approaching 100 feet tall. Younger trees were often densely packed and live, so low ground cover was typically sparse, but the litter layer was dense (Table 10).

Table 3. Composition of willow woodland within Prado Basin.

Trees per acre

	Tree count per size class (dbh) in inches						
	0–1.5	1.5–3	3–6	6–9	9–15	15–21	Totals
Salix gooddingii	164	176	254	66	16	1	677
Salix lasiolepis	26	55	48	1	-	-	130
Populus fremontii	-	-	1	-	-	-	1
Ricinus communis	2	-	-	-	-	-	2
Standing snags	4	8	4	1	1	-	18
Totals	196	239	307	68	17	1	828

Low Ground Cover

	Cover contributions (%)
Litter	52.3
Deadfall	14.7
Plant cover	8.1
Total ground cover	75.1
Bare ground	24.9

Plant cover contributors (%)

Salix gooddingii	2.6	*Scirpus* spp.	0.1
Typha spp.	1.4	*Cyperus* spp.	0.1
Bidens spp.	1.3	*Polygonum* spp.	0.1
Helianthus annuus	0.7	*Chenopodium ambrosioides*	0.1
Sagittaria latifolia	0.6	*Echinochloa crusgalli*	0.1
Xanthium strumarium	0.4	*Solanum douglasii*	tr
Salix lasiolepis	0.3	*Sonchus* spp.	tr
Urtica holosericea	0.2	*Ricinus communis*	tr

Data are from 10 0.1–acre circular plots for tree counts and low cover estimations usually within 10 0.25m quadrats per plot. Tree stand height varied from 25 feet to 40 feet and canopy cover ranged from 35% to 80% (Zembal et al. 1985).

Table 4. Composition of woodland with dominant cottonwoods.

Tree density

	Tree count per size class (dbh) in inches					
	0–1.5	1.5–3	3–6	6–9	9–15	Trees/acre
Salix gooddingii	1	14	40	9	4	340
Populus fremontii	-	3	12	6	2	115
Salix lasiolepis	-	-	-	1	-	5
Standing snags	4	2	-	1	-	35
Totals	5	19	52	17	6	495

Table 4 (cont.)

Low ground cover

	Cover contributions (%)
Litter	34.7
Deadfall	-
Plant cover	48.2
Total low cover	82.9
Bare ground	17.1

Plant cover contributors (%)

Cyperus spp.	21.1	Cynodon dactylon	0.6
Bidens spp.	12.8	Artemisia douglasiana	0.2
Sonchus oleraceus	4.5	Rorippa palustris	0.2
Salix gooddingii	3.9	Echinochloa crusgalli	0.2
Baccharis salisifolia	3.9	Chenopodium ambrosioides	0.1
Rumex spp.	0.6	Erodium cicutarium	0.1

Data are from two 0.1–acre circular plots for tree counts and 10 -1m quadrats per plot for estimations of low cover. Tree stand heights varied from 40 feet to about 65 feet and canopy cover ranged from 45% to 85%.

Table 5. Plant composition in freshwater marsh along Temescal Creek.

Tree density

	Tree count per size class (dbh) in inches				
	0–1.5	1.5–3	3–6	Total	Trees/acre
Salix gooddingii	201	10	3	214	2,166
Salix lasiolepis	66	24	-	90	911
Standing snags	8	1	-	9	91
Totals	275	35	3	313	3,168

Low ground cover

	Cover contributions (%)
Litter	-
Deadfall	15.1
Plant cover	54.2
Total low cover	69.3
Mud and water	30.7

Plant cover contributors (%)

Baccharis salicifolia	24.2	Venegasia carpesioides	1.0
Typha spp.	17.7	Polygonum lapathifolium	0.8
Scirpus spp.	4.5	Cynodon dactylon	0.5
Artemisia dracunculus	3.5	Cardaria draba	0.1
Sprouting forbs	1.9		

Tree density data are from 2 -100m x 2m belt transects. Low ground cover and canopy cover estimates are from 20 -1m quadrats. Canopy cover ranged between 0% and 80% and averaged 17.3%.

Table 6. Composition of willow woodland along the Santa Ana River.

Tree Density

Tree count per size class (dbh) in inches

	0–1.5	1.5–3	3–6	6–9	9–15	trees/acre
Salix gooddingii	39	80	94	39	11	526
Salix lasiolepis	45	30	75	8	-	316
Salix laevigata	3	2	1	4	-	20
Populus fremontii	1	-	1	-	1	6
Sambucus mexicana	3	-	-	-	-	6
Standing snags	87	40	22	2	-	302
Totals	178	152	193	53	12	1,176

Low Ground Cover

	Cover contributions (%)
Litter	46.3
Deadfall	13.1
Plant cover	34.4
Total low cover	93.8
Bare ground	6.2

Plant cover contributors (%)

Bidens spp.	10.5	Sonchus spp.	0.7
Baccharis salicifolia	4.4	Typha spp.	0.5
Urtica holosericea	3.2	Bromus diandrus	0.3
Salix gooddingii	2.9	Marah macrocarpa	0.3
Polygonum sp.	2.4	Juncus app.	0.1
Cyperus spp.	1.8	Picris echioides	0.1
Eleocharis sp.	1.6	Urtica urens	0.1
Artemisia douglasiana	1.5	Epilobium sp.	0.1
Vitis girdiana	1.3	Conium maculatum	0.1
Scirpus spp.	1.1	Solanum douglasii	tr
Arundo donax	0.9	Heterotheca sp.	tr

Data are from 5 0.1–acre circular plots for tree counts and low cover estimations were from 10 0.25m quadrats per plot. Tree stand heights varied from 25 feet to 50 feet and canopy cover ranged from 25% to 100%.

Table 7. Composition of willow woodland along Chino Creek.

Tree density

	Tree count per size class (dbh) in inches					
	0–1.5	1.5–3	3–6	6–9	9–15	trees/acre
Salix gooddingii	39	44	29	7	6	625
Salix lasiolepis	5	25	6	3	-	195
Salix laevigata	8	9	7	1	-	125
Standing snags	95	13	1	1	-	550
Totals	147	91	43	12	6	1,495

Table 7 (cont.)

Low Ground Cover

	Cover contributions (%)
Litter	3.8
Deadfall	12.8
Plant cover	77.7
Total low cover	94.3
Bare ground	5.7

Plant cover contributors (%)

Atriplex patula	34.8	*Polygonum lapathifolium*	1.5
Urtica holosericea	34.5	*Salix gooddingii*	0.2
Rumex crispus	6.7		

Data are from 2 0.1–acre circular plots for tree counts and 10 1m quadrats per plot for estimations of low cover. Tree stand heights varied from 50 feet to 70 feet and canopy cover ranged form 60% to 90%.

Table 8. Composition of willow woodland along Temescal Creek.

Tree density

	Tree count per size class (dbh) in inches			
	0–1.5	1.5–3	3–6	trees/acre
Salix gooddingii	47	34	33	570
Salix lasiolepis	65	22	6	465
Standing snags	-	1	-	5
Totals	112	57	39	1,040

Low ground cover

	Cover contributions (%)
Litter	16.5
Deadfall	24.7
Plant cover	41.3
Total low cover	82.5
Bare ground	17.5

Plant cover contributors (%)

Raphanus sativa	11.0	*Brassica geniculata*	3.2
Urtica holosericea	10.0	*Baccharis glutinosa*	2.3
Ambrosia psilostachya	8.8	*Rumex* spp.	0.5
Artemisia dracunculus	4.5		

Tree counts are from 2 0.1–acre circular plots. Low ground and canopy cover estimates are from 10 1m quadrats (5 per plot) placed randomly in the plots. Canopy cover ranged between 40% and 60% and averaged 47.5%. Average tree height varied between 25 and 30 feet.

Table 9. Composition of willow woodland along Mill Creek.

Tree density

	Tree count per size class (dbh) in inches					
	0–1.5	1.5–3	3–6	6–9	9–15	Trees/acre
Salix goodingii	-	14	50	35	6	525
Standing snags	-	1	-	-	-	5
Totals	-	15	50	35	6	530

Low ground cover

	Cover contributions (%)
Litter	50.1
Dead fall	3.8
Plant cover	5.1
Total low cover	59.0
Bare ground	41.0

	Plant cover contributors (%)
Hordeum leporinum	3.3
Bromus diandrus	1.6
Cynodon dactylon	0.2

Data are from 2 .0.1-acre circular plots for tree counts and 10 - 1m quadrats per plot for estimations of low cover. Tree stand heights varied from 55 feet to 70 feet and canopy cover ranged from 35% to 80%.

Table 10. Composition of the woodland vegetation within the Prado Basin compared with that along the outlying watercourses.

Tees per acre

	Prado Basin	Santa Ana River	Chino Creek	Temescal Creek	Mill Creek
Salix gooddingii	677	526	625	570	525
Salix lasiolepis	130	316	195	465	-
Salix laevigata	-	20	125	-	-
Populus fremontii	1	6	-	-	-
Sambucus mexicana	-	6	-	-	-
Ricinus communis	2	-	-	-	-
Standing snags	18	302	550	5	5
Totals	828	1,176	1,495	1,040	530

Table 10 (cont.)

Low ground cover *(%)*

	Prado Basin	Santa Ana River	Chino Creek	Temescal Creek	Mill Creek
Litter	52.3	46.3	3.8	16.5	50.1
Deadfall	14.7	13.1	12.8	24.7	3.8
Plant cover	8.1	34.4	77.7	41.3	5.1
Total low cover	75.1	93.8	94.3	82.5	59.0
Bare ground	24.9	6.2	5.7	17.5	41.0

Interspersed with the eucalyptus groves and above them, on the slopes and undeveloped hills, were shrublands and grasslands that were mostly quite open and show the effects of heavy grazing. In a few, less accessible areas there were patches of less disturbed shrublands, varying locally by containing more elements of chaparral than coastal sage scrub. The chaparral influence was strongest above the western shoreline, a continuation of the vegetation on the eastern slope of the Chino Hills. The effects of grazing and trampling on the vegetation were apparent elsewhere (but not in the remnant shrublands) in the low species diversity, low shrub density, and the abundance of lower cover often comprised of weedy annual grasses.

MACROINVERTEBRATES

Two species of macroinvertebrates were conspicuous in the Prado Basin and environs. Individuals of one of these species, freshwater clams (Anodonta sp.), were observed in Temescal Creek. Remains of these clams were found near picnicing spots, evidence that some of the people recreating in the area are harvesting them. Freshwater clams probably form part of the diet of many organisms present in the project area.

Crayfish (Procambarus spp.) were found abundantly in the basin and all of the associated drainages. In one 22 square meter section, 186 individuals were counted and in a 36 square meter drying pond there were about 50 crayfish. Along banks where burrows were left dry for a time and could be seen, counts ranged between 2 and 8 burrows per meter. Procambarus spp. are detrital feeders and form a focal point in the food web of the project area. Aquatic and terrestrial species from several trophic levels feed on these invertebrates. Observed consumers included bullfrogs (Rana catesbeiana), red-shouldered hawks (Buteo lineatus) (Bloom 1983), herons, great egrets (Ardea albus), coyotes (Canis latrans), raccoons (Procyon lotor), and probably a variety of other species as well.

Crayfish are also heavily exploited by humans in the project area. Individuals were frequently seen carrying buckets and trash can liners containing hundreds of these animals. The level of exploitation appears high enough that competition with wildlife for this food resource is probably occurring. The crayfish "bloom" is highly seasonal and with the lowering of water levels in the reservoir, literally thousands were seen roaming away from drying areas. For wildlife and humans, the crayfish harvest appears to be a feast or famine situation. The "take" by humans is concentrated along the watercourses and probably reduces greatly the consistent availability of crayfish to wildlife. These people meticulously comb the creek banks and appear to greatly reduce local populations.

FISH

The common fishes of the watershed are nonnative (Table 11). This domination by introduced species is typical in areas that have been altered by human activities (Moyle 1976). Habitat alterations affecting the fish of the project area include streambed modifications (such as channel cutting, pond building, flood control near roads), oil drilling, and great water level fluctuations behind Prado Dam. Agriculture and other such adjacent land uses also affect fish habitat. Water is diverted from the Santa Ana River and then returned as agricultural "waste." This water has high concentrations of nitrates and other pollutants (Knepper 1984 pers. comm.). Mercury and lead have been detected in the water (USGS 1981), and PCB's are present in the fish (Zeiger 1982). Some of these chemicals can bio-accumulate.

Only certain species can cope with these kinds of habitat perturbations. The species that can, tend to be very prolific and capable of tolerating a wide range of environmental conditions. All of the species found in the project area are described by Moyle (1976) as being highly fecund. Goldfish (Corassius auratus), carp (Cyprinus carpio), mosquito fish (Gambusia affinis), bluegill (Lepomis macrochirus), and green sunfish (Lepomis cyanellus) are noted for living in altered habitats or tolerating extreme environmental conditions (Moyle 1976). Carp and goldfish, due to their feeding habits may contribute to the disturbed conditions of aquatic habitats. Many of these introduced species have been associated with the decline of native species.

The prickly sculpin (Table 11) is a saltwater species that has been collected many miles up the river from the ocean. There are 27 species of fish that have been collected at the river mouth (Reisch 1997).

The fish of the project area are an important part of this ecosystem. They form an integral part of the food web. For example, the remains of hundreds of threadfin shad (Dorosma petense) were found beneath heron nests. The abundance of belted kingfishers is also indicative of large populations of small forage fishes in the project area.

Table 11. Fish Recently Collected in the Santa Ana River Watershed.

Family & Scientific Name	Common Name	Native
Catostomidae		
Catostomus santaanae	Santa Ana sucker	yes
Centrarchidae		
Lepomis cyanellus	Green sunfish	
Lepomis macrochirus	Bluegill	
Micropterus salmoides	Largemouth bass	
Pomoxis nigromaculatus	Black crappie	
Cichlidae		
Tilapia mossambica	Mozambique tilapia	
Tilapia zillii	Redbelly tilapia	
Clupeidae		
Dorosoma petenense	Threadfin shad	
Cottidae		
Cottus asper	Prickly sculpin	yes*
Cyprinidae		
Carassius auratus	Goldfish	
Cyprinus carpio	Carp	
Gilia orcutti	Arroyo chub	yes
Pimephales promelas	Fathead minnow	
Rhinichthys osculus	Speckled dace	yes
Ictaluridae		
Ameiurus melas	Black bullhead	
Ameiurus natalis	Yellow bullhead	
Ictalurus punctatus	Channel catfish	
Poeciliidae		
Gambusia affinis	Mosquitofish	
Poecilia latipinna	Sailfin molly	
Salmonidae		
Oncorhynchus mykiss	Rainbow trout	
Salmo trutta	Brown trout	

In summary, the fish and macroinvertebrates of the project area, although largely comprised of non–native species, are ecologically important because of the amount of food they contribute to other wildlife, including terrestrial species. Additionally, the plight of the native species is of great concern. Habitat alteration and threats posed by the abundance of introduced species led to the listing of the Santa Ana sucker by the Federal government as threatened (see section on Threatened and Endangered Species). The sucker is one of the species targeted for management actions in the watershed.

REPTILES AND AMPHIBIANS

A minimum total of 10 species of amphibians and 34 species of reptiles have been recently observed in the watershed or have been found there historically and probably persist (Glaser 1970, Robertson and Shipman 1974, Stebbins 1966, Zembal 1985, Zembal et al. 1985). Four species, two frogs and two turtles, are non-native members of the fauna.

Pacific tree frogs (Hyla regilla) and bullfrogs were the most commonly observed amphibians on the river, although western toads (Bufo boreas) were plentiful as well (nomenclature from Collins et al. 1978). In the mountain canyons, the California tree frog (Hyla cadaverina) was the most abundant amphibian.

The sighting of a red-legged frog (Rana aurora) along the south shore of the Prado Basin in 1984 was the last report for that Federally threatened species in the watershed; it has probably been extirpated, in large part due to competition with, and predation by, bullfrogs (Rana catesbeiana). The Federally endangered arroyo southwestern toad (Bufo microscaphus californicus) was found along at least one tributary of the river (see section on Threatened and Endangered Species).

Near mid-river, western fence lizards (Sceloporus occidentalis) were the most frequently encountered reptiles in riparian woodlands and were quite common, whereas side-blotched lizards (Uta stansburiana) were probably more abundant in total numbers but were found mostly in the uplands. Western whiptails (Cnemidophorus tigris) were the most abundantly observed reptiles only very locally, in minimally disturbed open shrublands. Western skinks (Eumeces skiltonianus) were also observed only in the remnant shrublands and only in low numbers. The only snake that was regularly observed, the gopher snake (Pituophis melanoleucus), was sighted in uplands as well as in drier riparian habitats.

Western fence lizards and side-blotched lizards were the most commonly observed reptiles in the mountain canyons in the upper watershed, as well. Western whiptails were occasionally seen on the canyon slopes and in open shrublands. Less common were the sagebrush lizards (Sceloporus graciosus) and southern alligator lizards (Gerrhonotus multicarinatus).

The snakes observed in the upper watershed were the Rosy Boa (Lichanura trivirgata), striped racer (Masticophis lateralis), gopher snake, common kingsnake (Lampropeltis getulus), California mountain kingsnake (Lampropeltis zonata), two-striped garter snake (Thamnophis couchi hammondi), and pacific rattlesnake (Crotalus viridis). The most commonly observed snakes were pacific rattlesnakes, striped racers, and gopher snakes. The red rattlesnake (Crotalus ruber) and speckled rattlesnake (Crotalus mitchelli) were observed regularly in the upper Santa Ana Canyon.

The San Diego horned lizard (Phrynosoma coronatum blainvillei), was once considered for Federal listing but currently has no special legal status. Individuals were found occasionally on sandy substrate in the mountain canyons. Both individuals and droppings were regularly seen. They were found in scattered localities along the river to the drier fringes in the lower Santa Ana Canyon, below Prado Dam. McGurty (1980) considered this subspecies endangered.

Except with notable, local exception, the diversity of reptiles and amphibians in the river riparian appeared to be relatively low. This could be due to the secretive nature, and nocturnal and fossorial habits of many species; they often can go undetected during survey work that relies upon observations. Alternatively, the diversity may actually be low due to past alterations and current uses of much of the watershed, including extensive agricultural, flood control, grazing, mowing, and intermittently prolonged inundation. The highest observed diversities and abundances were along the least visited, most isolated tributaries or sections, particularly in the mountain canyons.

BIRDS

Two hundred and fifty-six species of birds have been observed recently along the river, or would most likely be present where suitable habitat persists. A checklist can be found at the end of this section.

Prado Basin

Of the 178 species observed in one study of the Prado Basin (Zembal 1985, 1990), 100 species were most closely associated with riparian and open—water habitats; 29 species were mostly observed in shrublands or other upland areas; and 49 species were regular in both riparian and upland areas. There were 92 species (52% of the total) documented as breeders, 4 species (2.3%) were probable breeders, 6 species (3.4%) were possible breeders, 7 species (3.9%) were known local breeders (that were observed using the project area but not breeding therein), 3 species (1.7%) were probably nonbreeding summer residents, 3 species (1.7%) were rare escapes of unknown status, and the remaining 63 species (35%) were nonbreeding visitants or transients.

Breeding Avifauna

The common breeding species in the basin woodlands included the house wren (Troglodytes aedon), American goldfinch (Carduelis tristis), black—headed grosbeak (Pheucticus melanocephalus), brown—headed cowbird (Molothrus ater), downy woodpecker (Picoides pubescens), spotted towhee (Pipilo maculatus), mourning dove (Zenaida macroura), Bullock's oriole (Icterus bullockii), American crow (Corvus brachyrhynchos), Bewick's wren (Thryomanes bewickii), bushtit (Psaltriparus minimus), and song sparrow (Melospiza melodia). Yellow warblers (Dendroica petechia) were regular in taller willow stands, and yellow—breasted chats (Icteria virens) were interspersed mostly along the edges of the basin and along thé watercourses, wherever the mid- and understory was thick. There were regularly spaced pairs of black phoebes (Sayornis nigricans) and green herons (Butorides viresens), as well as lazuli buntings (Passerina amoena) and blue grosbeaks (Guiraca caerulea) along the riparian edge where shrubbier riparian habitat was prevalent. The great blue heron (Ardea herodias), double-crested cormorant (Phalacrocorax auritus), and black-crowned night-heron (Nycticorax nycticorax) were extremely conspicuous breeders but present in very local concentrations. Also conspicuous, was the significantly large population of nesting white-tailed kites (Elanus leucurus), red-shouldered hawks, and red-tailed hawks (Buteo jamaicensis). Nests of each of these raptors were regularly spaced along the past reservoir shoreline and the watercourses. Nesting tree swallows (Tachycineta bicolor) were very abundant locally, with concentrations in the snag fields. In one such field of about one acre in size, 12 pairs were observed visting nests.

Red-winged blackbirds (Agelaius phoeniceus) and marsh wrens (Cistothorus palustris) were locally abundant nesters in emergent willows, as well as freshwater marsh plants. Several additional species nested at the water line in emergent willows including a large population of pied-billed grebes (Podilymbus podiceps), American coots (Fulica americana), and ruddy ducks (Oxyura jamaicensis), with more widely spaced mallards (Anas platyrhynchos) and cinnamon teal (Anas cyanoptera). The waterfowl also nested on the dikes of the duck ponds, on isolated high ground within the ponds, and in marginal emergent reeds in the few ponds allowed to become overgrown. At least one pair of northern shovelers (Anas clypeata) nested along one pond and several northern pintail (Anas acuta) nested in the marsh along Temescal Creek. Other nesting species on dry open flats, isolated in the ponds, included the American avocet (Recurvirostra Americana), black-necked stilt (Himantopus mexicanus), killdeer (Charadrius vociferous), and at least one pair of spotted sandpipers (Actitis macularia). Additional conspicuous marsh-nesting birds were red-winged blackbirds, marsh wrens, common yellowthroats (Geothlypis trichas), song sparrows, tricolored blackbirds (Agelaius tricolor), American bitterns (Botaurus lentiginosus), Virginia rails (Rallus limicola), and common moorhens (Gallinula chloropus).

Inundated willow woodland in the basin provides nesting habitat for several species of water-associated birds, as long as the water level remains fairly constant during the breeding season. Periodic inundation, however, prohibits the widespread development of the thick lower ground cover and shrubby riparian growth that is a common component of the creek side habitat. Consequently, near ground and ground nesting species are very locally distributed within the basin, whereas they are widespread and much more common along the watercourses where they enter the basin and upstream. This affected species such as common yellowthroats, song sparrows, yellow-breasted chats, and least Bell's vireos (Vireo bellii pusillus), a Federally listed endangered species. The lowest known 1983 nesting location for a Bell's Vireo was near elevation 510 feet where Temescal Creek enters the basin.

Six species of hawks and five species of owls were documented as breeders. The six hawk species that bred on the river were the black-shouldered kite, Cooper's hawk (Accipiter cooperii), red-shouldered hawk, red-tailed hawk, golden eagle (Aquila chrysaetos), and American kestrel (Falco sparverius). The five breeding owl species were the common barn owl (Tyto alba), western screech-owl (Otus kennicottii), great horned owl (Bubo virginianus), burrowing owl and long-eared owl (Asio otus). Wintering raptors include the turkey vulture (Cathartes aura), osprey, northern harrier and sharp-shinned hawk.

Casual observations suggested other differences in the species diversity and abundance of nesting birds within the basin lowlands versus along even slightly higher ground, particularly along the river and creeks. The absence of low to mid-level foliage and presence of water obviously accounted for certain differences in the local presence or abundance of several species. Additionally, certain canopy nesters may not have nested as abundantly over water in the emergent woodlands as over drier vegetated ground along the watercourses and higher ground in the basin (nearshore and along berms). For other species, the opposite appeared to be the case. The red-shouldered hawks and white-tailed kites, for example, appeared to be more uniformly distributed along the near shore band of the past reservoir and along the watercourses. In contrast, the nests of certain species were found in local concentrations within the basin. Most obvious were the Bullock's oriole and hooded oriole (Icterus cucullatus) with 8 Bullock's and 4 hooded oriole nests spaced 50-100m between one another, and small area counts estimating densities of about 0.538 territorial individuals per acre. In one such area, several of the orioles were observed foraging well away from their nests on an adjacent, open grassy slope. House wrens totally dominated certain large willow groves in terms of numbers, with small area counts revealing densities of roughly 0.462 singing birds per acre. Casual observations suggested local concentrations of several other species as well, including the mourning dove, American crow, green heron, western kingbird (Tyrannus verticalis) and Cassin's kingbird (Tyrannus vociferans). The expansiveness of such an unusually large forest of woodlands in the Prado Basin has apparently led to the local occurrence of habitat blocks that are unusually well suited to certain species.

Whereas certain species, including the more water-oriented, were most abundant in, or nearly confined to areas holding impounded water, several others were more regularly encountered on the edge of the basin and/or outward along the watercourses. These included the acorn woodpecker (Melanerpes formicivorus), Nuttall's woodpecker (Picoides nuttallii), Pacific-slope flycatcher (Empidonax difficilis), ash-throated flycatcher (Myiarchus cinerascens), oak titmouse (Parus inornatus), wrentit (Chamaea fasciata), orange-crowned warbler (Vermivora celata), lesser goldfinch (Carduelis psaltria), California quail (Callipepla californica), and western wood-pewee (Contopus sordidulus). In the vicinity of the basin, belted kingfishers and northern rough-winged swallows (Stelgidopteryx serripennis) were encountered most regularly along the lower Santa Ana River, probably because vertical earthen banks and potential nest holes were most abundant there.

Along the edge of the reservoir, above the riparian habitat, were old fields and grazed grasslands, shrublands, and eucalyptus groves. Only two regular breeders were abundant in the old fields with almost no shrub cover, the western meadowlark (Sturnella neglecta) and the horned lark (Eremophila alpestris); burrowing owls (Athene cunicularia) also nested therein, but in much lower numbers. However, these open habitats also comprised the single most heavily used hunting areas for the large resident and wintering raptor population, and for loggerhead shrikes (Lanius ludovicianus) as well. The most frequently encountered nesting species in the shrublands included the California towhee (Pipilo crissalis), lesser goldfinch, bushtit, California thrasher (Toxostoma redivivum), spotted towhee, rufous-crowned sparrow (Aimophila ruficeps), Bewick's wren, California quail, wrentit, and lazuli bunting. Nests of several species were found in the eucalyptus groves including red-tailed hawk, red-shouldered hawk, house wren, western kingbird, Cassin's kingbird, loggerhead shrike, Bullock's oriole, hooded oriole, Anna's hummingbird (Calypte anna), and house finch (Carpodacus mexicanus). Other species that exhibited territoriality in the eucalyptus groves and probably nested therein included the European starling (Sturnus vulgaris), spotted towhee, blue grosbeak, song sparrow, ash-throated flycatcher, American crow, common yellowthroat, northern mockingbird (Mimus polyglottos), northern flicker (Colaptes auratus), and house sparrow (Passer domesticus). Nests of the red-tailed hawk and red-shouldered hawk were regularly located in eucalyptus trees because they were the tallest trees available. Oriole and kingbird nests were locally concentrated in eucalyptus trees.

Wintering Avifauna

The significantly large raptor population in the Prado Basin was augmented in winter, both in terms of number of individuals and number of species. A total of 19 raptor species have been detected wintering including rare sightings of the ferruginous hawk (Buteo regalis) and bald eagle (Haliaeetus leucocephalus). No observations of northern harriers (Circus cyaneus) were obtained during the breeding season but they were commonly seen hunting over the open fields in winter. Sharp-shinned hawks (Accipiter striatus) were present only in winter; sightings of osprey (Pandion haliaetus) and peregrine falcons (Falco peregrinus) were also most frequent in winter; and the numbers of nearly all of the known resident species of raptors were also higher in winter. The riparian forest, eucalyptus groves, and surrounding relatively open habitats appear to collectively provide excellent raptor habitat

The most commonly encountered winter visitants in riparian woodlands were yellow-rumped warblers (Dendroica coronata) and ruby-crowned kinglets (Regulus calendula). Where more understory growth was present, Lincoln's sparrows (Melospiza lincolnii) were abundant. White-crowned sparrow (Zonotrichia leucophrys) flocks of up to 50 or more birds were common along shrublands and the riparian fringe. In more open areas, American pipets (Anthus rubescens) and savannah sparrows (Passerculus sandwichensis) were commonly observed foraging along fields, sandbars, and ponds in flocks of 50–100 individuals or more. Say's phoebes (Sayornis saya), western bluebirds (Sialia mexicana), and mountain bluebirds (Sialia currucoides) were conspicuous as they foraged along open areas in the woodlands and from fence posts in the open fields.

The egrets were apparent in the largest numbers in winter. Over 50 cattle egrets (Bubulcus ibis) were routinely observed in single small fields, foraging along behind cattle or amongst plantings. Up to 35 snowy egrets (Egretta thula) were seen foraging along the shallow water of single flooded fields or pond margins, with intermixed great egrets in lower numbers.

The European starlings built to incredible numbers in winter. In one small cattle feedlot, a hunter's shot brought approximately 15,000 starlings into the air at once. Many shorebirds wintered in the basin and foraged along the open pond margins and edges of the reservoir. The largest numbers observed were of least sandpipers (Calidris minutilla) and long-billed dowitchers (Limnodromus scolopaceus). Far fewer numbers of western sandpipers (Calidris mauri) and greater yellowlegs (Tringa melanoleuca) were observed.

On the ponds, American coots, ruddy ducks and eared grebes (Podiceps nigricollis) became much more abundant. Examples of the densities of these three species were obtained on the Corona Sewage Ponds. The eight cells cover an area of about 45 acres. On single counts, there were 103 eared grebes, 541 American coots, and 764 ruddy ducks. Such concentrations were also observed on the ponds in the basin and there was an obvious exchange of flights and individuals between the basin and sewer ponds. The winter concentrations of waterfowl in the basin were at least as large as those on any of the southern California coastal lagoons and Prado may hold the largest wintering populations of some species. There was a significantly large concentration of Canada geese (Branta canadensis), for example, with a local population of about 5,000 birds. A few snow geese (Chen caerulescens) and greater white-fronted geese (Anser albifrons) were sometimes mixed in with the Canada geese. Early in one winter season, all 5,000 geese were observed in the area, grazing in the field between the women's prison, the Prado Regional Park, Cucamonga Avenue, and the reservoir. The local population also heavily used the Hidden Valley Wildlife Refuge (located about 5 miles upstream along the river), although flight line directions suggested constant exchanges of birds between the basin and the refuge. At the close of the hunting season, many of the birds foraging in the study area began spending the night on the north ponds in the basin. During the season, flight direction and honking suggested that they roosted on the reservoir but deeper in, at some unknown locality.

Sixteen species of ducks were observed in the Prado area and many thousands of individuals wintered there. The most abundant of the waterfowl were green-winged teal (Anas crecca), mallard, cinnamon teal, northern shoveler, American widgeon (Anas Americana), ring-necked duck (Aythya collaris), and ruddy duck. There were many thousands of each of the commoner seven species. As many as 79 Green-winged Teal were counted on one 1-acre pond and the two hunting clubs reported shooting 1,208 individuals during one past season. A total of 972 mallards were reported shot by the two hunting clubs in the Prado Basin. A count of 132 cinnamon teal was made over 50 acres of ponded water and 679 individuals were reported shot by the two hunting clubs. About 1,500 northern shovelers were counted on the north part of the reservoir in late March 1984; 178 individuals were counted on about 25 acres of ponded water; and the two hunting clubs reported killing 462 individuals. The largest single count of American widgeon obtained was of 400 on the north ponds, although the reported duck club take was of 1,135 individuals. The largest concentration of ring-necked ducks was observed on the sewer ponds in early February, when 187 individuals were counted on the 45 acres of ponds. The ruddy duck appeared to be the commonest of the waterfowl wintering in the basin; 256 were counted on a 5-acre pond and 764 were present during one count of the sewage ponds.

The most outstanding feature of the Prado Basin and environs is its vast expanse of riparian habitat and associated avifauna. This area is extremely important to migratory bird species. In the spring, there is an influx of migratory passerines. In winter, there are great numbers of wintering waterfowl and raptors.

Some Avian Species of Special Concern

Three species of birds listed by both the State and Federal governments occur in the project area, the bald eagle, least Bell's vireo, and southwestern willow flycatcher.

Generally, three or fewer of the State-listed endangered Yellow-billed Cuckoos (*Coccyzus americanus*) have been found near the Prado Basin annually. In 1984, there was a pair in the Prado Basin and two pairs just upstream along the Santa Ana River. One of these birds was seen carrying food, presumably for nestlings. Gaines (1977) detected three cuckoos in this general region. One individual was seen below Prado Dam at Featherly Park in 1976. These observations suggest the regular occurrence of cuckoos in the basin and environs. Cuckoos have large home ranges or territories of at least 10 ha, and possibly much larger (Laymon 1980). Furthermore, this species is secretive and fairly difficult to detect. The basin and environs appear to possess enough habitat for many more yellow-billed cuckoos than have been found. Indeed, this species illustrates the difficulties of working in the project area. The vast expanse of habitat, lack of access, and secretive nature of the cuckoo would make total assessment of the cuckoo's status in the basin exceedingly difficult.

The Blue List, List of Species of Special Concern, and the Sensitive Species List are all early warning devices or acknowledgements of the plight of several species of birds. Publication of these lists is an attempt to focus attention so that further declines can be arrested before legally binding recognition of these species rarity is necessary. All of these lists are warnings that unless current trends are reversed, it will be necessary to list these species in the future. The occurrence of so many rare and sensitive species in the

Prado Basin and environs is noteworthy (Zémbal et al. 1985). Riparian habitat is dwindling away elsewhere in southern California and the Prado Basin is an extremely important refugia.

Threats by the Brown-Headed Cowbird

An unfortunate aspect of the avifauna of the project area is the large brown-headed cowbird population. This brood parasite lays its eggs into the nests of other species. The host species then raises a cowbird, often to the demise of its own young. Because the invasion of California by cowbirds is relatively recent, and unprecedentedly swift, due, in part, to large-scale land use changes, the impact on native species (for example, least Bell's vireos, yellow warblers, willow flycatcher, etc., Garrett and Dunn 1981) is high. Cowbirds seem to have an affinity for livestock, agriculture, and associated land uses; hence, the large population in the project area.

Avifauna of the Upper Watershed

One hundred and four species of birds were observed in the upper watershed and environs, mostly below the pine belt during earlier studies (Zembal and Kramer 1984). A total of 56 species of wintering birds was detected on wintering bird assessment plots. There were 42 species in the floodplain habitats along the Santa Ana River, 40 species in riparian habitat on Lytle Creek, and 38 species in the chaparral on a floodplain terrace on Lytle Creek. The most abundant wintering birds included the ruby-crowned kinglet, California towhee, hermit thrush (Catharus guttatus), black phoebe, rock wren (Salpinctes obsoletus), western scrub-jay (Aphelocoma californica), Bewick's wren, lesser goldfinch, wrentit, spotted towhee, golden-crowned sparrow (Zonotrichia atricapilla), and dark-eyed junco (Junco hyemalis).

The wintering raptors in the upper watershed include the golden eagle, sharp-shinned hawk, Cooper's hawk, red-tailed hawk, American kestrel, red-shouldered hawk, turkey vulture, barn owl, and western screech owl.

Table 12. Wintering Birds per 100 acres of the Upper Santa Ana River and Lytle Creek.

	Riparian		Chaparral
	Santa Ana Canyon	Lytle Creek	Lytle Creek
Ruby-crowned Kinglet	28	42	7
California Towhee	23	54	66
Hermit Thrush	18	25	11
American Goldfinch	18	-	-
Black Phoebe	13	4	+
Rock Wren	13	4	-
Western Scrub-Jay	10	29	21
Bewick's Wren	10	8	3
Lesser Goldfinch	10	21	7
Northern Flicker	8	8	7
Wrentit	8	54	52
California Thrasher	8	8	17
Dark-eyed Junco	8	33	34
Mountain Quail	5	4	-
Bushtit	5	8	7
Spotted Towhee	5	46	55
Song Sparrow	5	17	+
Red-tailed Hawk	3	8	+
American Kestrel	3	+	+
Common Snipe	3	-	-
Anna's Hummingbird	3	4	41
Nuttall's Woodpecker	3	4	3
Canyon Wren	3	4	-
Loggerhead Shrike	3	-	+
Common Yellowthroat	3	-	-
Golden-crowned Sparrow	3	13	48
House Finch	3	-	11
Pine Siskin	3	62	+
Cooper's Hawk	+	+	+
Red-shouldered Hawk	+	+	+
Spotted Owl	+	-	-
Vaux's Swift	+	-	-
Belted Kingfisher	+	-	-
Say's Phoebe	+	-	-
Common Raven	+	-	3
Oak Titmouse	+	4	17
American Dipper	+	-	-
California Gnatcatcher	+	-	-
Yellow-rumped Warbler	+	+	3
Rufous-crowned Sparrow	+	+	3
Fox Sparrow	+	+	-
Lincoln's Sparrow	+	4	-
Steller's Jay	-	29	+
Mountain Chickadee	-	8	+
Purple Finch	-	8	14

Table 12 (cont.)

	Riparian Santa Ana Canyon	Riparian Lytle Creek	Chaparral Lytle Creek
Band-tailed Pigeon	-	4	-
White-throated Swift	-	4	-
Western Bluebird	-	4	17
Sharp-shinned Hawk	-	+	-
Golden Eagle	-	+	-
American Crow	-	+	3
White-crowned Sparrow	-	+	14
California Quail	-	-	11
America Robin	-	-	3
Red-breasted Sapsucker	-	-	+
Golden-crowned Kinglet	-	-	+
Total Species	42	40	38
Total Count	218	527	479

*Numbers are birds per 100 acres and includes only those observed on the winter-bird plots.

A total of 61 species of breeding birds was detected on bird plots in the upper watershed (Table 13). There were 47 species detected in the floodplain habitats along the Santa Ana River, 39 species in riparian habitats on Lytle Creek, and 30 species in the chaparral on a floodplain terrace on Lytle Creek. The common breeding species included the song sparrow, lesser goldfinch, Costa's hummingbird (Calypate costae), California towhee, rock wren, spotted towhee, black-headed grosbeak, lazuli bunting, Bullock's oriole, house wren, black phoebe, ash-throated flycatcher, western scrub-jay, Anna's hummingbird, and wrentit. Breeding raptors in the upper canyons and environs included the golden eagle, Cooper's hawk, red-tailed hawk, American kestrel, barn owl, great horned owl, and western screech owl. (The winter counts and breeding bird censuses were published in American Birds.

During both Springs that the avifauna of the upper canyons was examined intensively, the endangered least Bell's vireo was a visitor to the upper Santa Ana River Canyon. Two singing male Bell's vireos were present briefly in the Santa Ana Canyon riparian thickets in the spring of 1984 and one in 1985. Breeding did not occur.

Table 13. Breeding birds of the Upper Santa Ana Canyon and Lytle Creek, 1985.

	Riparian		Chaparral
	Santa Ana Canyon	Lytle Creek	Lytle Creek
Song Sparrow	68	87	-
Lesser Goldfinch	46	54	28
Costa's Hummingbird	32	27	24
California Towhee	26	50	36
Rock Wren	25	+	-
Spotted Towhee	24	50	45
Black-headed Grosbeak	19	21	4
Lazuli Bunting	17	17	4
Bullock's Oriole	17	8	-
House Wren	15	50	+
Black Phoebe	13	-	-
Ash-throated Flycatcher	10	12	12
Western Scrub-Jay	10	12	11
Mourning Dove	8	-	7
Anna's Hummingbird	8	27	14
Western Wood-Pewee	8	8	4
Violet-green Swallow	8	-	-
Wrentit	8	25	76
Brown-headed Cowbird	8	4	7
House Finch	8	8	7
White-throated Swift	5	-	-
Northern Flicker	5	4	4
Bushtit	5	8	4
Canyon Wren	5	-	-
Yellow Warbler	5	-	-
Black-chinned Hummingbird	2	12	4
Nuttall 's Woodpecker	2	2	2
Bewick's Wren	2	6	17
California Thrasher	2	10	19
Wilson's Warbler	2	8	-
Rufous-crowned Sparrow	2	4	2
Brewer's Blackbird	2	-	-
Mountain Quail	1	-	-
Blue-gray Gnatcatcher	1	6	53
Orange-crowned Warbler	1	19	-
Mallard	+	-	-
Cooper's Hawk	+	-	-
Red-tailed Hawk	+	-	-
American Kestrel	+	-	-
Greater Roadrunner	+	-	2
Pacific-slope Flycatcher	+	19	-
No. Rough-winged Swallow	+	-	-
Oak Titmouse	+	6	11
Warbling Vireo	+	4	-
Common Yellowthroat	+	-	-
Black-chinned Sparrow	+	+	+
Red-winged Blackbird	+	-	-
Common Raven	-	-	-

	Riparian Santa Ana Canyon	Riparian Lytle Creek	Chaparral Lytle Creek
Phainopepla	–	+	+
California Quail	–	–	7
Downy Woodpecker	–	–	–
American Dipper	–	–	–
Least Bell's Vireo	–	–	–
Yellow-breasted Chat	–	–	–
Steller's Jay	–	8	–
Swainson's Thrush	–	6	–
Lawrence's Goldfinch	–	6	+
Dark-eyed Junco	–	4	–
Purple Finch	–	4	14
Hutton's Vireo	–	+	–
Western Tanager	–	+	–
Total Species	47	39	30
Territories/100 acres	421	600	413

Birds at the Santa Ana River Mouth

Surveys of the marsh and river mouth habitats in 1995 revealed 94 species of birds (Kelsey and Collins 1995). Fifteen of these coastal species were not included on the earlier Prado checklist.

Avian Checklist of the Santa Ana River Watershed

Table 14 is a checklist of 256 species of birds observed in the watershed.

Table 14. AVIFAUNA OF THE SANTA ANA RIVER

Long-Legged Waders

Bitterns and Herons

American Bittern
Least Bittern
Great Blue Heron
Great Egret
Snowy Egret
Little Blue Heron
Cattle Egret
Green Heron
Black-crowned Night-Heron

Storks & Ibises

White-faced Ibis
Wood Stork
Red-throated Loon

Gull-like Birds

Gulls, Terns, and Jaegers

Parasitic Jaeger
Bonaparte's Gull
Ring-billed Gull
California Gull
Herring Gull
Western Gull
Elegant Tern
California Least Tern
Caspian Tern
Forester's Tern
Black Tern
Black Skimmer

Upright Perching Water Birds

Double-crested cormorant

Duck-like Birds

Swans, Geese, and Ducks

Snow Goose
Canada Goose
Wood Duck
Green-winged Teal
Mallard
Northern Pintail
Blue-winged Teal
Cinnamon Teal
Northern Shoveler
Gadwall
American Wigeon
Canvasback
Redhead
Ring-necked Duck
Greater Scaup
Lesser Scaup
Bufflehead
Hooded Merganser
Common Merganser
Red-breasted Merganser
Ruddy Duck
Greater White-fronted Goose
Common Goldeneye

Grebes

Pied-billed Grebe
Eared Grebe
Western Grebe
Clark's Grebe

Pelicans

American White Pelican
Brown Pelican

Sandpiper-like Birds

Sandpipers, Phalaropes, and Allies

Greater Yellowlegs
Lesser Yellowlegs
Solitary Sandpiper
Willet
Spotted Sandpiper
Whimbrel
Long-billed Curlew
Marbled Godwit
Western Sandpiper
Least Sandpiper
Baird's Sandpiper
Pectoral Sandpiper
Ruddy Turnstone
Dunlin
Ruff
Short-billed Dowitcher
Long-billed Dowitcher
Common Snipe
Wilson's Phalarope
Red-necked Phalarope

Plovers

Black-bellied Plover
Snowy Plover
Semipalmated Plover
Kildeer

Stilts and Avocets

Black-necked Stilt
American Avocet

Chicken-like Marsh Birds

Rails, Gallinules, Coots

Virginia Rail
Sora
Common Moorhen
American Coot

Upland Ground Birds
California Quail
Mountain Quail
Greater Roadrunner

Owls
Western Screech-Owl
Great Horned Owl
Burrowing Owl
Long-eared Owl
Short-eared Owl
Spotted Owl
Barn Owl

Nighthawks
Lesser Nighthawk

Hawk-like Birds
Kites, Hawks, and Eagles
Osprey
White-tailed Kite
Bald Eagle
Northern Harrier
Sharp-shinned Hawk
Cooper's Hawk
Red-shouldered Hawk
Swainson's Hawk
Red-tailed Hawk
Ferruginous Hawk
Golden Eagle

Vulture
Turkey Vulture

Caracaras and Falcons
American Kestrel
Merlin
Peregrine Falcon
Prairie Falcon

Pigeon-like Birds
Pigeons and Doves
Rock Dove
Spotted Dove
White-winged Dove
Mourning Dove
Common Ground-Dove
Band-tailed Pigeon

Swallow-like Birds
Swallows
Purple Martin
Tree Swallow
Violet-green Swallow
Northern Rough-winged Swallow
Bank Swallow
Cliff Swallow
Barn Swallow

Swifts
Black Swift
Chimney Swift
Vaux's Swift
White-throated Swift

Tree-clinging Birds
Woodpeckers and Allies
Acorn Woodpecker
Red-breasted Sapsucker
Nuttall's Woodpecker
Downy Woodpecker
Hairy Woodpecker
Northern Flicker
Willliamson's Sapsucker

Hummingbirds (HB)
Black-chinned HB
Anna's HB
Costa's HB
Rufous HB
Allen's HB

Perching Birds
Sparrows, Towees, Juncos, and Allies
Green-tailed Towhee
Spotted Towhee
California Towhee
Rufous-crowned Sparrow
Chipping Sparrow
Vesper Sparrow
Lark Sparrow
Black-chinned Sparrow
Sage Sparrow
Savannah Sparrow
Belding's Savannah Sparrow
Grasshopper Sparrow
Fox Sparrow
Song Sparrow
Lincoln's Sparrow
Swamp Sparrow
Golden-crowned Sparrow
White-crowned Sparrow
Dark-eyed Junco
Chestnut-collared Longspur
House Sparrow

Finches and Allies
Purple Finch
House Finch
Pink Siskin
Lesser Goldfinch
Lawrence's Goldfinch
American Goldfinch

Wood Warblers
Orange-crowned Warbler
Nashville Warbler
Northern Parula
Yellow Warbler
Black-throated Blue Warbler
Yellow-rumped Warbler

Black-throated Gray Warbler
Townsend's Warbler
Hermit Warbler
Palm Warbler
Black-and-White Warbler
American Redstart
Northern Waterthrush
Kentucky Warbler
MacGillivrays' Warbler
Common Yellowthroat
Wilson's Warbler
Yellow-breasted Chat

Old World Warblers
Ruby-crowned Kinglet
Golden-crowned Kinglet
California Gnatcatcher
Blue-gray Gnatcatcher

Tyrant Flycatchers
Olive-sided Flycatcher
Western Wood-Pewee
Southwestern Willow Flycatcher
Hammond's Flycatcher
Gray Flycatcher
Pacific-slope Flycatcher
Black Phoebe
Eastern Phoebe
Say's Phoebe
Vermillon flycatcher
Ash-throated Flycatcher
Cassin's Kingbird
Western Kingbird
Eastern Kingbird
Scissor-tailed Flycatcher

Titmice
Oak Titmouse
Mountain Chickadee
Bushitt

Pipits
American Pipit

Blackbirds and Orioles
Red-winged Blackbird
Tricolored Blackbird
Western Meadowlark
Yellow-headed Blackbird
Brewer's Blackbird
Great-tailed Grackle
Brown-headed Cowbird
Hooded Oriole
Bullock's Oriole

Tanagers, Grosbeaks, and Buntings
Western Tanager
Rose-headed Grosbeak
Black-headed Grosbeak
Blue Grosbeak
Lazuli Bunting
Indigo Bunting

Jays, Magpies, and Crows
Western Scrub Jay
Stellar Jay
American Crow
Common Raven

Wrens
Rock Wren
Bewick's Wren
House Wren
Marsh Wren
Canyon Wren
Catcus Wren

Dipper
American Dipper

Vireos
White-eyed Vireo
Least Bell's Vireo
Solitary Vireo
Hutton's Vireo
Warbling Vireo
Red-eyed Vireo

Thrushes
Western Bluebird
Mountain Bluebird
Swainson's Thrush
Hermit Thrush
American Robin
Wrentit

Mockingbird and Thrashers
Northern Mockingbird
California Thrasher
Sage Thrasher

Starling
European Starling
Waxwings
Cedar Waxwing
Shrikes
Loggerhead Shrike
Larks
Horned Lark
Cuckoo
Yellow-billed Cuckoo
Kingfisher
Belted Kingfisher
Phainopepla
Phainopepla

MAMMALS

Twenty-three species of mammals, including three that are nonnative, were observed along the middle river. These included one marsupial, one insectivore, two lagomorphs, 11 rodents, seven carnivores, and the mule deer. Chiropterans have not been surveyed well but there could be as many as 15 species in the watershed (Zembal 1984).

Six species of mammals found in the Prado Basin and environs are listed in the California Hunting Regulations with seasons and limits set by the State Fish and Game Commission. The mule deer (Odocoileus hemionus) is a big game animal; the Audubon cottontail (Sylvilagus audubonii) and jackrabbit (Lepus californicus) are resident small game animals; the gray fox (Urocyon cinereoargenteus) and the raccoon (Procyon lotor) are furbearing mammals; and the bobcat (Felis rufus) is a regulated nongame mammal. The mountain lion (Felis concolor) is protected under special State legislation and there are two listed small mammals, the endangered San Bernardino kangaroo rat (Dipodomys merriami parvus) (in the upper watershed only) and the threatened Stephen's kangaroo rat (Dipodomys stephensi) (in western Riverside County only).

The deer mouse (Peromyscus maniculatus) was by far the most commonly captured small mammal in previous studies of riparian habitat within the Santa Ana River Watershed. The species was captured most abundantly in the uplands, but animals were also trapped in riparian habitats. The high reproductive potential and mobility of cricetine mice may function to make them extremely efficient colonizers, able to take advantage of areas, such as floodplains and flood control basins that are suitable only on an intermittent basis (Whitford 1976). The abundance of local temporary disruption of habitat in the project area (inundation, plowing, and heavy grazing for a time that renders large areas unsuited to the presence or abundance of small mammals) may serve to foster the continued apparent dominance of deer mice in the small mammalian fauna of the Prado Basin and other floodplain areas. The other six species of rodents captured were taken in relatively low numbers. The introduced house mouse (Mus musculus) and black rat (Rattus rattus) were taken near current or abandoned dwellings, piles of human refuse, and in situations that were too wet for native small mammals.

The California Ground Squirrel (Spermophilus beecheyi) was the most abundantly encountered small mammal in the project area. The open uplands and heavily grazed fields provide ideal habitat for this species. Of the two lagomorphs found in the project area, the Audubon cottontail was the most common and was locally quite numerous. Animals were observed in grasslands, shrublands, in shrubby riparian growth, and along the margins of woodlands. Jackrabbits were locally very abundant in sparsely vegetated places. The coyote and raccoon were the most commonly encountered of the seven species of carnivores documented. Raccoon tracks were so abundant that we strongly suspect that they are the most abundant of the carnivores in terms of numbers of individuals. Both species are relatively omnivorous and appeared, through sign, to take full advantage of the incredible abundance of crayfish.

The next most commonly documented of the carnivores were the striped skunk (Mephitis mephitis) and long-tailed weasel (Mustela frenata). Bobcats were regular in occurrence throughout the Basin but in relatively low numbers. The feral cats (Fells domesticus) observed in the study area appeared to be entirely wild. Mule deer tracks were occasionally observed in the Prado Basin. The grazing lands and crops along with the dense cover of willow woodland provide support for small herds here and there along the middle river. The largest herds are probably associated with the upper river abutting the National Forest and the lower canyon and adjacent Chino Hills. The habitat breadth is more suitable in these areas and the deer sign was most regularly encountered.

A total of 13 kangaroo rats were captured in riparian habitat edges during 1,002 trap-nights in the Basin and all were pacific kangaroo rats (Dipodomys agilis).

Thirty species of mammals were detected in upper watershed, only one of which, the common opossum (Didelphis marsupialis), is an introduced species. These 30 species included one species of marsupial, two bats, three lagomorphs, 14 rodents, nine carnivores, and one ungulate. Annotations for these species are available in earlier reports (Zembal and Kramer 1984).

Ten species of these mammals are listed in the California Hunting Regulations, with seasons and bag limits set by the State Fish and Game Commission. Those additional to the species listed above for the Basin include the brush rabbit (Sylvilagus bachmani), a resident small game animal; the badger (Taxidea taxus), and beaver (Castor canadensis) are furbearing mammals; and the ringtail (Bassariscus astutus) is fully protected.

The most commonly observed small mammals during daylight hours were California ground squirrels and the rabbits. The ground squirrels were common along the dirt road margins, in boulder heaps, open disturbed areas, and open shrublands. The jack rabbits were most common on the open floodplain, whereas cottontails were prevalent on the floodplain margins where riparian thickets provided escape cover, and brush rabbits were very common in dense chaparral.

The most abundant small nocturnal mammals included deer mice, brush mice (Peromyscus boylii), cactus mice (P. eremicus) (in the Santa Ana River floodplain), the desert woodrat (Neotoma lepida), and the Pacific kangaroo rat. The diggings of pocket gophers (Thomomys bottae) were occasionally observed in open shrublands. The other rodents encountered in the project area were the San Diego pocket mouse (Perognathus fallax), California pocket mouse (P. californicus), western harvest mouse (Reithrodontomys megalotis), dusky-footed woodrat (Neotoma fuscipes), and California vole (Microtus californicus). Western gray squirrels (Sciurus griseus) were observed sporadically in the slope woodlands along Lytle Creek and in oak—dominated draws along the Santa Ana River. The sparse stick nests and droppings of the desert woodrat were common in the open floodplain amongst boulders, but on the slopes and in dense riparian growth, the more elaborate nests of the dusky—footed woodrat were abundant. Because of the similarity of the habitats, species composition of the small mammalian fauna was quite similar for the upper Lytle Creek and the Santa Ana River.

The bats of the project area have not been studied. Observations of several individuals in flight indicated the presence of the western pipistrelle (Pipistrellus hesperus) and at least two species of Myotis. There is an old report of hoary bats (Lasiurus cinereus) from the upper Santa Ana Canyon, as well (Ingles 1929).

Beaver dams were found on two side channels of the upper Santa Ana River, but they do not appear to be abundant anywhere along the river.

The coyote, raccoon, and striped skunk were the commonest of the carnivores detected in the upper watershed. Additional carnivores included the mountain lion, bobcat, ringtail, gray fox, badger, and long—tailed weasel.

The mule deer is the most economically important big game mammal in California and is found throughout the upper Santa Ana Canyon and Lytle Creek. Upper watershed areas provide key winter range for deer and receive heavy use by hunters (USFS 1985). In addition, the Santa Ana River Canyon provides an important corridor for movements during seasonal migration and appears to comprise an appropriate mosaic of habitats for some fawning.

ENDANGERED SPECIES

There are nine listed species in the watershed that could be affected by the proposed activities. Two are plants, the Santa Ana River woolly star and slender-horned spine flower; one fish, the Santa Ana River sucker; one amphibian, the southwestern arroyo toad; three birds, the southwestern willow flycatcher, least Bell's vireo, and bald eagle; and two mammals, the San Bernardino kangaroo rat and Stephen's kangaroo rat. It is the goal of the watershed program to benefit these species through management and habitat restoration and thereby to accommodate and benefit all native wildlife including additional rare species.

Santa Ana River Woolly Star

The Santa Ana River woolly star was listed as a federally endangered species on September 28, 1987. The woolly star is a short-lived, perennial, subshrub of the phlox family (Polemoniaceae). It has a basally branched, generally erect or spreading form, reaching 30 inches in height. The entire plant, including the inflorescence, is covered with woolly pubescence, giving it a silvery-white appearance. The inflorescence is dense and spiny-bracted with about 20 flowers. Flowers have blue to violet-blue, elongate, funnel-shaped corollas usually longer than 1.0 inch. The light gray-green leaves generally curve upward, are irregularly divided to the midrib into two to six narrow lobes, and are up to 2.0 inches long.

Four other subspecies of Eriastrum densifolium have been recognized. A key feature that distinguishes E. d. sanctorum from other subspecies is the length of its floral tube. Floral tube lengths in the other three subspecies do not exceed 0.8 inches. Eriastrum densifolium ssp. sanctorum occurs at elevations below 2,000 feet, lower than some of the other subspecies.

No critical habitat has been designated. Woolly star is a pioneer species that colonizes washed sand deposits created by sporadic stream flow action. Between major flood events, these deposits typically exist as terraces above the high water mark of the river and associated braided streams. Woolly star grows primarily in Riversidean alluvial fan sage scrub (RAFSS) in sandy soils from 1,240 to 1,900 feet in elevation. It thrives in nutrient poor sands of early phase RAFSS habitat that have more than 97% sand particles. The dominant species on young substrates include California buckwheat, scalebroom (Lepidospartum squamatum), fastigiate golden aster (Heterotheca fastigiata), and California croton (Croton californica). Woolly star also remains competitive on intermediate-aged substrates that have between 90% and 97% sand particles. The dominant species on intermediate substrates include California buckwheat, scalebroom, California juniper, valley cholla (Opuntia californica var. parkeri), and coastal prickly pear (Opuntia littoralis). In the few locations where woolly-star occurs in mature phase RAFSS, stands are relatively small and appear to be declining; probably because competition from shrubs and annual herbs limits the establishment of the subspecies. The dominant species on older substrates include sugar bush, holly-leaved cherry, and chamise. Total vegetative cover at sites supporting woolly-star ranges from 42% to 48% at younger sites and 66% to 88% at older sites.

Woolly star is a short-lived perennial species. The average life span of this perennial is 5 years, with a maximum life expectancy of 10 years. Woolly star begins reproduction in the second season of growth. The blooming period is from late May through mid-August with heaviest blooms occurring in June. Total seasonal rainfall and time of rainfall may have an effect on the time of flowering.

Woolly star is primarily an outcrosser, and depends on pollinators for dispersal because seeds typically fall within 4 inches of the parent plant. The flowers of woolly-star mature and release pollen prior to the maturation and receptivity of the stigma. Jones and Burk (1996) documented a "drastic reduction" in fruit and seed set in 1995, corresponding with a reduction in observed pollinator populations that year. Identified pollinators of woolly-star are the solitary digger bee (Micranthophora flavocinta), giant flower-loving fly (Rhaphiomidas acton acton), California bumblebee (Bombus californicus), white-lined sphinx moth (Hyles lineata), the black-chinned hummingbird (Arhilochus alexandri), and Anna's hummingbird (Calypte anna). The digger bee is an important pollinator in early phase RAFSS habitat, whereas hummingbirds and the giant flower-loving fly are important pollinators at intermediate stage sites. The California bumblebee and giant flower-loving fly may be the primary pollinators in both the Santa Ana River and Cajon Creek washes, although overall pollinator assemblages differed among sites.

When seeds of woolly star are wetted, the outer seed coat forms a mucilaginous mass that readily attaches the seed to the surrounding soil particles. Hence, it is unlikely that woolly star efficiently disperses into new habitats unless floods carry the seeds greater distances. The optimum temperature for germination is about sixty degrees Fahrenheit and no scarification or other treatment of any kind is necessary to stimulate germination. During demographic studies in the late 1980s, seedlings germinated simultaneously with the first major autumn storms. The median survival time of woolly star seedlings was determined to be significantly longer in early phase RAFSS than in older sites. Mortality in early phase RAFSS was not negatively correlated with seedling density, whereas at older sites mortality was density-dependent.

Historically, habitat for woolly star likely occurred in a mosaic pattern, shifting in time and space across alluvial floodplains. Woolly star habitat still exists in a mosaic pattern within remaining patches of alluvial fan scrub along the Santa Ana River and Lytle and Cajon Creeks. The pattern of distribution of sub-populations, combined with current knowledge of the genetic diversity and pollinator ecology, suggests that the subspecies functions as a meta-population. The woolly star has a standing seed bank. Those seeds not immediately shed from the fruits are stored within the capsules. During floods, long distance movement of encapsulated seeds down the floodplain is possible, facilitating some gene flow between sub-populations.

Woolly star was listed because the remaining 10% of its range was threatened by encroaching developments within the floodplain, sand and gravel mining, grazing by domestic animals, competition from exotic plants, and other factors. Historically, woolly star occupied about 60 miles of habitat along the Santa Ana River from an elevation of about 2,000 feet at the base of the San Bernardino Mountains, through Riverside County, to about 500 feet in the vicinity of Santa Ana Canyon in Orange County. Woolly star may have occupied alluvial habitats in Orange County as far downstream as Santiago Canyon. Today, the subspecies is known from one extended, fragmented population in San Bernardino County on alluvial terraces along the

Santa Ana River and its tributaries. No individuals have been located in Riverside or Orange Counties during recent decades.

Since its listing, the status of this woolly-star has been one of continuing decline, with land development responsible for a significant portion of the loss of habitat. Current threats include urban development, off-road vehicles, flood control activities, sand and gravel mining operations, and competition from non-native plants.

Slender-horned Spineflower

The slender-horned spineflower (Dodecahema leptoceras) was federally listed as endangered on September 28, 1987. A monospecific genus in the buckwheat family (Polygonaceae), the species is a small, ephemeral, low spreading annual that is difficult to detect from more than 15 feet away. The species is only readily detectable in the spring, when in flower or shortly thereafter. The leaves and bracts turn bright red by the time flower cluster appear.

No critical habitat has been designated for this plant. Dodecahema leptoceras is generally associated with old formation alluvial benches and floodplain terraces in washes and lower slopes of mountains below 2,000 feet in soft chaparral and alluvial scrub vegetation. The species generally inhabits openings in intermediate and mature Riversidean alluvial fan sage scrub, where disturbance from flooding is less frequent which is characterized by flood flows, scouring, and deposition of Entisol-type alluvium. Adequate alluvial scrub habitat and active fluvial processes are important to maintain habitat. The ideal habitat appears to be a terrace or bench that receives overbank deposits every 50 to 100 years (Prigge, et al., 1993).

The slender-horned spineflower is an herbaceous annual and a spring-bloomer, expected to germinate following winter precipitation. Germination often does not occur in years with inadequate rainfall. The normal life span is less than 4 months. The flowering period varies between April and June depending on the timing and the amount of winter rainfall. The species has white to pink flowers, 1.2 to 2 mm in length, which produce small brown or black single-seeded achenes, 1.7 to 2 mm long.

This spineflower is protandrous (anthers develop earlier than stigma), suggesting that the slender-horned spineflower is an obligate outcrosser; however, the species is apparently self-compatible (Reveal 1989, cited in Prigge *et al.* 1993). Small native bees, wasps and occasionally ants have been observed visiting D. leptoceras, however only a single wasp species, Plenoculus davisii, has been identified as a pollinator. The plant is probably pollinated by a variety of species.

After flowering, the plants die back, become brittle and may disintegrate. The involucre has six ascending and six descending awns, rendering it ideally suited for animal dispersal. Potential dispersal agents include coyotes, rabbits, rodents, and deer. Dispersal may also occur via flood water or wind.

Population size varies considerably from year to year depending on the amount and seasonality of rainfall, as well as seed set from previous years. Germination often does not occur in years with inadequate rainfall. Occurrences of Dodecahema leptoceras within individual drainage basins are best considered metapopulations. This term implies a fluidity in space and time where small groups of individuals of a species, with a naturally dissected range, grow in a localized site for a time then disappear.

The species is known from nine occurrences, ranging from Bee Canyon at the northeast limit of its known range, west to the Santa Ana River Wash in Redlands (supporting a cluster of several sub-populations), and south to Temescal Canyon, Bautista Canyon, and the Vail Lake area of Riverside County, California. Known occurrences on National Forest lands are at Bautista Canyon on the San Bernardino National Forest and south of Vail Lake on the Cleveland National Forest. Occurrences at Bee Canyon, Big Tujunga Canyon, Cajon Creek, Santa Ana River, Temescal Creek, San Jacinto River, and Dripping Springs are on alluvial outwashes downstream of National Forest lands.

Historically, this spineflower was reported to occur in many of the alluvial systems on the coastal side of the transverse range in Los Angeles and San Bernardino counties, and at the base of the interior slopes of the Agua Tibia mountains in Riverside County. Many of these alluvial fans coalesced into an extensive bajada to form a nearly continuous skirt along these mountains. Most historic collections of slender-horned spineflower were from stands that have been extirpated. At present, only about one-third of all known historic locations for this species are still extant. At least 15 previously known sites no longer support populations (California Natural Diversity Data Base (CNDDB) 1997, Michael Brandman Associates 1988).

This species was listed due to a dramatic reduction in range and immediate and tangible threats to many of its remaining known occurrences. The slender-horned spineflower is dependent upon washes and thus vulnerable to activities that would result in alterations of hydrology (e.g., channelization, restriction of active sediment transport, and removal of sandy substrate). The primary threats to Dodecahema leptoceras are loss of habitat through urbanization and flood control projects, and associated hydrological and fluvial geomorphological changes to the alluvial systems that maintain this characteristic habitat type. Off road vehicle activity and invasion of exotic species are also grave threats to some occurrences. Dispersed recreation can lead to trampling of plants.

Along with its alluvial scrub habitat, the slender-horned spineflower's range has been significantly reduced and fragmented by the intense development within the greater Los Angeles area. Flood control structures such as debris dams and channelization have altered the natural flooding regimes or natural forces responsible for habitat renewal. Other impacts to this species' habitat include agriculture, sand and gravel mining, invasion of non-native plant species, off-road vehicle activity, and construction of various dams and debris basins upstream of and/or within habitat for this species, including the Seven Oaks Dam on the Santa Ana River.

Santa Ana Sucker

The Santa Ana sucker(Catostomus santaanae) is silvery below, darker along the back with irregular blotches, and the membranes connecting the rays of the tail are pigmented.

The Santa Ana sucker inhabits streams that are generally small and shallow, with currents ranging from swift (in canyons) to sluggish (in the bottomlands). All of the streams are subject to periodically severe flooding. Suckers appear to be most abundant where water is cool (less than 22 deg. Celsius), unpolluted, and clear; however, they can tolerate and survive in seasonally turbid water (Moyle 1976, Moyle and Yoshiyama 1992).

Suckers generally live no more than 3 years (Greenfield et al. 1970). Spawning occurs from early April to early July. Peak spawning activity occurs in late May and June. Females, ranging in size from 78 mm to 158 mm in length, produce approximately 4,000 to 16,000 eggs (Moyle 1976). Suckers feed mostly on algae, which they scrap off of rocks and other hard substrates. Larger fish generally feed more on insects than do smaller fish (Moyle 1976). The combination of early sexual maturity, protracted spawning period, and high fecundity potentially allows the sucker to quickly repopulate streams following periodic flood events that can decimate populations (Greenfield et al. 1970, Moyle 1976).

The Santa Ana sucker was federally listed as threatened on May 12, 2000. Critical habitat has not been proposed for the sucker. Within its native range, the species is now restricted to three noncontiguous populations: lower Big Tujunga Creek (Los Angeles River drainage), the East, West, and North Forks of the San Gabriel River (San Gabriel River drainage), and the lower and middle Santa Ana River (Santa Ana River drainage) (Moyle and Yoshiyama 1992). An introduced population also occurs in the Santa Clara River drainage system of Ventura and Los Angeles Counties (Smith 1966, Moyle 1976, Swift et al. 1993). Although the sucker was described as common in the 1970s, the species has experienced declines throughout most of its range (Swift et al. 1993).

Although historically present, the species may have been extirpated from the Los Angeles River (Swift et al. 1993). The portions of Big Tujunga Creek occupied by the sucker constitute approximately 25% of the total remaining native range of the species. Approximately 60% of the range of the sucker in the Los Angeles River basin occurs on private lands. The remaining 40% of the range in the Los Angeles River basin occurs on Angeles National Forest lands.

In the San Gabriel River, the sucker appears extant only upstream of the confluence of the East, West, and North Forks of the San Gabriel River. The portions of the San Gabriel River occupied by the sucker constitute approximately 15% of the total remaining native range of the species. Suckers were present in Piru Creek, a major Santa Clara tributary, by 1934 and in the Santa Clara River proper and its Sespe Creek tributary by 1940 (Buth and Crabtree 1982).

The sucker survives in the lower portions of the Santa Ana River, from the Imperial Highway (SR 90) to Rubidoux near the city of Riverside, but is now apparently absent from the upper reach of this river in the San Bernardino Mountains (Moyle and Yoshiyama 1992, Swift et al. 1993). The portions of the Santa Ana River occupied by the sucker constitute approximately 60% of the total remaining native range of the species. Approximately 95% of the range of the sucker in the Santa Ana River basin occurs on private lands. The balance is within state, county, city, and regional park lands, with a small portion, 3%, on military lands. Chadwick and Associates (1996) noted that length-frequency analysis indicates suckers are naturally reproducing in the Santa Ana River system. Evidence suggests suckers were using tributaries including Tequesquite Arroyo, Sunnyslope Channel, and Anaza Park Drain for spawning and nurseries.

Urbanization/development and associated habitat loss are potentially significant threats to the Santa Ana sucker. Urbanization/development may have caused the extirpation of Santa Ana suckers from lowland reaches of the Los Angeles and San Gabriel Rivers. Also, the elimination of Santa Ana suckers from the upper Santa Ana River in the San Bernardino Mountains may be partially caused by dewatering of the river by hydropower water rights users. As the Los Angeles urban area expanded, the Los Angeles, Santa Ana, and San Gabriel rivers were highly modified, channelized, or moved in an effort to either capture water runoff or protect property. All three river systems within the historic range of the sucker have dams that isolate and fragment fish populations. Dams likely have resulted in some populations being excluded from suitable spawning and rearing tributaries. Reservoirs also provide areas where introduced predators and competitors can live and reproduce. Seven Oaks Dam, now under construction upstream from the present range of Santa Ana sucker in the Santa Ana River, prevents future upstream movement of fish and further isolate the sucker populations from their native range in the headwaters of the system.

Water quality problems are a potential threat to the Santa Ana sucker. Although water quality tolerances of this species are unknown, in general, point and non-point source pollution (e.g., urban runoff, sedimentation, etc.) have significantly degraded the aquatic resources in most of the native range of the sucker. Based on available information, increased turbidity and associated deposition of fine particles and sand likely threaten the sucker population in the Santa Ana River by decreasing the availability of cobble and other hard substrates preferred by the species (Moyle and Yoshiyama 1992). Successive high flows threaten to eliminate the sucker population in the West Fork of the San Gabriel River by rapidly depleting the individuals soon after they migrate into the mainstem from tributaries. Proposals exist to sluice or otherwise remove sediment from the Cogswell, Morris, and San Gabriel reservoirs on the San Gabriel River system. The potential effects of these proposals, the deposition of large amounts of silt on the streambed and rapid increase in suspended sediments in the water column, threaten the Santa Ana sucker populations in the San Gabriel River. Many and various local inputs threaten Santa Ana River water quality, such as runoffs from light industry and surrounding farm lands (T. Haglund, in Sierra Club Legal Defense Fund 1994).

Predation may be a serious threat to the Santa Ana sucker. Moyle and Yoshiyama (1992) concluded that introduced brown trout (Salmo trutta) may have caused the extirpation of the sucker from the upper San Gabriel River in the San Bernardino Mountains. Centrachids (sunfishes) and bullheads are noted to prey on suckers; in the Los Angeles River such introduced predators aggregate in pools during droughts, presumably feeding on native fishes, including suckers (Sierra Club Legal Defense Fund 1994). Similar conditions exist in the Santa Ana River. Other nonnative predatory species that may cause serious problems for the sucker include bullfrogs, African clawed frog, crayfish, and other introduced species of fish.

Arroyo Toad

The arroyo toad is a small, dark-spotted toad of the family Bufonidae. The parotoid glands, located on the top of the head, are oval-shaped and widely separated. A pale area or stripe is usually present on these glands and on top of the eyes. The arroyo toad's underside is buff-colored and usually without spots (Stebbins 1985). Recently metamorphosed individuals will easily blend in with the substrate and are usually found adjacent to water.

Arroyo toads use low gradient stream reaches with sand or gravel substrates. Stream order, elevation, and floodplain width are important factors in determining the size and long-term viability of a population of arroyo toads (Sweet 1992, Barto 1999, Griffin 1999). Streams with the greatest potential to support large, self-sustaining populations are typically of a high stream order (i.e., 3rd to 6th order), at low elevations (below 3,000 feet), with wide floodplains. Optimal habitat consists of low gradient portions of slow-moving streams with shallow pools that contain nearby sandbars and adjacent, undeveloped stream terraces. During the breeding season, arroyo toads require streams that have shallow pools with fine textured substrates (i.e., sand or gravel) in which to deposit their eggs. Outside of the breeding season arroyo toads are essentially terrestrial and are known to utilize a variety of upland habitats including, but not limited to, coastal sage scrub, chaparral, grassland, and oak woodland (Holland 1995, Griffin et al. 1999).

Critical habitat was proposed for the arroyo toad on June 8, 2000 (65 FR 36512). The proposal includes approximately 193,600 hectares (478,400 acres) of habitat in Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego Counties, California. The primary constituent elements of proposed critical habitat for the arroyo toad include: (1) rivers and streams with sufficient flowing water of suitable quality at the appropriate times to provide space, food, and cover needed to sustain eggs, tadpoles, metamorphosing juveniles, and adult breeding toads; (2) low-gradient stream segments (typically less than 4%) with sandy or fine gravel substrates which support the formation of shallow pools and sparsely vegetated sand and gravel bars for breeding and rearing of tadpoles and juveniles; (3) a natural flooding regime or one sufficiently corresponding to a natural regime such that adequate numbers and sizes of breeding pools and sufficient terrace habitats with appropriate vegetation are maintained to provide for the needs of all life stages of the toad; (4) upland habitats of sufficient width and quality (i.e., loose, sandy soil that allows burrowing) to provide foraging and living areas for sub-adult and adult arroyo toads; (5) few or no nonnative species that prey upon or compete with arroyo toads, or degrade their habitat; (6) stream channels and upland habitats where manmade barriers do not completely or substantially impede migration to overwintering sites, dispersal between populations, or recolonization of areas that contain suitable habitat; and (7) undisturbed habitats. Two units of critical habitat were proposed in the Santa Ana River watershed. Unit 8 is 1,200 ha (3,000 acres) and centered around the confluences of Santiago, Black Star, and Baker Creeks just above Irvine Lake. Unit 9 includes part of the San Jacinto River, Bautista Creek and adjacent uplands east of the town of Hemet in Riverside County. It encompasses 5,370 ha (13,300 acres).

Arroyo toad larvae feed on loose organic material such as interstitial algae, bacteria, and diatoms. They do not forage on macroscopic vegetation (Sweet 1992, Jennings and Hayes 1994). Juvenile toads rely on ants almost exclusively (U.S. Fish and Wildlife Service 1999). By the time they reach 17 to 23 mm in length, they take more beetles, along with the ants (Sweet 1992, U.S. Fish and Wildlife Service 1999). Adult toads probably consume a wide variety of insects and arthropods including ants, beetles, spiders, larvae, caterpillars, and others.

Breeding typically occurs from February to July in streams with persistent water (Griffin et al. 1999). Female arroyo toads must feed for a minimum of approximately two months to develop the fat reserves needed to produce a clutch of eggs (Sweet 1992). Eggs are deposited and larvae develop in shallow pools with minimal current and little or no emergent vegetation. The substrate in these pools is generally sand or fine gravel overlain with silt. Arroyo toad eggs hatch in 4 to 5 days and the larvae are essentially immobile for an additional 5 to 6 days (Sweet 1992). They then begin to disperse from the pool margin into the surrounding shallow water, where they spend an average of 10 weeks (Sweet 1992). After metamorphosis (June-July), the juvenile toads remain on the bordering gravel bars until the pool no longer persists (usually from eight to twelve weeks depending on site and yearly conditions) (Sweet 1992). Most individuals become sexually mature by the following spring (Sweet 1992).

This species has been observed moving approximately 1.6 kilometers (1 mile) within a stream reach and 1 kilometer (0.6 mile) away from the stream, into native upland habitats (Holland 1995, Sweet 1992) or agricultural areas (Griffin et al. 1999). Movement distances may be regulated by topography and channel morphology. Griffin (1999) reported a female arroyo toad traveling more than 300 meters (948 feet) perpendicular from a stream and Holland (1998) found arroyo toads 1.08 kilometers (0.7 miles) from a water course. Arroyo toads are critically dependent on upland terraces and the marginal zones between stream channels and upland terraces during the non-breeding season, especially during periods of inactivity, generally late fall and winter (Sweet 1992).

Arroyo toad population numbers and densities are not currently known because insufficient data is available on the species' normal population dynamics and on habitat characteristics that correlate with density. This species was historically found in at least 22 river basins in southern California from the upper Salinas River system in Monterey County to San Diego County and southward to the vicinity of San Quintin, Baja California, Mexico. They have been extirpated from an estimated 75 percent of their former range in the United States and they now occur primarily in small, isolated areas in the middle to upper reaches of streams.

The Service listed the arroyo toad as endangered on December 16, 1994 (59 FR 63264) and a recovery plan was published in July 1999 (U.S. Fish and Wildlife Service 1999). At the time of listing, the arroyo toad was described as the arroyo southwestern toad (Bufo microscaphus californicus). Gergus (1998) recently published genetic justification for the reclassification of the arroyo southwestern toad as a full species (i.e., arroyo toad [Bufo californicus]).

The current distribution of the arroyo toad in the United States is from the Salinas River Basin in Monterey County, south to the Tijuana River and Cottonwood Creek Basin along the Mexican Border. Arroyo toads are also known from a seemingly disjunct population in the Arroyo San Simeon River System, about 16 kilometers (10 miles) southeast of San Quintin, Baja California (Gergus et al. 1997). Although the arroyo toad occurs principally along coastal drainages, it also has been recorded at several locations on the desert slopes of the Transverse Range (Patten and Myers 1992, Jennings and Hayes 1994). The current elevational range for most arroyo toad populations in San Diego County is about 300 to 1,400 meters (1,000 to 4,600 feet), although they were historically known to extend into the lower portions of most river basins (U.S. Fish and Wildlife Service 1999).

Because arroyo toad habitats (i.e., broad, flat floodplains in southern California) are favored sites for flood control projects, agriculture, urbanization, and recreational facilities such as campgrounds and off-highway vehicle parks, many arroyo toad populations were reduced in size or extirpated due to extensive habitat loss from 1920 to 1980 (U.S. Fish and Wildlife Service 1999). The loss of habitat, coupled with habitat modifications due to the manipulation of water levels in many central and southern California streams and rivers, as well as predation from introduced aquatic species, caused arroyo toads to disappear from a large portion of their previously occupied habitat in California (Jennings and Hayes 1994). Currently, the major threats to arroyo toad populations are from stream alteration, introduction of exotic species, urban and rural development, mining, recreation, grazing, drought, wildfire, and large flood events.

Least Bell's Vireo

The least Bell's vireo, Vireo bellii pusillus), is a small, olive-gray neotropical migratory songbird that presently nests and forages almost exclusively in riparian woodland habitats in California and northern Baja California, Mexico (Garrett and Dunn 1981, Gray and Greaves 1981, Miner 1989; AOU 1998). Bell's vireos as a group are highly territorial (Barlow 1962, Fitch 1958, Salata 1983) and are almost exclusively insectivorous (Chapin 1925, Miner 1989).

Least Bell's vireos generally begin to arrive from their wintering range in southern Baja California, and, possibly, mainland Mexico, and establish breeding territories by mid-March to late March (Garrett and Dunn 1981; Salata 1983, 1983; Hays 1989; Pike and Hays 1992). However, a singing vireo was on territory in the Prado Basin on March 2, 1994 (James Pike, pers. comm.). A large majority of the breeding vireos in the Prado Basin typically depart the breeding grounds by the third week of September and only a few Bell's vireos are found wintering in California or the United States as a whole (Barlow 1962, Nolan 1960, Ehrlich et al. 1988, Garrett and Dunn 1981, Salata 1983, 1983, Pike and Hays 1992).

Least Bell's vireo nesting habitat typically consists of riparian woodlands with well-developed overstories, understories, and low densities of aquatic and herbaceous cover (Zembal 1984, Zembal et al. 1985, Hays 1986, Hays 1989, Salata 1983, RECON 1988). The understory frequently contains dense subshrub or shrub thickets. These thickets are often dominated by sandbar willow, mule fat, young individuals of other willow species, such as arroyo willow or black willow and one or more herbaceous species (Salata 1983, 1983, Zembal 1984, Zembal et al. 1985). Significant overstory species include mature arroyo willows and black willows. Occasional cottonwoods and western sycamore occur in some vireo habitats and there additionally may be locally important contributions to the overstory by coast live oak.

Although the least Bell's vireo occupies home ranges that typically range in size from 0.5 to 4.5 acres (Regional Environmental Consultants 1988), a few may be as large as 10 acres (J. Greaves, pers. comm.). In general, areas that contain relatively high proportions of degraded habitat have lower productivity (hatching success) than areas that contain high quality riparian woodland (Jones 1985, RECON 1988, Pike and Hays 1992).

Because of a documented, drastic decline in numbers and continuing threats to the species and its riparian woodland habitats, the least Bell's vireo was listed as an endangered species by the California Department of Fish and Game in 1980. Subsequently, the vireo was listed as endangered by the U.S. Fish & Wildlife Service on May 2, 1986 (51 FR 16474). Critical habitat was designated by the Service on February 3, 1994 (59 FR 4845), and includes all riverine and floodplain habitats with appurtenant riparian vegetation in the Prado Basin below the elevation of 543 feet.

The past, unparalleled decline of this California land bird (Salata 1986, U.S. Fish and Wildlife Service 1986) has been attributed, in part, to the combined, perhaps synergistic effects of the widespread and relentless destruction of riparian habitats, habitat fragmentation, and brood-parasitism by cowbirds (Garrett and Dunn 1981). The historic loss of wetlands (including riparian woodlands) in California has been estimated at 91% (Dahl 1990). Much of the remaining habitat is fragmented or infested with alien plants (e.g., giant reed) and exotic animals (e.g., cowbirds). Reductions in vireo numbers in southern California and the San Joaquin and Sacramento Valleys were evident by the 1930s and were "apparently coincident with increase of cowbirds which heavily parasitize this vireo" (Grinnell and Miller 1944).

During the 1999 breeding season, the least Bell's vireo population in the Prado Basin and environs was studied and managed for the fourteenth consecutive year. Study areas included the Basin proper and contiguous reaches of the Santa Ana River and Chino Creek. The data necessary to determine vireo status and distribution, breeding chronology, reproductive success, and nest site preferences were obtained, when possible, during daily visits to appropriate riparian woodland habitats throughout the basin. In addition, brown-headed cowbirds present in vireo home ranges were routinely censused, and modified Australian crow traps were deployed throughout the basin and adjacent Santa Ana River in an attempt to control this brood-parasitic and rapidly expanding species.

Of the 336 territorial male vireos that were detected within the Prado Basin study area in 1999, 224 were paired (Pike et al. 1999). By contrast, 270 pairs were recorded in 1998, 195 pairs were detected in 1996, and 164 pairs were located in 1995 (Pike and Hays 1998). The reason for this substantial decrease in the number of breeding pairs remains unknown.

In 1999, a minimum of 489 known fledged young was produced by Prado Basin vireo breeding pairs, resulting in a 10 percent increase over the corresponding total recruitment (450) in 1998. Nesting success in 1999 was 57%, which exceeded the corresponding figures for 1998 (41% and 1997 (50%) (Pike et al. 1999). Although the average number of fledglings per breeding pair (2.2) in 1999 was the highest recorded since 1995, this average is substantially below the 1988-1991 fledglings-per-pair average of 3.1. In recent years, significantly fewer pairs have elected to renest after successfully fledging young on their first attempt (Pike et al. 1999).

By the end of the breeding season in 1998, 2,333 cowbirds had been trapped and removed from vireo and flycatcher habitats within the Prado Basin and an additional 105 cowbirds were removed from Hidden Valley Wildlife Refuge adjacent to the Santa Ana River in Norco. More than 1,314 cowbirds were removed from in or near vireo and flycatcher habitat in 1997. Correspondingly, the 13 percent parasitism rate in 1998 was the lowest recorded within the Prado Basin. Vireos continued to demonstrate a strong preference for nesting and foraging in willows and mule fat (Pike and Hays 1998). Of all nests in 1997 for which data were available (N=239), 54 percent were placed in various willow species and 40 percent were found in mule fat (The Nature Conservancy 1997).

The vireo was historically described by multiple observers as common to abundant in the appropriate riparian habitats from as far north as Tehama County, California, to northern Baja California, Mexico (Grinnell and Storer 1924, Willett 1933, Grinnell and Miller 1944, Wilbur 1980). Widespread habitat losses have fragmented most remaining populations into small, disjunct, and widely dispersed sub-populations. The remaining birds are concentrated in San Diego and Riverside counties (U. S. Fish and Wildlife Service 1998).

Although the species has begun to recover with approximately 2,000 vireos were on territories within California in 1998 (Service, unpublished data), preliminary data indicate that the United States breeding population in 1999 was almost certainly smaller. Population declines were noted at Marine Corps Base, Camp Pendleton, the Prado Basin, and at other locales throughout the range of the species in 1999 (Service, unpublished data). The reason for this apparent, recent population decline is unknown. Nevertheless, the Prado Basin population of vireos remained the second largest overall and the largest by far north of San Diego County. The largest population of vireos range-wide continues to be located on Marine Corps Base, Camp Pendleton in San Diego County. The recent Camp Pendleton and Prado vireo populations have represented approximately 60% or more of all known vireo territories.

Southwestern Willow Flycatcher

The southwestern willow flycatcher (*Empidonax traillii extimus*), a relatively small, insectivorous (passerine) songbird, is approximately 15 centimeters (5.75 inches) in length. Both sexes of southwestern willow flycatchers have grayish-green back and wings, whitish throats, light gray-olive breasts, and pale, yellowish bellies. The song is a sneezy "fitz-bew" or "fitz-a-bew" and the typical call is a breathy "whit" (e.g., Unitt 1987).

The southwestern willow flycatcher is a recognized subspecies of the willow flycatcher (*Empidonax traillii*). Although previously considered conspecific with the alder flycatcher (*Empidonax alnorum*), the willow flycatcher is distinguishable from that species by morphology (Aldrich 1951), song type, habitat use, structure and placement of nests (Aldrich 1953), eggs (Walkinshaw 1966), ecological separation (Barlow and MacGillivray 1983), and genetic distinctness (Seutin and Simon 1988).

The southwestern willow flycatcher is one of five subspecies of the willow flycatcher currently recognized (Hubbard 1987, Unitt 1987, Browning 1993). The willow flycatcher subspecies are distinguished primarily by differences in color and morphology. Although the subspecific differences in color have been termed "minor" (Unitt 1987), Lehman (pers. comm.) has indicated that the southwestern willow flycatcher in California is distinguishable in the field from other forms of willow flycatchers that might be present (in migration) within the breeding range of the former. Unitt (1987) and Browning (1993) concluded that the southwestern willow flycatcher is paler than other willow flycatcher subspecies. Preliminary data also suggest that the song dialect of the southwestern willow flycatcher is distinguishable from other willow flycatchers.

The breeding range of the southwestern willow flycatcher includes southern California, southern Nevada, Arizona, New Mexico, and western Texas (Hubbard 1987, Unitt 1987, Browning 1993). The species may also breed in southwestern Colorado, but nesting records are lacking. Records of breeding in Mexico are few and confined to extreme northern Baja California and Sonora (Unitt 1987, Howell and Webb 1995). Willow flycatchers winter in Mexico, Central America, and northern South America (Phillips 1948, Ridgely 1981, AOU 1983, Stiles and Skutch 1989, Ridgely and Tudor 1994, Howell and Webb 1995).

Breeding southwestern willow flycatchers are often present and singing on territories in mid-May (exceptionally in late April in southern California). Southwestern willow flycatchers are generally gone from breeding grounds in southern California by late August (The Nature Conservancy 1994) and are exceedingly scarce in the United States after mid-October (e.g., Garrett and Dunn 1981). The first southwestern willow flycatcher of the 1998 Prado Basin breeding season were detected on May 4 and the last was noted on August 9. In 1997, the first bird of the breeding season was detected on May 7 and the last (a juvenile) was noted on September 10.

The southwestern willow flycatcher breeds in riparian habitats along rivers, streams, and other wetland habitats where dense growths of willows (*Salix* spp.), coyote-bush (*Baccharis* spp.), arrowweed (*Pluchea sericea*), buttonbush (*Cephalanthus occidentalis*) [not found in southern California], or other plants of similar structure and configuration are present. The flycatcher nests in thickets of trees and shrubs approximately 4 to 7 meters (13 to 23 feet) or more in height with dense foliages from approximately 0 to 4 meters (0 to 13 feet) above ground. Overstories are often present in occupied habitats and composed of willows or cottonwoods or, in some portions of the species' range, tamarisks (*Tamarix*, spp.) (e.g., Phillips 1948, Grinnell and Miller 1944, Whitmore 1977, Hubbard 1987, Unitt 1987, Whitfield 1990, Brown 1991, U.S. Fish and Wildlife Service 1993, 1995). Although nesting willow flycatchers of all subspecies generally prefer areas with surface water nearby (Bent 1960, Stafford and Valentine 1985, Harris et al. 1986), the southwestern willow flycatchers in the Prado Basin virtually always nest near surface water or saturated soil (e.g., The Nature Conservancy 1994).

All known southwestern willow flycatcher territories within the Prado Basin have been situated in relatively close proximity to water-filled creeks or channels. In addition, territories have usually consisted of overgrown clearings containing varying amounts of nettles and with, at least, a few moderately tall, often dense, willows. Among the five nests found in 1996, two were placed in arroyo willow, one was found in a red willow (*Salix laevigata*), one was placed in a sandbar willow, and one was placed in a tamarisk. During the 1997 season, both nests that were discovered had been placed in arroyo willow. Nests have been placed as low as 0.61 meters above ground level.

All three resident subspecies of the willow flycatcher (*E. t. extimus*, *E. t. brewsteri*, and *E. t. adastus*) were once considered widely distributed and common within California wherever suitable habitat existed (e.g., Grinnell and Miller 1944). The historic range of *E. t. extimus* in California apparently included all lowland riparian areas of the southern third of the state. Nest and egg collections indicate the bird was a common breeder along the lower Colorado River near Yuma in 1902. Willett (1933) considered the bird to be a common breeder in coastal southern California. Most recently, Unitt (1987) concluded that the southwestern willow flycatcher was once fairly common in the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County.

The southwestern willow flycatcher is apparently vulnerable to the same factors that have caused the decline of the vireo within those species' shared ranged in the Californias and thus has almost been extirpated as a breeding species throughout much of southern California (e.g., Garrett and Dunn 1981, Unitt 1987). Because range-wide, recent surveys have essentially corroborated these assumptions, the current status of E. t. extimus is likely much more precarious than that of the vireo, which has begun to recover in southern California.

On July 23, 1993, the Service proposed the southwestern willow flycatcher as an endangered species throughout its range (58 FR 39495) and simultaneously proposed critical habitat for the species. Although deferring a decision on the designation of critical habitat, the Service listed the flycatcher as endangered on February 27, 1995 (59 FR 10693). Critical habitat for the flycatcher, including much of the Prado Basin, was designated by the Service on August 20, 1997 (62 FR 39129 and 62 FR 44228). Breeding willow flycatchers are listed as endangered by the States of California and Arizona.

The Prado Basin southwestern willow flycatcher population was studied and managed for the 14th consecutive year within the Prado Basin, adjacent Santa Ana River, and environs during the 1999 breeding season. The data necessary to determine southwestern willow flycatcher status and distribution, breeding chronology, reproductive success, and nest site preferences were obtained whenever and wherever possible during daily visits to appropriate riparian woodland habitats throughout the basin. In addition, cowbirds present in southwestern willow flycatcher home ranges were routinely censused, and modified Australian crow traps were once deployed throughout the basin and adjacent Santa Ana River in an attempt control this brood-parasitic species and thus maximize the local breeding success of the vireo, flycatcher, and a large number of other sensitive passerine bird species.

Despite 14 consecutive years of cowbird management and habitat conservation efforts within the Prado Basin, a total of only five flycatcher home ranges was detected within the Prado Basin during the 1999 breeding season. Four of the five territorial flycatchers were likely returning to home ranges that were occupied during the previous season. Pairs were eventually found in only three of these home ranges. Two of the three pairings resulted in successful breeding, producing a total of five fledglings (Pike et al. 1999).

Although flycatcher home ranges have been detected nearly throughout the surveyed portions of the Basin, successful breeding prior to 1996 had been detected only in North Basin and West Basin (Chino Creek). From 1996 to 1998, however, the only successful breeding occurred in two adjacent home ranges in South Basin. Given that only three breeding pairs of southwestern willow flycatchers were present within the survey area during the 1999 breeding season, southwestern willow flycatchers likely are in danger of disappearing from the Prado Basin and environs.

The available information suggests that all three willow flycatcher subspecies breeding in California have declined substantially, with declines most critical in E. t. extimus, the southwestern willow flycatcher, which remains only in small, disjunct nesting groups (e.g., Unitt 1987, U.S. Fish and Wildlife Service 1995), like those found in the Prado Basin. Status reviews or analyses conducted before the listing of the southwestern willow flycatcher considered extirpation from California to be possible, even likely, in the foreseeable future (e.g., Garrett and Dunn 1981, Harris et al. 1986).

The Prado Basin population is one of only six permanent breeding sites that now exist in California, and only three southwestern willow flycatcher populations in California contain 20 or more nesting pairs. Despite the virtual elimination of impacts from livestock grazing to the large and important flycatcher population on the South Fork of the Kern River (Harris et al. 1986, Whitfield 1990), numerical declines in the population levels were observed in 1991 and 1992. Fortunately, increases in nesting success were realized in 1992 and 1993; these increases were attributed to removing cowbird eggs or nestlings found in southwestern willow flycatcher nests, and cowbird trapping (Whitfield and Laymon, Kern River Research Center, in litt., 1993). The Kern River population consisted of 29 pairs in 1996 (M. Whitfield, pers. comm., 1996). Another large, and relatively stable, nesting population is along the Santa Margarita River on Marine Corps Base Camp Pendleton, where cowbird numbers have also been reduced by trapping. Approximately 20 pairs were detected on Camp Pendleton in 1996. The third and last "large" population persists on the Upper San Luis River, where 25 pairs were detected in 1996 (Bill Haas, pers comm., 1996).

Although five other nesting groups were known in southern California in 1996, all but one of these consisted of four or fewer nesting pairs in recent years (Service, unpublished data). A total of 104 pairs of southwestern willow flycatchers was recorded in California in 1996 and preliminary data indicate that 100 pairs were present in the state in 1998 (Service, unpublished data).

Unitt (1987) reviewed historical and contemporary records of the southwestern willow flycatcher throughout its range and determined that the species had declined precipitously during the last 50 years. Unitt (1987) argued convincingly that the southwestern willow flycatcher is faring poorly throughout much of its breeding range (see also Monson and Phillips 1981, Garrett and Dunn 1981, U.S. Fish and Wildlife Service 1995). Unitt (1987) has postulated that the "total population of the subspecies is well under 1,000 pairs; I suspect that 500 is more likely." Recent range-wide surveys have corroborated Unitt's hypothesis.

Throughout the known range of the flycatcher, occupied riparian habitats have been, and remain, widely separated by vast expanses of relatively arid lands. However, the southwestern willow flycatcher has suffered the extensive loss and modification of these cottonwood-willow riparian habitats due to grazing, flood control projects, and other water or land development projects (e.g., Klebenow and Oakleaf 1984, Taylor and Littlefield 1986, Unitt 1987, Dahl 1990; U.S. Fish and Wildlife Service 1995). Estimated losses of wetlands between 1780 and the 1980's in the American southwest are; California (91 percent), Nevada (52 percent), Utah (30 percent), Arizona (36 percent), New Mexico (33 percent), and Texas (52 percent) (Dahl 1990). Changes in riparian plant communities have resulted in the reduction, degradation, and elimination of nesting habitat for the willow flycatcher, curtailing the ranges, distributions, and numbers of western subspecies, including E. t. extimus (e.g., Klebenow and Oakleaf 1984, Taylor and Littlefield 1986, Unitt 1987, Ehrlich et al. 1992).

The species is also impacted by a variety of other factors, including brood parasitism by cowbirds (Unitt 1987; Ehrlich et al. 1992; U.S. Fish and Wildlife Service 1993, 1995). Parasitism rates of flycatcher nests have recently ranged from 50 to 80 percent in California (Whitfield 1990; M. Whitfield and S. Laymon, unpublished data) to 100 percent in the Grand Canyon in 1993 (U.S. Fish and Wildlife Service 1993). Mayfield (1977) concluded that a species or population might be able to survive a 24 percent parasitism rate, but that much higher losses "would be alarming." In any case, a composite of all current information indicates continuing declines, poor reproductive performance, and continued threats to most of the extant populations of flycatchers (e.g., Brown 1991; Whitfield and Laymon (Kern River Research Center, in litt., 1993); U.S. Fish and Wildlife Service 1993, 1995; Service, unpublished data).

Bald Eagle

In 1978 the bald eagle was listed as endangered in the lower 48 states except for Michigan, Minnesota, Wisconsin, Washington, and Oregon where it was considered threatened (64 FR 36453). In 1995 the bald eagle was reclassified to threatened within the lower 48 states (64 FR 36453), and on July 4, 1999, the eagle was proposed for delisting. The bald eagle is a large, mostly dark-brown raptor. Adult bald eagles have a white heads and tails, which are developed at about four to six years of age. Juvenile bald eagles are mostly brown and can be confused with golden eagles. Females can weigh from 8 to 14 pounds, and males from 8 to 10 pounds. Bald eagles usually have a wingspan of six to seven feet. The bald eagle is the second largest raptor in California; the California condor is slightly larger.

Rangewide, bald eagles occur primarily near seacoasts, rivers, swamps, and large lakes (AOU 1998). Within southern California, although birds are found in these same habitats, they are most often recorded at large inland bodies of water with mixed conifer (Garrett and Dunn 1981). However, some use chaparral and oak/sycamore. Day roost sites often are snags. Night roosting often occurs within 0.5 miles of water on steep north or northwest facing slopes with green trees. Bald eagles feed on fish, coots, waterfowl, seagulls, and carrion (Stephenson and Calcarone 1999, 64 FR 36453). Nesting most often occurs in large trees near water, but occasionally nests occur on cliffs or the ground. Eagles usually need areas free from disturbance (64 FR 36453).

Bald Eagles breed from Alaska eastward to Newfoundland southward to Baja California, Sonora, Texas, and Florida (64 FR 36453). The species winters in the large majority of the breeding range, but generally withdraws from central Alaska and the central and the northern portions of Canada (AOU 1998).

Documentation of pair bonding behavior is limited. Southern nesting eagles can potentially start courtship in September, approximately one month before laying eggs. The nesting season will last about 6 months. Incubation lasts about 35 days. Eagles fledge at about 11-12 weeks, but parental care may extend for another 4-11 weeks. Upon leaving the nesting site, most juvenile eagles migrate a few hundred miles to wintering areas (64 FR 36453). Wintering eagles gather around sites with water and good roosting areas. In southern California, eagles are mainly wintering, with a few exceptions (Stephenson and Calcarone 1999). Eagles will take 4-5 years to reach maturity (64 FR 36453).

Bald eagle populations have increased dramatically since the implementation of the five regional recovery plans. Most population goals have been met or exceeded. In 1994 there were 4,450 breeding areas with 1.16 young each. This indicates a 462% increase over 1974 estimates. From 1990-1994, the population increased 47%. The positive results have continued and in 1998 there were 5,748 breeding areas with all but 2 states having nesting pairs. An eagle population needs about a 0.7 young/pair rate to be sustainable (Sprunt et al. 1973). Since the rate averaged 1 in the Pacific region (64 FR 36453), the population should grow.

While the bald eagle recovery is impressive, not all goals have been reached. In the Pacific Region of Idaho, Nevada, California, Oregon, Washington, Montana, and Wyoming 28 of 37 (76%) management zones have met population goals (64 FR 36453). Eleven of the 28 zones have more than doubled their goals, but the Pacific Region recovery plan states that the goal is for 80% of management zones to meet population goals. This goal may not be reached since not all management zones have preferred habitat. The success rate for all breeding areas, combined has exceeded 65% for years (64 FR 36453).

Habitat loss, the effects of some pesticides on reproductive success, and persecution necessitated the listing of bald eagles. Certain areas still have difficulties with contamination including along the Great

Lakes, Maine, the Columbia River, and in southern California (64 FR 36453). In addition, power line construction and human caused disturbances can be a problem. Disease and predation are generally not thought to be significant problems for the population. Overall, successful captive breeding efforts, the banning of certain organochlorine pesticides, and other recovery efforts have resulted in significant increases in eagle numbers on the continent (64 FR 36453).

The bald eagle has been found breeding in the southern Los Padres and Santa Lucia mountain ranges. Specifically, breeding has occurred at Nacimiento Lake, San Antonio Lake, and Cachuma Lake.

Wintering populations occur in both the San Jacinto and San Bernardino Mountains. A large wintering population occurs at Big Bear Lake in the San Bernardino Mountains. About 20-30 eagles congregated here from November to March annually from 1978-2000. The eagles begin to appear in the 3rd week of October, peak in January or February and are gone sometime in April.

Average monthly winter bald eagle counts for the years 1978 to 2000 for the Big Bear Valley, including Big Bear and Baldwin Lakes, were as follows: December, 12, January, 17, February, 15, March, 10, and, April 0. The high count average was 20.3.

Other large reservoirs may support 2-10 wintering eagles annually. Breeding/potential breeding activity has occurred with the following results:

Upper Miller Canyon 1990: 2 eggs, unsuccessful 1991: nest building, no known egg-laying

Lake Hemet (also on private land): adult pair through July in multiple years

Potential threats include increased urban development on private lands around Big Bear, Silverwood, and Baldwin Lakes. The removal of perching trees on public and private sites due to safety concerns has occurred. Not only may roosting areas be subject to loss, but disturbance levels may increase due to higher shoreline visitation.

Another concern for eagles is the power lines in the Big Bear area. Two electrocutions have occurred since 1988. One on the east side of Baldwin Lake and one on the north side of Stanfield Marsh by Big Bear Lake.

A boardwalk in Stanfield Marsh developed by the Municipal Water District has seemed to cause the abandonment of the area by eagles for day use. An additional factor in the abandonment is the lack of enforcement of the Castle Glen conservation easement. The easement, which is under the Nature Conservancy's jurisdication, is to prevent the public from entry and from stopping along Big Bear Boulevard. Several hundred people may use the area for sledding/snow on some weekends. Currently, the Forest Service generally imposes a December 1 to April 1 restriction on permitted activities in eagle habitat.

Wintering populations occur in the San Diego Ranges. Only transient eagles occur in the Santa Ana Mountains. Large reservoirs may support between 2-10 wintering eagles annually. In the San Gabriel Mountains and Castaic ranges, large reservoirs may support between 2-10 wintering eagles annually.

San Bernardino Kangaroo Rat

The San Bernardino kangaroo rat (Dipodomys merriami parvus) is one of 19 recognized subspecies of Merriam's kangaroo rat (D. merriami), a widespread species distributed throughout arid regions of the western United States and northwestern Mexico (Hall and Kelson 1959, Williams 1993). In coastal southern California, Merriam's kangaroo rat is the only species of kangaroo rat with four toes on each of its hind feet. The San Bernardino kangaroo rat has a body length of about 95 mm (3.7 in) and a total length of 230 to 235 mm (9 to 9.3 in). The hind foot measures less than 36 mm (1.4 in) in length. The body color is pale yellow with a heavy overwash of dusky brown. The tail stripes are medium to dark brown and the foot pads and tail hairs are dark brown. The flanks and cheeks of the subspecies are dusky (Lidicker 1960). The San Bernardino kangaroo rat is considerably darker and smaller than either of the other two subspecies of Merriam's kangaroo rat that occur in southern California, D. merriami merriami and D. merriami collinus. The San Bernardino kangaroo rat, endemic to southern California, is one of the most highly differentiated subspecies of Merriam's kangaroo rat and, according to Lidicker (1960), "it seems likely that it has achieved nearly species rank".

The historical range of this species extended from the San Bernardino Valley in San Bernardino County to the Menifee Valley in Riverside County (Hall and Kelson 1959, Lidicker 1960). Within this range, the San Bernardino kangaroo rat was known from more than 25 localities (McKernan 1993). From the early 1880s to the early 1930s, the San Bernardino kangaroo rat was a common resident of the San Bernardino and San Jacinto Valleys of southern California (Lidicker 1960). At the time of listing, based on the distribution of suitable soils and data from museum collections, the historical range was estimated to encompass approximately 130,587 ha (326,467 ac) (U.S. Fish and Wildlife Service unpubl. GIS maps, 1998 in 63 FR 51005). Recent studies indicate that the species occupies a wider range of soil and vegetation types than previously thought (McKernan 2000 pers. comm.), which suggests that the species' historical range may have been larger than previously estimated.

Although the entire historical range would not have been occupied at any given time due to hydrological processes and resultant variability in habitat suitability, the San Bernardino kangaroo rat was widely distributed across the San Bernardino and San Jacinto valleys. By the 1930s, suitable habitat was probably reduced to approximately 11,200 ha (28,000 ac) (McKernan 1997). Habitat destruction continued and in 1997 the San Bernardino kangaroo rat was thought to occupy only 1,299 ha (3,247 ac) of suitable habitat at seven locations (McKernan 1997). At the time of listing, it was estimated that an additional 5,277 ha (13,193 ac) of habitat was probably occupied by the San Bernardino kangaroo rats within the Santa Ana River, Lytle and Cajon Creeks, and the San Jacinto River. There were also smaller remnant populations at City Creek, Etiwanda alluvial fan and wash, Reiche Canyon, and South Bloomington (including Jurupa Hills). At the time of listing, approximately 1,358 ha (3,396 ac) of the 5,277 ha (13,193 ac) of additional habitat was too mature or degraded to support San Bernardino kangaroo rats. Additional research has indicated that San Bernardino kangaroo rats occupy mature alluvial scrub, coastal sage scrub, and even chaparral vegetation types (McKernan 2000 pers comm.). Thus, a minimum of approximately 6,576 ha (16,440 ac) of habitat was likely occupied at the time of listing.

Critical habitat has been proposed for the Santa Ana River (including City, Plunge, and San Timoteo Creeks), Lytle and Cajon Creeks, San Jacinto River and Bautista Creek, Etiwanda alluvial fan (including the Etiwanda Wash), Reche Canyon, and Jurupa Hills-South Bloomington (McKernan 1997; California Natural Diversity Data Base (CNDDB) 2000; University of California, Riverside species database 2000; database for the San Bernardino Valley-Wide Multiple Species Habitat Conservation Plan (MSHCP) 2000; and section 10(a)(1)(A) survey reports 1998-2000). The areas proposed as critical habitat are an expansion of the known locations of the San Bernardino kangaroo rat identified in the final listing rule and are within the known geographical range of this species. Areas with small, scattered populations or habitats that were highly fragmented, or were no longer subject to natural processes were not proposed as critical habitat.

Habitat for the San Bernardino kangaroo rat has been severely reduced and fragmented by development in the San Bernardino and San Jacinto Valleys. As noted by Andren (1994) in a discussion of highly fragmented landscapes, reduced habitat patch size and isolation exacerbate the effects of habitat loss on a species' persistence and may preclude recolonization of suitable habitat following local extinction.

Past and ongoing causes of fragmentation of San Bernardino kangaroo rat habitat include conversion of lands to urban, industrial, agricultural, and recreational uses; construction of roads and freeways; and development of flood control structures such as dams, levees, and channels. The effect of these human-caused disturbances is two-fold: (1) they reduce the amount of suitable habitat for the San Bernardino kangaroo rat, breaking large areas into smaller patches, and (2) they act as barriers to movement between the remaining suitable habitat patches.

San Bernardino kangaroo rats are typically found on alluvial fans, flood plains, along washes, in adjacent upland areas containing appropriate physical and vegetative characteristics, and in areas with historic braided channels (McKernan 1997). These areas consist of sand, loam, sandy loam, or gravelly soils (McKernan 1993) that are associated with alluvial processes. San Bernardino kangaroo rats also occupy areas where sandy soils are at least partially deposited by winds (e.g., northwest of the Jurupa Hills) (McKernan 1997). These soils allow kangaroo rats to dig simple, shallow burrow systems (McKernan 1997) and typically support alluvial sage scrub and chaparral vegetation.

Alluvial sage scrub, or Riversidean Alluvial Fan Scrub (Holland 1986) is considered a distinct and rare plant community found primarily on alluvial fans and flood plains along the southern bases of the Transverse Ranges and portions of the Peninsular Ranges in southern California (CNDDB 1996). This relatively open vegetation type is adapted to periodic flooding and erosion (Hanes et al. 1989) and is comprised of an assortment of drought-deciduous shrubs and larger evergreen woody shrubs characteristic of both coastal sage scrub and chaparral communities (Smith 1980).

Three phases of alluvial sage scrub have been described: pioneer, intermediate, and mature. The phases are thought to correspond to factors such as flood scour, distance from flood channel, time since last catastrophic flood, and substrate features (Smith 1980, Hanes et al. 1989). The vegetation of early and intermediate stages is relatively open, and supports the highest densities of the San Bernardino kangaroo rat (McKernan 1997).

The latest, or mature, phase of alluvial sage scrub is rarely affected by flooding and supports the highest plant density (Smith 1980). The mature terraces and upland areas adjacent to them supporting the oldest phase of sage scrub provide an important refugia for San Bernardino kangaroo rats during flood events.

Similar to other subspecies of Merriam's kangaroo rat, the San Bernardino kangaroo rat prefers moderately open habitats characterized by low shrub canopy cover (McKernan 1997). However, the species uses areas of denser vegetation, and McKernan (pers. comm. 2000) stated that such areas are essential to San Bernardino kangaroo rat conservation. Research conducted by Braden and McKernan (2000) during 1998 and 1999 demonstrated that areas with late phases of the flood plain vegetation, including some areas of moderate to dense vegetation, are at least periodically occupied by the species.

Little is known about home range size, dispersal distances, or other spatial requirements of the San Bernardino kangaroo rat. However, home ranges for the Merriam's kangaroo rat in the Palm Springs, California, area average 0.33 ha (0.8 ac) for males and 0.31 ha (0.8 ac) for females (Behrends et al. 1986). Furthermore, Blair (1943) reported much larger home ranges for Merriam's kangaroo rats in

New Mexico, where home ranges averaged 1.7 ha (4.1 ac) for males and 1.6 ha (3.8 ac) for females. Space requirements for the San Bernardino kangaroo rat likely vary according to season, age and sex of animal, food availability, and other factors. Although outlying areas of their home ranges may overlap, Dipodomys adults actively defend small core areas near their burrows (Jones 1993). Home range overlap between males and between males and females is extensive, but female-female overlap is slight (Jones 1993). The degree of competition between San Bernardino kangaroo rats and sympatric species of kangaroo rats for food and other resources is not presently known.

Similar to other kangaroo rats, the Merriam's kangaroo rat is generally granivorous (feeds on seeds and grains) and often stores large quantities of seeds in surface caches (Reichman and Price 1993). Green vegetation and insects are also important seasonal food sources. Insects, when available, have been documented to constitute as much as 50% of a kangaroo rat's diet (Reichman and Price 1993).

Wilson et al. (1985) reported that compared to other rodents, Merriam's kangaroo rat, and heteromyids in general, have relatively low reproductive output. Rainfall and the availability of food have been cited as factors affecting kangaroo rat populations. Droughts lasting more than a year can cause rapid declines in population numbers after seed caches are depleted (Goldingay et al. 1997).

Little information exists on the specific types and local abundances of predators that feed on the San Bernardino kangaroo rat. Potential native predators include the common barn owl, great horned owl, long-eared owl, gray fox, coyote, long-tailed weasel, bobcat, badger, San Diego gopher snake, California king snake, red diamond rattlesnake, and southern Pacific rattlesnake, among others. Domestic cats (Felis cattus) are known to be predators of native rodents (Hubbs 1951, George 1974) and have the ability to reduce population sizes of rodents (Crooks and Soule 1999). Predation of San Bernardino kangaroo rats by domestic cats has been documented (McKernan, pers. comm., 1994).

A limited amount of data exists pertaining to population dynamics of the San Bernardino kangaroo rat. Braden and McKernan (2000) documented substantial annual variation on a trapping grid in San Bernardino County, where densities ranged from 2 to 26 animals per hectare (2.47 acre). The reasons for these greatly disparate values are unknown. These fluctuations bring to light several important aspects of the species' distribution and life history which should be considered when identifying areas essential for the conservation of the species: (1) A low population density observed in an area at one point in time does not mean the area is occupied at the same low density any other month, season, or year; (2) a low population density is not an indicator of low habitat quality or low overall value of the land for the conservation of the species; (3) an abundance of San Bernardino kangaroo rats can decrease rapidly; and (4) one or more factors (e.g., food availability, fecundity, disease, predation, genetics, environment) are strongly influencing the species' population dynamics in one or more areas. High-amplitude, high-frequency fluctuations in small, isolated populations make them extremely susceptible to local extinction.

Stephens' Kangaroo Rat

The Stephens' kangaroo rat was federally listed as endangered on March 31, 1988. Stephens' kangaroo rats are 2.7-3.0 cm long, with long hind legs, small front legs and feet, and a white belly. This species is dark brown with a long black and white tail (CDFG 2000). It is distinguished from the Panamint kangaroo rat (Dipodomys panamintinus) by being smaller (Whitaker 1989).

Today, the Stephens' kangaroo rat is found almost exclusively in open, often disturbed, nonnative grasslands or in sparse shrublands with areal cover of less than approximately 30% (Hogan 1981). The Stephens' kangaroo rat has been found on 36 types of well-drained soils, and more than 125 soils are thought to be potentially suitable. These soils include those capable of supporting annual grasses mixed with forbs and shrubs. Additionally, soils must exhibit compaction characteristics suitable for the establishment of burrows. Soils not considered suitable for Stephens' kangaroo rat include heavily alkaline or clay soils, highly rocky soils, shallow soils less than 50 centimeters, soils in areas exceeding 25% slope, and soils above approximately 3,000 feet in elevation. Stephens' kangaroo rats feed on green vegetation, seeds, and, to a limited extent, insects. These animals will create their own burrow system in areas with sandy soils and use existing burrow systems of gophers and ground squirrels in areas of compacted soils.

The spring growing season and increased availability of food usually coincide with the reproductive peak of Stephens' kangaroo rat. The breeding season generally occurs between April and June with a litter of two to three by late spring. These animals emerge at night to forage in areas around their burrows. They return to the burrow to store the foods gathered into their cheek pouches (CDFG 2000). Population studies have indicated seasonal and annual variations in the number of animals occupying a given area. These variations have been linked to the amount of rainfall and subsequent seed production. A positive linear relationship exists between precipitation and population levels of Stephens' kangaroo rat. Observations of Stephens' kangaroo rat populations by Price and Endo (1989) at locations separated by approximately 12 miles, indicate that populations in western Riverside County can show more than a tenfold temporal density fluctuation in response to regional rainfall patterns.

The patchy distribution of Stephens' kangaroo rat appears to be defined by soil type, vegetative stage, and slope (O'Farrell and Uptain 1989). This species appears to be adapted for existence in intermediate vegetative seral stages. Fallow farmland is invaded by weedy species, and rodents such as the Botta's gopher (Thomomys umbrinus) that facilitate colonization by the Stephens' kangaroo rats. Absent successional setbacks that maintain relatively open grass or forb lands, eventual maturation of vegetative communities renders habitat unsuitable for the Stephens' kangaroo rat.

Stephens' kangaroo rats occur in arid grassland habitat in northern San Diego, western Riverside County, and on the southwestern edge of San Bernardino Counties. Specific populations occur at Camp Pendleton Marine Corps Base, the adjacent Fallbrook Naval Weapons Station, around Lake Henshaw/Warner Springs, and the Guejito and Santa Maria Valleys.

Reported densities of Stephens' kangaroo rats range from 3 to 23.7 individuals per acre during the summer months (Bleich 1973, Thomas 1975). Fall and winter densities range from 2 to 6 individuals per acre (Price and Endo 1989). According to O'Farrell and Uptain (1989), most of the currently occupied habitat contains populations of low (less than 2 individuals per acre) or medium density (2 to 4 individuals per acre), and only a few areas contain a high population density (greater than 4 individuals per acre).

Much of the habitat in the range of the species was historically converted to agriculture. In addition, urban expansion has increased dramatically since 1984. These two land use changes have contributed to the decline and fragmentation of Stephens' kangaroo rat populations and remain the primary threat to the continued existence of the species.

THE ECOLOGY AND CONTROL OF GIANT REED

Introduction

The riparian forests of Southern California have become infested with many non-native species; two are particularly problematic, giant reed (Arundo donax) and saltcedar (Tamarix spp.). Public and private agencies with ownership and management responsibilities share a common concern dealing with wild fires, loss of habitat, excessive transpiration of water and obstruction of the floodway caused by these invasives.

More than 95% of the historic riparian habitat in the southern part of the state has been lost to agriculture, development, flood control, and other human-caused impacts. The greatest threat today to the remaining riparian corridors is the invasion of exotic plant species, primarily giant reed. Giant reed readily invades riparian channels, especially in disturbed areas, is very competitive, difficult to control, and does not provide significant food or nesting habitat for native animals. The reed competes with native species such as willows, mulefat, and cottonwoods that do provide nesting habitat for species such as least Bell's vireo, willow flycatcher, and countless other native organisms.

Giant reed replaces native riparian forests by invading after floods and fires, and by growing faster than the native species. Spreading mainly by stolons and other vegetative parts, giant reed invades riparian communities at any stage of succession. It grows very quickly, up to 2 inches per day, is highly flammable, and re-sprouts rapidly after a fire. Because of these characteristics, once giant reed invades a riparian area it redirects the succession of the community towards pure stands of reed, often involving increasingly frequent and catastrophic fires.

Giant reed was introduced into southern California more than 100 years ago by Spanish settlers who used it for erosion control on ditches. It was also planted to serve as a food source for pigs and goats, and as thatch roofing for homes. Saltcedar was similarly introduced in the early 1800's as an ornamental and as a windbreak. These weeds have since infested nearly every drainage system in the southwestern United States (Brotherson and Field 1987) including tens of thousands of acres of riparian habitat in California.

These large weeds out-compete the native plants for space and other resources, and can cause significant disruption of entire ecosystems. Their presence inhibits seedling recruitment of native riparian species (Duncan and Carrigan 1992). Both species crowd out natives and use massive amounts of water making it unavailable to natives and potentially lowering the water table. Saltcedar exudes salt from its leaves in the course of transpiration (Thomson et al. 1969), creating saline soils that inhibit germination of native plants. In addition, both species are highly flammable and so can alter the fire regime of riparian and adjacent habitats. Giant reed, by far the greatest threat of the two weeds in coastal Southern California river systems because of its aggressive and invasive nature (Hoshovsky 1988), ongoing management is necessary to prevent total habitat conversion. Periodic fires in river floodplains have favored the fast growing giant reed over native riparian vegetation. Today, thousands of acres are infested with the plant. This acreage increases each year in response to flood events, fires, and other disturbances.

To return an aquatic community to its native character, giant reed and saltcedar should be removed through biomass reduction and the application of herbicides. The biomass of extensive stands of these weeds must be removed mechanically or through the application of prescribed fire. In some cases, the treated plants may be left to die and decay. Physical removal of treated reeds should not be done until at least four to six weeks following application of herbicide to ensure that rootstocks are killed. The initiation of treatment should allow enough time for plants to die prior to flood season to prevent viable propagules from spreading downstream with storm flows. Similarly, material should not be stockpiled close to flowing water and should be removed from the floodplain prior to flood season. Stalks removed in the Santa Ana River Watershed have been run through a chipper. The chips are too small to sprout in wet soil and can be left onsite.

Treated sites on the Santa Ana River are left to reseed naturally with willow and cottonwood; natural regeneration plays the dominant role in the maintenance of native riparian vegetation where natural flood processes still operate. Individual willows cast thousands of wind and water borne seeds, and the river deposits enough of them in suitable growing sites to keep this dynamic habitat in constant regeneration. Furthermore, in most areas where Arundo has been removed, it has been intermixed with native trees and shrubs that grow expansively with the reduced competition, eventually filling in the voids. In few cases, it could be desirable to plant cuttings or rooted material. Selective planting may help reduce re-infestation of giant reed and saltcedar by helping native plants establish and outcompete the non-native plants. However, in such a large, dynamic riparian community as the Santa Ana River Watershed, extensive replanting should not be necessary with but few exceptions. In fact, re-vegetation efforts on the Santa Ana River over the past 20 years have been largely problematic and unsuccessful in the long term. The river has removed them through scour and sediment deposition, or the planted trees have been replaced by giant reed.

Benefits of Removal of Invasive Plants

Removal of these weeds offers a number of benefits to landowners, land managers, and public agencies:

1. Fire Protection: Giant reed is extremely flammable, increasing both fire risk and fire intensity. In areas where extensive stands of giant reed have developed, there is a risk to natural resources, homes, bridges, and other infrastructure. Public fire agencies must deal with an ever-increasing threat as giant reed expands in the watershed. Removing large areas of giant reed will greatly reduce the fire risk.

The pervasion of giant reed greatly increases the risk of catastrophic fire. It is extremely flammable, and once established within a riparian area, it redirects the natural function of the site by increasing the probability and intensity of wildfires. Giant reed can effectively change riparian forests from a flood-defined to a fire-defined community.

In addition to the ecological implications of this change in fire regime, the increasingly frequent and intense wildfires associated with stands of Arundo are a major risk to human life and property, especially within urban centers. Without measures to eliminate large stands of giant reed, and to remove giant reed and tamarisk from the system, intense fires, with extreme risk to life and property, will continue and accelerate in these communities.

2. Floodway Protection: Heavy rains can wash debris dams of giant reed and saltcedar down river, pushing mats of dense roots and stalks against bridge abutments, clogging channels, and re-directing the river to flood adjacent lands. The River Road Bridge has been damaged severely twice by water pushing reed stalks and debris against the abutments. In eliminating stands of giant reed, the material is removed that causes the congestion and impedes flood flows.

By virtue of its great biomass, rapid growth, and dense, interconnected root masses, giant reed poses a substantial flood management problem. Floodwaters strip portions of the standing crop of canes and root masses from the substrate and these mats combine with trash to form substantial debris dams. In contrast, native riparian species are more adapted to bend than to break during high flows greatly reducing the amount of vegetative debris that is washed downstream.

The fate of large quantities of Arundo debris is to be washed up on the beaches near the mouth of the Santa Ana River. The annual clean up of this debris costs the public many millions of dollars.

Additionally, vegetation control activities of flood management agencies contribute to the spread of giant reed throughout the river system. Annual mowing of managed flood channels results in numerous cut stem and root pieces, which are available to wash downstream and infect new areas of the river. Channel maintenance activities need to be coordinated with other giant reed management goals on the river to eliminate this source of downstream contamination. Complete control and eradication of giant reed, rather than annual maintenance mowing, should result in substantial annual savings to the flood management agencies.

3. Protection of Endangered Species and Native Wildlife: Riparian vegetation serves as critical habitat for many state and federally listed threatened and endangered species such as the least Bell's vireo. Additionally, riparian habitat is one of our most productive habitats for wildlife with unique, unparalleled diversity and abundance. Critical Habitat for these species has

been reduced by development by about 95% and giant reed has replaced over 50% of what is left on the Santa Ana River. This exotic weed out-competes the native willows and cottonwood that native wildlife depends upon. Infestation by giant reed increases the probability and intensity of wildfire, redirecting succession towards pure stands of reed at the expense of native riparian habitat. Preventing the spread of giant reed and saltcedar will prevent the further deterioration of habitat for many of the sensitive, threatened, and endangered riparian species. As areas of giant reed and saltcedar are removed and converted back to native riparian habitat, rare species will be able to expand their populations.

4. Water Quality: Extensive stands of giant reed along rivers lack the dense foliage canopy of native riparian forest. As a result, near-shore stream habitats lack the shade offered by the vegetational canopy, and water temperatures are thus several degrees higher than under natural conditions. Higher water temperatures have a direct negative impact on native stream fishes such as the arroyo chub and Santa Ana sucker. Higher temperatures also increase algal growth and lower water oxygen, resulting in lower water quality. Replacing these stands of exotics with native riparian forest will, in time, result in sufficient overhanging foliage to provide the necessary cooler water temperatures, bank cover, and improved water quality needed to protect populations of native fish species.

The lack of streamside canopy structure may degrade water quality in other ways. Studies have shown that, in the shallower sections of the river, high levels of algal photosynthetic activity can increase pH levels which facilitate the conversion of total ammonia to the toxic unionized ammonia form (Bell 1993). An additional water quality threat is the salinization of sites invaded by saltcedar.

Water quality and quantity are very important to downstream users of the river system, as well. In addition to human uses, the river supplies water to diverse wildlife habitats along its path. Ensuring adequate water supply to these habitats nurtures and protects native wildlife, including the endangered least Bell's vireo.

5. Water Conservation: Giant reed has three times the water uptake of native riparian species. For example, researchers at the University of California, Riverside estimate that clearing 10,000 acres of Arundo from the Santa Ana River would result in a water savings of approximately 37,000 acre-feet per year. In addition, removing these exotics would result in more in-stream water, benefiting the native aquatic organisms.

The removal of every 1,000 acres of giant reed and subsequent recovery of native vegetation will yield a water savings of approximately 3,800 acre-feet per year. This is enough to supply almost 20,000 residents with water. The cost of providing imported water to residents is high and increasing. The savings to the water suppliers, and ultimately to the residents, would be enormous. Furthermore, reducing the demand for water will ultimately reduce the need for future water projects and their environmental costs.

Control of Invasive Plants

The pervasion of giant reed on the Santa Ana River is counter-indicated if Federal, state, and local agency, and societal goals for uses of the river resources and environs are to be met. Giant reed must be controlled but will not be without great cost and a major shift from the traditional approach to wetland mitigation and resource management. Mitigation will have to start upstream, not necessarily next to the impact and the rarest species must be managed to greater productivity to offset unavoidable impacts of the weed control activities. Impacts could include some loss of short term habitat values at specific locales and disturbance of rare species. In the long term, however, the function of the river will be restored, there will be a major gain in wetland acreage, resources will be maximized, and rare species recovered.

The focus of non-native plant control should be maintenance of a system with a minimum percent coverage (i.e. less than 5% relative coverage) of giant reed and saltcedar. Control efforts should start from the upper reaches of a river and its major tributaries, with a goal of managing the river corridor, minimizing the expansion and invasion of non-native plant populations into pristine or previously cleared areas, and coordinating these actions with parallel projects and flood control activities to maximize effectiveness. Other objectives include managing endangered species and other wildlife resources to counteract any impacts of the control program while the native vegetation recovers. Also, in a few instances, re-vegetation could be employed in key areas where aesthetics necessitate it.

The following are important considerations for exotic plant control programs that are integrated into the watershed program:

- Work should be conducted from the most upstream location within a watershed. This is important particularly for control of exotic species that spread by vegetative stalks such as the giant reed.

- Active maintenance including ongoing removal and re-treatment of exotic plants must be of longer duration than what has been traditionally accepted. A minimum of 20 years should be the standard to prevent re-infestation.

- Work should be conducted during a time that avoids the breeding season for birds and ensures maximum uptake of herbicide by the exotic plants. This period has been determined to be post-flowering, September through mid-November, for giant reed. During the breeding season, biological monitoring must accompany the removal efforts to avoid untoward impacts.

- Green cane and roots of the giant reed must be kept away from the water to prevent downstream re-infestation.

The optimal time for treatment of giant reed with herbicides is between September 1 and November 15. If using herbicides in stands containing a mixture of exotic and native vegetation between April 15 and September 15, the U.S. Fish and Wildlife Service should be contacted regarding potential impacts to migratory birds and endangered species. For all activities, the conditions in the Regional General Permit No. 41 issued by the Army Corps of Engineers for work on exotics, shall be followed.

A suite of methods is needed to control giant reed, saltcedar, and other system-level weeds depending upon the species being treated, the presence or absence of native plants, the density of the stand, the amount of biomass that must be dealt with, the terrain, and the season.

The key to effective treatment of established phreatophytes is killing of the root masses. This requires treatment of the plant with systemic herbicide at appropriate times of the year to ensure translocation to the roots. Only one herbicide is currently labeled for wetlands use by the EPA, Rodeo, produced by Monsanto Corp. Rodeo is a broad-spectrum herbicide that can be used on giant reed, saltcedar, and most other monocots and dicots. It has proven very effective against giant reed. Garlon 3A, produced by Dow Chemical Corp., is a dicot-specific herbicide which has been proven effective against saltcedar in the desert. Dow has made application to the EPA for approval for use in wetlands, but that process has not been completed. Other herbicides might also be used as labels and conditions allow. Candidates include Fusilade-DX (fluazapop-butyl) and Post (Sethoxidan), which are monocot-specific herbicides. Neither is currently labeled for wetlands use.

The most effective treatment of giant reed is the foliar application of a solution of Rodeo post-flowering and pre-dormancy. During this period of time, usually late-August to early November, the plants are actively translocating nutrients to the root masses in preparation for winter dormancy. This timing of application results in effective translocation of herbicide to the roots. Two to three weeks after treatment, the leaves and stalks turn brown and soften, creating an additional advantage in dealing with the biomass; cut green stems might take root if left on damp soil and are very difficult to cut and chip. Treated stems have little or no potential for rooting and are brittle. They may be left intact on the ground or chipped on site and left for mulch.

Cut-stem, or cut-stump treatment requires more time and labor than foliar spraying, and requires careful timing. Cut stems must be treated within one to two minutes in order to ensure uptake of herbicide into the tissues. This treatment is also best done post-flowering. The chief advantage of cut-stem treatment is that it requires less herbicide, surgically applied to the stem. Because of the labor required it is rarely cheaper than foliar spraying except on very small, isolated patches or individual plants.

The approach usually taken by the Watershed Program has been to cut the stalks by hand and remove the biomass, wait three to six weeks for the plants to grow to three or four feet tall, then apply a foliar spray of Rodeo solution. The chief advantage of this approach is that less herbicide must be applied to treat the fresh growth compared with tall, established plants, and that coverage is often better because of the shorter and uniform-height plants. However, cutting of the stems results in the plants returning to growth phase, drawing nutrients from the root mass. As a result there is less translocation of herbicide to the roots and less root-kill. However, follow-up treatments are usually required, anyway. Root kill is almost never achieved with a single application of herbicide except on very young stands.

Other exotic species are treated with appropriate herbicides after consultation with a licensed Pest Control Advisor. Rodeo is the most effective material for the treatment of pampas grass, while Rodeo or Garlon-3A is effective against castor bean, cocklebur, and other dicots.

Pure stands of giant reed can be efficiently treated by aerial application of an herbicide concentrate, usually by helicopter. Helicopter application can deal with at least 100 acres per day. Special spray apparatus produces extremely fine droplets of concentrated herbicide, which actually reduces herbicide use, minimizes over-spray, and results in greater kill. Heavy machinery can also be used where little or no native material is at risk.

In areas where helicopter access is impossible, where giant reed makes up the understory, where patches are too small to make aerial application financially efficient, or where weeds are mixed with native plants, herbicides must be applied by hand. Street-vehicles with 100 gallon spray tanks are a good alternative where road access is available, but small four wheel drive vehicles equipped with 15 gallon sprayers are the preferred approach where the streambed is not so rocky as to prevent access. Four or five gallon backpack sprayers are the final alternative where the vegetation is too dense, or the landscape too rugged for vehicles to be effective.

Methods for vegetation removal include use of prescribed fire, heavy machinery (e.g. bulldozers), hand-cutting by chainsaw or brushcutter, hydro-axe, shredder, chipper, or biomass burning or removal by vehicle. Prescribed fire, or burning piles of stacked biomass, is the most cost-effective way of removing biomass as long as it does not threaten native vegetation or other resources. Prescribed burning should be conducted between September and February to avoid impacts to breeding birds. Chipping is more costly in terms of equipment and labor, but cut, dried chips pose no threat for regeneration or for forming debris dams. Hauling of biomass by vehicle is extremely expensive and should only be done as a last resort. Most landfills will not accept giant reed and those that do will only accept if cut into short lengths and bagged into plastic trash bags, making the labor costs very high. The use of heavy machinery such as the hydro-ax is extremely expensive. The machines are slow; a hydro-ax can only cut between one and three acres per day. Cutting by hand and chipping have been used almost exclusively, so far in the upper Santa Ana Watershed.

One of the most important considerations when undertaking an exotic plant control program is a long-term maintenance and monitoring period. The purpose of this is to ensure that satisfactory results are being achieved through the weed control project. The management goal is to remove these weeds so that native species will naturally re-establish themselves. As the native riparian vegetation matures and the upstream sources of exotic vegetation is removed, maintenance efforts will be considerably decreased. By the third year, monitoring and maintenance efforts would be considerably lower than the first two years. Adequate funding for the long-term monitoring and maintenance must be considered during the initial planning efforts.

Arundo control and endangered species management are the top priorities of the Watershed Program. These tasks are so extensive and expensive that re-vegetation efforts have been minimal. Furthermore, natural re-vegetation has filled in the removal sites quite quickly in most cases. In special cases, plantings will be necessary and the following guidelines will be followed.

1. Site analysis: Once planting sites have been identified, field investigations of the existing environmental conditions must be made. Soil texture and depth to groundwater need to be measured.

Consideration of the hydrologic regime is critical to successful re-vegetation; without appropriate hydrology, planting efforts will likely fail.

2. Site preparation: This includes initial weed control treatments and appropriate soil tillage prior to planting. Initial weed control treatments are addressed above. Tillage is important to break up soil aggregation and compaction in areas where planting is planned. There appears to be a direct correlation between volume of soil tilled and tree growth (Anderson 1991). If a thick root mass or Arundo rhizome network remains on site, it may act as a physical barrier for establishment of riparian seedlings or pole cuttings. It addition, a thick rootmass (2-4 feet) may increase the depth to groundwater enough to hinder or preclude growth of native riparian plants. Therefore, when practical, root masses should be removed.

3. Irrigation and water source: In situations where riparian vegetation is planted on terraces above the water table, a reliable water source and irrigation are necessary. Plantings of pole cuttings is adequate in low terrace areas where plants will have ready access to groundwater. Short—term irrigation may be used to enhance and promote seedling establishment during the first year or two. Extensive or prolonged irrigation is counter-productive since the goal is self-sustaining vegetation.

4. Planting: The planting design will be based on local vegetational cover in adjacent riparian habitat. Emphasis is given to understory and shrubby elements and establishing them in places where they will not be replaced quickly by trees. Mulefat planting is a priority, since it is used for vireo nest placement and is in far lower supply than desirable in many locations.

Species that may be planted locally include: S. lasiolepis, S. gooddinggii, S. hindsiana and P. fremontii, at a density of about 2,400 cuttings/acre (6′ x 6′). Mulefat is typically planted in monotypic blocks at a density of 4840/acre (3′ x 3′); however, individual plants can be clumped to mimic natural establishment. Block location and size must be determined by assessing soil and groundwater conditions.

Fresh cuttings are used, measuring 2 ft long and at least .25 in diameter, taken as close to the project site as is feasible. Cuttings should be taken from as many different individuals as is feasible to ensure genetic diversity within the population. Cuttings should be taken while the tree is dormant, and cuttings taken later in dormancy have a better survival than those taken earlier. In southern California, riparian species start to break dormancy soon after the winter rains have started, usually February to March. Ideally then, cuttings should be taken and planted in December and January. If the winter rains have not started by planting, the entire site should be thoroughly saturated by irrigation to ensure that the cuttings have adequate moisture. If planting starts after the trees have flushed, and late enough in the year that temperatures will desiccate the cuttings, buds can be stripped off and the cuttings soaked for up to 4 days to increase moisture content. Cuttings should not be taken or planted after May, as fresh cuttings in a field situation have poor survival.

5. Weed control: Controlling annual weeds in the first year of growth increases the growth, and survival rate, of the natives used in riparian restoration. A combination of mowing, weeding by hand, and treatment with herbicides is used on an as-needed basis. Mowing should be performed when a visual assessment of the site indicates that weeds are inhibiting site access or are having a negative impact on planted stock due to light or water competition. Straw mulch can be used to control weeds at the base of the plantings and should be applied immediately after planting.

There is a great need for community support in a watershed-wide exotic plant control program. Unless weed problems on privately owned upstream land are addressed with the rest of the watershed there will be long-term and financially costly annual monitoring and treatment required to maintain treated areas in a weed-free state. One of the goals for a good long-range management plan is strong community support. Getting the public interested in helping with exotic plant control, promoting awareness of the impacts from exotics, and empowering individuals to maintain an exotics-free environment are important strategies for success on the Santa Ana River.

Once community members have been provided educational materials, attended meetings, and helped with local programs, they become project leaders. This strengthens the program in several ways. First, less outside resources will be necessary due to community participation. The community will direct their government to support these programs through letters, *etc.* Many community members live their entire lives in the area, whereas we tend to come and go with our jobs. It will be these individuals that will keep the program going. Finally, an educated community is one that can make sound decisions regarding maintaining the biological integrity of their community.

The Resource Conservation Districts work extremely well with the public. They have employed many techniques in successfully engaging and vesting the public in the Watershed Program including: flyers, brochures, door-to—door campaign, community meetings, and social group meetings.

ENVIRONMENTAL EFFECTS OF THE ACTIVITIES OF THE WATERSHED PROGRAM

The long-term goal of the Watershed Program is to restore the natural functions of the Santa Ana River. The current associated activities include: removal, control, and eradication of invasive species, particularly giant reed and cowbirds, which interfere with river function and resource abundance; increasing wetlands and open space; managing endangered species toward recovery; and involving the public.

Significant management efforts for endangered species, including the control of cowbirds and their effects on nesting birds, began in 1986. There were observer encroachments into the habitat, disturbance to nesting least Bell's vireos, and incursions into nests. These activities continue today and are proposed for subsequent years under permit with the U. S. Fish and Wildlife Service and authorization for the harm or harassment of the potentially affected endangered species. Approximately 650 hours were spent in the field in, and adjacent to, vireo-occupied habitat in 1986. There were 19 pairs of vireos detected in the Basin during that initial year of intensive monitoring; 20 fledged youngsters were observed; but there was a 39% rate of cowbird parasitism. There were also 858 cowbirds removed from the riparian habitat in the Basin in 1986.

The management activities have been conducted annually since 1986 and the negative effects of these activities have been minor incidental habitat damage and disturbance of endangered birds in the riparian habitat. Approximately 3,000 hours were spent in the field in, and adjacent to vireo-occupied habitat, potentially disturbing vireos during the nesting season in 2000. The positive effects are best portrayed through the results on the vireo population in the Prado Basin. During the 2000 breeding season, 357 territorial males and 281 breeding pairs were detected. This is a 1,479% increase in the vireo breeding population. A total of 2,595 cowbirds were removed from the Basin and as a result, cowbird parasitism was down to 8%. As a direct result of the increasing vireo population and decreased nest parasitism, 649 fledglings were observed (Pike et al. 2000).

The most significant environmental effect of the management activities has been the recovery of the vireo in the Prado Basin. However, other native nesting birds are equally as affected by cowbird parasitism and should be benefited as well by cowbird control. This has been qualitatively observed in the richness of the nesting avifauna in the Basin, compared to unmanaged riparian areas in the watershed.

The proposed management activities for the year 2000 and in subsequent years expand the areas to be managed beyond the Basin. The results should be similar. There will be human encroachment, some minor disturbance of nesting birds, and minimal habitat damage, mostly associated with the incidental breakage or crushing of vegetation. These effects are to be kept to an absolute minimum but they do occur at an incidental and insignificant level.

Beginning in the year 2000, the bird management activities began on San Timoteo Creek in the upper watershed and along the river above Prado Basin to the Hidden Valley Preserve. If the funding is available beginning in 2001, the management activities will be expanded above Hidden Valley and into the lower canyon, below Prado Basin. Initially, 2 - 3 miles of the river above Hidden Valley will be added and the 7.5 miles of the lower canyon. Eventually, these activities will be conducted in all of the riparian habitat in the watershed. The effects over time are likely to be similar to those observed in the Basin.

The willow flycatcher has probably benefited from these same management activities but has only held its own in the Basin. It has not responded with the dramatic increase in population observed of the vireo. Consequently, it will be a future focus of the management and study activities. The attempt will be made to focus on the flycatchers needs through study first, then management, to understand and try to provide for this species' specific needs. The overall goal is to increase the flycatcher population to a more viable level.

Similarly, other listed species will be subject to monitoring, study, and management when the needed funding levels are obtained. The Watershed Program is currently partnering with efforts for the Santa Ana sucker, for example. Studies have been ongoing for two years and this program will focus on habitat management and restoration. A 300-foot stream has been created at the Riverside-Corona RCD. Once permits are obtained, sucker fry from the river will be raised in the predator-free environment of the artificial stream. When they have obtained a size more capable of dealing with the many exotic predators of the river, they will be re-introduced to sites that have been restored.

River restoration will involve the cleanup of trash and debris; control of exotic predators; structure placement to deny access by exotic predators; placement of logs, trees, rocks, or other appropriate objects to enhance habitat through shading, providing cobbled surfaces, eddies, and pools. These activities will have minor negative effects associated with momentary potential increases in turbidity and other results of human incursion into the aquatic environment. There will also be local population reductions in the exotic fish populations, frogs, and crayfish. However, the long-term benefit will be restoration of diversity in the habitat structure of the aquatic environment, reduction in exotic predator population levels, and increased habitat for native fishes. Several of these activities may require permits from the Corps, Department, and RWQCB. The overall goal will be the eventual recovery of native fish populations in the river and tributaries.

Endangered species management and recovery will be integrated into the annual work plan for other listed species in the watershed as need, opportunity, and wherewithal develop. Fully operational, the Watershed Program would engage in annual activities expending $ 2.5 - 5 million. At the point where this level of activity appears sustainable, each of the 9 listed target species would receive the benefit of specific and adaptive management. The adaptive nature of the program would extend to the inclusion of other rare species, where modifications of intended implementation measures would reap benefits disproportionate to the effort required.

Habitat restoration has been largely accomplished with the removal of giant reed and expansion of adjacent native riparian habitat. In many areas, removal of the reeds has exposed diminutive willows, barely vegetated, that grow expansively with the reduced competition for light, nutrients, and moisture. On San Timoteo Creek in the upper watershed, over 60% of 209 recently treated acres already support riparian habitat (Figure 2). Plantings have been, and will be done locally where the need is greatest for short-term cover. These will be pole plantings done where ground water is available.

In the Prado Basin, approximately 200 acres have been treated for Arundo. About 75% of this acreage is still relatively free of giant reed but this has taken major annual effort and the remainder has been heavily re-infested. Giant reed removal was done in the Basin along with plantings as part of efforts to restore habitat for the vireo. There is such a significant concentration of vireos in the Basin today, that restoration is ongoing, although costly. The Basin is heavily infested with giant reed and there are 8,000 - 10,000 acres of it upstream, ready to break off in high flows and replant downstream.

Consequently, giant reed removal is being concentrated upon in the upper watershed and along isolated tributaries. Approximately 305 acres of Arundo have been removed from the upper watershed and isolated tributaries since 1997 (Figure 3). This not only results in the redevelopment and expansion of native habitat on treated sites, it reduces source material for continued expansion of Arundo downstream.

Treatment will continue in future phases of the program along the tributaries and mainstem down to the San Bernardino County line and into Riverside. The initial treatment of San Timoteo Creek including Live Oak Canyon will be completed in 2001. Cajon Creek and most of Lytle Creek will also be completed.

The environmental effects of the activities associated with removal include temporary disturbance of native wildlife, crushing or trimming of native plants, including willows and mulefat. The disturbance with noise and human activity is kept to the minimum level possible and is monitored in areas where listed species could be affected. The ultimate goal of the monitoring is to avoid effects on the reproductive activities of rare riparian species. Crushed and cut plants usually resprout and provide low nesting cover by the following spring.

The negative impacts associated with giant reed removal are short term and insignificant. Monitoring and resulting cessation or modification of work are built into the methodologies, as contained in the Regional General Permit No. 41 issued by the Corps and the recently obtained Streambed Alteration Agreement for the watershed efforts. The watershed activities are also conducted in conjunction with stipulations contained in the Section 401 permit issued by the California Regional Water Quality Control Board for the program activities in the Santa Ana River Watershed.

The longer-term benefits of the program activities begin to be realized within one growing season following initial treatment and removal of giant reed with the spread of native vegetation onto and over removal sites. Downstream of the removal areas, dozens of acres of additional infestation by giant reed and subsequent loss of habitat and wildlife values are avoided. Additional benefits are realized and include: reduction in water consumption; reduction in the threat of intense fires; reduction in water flow blockage; reduction in storm-swept debris; and increased ability of the riverine habitats to recover naturally.

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Appendix L-2

Critical Habitat Designation for Santa Ana Sucker (70 FR 425)

FR Doc 04-28286
[Federal Register: January 4, 2005 (Volume 70, Number 2)]
[Rules and Regulations]
[Page 425-458]
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
50 CFR Part 17
RIN 1018-AT57

Subject = "Final Rule To Designate Critical Habitat for the Santa Ana Sucker (*Catostomus santaanae*) in Los Angeles County, California"

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), designate critical habitat for the threatened Santa Ana sucker (*Catostomus santaanae*) pursuant to the Endangered Species Act of 1973, as amended (Act). This species is now restricted to three noncontiguous populations in three different stream systems in southern California: The lower and middle Santa Ana River in San Bernardino, Riverside, and Orange counties; the East, West, and North Forks of the San Gabriel River in Los Angeles County; and lower Big Tujunga Creek, a tributary of the Los Angeles River in Los Angeles County. We have identified 23,719 acres (ac) (9,599 hectares (ha)) of aquatic and riparian habitats essential to the conservation of the Santa Ana sucker. We are designating two areas in Los Angeles County, one along the San Gabriel River (Unit 2) and the other along the Big Tujunga Creek (Unit 3) as critical habitat for Santa Ana sucker. These units encompass approximately 8,305 ac (3,361 ha) of essential habitat for the Santa Ana sucker within Los Angeles County. Essential habitat for the Santa Ana sucker in Orange, Riverside, and San Bernardino counties has been excluded from the final critical habitat designation, because we have concluded that the benefits of excluding these lands from critical habitat designation outweigh the benefits of their inclusion pursuant to section 4(b)(2) of the Act.

DATES: This rule becomes effective on February 3, 2005.

ADDRESSES: Comments and materials received, as well as supporting information used in this rulemaking, are available for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, 6010 Hidden Valley Road, Carlsbad, California 92009. You may obtain copies of the final rule and the economic analysis from the field office address above or by calling (760) 431-9440, or from our Internet site at http://carlsbad.fws.gov.

If you would like copies of the regulations on listed wildlife or have questions about prohibitions and permits, please contact the Carlsbad Fish and Wildlife Office (see ADDRESSES above).

FOR FURTHER INFORMATION CONTACT: Mr. Jim Bartel, Field Supervisor, Carlsbad Fish and Wildlife Office, at the address and phone number listed above.

SUPPLEMENTARY INFORMATION:

Designation of Critical Habitat Provides Little Additional Protection to Species

In 30 years of implementing the Act, the Service has found that the designation of statutory critical habitat provides little additional protection to most listed species, while consuming significant amounts of available conservation resources. The Service's present system for designating critical habitat has evolved since its original statutory prescription into a process that provides little real conservation benefit, is driven by litigation and the courts rather than biology, limits our ability to fully evaluate the science involved, and consumes enormous agency resources, and imposes huge social and economic costs. The Service believes that additional agency discretion would allow our focus to return to those actions that provide the greatest benefit to the species most in need of protection.

Role of Critical Habitat in Actual Practice of Administering and Implementing the Act

While attention to and protection of habitat is paramount to successful conservation actions, we have consistently found that, in most circumstances, the designation of critical habitat is of little additional value for most listed species, yet it consumes large amounts of conservation resources. Sidle (1987) stated, "Because the Act can protect species with and without critical habitat designation, critical habitat designation may be redundant to the other consultation requirements of section 7." Currently, only 445 species or 36 percent of the 1,244 listed species in the U.S. under the jurisdiction of the Service have designated critical habitat. We address the habitat needs of all 1,244 listed species through conservation mechanisms such as listing, section 7 consultations, the Section 4 recovery planning process, the Section 9 protective prohibitions of unauthorized take, Section 6 funding to the States, and the Section 10 incidental take permit process. The Service believes that it is these measures that may make the difference between extinction and survival for many species.

We note, however, that a recent 9th Circuit judicial opinion, Gifford Pinchot Task Force v. United States Fish and Wildlife Service, has invalidated the Service's regulation defining destruction or adverse modification of critical habitat. We are currently reviewing the decision to determine what effect it may have on the outcome of consultations pursuant to Section 7 of the Act.

Procedural and Resource Difficulties in Designating Critical Habitat

We have been inundated with lawsuits for our failure to designate critical habitat, and we face a growing number of lawsuits challenging critical habitat determinations once they are made. These lawsuits have subjected the Service to an ever-increasing series of court orders and court-approved settlement agreements, compliance with which now consumes nearly the entire listing program budget. This leaves the Service with little ability to prioritize its activities to direct scarce listing resources to the listing program actions with the most biologically urgent species conservation needs.

The consequence of the critical habitat litigation activity is that limited listing funds are used to defend active lawsuits, to respond to Notices of Intent (NOIs) to sue relative to critical habitat, and to comply with the growing number of adverse court orders. As a result, listing petition responses, the Service's own proposals to list critically imperiled species, and final listing determinations on existing proposals are all significantly delayed. The accelerated schedules of court ordered designations have left the Service with almost no ability to provide for adequate public participation or to ensure a defect-free rulemaking process before making decisions on listing and critical habitat proposals due to the risks associated with noncompliance with judicially-imposed deadlines. This in turn fosters a second round of litigation in which those who fear adverse impacts from critical habitat designations challenge those designations. The cycle of litigation appears endless, is very expensive, and in the final analysis provides relatively little additional protection to listed species.

The costs resulting from the designation include legal costs, the cost of preparation and publication of the designation, the analysis of the economic effects, the cost of requesting and responding to public comment, and in some cases the costs of compliance with the National Environmental Policy Act (NEPA), all are part of the cost of critical habitat designation. None of these costs result in any benefit to the species that is not already afforded by the protections of the Act enumerated earlier, and they directly reduce the funds available for direct and tangible conservation actions.

Background

This revised final rule addresses the designation of critical habitat for the Santa Ana sucker (*Catostomus santaanae*) (sucker), which is endemic to the Los Angeles River, the San Gabriel River, and the Santa Ana River, and assumed to be introduced to the Santa Clara River in California. In this revised final rule, we discuss information obtained since the proposed and original final critical habitat rules published concurrently in the Federal Register on February 26, 2004 (69 FR 8911 and 69 FR 8839).

The sucker has evolved in the dynamic hydrological systems of southern California and requires clean, clear, and relatively cool streams of varying width and depth with appropriate substrates (e.g., a mix of sand, gravel, cobble, and boulder). The sucker scrapes algae and invertebrates from hard substrates such as gravel and cobbles and spawns over a gravel and cobble substrate. Please refer to the final rule listing the species as threatened (65 FR 19686) and our previous final critical habitat rule (69 FR 8839) for a more detailed discussion about the species' physical description, ecology, range, distribution, and a discussion of factors affecting the species.

Previous Federal Action

On July 9, 2001, California Trout, Inc., the California-Nevada Chapter of the American Fisheries Society, the Center for Biological Diversity, and the Friends of the River (plaintiffs) filed a 60-day notice of intent to sue over our failure to designate critical habitat for the Santa Ana sucker. The plaintiffs filed a second amended complaint for declaratory judgment and injunctive relief on March 19, 2002, with the U.S. District Court for the Northern District of California. On February 26, 2003, the district court ordered the Service to designate final critical habitat for the Santa Ana sucker by no later than February 21, 2004, and enjoined the Service from issuing any section 7 concurrence letters or biological opinions on actions that "may affect" the sucker until such time as the final critical habitat is designated. The Service published the proposed and final rules concurrently on February 26, 2004 (69 FR 8911 and 69 FR 8839). As a result, the injunction prohibiting the issuance of biological opinions and concurrence letters was lifted. See the proposed rule (69 FR 8911) for a discussion of why the final rule and proposed rule were published at the same time.

The proposed critical habitat rule, published on February 26, 2004 (69 FR 8911), included a 60-day comment period during which the public could submit comments on the proposed designation. On August 19, 2004, we published a notice in the Federal Register (69 FR 51416) announcing the reopening of a 30-day comment period on the proposed critical habitat rule and the scheduling of a public hearing, which was held in Pasadena, California on September 9, 2004. On October 1, 2004, we published a Federal Register notice (69 FR 58876) announcing the availability of the draft economic analysis of the proposed critical habitat designation and reopening a 10-day public comment period for the economic analysis and proposed designation. On October 25, 2004, we published another notice in the Federal Register (69 FR 62238) reopening a 30-day comment period on the draft economic analysis and the proposed designation.

Summary of Comments and Recommendations

During the initial 60-day public comment period for the proposed rule (69 FR 8911), we contacted all appropriate State and Federal agencies, county governments, elected officials, scientific organizations, and other interested parties, via mail and/or fax, and invited them to submit comments and/or information concerning the proposed rule. We also published newspaper notices in the The Press-Enterprise, Riverside, CA, and in the Los Angeles Times, Los Angeles, CA, inviting public comment. During the first comment period, we received comments from three county agencies, three water districts, two businesses, three groups, and 14 individuals. Of the 22 letters we received, four letters supported the designation as proposed, six letters suggested expanding the designation, six letters suggested reducing the designation, one letter requested clarification of the designation, and five letters were neutral.

During the second comment period, we received comments from one utility agency, three groups, and four individuals. Of the six letters we received, one letter supported the designation as proposed, two letters suggested expanding the designation, one letter suggested reducing the designation, and two letters were neutral. At the public hearing during the second comment period, we received 21 oral comments, all of which requested a reduction in the designation. A transcript of the hearing is available for inspection (see ADDRESSES section).

During the third comment period (October 1 to 12, 2004), which regarded the draft economic analysis, we received comments from 1 county agency, 3 water districts, 1 business, 4 groups, and 2 individuals. Of the 7 letters we received, 4 letters were requests for an extension of the comment submission period, and 3 letters contained suggestions for improvements to the draft economic analysis. Of the latter 3 letters, 1 supported the designation as proposed and 2 suggested reducing the designation.

During the fourth comment period (October 25 to November 24, 2004), which regarded the draft economic analysis, we received comments from 7 groups, 8 individuals, and 1 project authority (representing 1 county agency and 4 water districts). Of the 13 letters we received, 10 letters supported the designation as proposed, 2 letters suggested reducing the designation, and 1 letter requested clarification of the draft economic analysis. (After the comments deadline, we received 2 letters with comments from 1 county agency suggested reducing the designation, and a letter from 1 business requesting an extension of the comments deadline.)

In accordance with our peer review policy published in the Federal Register on July 1, 1994 (59 FR 34270), we requested the expert opinions of seven independent specialists who are recognized authorities on freshwater fish of Southern California regarding pertinent scientific or commercial data and assumptions relating to the supporting biological and ecological information in the proposed designation. The purpose of such review is to ensure that the designation is based on scientifically sound data, assumptions, and analyses, including input of appropriate experts and specialists.

We reviewed all comments, including the oral statements presented at the public hearing and the written comments received from peer reviewers and the public during the comment periods, for substantive, relevant issues and new data regarding critical habitat and the Santa Ana sucker. Peer reviewer comments are summarized separately in the following section. We have grouped public comments into six general issues relating to critical habitat and the draft economic analysis, combined and summarized similar comments, and provided our responses in the Public Comments section below.

Peer Review Comments

We received three written responses from peer reviewers recommending expansion of critical habitat and one written response supporting critical habitat as designated. One additional peer reviewer supported designated critical habitat, but this letter was received after the deadline. Two peer reviewers supplied specific edits and comments on the critical habitat unit boundaries and the primary constituent elements. Comments from peer reviewers have been incorporated into this final rule as appropriate.

(1) Comment: The upper boundary of critical habitat on the East Fork of the San Gabriel River should be the Bridge-of-No-Return and was incorrectly delineated on the map in the final rule (69 FR 8859).

Our Response: We acknowledge that this upper boundary was incorrectly delineated on the map of Unit 2 in the original final rule. This area was also inadvertently left out of the legal description of the unit. As a result, we cannot include the area in the revised final designation even though this area is essential to the conservation of the sucker. We may, under the Act, revise the designation of critical habitat in the future to include this area.

(2) Comment: The stretches of the San Gabriel River between the San Gabriel Dam and the Morris Dam reservoir, between the Highway 39 bridge and the Fish Canyon confluence with the river, and upstream of Cogswell Dam should be included in critical habitat because these areas contain potentially occupied and/or restorable habitat.

Our Response: Although we appreciate the importance of potentially suitable habitat within these stretches of the San Gabriel River, we do not have sufficient information to determine if these portions of the river contain the primary constituent elements essential to the conservation of the sucker and therefore, we could not designate these areas as critical habitat. Under the Act, we can revise critical habitat in the future if new information becomes available indicating that these areas are essential.

(3) Comment: Devil's Gulch, a tributary to the East Fork of the San Gabriel River, should not have been included in designated critical habitat because it does not support the Santa Ana sucker.

Our Response: Devil's Gulch was not designated as critical habitat.

(4) Comment: There is a barrier to fish movement upstream from the San Gabriel River into Big Mermaid's Canyon and therefore Big Mermaid's Canyon should not be designated as critical habitat.

Our Response: Using the best available information, including records from the California Natural Diversity Database (CNDDB), we determined that Big Mermaid's Canyon previously supported suckers and still is essential to the conservation of the sucker in that it transports water and substrate essential to the maintenance of occupied sucker habitat downstream.

(5) Comment: Haines Creek should be specifically described as part of designated critical habitat for the sucker.

Our Response: Haines Creek is located within the boundaries of the Big Tujunga Creek Critical Habitat Unit (Unit 3), and has been specifically listed in the description of this unit in this revised final rule.

(6) Comment: The Service has not adequately supported its statement that the upper Santa Ana Wash and tributaries provide sediment transport to occupied habitat.

Our Response: We based the Santa Ana sucker critical habitat designation on the best available information, including expert opinion (Dr. Thomas Haglund, Ichthyologist, pers. comm. 2004; Dr. Jonathan Baskin, Ichthyologist, California State Polytechnic University, Pomona, pers. comm. 2004) and studies in similar river systems in California (NOAA 2003).

While the Santa Ana Wash was proposed as critical habitat based on, among other things, its contribution of sediments and maintenance of a functioning hydrograph, these attributes do not, of themselves, warrant determining that an area is "essential to the conservation of the species", which is the statutory standard for designation of unoccupied areas. Therefore, Unit 1B, Santa Ana Wash, has been removed from the revised designation. The basis for this removal is summarized in the section entitled "Summary of Changes".

(7) Comment: The criteria used to designate individual tributaries in Unit 1B, the Santa Ana Wash and in Unit 3, Big Tujunga Creek as critical habitat were not consistently applied.

Our Response: We based our determination to designate tributaries in Unit 1B and Unit 3 on the best available data, including aerial photographs and historical sucker occurrences. We determined that these tributaries maintain a functioning hydrological system, provide and transport sediment downstream to occupied habitat, support riparian systems, and maintain the long-term viability of the sucker populations. We believe that we applied these criteria consistently to each area designated as critical habitat. Please refer to the Methods and Criteria Used To Delineate Critical Habitat section of this rule for a more detailed discussion. However, the Santa Ana Wash and associated tributaries within Unit 1B have been excluded from the revised designation. The basis for this exclusion is summarized in the section entitled "Summary of Changes".

(8) Comment: The primary constituent element describing substrate types should be refined to include low-embeddedness.

Our Response: We concur and have revised the description of the primary constituent element describing substrate. Please refer to the Primary Constituent Elements section of this rule for a detailed description.

(9) Comment: Minimum water depth of from 3 to 30 centimeters (cm) (1.2 to 11.8 inches (in)) should be changed. Depths less than 4 cm (1.6 in) would not provide habitat for most life stages of the sucker.

Our Response: We used 3 cm (1.2 in) as the minimum water depth because of the observations of larval suckers in sandy habitats with depths of 3 to 10 cm (1.2 to 3.9 in) of water along the margins of rivers and streams (Haglund et al., 2004).

(10) Comment: Juvenile suckers migrate into tributaries, possibly attracted by the cooler temperatures these tributaries experience in the spring. Therefore, tributaries should be included as a primary constituent element in critical habitat. Sunnyslope Creek, Arroyo Tequesquite, Evans

Lake Drain, Mt. Rubidoux Creek, Agua Mansa Drain, and the tributaries draining Hidden Valley Regional Park wetlands should be included as critical habitat.

Our Response: If a tributary within the critical habitat boundaries contained one or more of the primary constituent elements, then it was considered essential habitat. Some tributaries within the critical habitat boundaries do not contain any of the primary constituent elements and were not, therefore, considered essential. For example, a concrete-lined storm drain directing urban runoff into one of the rivers is unlikely to provide any of the primary constituent elements essential to the conservation of the species. Although we did not specifically describe tributaries as a primary constituent element, they are necessary in a functioning hydrological system and are included in the critical habitat designation where appropriate.

Several of the drains, creeks, and other tributaries listed by the commenter contain the primary constituent elements and are considered essential habitat but were excluded from the critical habitat designation under section 4(b)(2) of the Act, because they are protected under the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP).

(11) Comment: Unnatural or anthropogenic ebbs and peaks in water volume may be inadvertently included as primary constituent elements, since the description of a functioning hydrological system as a primary constituent element did not specify that it must contain a natural hydrograph.

Our Response: We concur and have revised the primary constituent element describing a functional hydrological system. Please refer to the Primary Constituent Elements section of this rule for a detailed description.

Public Comments

Issue 1: Comments on the Adequacy and the Extent of Critical Habitat Designation

(12) Comment: Critical habitat should be designated in the Santa Clara River because (1) the Santa Clara River is essential to the conservation of the Santa Ana sucker, (2) the population provides increased genetic variability to the overall sucker population, (3) the Santa Clara River is threatened by rapid development within its watershed, and (4) the Santa Clara River is not otherwise protected under the Act. The Santa Ana sucker in the Santa Clara River should be listed under the Act, since there remains much ambiguity regarding its status as an introduced species in the Santa Clara River.

Our Response: Since the sucker population in the Santa Clara River is not federally listed (65 FR 79686), critical habitat could not be designated for that population. The sucker was not listed in the Santa Clara River due to the lack of evidence showing the sucker was native to the Santa Clara River. Our earliest record of the sucker in the Santa Clara River watershed is from 1934 (Hubbs et al. 1943). Conversely, we have records of the sucker in the Santa Ana River from 1897 (Snyder 1908). Therefore, based on the best available data, we have presumed the sucker in the Santa Clara River was introduced. If we determine the Santa Clara River population to be crucial to the recovery of the species as we prepare the recovery plan, we may need to reevaluate the status of this population under the Act.

(13) Comment: Since the area below Prado Dam in the Santa Ana River is not adequately protected by either the Santa Ana Sucker (SAS) Conservation Program or by the Western Riverside MSHCP, it should be included in the critical habitat designation. Since the SAS

Conservation Program focuses conservation efforts on the upper stretch of the Santa Ana River, it may not adequately address the conservation needs of the sucker throughout the Santa Ana River. Another commenter stated that the benefits of including the areas covered by these plans in the critical habitat designation outweigh potential costs to other agencies and that critical habitat designation provides greater benefits to the sucker than either of the plans.

Our Response: Section 4(b)(2) of the Act allows the Service to exclude any area from critical habitat if we determine that the benefits of such an exclusion outweigh the benefits of including the area in the critical habitat designation, unless, based on the best scientific and commercial data available, we determine that failure to designate the area as critical habitat will result in the extinction of the species. Exclusions can be based on Integrated Natural Resource Management Plans (INRMPs) on military lands, Habitat Conservation Plans (HCPs), or other formal conservation plans; except for INRMPs, plans must provide conservation benefits to the species as well as assurances that the plan will be implemented and the conservation effort will be effective. We have determined that both the Western Riverside MSHCP and the SAS Conservation Program satisfy these requisites, and have, therefore, concluded that the benefits of excluding the lands covered by these plans from the final critical habitat designation outweigh the benefits of including these areas. As such, they are excluded from critical habitat designation. See Lands Covered Under Existing Conservation Plans for a detailed discussion.

(14) Comment: Habitat within the boundaries of the Western Riverside MSHCP and SAS Conservation Program meet the definition of critical habitat and should be included in designated critical habitat.

Our Response: Although the habitat within the boundaries of these conservation plans contains one or more of the physical and biological characteristics essential to the conservation of the sucker, we have determined that these conservation plans provide special management and/or protection for the Santa Ana sucker, and have concluded that the benefits of excluding the lands covered by these plans from the final critical habitat designation outweigh the benefits of including these areas. Thus, we have excluded these areas from critical habitat designation under 4(b)(2) of the Act.

Issue 2: Comments on Individual Units

(15) Comment: Commenters stated that Santa Ana suckers are declining as a result of heavy recreational use in the San Gabriel River. Conversely, some other commenters stated suckers in the San Gabriel River were not declining as the result of recreational activities or as a result of the use of summer homes.

Our Response: Based on the best available information, we believe that recreational suction dredging, artificial pool creation, off-road vehicle use, swimming, wading, bathing, and the use of recreational summer homes may have varying detrimental effects on the Santa Ana sucker.

Suction dredging, which occurs on a recreational basis in the San Gabriel River can result in the death of fish eggs, larvae, and fry (Harvey and Lisle 1998; Griffith and Andrews 1981). Suction dredging can also change the functional composition of the invertebrate community and increase sedimentation rates in sensitive spawning and feeding habitats (Somer and Hassler 1992).

The use of the river as an off-highway vehicle (OHV) recreational area may result in adverse effects to the sucker, if the OHV use occurs in areas used by the sucker during the spawning and nursery season, or if vehicles leak oil, gas, and other pollutants into the river. OHV use can change the physical structure of habitat (Wender and Walker 1998; Texas Chapter of American Fisheries Society 2002; Brown 1994), crush eggs and larvae within the substrate (Texas Chapter of American Fisheries Society 2002), and reduce the taxonomic diversity of the macroinvertebrate and algal species (Texas Chapter of American Fisheries Society 2002) which is the food base for the sucker (Haglund and Baskin 2003; Greenfield et al. 1970). Haglund and Baskin (2002) recently completed a one-year study in the San Gabriel River; their results suggest that macroinvertebrate diversity was reduced in vehicle ruts and tracks. However, they concluded there was no evidence at that time to indicate that the intensity of OHV usage was related to trends in native fish populations (although they recommended further investigation before drawing firm conclusions).

Swimming, wading, and bathing can degrade the physical structure and water quality of streams. Erosion associated with heavy recreational use along streambanks contributes to degraded habitat conditions including increased sedimentation in potential spawning and feeding grounds and loss of habitat structure (e.g., pools, riffles, shallow sandy margins) that provide essential elements to the survival of the sucker. The damming of the river to create recreational swimming pools may temporarily eliminate fish passage and limit the availability of suitable habitat for the sucker (Ally, in litt. 2001). Pollution associated with personal care products (e.g., suntan lotion, shampoo, soap, insect repellent) that can be released into the aquatic environment during swimming, wading, and bathing can have adverse physiological effects on the endocrine system of fishes (Daughton and Ternes 1999).

We have been working and will continue to work with the U. S. Forest Service (Forest Service) to ensure their actions with respect to the sucker will not result in jeopardy to or take of the species. The Forest Service has recently implemented measures to reduce OHV activity in areas in which suckers are suspected to spawn as part of the Angeles National Forest Santa Ana Sucker Conservation Strategy.

(16) Comment: The San Gabriel Canyon OHV Area is currently a Department of Defense training facility and is also covered under a Forest Service management plan. Therefore, this area should be excluded from designated critical habitat.

Our Response: Section 4(b)(2) of the Act allows the Service to exclude any area from critical habitat if the Service determines the benefits of such exclusion outweigh the benefits of specifying such area as part of critical habitat, unless, based on the best scientific and commercial data available, the Service determines that failure to designate the area as critical habitat will result in the extinction of the species. Exclusions can be based on INRMPs for military lands, HCPs, and formal conservation plans. We have confirmed with the Forest Service that the Department of Defense does not currently use the San Gabriel Canyon OHV Area as a training facility (Bill Brown, U.S. Forest Service, pers. comm. 2004), and therefore does not qualify for exclusion as provided for military lands under section 4(b)(2) of the Act.

The Service must determine that a management plan provides a conservation benefit to the species, and assurances that the management plan will be implemented, and the conservation effort will be effective. We have reviewed the San Gabriel Canyon Off-Road Vehicle Management Plan (U.S. Forest Service 1985) for consistency with the aforementioned criteria. While we appreciate the significant amount of effort private individuals and the Forest Service have expended in the development of this management plan, it does not adequately address the conservation needs of the sucker in the San Gabriel River and therefore, we cannot exclude this area from the critical habitat designation under 4(b)(2) of the Act. We are working with the Forest Service to better conserve the sucker in this area.

(17) Comment: Only a small portion of the San Gabriel Canyon OHV Area contains suitable habitat for the Santa Ana sucker.

Our Response: Our regulations allow us to designate critical habitat in areas where the species is not present if they are in proximity to areas occupied by the species and are essential to their conservation (50 CFR 424.12(d)). Although suckers may not occupy this area when the reservoir is full, this area does provide a linkage between the West, East, and North Forks of the San Gabriel River. Linkages are essential to maintaining the genetic structure and viability of the species in this river. Therefore, we consider all portions of the San Gabriel Canyon OHV Area within the geographical boundaries of the designation as critical habitat.

(18) Comment: Habitat for the sucker is not present in the plunge pool immediately downstream of Cogswell Dam or for 1,000 feet downstream of Cogswell Dam in the West Fork of San Gabriel River. Therefore, this section of the river should be excluded from critical habitat.

Our Response: Based on the best available information, we have determined that this area of the West Fork of the San Gabriel River contains substrate, vegetation, and water that are essential for the conservation of the species (Haglund and Baskin 1996; Haglund and Baskin 1995; U.S. Forest Service 2003). The Santa Ana sucker was detected in the vicinity of this area during the last decade (Haglund and Baskin 1996). Therefore, since this area had been occupied and since it contains the primary constituent elements of critical habitat, this area will remain designated as critical habitat. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(19) Comment: A 1,000-foot portion of the East Fork of the San Gabriel River downstream of the confluence of the East, West, and North forks should be excluded from critical habitat because critical habitat designation will limit the implementation of flood protection measures, the amount of water that can be stored behind the San Gabriel Dam, and revenue for the hydroelectric plant located downstream of the dam.

Our Response: This area was included in the critical habitat designation because it provides a linkage between the West, East, and North Forks of the San Gabriel River. Linkages are essential to maintaining the genetic structure and viability of the species in this river. Our regulations allow us to designate critical habitat in areas where the species is not present if they are in proximity to areas occupied by the species and are essential to their conservation (50 CFR 424.12(d)). In addition, significant numbers of suckers were detected in the vicinity of this area during recent surveys (M. Chimienti, Los Angeles County Department of Public Works, pers. comm. 2004). Therefore, this area of the East Fork of the San Gabriel River will remain in the critical habitat designation. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(20) Comment: Within the San Gabriel River, critical habitat should be designated between Morris Dam and Fish Canyon as well as lower San Jose Creek, a tributary to San Gabriel River. The commenter did not state why this area should be designated.

Our Response: Although we appreciate the potential for habitat in this portion of the San Gabriel River and lower San Jose Creek, we do not have sufficient information to determine if these areas contain the primary constituent elements essential to the conservation of the sucker. Therefore, we cannot designate these areas as critical habitat. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(21) Comment: Within Big Tujunga Creek, habitat for the sucker is not present in the plunge pool immediately below Big Tujunga Dam or for one mile downstream of Big Tujunga Dam. Therefore, these sections of Big Tujunga Creek should be excluded from critical habitat.

Our Response: We have determined that the upstream sections of the Big Tujunga Creek transport sediment from upstream tributaries to known occupied habitat in the lower Big Tujunga Creek. In addition, this portion of the creek meets the definition of critical habitat since it contains water, substrates, and riparian and aquatic vegetation essential for the conservation of the species (Andresen 2001; Haglund and Baskin 2001). Although some structures in this area may seasonally limit upstream movement of suckers, these structures are not necessarily year-round impediments to fish passage (Swift 2002). Therefore, since this area maintains essential habitat downstream, has a strong potential to be occupied, and contains the primary constituent elements of critical habitat, this area is essential to the conservation of the species and will remain in the critical habitat designation. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(22) Comment: Habitat is not present within an unnamed tributary of Big Tujunga Creek that is 500 feet downstream of Foothill Boulevard.

Our Response: We have not been provided with enough information to determine the location of this unnamed tributary. However, the floodplain of Big Tujunga Creek meets the definition of critical habitat since it contains the necessary hydrology, substrates, water, and vegetation essential to the conservation of the species. Therefore, any tributaries with these primary constituent elements are considered critical habitat when they are within the Big Tujunga Creek floodplain. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(23) Comment: Some commenters stated that Little Tujunga Creek in Unit 3 should be excluded from critical habitat because it is not occupied by the sucker, and does not provide sediment or water to occupied habitat in Big Tujunga Creek. Other commenters emphasized the importance of maintaining the original area proposed as critical habitat, including Little Tujunga Creek.

Our Response: Based on comments and information we received during the public comment periods and additional field investigations, we have removed Little Tujunga Creek upstream of its confluence with Big Tujunga Creek from the final critical habitat designation and revised the maps accordingly.

(24) Comment: In Unit 3, critical habitat should be designated in Trail Canyon and La Paloma Canyon and all other tributaries to the Big Tujunga Creek.

Our Response: Although we appreciate the potential for habitat and water supply in Trail and La Paloma Canyons, as well as in many of the other tributaries to Big Tujunga Creek, we do not have sufficient information to determine if these tributaries contain the primary constituent elements essential to the conservation of the sucker. Therefore, we cannot designate these areas as critical habitat. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(25) Comment: Critical habitat should be designated in the Los Angeles River between State Route 134 and Interstate 5.

Our Response: Although we appreciate the potential for habitat in this portion of the Los Angeles River, we do not have sufficient information to determine if it contains the primary constituent elements essential to the conservation of the sucker. Therefore, we cannot designate this area as critical habitat. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(26) Comment: Unit 1B (Santa Ana Wash) is not occupied and therefore is not essential to the conservation of the species. Also, Mill Creek is generally dry and could not support the sucker. Furthermore, the Service has not demonstrated that Unit 1B supports a natural hydrograph, is essential to the conservation of the species, or is necessary for the long-term viability of the species.

Our Response: As stated in the previous final critical habitat rule or listing rule, Mill Creek, City Creek, and the upper Santa Ana Wash in Unit 1B are a source of sediment for the occupied portion of the Santa Ana River (Dr. Thomas Haglund, pers. comm. 2004; Dr. Jonathan Baskin, pers. comm. 2004; EIP Associates 2004). This sediment, which is composed of cobble, gravel, and sand, provides spawning and feeding substrates for the sucker and is essential to the conservation of the species.

In addition to sediment transport, Unit 1B supports a functioning hydrological system (Dr. Thomas Haglund, pers. comm. 2004; Dr. Jonathan Baskin, pers. comm. 2004) that experiences peaks and ebbs in water volume within the Santa Ana River watershed (Dr. Thomas Haglund, pers. comm. 2004; Dr. Jonathan Baskin, pers. comm. 2004). Although much of the surface water within Unit 1B has been diverted for municipal uses or other purposes, heavy rainstorms during the rainy season do provide flows that are biologically important to the sucker (Swift 2001; EIP Associates 2004).

While the Santa Ana Wash was proposed as critical habitat based on, among other things, its contribution of sediments and maintenance of a functioning hydrograph, these attributes do not, of themselves, warrant determining that an area is "essential to the conservation of the species", which is the statutory standard for designation of unoccupied areas. Therefore, Unit 1B, Santa Ana Wash, has been removed from the revised designation. The basis for this removal is summarized in the section entitled "Summary of Changes".

(27) Comment: Unit 1B does not support riparian systems that are essential to the conservation of the sucker.

Our Response: As stated in previous rules, the existing riparian habitat in City Creek, Mill Creek, and the upper Santa Ana Wash in Unit 1B contributes to maintaining water quality and the community structure essential for the conservation of the sucker. City Creek, Mill Creek, and the upper Santa Ana Wash contribute organic nutrients (e.g., woody debris, invertebrates) to the system (Klapproth and Johnson 2000a; Sweeney 1993) and filter pollutants and sediments entering the watershed (Mills and Stevenson 1999; Klapproth and Johnson 2000b.

Unit 1B, Santa Ana Wash, has been removed from the revised designation. The basis for this removal is summarized in the section entitled "Summary of Changes".

(28) Comment: In Unit 1B, the Service inconsistently and arbitrarily included a portion of the Santa Ana River covered by the Santa Ana Sucker (SAS) Conservation Program. This portion of the river extends upstream from the La Cadena Avenue bridge to the Mission Channel confluence with the Santa Ana River.

Our Response: The portion of Unit 1B between the La Cadena Avenue bridge and the Mission Channel confluence was inadvertently included in the previous critical habitat designation. The text and maps have been modified in this revised final rule to reflect the exclusion of all areas covered by the SAS Conservation Program as allowed under section 4(b)(2) of the Act (see Unit 1 map).

(29) Comment: There are no new anticipated impacts to the Santa Ana Wash (Unit 1B) and therefore, it should be excluded from critical habitat designation.

Our Response: The Santa Ana Wash is threatened by rapid development of the Santa Ana River watershed in San Bernardino County, and by the demand for increased building materials (e.g., sand and gravel) and water supplies. However, Unit 1B, Santa Ana Wash, has been removed from the revised designation. The basis for this removal is summarized in the section entitled "Summary of Changes".

(30) Comment: Chino Creek in Unit 1A does not contain habitat for the Santa Ana sucker and should be removed from the critical habitat designation.

Our Response: Chino Creek supported the Santa Ana sucker historically (Koehn, in litt. 1966), and still contains one or more of the primary constituent elements (Swift, pers. comm. 2004). In addition, the riparian habitat adjacent to the stream and the stream's contribution to the overall hydrological regime help the sucker population in the Santa Ana River.

While Chino Creek in the Northern Prado Basin was proposed as critical habitat based on, among other things, its contribution of sediments and maintenance of a functioning hydrograph, these attributes do not, of themselves, warrant determining that an area is "essential to the conservation of the species", which is the statutory standard for designation of unoccupied areas. Therefore, Unit 1A, Northern Prado Basin, has been removed from the revised designation. The basis for this removal is summarized in the section entitled "Summary of Changes".

(31) Comment: Critical habitat should be designated in Cajon Creek, a tributary to the Santa Ana River.

Our Response: Although we appreciate the potential for sucker habitat in Cajon Creek, we do not have sufficient information to determine if this tributary contains the primary constituent elements essential to conservation of the sucker. Therefore, we cannot designate this tributary as critical habitat. Under the Act, we can revise critical habitat in the future, if new information becomes available.

(32) Comment: Please clarify if energy facilities are specifically excluded from the designated critical habitat and whether this includes powerhouse number 3 on Mill Creek in Unit 1B.

Our Response: We have clarified the language in the final rule to specifically exclude energy production facilities from the critical habitat designation. However, stream channels adjacent to energy production facilities within the geographical boundaries of the critical habitat designation that contain one or more of the primary constituent elements are considered critical habitat. Unit 1B, which includes Mill Creek, has been removed from the revised critical habitat designation.

Issue 3: Comments on Science

(33) Comment: Information used in designating critical habitat was inaccurate, insufficient, and not the best available data.

Our Response: We believe we used the best available commercial and scientific data to designate critical habitat for the sucker, including peer-reviewed primary source journal articles, expert opinions, species survey reports, project reports, and other scientific studies. All new information provided during the public comment periods was considered in this final designation as appropriate.

Issue 4: Procedural and Legal Comments

(34) Comment: The Service cannot exclude lands covered by conservation plans from critical habitat if those plans use public funds and lands to mitigate the taking of threatened and endangered species by private applicants for private purposes.

Our Response: Section 4(b)(2) of the Act allows the Service to exclude any area from critical habitat if the Service determines the benefits of such exclusion outweigh the benefits of designating such area as critical habitat, unless, based on the best scientific and commercial data available, the Service determines that failure to designate the area as critical habitat will result in the extinction of the species. Exclusions under section 4(b)(2) can be based on INRMPs, HCPs, and formal conservation plans, or other relevant considerations. In the case of HCPs and other formal conservation plans, the Service must determine that the plan provides conservation benefit to the species, and assurances that the management plan will be implemented and the conservation effort will be effective. The Service is not prohibited from excluding lands covered by plans using public funds or public lands if the plan meets the aforementioned criteria.

(35) Comment: The Service unlawfully pre-determined that the exclusion of essential sucker habitat from designated critical habitat outweighs any benefit.

Our Response: We issued the final rule (69 FR 8839) designating critical habitat for the sucker without the opportunity for public comment, because we found it would be impracticable and contrary to the public interest to delay the effective date of the final rule (see comment 37 for further details). In the proposed rule (69 FR 8911) that was published concurrently with the final rule, we specifically solicited comments from the public on the exclusion of essential habitat from the critical habitat designation. If additional information had been submitted during the comment period indicating that the conservation plans on which these exclusions were based were not conserving the sucker, we could have re-proposed critical habitat for the excluded areas. However, we did not receive any comments to that effect. Furthermore, the Western Riverside MSHCP has been finalized and an Incidental Take Permit has been issued for this plan. Significant progress has been made in the ongoing formal consultation with the U.S. Army Corps of Engineers (the Corps) on the SAS Conservation Program and we expect to issue a biological opinion on this program shortly. Therefore, we have excluded these areas of essential habitat from the critical habitat designation as allowed under section 4(b)(2).

(36) Comments: The Service did not comply with the National Environmental Policy Act (NEPA). Under NEPA, an Environmental Impact Statement or an Environmental Assessment must be prepared.

Our Response: Environmental impact statements and environmental assessments, as defined under NEPA, are not required for regulations enacted under section 4 of the Act (see 48 FR 49244; October 25, 1983). We published a notice outlining our reasons for this determination in the Federal Register on October 25, 1983 (48 FR 49244).

(37) Comment: The rights of concerned citizens were violated because they were not allowed to participate in the rule-making process.

Our Response: The Service published the previous final rule designating critical habitat for the sucker (69 FR 8839) without providing an opportunity for the public to comment under the good cause exemption of the Administrative Procedure Act (APA). Section 553(b)(B) of the APA recognizes an exemption to the public comment requirements. The Service issued the final rule designating critical habitat for the sucker without the opportunity for public comment, because we found it would be impracticable and contrary to the public interest to delay the effective date of the final rule (see comment 37 for further details). The Service also provided the opportunity for the public to comment on the proposed rule identical to and issued concurrently with the final rule. We have reviewed and responded to the substantive comments that we received by the deadline of the each of the 4 public comment periods. Based on these comments, we have revised the final rule to reflect corrections and modifications to the final rule designating critical habitat for the sucker as appropriate.

(38) Comment: The Service failed to hold formal public hearings as required under section 556 and 557 of title 5 of the APA. In addition, all settlements resulting from ongoing negotiations with the Service should be made part of the administrative record for this critical habitat designation.

Our Response: Section 553(d) of the APA allows publication of a final rule to take effect immediately upon publication if the agency finds good cause for doing so and provides the reasoning in the final rule. In the final rule published on February 26, 2004, designating critical habitat for the Santa Ana sucker, we stated that we found good cause to make the final rule effective immediately upon publication for reasons outlined in the response to comment 37. Delaying publication of the rule to hold public hearings would have been impracticable and contrary to the public interest at that time (69 FR 8840). We subsequently held a public hearing on the proposed rule--which was identical to and published concurrently with the final rule--on September 9, 2004. Therefore, we have complied with the requirements of the APA and the Act.

(39) Comment: The Service can publish a rule that is effective immediately only if the Service has determined the sucker requires emergency protection. If the Service publishes a rule that is effective immediately, the Service must incorporate reasons for the emergency determination into the final rule. Since there was no justification for emergency designation included in the publication of the final rule, the final rule is invalid and unenforceable.

Our Response: Section 553(d) of the APA allows publication of a final rule to take effect immediately upon publication if the agency finds good cause for doing so and provides the reasoning in the final rule. In the final rule published on February 26, 2004, designating critical habitat for the Santa Ana sucker, we stated that we found good cause to make the final rule effective immediately upon publication for the following reasons: (1) To comply with the district court's order; (2) to conduct section 7 consultations and prepare written concurrences regarding projects funded, permitted, or carried out by Federal agencies that may affect the Santa Ana sucker or its essential habitat; (3) to ensure those activities will not jeopardize the continued existence of the species; and (4) to ensure Federal agencies can comply with the requirements of the Act, including section 9. Delaying the effective date of the rule would have been impracticable and contrary to the public interest (69 FR 8840). We complied with the requirements of the APA and the Act and therefore the rule is valid and effective. The Service did not issue the final rule based on an emergency finding requiring immediate designation of critical habitat for the sucker.

(40) Comment: Data were not made available for public review.

Our Response: As stated in the proposed and final critical habitat rules published on February 26, 2004, the supporting information for the rules is available to the public for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service office in Carlsbad, California.

(41) Comment: The designation of critical habitat in the Santa Ana and San Gabriel Rivers, and the Big Tujunga Creek will limit the ability of flood control agencies and water conservation districts from maintaining sufficient flood protection and water supplies.

Our Response: The designation of critical habitat does not prevent public agencies from implementing flood control protection and water conservation actions. If these actions require a Federal permit, funding, or permission and if the Federal agency determines that these actions may adversely modify designated critical habitat, the Federal agency must request consultation with the Service prior to initiating that action.

(42) Comment: The designation of critical habitat should not preclude cooperative conservation efforts implemented in concert with actions that may adversely affect the sucker.

Our Response: We encourage cooperative conservation efforts by private individuals, organizations, and local, county, State, and Federal government agencies. We will continue to work with Federal, State, and local entities and private individuals to minimize project-related impacts to the sucker and its habitat.

Issue 5: Misinterpretation of the Original Final Rule

(43) Comment: The Service unfairly exempted Federal agencies and private individuals from the requirements of critical habitat.

Our Response: In the previous final rule, the Service did not exempt Federal agencies or private individuals from regulations regarding critical habitat. Instead, the Service described potential Federal actions that may be affected by the critical habitat designation or that may affect critical habitat. If a Federal agency determines their action may affect critical habitat, then they will be required to consult with the Service under section 7 of the Act. Private individuals do not have to consult with the Service if their actions may affect critical habitat unless their actions are permitted or funded by a Federal agency. However, private individuals should consult with the Service if their actions have the potential to result in take of individual suckers and therefore violate section 9 of the Act.

(44) Comment: The critical habitat designation will result in the closure of the National Forest lands to the public resulting in significant effects to many recreational users.

Our Response: The designation of critical habitat does not require the Forest Service to close critical habitat areas within the National Forest to the public. The Forest Service will be required to consult with the Service under section 7 of the Act, if they determine that any of their actions may adversely modify critical habitat. However, we intend to continue working with the Forest Service to minimize any impacts to the sucker and its habitat that may result from recreation activities.

Issue 6: Comments on Economic Analysis or Lack of Economic Analysis

(45) Comment: The Service violated the Act because it did not complete an economic analysis prior to issuing a final critical habitat rule, and therefore the rule should be vacated.

Our Response: As previously stated (see response to comments 35 and 37), we dispensed with the notice and comment period for the final designation of critical habitat under the good cause exemption of the APA (69 FR 8839), while concurrently publishing the proposed rule to allow for public comment. In the proposed rule (69 FR 8911), we announced our intention to prepare an economic analysis and seek public review and comment on the economic analysis.

(46) Comment: Several comments objected to the short timeframe allowed for comments and the lack of immediate availability of the draft economic analysis online.

Our Response: We had two comment periods for the draft Economic Analysis, the first for 10 days and the second for 30 days. A Notice of Availability (NOA) was published in the Federal Register on October 1, 2004 (69 FR 58876) opening a 10-day public comment period on the economic analysis. On October 25, 2004, we published another notice in the Federal Register (69 FR 62238) reopening a 30-day comment period on the draft economic analysis and the proposed designation. All comments on the economic analysis have been incorporated into the final economic analysis and the revised final rule as appropriate.

(47) Comment: Two groups suggested that prior written comments they had submitted concerning the economic impacts of the Santa Ana Sucker critical habitat designation were not addressed by the draft economic analysis.

Our Response: Northwest Economic Associates (NEA) and the Service reviewed all of the previously submitted comments in the course of preparing the draft economic analysis. The comments provided useful insight into potential economic effects of the listing and designation of critical habitat for the sucker. However, in some cases, further research revealed that the economic effects could not be substantiated through available information or that the effects were considered too speculative to be considered reasonably foreseeable. For example, one commenter noted that private lands within critical habitat that are dedicated for recreational purposes but not excluded will require "re-evaluation of [previously approved] private projects." This re-evaluation would result in assessment of an "appropriate fee," with an effect of "greater than 100 million dollars." The authors found no evidence that such a fee would result from designation of critical habitat. In other cases, the draft economic analysis included costs that were not addressed by prior written comments.

(48) Comment: One comment suggested that the amenity values estimates should appear in the main report, not an appendix.

Our Response: See response to Comment 49.

(49) Comment: One comment suggested that the amenity values as analyzed are highly conservative and that a broader range should be presented, using a broader range of assumptions.

This comment also stated that other benefits, such as indirect or non-use benefits, should be analyzed as well. It also criticized the use of different accounting standards in the evaluation of benefits (amenity values) and costs.

Our Response: We appreciate the comment in support of the approach used in the DEA to estimate some of the economic benefits that may be associated with designating riparian corridors as critical habitat for the SAS. However, after further consideration and consultation with the Office of Management and Budget (OMB), we have decided that this approach does not fully meet the minimum standards required by OMB in estimating the potential economic benefits of a proposed Federal action. OMB Circular A-4 stresses that the Benefit-Transfer method, which was the approach used in the DEA, should only be used as a last-resort option to measuring benefits and should not be used without explicit justification. The underlying rationale for this reasoning is that while the Benefit-Transfer method can provide a quick, low-cost approach for obtaining desired monetary values (as opposed to collecting original data), the methods are often associated with uncertainties and potential biases of unknown magnitude.

Circular A-4 is very specific in the criteria that must be satisfied in order to use the Benefit-Transfer method. Criteria include using studies that are based on adequate data, sound and defensible empirical methods and techniques, and ensuring that the studies relied upon are measuring similar values that do not have unique attributes. In the DEA, we relied on two studies (Colby and Wishart 2002, Streiner and Loomis 1995) the first measuring the property value premium riparian areas generate for nearby landowners in the arid West, the second measuring the benefits incurred by nearby landowners associated with restoring degraded urban streams. Neither study, it was determined after consultation with OMB, fully met the necessary criteria to base an assessment of the potential economic benefits of SAS critical habitat designation. In the Colby study, concern was expressed over the statistical robustness of the overall model. Concerns over the Loomis study focused on the fact that the measurement of the value associated with restoring degraded riparian corridors was not equivalent to the designation of critical habitat, which essentially recognizes healthy riparian corridors that can support the species. While we attempted to address these and other concerns in the DEA, we were not able to fully satisfy all of the necessary criteria that would allow us to transfer the findings of these two studies to the SAS.

In future analyses we will continue to investigate the appropriateness of using existing data to estimate the economic benefits of critical habitat designation. However, even if we are able to credibly measure such effects, we continue to believe that in carrying out our duty under section 4(b)(2) of the Act that the benefits associated with designating any particular area as critical habitat are best expressed and considered in biological terms.

(50) Comment: One comment questioned the failure of the draft economic analysis to address economic impacts to the mining industry. An independent report on potential economic impacts was attached to this comment in support.

Our Response: The draft economic analysis considered impacts to the sand and gravel mining industry. Sand and gravel are important resources in southern California that support development activities such as residential and commercial construction and road building. Due to the costs of transporting the material, sand and gravel mines tend to be located in areas relatively near development. Some of these mines have historically been, and continue to be, located within flood plains and can directly impact sucker habitat. The upper Santa Ana River area has had mining activities for many years.

The boundaries of the proposed critical habitat exclude existing mining activities and the Service has indicated that no burdens will be imposed on existing facilities that operate according to historic practices, as discussed in the draft economic analysis. The independent report suggests the possibility of future expansion of mining activities within Unit 1B. The Corps has received no request for permits to expand operations within the proposed critical habitat. There has only been one emergency consultation associated with sand and gravel mining since the sucker was listed, and it was conducted to protect a bridge and did not involve an ongoing commercial operation. While it is true that new mining activity is being considered within Unit 1B, there is no information with which to demonstrate economic effects. An HCP that will cover mining activities is in the initial stages of development but lacks sufficient detail to base reasonable predictions on how the critical habitat designation for the sucker will affect new mining activities within Unit 1B. However, the HCP has not yet specifically considered the Santa Ana sucker, and therefore no documentation is available to suggest additional conservation measures that may need to be adopted. Furthermore, Unit 1B is not included in the revised critical habitat designation.

(51) Comment: One comment questioned the failure of the draft economic analysis to address economic impacts of the water conservation project at Seven Oaks Dam in Unit 1B.

Our Response: The draft economic analysis considered potential economic impacts to the proposed water conservation project. According to the Corps, Seven Oaks Dam has not been permitted as a water conservation facility. Its primary purpose is for flood control. Several agencies have pursued the idea of using Seven Oaks as a source of municipal water supply. For example, a letter dated December 11, 2000 from the Service to the Corps attached to the comment letter refers to actions by the Corps and the San Bernardino Valley Municipal Water District indicating that water conservation activities are reasonably certain to occur and that the application accompanying the petition to revise the appropriation of the Santa Ana River requests the right to store up to 50,000 acre-feet per annum in the reservoir formed by Seven Oaks Dam. However, recent discussions with the Corps suggest that no decisions to change the dam's purpose have been finalized. It is uncertain whether Seven Oaks Dam will be permitted for water conservation with or without critical habitat designation for the sucker. Furthermore, the Service has indicated that it will not require conservation measures unless the releases from the dam are altered from past practices. There is no indication how and if the flow regime will be altered even if the dam is used to provide additional water supply to municipalities. Furthermore, we find no evidence that the Corps is proposing a change of use of the facility to include water conservation.

(52) Comment: One comment stated that the although they believe the draft economic analysis underestimates the full economic impact of critical habitat designation, the estimates contained in the analysis still support the exclusion of Unit 1B as benefits do not outweigh costs.

Our Response: The draft economic analysis did consider the effects of mining and water conservation as described above. Also as discussed above, we did consider the economic and other impacts of the designation when we issued our interim rule, however we also conducted an economic analysis to more fully consider these impacts.

(53) Comment: Two groups asserted that the draft economic analysis mischaracterizes the San Gabriel Canyon OHV Area status, and expressed a desire to have local efforts toward sucker recovery be included in the draft economic analysis.

Our Response: The draft economic analysis included efforts to properly characterize the status of OHV use in the San Gabriel Canyon. In response to the Santa Ana sucker's listing and critical habitat designation, the Forest Service has installed information signs in the OHV area. In the OHV staging area, there are some educational brochures available with general information on acceptable and unacceptable behaviors. There is also a kiosk with informational signs relating to the sucker. In the past three years, the Forest Service has coordinated with the Service and California Department of Fish and Game (CDFG) to develop "avoidance criteria" for OHV users at San Gabriel OHV Park, to include the elimination of two stream crossings and the placement of rock and boulders along the riverbank to prevent people from driving into the river. Patrols have increased in sensitive areas, especially during weekends. The Forest Service also has worked with the local OHV club to develop sucker education programs. In addition to the Forest Service efforts, the OHV club is self-policing its members. The OHV club has placed at least one vehicle and drivers per weekend at the San Gabriel OHV Area for the past several years. The draft economic analysis included costs associated with efforts by local OHV groups to provide protection measures and minimize impacts to sucker habitat (pp. 75-78). These costs are shown in Tables 30 and 31 of the draft economic analysis.

(54) Comment: Two groups claim that mitigation of other projects, such as dams, is incorrectly described within the draft economic analysis and that the costs of mitigation are understated.
Our Response: There are five flood control dams and multiple hydroelectric facilities operating in and around the essential habitat units for the sucker. The economic effects on these operations were quantified in Section 6.6 of the draft economic analysis.

(55) Comment: Two groups suggest that the draft economic analysis should address recovery.

Our Response: Economic analyses only address cost associated with designation of critical habitat, as required by the Act.

(56) Comment: One group suggests that the draft economic analysis findings support the inclusion of all areas currently designated as critical habitat for the sucker.

Our Response: The Secretary considers the draft economic analysis along with other information in determining whether the benefits of excluding particular areas from a revised final critical habitat designation outweigh the biological benefits of including those areas in a revised final designation.

(57) Comment: One comment from the Santa Ana Watershed Project Authority provided a number of details on the Santa Ana Regional Interceptor (SARI) line to correct information presented in the draft economic analysis. The comment noted the difficulty in estimating costs for a project that is still conceptual and suggests that the ultimate design choice will likely result in costs "significantly less" than those in the draft economic analysis.

Our Response: We appreciate the comment from the watershed authority. The draft economic analysis was based at the time on the information obtained through the Corps, Orange County Sanitation District, and public information about the line available through the internet. The analysis recognizes that a variety of alternatives are under consideration at this time and that associated construction cost estimates are preliminary. However, because the commenter did not provide any specific new estimates, we will rely on those presented in the draft economic analysis, with the understanding that they may overstate actual final costs should one of the design alternatives be implemented.

(58) Comment: The County of Los Angeles Department of Public Works submitted a very detailed comment letter addressing a number of specific areas in the draft economic analysis. This letter was received after the deadline for comments. Nevertheless, the comments are addressed below.

Our Response: The County of Los Angeles Department of Public Works (Public Works) provides several comments that argue for exclusion of Unit 3, Big Tujunga Creek. In addition, Public Works provides several comments that can be addressed through minor changes and additions to the text in the draft economic analysis and do not result in changes to estimated economic effects. Public Works expressed concern that future utilization of sediment placement sites may be affected by sucker conservation activities. However, there is no evidence from past consultations to suggest that current sediment placement sites will be affected or will be the subject of future consultations. In the comment letter, Public Works speculates that future sucker conservation activities will affect the availability of water conservation storage in San Gabriel Reservoir. However, as stated in the draft economic analysis, no conservation measure or ponding restrictions are anticipated as protection measures for the sucker. Consequently, it was considered to be reasonable to exclude water conservation losses in San Gabriel Reservoir in the draft economic analysis.

Several of the comments from Public Works addressed sediment removal activities. Public Works stated that the draft economic analysis failed to mention the sediment management plan for Cogswell Reservoir and associated sucker conservation activities. While the draft economic analysis does not mention the plan or consider sucker-related costs, the authors believe that the conservation measures discussed in the comment letter would be implemented with or without the sucker listing and critical habitat designation. It appears that these measures were in place prior to the sucker listing and that they were instituted for the benefit of a number of fish species and have not been altered to specifically address the Santa Ana sucker. Public Works states that periodic cleanouts of Big Tujunga Reservoir will also be necessary in the future and that annual monitoring of the sucker will likely be required as a result. This is new information that was not considered in the draft economic analysis, as it was received after the close of the comment period. Public Works estimates that annual sucker-related costs for the routine cleanouts, which will occur once every ten years, will be $82,350.

Public Works also contends that ongoing costs associated with the Big Tujunga Wash Mitigation Bank should be included in the economic analysis. Mitigation Bank costs were not included in the draft economic analysis because the site was purchased as mitigation for flood control activities prior to the sucker listing. Furthermore, it appears that the activities related to the Mitigation Bank cited in the comment letter would have occurred with or without the sucker listing and critical habitat designation. While it is possible that a small portion of the costs of these activities could be attributed to sucker-related conservation activities, the consultation history reveals that these activities presented only minor concerns for the sucker.

Finally, Public Works argues for inclusion of potential impacts to energy supply at San Gabriel Dam and provides an estimate of losses between $300,000 and $1 million annually. However, Public Works admits that it is "not aware of any final Santa Ana Sucker Conservation Strategy adopted yet for the San Gabriel River." The estimates of hydropower losses are contingent upon hypothetical reservoir level restrictions. Such restrictions have not been imposed and there is little indication to suggest that they will be imposed in the foreseeable future.

(59) Comment: Public Works states that the draft economic analysis does not fully consider the economic costs of components of private development projects that are transferred to public agencies for management.

Our Response: The draft economic analysis utilized the development mitigation costs as presented in the Western Riverside MSHCP as a means of estimating economic costs of private development. These costs are considered to be representative of the full costs of mitigation, including ongoing management. While there may be some additional costs associated with ongoing operation and maintenance of specific components of development projects, at this time there is inadequate information available to support their inclusion in the draft economic analysis.

(60) Comment: Public Works states that the effects on road maintenance and transportation are underestimated in the analysis because it only considers costs related to past transportation projects, noting: "There were only 4 past project[s], all of which were related to Bridge Projects."

Our Response: The draft economic analysis considered a broader approach in estimating future costs. Future projects were estimated using Geographic Information System (GIS) coverage of past Corps permitting within the Santa Ana sucker critical and essential habitat boundaries to identify projects occurring within sucker habitat. In total, 49 Corps permits were issued within sucker habitat between 1999 and 2003. All permits involving construction and maintenance of transportation facilities were selected from this list. In total, ten permits were issued for transportation projects over the five-year period. Thus, the draft economic analysis considers future sucker-related costs on transportation activities by assuming that past permits are appropriate indicators of future costs. Public Works further contends that affected transportation projects are likely to increase in the future. However, no evidence was uncovered during research for the draft economic analysis to support this conclusion.

(61) Comment: One comment notes that "the ensuing analysis on small entities [addressed in Appendix A] appears to not include costs to the Corps and Public Works. The comment quotes Paragraph 3 of Page A-4, which includes: "There are five flood control dams operating in and around the critical and essential habitat units for the sucker... The facilities are operated by the U.S. Army Corps of Engineers or owned by [Public Works], and do qualify as small entities."

Our Response: Although the authors acknowledge the quote on Page A-4, the statement in the draft economic analysis is in error. The last sentence should state, "The facilities are operated by the USACE or owned by the LADPW, and do not qualify as small entities." The analysis remains unchanged, as these facilities exceed the size standards for small entities, and were properly omitted from the analysis.

Summary of Changes From the Proposed Rule and the Original Final Rule

On the basis of public comments, we reviewed our description and delineation of critical habitat in the Big Tujunga Creek and the San Gabriel and Santa Ana Rivers. Using information provided in these comments and obtained from field work, we removed Little Tujunga Creek upstream of its confluence with Big Tujunga Creek in Los Angeles County from the critical habitat designation in Unit 3, Big Tujunga Creek. We also refined the text to accurately reflect the critical habitat designation in the San Gabriel River. The text in the proposed rule stated that the upper boundary of Unit 2 along the East Fork of the San Gabriel River in Los Angeles County extended to the Bridge-of-No-Return. However, this upper boundary was not delineated on the map or the legal description of this unit. While this area is essential to the conservation of the species, it cannot be included in the revised final rule since it was never actually proposed.

We also removed proposed units 1A and B from the designation. Units 1A and 1B were proposed because are a source of sediment for the occupied portion of the Santa Ana River. This sediment, which is composed of cobble, gravel, and sand, provides spawning and feeding substrates for the sucker downstream of the proposed units. They were also proposed due to their conveying flood waters to help maintain variability in the hydrological system downstream, because they support riparian vegetation that provides organic nutrients and woody debris which becomes food for the species downstream, and because potions were historically, but not currently, occupied.

However, these attributes do not, of themselves, warrant determining that an area is "essential to the conservation of the species", which is the statutory standard for designation of unoccupied areas. There are many things--indeed, an almost endless range of possibilities--which contribute to the maintenance of primary constituent elements or otherwise provide a beneficial influence to areas designated as critical habitat. That does not warrant also designating the areas from which they originate, or pass through, as critical habitat.

In fact, Congress has instructed us to be "exceedingly circumspect" in designating critical habitat outside of areas currently occupied by the species (House Report 95-1625). With that guidance in mind, we do not find these unoccupied areas essential to the conservation of the species, and so have not designated them as critical habitat.

Overall, these changes resulted in reducing the designated critical habitat by 12,824 ac (5,190 ha). Table 1 outlines the changes in acreages for each unit between the original and revised final rules.

Table 1.--Changes in Acreages (ac; ha) for Each of the Units Between Original and Revised Final Rules

Unit	Original final rule	Revised final rule
Santa Ana River, San Bernardino County (Units 1A and 1B).	11,709 ac (4,738 ha).	0 ac (0 ha)
San Gabriel River, Los Angeles County (Unit 2).	5,765 ac (2,333 ha).	5,765 ac (2,333 ha)
Big Tujunga Creek, Los Angeles County (Unit 3).	3,655 ac (1,479 ha).	2,540 ac (1,028 ha)
Total..................	21,129 ac (8,551 ha).	8,305 ac (3,361 ha)

Critical Habitat

Please refer to the previous final rule designating critical habitat for the Santa Ana sucker for a general discussion of sections 3, 4, and 7 of the Act and our policy in relation to the designation of critical habitat (69 FR 8839).

Methods

As required by section 4(b) of the Act and its implementing regulations (50 CFR 424.12), this rule is based on the best scientific and commercial data available concerning the species' current and historical range, habitat, biology, and threats. In preparing this rule, we reviewed and summarized the current information available on the Santa Ana sucker, including the physical and biological features essential for the conservation of the species (see "Primary Constituent Elements" section), and identified the areas containing these features. We also identified areas outside the geographic range of the species that are essential for its conservation. These areas contribute sediment necessary to maintain breeding and feeding substrates in occupied areas. The information used in the preparation of this designation includes: site-specific species and habitat information collected and/or maintained by the Service; the California Natural Diversity Database (CNDDB); unpublished survey reports, notes, and communications with qualified biologists or experts; peer reviewed scientific publications; the Angeles National Forest Santa Ana Sucker Conservation Strategy (U.S. Forest Service 2003); the SAS Conservation Program (Conservation Team 2003); the final listing rule for the sucker published April 12, 2000 (65 FR 19686); and discussions and recommendations from Santa Ana sucker experts.

Primary Constituent Elements

In accordance with sections 3(5)(A)(i) of the Act and regulations at 50 CFR 424.12, in determining which areas to designate as critical habitat, we are required to base critical habitat determinations on the best scientific and commercial data available and to focus on those physical and biological features (primary constituent elements) essential to the conservation of the species and may require special management considerations or protection. These primary constituent elements include, but are not limited to: space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing (or development) of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

Much of what is known about the physical and biological requirements of Santa Ana sucker was described in the previously published final rule designating critical habitat for the species (69 FR 8839). The primary constituent elements for the Santa Ana sucker were determined by reviewing studies examining the habitat requirements and ecology of the sucker in the Santa Ana River (Allen 2003; Baskin and Haglund 2001; Haglund et al. 2003; Haglund et al. 2004; Saiki 2000; Swift 2001), the San Gabriel River (Saiki 2000; Haglund and Baskin 2002; Haglund and Baskin 2003), and the Santa Clara River (Greenfield et al. 1970). Designated critical habitat has been designed to provide sufficient habitat to maintain self-sustaining populations of sucker throughout its range, and to provide those physical or biological features essential for the conservation of the species. These physical or biological features provide for the following: (1) Space for individual and population growth and for normal behavior (primary constituent elements 1, 2, 3, and 6); (2) food, water, air, light, minerals, or other nutritional or physiological requirements (primary constituent elements 1, 2, 3, 4, 5, and 6); (3) cover or shelter (primary constituent elements 2 and 6); (4); sites for breeding, reproduction, and development of offspring (primary constituent elements 1, 2, 3, and 6); and (5) habitats that are representative of the historic geographical and ecological distribution of the species (primary constituent elements 1, 2, 3, 4, 5, and 6). Based on the occurrence of this species and associated biological information, all of these physical or biological features are essential to the conservation of the species.

We believe conservation of the Santa Ana sucker is dependent upon multiple factors, including the conservation and management of areas to maintain "normal" ecological functions where existing populations survive and reproduce. The areas we are designating as critical habitat provide some or all of the physical or biological features essential for the conservation of this species. Based on the best available information, the primary constituent elements essential for the conservation of the sucker are the following:

(1) A functioning hydrological system that experiences peaks and ebbs in the water volume reflecting seasonal variation in precipitation throughout the year;

(2) A mosaic of loose sand, gravel, cobble, and boulder substrates in a series of riffles, runs, pools, and shallow sandy stream margins;

(3) Water depths greater than 3 cm (1.2 in) and bottom water velocities greater than 0.03 m per second (0.01 ft per second);

(4) Non-turbid water or only seasonally turbid water;

(5) Water temperatures less than 30°C (86°F); and

(6) Stream habitat that includes algae, aquatic emergent vegetation, macroinvertebrates, and riparian vegetation.

Based on the specific biological and physical requirements of this species, critical habitat units contain many of the same physical and biological features. Management, therefore, will address both the maintenance of these features and the reduction of threats specific to each critical habitat unit.

Criteria Used To Identify Essential Habitat

We considered several factors in selecting areas essential to the conservation of the Santa Ana sucker. We reviewed all streams and rivers currently occupied by the sucker and those areas outside of the current geographical distribution supporting one or more of the primary constituent elements.

We analyzed the known historical and current distribution of suckers based on data from the Carlsbad Fish and Wildlife Office internal geographic information systems (GIS) database, California Natural Diversity Database (CNNDB), Los Angeles County Museum Ichthyology Catalog, and the Fish Division of the University of Michigan Museum of Zoology. We also reviewed various scientific articles and reports on the Santa Ana River (Allen 2003; Baskin and Haglund 2001; Haglund et al. 2003; Haglund et al. 2004; Saiki 2000; Swift 2001), the Big Tujunga Creek (Haglund and Baskin 2001; Holland and Swift 2002), and the San Gabriel River (Saiki 2000; Haglund and Baskin 2002; Haglund and Baskin 2003).

Historically occupied river stretches that have been highly modified by the construction of canals with concrete-lining on sides and bottoms were not considered essential habitat. Other historically occupied habitat no longer providing primary constituent elements were eliminated from this analysis. We selected areas essential for the conservation of the sucker based on the potential for restoration and the presence of one or more of the primary constituent elements in currently occupied and potentially occupied habitat. We eliminated the Santa Clara River population in Ventura and Los Angeles counties from this analysis because it does not appear to represent a native population of the Santa Ana sucker (and it is not listed). We determined that streams, rivers, and associated riparian habitat within the Santa Ana River, San Gabriel River, and Big Tujunga Creek and associated tributaries provide essential habitat for the sucker.

We then considered if this essential area was adequate for the conservation of the Santa Ana sucker, and concluded that it is. The greatest threat to the conservation of the sucker lies in the human-generated alteration of the function, physical structure, water supply, and water quality of existing habitat. The physical structure of and water supply to each of the three currently occupied streams have been altered by flood control structures (e.g., dams, drop structures, concrete-lined channels), and water conservation operations. In addition to these easily identifiable threats, pollution and water quality standards that are not protective of the sucker also threaten the survival and recovery of the species.

We used the best available scientific and commercial information to determine which areas are essential to the conservation of the sucker. However, we recognize that the historic and recent collection records for this species are incomplete. River segments or small tributaries not included in this final designation may harbor small limited populations of the sucker or may become occupied in the future. The exclusion of such areas does not diminish their potential individual or cumulative importance to the conservation of the species. We believe that proper management of each of the three designated critical habitat units will provide lasting conditions capable of supporting sucker populations and allow for assisted or natural dispersal into adjacent streams in each watershed.

We will continue (with the assistance of State, Federal, and private researchers), to conduct surveys, research, and conservation actions on the species and its habitat in areas designated and not designated as critical habitat. When additional scientific information becomes available on the species' biology, distribution, and threats, we will evaluate the need to revise critical habitat or refine boundaries of critical habitat as appropriate. Areas occupied by this species that are not designated as critical habitat will continue to receive protection under the Act's section 7 jeopardy standard where a Federal nexus may occur (see "Critical Habitat" section).

Mapping

We determined that three units are essential to the conservation of Santa Ana sucker, and are designating critical habitat in 2 of those units. The third unit consists entirely of essential habitat that is being excluded pursuant to section 4(b)(2) of the Act (see Exclusions Under Section 4(b)(2) of the Act for a detailed discussion of this exclusion). We used site-specific information to determine the extent of these units. The designated critical habitat units were delineated by screen digitizing polygons (map units) using ArcView, a computer GIS program. Based on the known distribution of the sucker, the dynamics of alluvial floodplain systems, and riparian habitat associated with rivers and streams, we placed boundaries around the species' locations, as well as their primary constituent elements. In defining these critical habitat boundaries, we made an effort to exclude all developed areas, such as housing developments, active mines, and other lands unlikely to contain the primary constituent elements essential for the conservation of the sucker. We used Universal Transverse Mercator (UTM) zone 11, North American Datum 1927 (NAD27) coordinates in meters (m) to designate the boundaries of critical habitat.

Need for Special Management Considerations or Protection

Areas occupied by the species and designated as critical habitat contain one or more of the primary constituent elements essential to the conservation of the species (see "Primary Constituent Elements" section). Unoccupied areas that contain one or more of the PCEs are also included in the designation. When designating critical habitat, we assess whether the areas containing PCEs may require special management considerations or protections. Regulations at 50 CFR 424.02(j) define special management considerations or protection to mean any methods or procedures useful in protecting the physical and biological features of the environment for the conservation of listed species. Critical habitat designations apply only to Federal activities or those funded or authorized by a Federal agency.

All critical habitat units identified in this final designation may require special management considerations or protection to maintain a functioning hydrological regime consisting of a mosaic of loose sand, gravel, and cobble substrates; channel morphology (i.e., runs, riffles, pools, and stream margins); sufficient water quality, volume, and depth; and complex native stream associations involving algae, aquatic emergent vegetation, macroinvertebrates, and riparian vegetation. Each designated unit is threatened by activities that may result in the alteration of the hydrological system, reduced water quality or supply, loss of suitable substrates for spawning and feeding, loss of complex floral and faunal associations, and an increase in populations of nonnative predatory and competitive species.

We have determined the critical habitat units may require special management or protection, due to the existing threats to this fish, and because no long-term protection or management plans exist for any of the units. Absent special management or protection, these three units are susceptible to existing threats and activities such as the ones listed in the "Effects of Critical Habitat" section, which could result in degradation and disappearance of the populations and their habitat.

Critical Habitat Designation

We determined that three units are essential to the conservation of Santa Ana sucker, and are designating critical habitat in 2 of those units. The third unit consists entirely of essential habitat that is being excluded pursuant to section 4(b)(2) of the Act (see Exclusions Under Section 4(b)(2) of the Act for a detailed discussion of this exclusion).

Essential Habitat Excluded From Critical Habitat (Unit 1) for Santa Ana Sucker, Orange, Riverside, and San Bernardino Counties, California (15,414 ac (6,238 ha))

The Santa Ana River essential habitat excluded from designation includes the mainstem of the Santa Ana River from the confluence of Mission Channel and the Santa Ana River downstream to the vicinity of the Route 90 crossing and portions of Prado Basin, as identified in the map titled "Essential habitat excluded from critical habitat (Unit 1) for Santa Ana Sucker" in the Regulations Promulgation section. The Santa Ana River supports one of three listed populations of the Santa Ana sucker. Approximately 60 percent of the total remaining range of the listed Santa Ana sucker is in the Santa Ana River (65 FR 19686).

The occupied essential habitat has been excluded from designation because they fall within the Western Riverside MSHCP (Riverside County) and the SAS Conservation Program (Orange, Riverside, and San Bernardino counties). The basis for these exclusions are summarized in the section entitled "Exclusions Under 4(b)(2)".

Critical Habitat Unit Descriptions

We are designating two critical habitat units encompassing 8,305 ac (3,361 ha) of streams and rivers in Los Angeles County. We are designating critical habitat on lands having one or more of the primary constituent elements as described above. Lands designated as critical habitat are under Federal (6,356 ac (2,573 ha)) and private (1,949 ac (790 ha)) ownership. For each stream reach identified as a critical habitat unit, the up- and downstream boundaries are described in general in the unit descriptions below; more precise latitudinal and longitudinal (UTM) coordinates for the unit boundaries are provided in the Regulation Promulgation section of this rule. Habitat areas contained within the designated units constitute our best evaluation of areas essential for the conservation of the sucker. Critical habitat for the sucker may be revised should new information become available.

We have designated critical habitat in Los Angeles County. We determined that essential habitat for the Santa Ana sucker occurs in four counties (Los Angeles, Orange, Riverside, and San Bernardino counties). Essential habitat for the Santa Ana sucker in Riverside, Orange, and portions of San Bernardino counties is being excluded from critical habitat designation under section 4(b)(2) of the Act (See Exclusions Under 4(b)(2) of the Act for a detailed discussion of these exclusions).

To provide determinable legal descriptions of the critical habitat boundaries, we drew polygons around these units. Criteria used to delineate the unit boundaries included the primary constituent elements, the known extent of the populations, and the extent of riparian vegetation on an aerial image. We made an effort to avoid developed areas that are unlikely to contribute to the conservation of Santa Ana sucker. Areas within the boundaries of the mapped units such as paved roads, bridges, parking lots, railroad tracks, railroad trestles, and residential, commercial, and industrial developments including energy production facilities do not contain one or more of the primary constituent elements and are therefore not considered critical habitat for the sucker. Federal actions limited to these areas would not trigger consultation pursuant to section 7 of the Act, unless they affect the species or primary constituent elements in the critical habitat. The areas designated as critical habitat in Los Angeles County are under Federal and private ownership.

Unit 2: San Gabriel River Critical Habitat Unit, Los Angeles County, California (5,765 ac (2,333 ha)).

The San Gabriel River Unit (Unit 2) consists of the West, North, and East Forks of the San Gabriel River and the following tributaries: Cattle Canyon Creek, Bear Creek, Bichota Canyon Creek, and Big Mermaids Canyon Creek. The San Gabriel River portion of the unit extends from the Cogswell Dam on the West Fork to 3,882 ft (1,229 m; 0.77 miles; 1.21 kilometers) downstream of the Bridge-of-No Return on the East Fork, and just above the confluence of Coldbrook and Soldier creeks on the North Fork. Suckers occupy the West, North, and East Forks of the San Gabriel River and Cattle Canyon Creek, Bear Creek, and Big Mermaids Canyon Creek.

Approximately 15 percent of the total remaining range of the listed Santa Ana sucker is in the San Gabriel River (65 FR 19686). Approximately 15 percent of its distribution in the San Gabriel River Basin occurs on private lands, and the remaining 85 percent occurs in the Angeles National Forest (65 FR 19686).

The San Gabriel River Unit provides the best remaining habitat capable of sustaining the Santa Ana sucker. Data gathered during sampling indicated the San Gabriel River may contain the largest population of Santa Ana suckers (R. Ally, in litt. 1996; Mike Guisti, CDFG, in litt. 1996; M. Wickman, in litt., 1996; Juan Hernandez, CDFG, in litt. 1997; M. Saiki, pers. comm. 1999). Moyle and Yoshiyama (1992) considered the population of suckers in the San Gabriel River drainage to be the only viable population within the species' native range. This population is found in the relatively undisturbed watershed of the Angeles National Forest, unlike the population within the Santa Ana River which is within a highly urbanized watershed receiving significant urban and agricultural run-off. The high quality riparian habitat adjacent to the river and tributaries provide organic inputs essential to the maintenance of a healthy stream ecosystem (Diana 1995; Klapproth and Johnson 2000a; Sweeney 1993). The East and North Forks and associated tributaries are largely unimpeded by dams or other obstructions.

This is the only unit that has a sediment transport and hydrological regime existing in a relatively natural state. This unit supports a population occurring within a relatively intact watershed that provides good water quality, supply, and sediment transport. The inclusion of this area in critical habitat ensures the conservation of the only extant population of listed suckers that can avoid chronic exposure to urban run-off or tertiary-treated wastewater discharges, reduced water supply, and loss of feeding and spawning substrates. Lands designated as critical habitat may require special management to avoid and minimize activities associated with recreational off-road vehicle use, grazing, road, bridge, or dam construction and/or maintenance in the Angeles National Forest.

Unit 3: Big Tujunga Creek Critical Habitat Unit, Los Angeles County, California (2,540 ac (1,028 ha)).

The Big Tujunga Creek Unit (Unit 3) consists of the stretch of Big Tujunga Creek between the Big Tujunga Dam and Hansen Dam and the following tributaries: Stone Canyon Creek, Delta Canyon Creek, and Gold Canyon Creek. Haines Creek, a small stream within the floodplain of Big Tujunga Creek is also within this critical habitat designation. The Santa Ana sucker occupies the Big Tujunga Creek between Big Tujunga Dam and Hansen Dam. Please see "Summary of Changes From the Proposed Rule and the Original Final Rule" section for more details on the removal of Little Tujunga Creek from the critical habitat designation.

Approximately 25 percent of the total remaining range of the Santa Ana sucker is within Big Tujunga Creek (65 FR 19686). In Big Tujunga Creek, approximately 60 percent of the current range of the Santa Ana sucker occurs on private lands. The remaining 40 percent of the range occurs on Angeles National Forest lands managed by the Forest Service.

The upstream portion of this population in Big Tujunga Creek is largely contained within the Angeles National Forest. It is not exposed to the effects of urban run-off and tertiary treated wastewater discharge. This is the only unit supporting three of the remaining native freshwater fishes in southern California (Swift 1993). Although this ecological association is not well understood at this time, this fragile community may offer unique insights into the ability of the sucker to coexist with native and nonnative species in this ecosystem. This unit contains one or more PCEs and is also essential because it maintains habitat for the northernmost extent of the distribution of the Santa Ana sucker. The unit enhances the long-term sustainability of the sucker by maintaining its genetic adaptive potential and a well-distributed geographical range to buffer the sucker's particular vulnerability to environmental fluctuations and catastrophe (Moyle 2002).

Stone Canyon Creek, Delta Canyon Creek, and Gold Canyon Creek are not known to be occupied, but are essential to the conservation of the sucker because they transport sediment necessary to maintain preferred substrates utilized by this fish. These creeks convey stream flows and flood waters necessary to maintain habitat conditions for the Santa Ana sucker; and support riparian habitats that protect water quality in the occupied portions of the Big Tujunga Creek. Similar to the Santa Ana River, these tributaries are essential to the Big Tujunga Creek sucker population because they provide renewal of spawning and feeding substrates and peaks and ebbs in water volumes. These three tributaries are particularly essential to the conservation of the sucker and require special management and protection since the Big Tujunga Dam has reduced the transfer of sediment downstream and altered the natural flow in the upper Big Tujunga Creek.

The sucker has been able to maintain its population in the Big Tujunga Creek despite the fragmented habitat and presence of nonnative species. Most likely, the sucker population has survived because of the presence of the relatively undisturbed condition of the tributaries to Big Tujunga Creek.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7 of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out are not likely to destroy or adversely modify critical habitat. In our regulations at 50 CFR 402.2, we define destruction or adverse modification as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to: Alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." We are currently reviewing the regulatory definition of adverse modification in relation to the conservation of the species.

Section 7(a) of the Act requires Federal agencies, including the Service, to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is proposed or designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402.

Section 7(a)(4) of the Act requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. Conference reports provide conservation recommendations to assist the agency in eliminating conflicts that may be caused by the proposed action. We may issue a formal conference report if requested by a Federal agency. Formal conference reports on proposed critical habitat contain an opinion that is prepared according to 50 CFR 402.14, as if critical habitat were designated. We may adopt the formal conference report as the biological opinion when the critical habitat is designated, if no substantial new information or changes in the action alter the content of the opinion (see 50 CFR 402.10(d)). The conservation recommendations in a conference report are advisory.

If a species is listed or critical habitat is designated, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Through this consultation, the action agency ensures that their actions do not destroy or adversely modify critical habitat.

When we issue a biological opinion concluding that a project is likely to result in the destruction or adverse modification of critical habitat, we also provide reasonable and prudent alternatives to the project, if any are identifiable. "Reasonable and prudent alternatives" are defined at 50 CFR 402.02 as alternative actions identified during consultation that can be implemented in a manner consistent with the intended purpose of the action, that are consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Director believes would avoid destruction or adverse modification of critical habitat. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where critical habitat is subsequently designated and the Federal agency has retained discretionary involvement or control over the action or such discretionary involvement or control is authorized by law. Consequently, some Federal agencies may request reinitiation of consultation or conference with us on actions for which formal consultation has been completed, if those actions may affect designated critical habitat or adversely modify or destroy proposed critical habitat.

Federal activities that may affect the Santa Ana sucker or its critical habitat will require section 7 consultation. Activities on private or State lands requiring a permit from a Federal agency, such as a permit from the Corps under section 404 of the Clean Water Act, a section 10(a)(1)(B) permit from the Service, or some other Federal action, including funding (e.g., Federal Highway Administration (FHA) or Federal Emergency Management Agency (FEMA) funding), will also continue to be subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat and actions on non-Federal and private lands that are not federally funded, authorized, or permitted do not require section 7 consultation.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe in any proposed or final regulation that designates critical habitat those activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation. Activities that may destroy or adversely modify critical habitat may also jeopardize the continued existence of the Santa Ana sucker. Federal activities that, when carried out, may adversely affect critical habitat for the sucker include, but are not limited to:

(1) Actions that would alter the hydrology to a degree that appreciably reduces the value of the critical habitat for both the long-term survival and recovery of the species. Such activities could include, but are not limited to, impoundment, channelization, water diversion, construction, licensing, re-licensing, and operation of dams or other water impoundments.

(2) Actions that would significantly alter water quality to a degree that appreciably reduces the value of the critical habitat for both the long-term survival and recovery of the species. Such activities could include, but are not limited to, release of chemicals, biological pollutants, or heated effluents into the surface water or connected groundwater at a point source or by dispersed release (non-point).

(3) Actions that would significantly increase sediment deposition within the stream channel to a degree that appreciably reduces the value of the critical habitat for both the long-term survival and recovery of the species. Such activities could include, but are not limited to, excessive sedimentation from livestock grazing, road construction, timber harvest, off-road vehicle use, residential, commercial, and industrial development, and other watershed and floodplain disturbances.

(4) Actions that would significantly alter channel morphology or geometry to a degree that appreciably reduces the value of the critical habitat for both the long-term survival and recovery of

the species. Such activities could include, but are not limited to, channelization, impoundment, road and bridge construction, mining, and destruction of riparian vegetation.

(5) Actions that would introduce, spread, or augment nonnative aquatic species into critical habitat to a degree that appreciably reduces the value of the critical habitat for both the long-term survival and recovery of the species. Such activities could include, but are not limited to, stocking for sport, biological control, or other purposes; aquaculture; and construction and operation of canals.

Previous Section 7 Consultations

Federal actions that we have reviewed since the sucker received protection under the Act include Federal land management plans, flood control, channelization, channel maintenance, dam construction, dam operation, bridge construction, a habitat conservation plan, and issuance of permits under section 404 of the Clean Water Act. Federal agencies involved with these activities included the Forest Service, the Corps, and the FHA. Since the listing of the sucker, 10 formal consultations have been initiated and 8 have been completed. None of the completed consultations resulted in a finding that the proposed action would jeopardize the continued existence of the sucker.

In each of the biological opinions resulting from these consultations, we included discretionary conservation recommendations to the action agency. Conservation recommendations are activities that would avoid or minimize the adverse effects of a proposed action on a listed species or its critical habitat, help implement recovery plans, or develop information useful to the species' conservation.

These biological opinions also included nondiscretionary reasonable and prudent measures, with implementing terms and conditions, which are designed to minimize the proposed action's incidental take of the sucker. Section 3(18) of the Act defines the term take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or to attempt to engage in any such conduct." Harm is further defined in our regulations (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Conservation recommendations and reasonable and prudent measures provided in previous biological opinions for the sucker have included: restricting in-stream activities during the spawning and nursery season; minimizing activities in actively flowing streams; reducing pollution from roads and highways; restoring, enhancing, or creating sucker habitat; maintaining or improving water quality standards, developing a nonnative aquatic species removal program; modifying or removing obstructions to fish passage; investigating velocities against which suckers can swim; and conducting sediment transport studies.

The designation of critical habitat will not have an impact on private landowner activities not requiring Federal funding or permits. Designation of critical habitat is only applicable to activities approved, funded, or carried out by Federal agencies.

If you have questions regarding whether specific activities may constitute adverse modification of critical habitat in California, contact Ecological Services, Carlsbad Fish and Wildlife Office ((760) 431-9440). To request copies of the regulations on listed wildlife and plants, and for inquiries regarding prohibitions and permits, please contact the U.S. Fish and Wildlife Service, Branch of

Endangered Species, 911 N.E. 11th Avenue, Portland, OR 97232 (telephone (503) 231-2063; facsimile (503) 231-6243).

Exclusions Under Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that critical habitat shall be designated, and revised, on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. An area may be excluded from critical habitat if it is determined that the benefits of exclusion outweigh the benefits of specifying a particular area as critical habitat, unless the failure to designate such area as critical habitat will result in the extinction of the species.

Lands we have excluded pursuant to section 4(b)(2) include those covered by the following types of plans if they provide assurances that the conservation measures they outline will be implemented and effective: (1) Legally operative HCPs that cover the species, (2) draft HCPs that cover the species and have undergone public review and comment (i.e., pending HCPs), (3) Tribal conservation plans that cover the species, (4) State conservation plans that cover the species, and (5) National Wildlife Refuge System Comprehensive Conservation Plans.

We have determined that the benefits of excluding essential habitat within the boundaries of the Western Riverside MSHCP and essential habitat within the area covered by SAS Conservation Program outweigh the benefits of including these areas as critical habitat, as described in further detail below. Exclusion of these areas will not result in the extinction of the sucker.

Western Riverside Multiple Species Habitat Conservation Plan

Section 10(a) of the Act authorizes the Service to issue to non-Federal entities a permit for the incidental take of endangered or threatened species. This permit allows a non-Federal landowner to proceed with an activity that is legal in all other respects, but results in the incidental taking of a listed species (i.e., take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity). The Act specifies that an application for an incidental take permit must be accompanied by a conservation plan. A permit may not be issued unless the conservation plan submitted to the Service meets certain requirements, as provided in section 10(a)(2)(A) of the Act. For example, the conservation plan must specify what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps. After an opportunity for public comment on the conservation plan, the Service may issue the permit provided we determine that certain conditions, as specified in section 10(a)(2)(B), are met. For instance, the Service must find that the taking will be incidental, and the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

The Western Riverside MSHCP was in development for six years and we issued a biological opinion and a 75-year Incidental Take Permit (ITP) on June 22, 2004. Participants in the Western Riverside MSHCP include 14 cities: the County of Riverside (including the Riverside County Flood Control and Water Conservation District, Riverside County Transportation Commission, Riverside County Parks and Open Space District, and Riverside County Waste Department); the California Department of Parks and Recreation; and the California Department of Transportation. The Western Riverside MSHCP will also serve as a sub-regional plan under the State's Natural Community Conservation Program (NCCP) and was developed in cooperation with the California Department of Fish and Game. The NCCP permit was issued on July 22, 2004. Within the 1.26 million-acre (510,000 ha) planning area of the Western Riverside MSHCP, approximately 153,000 ac (62,000 ha) of diverse habitats are proposed for conservation. The conservation of 153,000 ac (62,000 ha) will complement other, existing natural and open space areas that are already conserved through other means (e.g., State Parks, Forest Service, and county park lands).

We believe that the Western Riverside MSHCP meets the three criteria used by the Service to determine if a plan provides adequate special management or protection to a listed species. First, the Western Riverside MSHCP provides a conservation benefit to the species through the protection of 3,480 acres of habitat within the Santa Ana River. The primary constituent elements of essential habitat for the sucker will be maintained in the Santa Ana River in Riverside County by the following conservation measures: (1) The implementation of a nonnative species removal program, (2) maintaining or improving water quality standards, (3) removing or modifying barriers to fish passage within the Santa Ana River, and (4) assessing any threats from degraded habitat to the sucker in the Santa Ana River in Riverside County and addressing those threats as feasible. Third, the Western Riverside MSHCP provides assurance that the conservation management strategies and actions will be implemented. All permittees for the Western Riverside MSHCP have entered into an Implementation Agreement to ensure that conservation measures for each species are being implemented as appropriate. This Implementing Agreement was signed by all Permittees on June 22, 2004. Funding for the conservation measures and land acquisition, which is described by the Implementing Agreement, will be supported by fees collected by Riverside County, the Cities, and other Permittees. The Western Riverside MSHCP provides assurances that conservation strategies and actions will be implemented by outlining a schedule of management and monitoring activities to be conducted for the Santa Ana sucker. Third, to provide assurances that the conservation strategies and measures will be effective, the HCP was developed on the basis of the best available information, and the adaptive management program developed for the Western Riverside MSHCP uses a flexible approach to management to ensure that the covered species, including the sucker, are maintained and/or enhanced within the MSHCP Conservation Area during the term of the Incidental Take Permit. Management principles and the monitoring efforts are described in the Western Riverside MSHCP document available at the County of Riverside website: http://rcip.org/conservation.htm.

For the reasons described above, we have determined that lands covered by the Western Riverside MSHCP can be excluded from this final designation of critical habitat pursuant to section 4(b)(2) of the Act.

Draft Santa Ana Sucker Conservation Program and Associated Maintenance and Operation Activities of Existing Water Facilities on the Santa Ana River

The SAS Conservation Program, developed over a six-year period, is a multi-agency partnership of Federal, local government agencies, and the private sector that encourages a river-wide approach to conservation of the Santa Ana sucker within the Santa Ana River and its tributaries. This partnership is intended to: Increase the knowledge base to implement recovery strategies for the sucker in the Santa Ana River; ensure that each participating agency minimizes, to the extent possible, effects from routine activities that occur within their jurisdiction in the Santa Ana River; and develop restoration techniques for degraded habitat. Partners in the SAS Conservation Program include the Corps, the Service, Santa Ana Watershed Project Authority, and the following participating agencies (Participants): Orange County Water District, Orange County Resources and Development Management Department, Orange County Sanitation District, Riverside County Flood Control and Water Conservation District, Riverside County Transportation Department, City of Riverside Regional Water Quality Control Plant, San Bernardino County Flood Control District, and the City of San Bernardino Municipal Water Department Rapid Infiltration and Extraction Facility.

We believe that the SAS Conservation Program meets the criteria used by the Service to determine if a plan provides adequate special management or protection to a listed species. First, the SAS Conservation Program provides a conservation benefit to the species through the development of avoidance and minimization measures, research, and habitat restoration efforts. Participants in the SAS Conservation Program are required to implement specific avoidance and minimization measures that will significantly reduce the magnitude of the effects of their activities on the sucker. The SAS Conservation Program has also yielded several scientific reports, many of which were used in preparation of the critical habitat designation. The SAS Conservation Program is also funding efforts to restore or enhance primary constituent elements of critical habitat in the Santa Ana River watershed. Planned research projects of the SAS Conservation Program in 2004 include the development of habitat restoration methods, characterization of the movement and diet of various life history stages of suckers, and investigate the effects of nonnative adult fish on larval and juvenile suckers.

Second, the SAS Conservation Program provides assurances that the conservation management strategies and actions will be implemented. Although the SAS Conservation Program is in draft form currently, we expect that the section 7 consultation on the SAS Conservation Program initiated with the U.S. Army Corps of Engineers in January 2003 will be completed within the following year. Further, the Participants have shown their commitment to the SAS Conservation Program by meeting monthly with the Service since 1998 to develop and implement appropriate measures to conserve and/or conduct research and focus habitat restoration goals on recovering the species in the Santa Ana River. The Participants have also drafted a Memorandum of Agreement that is currently being discussed. For the past 6 years, the SAS Conservation Program has been funded for $125,000 per annum on an annual basis by the Participants. Participants will continue funding at this level or greater for the life of the SAS Conservation Program. The Administrator of the SAS Conservation Program, currently the Santa Ana Watershed Project Authority, annually issues an invoice to each Participant. Implementation of the SAS Conservation Program is assured by the requirement that an Annual Operating Plan must be submitted to the Service and the SAS Conservation Team by July 31st of each year, and approved by August 31st, which then functions from September 1st through August 31st of the following year.

Third, to provide assurances that the conservation strategies and measures will be effective, the SAS Conservation Program was developed on the basis of the best available information. The SAS Conservation Program also requires an annual report that summarizes all activities conducted during the past year, provides success or failure of existing avoidance and minimization measures, and any recommendations be submitted to the Service for review. The SAS Conservation Program also includes an Annual Operating Plan that allows the Service to refine research and habitat restoration goals and objectives and avoidance and minimization measures as necessary based on the information supplied in their annual reports.

For the reasons described above, we have determined that lands covered by the SAS Conservation Program can be excluded from this final designation of critical habitat pursuant to section 4(b)(2) of the Act.

(1) Benefits of Inclusion

The benefits of designating critical habitat on lands within the boundaries of HCPs and other conservation plans that cover the species for which critical habitat is being designated are small. Conservation plans generally include management measures and protections designed to protect, restore, monitor, manage, and enhance the habitat to benefit the conservation of the species, while a critical habitat designation can only mandate protection against actions with a Federal nexus. There is nothing in the critical habitat designation which ensures restoration, monitoring, active management or habitat enhancement. The Western Riverside MSHCP seeks to accomplish these goals for the Santa Ana sucker through the implementation of specific conservation measures. The principal benefit of designating critical habitat is that federally authorized or funded activities that may affect a species' critical habitat would require consultation with us under section 7 of the Act. Under section 7, proposed actions that would adversely modify or destroy designated critical habitat cannot go forward, unless they are altered to eliminate the adverse modification or destruction of critical habitat.

An important objective of the Western Riverside MSHCP is to implement measures, including monitoring and management, necessary to conserve important habitat for the Santa Ana sucker within the plan's boundaries. Thus, the purpose of the Western Riverside MSHCP is consistent with the purpose served by undergoing consultation under section 7 to ensure that critical habitat of the sucker is not adversely modified by a proposed Federal action, and provides benefits far in excess of those that would result from the critical habitat designation. Because issuance of an incidental take permit (ITP) under section 10 is a Federal action, we completed an internal section 7 consultation for every species that is covered under the MSHCP and ITP, including the Santa Ana sucker. During consultation, we analyzed the impacts of the MSHCP and ITP on the Santa Ana sucker and its essential habitat within the plan boundaries and whether or not that habitat was officially designated as critical habitat. Therefore, including the Santa Ana River within the boundaries of the Western Riverside MSHCP as critical habitat would provide little benefit to the Santa Ana sucker, because the potential impacts to the species' essential habitat within the MSHCP area have been addressed under the plan and have been analyzed in our internal section 7 consultation on the ITP.

The SAS Conservation Program includes measures to restore, monitor, and enhance habitat for the Santa Ana sucker in the Santa Ana River. Similar to the Western Riverside MSHCP, the SAS Conservation Program is specifically designed to benefit the sucker and its essential habitat within the Santa Ana River. The SAS Conservation Program is a comprehensive conservation program for the sucker that includes measures to minimize the impacts of routine water management activities on the sucker and restore degraded river habitat to improve the species' prospects for survival and recovery. As noted previously, this type of active management and restoration is not part of a critical habitat designation. Because the SAS Conservation Program is specifically designed to benefit the sucker and its essential habitat within the Santa Ana River habitat and the programmatic consultation on the SAS Conservation Program will analyze the effects of the SAS Conservation Program on the sucker and its habitat, the designation of critical habitat within the area covered by the SAS Conservation Program would provide fewer benefits to this species than does the SAS Conservation Program.

(2) Benefits of Exclusion

Excluding lands within the Western Riverside MSHCP or within the area covered by the SAS Conservation Program from critical habitat will provide several benefits. Exclusion of the lands from the final designation will allow us to continue working with the participants in a spirit of cooperation and partnership. In the past, HCP applicants and participants in voluntary conservation programs have generally viewed the designation of critical habitat as having a potential negative regulatory effect that discourages voluntary, cooperative, and proactive efforts to conserve listed species and their habitats by non-Federal parties. Partners and cooperators view designation of critical habitat as an indication by the Federal government that their proactive efforts to protect the species and its habitat are inadequate. Excluding these areas from critical habitat will ensure the continuation of the existing conservation efforts and provide the basis for future opportunities to conserve species and their essential habitat.

(3) Benefits of Exclusion Outweigh the Benefits of Inclusion

We are excluding areas along the Santa Ana River because they are within the planning area boundary for the Western Riverside MSHCP and the SAS Conservation Program from critical habitat designation. Exclusion of these areas will not result in extinction of the sucker. We find the benefits of exclusion outweigh the benefits of designating the areas covered by the plans as critical habitat.

The exclusion of these areas from critical habitat will help preserve the partnerships we have developed with the local jurisdictions and agencies in the development of the Western Riverside MSHCP and SAS Conservation Program. The only potential benefit of designating critical habitat within these areas, apart from the conservation actions discussed above, would be educational--informing the public of areas essential for the long-term survival and conservation of the species. However, this information has already largely been provided to the public through the critical habitat designation process and resulting publicity, including public participation as set forth above, the material provided on our website, and through the ample opportunity for public participation provided throughout the development of the Western Riverside MSHCP. The Corps is also likely to issue a Public Notice and solicit public comment on the issuance of a permit for activities related to the maintenance and operation of existing water facilities on the Santa Ana River in association with the SAS Conservation Program, further increasing the public's knowledge of the importance of the Santa Ana River to the sucker. We believe that designating critical habitat has little benefit in areas covered by the Western Riverside MSHCP and SAS Conservation Program. The Western Riverside MSHCP and SAS Conservation Program have ensured authorized activities within these areas include measures to protect the Santa Ana sucker and its habitat.

Based on our evaluation of our past consultation history on the sucker and the analysis conducted for those consultations, we believe that we have a general understanding of potential impacts, including those related to economics, of this designation. We have considered these potential impacts in the development of this designation and do not believe, at this time, that additional exclusion, including those based on economics, pursuant to section 4(b)(2) of the Act are warranted.

Economic Impacts

Section 4(b)(2) of the Act requires us to designate critical habitat on the basis of the best scientific and commercial information available and to consider the economic and other relevant impacts of designating a particular area as critical habitat. We may exclude areas from critical habitat upon a determination that the benefits of such exclusions outweigh the benefits of specifying such areas as critical habitat. We cannot exclude such areas from critical habitat when such exclusion will result in the extinction of the species concerned.

Following the publication of the proposed critical habitat designation, we conducted an economic analysis to estimate the potential economic effect of the designation. The draft analysis was made available for public review on October 1, 2004 (69 FR 58876); the public comment period was open for 10 days. On October 25, 2004, we published another notice in the Federal Register (69 FR

62238) reopening a 30-day comment period on the draft economic analysis and the proposed designation.

The primary purpose of the economic analysis is to estimate the potential economic impacts associated with the designation of critical habitat for the sucker. This information is intended to assist the Secretary in making decisions about whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation. This economic analysis considers the economic efficiency effects that may result from the designation, including habitat protections that may be co-extensive with the listing of the species. It also addresses distribution of impacts, including an assessment of the potential effects on small entities and the energy industry. This information can be used by the Secretary to assess whether the effects of the designation might unduly burden a particular group or economic sector.

This analysis focuses on the direct and indirect costs of the proposed rule. However, economic impacts to land use activities can exist in the absence of critical habitat. These impacts may result from, for example, local zoning laws, State and natural resource laws, and enforceable management plans and best management practices applied by other State and Federal agencies. Economic impacts that result from these types of protections are not included in the analysis as they are considered to be part of the regulatory and policy baseline.

Categories of direct and indirect costs considered in the analysis included the costs associated with: (1) Conducting section 7 consultations; (2) modifications to projects, activities, or land uses resulting from section 7 consultations; (3) uncertainty and public perceptions resulting from the designation of critical habitat, including potential effects on property values; and (4) the potential offsetting beneficial costs associated with critical habitat. The most likely economic effects of critical habitat designation are on activities funded, authorized, or carried out by a Federal agency (i.e., direct costs).

The economic analysis determined that retrospective costs (i.e., costs since listing, 1999-2004) total $4.2 million, with transportation comprising $3.4 million of those costs. The remainder of retrospective costs was split among OHV recreation, flood control agencies, and Federal agencies. Total prospective costs of the proposed rule (i.e., costs for the 20-year period 2004-2024) are $30.5 million assuming a three percent discount rate and $21.8 million with a seven percent discount rate. Annual prospective costs are estimated to be $2.0 million. Costs associated with transportation contribute 49 percent of the annual costs and overall prospective costs. Other leading activities include water supply, flood control agencies, and residential and commercial development.

Clarity of the Rule

Executive Order 12866 requires each agency to write regulations and notices that are easy to understand. We invite your comments on how to make this final rule easier to understand, including answers to questions such as the following:

(1) Are the requirements in the final rule clearly stated?

(2) Does the final rule contain technical jargon that interferes with the clarity?

(3) Does the format of the final rule (grouping and order of the sections, use of headings, paragraphing, and so forth) aid or reduce its clarity?

(4) Is the description of the notice in the SUPPLEMENTARY INFORMATION section of the preamble helpful in understanding the final rule?

(5) What else could we do to make this final rule easier to understand?

Send a copy of any comments on how we could make this final rule easier to understand to: Office of Regulatory Affairs, Department of the Interior, Room 7229, 1849 C Street, NW., Washington, DC 20240. You may e-mail your comments to this address: Exsec@ios.doi.gov.

Required Determinations

Regulatory Planning and Review

In accordance with Executive Order 12866, this document is a significant rule in that it may raise novel legal and policy issues, but will not have an annual effect on the economy of $100 million or more or affect the economy in a material way. Due to the tight timeline for publication in the Federal Register, the Office of Management and Budget (OMB) has not formally reviewed this rule. As explained above, we prepared an economic analysis of this action. We used this analysis to meet the requirement of section 4(b)(2) of the Act to determine the economic consequences of designating the specific areas as critical habitat. We also used it to help determine whether to exclude any area from critical habitat, as provided for under section 4(b)(2), if we determine that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless we determine, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species.

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (5 U.S.C. 601 et seq., as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the Regulatory Flexibility Act (RFA) to require Federal agencies to provide a statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA also amended the RFA to require a certification statement.

Small entities include small organizations, such as independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents; as well as small businesses. Small businesses include manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than $5 million in annual sales, general and heavy construction businesses with less than $27.5 million in annual business, special trade contractors doing less than $11.5 million in annual business, and agricultural businesses with annual sales less than $750,000. To determine if potential economic impacts to these small entities are significant, we consider the types of activities that might trigger regulatory impacts under this rule, as well as the types of project modifications that may result. In general, the term "significant economic impact" is meant to apply to a typical small business firm's business operations.

To determine if the rule could significantly affect a substantial number of small entities, we consider the number of small entities affected within particular types of economic activities (e.g., housing development, grazing, oil and gas production, timber harvesting). We apply the "substantial number" test individually to each industry to determine if certification is appropriate. However, the SBREFA does not explicitly define "substantial number" or "significant economic impact." Consequently, to assess whether a "substantial number" of small entities is affected by this designation, this analysis considers the relative number of small entities likely to be impacted in an area. In some circumstances, especially with critical habitat designations of limited extent, we may aggregate across all industries and consider whether the total number of small entities affected is substantial. In estimating the number of small entities potentially affected, we also consider whether their activities have any Federal involvement.

Designation of critical habitat only affects activities conducted, funded, or permitted by Federal agencies. Some kinds of activities are unlikely to have any Federal involvement and so will not be affected by critical habitat designation. In areas where the species is present, Federal agencies already are required to consult with us under section 7 of the Act on activities they fund, permit, or implement that may affect the sucker. Federal agencies also must consult with us if their activities may affect critical habitat. However, we believe this will result in minimal additional regulatory burden on Federal agencies or their applicants because most consultations would already be required due to the presence of the Santa Ana sucker or other federally listed species or their respective critical habitats (e.g., San Bernardino kangaroo rat (Dipodomys merriami parvus)), and consultations to avoid the destruction or adverse modification of critical habitat would be incorporated into the existing consultation process and trigger only minimal additional regulatory impacts beyond the duty to avoid jeopardizing any listed species.

Designation of critical habitat could result in an additional economic burden on small entities due to the requirement to reinitiate consultation for ongoing Federal activities. The economic analysis determined that costs involving conservation measures for the SAS would be incurred for activities involving residential and commercial development, water treatment facilities, the Santa Ana River Interceptor (SARI) line, water supply, flood control agencies, off-highway vehicle (OHV) recreation, transportation, flood control dams, and federal agencies. Of these, only businesses that are involved with land development would be affected; in all other cost categories, the affected entities exceed the SBA size criteria for small entities. For businesses that are involved with land development, the relevant threshold for small businesses is an annual revenue of $6 million or less. The effects on small businesses in the land development sector would be concentrated in San Bernardino, where most of the development is expected to take place. Based on the estimated costs to development and the average sales per small business, the annual costs range from 0.13 percent to 3.97 percent of sales for a small firm in the land development sector depending upon county.

In general, two different mechanisms in section 7 consultations could lead to additional regulatory requirements for the approximately four small businesses, on average, that may be required to consult with us each year regarding their project's impact on the Santa Ana sucker and its habitat. First, if we conclude, in a biological opinion, that a proposed action is likely to jeopardize the continued existence of a species or adversely modify its critical habitat, we can offer "reasonable and prudent alternatives." Reasonable and prudent alternatives are alternative actions that can be implemented in a manner consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that would avoid jeopardizing the continued existence of listed species or result in adverse modification of critical habitat. A Federal agency and an applicant may elect to implement a reasonable and prudent alternative associated with a biological opinion that has found jeopardy or adverse modification of critical habitat. An agency or applicant could alternatively choose to seek an exemption from the requirements of the Act or proceed without implementing the reasonable and prudent alternative. However, unless an exemption were obtained, the Federal agency or applicant would be at risk of violating section 7(a)(2) of the Act if it chose to proceed without implementing the reasonable and prudent alternatives.

Second, if we find that a proposed action is not likely to jeopardize the continued existence of a listed animal or plant species, we may identify reasonable and prudent measures designed to minimize the amount or extent of take and require the Federal agency or applicant to implement such measures through non-discretionary terms and conditions. We may also identify discretionary conservation recommendations designed to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, help implement recovery plans, or to develop information that could contribute to the recovery of the species.

Based on our experience with consultations pursuant to section 7 of the Act for all listed species, virtually all projects--including those that, in their initial proposed form, would result in jeopardy or adverse modification determinations in section 7 consultations--can be implemented successfully with, at most, the adoption of reasonable and prudent alternatives. These measures, by definition, must be economically feasible and within the scope of authority of the Federal agency involved in the consultation. We can only describe the general kinds of actions that may be identified in future reasonable and prudent alternatives. These are based on our understanding of the needs of the species and the threats it faces, as described in the final listing rule and this critical habitat designation. Within the final CHUs, the types of Federal actions or authorized activities that we have identified as potential concerns are:

(1) Regulation of activities affecting waters of the United States by the Corps under section 404 of the Clean Water Act;

(2) Regulation of water flows, damming, diversion, and channelization implemented or licensed by Federal agencies;

(3) Transportation issues such as bridges, rights-of-way, etc. that may involve the Federal Highway Administration;

(4) Regulation of grazing, mining, and recreation by the USFS;

(5) Hazard mitigation and post-disaster repairs funded by the FEMA; and

(6) Activities funded by the EPA, U.S. Department of Energy, or any other Federal agency.

It is likely that a developer or other project proponent could modify a project or take measures to protect the sucker. The kinds of actions that may be included if future reasonable and prudent alternatives become necessary include conservation set-asides, management of competing nonnative species, restoration of degraded habitat, and regular monitoring. These are based on our understanding of the needs of the species and the threats it faces, as described in the final listing rule and proposed critical habitat designation. These measures are not likely to result in a significant economic impact to project proponents.

In summary, we have considered whether this would result in a significant economic effect on a substantial number of small entities. We have determined, for the above reasons and based on currently available information, that it is not likely to affect a substantial number of small entities. Federal involvement, and thus section 7 consultations, would be limited to a subset of the area designated. The most likely Federal involvement could include Corps permits, permits we may issue under section 10(a)(1)(B) of the Act, FHA funding for road improvements, and regulation of grazing, mining, and recreation by the USFS. A regulatory flexibility analysis is not required.

Small Business Regulatory Enforcement Fairness Act (5 U.S.C. 801 et seq.)

Under SBREFA, this rule is not a major rule. Our detailed assessment of the economic effects of this designation is described in the economic analysis. Based on the effects identified in the economic analysis, we believe that this rule will not have an annual effect on the economy of $100 million or more, will not cause a major increase in costs or prices for consumers, and will not have significant adverse effects on competition, employment, investment, productivity, innovation, or the ability of U.S.-based enterprises to compete with foreign-based enterprises. Refer to the final economic analysis for a discussion of the effects of this determination.

Executive Order 13211

On May 18, 2001, the President issued Executive Order 13211 on regulations that significantly affect energy supply, distribution, and use. Executive Order 13211 requires agencies to prepare Statements of Energy Effects when undertaking certain actions. This final rule to designated critical habitat for the Santa Ana sucker is not expected to significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action and no Statement of Energy Effects is required.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.), we make the following findings:

(a) This rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, Tribal governments, or the private sector and includes both "Federal intergovernmental mandates" and "Federal private sector mandates." These terms are defined in 2 U.S.C. 658(5)-(7). "Federal intergovernmental mandate" includes a regulation that "would impose an enforceable duty upon State, local, or tribal governments" with two exceptions. It excludes "a condition of federal assistance." It also excludes "a duty arising from participation in a voluntary Federal program," unless the regulation "relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority," if the provision would "increase the stringency of conditions of assistance" or "place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding" and the State, local, or Tribal governments "lack authority" to adjust accordingly. (At the time of enactment, these entitlement programs were: Medicaid; AFDC work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement.) "Federal private sector mandate" includes a regulation that "would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance; or (ii) a duty arising from participation in a voluntary Federal program."

The designation of critical habitat does not impose a legally binding duty on non-Federal government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities who receive Federal funding, assistance, permits or otherwise require approval or authorization from a Federal agency for an action may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply; nor would critical habitat shift the costs of the large entitlement programs listed above on to State governments.

(b) We do not believe that this rule will significantly or uniquely affect small governments because it will not produce a Federal mandate of $100 million or greater in any year, that is, it is not a "significant regulatory action" under the Unfunded Mandates Reform Act. The designation of critical habitat imposes no obligations on State or local governments. As such, Small Government Agency Plan is not required.

Takings

In accordance with Executive Order 12630 ("Government Actions and Interference with Constitutionally Protected Private Property Rights"), we have analyzed the potential takings implications of designating approximately 8,305 ac (3,361 ha) of lands in Los Angeles County, California as critical habitat for the Santa Ana sucker in a takings implication assessment. The takings implications assessment concludes that this final designation of critical habitat for the sucker does not pose significant takings implications.

Federalism

In accordance with Executive Order 13132, this rule does not have significant federalism effects. A federalism assessment is not required. In keeping with Department of the Interior policy, the Service requested information from, and coordinated development of this critical habitat designation with, appropriate State resource agencies in California, as well as during the listing process. The impact of the designation on State and local governments and their activities was fully considered in the economic analysis. As discussed above, the designation of critical habitat in areas currently occupied by the Santa Ana sucker would have little incremental impact on State and local governments and their activities. The designations may have some benefit to these governments in that the areas essential to the conservation of these species are more clearly defined, and the primary constituent elements of the habitat necessary to the survival of the species are identified. While making this definition and identification does not alter where and what federally sponsored activities may occur, it may assist local governments in long-range planning, rather than waiting for case-by-case section 7 consultation to occur.

Civil Justice Reform

In accordance with Executive Order 12988, the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the Order. We are designating critical habitat in accordance with the provisions of the Act, as amended. This rule uses standard property descriptions and identifies the primary constituent elements within the designated areas to assist the public in understanding the habitat needs that are essential for the conservation of the Santa Ana sucker.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain new or revised information collection for which OMB approval is required under the Paperwork Reduction Act. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act

We have determined that we do not need to prepare an Environmental Assessment or an Environmental Impact Statement as defined by the National Environmental Policy Act of 1969, in connection with regulations adopted pursuant to section 4(a) of the Act. We published a notice outlining our reasons for this determination in the Federal Register on October 25, 1983 (48 FR 49244).

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Government" (59 FR 22951), Executive Order 13175, and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. We are not aware of any Tribal lands essential for the conservation of the Santa Ana sucker. Therefore, the critical habitat designation for the sucker does not contain any Tribal lands or lands that we have identified as impacting Tribal trust resources.

References Cited

A complete list of all references cited in this rule is available upon request from the Carlsbad Fish and Wildlife Office (see ADDRESSES section).

Author The primary author of this document is the Carlsbad Fish and Wildlife Office (see ADDRESSES section).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

For the reasons given in the preamble, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

PART 17--[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500, unless otherwise noted.

2. Amend Sec. 17.11(h), by revising the entry for "Sucker, Santa Ana" under "FISHES" to read as follows:

see following page

3. Amend Sec. 17.95(e) by adding critical habitat for the Santa Ana sucker (*Catostomus santaanae*) in the same alphabetical order as this species occurs in 17.11(h).

Sec. 17.95 Critical habitat--fish and wildlife.
* * * * *
(e) Fishes. * * *
Santa Ana Sucker (*Catostomus santaanae*)

(1) Areas determined to be essential to the conservation of the Santa Ana sucker and designated critical habitat units are depicted for Los Angeles County, California, on the maps and as described as follows:

(2) Based on the best available information, primary constituent elements essential for the conservation of the Santa Ana sucker include the following:

(i) A functioning hydrological system that experiences peaks and ebbs in the water volume that reflects seasonal variation in precipitation throughout the year;

(ii) A mosaic of loose sand, gravel, cobble, and boulder substrates in a series of riffles, runs, pools, and shallow sandy stream margins;

(iii) Water depths greater than 3 cm (1.2 in) and bottom water velocities greater than 0.03 meter per second (0.01 feet per second);

(iv) Non-turbid water or only seasonally turbid water;

(v) Water temperatures less than 30 °C (86 °F); and

(vi) Stream habitat that includes algae, aquatic emergent vegetation, macroinvertebrates, and riparian vegetation.

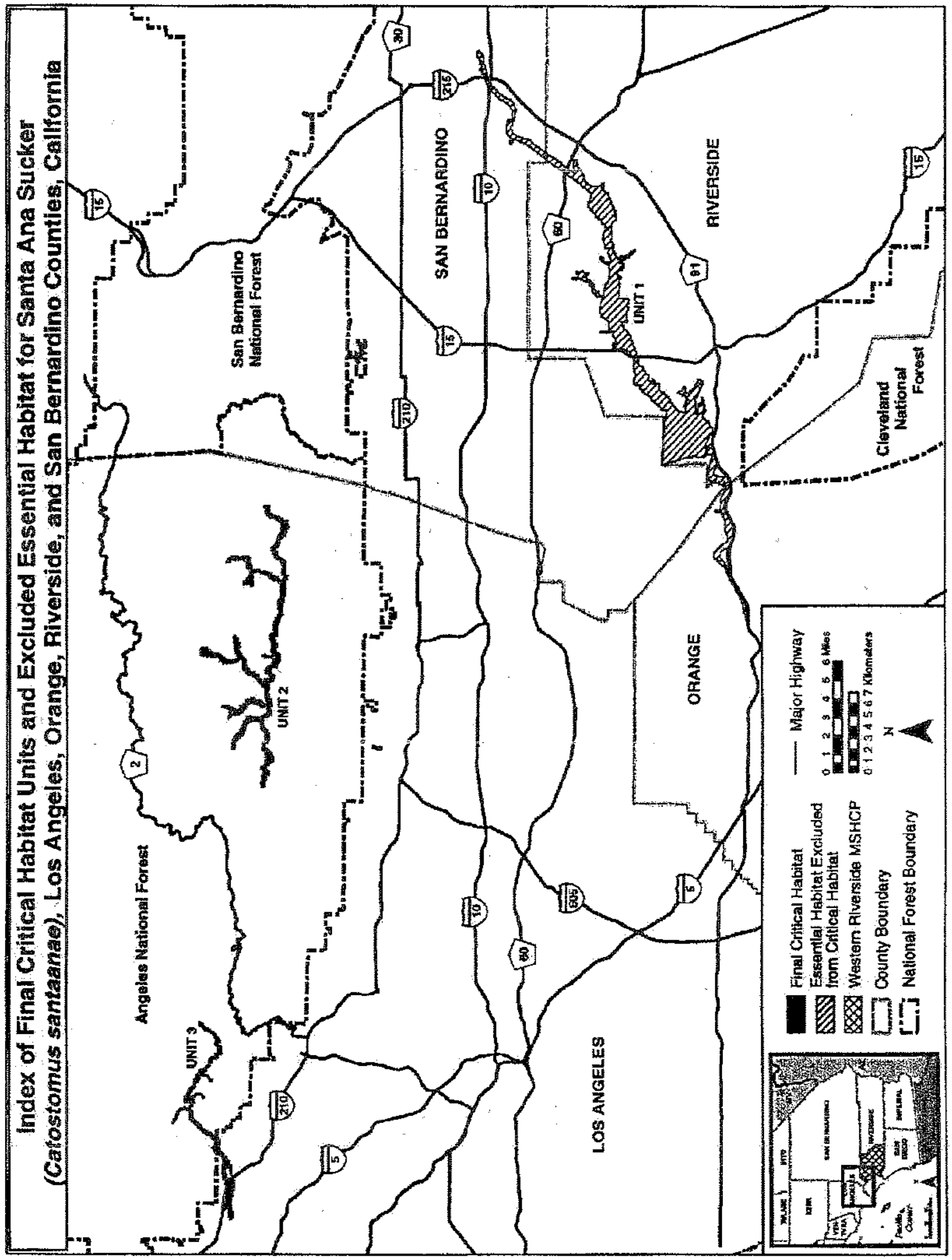
(3) Existing features and structures made by people, such as paved roads, bridges, parking lots, railroad tracks, railroad trestles, and residential, commercial, and industrial developments including energy production and distribution facilities (exclusive of the stream channel), do not contain one or more of the primary constituent elements and are not critical habitat. Federal actions limited to those areas, therefore, would not trigger a consultation under section 7 of the Act unless they may affect the species and/or primary constituent elements in adjacent critical habitat.

(4) Areas determined to be essential to the conservation of the Santa Ana sucker and designated critical habitat units are shown on the following index map.

Sec. 17.11 Endangered and threatened wildlife.

* * * * *
(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rule
Common name	Scientific name						
Fishes							
Sucker, Santa Ana................	(*Catostomus santaanae*).	U.S.A. (CA)........	Los Angeles River basin, San Gabriel River basin, Santa Ana River basin.	T	694	17.95(e)	N/A



BILLING CODE 4310-55-P

(5) Areas that have been determined to be essential to the conservation of the Santa Ana sucker and that have been excluded from critical habitat designation pursuant to section 4(b)(2) of the Act are described as follows:

(i) All essential areas within the boundaries of the Western Riverside Multiple Species Habitat Conservation Plan (which may be obtained by going to the Riverside County Integrated Project Web site (http://www.rcip.org/conservation.htm) and other areas of the Santa Ana River, from the confluence of Mission Channel and the Santa Ana River downstream to the vicinity of the Route 90, covered by the Santa Ana Sucker Conservation Program.

(ii) Note: Map of essential habitat excluded from critical habitat (Unit 1) for Santa Ana Sucker follows:

(6) The following textual unit descriptions are the definitive source for determining critical habitat boundaries. General location maps by unit are provided at the end of each unit description and are provided for general guidance purposes only, and not as a definitive source for determining critical habitat boundaries.

(7) Unit 2: San Gabriel River system in Los Angeles County, California.

(i) Unit 2 includes the West, North and East Forks of the San Gabriel River and the following tributaries: Cattle Canyon Creek, Bear Creek, Bichota Canyon Creek, and Big Mermaids Canyon Creek. The San Gabriel River portion of the unit extends from the Cogswell Dam on the West Fork to approximately 3,882 feet (1,229 meters; 0.77 miles; 1.21 kilometers) downstream from the Bridge-of-No Return on the East Fork, and portions of the North Fork. The lateral extent of Unit 2 is defined by the UTM coordinates described in the legal description.

Unit 2: San Gabriel River. Los Angeles County, California. From USGS 1:24,000 quadrangle maps Azusa, Crystal Lake, Glendora, Mount Baldy, Mount San Antonio, and Waterman Mountain, California, land bounded by the following UTM 11 NAD 27 coordinates (E, N):
422700, 3795100; 423300, 3795100; 423300, 3795000; 423400, 3795000; 423400, 3794400; 423300, 3794400; 423300, 3794300; 423200, 3794300; 423200, 3794200; 423100, 3794200; 423100, 3794000; 423000, 3794000; 423000, 3793400; 422900, 3793400; 422900, 3793300; 422800, 3793300; 422800, 3793200; 422700, 3793200; 422700, 3793100; 422600, 3793100; 422600, 3792900; 422500, 3792900; 422500, 3792800; 422400, 3792800; 422400, 3792100; 422500, 3792100; 422500, 3791800; 422700, 3791800; 422700, 3791900; 422900, 3791900; 422900, 3792000; 423100, 3792000; 423100, 3792100; 423800, 3792100; 423800, 3792200; 424500, 3792200; 424500, 3791900; 424300, 3791900; 424300, 3791800; 424000, 3791800; 424000, 3791700; 423900, 3791700; 423900, 3791600; 423400, 3791600; 423400, 3791700; 423200, 3791700; 423200, 3791600; 423000, 3791600; 423000, 3791500; 422900, 3791500; 422900, 3791400; 422700, 3791400; 422700, 3791300; 422600, 3791300; 422600, 3791200; 422500, 3791200; 422500, 3791100; 422400, 3791100; 422400, 3791000; 421700, 3791000; 421700, 3790900; 421600, 3790900; 421600, 3790800; 421500, 3790800; 421500, 3790700; 421400, 3790700; 421400, 3790600; 421300, 3790600; 421300, 3790200; 421200, 3790200; 421200, 3790100; 421100, 3790100; 421100, 3789900; 420800, 3789900; 420800, 3789800; 420700, 3789800; 420700, 3789700; 420600, 3789700; 420600, 3789600; 420500, 3789600; 420500, 3789500; 420700, 3789500; 420700, 3789400; 420800, 3789400; 420800, 3789000; 420900, 3789000; 420900, 3789100; 421100, 3789100; 421100, 3789200; 421200, 3789200; 421200, 3789300; 421700, 3789300; 421700, 3789200; 421800, 3789200; 421800, 3789100; 421900, 3789100; 421900, 3788900; 422000, 3788900; 422000, 3788800; 422200, 3788800; 422200, 3788700; 422400, 3788700; 422400, 3788500; 422500, 3788500; 422500, 3788600; 422600, 3788600; 422600, 3788700; 422500, 3788700; 422500, 3789400; 422600, 3789400; 422600, 3789600; 422800, 3789600; 422800, 3789400; 422900, 3789400; 422900, 3789300; 422800, 3789300; 422800, 3789200; 422700, 3789200; 422700, 3788800; 422800, 3788800; 422800, 3788700; 422900, 3788700; 422900, 3788800; 423100, 3788800; 423100, 3788900; 423300, 3788900; 423300, 3788800; 424000, 3788800; 424000, 3788900; 424100, 3788900; 424100, 3789000; 424600, 3789000; 424600, 3788900; 424700, 3788900; 424700, 3788700; 424800, 3788700; 424800, 3788600; 425000, 3788600; 425000, 3788700; 425500, 3788700; 425500, 3788600; 425800, 3788600; 425800, 3788500; 426100, 3788500; 426100, 3788300; 426400, 3788300; 426400, 3788200; 426800, 3788200; 426800, 3788300; 427000, 3788300;

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(ii) The map of Unit 2 follows:

(8) Unit 3: Big Tujunga Creek system in Los Angeles County, California.

(i) Unit 3 includes the stretch of Big Tujunga Creek between the Big Tujunga Dam and Hansen Dam and the following tributaries: Stone Canyon Creek, Delta Canyon Creek, and Gold Canyon Creek. The lateral extent of Unit 3 is defined by the UTM coordinates described in the legal description.

Unit 3: Big Tujunga Canyon. Los Angeles County, California. From USGS 1:24,000 quagrangle maps Condor Peak, San Fernando, and Sunland, California, land bounded by the following UTM 11 NAD 27 coordinates (E, N):
381900, 3797700; 382100, 3797700; 382100, 3797600; 382200, 3797600; 382200, 3797500; 382400, 3797500; 382400, 3797400; 382600, 3797400; 382600, 3797300; 382800, 3797300; 382800, 3797200; 383000, 3797200; 383000, 3797100; 383100, 3797100; 383100, 3797000; 383200, 3797000; 383200, 3796900; 383300, 3796900; 383300, 3796500; 383400, 3796500; 383400, 3796400; 383300, 3796400; 383300, 3796200; 383200, 3796200; 383200, 3796100; 383500, 3796100; 383500, 3796000; 383600, 3796000; 383600, 3796300; 383700, 3796300; 383700, 3796500; 384300, 3796500; 384300, 3796400; 384400, 3796400; 384400, 3796300; 384600, 3796300; 384600, 3796200; 384900, 3796200; 384900, 3796100; 385000, 3796100; 385000, 3796000; 385100, 3796000; 385100, 3795900; 385200, 3795900; 385200, 3795800; 385300, 3795800; 385300, 3795700; 385800, 3795700; 385800, 3795600; 386000, 3795600; 386000, 3795500; 386200, 3795500; 386200, 3795400; 386300, 3795400; 386300, 3795300; 386500, 3795300; 386500, 3795200; 386600, 3795200; 386600, 3795100; 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(ii) The map of Unit 3 follows:

Appendix L-3

Critical Habitat Designation for Steelhead Trout (69 FR 71880)

Federal Register

Friday,
December 10, 2004

Part II

Department of Commerce

National Oceanic and Atmospheric Administration

50 CFR Part 226

Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus tshawytscha*) and Steelhead (*O. mykiss*) in California; Proposed Rule

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 226

[Docket No. 041123329–4329–01; I.D. No. 110904F]

RIN 0648–AO04

Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus tshawytscha*) and Steelhead (*O. mykiss*) in California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration, Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: The National Marine Fisheries Service (NMFS) proposes to designate critical habitat for two Evolutionarily Significant Units (ESUs) of chinook salmon (*Oncorhynchus tshawytscha*) and five ESUs of *O. mykiss* (inclusive of anadromous steelhead and resident rainbow trout) listed under the Endangered Species Act of 1973, as amended (ESA). The specific areas proposed for designation in the rule text set out below include approximately 11,668 miles (18,669 km) of riverine habitat and 947 mi² (2,444 km²) of bay/estuarine habitat (primarily in San Francisco-San Pablo-Suisun Bays) in California. Some of the proposed areas, however, are occupied by two or more ESUs. However, as explained below, we are also considering excluding many of these areas from the final designation based on existing land management plans and policies, voluntary conservation efforts and other factors that could substantially reduce the scope of the final designations. The net economic impacts of ESA section 7 associated with designating the areas described in the proposed rule are estimated to be approximately $83,511,186, but we believe the additional exclusions under review could reduce this impact by up to 57 percent or more. We solicit information and comments from the public on all aspects of the proposal, including information on the economic, national security, and other relevant impacts of the proposed designation. We may revise this proposal and solicit additional comments prior to final designation to address new information received during the comment period.

DATES: Comments on this proposed rule must be received by 5 p.m. P.s.t. on February 8, 2005. Requests for public hearings must be made in writing by January 24, 2005.

ADDRESSES: You may submit comments, identified by docket number [041123329–4329–01] and RIN number [0648–AO04], by any of the following methods:

- E-mail: *critical.habitat.swr@noaa.gov*. Include docket number [041123329–4329–01] and RIN number [0648–AO04] in the subject line of the message.
- Federal e-Rulemaking Portal: *http://www.regulations.gov*. Follow the instructions for submitting comments.
- Agency Web site: *http://ocio.nmfs.noaa.gov/ibrm-ssi/index.shtml*. Follow the instructions for submitting comments at *http://ocio.nmfs.noaa.gov/ibrm-ssi/process.shtml*.
- Mail: Submit written comments and information to: Assistant Regional Administrator, Protected Resources Division, NMFS, 501 W. Ocean Blvd., Suite 4200, Long Beach, CA 90802–4213. You may hand-deliver written comments to our office during normal business hours at the address given above.
- Fax: 562–980–4027

FOR FURTHER INFORMATION CONTACT: Craig Wingert at the above address, at 562–980–4021, or by facsimile at 562–980–4027; or Marta Nammack at 301–713–1401. The proposed rule, maps, and other materials relating to this proposal can be found on our Web site at *http://swr.nmfs.noaa.gov*.

SUPPLEMENTARY INFORMATION:

Background

NMFS is responsible for determining whether species, subspecies, or distinct population segments of Pacific salmon and *O. mykiss* (inclusive of anadromous steelhead and some populations of resident rainbow trout) are threatened or endangered, and for designating constitute critical habitat for them under the ESA (16 U.S.C. 1531 *et seq*). To be considered for ESA listing, a group of organisms must constitute a "species." Section 3 of the ESA defines a species as "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." Since 1991, NMFS has identified distinct population segments of Pacific salmon and *O. mykiss* by dividing the U.S. populations of each species into evolutionarily significant units (ESUs) which it determines are substantially reproductively isolated and represent an important component in the evolutionary legacy of the biological species (56 FR 58612; November 20, 1991). Using this approach, every Pacific salmon and *O. mykiss* population in the U.S. is part of a distinct population segment that is eligible for listing as a threatened or endangered species under the ESU. In ESA listing determinations for Pacific salmon and *O. mykiss* since 1991 we have identified 52 ESUs in Washington, Oregon, Idaho and California. Presently, 25 ESUs are listed as threatened or endangered. One additional ESU (Oregon Coast coho salmon) was listed as threatened from 1998 to 2004 when it was removed from the list of threatened or endangered species as a result of a Court Order.

In a **Federal Register** document published on June 14, 2004 (69 FR 33101), we proposed to list 27 ESUs as threatened or endangered. The ESUs proposed for listing include 25 that are currently listed, but in most cases the ESUs are being redefined in either of two significant ways: By including hatchery fish that are no more than moderately divergent genetically from naturally spawning fish within the ESU, and in the case of *O. mykiss* species, by including some resident trout populations in the ESUs. We have also proposed to list the previously-listed Oregon Coast coho salmon population which is redefined to include some fish reared in hatcheries, and are proposing to list one new ESU (Lower Columbia River *O. mykiss*, was previously thought to be extinct in the wild). In this document, *O. mykiss* ESUs refer to ESUs that include populations of both anadromous steelhead and resident rainbow trout. Also, references to "salmon" in this notice generally include all members of the genus *Oncorhynchus*, including *O. mykiss*.

This **Federal Register** document describes proposed critical habitat designations for the following seven ESUs of Pacific salmon and *O. mykiss* in California: (1) California Coastal chinook salmon; (2) Northern California *O. mykiss*; (3) Central California Coast *O. mykiss*; (4) South-Central California Coast *O. mykiss*; (5) Southern California *O. mykiss*; (6) Central Valley spring run chinook salmon; and (7) Central Valley *O. mykiss*.

Section 3 of the ESA defines critical habitat as "the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed that are determined by the Secretary to be essential for the conservation of the species." Section 3 of the ESA (16 U.S.C. 1532(3)) also defines the terms "conserve," "conserving," and "conservation" to mean "to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary." Section 4 of the ESA requires that before designating critical habitat, we must consider economic impacts, impacts on national security and other relevant impacts of specifying any particular area as critical habitat, and the Secretary may exclude any area from critical habitat if the benefits of exclusion outweigh the benefits of inclusion, unless excluding an area from critical habitat will result in the extinction of the species concerned. Once critical habitat for a salmon or *O. mykiss* ESU is designated, section 7(a)(2) of the ESA requires that each Federal agency shall, in consultation with and with the assistance of NMFS, ensure that any action authorized, funded or carried out by such agency is not likely to result in the destruction or adverse modification of critical habitat.

Previous Federal Action and Related Litigation

Many Pacific salmon and *O. mykiss* ESUs in California and the Pacific Northwest have suffered broad declines over the past hundred years. We have conducted several ESA status reviews and status review updates for Pacific salmon and *O. mykiss* in California, Oregon, Washington, and Idaho. The most recent ESA status review and proposed listing determinations were published on June 14, 2004 (69 FR 33101). Six of the currently listed ESUs have final critical habitat designations. Table 1 summarizes the NMFS scientific reviews of West Coast salmon and *O. mykiss* and the ESA listing determinations and critical habitat designations made to date.

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
Snake River sockeye ESU	Endangered	1991	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 56 FR 58619; 11/20/1991 (Final rule) 56 FR 14055; 04/05/1991 (Proposed rule) *Critical Habitat Designations* 58 FR 68543; 12/28/1993 (Final rule) 57 FR 57051; 12/02/1992 (Proposed rule)	NMES 1991a.
Ozette Lake sockeye ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 14528; 03/25/1999 (Final rule) 63 FR 11750; 03/10/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11750; 03/10/1998 (Proposed rule)	NMFS 1998d. NMFS 1997f.
Sacramento River winter-run chinook ESU	Endangered	1994	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 59 FR 440; 01/01/1994 (Final rule) 57 FR 27416; 06/19/1992 (Proposed rule) 55 FR 49623; 11/30/1990 (Final rule) 55 FR 12831, 04/06/1990 (Emergency rule) 55 FR 102260; 03/20/1990 (Proposed rule) 54 FR 10260; 08/04/1989 (Emergency rule) 52 FR 6041; 02/27/1987 (Final rule) *Critical Habitat Designations.* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule)	
Central Valley spring-run chinook ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 50394; 09/16/1999 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1998b. NMFS 1999d.
			Listing Determinations 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 50394; 09/16/1999 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal)	

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998b.
California Coastal chinook ESU	Threatened	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1999d.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	NMFS 1998b.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998e.
Upper Willamette River chinook ESU	Threatened	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1999c.
			Listing Determinations	NMFS 1998e.
Lower Columbia River chinook ESU	Threatened	1999	69 FR 33102; 06/14/04 (Proposed rule)	NMFS 1999c.
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	
			65 FR 7764; 02/16/2000 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	NMFS 1998b.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998e.
Upper Columbia River spring-run chinook ESU.	Endangered.	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1998c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed NMFS 1999c rule)	
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	NMFS 1998b.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998e.
Puget Sound chinook ESU	Threatened.	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1999c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			63 FR 1807; 0/12/1998 (Proposal withdrawn)	
			59 FR 66784; 12/28/1994 (Proposed rule)	
			59 FR 42529; 08/18/1994 (Emergency rule)	
			57 FR 23458; 06/03/1992 (Correction)	
			57 FR 14653; 04/22/1992 (Final rule)	
			56 FR 29547; 06/27/1991 (Proposed rule)	NMFS 1991c.
Snake River fall-run chinook ESU	Threatened	1992	*Critical Habitat Designations*	NMFS 1999d.
			58 FR 68543; 12/28/1993 (Final rule)	
			57 FR 57051; 12/02/1992 (Proposed rule)	
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			63 FR 1807; 0/12/1998 (Proposal withdrawn)	
			59 FR 66784; 12/28/1994 (Proposed rule)	
			59 FR 42529; 08/18/1994 (Emergency rule)	
			57 FR 23458; 06/03/1992 (Correction)	
			57 FR 34639; 04/22/92 (Final rule)	
			56 FR 29542; 06/27/1991 (Proposed rule)	
			Critical Habitat Designations	
			58 FR 68543; 12/28/1993 (Final rule)	NMFS 1991b.
Snake River spring/summer-run chinook ESU.	Threatened	1992	57 FR 57051; 12/02/1992 (Proposed rule)	NMFS 1998b.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			61 FR 56138;–10/31/1996 (Final rule)	
			60 FR 38011; 07/25/1995 (Proposed rule)	
			Critical Habitat Designations	
			64 FR 24049; 05/05/1999 (Final rule)	Bryant 1994.
Central California Coast coho ESU	Threatened	1996	62 FR 62791; 11/25/1997 (Proposed rule)	NMFS 1995a.

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
Southern Oregon/Northern California Coast	Threatened	1997	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 62 FR 24588; 05/06/1997 (Final rule) 60 FR 38011; 07/25/1995 (Proposed rule) *Critical Habitat Designations* 64 FR 24049; 05/05/1999 (Final rule) 62 FR 62791; 11/25/1997 (Proposed rule)	NMFS 1997a. NMFS1996c. NMFS 1996e. NMFS 1995a. NMFS 1997a.
Oregon Coast coho ESU	Proposed Threatened*	1998	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 69 FR 19975; 04/15/2004 (Candidate list) 63 FR 42587; 08/10/1998 (Final rule) 62 FR 24588; 05/06/1997 (Proposal withdrawn) 61 FR 56138;10/31/1996 (6 mo. extension) 60 FR 38011; 07/25/1995 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 64 FR 24998; 0510/1999 (Proposed rule)	NMFS 1996b. NMFS 1996d. NMFS 1995a.
Lower Columbia River coho ESU	Proposed Threatened	1995	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 69 FR 19975; 04/15/2004 (Candidate list) 60 FR 38011; 07/25/1995 (Not warranted) *Critical Habitat Designations* n/a	NMFS 1996e. NMFS 1995a. BNFS 1991a.
Columbia River chum ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 14508; 03/25/1999 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule)	NMFS 1997e. NMFS 1999b. NMFS 1999c.
Hood Canal summer-run chum ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 14508; 03/25/1999 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule)	NMFS 1996d. NMFS 1997e. NMFS 1999b. NMFS 1999c.
Southern California *O. mykiss*+ ESU	Endangered	1997	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 67 FR 21568; 05/01/2002 (Redefinition of ESU) 62 FR 43937; 08/18/1997 (Final rule) 61 FR 41541; 08/09/1996 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1996b NMFS 1997b.
South-Central California Coast *O. mykiss* ESU	Threatened	1997	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 62 FR 43937; 08/18/1997 (Final rule) 61 FR 41541; 08/09/1996 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1996b. NMFS 1997b.
			Listing Determinations 69 FR 33102; 06/14/04 (Proposed rule) 62 FR 43937; 08/18/1997 (Final rule) 61 FR 41541; 08/09/1996 (Proposed rule) *Critical Habitat Designations* 68FR 55900; 09/29/2003 (removal)	

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1996b.
entral California Coast *O. mykiss* ESU	Threatened	1997	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1997b.
			Listing Determinations	
			69 FR 33102; 6/14/04 (Proposed rule)	NMFS 1996b.
			63 FR 13347; 03/19/1998 (Final rule)	NMFS 1997b.
			62 FR 43974; 08/18/1997 (6 mo. extension).	NMFS 1997c.
			61 FR 41541; 08/09/1996 (Proposed rule)	NMFS 1997d.
alifornia Central Valley *O. mykiss* ESU	Threatened	1998	*Critical Habitat Designations*	NMFS 1998a.
			68 FR 55900; 09/29/2003 (removal)	
			65 FR 7764; 02/16/2000 (Final rule)	
			64 FR 5740; 03/10/1999 (Proposed rule)	
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			65 FR 36074; 06/07/2000 (Final rule)	
			65 FR 6960; 02/11/2000 (Proposed rule)	
			63 FR 13347; 03/19/1998 (Not Warranted)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	NMFS 1996b.
			61 FR 41541; 08/09/1996 (Proposed rule)	NMFS 1997c.
			Critical Habitat Designations	NMFS 1998a.
orthern California *O. mykiss* ESU	Threatened	2000	n/a	NMFS 2000
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14517; 03/25/1999 (Final rule)	
			63 FR 11798; 03/10/1998 (Proposed rule)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designation	NMFS 1996b.
			68 FR 55900; 09/29/2003 (removal)	NMFS 1997d.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1999a.
pper Willamette River *O. mykiss* ESU	Threatened	1999	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1999c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			63 FR 13347; 03/19/1998 (Final rule)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	NMFS 1996b.
			68 FR 55900; 09/29/2003 (removal)	NMFS 1997c.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1997d.
ower Columbia River *O. mykiss* ESU	Threatened	1998	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1998a.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14517; 03/25/1999 (Final rule)	
			63 FR 11798; 03/10/1998 (Proposed rule)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	NMFS 1996b.
			68 FR 55900; 09/29/2003 (removal	NMFS 1997d.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1999a.
iddle Columbia River *O. mykiss* ESU	Threatened	1999	64 FR 5740; 03/10/1999 (proposed rule)	NMFS 1999c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			62 FR 43974; 08/18/1997 (Final rule)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1996b.
pper Columbia River *O. mykiss* ESU	Endangered	1997	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1997b.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			62 FR 43937; 08/18/1997 (Final rule)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST (
SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Pr ent re
Snake River Basin *O. mykiss* ESU	Threatened	1997	65 FR 7764; 02/16/2000 (Final rule) .... 64 FR 5740; 03/10/1999 (Proposed rule) ..	NM NM

* Previously listed as a "threatened" species (63 FR 42587, August 10, 1998). Threatened listing set aside in *Alsea Valley Allianc* *(Alsea Valley Alliance v. Evans,* 161 F.Supp.2d 1154 (D.Or.2001), *appeals dismissed* 358 F.3d 1181 (9th Cir. 2004).
+ *O. mykiss* ESUs include both anadromous "steelhead" and resident "rainbow trout" in certain areas (see 69 FR 33101; July 14, 2(

On February 16, 2000, NMFS published final critical habitat designations for 19 ESUs, thereby completing designations for all 25 ESUs listed at the time (65 FR 7764). The 19 designations included more than 150 river subbasins in Washington, Oregon, Idaho, and California. Within each occupied subbasin, we designated as critical habitat those lakes and river reaches accessible to listed fish along with the associated riparian zone, except for reaches on Indian land. Areas considered inaccessible included areas above long-standing natural impassable barriers and areas above impassable dams, but not areas above ephemeral barriers such as failed culverts.

In considering the economic impact of the February 16, 2000, action, NMFS determined that the critical habitat designations would impose very little or no additional requirements on Federal agencies beyond those already associated with the listing of the ESUs themselves. NMFS reasoned that since it was designating only occupied habitat, there would be few or no actions that destroy or adversely modify critical habitat that did not also jeopardize the continued existence of the species. Therefore, the agency reasoned that there would be no economic impact as a result of the designations (65 FR 7764, 7765; February 16, 2000).

The National Association of Homebuilders (NAHB) challenged the designations in District Court in Washington, DC on the grounds that he agency did not adequately consider economic impacts of the critical habitat designations (*National Association of Homebuilders* v. *Evans*, 2002 WL 1205743 No. 00–CV–2799 (D.D.C.)). NAHB also challenged NMFS' designation of Essential Fish Habitat (EFH) (Pacific Coast Salmon Fishery Management Plan, 2000). While the NAHB litigation was pending, the Court of Appeals for the 10th Circuit issued its decision in *New Mexico Cattlegrowers' Association* v. *U.S. Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001) (*NMCA*). In that case, the Court rejected the U.S. Fish and Wildlife Service (FWS) approach to economic analysis, which was similar to the approach taken by NMFS in the final rule designating critical habitat for 19 ESUs of West Coast salmon and *O. mykiss*. The Court ruled that "Congress intended that the FWS conduct a full analysis of all of the economic impacts of a critical habitat designation, regardless of whether those impacts are attributable co-extensively to other causes." Subsequent to the 10th Circuit decision, we entered into and sought judicial approval of a consent decree resolving the NAHB litigation. That decree provided for the withdrawal of critical habitat designations for the 19 Pacific salmon and *O. mykiss* ESUs and dismissed NAHB's challenge to the EFH designations. The District Court approved the consent decree and vacated the critical habitat designations by Court order on April 30, 2002 (*National Ass'n of Homebuilders* v. *Evans*, 2002 WL 1205743 (D.D.C. 2002)).

Subsequently, in response to a complaint filed in the District of Columbia by the Pacific Coast Federation of Fishermen's Associations, Institute for Fisheries Resources, the Center for Biological Diversity, the Oregon Natural Resources Council, the Pacific Rivers Council, and the Environmental Protection Information Center (PCFFA *et al.*) alleging that NMFS had failed to timely designate critical habitat for the 19 ESUs for which critical habitat had been vacated (as well as the Northern California *O. mykiss* ESU), PCFFA and NMFS filed—and the court approved—an agreement resolving that litigation and establishing a schedule for designation of critical habitat. On July 13, 2004, the D.C. District Court approved an amendment to the Consent Decree and Stipulated Order of Dismissal providing for a revised schedule for the submission of proposed and final rules designating critical habitat for the 20 ESUs to the **Federal Register**. For those ESUs that are included on the list of threatened and endangered species as of September 30, 2004, and which fall under the responsibility of the Northwest office of NMFS, proposed rules submitted to the **Federal Regist** later than September 30, 2004. ESUs that are included on the l threatened and endangered spe November 30, 2004, and which under the responsibility of NM Southwest Regional office, prop rules must be submitted to the **Register** for publication no late November 30, 2004. For those ESUs addressed in the propose and included on the lists of thr and endangered species as of Ju 2005, final rules must be submi the **Federal Register** for publica later than June 15, 2005. On Se 17, 2004, NMFS filed a motion Court seeking an additional 60- extension of the deadline for su to the **Federal Register** a propo for the 13 ESUs subject to the S 30, 2004, deadline. On October the court granted the motion.

Past critical habitat designati generated considerable public i Therefore, in an effort to engag public early in this rulemaking we published an advance notic proposed rulemaking (ANPR) o September 29, 2003 (68 FR 559 ANPR identified issues for consideration and evaluation, a solicited comments regarding t issues and information regardi areas and species under consid We received numerous comme response to the ANPR and cons them during development of th proposed rulemaking. Where a we have referenced these comm this **Federal Register** documen as in other documents supporti proposed rule. We encourage t submitted comments on the AN review and comment on this pr rule as well. We will address al comments in the final rule.

Methods and Criteria Used to Identify Proposed Critical Habitat

Salmon Life History

Pacific salmon are anadromous fish, meaning adults migrate from the ocean to spawn in freshwater lakes and streams where their offspring hatch and rear prior to migrating back to the ocean to forage until maturity. The migration and spawning times vary considerably across and within species and populations (Groot and Margolis, 1991). At spawning, adults pair to lay and fertilize thousands of eggs in freshwater gravel nests or "redds" excavated by females. Depending on lake/stream temperatures, eggs incubate for several weeks to months before hatching as "alevins" (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles called "fry" and begin actively feeding. Depending on the species and location, juveniles may spend from a few hours to several years in freshwater areas before migrating to the ocean. The physiological and behavioral changes required for the transition to salt water result in a distinct "smolt" stage in most species. On their journey juveniles must migrate downstream through every riverine and estuarine corridor between their natal lake or stream and the ocean. For example, smolts from Idaho will travel as far as 900 miles from the inland spawning grounds. En route to the ocean the juveniles may spend from a few days to several weeks in the estuary, depending on the species. The highly productive estuarine environment is an important feeding and acclimation area for juveniles preparing to enter marine waters.

Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and chinook salmon, have precocious life history types (primarily male fish known as "jacks") that mature and spawn after only several months in the ocean. Spawning migrations known as "runs" occur throughout the year, varying by species and location. Most adult fish return or "home" with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, while anadromous *O. mykiss* may return to the ocean and make repeat spawning migrations. This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (see review by Spence *et al.*, 1996). Spawning gravels must be of a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well-oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off channel areas) and from warm summer water temperatures (coldwater springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages salmon require cool water that is free of contaminants. They also require rearing and migration corridors with adequate passage conditions (water quality and quantity available at specific times) to allow access to the various habitats required to complete their life cycle.

The homing fidelity of salmon has created a meta-population structure with distinct populations distributed among watersheds (McElhany *et al.*, 2000). Low levels of straying result in regular genetic exchange among populations, creating genetic similarities among populations in adjacent watersheds. Maintenance of the meta-population structure requires a distribution of populations among watersheds where environmental risks (*e.g.*, from landslides or floods) are likely to vary. It also requires migratory connections among the watersheds to allow for periodic genetic exchange and alternate spawning sites in the case that natal streams are inaccessible due to natural events such as a drought or landslide.

Identifying the Geographical Area Occupied by the Species and Specific Areas within the Geographical Area

In past critical habitat designations, NMFS had concluded that the limited availability of species distribution data prevented mapping salmonid critical habitat at a scale finer than occupied river basins (65 FR 7764; February 16, 2000). Therefore, the 2000 designations defined the "geographical area occupied by the species at the time of listing" as all accessible river reaches within the current range of the listed species. Comments received on the ANPR expressed a range of opinions about the appropriate scale for defining occupied areas; many expressed concern that the 2000 designations were overly broad and inclusive and encouraged us to use a finer scale in designating critical habitat for salmon.

In the 2000 designations, NMFS relied on the U.S. Geological Survey's (USGS) identification of subbasins, which was the finest scale mapped by USGS at that time, to define the "specific areas" within the geographical area occupied by the species. The subbasin boundaries are based on an area's topography and hydrography, and USGS has developed a uniform framework for mapping and cataloging drainage basins using a unique hydrologic unit code (HUC) identifier (Seaber *et al.* 1986). The code contains separate two-digit identifier fields wherein the first two digits refer to a region comprising a relatively large drainage area (*e.g.*, Region 17 for the entire Pacific Northwest), while subsequent fields identify smaller nested drainages. Under this convention, fourth field hydrologic units contain eight digits and are commonly referred to as "HUC4s" or "subbasins." In the 2000 designations, therefore, we identified as critical habitat all areas accessible to listed salmon within an occupied HUC4 subbasin. Since the critical habitat designations in 2000, additional scientific information in the Pacific Northwest has significantly improved our ability to identify freshwater and estuarine areas occupied by salmonids and to group the occupied stream reaches into finer scale "specific areas" in the states of Washington, Oregon, and Idaho.

In the Pacific Northwest, we can now be somewhat more precise about the "geographical area occupied by the species" because Federal, state, and tribal fishery biologists in the northwest have made progress mapping actual species distribution at the level of stream reaches. The current mapping identifies occupied stream reaches where the species has been observed. It also identifies stream reaches where the species is presumed to occur based on the professional judgement of biologists familiar with the watershed. However, such presumptions may not be sufficiently rigorous or consistent to support a critical habitat designation. Much of these data can now be accessed and analyzed using geographic information systems (GIS) to produce consistent and fine-scale maps. As a result, nearly all salmonid freshwater and estuarine habitats in Washington, Oregon, and Idaho are now mapped and available in GIS at a scale of 1:24,000. Previous distribution data were often compiled at a scale of 1:100,000 or greater.

In California, similar fine-scale species distribution mapping efforts have not been conducted by Federal, State or tribal co-managers on the scale that was needed for the critical habitat designation effort, and therefore, maps of species distribution were not available for the seven ESUs addressed in this rulemaking. Given the need to identify and map occupied habitat more precisely and the lack of fine-scale species distribution mapping in California, the Southwest Regional office embarked on a major effort to compile available information on species distribution, habitat use, and other parameters, and develop species distribution and habitat use maps for all seven ESUs. In order to make this effort manageable, data were compiled for stream hydrography at a scale of 1:100,000 rather than the 1:24,000 scale of data that were available in the Pacific Northwest. Fishery biologists in the Southwest Region were organized into a series of teams tasked with compiling and organizing information available in the literature, from Federal and state agencies, and personal knowledge, regarding the spatial distribution, habitat use (*i.e.* spawning, rearing, and/or migration) and habitat quality on a stream reach basis for each of the seven ESUs in California. This information was organized into a series of databases and then converted to GIS data layers for the analysis of data and generation of distribution maps. The current mapping identifies occupied stream reaches where the various ESUs have been observed, and also identifies stream reaches where the ESUs are presumed to occur based on the professional judgement of biologists familiar with the watersheds. As in the Northwest, such presumptions, however, may not be sufficiently rigorous or consistent to support a critical habitat designation, and we therefore solicit information as to which stream reaches are actually occupied by the various ESUs addressed in this rule. We made use of these finer scale data for the critical habitat designations for the seven California ESUs, and now believe they enable us to make a more accurate delineation of the "geographical area occupied by the species" referred to in the ESA definition of critical habitat. The final critical habitat designations will be based on the final listing decisions for these ESUs due by June 2005 and thus will reflect occupancy "at the time of listing" as the ESA requires.

NMFS is now able to also identify "specific areas" (section 3(5)(a)) and "particular areas'(section 4(b)(2)) for ESUs in the Pacific Northwest (Oregon, Washington and Idaho) at a finer scale than in 2000. Since 2000, various Federal agencies in the Pacific Northwest have identified fifth field hydrologic units (referred to as "HUC5s" or hereafter "watersheds") throughout the Pacific Northwest using the USGS mapping conventions referred to above. This information is now generally available from these agencies and via the internet (California Spatial Information Library, 2004; Interior Columbia Basin Ecosystem Management Project, 2003; Regional Ecosystem Office, 2004). For ESUs in the Pacific Northwest, the agency used this information to organize critical habitat information systematically and at a scale that is relevant to the spatial distribution of salmon. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to the watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations that generally correspond to the area encompassed by subbasins or HUC5 watersheds (Washington Department of Fisheries *et al.*, 1992; Kostow, 1995; McElhany *et al.*, 2000).

In California, it was not possible to use the USGS's HUC5 watershed framework to organize the biological and other types of information since HUC5s have not been delineated for the entire geographical area occupied by the seven ESUs addressed in this rulemaking. The Southwest Region, therefore, used the State of California's CALWATER watershed classification system (version 2.2), which is similar to the USGS watershed classification system, to organize biological and other types of information. Under the CALWATER watershed classification system, geographic units range from hydrologic regions (the largest) to planning watersheds (the smallest). For the purposes of this critical habitat designation analysis, biological and other types of information were organized primarily by hydrologic subareas (HSAs) that generally correspond to major tributary watersheds and are roughly equivalent in size to USGS HUC5s. These smaller HSA watersheds were then aggregated into larger geographic units called hydrologic units that correspond to major watersheds or sub-regions for purposes of describing critical habitat for each of the seven ESUs in California. However, it must be recognized that even the CALWATER HSA watershed units used for the designations in California are very broad units, often containing several different populations of salmonids which may in fact be largely independent of each other.We therefore solicit information on ways to further improve the geographic precision of our habitat analyis.

Both the USGS and CALWATER systems map watershed units as polygons that bound a drainage area and encompass streams, riparian areas and uplands. Within the boundaries of any such watershed unit (HUC5 or HSA), there are stream reaches not occupied by the species. Land areas within the HUC5 or HSA boundaries are also generally not "occupied" by the species (though certain areas such as flood plains or side channels may be occupied at some times of some years). In California, we used the HSA watershed boundaries as a basis for aggregating occupied stream reaches and to delineate "specific" areas occupied by the species. This document generally refers to the occupied stream reaches within the watershed boundary as the "habitat area" to distinguish it from the entire area encompassed by the watershed boundary.

At the same time, the ESA requires that an area cannot be designated as critical habitat unless at the time of listing it contains physical or biological features essential to the conservation of the species. The ESA does not permit an area lacking such features to be designated as critical habitat in the hope that it may over time acquire such features and therefore aid in the conservation of the species.

The HSA watershed-scale aggregation of stream reaches also allowed us to analyze the impacts of designating a "particular area," as required by ESA section 4(b)(2). As a result of watershed processes, many activities occurring in riparian or upland areas and in non-fish-bearing streams may affect the physical or biological features essential to conservation in the occupied stream reaches. The watershed boundary thus describes an area in which Federal activities have the potential to affect critical habitat (Spence *et al.* 1996). Using HSA watershed boundaries for the economic analysis ensured that all potential economic impacts were considered. Section 3(5) defines critical habitat in terms of "specific areas," and section 4(b)(2) requires the agency to consider certain factors before designating "particular areas." In the case of Pacific salmonids, the biology of the species, the characteristics of its habitat, the nature of the impacts and the limited information currently available at finer geographic scales made it appropriate to consider "specific areas" and "particular areas" as the same unit.

In addition, HSA watersheds are consistent with the scale of recovery efforts for West Coast salmon. In its review of the long-term sustainability of Pacific Northwest salmonids, the National Research Council's Committee on Protection and Management of Pacific Northwest Anadromous Salmonids concluded that "habitat protection must be coordinated at landscape scales appropriate to salmon life histories' and that social structures and institutions "must be able to operate at the scale of watersheds" (National Research Council, 1996). Watershed-level analyses are now common throughout the West Coast (Forest Ecosystem Management Assessment Team, 1993; Montgomery *et al.*, 1995; Spence *et al.*, 1996). The recent recovery strategy developed for coho salmon in California by the California Department of Fish and Game (CDFG, 2004) organized its watershed assessment and recovery recommendations on the basis of CALWATER HSA watersheds. There are presently more than 400 watershed councils or groups in Washington, Oregon, and California alone (For the Sake of the Salmon, 2004). Many of these groups operate at a geographic scale of one to several watersheds and are integral parts of larger-scale salmon recovery strategies (Northwest Power Planning Council, 1999; Oregon Plan for Salmon and Watersheds, 2001; Puget Sound Shared Strategy, 2002; CALFED Bay-Delta Program, 2003). Aggregating stream reaches into watersheds allowed us to consider "specific areas," within or outside the geographical area occupied by the species, at a scale that often corresponds well to salmonid population structure and ecological processes.

Occupied estuarine and marine areas were also considered with regard to the seven ESUs in California. In previous designations of salmonid critical habitat the agency did not designate marine areas outside of estuaries and Puget Sound. In the Pacific Ocean, we concluded that there may be essential habitat features, but that they did not require special management considerations or protection (see *Physical or Biological Features Essential to the Conservation of the Species* and *Special Management Considerations or Protection* sections below). Several commenters on that previous rule questioned the finding, and we stated that we would revisit the issue (65 FR 7764; February 16, 2000). Since that time we have considered the best available scientific information, and related agency actions, such as the designation of Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act.

We now conclude that it is possible to delineate some estuarine areas in California (*e.g.*, the San Francisco-San Pablo-Suisun Bay complex, Humboldt Bay, and Morro Bay) that are occupied and contain essential habitat features that may require special management considerations or protection. Such estuarine areas are crucial for juvenile salmonids, given their multiple functions as areas for rearing/feeding, freshwater-saltwater acclimation, and migration (Simenstad *et al.*, 1982; Marriott *et al.* 2002). In many areas, especially the San Francisco Bay estuary, these habitats are occupied by multiple ESUs. Accordingly, we are proposing to designate specific occupied estuarine areas as defined by a line connecting the furthest land points at the estuary mouth.

Nearshore coastal marine areas may provide important habitat for rearing/feeding and migrating salmonids in California; however, we were not able to identify essential habitat features or conclude that such areas require special management considerations or protection.

For salmonids in marine areas farther offshore, it becomes more difficult to identify specific areas where essential habitat can be found. Links between human activity, habitat conditions and impacts to listed salmonids are less direct in offshore marine areas. Perhaps the closest linkage exists for salmon prey species that are harvested commercially (*e.g.*, Pacific herring) and, therefore, may require special management considerations or protection. However, because salmonids are opportunistic feeders we could not identify "specific areas" beyond the nearshore marine zone where these or other essential features are found within this vast geographic area occupied by Pacific salmon. Moreover, prey species move or drift great distances throughout the ocean and would be difficult to link to any "specific" areas.

Unoccupied Areas

ESA section 3(5)(A)(ii) defines critical habitat to include "specific areas outside the geographical area occupied" if the areas are determined by the Secretary to be "essential for the conservation of the species." NMFS regulations at 50 CFR 424.12(e) emphasize that we "shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species." NMFS regulations at 50 CFR 424.12(e) emphasize that we "shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species." We are not proposing to designate any areas not occupied at the time of listing; however, within the range of some ESUs, we have identified unoccupied areas which may be essential to their conservation, and we seek public comment on this issue.

Primary Constituent Elements and Physical or Biological Features Essential to the Conservation of the Species

In determining what areas are critical habitat, agency regulations at 50 CFR 424.12(b) require that we must "consider those physical or biological features that are essential to the conservation of a given species including space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species." The regulations further direct us to "focus on the principal biological or physical constituent elements * * * that are essential to the conservation of the species," and specify that the "known primary constituent elements shall be listed with the critical habitat description." The regulations identify primary constituent elements (PCE) as including, but not limited to: "roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types." An area must contain one or more PCEs at the time the species is listed to be eligible for designation as critical habitat; an area lacking a PCE may not be designated in the hope it will acquire one or more PCEs in the future.

NMFS biologists developed a list of PCEs specific to salmon for the ANPR (68 FR 55926; September 29, 2003), based on a decision matrix (NMFS, 1996) that describes general parameters and characteristics of most of the essential features under consideration in this critical habitat designation. As a result of biological assessments supporting this proposed rule (see Critical Habitat Analytical Review

Teams section), we are now proposing slightly revised PCEs.

The ESUs addressed in this proposed rulemaking share many of the same rivers and estuaries and have similar life history characteristics and, therefore, many of the same PCEs. These PCEs include sites essential to support one or more life stages of the ESU (sites for spawning, rearing, migration and foraging). These sites in turn contain physical or biological features essential to the conservation of the ESU (for example, spawning gravels, water quality and quantity, side channels, forage species). Specific types of sites and the features associated with them include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;

4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The habitat areas designated in this proposal currently contain PCEs within the acceptable range of values required to support the biological processes for which the ESUs use the habitat. It is important to note that the contribution of the PCEs to the habitat varies by site and biological function, illustrating the interdependence of the habitat elements such that the quality of the elements may vary within a range of acceptable conditions. An area in which a PCE no longer exists because it has been degraded to the point where it no longer functions as a PCE cannot be designated in the hope that its function may be restored in the future.

Special Management Considerations or Protection

An occupied area cannot be designated as critical habitat unless it contains physical and biological features that "may require special management considerations or protection." Agency regulations at 424.02(j) define "special management considerations or protection" to mean "any methods or procedures useful in protecting physical and biological features of the environment for the conservation of listed species." Many forms of human activity have the potential to affect the habitat of listed salmon ESUs including: (1) Forestry; (2) grazing and other associated rangeland activities; (3) agriculture and associated water withdrawals for agriculture; (4) road building/maintenance; (5) channel modifications/diking/stream bank stabilization; (6) urbanization; (7) sand and gravel mining; (8) mineral mining; (9) dams; (10) irrigation impoundments and water withdrawals; (11) wetland loss/removal; (12) exotic/invasive species introductions; and (13) impediments to fish passage. In addition to these, the harvest of salmonid prey species (*e.g.*, herring, anchovy, and sardines) may present another potential habitat-related management activity (Pacific Fishery Management Council, 1999). In recent years the Federal government and many non-Federal landowners have adopted many changes in land and water management practices that are contributing significantly to protecting and restoring the habitat of listed species. Thus, many of the available special management considerations or protections for these areas are already in place and the need for designating such areas as critical habitat is diminished accordingly. We request comment on the extent to which particular areas may require special management considerations or protection in light of existing management constraints. The contributions of these management measures are also relevant to the exclusion analysis under section 4(b)(2) of the ESA, and will be considered further in a later section of this notice.

Military Lands

The Sikes Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an Integrated Natural Resource Management Plan (INRMP). An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the installation. Each INRMP includes: an assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species; a statement of goals and priorities; a detailed description of management actions to be implemented to provide for these ecological needs; and a monitoring and adaptive management plan. Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management, fish and wildlife habitat enhancement or modification, wetland protection, enhancement, and restoration where necessary to support fish and wildlife and enforcement of applicable natural resource laws.

The recent National Defense Authorization Act for Fiscal Year 2004 (Public Law 108–136) amended the ESA to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(I) of the ESA (16 U.S.C. 1533(a)(3)(B)(I)) now provides: "The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation."

To address this new provision we contacted the Department of Defense (DOD) and requested information on all INRMPs that might benefit Pacific salmon. In response to the ANPR (68 FR 55926, September 29, 2003) we had already received a letter from the U.S. Marine Corps regarding this and other issues associated with a possible critical habitat designation on its facilities in the range of the Southern California *O. mykiss* ESU. In response to our request, the military services identified 25 installations in California with INRMPs in place or under development. Based on information provided by the military, as well as GIS analysis of fish distributional information compiled by NMFS" Southwest Region (NMFS, 2004a) and land use data, we determined that the following facilities with INRMPs overlap with habitat areas under consideration for critical habitat designation in California: (1) Camp Pendleton Marine Corps Base; (2) Vandenberg Air Force Base; (3) Camp San Luis Obispo; (4) Camp Roberts; and (5) Mare Island Army Reserve Center. Two additional facilities are adjacent to, but do not appear to overlap with, habitat areas under consideration for critical habitat in California: (1) Naval Weapons Station, Seal Beach/Concord Detachment; and (2) Point Mugu Naval Air Station. None of the remaining facilities with INRMPs in place overlapped with or were adjacent to habitat under consideration for critical habitat based on the information available to us. All of these INRMPs are final except for the Vandenberg Air Force Base INRMP, which is expected to be finalized in the near term.

We identified habitat of value to listed salmonids in each INRMP and reviewed these plans, as well as other information available regarding the management of these military lands. Our preliminary review indicates that each of these INRMPs addresses habitat for salmonids, and all contain measures that provide benefits to ESA-listed salmon and steelhead. Examples of the types of benefits include actions that control erosion, protect riparian zones, minimize stormwater and construction impacts, reduce contaminants, and monitor listed species and their habitats. Also, we have received some information from the DOD identifying national security impacts at certain sites including the Camp Pendleton Marine Corps Base and Vandenberg Air Force Base. On the basis of this information, therefore, we are not proposing to designate critical habitat in areas subject to the final INRMPs or the draft INRMP for Vandenberg Air Force Base at this time.

Critical Habitat Analytical Review Teams

To assist in the designation of critical habitat, we convened several Critical Habitat Analytical Review Teams (Teams) organized by major geographic areas that roughly correspond to salmon recovery planning domains in California. The Teams consisted of NMFS fishery biologists from the Southwest Region with demonstrated expertise regarding salmonid habitat within the domain. The Teams were tasked with compiling and assessing biological information pertaining to areas under consideration for designation as critical habitat. Each Team worked closely with GIS specialists to develop maps depicting the spatial distribution of habitat occupied by each ESU and the use of occupied habitat on stream hydrography at a scale of 1:100,000.

The Teams examined each habitat area within the watershed to determine whether the stream reaches occupied by the species contain the physical or biological features essential to conservation. The Teams also relied on their experience conducting section 7 consultations to determine whether there are management activities in the area that threaten the currently existing primary constituent elements identified for the species. Where such activities occur, the Teams concluded that there were "any methods or procedures useful in protecting physical and biological features" for the area (50 CFR 424.02(j)), and therefore, that the features "may require special management considerations or protection."

However, the Teams were not asked to evaluate the effects of existing management protections on the species, or analyze the usefulness of protective methods or procedures in addressing risks to PCEs. Thus, the Teams' evaluations do not reflect the extent to which an area will contribute to conservation of the species in the absence of a critical habitat designation.

In addition to occupied areas, the definition of critical habitat also includes unoccupied areas if we determine that area is essential for conservation of a species. Accordingly the Teams were next asked whether there were any unoccupied areas within the historical range of the ESUs that may be essential for conservation. For the seven ESUs addressed in this rulemaking, the Teams did not have information available that would allow them to conclude that specific unoccupied areas were essential for conservation; however, in many cases they were able to identify areas they believed may be determined essential through future recovery planning efforts. These are identified under the Species Descriptions and Area Assessments section, and we are specifically requesting information regarding such areas under Public Comments Solicited.

The Teams were next asked to determine the relative conservation value of each occupied area or watershed for each ESU. The Teams scored each habitat area based on several factors related to the quantity and quality of the physical and biological features. They next considered each area in relation to other areas and with respect to the population occupying that area. Based on a consideration of the raw scores for each area, and a consideration of that area's contribution to conservation in relation to other areas and in relation to the overall population structure of the ESU, the Teams rated each habitat area as having a "high," "medium" or "low" conservation value.

The rating of habitat areas as having a high, medium, or low conservation value provided information useful for the discretionary balancing consideration in ESA section 4(b)(2). The higher the conservation value for an area, the greater may be the likely benefit of the ESA section 7 protections. The correlation is not perfect because the Teams did not take the additional step of separately considering two factors: how likely are section 7 consultations in an area (that is, how strong is the "Federal nexus"), and how much protection would exist in the absence of a section 7 consultation (that is, how protective are existing management measures and would they likely continue in the absence of section 7 requirements). We considered the Team's ratings one useful measure of the "benefit of designating a particular area as critical habitat" as contemplated in section 4(b)(2). We are soliciting public comments on approaches that would better refine this assessment.

As discussed earlier, the scale chosen in California for the "specific area" referred to in the definition of critical habitat was an HSA watershed as delineated by the CALWATER classification system. This delineation required us to adapt the approach for some areas. In particular, a large stream or river might serve as a rearing and migration corridor to and from many watersheds, yet be embedded itself in a watershed. In any given watershed through which it passes, the stream may have a few or several tributaries. For rearing/migration corridors embedded in a watershed, the Teams were asked to rate the conservation value of the watershed based on the tributary habitat. We assigned the rearing/migration corridor the rating of the highest-rated watershed for which it served as a rearing/migration corridor. The reason for this treatment of migration corridors is the role they play in the salmon's life cycle. Salmon are anadromous—born in fresh water, migrating to salt water to feed and grow, and returning to fresh water to spawn. Without a rearing/migration corridor to and from the sea, salmon cannot complete their life cycle. It would be illogical to consider a spawning and rearing area as having a particular conservation value and not consider the associated rearing/migration corridor as having a similar conservation value.

Preliminary ESU mapping results and some of the preliminary HSA watershed conservation assessments developed by the Teams were shared with the CDFG for review and comment. In some instances, their reviews and comments resulted in changes to the ESU distribution maps, and in some cases changes in the conservation assessments. Because of time constraints, however, this comanager review process was limited in duration and focused on identifying major discrepancies in the mapping products developed by the Teams. These revised preliminary assessments, along with this proposed rulemaking, will once again be made available to these comanagers, as well as the general public and peer reviewers, during the public comment period leading up to the final rule. The Teams will be reconvened to review the comments and any new information that might bear on their assessments before the agency publishes final critical habitat designations.

Lateral Extent of Critical Habitat

In past designations NMFS described the lateral extent of critical habitat in various ways ranging from fixed distances to "functional" zones defined by important riparian functions (65 FR 7764, February 16, 2000). Both approaches presented difficulties, and this was highlighted in several comments (most of which requested that we focus on aquatic areas only) received in response to the ANPR (68 FR 55926; September 29, 2003). Designating a set riparian zone width will (in some places) accurately reflect the distance from the stream on which PCEs might be found, but in other cases may over- or understate the distance. Designating a functional buffer avoids that problem, but makes it difficult for Federal agencies to know in advance what areas are critical habitat. To address these issues we are proposing to define the lateral extent of designated critical habitat as the width of the stream channel defined by the ordinary high-water line as defined by the U.S. Army Corps of Engineers (Corps) in 33 CFR 329.11. In areas for which the ordinary high-water line has not been defined pursuant 33 CFR 329.11, the width of the stream channel shall be defined by its bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain (Rosgen, 1996) and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series (Leopold *et al.*, 1992). Such an interval is commensurate with nearly all of the juvenile freshwater life phases of most salmon and *O. mykiss* ESUs. Therefore, it is reasonable to assert that for an occupied stream reach this lateral extent is regularly "occupied." Moreover, the bankfull elevation can be readily discerned for a variety of stream reaches and stream types using recognizable water lines (*e.g.*, marks on rocks) or vegetation boundaries (Rosgen, 1996).

As underscored in previous critical habitat designations, the quality of aquatic habitat within stream channels is intrinsically related to the adjacent riparian zones and floodplain, to surrounding wetlands and uplands, and to non-fish-bearing streams above occupied stream reaches. Human activities that occur outside the stream can modify or destroy physical and biological features of the stream. In addition, human activities that occur within and adjacent to reaches upstream (*e.g.*, road failures) or downstream (*e.g.*, dams) of designated stream reaches can also have demonstrable effects on physical and biological features of designated reaches.

In estuarine areas we believe that mean extreme high water is the best descriptor of lateral extent. We are proposing the area inundated by extreme high tide because it encompasses habitat areas typically inundated and regularly occupied during the spring and summer when juvenile salmonids are migrating in nearshore estuarine areas. However, it may be more appropriate to use the ordinary high water level in estuarine nearshore areas and we request comment on this issue. As noted above for stream habitat areas, human activities that occur outside the area inundated by extreme or ordinary high water can modify or destroy physical and biological features of the nearshore habitat areas and Federal agencies must be aware of these important habitat linkages as well.

Species Descriptions and Area Assessments

This section provides descriptions of the seven Pacific salmon and *O. mykiss* ESUs addressed in this rulemaking and summarizes the Teams' assessment of habitat areas for each ESU. The Teams' assessments addressed PCEs in the habitat areas within occupied CALWATER HSA watersheds (as well as rearing/migration corridors for some ESUs). For ease of reporting and reference these HSA watersheds have been organized into "units" based on their associated subbasin or CALWATER Hydrologic Unit (HU).

California Coastal (CC) Chinook Salmon ESU

The CC chinook salmon ESU was listed as a threatened species in 1999 (64 FR 50394). The ESU includes all naturally spawned populations of chinook salmon from rivers and streams south of the Klamath River to and including the Russian River. Following completion of an updated status review (NMFS, 2003a) and review of hatchery populations located within the range of the ESU (NMFS, 2003b), NMFS recently proposed that the ESU remain listed as a threatened species and that seven hatchery populations be included as part of the ESU (69 FR 33102; June 14, 2004). Major watersheds occupied by naturally spawning fish in this ESU include Redwood Creek, Mad River, Eel River, several smaller coastal watersheds, and the Russian River. A Technical Recovery Team has been formed and is in the process of identifying the historical and extant population structure of this ESU; however, this is still in progress.

The Team's assessment for this ESU addressed habitat areas within 45 occupied watersheds or CALWATER HSAs that occur in 8 associated subbasins or CALWATER HUs (NMFS, 2004b). In addition to the 45 HSA watershed units, conservation assessments were also made for Humboldt Bay and the Eel River Estuary. As part of its assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of CC chinook salmon, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat

Unit 1. Redwood Creek Subbasin (HU #1107)

The Redwood Creek HU is located in the northern portion of the ESU and includes the Redwood Creek drainage. The HU encompasses approximately 294 mi^2 (758 km^2) and includes three occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 107 miles (171 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that all occupied areas contain one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including forestry, sand and gravel mining, agricultural water withdrawals and impoundments, grazing, and channelization. Of the three occupied HSA watersheds, two were rated as having high conservation value and one as having medium conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Trinidad Subbasin (HU #1108)

The Trinidad HU is located in the northern portion of the ESU and includes Big Lagoon and Little River. The HU encompasses approximately 131 mi² (338 km²) and contains two HSA watersheds both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 26 miles (42 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, agriculture, non-agricultural and agricultural water withdrawals, and grazing. Of the two occupied HSA watersheds, one was rated as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for conservation of the ESU.

Unit 3. Mad River Subbasin (HU #1109)

The Mad River HU is located in the northern portion of the ESU and includes the Mad River drainage. The HU encompasses approximately 499 mi² (1287 km²) and includes four HSA watersheds, three of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 53 miles (85 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including forestry, agriculture, and grazing. All of the occupied HSA watersheds were rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Eureka Plain Subbasin (HU #1110)

The Eureka Plain HU is located in the vicinity of Eureka and surrounds Humboldt Bay. The HU encompasses approximately 224 mi² (578 km²) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 74 miles (118 km) of occupied riverine and estuarine habitat in this HSA watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including urbanization, flood control channelization, and road building and maintenance. This single occupied HSA watershed was rated as having high conservation value to the ESU (NMFS, 2004b). The Team also evaluated Humboldt Bay into which most of these freshwater streams in this subbasin drain as a separate habitat unit. Humboldt Bay contains approximately 25 mi² (65 km²) of estuarine habitat which the Team found contained PCEs for rearing and migration and was of high conservation value since it provides migratory connectivity for juveniles and adults between high value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Eel River Subbasin (HU #1111)

The Eel River HU is located in the northern and central portion of the ESU and includes the Eel River and Van Duzen River drainages. This HU, which is the largest in the ESU, encompasses approximately 3,682 mi² (9,500 km²) and contains 19 occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 841 miles (1,345 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs including agriculture, forestry, sand and gravel mining, grazing, exotic/invasive species, agricultural and non-agricultural water withdrawals, and urbanization. Of these occupied HSA watersheds, three were rated as having low conservation value, four were rated as having medium conservation value, and twelve were rated as having high conservation value to the ESU (NMFS, 2004b). The Team also evaluated the Eel River estuary as a separate habitat unit and concluded it contained PCEs for rearing and migration and is of high conservation value since it provides migratory connectivity for juveniles and adults between high value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. Cape Mendocino Subbasin (HU #1112)

The Cape Mendocino HU is located in the central portion of the ESU and includes the Bear River and Mattole River drainages. This HU encompasses approximately 499 mi² (1,287 km²) and contains three HSA watersheds, two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 173 miles (277 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including agriculture, grazing, forestry, and agricultural water withdrawals. Both occupied HSA watersheds were rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Mendocino Coast Subbasin (HU #1113)

The Mendocino Coast HU is located in the southern portion of the ESU and includes several smaller coastal streams including the Ten Mile, Noyo, Albion, Navarro, and Garcia Rivers. This HU encompasses approximately 1,598 mi² (4,123 km²) and contains eighteen HSA watersheds, seven of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 204 miles (326 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, grazing, urbanization, agriculture, and agricultural and non-agricultural water withdrawals. Of the occupied HSA watersheds, the Team rated two as low in conservation value, three as medium in conservation value, and two as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 8. Russian River Subbasin (HU #1114)

The Russian River HU is located in the southernmost portion of the ESU and includes the Russian River drainage and its tributaries. The HU encompasses approximately 1,482 mi² (3,824 km²) and contains ten HSA watersheds within the range of the ESU, nine of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 133 miles (212 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded these occupied HSA areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including urbanization, agriculture, forestry, sand and gravel mining, grazing, flood control channelization, and agricultural water withdrawals. Of the occupied HSA watersheds, the Team rated three as low in conservation value, two as medium in conservation value, and four as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Northern California (NC) *O. mykiss* ESU

The NC *O. mykiss* ESU was listed as a threatened species in 2000 (65 FR 36074; June 7, 2000). The ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from Redwood Creek south to and including the Gualala River. Major watersheds occupied by naturally spawning fish in this ESU include Redwood Creek, Mad River, Eel River, several smaller coastal watersheds on the coast south to the Gualala River. *O. mykiss* within this ESU include both winter and summer run types, including what is presently considered to be the southernmost population of summer run *O. mykiss* in the Middle Fork Eel River (NMFS, 1996). The half-pounder life history type also occurs in the ESU, specifically in the Mad and Eel Rivers. Based on an updated status review (NMFS, 2003a) and an assessment of hatchery populations located within the range of the ESU (NMFS, 2003b), NMFS recently proposed that the ESU remain listed as a threatened species and that resident *O. mykiss* co-occurring with anadromous populations below impassible barriers (both natural and man-made) as well as two artificial propagation programs (Yager Creek Hatchery and North Fork Gualala River Hatchery) also be included in the ESU (69 FR 33102; June 14, 2004). A Technical Recovery Team has been formed and is in the process of identifying the historical and extant independent population structure of this ESU and associated population viability parameters for each population.

The Team's assessment for this ESU addressed habitat areas within 50 occupied watersheds or CALWATER HSAs that occur in 7 associated subbasins or CALWATER HUs. In addition to the 50 HSA watershed units, conservation assessments were also made for Humboldt Bay and the Eel River Estuary. As part of its assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of NC *O. mykiss*, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Redwood Creek Subbasin (HU #1107)

The Redwood Creek HU is located in the northern portion of the ESU and includes the Redwood Creek drainage. The HU encompasses approximately 294 mi² (758km²) and includes three HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 138 (220 km) of occupied riverine and estuarine habitat in the three occupied HSAs (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including forestry, sand and gravel mining, agricultural water withdrawals and impoundments, grazing and channelization. Of the three occupied HSA watersheds, one was rated as medium and two were rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Trinidad Subbasin (HU #1108)

The Trinidad HU is located in the northern portion of the ESU and includes Big Lagoon and Little River. The HU encompasses approximately 131 mi² (338 km²) and contains two HSA watersheds, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 66 miles (106 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including forestry, agriculture, non-agricultural and agricultural water withdrawals and grazing. Of the two HSA watersheds, one was rated by the Team as having medium conservation value and one was rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for conservation of the ESU.

Unit 3. Mad River Subbasin (HU #1109)

The Mad River HU is located in the northern portion of the ESU and includes the Mad River drainage. The HU encompasses approximately 499 mi² (1,287 km²) and contains four HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 169 miles (270 km) of occupied riverine and estuarine habitat in these occupied habitat areas (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including forestry, agriculture, and grazing. Of these occupied HSA watersheds, one was rated as having low conservation value and three were rated by the Team as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Eureka Plain Subbasin (HU #1110)

The Eureka Plain HU is located in the vicinity of Eureka and includes Humboldt Bay. The HU encompasses approximately 224 mi² (578 km²) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 122 miles (195 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including urbanization, flood control channelization, and road building and maintenance. The single HSA watershed in the subbasin was rated by the Team as having high conservation value to the ESU. The Team also evaluated Humboldt Bay into which most of these freshwater streams in this subbasin drain as a separate habitat unit. Humboldt Bay contains approximately 25 mi^2 (65 km^2) of estuarine habitat which the Team found contained PCEs for rearing and migration and was of high conservation value since it provides migratory connectivity for juveniles and adults between high value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Eel River Subbasin (HU #1111)

The Eel River HU is located in the north central portion of the ESU and includes the Eel River and Van Duzen River drainages. The HU encompasses approximately 3,682 mi^2 (9,500 km^2) and contains nineteen HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 1,269 miles (2,030 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied watershed areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including agriculture, forestry, sand and gravel mining, grazing, exotic/invasive species, agricultural and non-agricultural water withdrawals, and urbanization. Of these nineteen occupied watersheds, nine were rated by the Team as medium in conservation value and ten were rated as high in conservation value to the ESU (NMFS, 2004b). The Team also evaluated the Eel River estuary as a separate habitat unit and concluded it contained PCEs for rearing and migration and is of high conservation value since it provides migratory connectivity for juveniles and adults between high conservation value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. Cape Mendocino Subbasin (HU #1112)

The Cape Mendocino HU is located in the central portion of the ESU and includes the Bear River and Mattole River drainages. This HU encompasses approximately 499 mi^2 (1,287 km^2) and contains three HSA watersheds which are all occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 342 miles (547 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including agriculture, grazing, forestry, and agricultural water withdrawals. Of these watersheds, the Team rated two as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Mendocino Coast Subbasin (HU #1112)

The Mendocino Coast HU is located in the southern portion of the ESU and includes several smaller coastal streams such as Ten Mile, Noyo, Albion, Navarro, and Garcia Rivers. This HU encompasses approximately 1,598 mi^2 (4,123 km^2) and contains eighteen HSA watersheds that are all occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 1,022 miles (1,635 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including forestry, grazing, urbanization, agriculture, and agricultural and non-agricultural water withdrawals. Of these occupied HSA watersheds, the Team rated five as low in conservation value, four as medium in conservation value, and nine as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Central California Coast (CCC) O. mykiss ESU

The CCC *O. mykiss* ESU was listed as a threatened species in 1997 (62 FR 433937; August 18, 1997). The ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from the Russian River southward to and including Aptos Creek, as well as naturally spawned populations of *O. mykiss* in drainages of San Francisco and San Pablo Bay eastward to but excluding the Sacramento-San Joaquin Delta. Major coastal watersheds occupied by naturally spawning fish in this ESU include the Russian River, Lagunitas Creek, and San Lorenzo River. Important watersheds occupied by naturally spawning fish within the San Francisco Bay/San Pablo Bay area include Alameda Creek, Coyote Creek, Guadelupe Creek, Petaluma River, and the Napa River. Based on an updated status review (NMFS, 2003a) and an assessment of hatchery populations located within the range of the ESU (NMFS, 2003b), NMFS recently proposed that the ESU remain listed as a threatened species (69 FR 33102; June 14, 2004). In addition, NMFS proposed that: (1) Resident *O. mykiss* occurring with anadromous populations below impassable barriers (both natural and man made); (2) two artificially propagated populations (Don Clausen Fish Hatchery in the Russian River basin and the Kingfisher Flat Hatchery/Scott Creek hatchery in Scott Creek south of San Francisco); and (3) three resident *O. mykiss* sub-populations above Dam 1 on Alameda Creek also be included in the CCC *O. mykiss* ESU. For the purposes of this re-designation proposal, therefore, the watershed units occupied by resident *O. mykiss* in upper Alameda Creek were considered occupied. A Technical Recovery Team has been formed and is in the process of identifying the historical and extant independent population structure of this ESU as well as the associated viability criteria for these populations.

The Team's assessment for this ESU addressed habitat areas within 47 occupied watersheds or CALWATER HSAs that occur in 10 associated subbasins (or CALWATER HUs). Five of these HSAs encompass the San Francisco—San Pablo—Suisun Bay complex which constitutes migratory and rearing habitat for several Bay area tributary stream populations in this ESU. As part of this assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the CCC *O. mykiss* ESU, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Russian River Subbasin (HU #1114)

The Russian River HU is located in the northern portion of the ESU and includes the Russian River drainage and its tributaries. The HU encompasses approximately 1,482 mi^2 (3,824 km^2) and contains eleven HSA watersheds, ten of which are occupied. The unoccupied HSA does not contain fish because it is located above Coyote Dam, which is an impassable fish barrier used to facilitate water diversions from the Eel River and delivery downstream for agricultural and municipal purposes. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 713 miles (1,141 km) of occupied riverine and estuarine habitat in the 10 occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including urbanization, agriculture, grazing, flood control channelization, road building and maintenance, agricultural and non-agricultural water withdrawals, and non-hydro dams. Of the occupied HSA watersheds, the Team rated one as low in conservation value, two as medium in conservation value, and seven as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify and unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Bodega Bay Subbasin (HU #1115)

The Bodega Bay HU is located in the north central portion of the ESU and includes several small streams as well as Bodega Harbor. The HU encompasses approximately 147 mi^2 (411 km^2) and contains four HSA watersheds, two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 18 miles (29 km^2) of occupied riverine or estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including grazing, urbanization, agriculture, and agricultural water withdrawals. The Team rated one occupied HSA watershed as low in conservation value and one as medium in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 3. Marin Coastal Subbasin (HU #2201)

The Marin Coastal HU is located in the central portion of the ESU along the coast and includes several small watersheds including Lagunitas Creek. The HU encompasses approximately 327 mi^2 (844 km^2) and contains five HSA watersheds, four of which are occupied. The unoccupied HSA lacks satisfactory habitat and is of high gradient. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 74 miles (118 km) of occupied riverine or estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including grazing, urbanization, forestry, agricultural and non-agricultural water withdrawals, and non-hydro dams. Of the occupied HSA watersheds, the Team rated two as low in conservation value, one as medium in conservation value, and one as high in conservation value to the ESU. The Team did not identify any unoccupied areas in this subbasin that may be essential to the conservation of the ESU.

Unit 4. San Mateo Subbasin (HU #2202)

The San Mateo HU is located on the coast immediately south of the Golden Gate Bridge and includes several small creeks including San Gregorio and Pescadero Creeks. The HU encompasses approximately 257 mi^2 (663 km^2) and contains six HSA watersheds, five of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 146 miles (234 km) of occupied riverine or estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agriculture, agricultural and non-agricultural water withdrawals, urbanization, non-hydro dams, and road building and maintenance. Of these occupied HSA watersheds, one is low in conservation value, two are medium in value, and two are high in conservation value to the ESU (NMFS, 2004b). The Team did not identify and unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Bay Bridges Subbasin (HU #2203)

The Bay Bridges HU is located in the central portion of the ESU and includes portions of northern San Francisco Bay, San Pablo Bay, and some associated watersheds. The HU encompasses approximately 191 mi^2 (493 km^2) and contains four HSA watersheds, three of which are occupied. The San Francisco Bayside HSA is unoccupied by this ESU due to intense urbanization and lack of stream habitat. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 46 miles (74 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). One of the occupied HSAs (HSA #220312; Bay Waters) includes that portion of San Francisco Bay bounded by the Bay Bridge, the Golden Gate Bridge, and the Richmond Bridge, and encompasses an area of approximately 83 mi^2 (214 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, channel modification, flood control channelization, road building and maintenance, and wetland loss. Of the occupied watersheds, one each is rated low, medium and high, respectively, in conservation value to the ESU. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. South Bay Subbasin (HU #2204)

The South Bay HU is located in the southern portion of the ESU and includes South San Francisco Bay and associated tributaries such as Alamada Creek. This HU encompasses approximately 1,220 mi^2 (3.148 km^2) and contains four occupied HSA watersheds. One of these four watersheds (Upper Alameda Creek; HSA #220430) is not accessible to anadromous fish at this time, but is nonetheless considered occupied for the purposes of this critical habitat designation because genetic evidence indicates the resident O. mykiss that reside there are closely related to local anadromous steelhead (Nielsen 2003) and we have proposed to include these fish in the listed ESU (69 FR 33102; June 14, 2004). Fish distribution and habitat use data compiled by NMFS biologists identify approximately 172 miles (275 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a), including the Upper Alameda Creek HSA (#220430). One of the occupied HSAs (Bay Channel; HSA #220410) includes that portion of San Francisco Bay south of the Bay Bridge to the Dumbarton Bridge, and encompasses an area of approximately 173 mi^2 (446 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, flood control channelization, non-hydro dams, channel modification, and non-agricultural water withdrawals. Of these occupied HSAs, the Team rated one as low in conservation value, one as medium in conservation value, and two as high in conservation value to the ESU. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Santa Clara Subbasin (HU #2205)

The Santa Clara HU is located in the southern portion of the ESU and includes part of South San Francisco Bay and associated tributaries including Coyote Creek and the Guadalupe River. This HU encompasses approximately 840 mi^2 (2,167 km^2) and contains five HSA watersheds, four of which are occupied. The remaining HSA is unoccupied due to lack of stream habitat and intense urbanization. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 135 miles (216 km) of occupied riverine or estuarine habitat in the occupied watersheds (NMFS, 2004a). One of the occupied HSAs (Dumbarton South; HSA #220510) includes that portion of San Francisco Bay south of the Dumbarton Bridge, and encompasses an area of approximately 15 mi^2 (39 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including road building and maintenance, urbanization, wetland loss, flood control channelization, non-hydro dams, and non-agricultural water withdrawals. Of the occupied watersheds, the Team rated one as low in conservation value, two as medium in conservation value, and one as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 8. San Pablo Subbasin (HU #2206)

The San Pablo HU is located in the central portion of the ESU and includes part of San Pablo Bay as well as several associated tributaries including the Petaluma River, Sonoma Creek, and the Napa River. This HU encompasses approximately 1,018 mi^2 (2,626 km^2) and contains six occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 392 miles (627 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). One of the occupied HSAs (San Pablo Bay; HSA #220610) includes San Pablo Bay from the Richmond Bridge to the Carquinez Bridge, and encompasses an area of approximately 115 mi^2 (297 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, road building and maintenance, channel modification, flood control channelization, agriculture, wetland loss, and non-hydro dams. Of these occupied watersheds, the Team rated two as low, one as medium, and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 9. Suisun Bay Subbasin (HU #2207)

The Suisun Bay HU is located in the easternmost portion of the ESU and includes Suisun Bay and associated tributaries including Mount Diablo Creek and Suisun Creek. This HU encompasses approximately 653 mi^2 (1,684 km^2) and contains eight HSA watersheds, five of which are occupied. The remaining three HSA watersheds are unoccupied due to unsuitable habitat and/or barriers and urbanization. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 86 miles (138 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). One of the occupied HSAs (Suisun Bay; HSA #220710) includes Suisun Bay which encompasses an area of approximately 56 mi^2 (143 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, road building and maintenance, wetland loss, non-hydro dams, flood control channelization, and agricultural and non-agricultural water withdrawals. Of the occupied watersheds, the Team rated four as low and one as medium in conservation value for the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 10. Big Basin Subbasin (HU #3304)

The Big Basin HU is located in the southernmost coastal portion of the ESU south of the Golden Gate Bridge and includes several small coastal streams such as Gazos Creek, Waddell Creek, Scott Creek, the San Lorenzo River, Soquel Creek and Aptos Creek. This HU encompasses approximately 367 mi^2 (947 km^2) and contains four occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 220 miles (352 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including road building and maintenance, forestry, agricultural and non-agricultural water withdrawals, and non-hydro dams. Of these occupied watersheds, the Team rated one as medium and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

South-Central California Coast (SCCC) O. mykiss ESU

The SCCC *O. mykiss* ESU was listed as a threatened species in 1997 (62 FR 43937). The ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from the Pajaro River southward to, but not including, the Santa Maria River. The major watersheds occupied by naturally spawning fish in this ESU include the Pajaro River, Salinas River, Carmel River, and numerous smaller rivers and streams along the Big Sur coast and southward. Most of the rivers in this ESU drain the Santa Lucia Range, the southernmost unit of the California Coast Range, and only winter steelhead are found in this ESU. The climate is drier and warmer than in the north, as reflected in vegetational changes from coniferous forest to chapparral and coastal scrub. The mouths of many rivers and streams in this ESU are seasonally closed by sand berms that form during periods of low flow in the summer. Based on an updated status review (NMFS, 2003a), NMFS recently proposed that the ESU remain listed as a threatened species and that resident *O. mykiss* co-occurring with anadromous populations below impassible barriers (both natural and man-made) be included in the ESU (69 FR 33102; June 14, 2004). A Technical Recovery Team has been formed and is in the process of identifying the historical and extant independent population structure of this ESU and associated population viability criteria. The time frame for completion of this work is uncertain.

The Team's assessment for this ESU addressed habitat areas within 30 occupied watersheds or CALWATER HSAs that occur in 8 associated subbasins (or CALWATER HUs). In addition to 29 HSA watershed units, a conservation assessment was also made for Morro Bay (a separate HSA unit) which provides rearing and migration PCEs for this ESU. As part of its conservation assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitat across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the SCCC *O. mykiss* ESU, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Pajaro River Subbasin (HU #3305)

The Pajaro River HU is located in the northern part of the ESU and includes the Pajaro River and its tributaries. The HU encompasses approximately 1,311 mi^2 (3,382 km^2) and contains five occupied HSA watersheds, although a portion of one HSA is located outside the boundary of the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 296 miles (474 km) of occupied riverine and/or estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including flood control channelization, agricultural and non-agricultural water withdrawals, road building and maintenance, and non-hydro dams. Of the five occupied watersheds, the Team rated three as medium in conservation value and two as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible habitat above Uvas Dam in Uvas Creek (a tributary to the Pajaro River) may be essential to the conservation of the ESU. The Team concluded that this unoccupied habitat area may be essential for conservation because: (1) It supports *O. mykiss* native to the Pajaro River watershed and contains habitat suitable for spawning and rearing; and (2) efforts are underway to implement a long-standing agreement between the South Santa Clara Valley Water Conservation District and the State of California to provide fish passage past this dam. We seek comment on whether this unoccupied area should be proposed as critical habitat.

Unit 2. Bolsa Neuva Subbasin (HU #3306)

The Bolsa Neuva HU is a small watershed unit located in the northern part of the ESU which includes Elkhorn Slough. The HU encompasses approximately 51 mi^2 (132 km^2) and contains one HSA watershed and approximately 63 miles of streams (at 1:100,000 hydrography). Fish distribution and habitat use data compiled by NMFS biologists indicate that this watershed is not occupied (NMFS, 2004a). The Team did not identify this unoccupied HSA as a habitat area that was essential for the conservation of the ESU. Because this HU did not contain occupied habitat or unoccupied habitat that the Team believed may be essential for the conservation of the ESU, it was not considered further in the designation process.

Unit 3. Carmel River Subbasin (HU #3307)

The Carmel River HU is located in the northwestern portion of the ESU and includes the Carmel River watershed. The HU encompasses approximately 256 mi^2 (660 km^2) and contains only one HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 136 miles (218 km) of occupied riverine and estuarine habitat in this watershed (NMFS, 2004a). The Team concluded that this occupied watershed contained habitat areas with one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including flood control channelization, non-hydro dams, and non-agricultural water withdrawals. The Team rated this watershed as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for conservation of the ESU.

Unit 4. Santa Lucia Subbasin (HU #3308)

The Santa Lucia HU is located along the Big Sur coastal area and includes the Big Sur River and Little Sur River watersheds. The HU encompasses approximately 302 mi^2 (779 km^2) and contains only a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 102 miles (163 km) of occupied riverine and estuarine habitat in this watershed (NMFS, 2004a). The Team concluded that this occupied watershed contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) and identified at least one management activity that may affect the PCEs, including road building and maintenance. The Team rated this watershed as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Salinas River Subbasin (HU #3309)

The Salinas River HU is located in the north-central portion of the ESU and includes the Salinas River watershed which is the largest in the ESU. The Salinas River HU encompasses approximately 3,527 mi^2 (9,099km^2) and contains twelve HSA watersheds, seven of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 375 miles (600 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including agriculture, flood control channelization, wetland loss, road building and maintenance, non-hydro dams, and agricultural water withdrawals. Of the occupied watersheds, the Team rated four as having low conservation value, one as having medium conservation value, and two as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. Estero Bay (HU #3310)

The Estero Bay HU is located along the southern coast of the ESU and includes several relatively small coastal streams including Arroyo De La Cruz, San Simeon Creek, Santa Rosa Creek, Morro Creek, Chorro Creek, San Luis Obispo Creek, and Arroyo Grande Creek. The HU encompasses approximately 751 mi^2 (436 km^2) and contains seventeen HSA watersheds, sixteen of which are occupied. One of these occupied watersheds is Morro Bay into which the Morro Creek and Chorro Creek watersheds drain. Morro Bay proper encompasses an area of approximately 3 mi^2 (8 km^2) and is an important rearing and migratory habitat for populations that occupy the watersheds that drain into the Bay. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 352 miles (563 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including grazing, agriculture, urbanization, non-hydro dams, road building and maintenance, and agricultural water withdrawals. Of the occupied HSA watersheds, the Team rated two as low, seven as medium, and seven as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Units 7 (Santa Maria HU #3312) and 8 (Estrella HU #3317)

Portions of the Santa Maria and Estrella HUs are within the geographic range of this ESU, but do not contain occupied riverine or estuarine habitat. The Santa Maria HU includes a single HSA (Guadalupe; 331210) which is divided by the ESU boundary. All occupied habitat within this HSA occurs within the range of the Southern California steelhead ESU. The Estrella HU contains a single HSA (Estrella River; 331700) which is unoccupied. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU. Because these areas did not contain occupied habitat or unoccupied habitat that may be essential for the conservation of the ESU, they were not considered further in the designation process.

Southern California (SC) O. mykiss ESU

The SC *O. mykiss* ESU was listed as an endangered species in 1997 (62 FR 3937; August 18, 1997). In 2002, the status of the ESU was updated and its range extended based on new information indicating that anadromous *O. mykiss* had re-colonized watersheds from which it was thought to have been extirpated (67 FR 21586; May 1, 2002). The SC *O. mykiss* ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from the Santa Maria River in San Luis Obispo County southward to the U.S.—Mexican Border (67 FR 21586). Major coastal watersheds occupied by naturally spawning fish in this ESU include the Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers. Several smaller streams in Santa Barbara, Ventura and northern Los Angeles County also support naturally spawning steelhead, as do two watersheds (San Juan Creek and San Mateo Creek) in southern Orange County and northern San Diego County. These southernmost populations are disjunct in distribution and are separated from the northernmost populations by approximately 80 miles (128 km). Based on an updated status review (NMFS, 2003a), NMFS recently proposed that the ESU remain listed as an endangered species (69 FR 33102; June 14, 2004). In addition, NMFS proposed that resident *O. mykiss* occurring with anadromous populations below impassable barriers (both natural and man made) also be included in the ESU. A Technical Recovery Team has been formed for the South-Central coast of California and is in the process of identifying the historical and extant independent population structure of this ESU and the SCCC *O. mykiss* ESU, as well as the associated viability criteria for these populations.

The Team's assessment for this ESU addressed habitat areas within 37 occupied watersheds or CALWATER HSAs that occur in 8 associated subbasins or CALWATER HUs. As part of its assessment, the Team considered the conservation value of each habitat area (or HSA) in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the SC *O. mykiss*, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Santa Maria River Subbasin (HU #3312)

The Santa Maria River HU is located in the northwestern portion of the ESU and includes the Santa Maria River and its upstream tributaries, the Sisquoc and Cuyama Rivers. The HU encompasses an area of approximately 704 mi^2 (1816 km^2) and contains three occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 219 miles (350 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including non-hydro dams, water withdrawals, sand and gravel mining, and grazing. Of the occupied watersheds, the Team rated two as low and one as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Santa Ynez River Subbasin (HU #3314)

The Santa Ynez River HU is located in the northwestern portion of the ESU and includes the Santa Ynez River watershed. The HU encompasses an area of approximately 485 mi^2 (1,251 km^2) and contains six HSA watersheds, five of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 138 miles (221 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including grazing, water withdrawals, non-hydro dams, urbanization, barriers to migration, and road building and maintenance. Of these occupied watersheds, the Team rated one as low, two as medium, and two as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of the Santa Ynez River and its tributaries above Bradbury Dam may be essential to the conservation of this ESU. The Team reached this conclusion because historical records indicate that the upper portion of the Santa Ynez watershed above Bradbury Dam provided the principal spawning and rearing habitat for a historically large anadromous *O. mykiss* population within this river system prior to construction of the dam. In addition, most of these unoccupied river reaches are located on lands under public ownership and management, primarily the Los Padres National Forest. Because of the large size of the Santa Ynez river system, it is likely to have historically supported one or more independent populations which contributed to the resiliency of the ESU and served as a buffer against extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats, thus the re-establishment of larger populations such as the one that historically occurred in the Santa Ynez River may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Bradbury Dam should be proposed as critical habitat.

Unit 3. South Coast Subbasin (HU #3315)

The South Coast HU is located in the northwestern portion of the ESU and includes several small coastal streams such as Jalama Creek, Arroyo Hondo, Mission Creek, and Carpinteria Creek. The HU encompasses an area of approximately 375 mi^2 (968 km^2) and contains five occupied HSAs. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 152 miles (243 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including agriculture, migration barriers or impediments, water withdrawals, urbanization, road building and maintenance, and wetland loss. Of the occupied watersheds, the Team rated all five as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Ventura River Subbasin (HU #4402)

The Ventura River HU is located in the northwestern portion of the ESU and includes the Ventura River and its associated tributaries. The HU encompasses an area of approximately 162 mi^2 (259 km^2) and contains four occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 68 miles (109 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including urbanization, agriculture, water withdrawals, non-hydro dams, barriers or impediments, and exotic or invasive species. Of these occupied watersheds, the Team rated two as medium and two as high in conservation value (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Matilija Creek and its tributaries above Matilija Dam and inaccessible reaches of Coyote and Santa Ana Creeks above Casitas Dam may be essential to the conservation of this ESU. The Team reached this conclusion because historical records indicate that the inaccessible habitat reaches above Matilija and Casitas Dams provided the principal spawning and rearing habitat for a historically large anadromous *O. mykiss* population within the Ventura River watershed prior to construction of the dams. In addition, most of these unoccupied river reaches are located on lands under public ownership and management, primarily the Los Padres National Forest. Because of the relatively large size of the Ventura River watershed, it is likely to have historically supported one or more independent populations prior to dam construction which contributed to the resiliency of the ESU and served as a buffer against extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats. Thus the re-establishment of larger populations such as the ones that historically occurred in the Ventura River watershed may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Matilija and Casitas Dams should be proposed as critical habitat.

Unit 5. Santa Clara—Calleguas Subbasin (HU #4403)

The Santa Clara—Calleguas HU is located in the northwestern portion of the range of the ESU and includes the Santa Clara River and its tributaries including Sespe Creek. That portion of the HU within the range of the ESU encompasses a large area of approximately 1,236 mi^2 (3,189 km^2) and contains 14 HSA watersheds, only 6 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 182 miles (291 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including agriculture, irrigation water withdrawals, barriers and impediments, dams, urbanization, and exotic/invasive species. Of these occupied watersheds, the Team rated one as medium and five as high in conservation value (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Piru Creek and its tributaries above Santa Felicia Dam may be essential to the conservation of this ESU. The Team reached this conclusion because historical records indicate that the inaccessible habitat reaches above Santa Felicia Dam provided the principal spawning and rearing habitat for a historically large anadromous *O. mykiss* population within the Santa Clara River watershed prior to construction of the dam. In addition, most of these unoccupied river reaches are located on lands under public ownership and management, primarily the Los Padres National Forest. Because of the large size of the Santa Clara River watershed, it is likely to have historically supported one or more independent populations prior to dam construction which contributed to the resiliency of the ESU and served as a buffer against its extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats, thus the re-establishment of larger populations such as the one that historically occurred in the Santa Clara River watershed may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Santa Felicia Dam should be proposed as critical habitat.

Unit 6. Santa Monica Bay Subbasin (HU #4404)

The Santa Monica Bay HU is located in the northwestern portion of the ESU and includes Topanga Creek, Malibu Creek, and Arroyo Sequit. That portion of the HU within the ESU encompasses approximately 328 mi^2 (846 km^2) and includes 29 HSA watersheds, only 3 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 11 miles (18 km) of occupied riverine and estuarine habitat in the 3 occupied watersheds (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including road building and maintenance, urbanization, barriers and impediments, and flood control and other channel modifications. Of these occupied watersheds, the Team rated all three as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Malibu Creek above Rindge Dam may be essential to the conservtion of this ESU. The Team reached this conclusion because historical records indicate that the inaccessible habitat reaches above Rindge Dam provided the principal spawning and rearing habitat for an important anadromous *O. mykiss* population within the Malibu River watershed prior to construction of the dam. Because of the size of this watershed, it is likely to have historically supported an independent population prior to dam construction which contributed to the resiliency of the ESU and served as a buffer against its extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats, thus the re-establishment of larger populations such as the one that historically occurred in Malibu Creek may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Rindge Dam should be proposed as critical habitat.

Unit 7. Calleguas Subbasin (HU #4408)

The Calleguas HU is located in the northwestern portion of the ESU and includes Calleguas Creek and estuary. That portion of the HU within the range of the ESU encompasses a large area of approximately 344 mi^2 (888 km^2) and 12 HSA watersheds, only 2 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 1 mile (1.6 km) of occupied freshwater and estuarine habitat in the occupied HSA watersheds (NMFS, 2004b). The Team concluded that the occupied watersheds contained one or more PCEs (*i.e.*, rearing and migratory habitat) and identified management activities that may affect the PCEs, including agriculture, channel modifications, and barriers or impediments. The Team also concluded that both watersheds have a low conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas that may be essential to the conservation of the ESU.

Unit 8. San Juan Subbasin (HU #4901)

The San Juan HU is located in the southern portion of the ESU and includes the San Juan Creek and San Mateo Creek watersheds which have recently been re-colonized by anadromous *O. mykiss*. That portion of the HU within the range of the ESU encompasses an area of approximately 496 mi^2 (1,280 km^2) and contains 18 HSA watersheds, 9 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 66 miles (106 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that the occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including urbanization, road building and maintenance, barriers and impediments, channel modifications or flood control structures, agriculture, agricultural and non-agricultural water withdrawals, and exotic/invasive species. Of these occupied watersheds, the Team rated one as low, one as medium, and seven as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas that may be essential for the conservation of the ESU.

Within the range of the SC *O. mykiss* ESU, which extends from the Santa Maria River southward to the U.S.—Mexico border, there are a large number of HSA watersheds and their associated subbasins (or HUs) that are not occupied. These unoccupied subbasins include the San Gabriel River, Los Angeles River, Santa Ana River, Santa Margarita River, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, Otay River and Tijuana River. Because these areas are unoccupied and were not considered essential for conservation of the ESU by the Team, they were not considered further in the designation process.

Central Valley (CV) Spring-Run Chinook ESU

The CV spring-run chinook ESU was listed as a threatened species in 1999 (64 FR 50394). The ESU includes all naturally spawned populations of spring-run chinook salmon in the Sacramento River and its tributaries. The agency recently conducted a review to update the ESU's status, taking into account new information and considering the net contribution of artificial propagation efforts in the ESU. A single artificially propagated spring-run chinook stock resides within the historical geographic range of the ESU (Feather River Hatchery spring-run chinook program), but it is not considered part of the ESU because of introgression with fall-run chinook salmon. NMFS has recently proposed that the CV spring-run chinook ESU remain listed as a threatened species (69 FR 33102; June 14, 2004). No artificial propagation programs were proposed for listing.

A Technical Recovery Team has been established for the Central Valley recovery planning domain, and it has identified historic and extant demographically independent populations of spring chinook (NMFS, 2004; NOAA Technical Memorandum NOAA–TM–NMFS–SWFSC–370). The TRT divided the range of the spring-run chinook ESU into four geographic groups. Geographic areas in each group inhabit similar environments based on a principle components analysis of environmental variables. The four geographic groups are the southern Cascades, northern Sierra, southern Sierra, and Coast Range. The TRT identified at least 18 historically demographically independent populations of spring-run chinook distributed among these four geographic areas, plus an additional seven likely dependent populations that may have been strongly influenced by adjacent independent population. Three of the 18 independent populations are extant (Mill, Deer and Butte Creek populations) and all occur in the Southern Cascade geographic area. Several extant dependent populations have intermittent runs of spring chinook including Big Chico, Antelope, and Beegum Creeks. Recovery planning will likely emphasize the need for having viable populations distributed across the range of the identified geographic areas (Ruckelshaus *et al.*, 2002; McElhany *et al.*, 2003). Recovery planning efforts are currently focused on working with the CalFed and Central

Valley Project Improvement Act programs to implement habitat restoration projects and other recovery related efforts in the Central Valley. The Team considered the TRT products in rating each watershed and also solicited input from the TRT on the distributional and habitat use information that was compiled as well as the conservation assessment of occupied HSAs.

The Team's assessment for this ESU addressed habitat areas within 37 occupied watersheds or CALWATER HSAs that occur in 15 associated subbasins or CALWATER HUs. This assessment also included four HSAs that encompass the San Francisco-San Pablo-Suisun Bay complex, which constitutes rearing and migration habitat for this ESU. This complex is treated as a separate unit in the following ESU description even though it is not a CALWATER HU. As part of its assessment, the Team considered the conservation value of each habitat area (or HSA) in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the CV spring-run chinook, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Tehama Subbasin (HU #5504)

The Tehama HU is located in the north central portion of the ESU and includes portions of the mainstem Sacramento River, the lower portions of two westside tributaries (Thomes and Stony Creeks) and the lower portions of three eastside tributaries (Mill Creek, Deer Creek, and Pine Creek). The HU encompasses an area of approximately 1,119 square miles (2,887 km^2) and contains two HSA watersheds, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 250 miles (400 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including agricultural water withdrawals, fish passage impediments, stream bank stabilization for flood control, dam operations, urbanization, rangeland management, diking, and point and non-point source water pollution. Of these occupied watersheds, the Team rated one as medium and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Whitmore Subbasin (HU #5507)

The Whitmore HU is located in the north eastern portion of the ESU and includes portions of upper Battle Creek (North and South Forks), upper Bear Creek, and the Cow Creek watershed. The HU encompasses an area approximately 913 mi^2 (2,355 km^2) and contains seven HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 58 miles (93 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including agricultural and no-agricultural water withdrawals, forestry, rangeland management, hydropower diversions, urbanization, and fish passage impediments. Of these watersheds, the Team rated three as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 3. Redding Subbasin (HU #5508)

The Redding HU is located in the northernmost portion of the ESU and includes portions of the upper Sacramento River mainstem, westside tributaries including Cottonwood Creek (portions of both the Middle and South Forks) and Clear Creek, and the lower portions of several eastside tributaries (Cow Creek, Bear Creek, and lower Battle Creek). The HU encompasses an area of approximately 705 mi^2 (1,818 km^2) and contains two occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 159 miles (254 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including rangeland management, gravel mining, fish passage impediments, dam operations and flood control water storage, and agricultural water withdrawals. The Team rated both occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Eastern Tehama Subbasin (HU #5509)

The Eastern Tehama HU is located in the northeastern portion of the ESU and includes portions of several important populations including Mill Creek, Deer Creek, Antelope Creek, and the upper portion of Big Chico Creek. The HU encompasses an area of approximately 896 mi^2 (2,311 km^2) and contains ten HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 117 miles (187 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, rangeland management, fish passage impediments, road building and maintenance, and agricultural water withdrawals. Of the occupied watersheds, the Team rated them all high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin may be essential for the conservation of the ESU.

Unit 5. Sacramento Delta Subbasin (HU #5510)

The Sacramento Delta HU is located in the southern portion of the ESU and includes portions of the mainstem Sacramento River and the Deep Water Ship Channel. The HU encompasses an area of approximately 446 mi^2 (1,150 km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 180 miles (288 km) of occupied riverine habitat in this watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, point and non-point water pollution, invasive/non-native species, diking, and streambank stabilization for flood control. The Team rated this watershed as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in the subbasin that may be essential for conservation of the ESU.

Unit 6. Valley Putah-Cache Subbasin (HU #5511)

The Valley Putah-Cache HU is located in the southern portion of the ESU and includes portions of Putah and Cache Creeks. This HU encompasses an area of approximately 961 mi^2 (2,479 km^2) and contains two HSA watersheds within the range of the ESU, one of which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 16 miles (26 km) of occupied riverine habitat in this watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urban development, agricultural water withdrawals, and impediments to fish passage. The Team rated the occupied watershed as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Marysville Subbasin (HU #5515)

The Marysville HU is located in the central portion of the ESU and includes portions of the lower Feather and Yuba Rivers. This HU encompasses an area of approximately 417 mi^2 (1,076 km^2) and contains three HSA watersheds, two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only 58 miles (93 km) of occupied riverine habitat in these occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, hydroelectric and municipal water diversions, water storage for flood control, dam operations, streambank stabilization for flood control, diking, and fish passage impediments. The Team rated both occupied watersheds as high in conservation value to the ESU (NMFS, 2004b).

The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU; however, the Team did conclude that inaccessible stream reaches in the Upper Feather River above Oroville Dam in the adjacent subbasin (HU #5518) may be essential to the conservation of this ESU. Specifically, the Team identified the following stream reaches above Oroville Dam that may be essential for conservation of this ESU: from Oroville Dam upstream along the West Branch of the Feather River to the vicinity of Kimshew Falls; along the North Fork of the Feather River upstream of the location of Lake Almanor; along the East Branch of the NF Feather River including Indian Creek and Spanish Creek; the South Middle Fork of the Feather River, and the South Fork of the Feather River upstream to the first natural impassible barrier. Both spring-run chinook and steelhead historically occurred in the Upper Feather River prior to Pacific Gas and Electric's hydroelectric development in the North Fork watershed and the construction of Oroville Dam. Construction of Oroville Dam extirpated both the spring-run chinook and steelhead populations in this upper watershed. The Team concluded that spawning, rearing, and migratory habitat occurs above Oroville Dam in these inaccessible reaches, but it is in better condition for steelhead than spring-run chinook salmon. The feasibility of providing fish passage past Oroville Dam is currently being evaluated through the ongoing FERC relicensing process for this facility. The Team concluded this inaccessible habitat may be essential for the conservation of this ESU because the genetic integrity of spring-run chinook in the Lower Feather River has been compromised by Feather River Hatchery practices (*i.e.*, introgression of spring and fall runs in the hatchery), and providing access to the unoccupied habitat above the dam would allow for expansion of the population in this watershed. We seek comment on whether this unoccupied habitat should be proposed as critical habitat.

Unit 8. Yuba River Subbasin (HU #5517)

The Yuba River HU is located in the central and eastern portion of the ESU and includes part of the upper Yuba River watershed. This HU encompasses an area of approximately 1,436 mi^2 (3,704 km^2) and contains sixteen HSA watersheds, only four of which are occupied. Virtually all of these watersheds, however, are outside the previously identified boundary of the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 22 miles (35 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and non-agricultural water withdrawals, fish passage impediments, and dam operations. Of these occupied watersheds, the Team rated one as low, one as medium, and two as high in conservation value to the ESU (NMFS, 2004b).

The Team concluded that inaccessible stream reaches on the Upper Yuba River above Englebright Dam may be essential to the conservation of this ESU, including those upstream reaches on the North Yuba to New Bullards Bar Dam, on the Middle Yuba to Milton Dam, and on the South Yuba to Lake Spaulding. All three forks of the Upper Yuba River historically supported populations of spring chinook and steelhead (Yoshiyama *et al.*, 1995). The Team considered this area to be essential for conservation because it provides one of the largest areas of suitable habitat in the Central Valley that can be accessed by providing passage at one relatively small dam. The Lower Yuba is also considered to have a good "seed" population of both spring chinook and steelhead and both populations are considered relatively free of hatchery influence. A large, multi-million dollar study program is underway through the CALFED Ecological Restoration Program to evaluate the feasibility of restoring anadromous salmonid populations to the Upper Yuba River. We seek comment on whether this unoccupied habitat should be proposed as critical habitat.

Unit 9. Valley-American Subbasin (HU #5519)

The Valley-American HU is located in the south-central and eastern portion of the ESU and includes portions of the Lower American River, the mainstem Sacramento River, and the lower Feather River. This HU encompasses an area of approximately 958 mi^2 (2,471 km^2) and contains four HSA watersheds, only two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 61 miles (98 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point source and non-point source water pollution, streambank stabilization for flood control, fish passage impediments, water storage for flood control, dam operations, and urbanization. The Team rated one watershed as medium in conservation value and one as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 10. Colusa Basin Subbasin (HU #5520)

The Colusa Basin HU is located in the central portion of the ESU and includes portions of the mainstem Sacramento River, lower Butte Creek, and the Butte Creek-Sutter Bypass. This HU encompasses an area of approximately 2,767 mi^2 (7,139 km^2) and contains five HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 230 miles of occupied riverine habitat, including the Butte Creek-Sutter Bypass, in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, point and non-point source pollution, diking, wildlife habitat management, flood control operations, and non-native/invasive species. The Team rated all four occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 11. Butte Creek Subbasin (HU #5521)

The Butte Creek HU is located in the northeastern portion of the ESU and includes portions of upper Butte Creek. This HU encompasses an area of approximately 207 mi^2 (534 km^2) and contains three HSA watersheds, only one of which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 15 miles (24 km) of occupied riverine habitat in the watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified water diversions for hydroelectric power as the principal management activity that may affect the PCEs. The Team rated this occupied watershed as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Upper Butte Creek above Centerville Dam upstream to Butte Meadow may be essential to the conservation of this ESU. It is uncertain whether this area was historically used by the ESU, but spawning, rearing, and migration is present in the inaccessible areas and is thought to be in good condition. The Team believed this area may be essential for conservation because current spring run chinook and steelhead spawning in this watershed is all below an elevation of 1,000 ft and other spring-run chinook populations within the ESU typically spawn above 2,000 ft. High water temperatures in the lower portion of Butte Creek have led to significant spring-run chinook pre-spawning mortalities in recent years, and the Team concluded that improved fish passage over the Centerville Diversion Dam would increase the range of this ESU and reduce the risk of adult losses in the lower stream reaches. The Team expects that feasibility of passage at the Centerville Diversion Dam will be evaluated through the upcoming FERC relicensing process for the facility. We seek comment on whether these unoccupied habitat areas should be proposed as critical habitat.

Unit 12. Ball Mountain Subbasin (HU #5523)

The Ball Mountain HU is located in the northwestern portion of the ESU and includes a portion of upper Thomes Creek. This HU encompasses an area of approximately 334 mi^2 (862 km^2) and contains three HSAs, only one of which is occupied primarily in the Thomes Creek watershed. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 15 miles (24 km) of occupied riverine habitat in the single occupied HSA watershed (NMFS, 2004a). The Team concluded that the occupied areas in this watershed contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified rangeland management as the principal activity that may affect the PCEs. The Team rated this single occupied watershed as low in conservation value to the ESU (NMFS, 2004b). The Team did not identify any occupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 13. Shasta Bally Subbasin (HU #5524)

The Shasta Bally HU is located in the northwestern portion of the ESU and includes portions of South Fork Cottonwood Creek and Beegum Creek. This HU encompasses an area of approximately 905 mi^2 (2,335 km^2) and contains nine HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 50 miles (80 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, rangeland management, road building and maintenance, water diversion for hydroelectric power generation, water storage for flood control, dam operations, gravel mining, and fish passage impediments. The Team rated one watershed as low in conservation value and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat in this subbasin that is essential for the conservation of the ESU.

Unit 14. North Diablo Range Subbasin (HU #5543)

The North Diablo Range HU is located in the southernmost portion of the ESU near the Delta and includes only a small portion of the south-central Delta. This HU encompasses an area of approximately 315 mi^2 (812 km^2) and only a single HSA which is partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 4 miles (6 km) of occupied riverine or estuarine habitat in this HSA (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, rearing and migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, and invasive/non-native species. The Team rated this single watershed as medium in conservation value (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 15. San Joaquin Delta Subbasin (HU #5544)

The San Joaquin Delta HU is located in the southernmost portion of the ESU and includes portions of the central and south Delta. This HU encompasses an area of approximately 628 mi^2 (1,620 km^2) and contains a single HSA watershed which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 142 miles (227 km) of occupied estuarine habitat in this HSA (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, invasive/non-native species, and entrainment and flow alterations. The Team rated this single watershed as low in conservation value (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 16. Suisun Bay (HU #2207), San Pablo Bay (HU #2206) and San Francisco Bay (HU #s 2203 and 2204)

Portions of four HUs (2207, 2206, 2203, 2204) comprise the Suisun Bay-San Pablo-San Francisco Bay complex that is utilized by this ESU. These four HUs contain both estuarine habitat in the Bay complex as well as freshwater tributaries to the Bay complex, but only the 4 HSAs (HSAs: 220710, 220610, 220410, and 220312) that comprise the estuarine Bay complex are occupied by this ESU. These four HSAs encompass approximately 427 mi^2 (1,102 km^2) of estuarine habitat that serves as a rearing and migratory corridor providing connectivity between freshwater spawning, rearing, and migratory habitats for this ESU in the Sacramento-San Joaquin basin and the ocean. The Team concluded that these four HSAs were occupied and contained PCEs for migratory habitat that support this ESU, and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point and non-point source water pollution, diking, streambank stabilization activities, industrial development, invasive/non-native species, wetland/estuary management, and habitat restoration. Of these occupied HSAs, the Team rated one as having low conservation value (#220410) and three as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in the San Francisco-San Pablo-Suisun Bay complex that may be essential for the conservation of this ESU.

Unoccupied Habitat Outside the ESU Range That May Be Essential to Conservation

The Team identified several unoccupied habitat areas in the Central Valley that are outside the current range of the CV spring-run chinook ESU, but that may be essential for its conservation. We seek comment on whether these unoccupied areas should be proposed as critical habitat. These areas are identified below:

(1) *Lower and Upper Mokelumne River.* The Team concluded that currently unoccupied portions of the Lower Mokelumne River from its confluence with the San Joaquin River upstream to Comanche Dam may be essential for the conservation of this ESU. In addition, the Team concluded that inaccessible reaches of the Upper Mokelumne River above Comanche Dam up to Bald Rock Falls (which is 7 miles above Electra Dam) may be essential to the conservation of this ESU. The Mokelumne River historically supported large runs of spring run chinook salmon (Yoshiyama *et al.*, 1995) which have been extirpated. The lower portion of the Mokelumne River would be essential as a migratory corridor for spring chinook access to the upper watershed above Comanche Dam. Suitable habitat exists above Comanche Dam, but it has been altered by Comanche and Pardee reservoirs. The Central Valley Technical Recovery Team identifies this as a historically independent population and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

(2) *Lower and Middle Stanislaus River.* The Team concluded that currently unoccupied reaches of the Lower Stanislaus River from its confluence with the San Joaquin River up to Goodwin Dam may be essential for the conservation of this ESU. The Team also concluded that inaccessible habitat reaches in the Middle Stanislaus River from Goodwin Dam to New Melones Dam may be essential to the conservation of this ESU. The Stanislaus River historically supported a large population of spring-run chinook salmon (McEwan 1996; Yoshiyama 1996) which was extirpated with the construction of Goodwin Dam. The lower portion of the Stanislaus River would be essential as a migratory corridor for spring chinook access to the upper watershed above Goodwin Dam. Depending upon dam operations and resulting instream water temperatures, rearing and spawning habitat might be available in this lower reach. Suitable habitat exists above Goodwin Dam and fish passage at the Dam is thought to be feasible. The Central Valley Technical Recovery Team identifies this as a historically independent population and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

(3) *Lower and Middle Tuolumne River.* The Team concluded that currently unoccupied reaches of the Lower Tuolumne River from its confluence with the San Joaquin River up to LaGrange Dam may be essential for the conservation of this ESU. The Team also concluded that inaccessible habitat reaches in the Middle Tuolumne River between LaGrange and New Don Pedro Dams may be essential to the conservation of this ESU. The Tuolumne River historically supported a large population of spring-run chinook salmon (McEwan 1996; Yoshiyama 1996) which was extirpated with the construction of LaGrange Dam. The lower portion of the Stanislaus River would be essential as a migratory corridor for spring chinook access to the upper watershed above LaGrange Dam. Depending upon dam operations and resulting instream water temperatures, rearing and spawning habitat might be available in this lower reach. Suitable habitat is thought to exist above LaGrange Dam for this ESU although feasibility of providing passage above the dam is uncertain. The Central Valley Technical Recovery Team identifies this as a historically independent population that is now extirpated and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

(4) *Lower and Middle Merced River.* The Team concluded that currently unoccupied reaches of the Lower Merced River from its confluence with the San Joaquin River up to Crocker-Huffman Dam may be essential for the conservation of this ESU. The Team also concluded that inaccessible habitat reaches in the Middle Merced River between Crocker-Huffman and Exchequer Dams may be essential to the conservation of this ESU. The Merced River historically supported a large population of spring-run chinook salmon (Yoshiyama 1996) which was extirpated with the construction of Crocker-Huffman Dam. The lower portion of the Merced River would be essential as a migratory corridor for spring-chinook access to the upper watershed above Crocker-Huffman Dam. Depending upon dam operations and resulting instream water temperatures, rearing and spawning habitat might be available in this lower reach. Suitable habitat is thought to exist above Crocker-Huffman Dam for this ESU although passage at the Dam is thought to be feasible because of its low height. The Central Valley Technical Recovery Team identifies this as a historically independent population that is now extirpated and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

Central Valley (CV) O. mykiss ESU

The CV *O. mykiss* ESU was listed as a threatened species in 1998 (63 FR

13347; March 19, 1998). The ESU includes all naturally spawned populations of *O. mykiss* in the Sacramento and San Joaquin Rivers and their tributaries, but excludes *O. mykiss* from San Francisco and San Pablo Bays and their tributaries. Based on an updated status review (NMFS 2003a) and an assessment of hatchery populations located within the range of the ESU (NMFS 2003b), NMFS recently proposed that the ESU remain listed as a threatened species (69 FR 33102; June 14, 2004). In addition, NMFS proposed that resident *O. mykiss* occurring with anadromous populations below impassable barriers (both natural and man made) and two artificially propagated populations (Coleman National Fish Hatchery on Battle Creek and Feather River Hatchery on the Feather River) also be included in the CV *O. mykiss* ESU. Two artificially propagated *O. mykiss* stocks reside within the historical geographic range of the ESU (Nimbus Fish Hatchery on the American River and Mokelumne River Hatchery on the Mokelumne River), but are not considered part of the ESU because they are derived from out-of-ESU broodstock (69 FR 33102; June 14, 2004). A Technical Recovery Team has been established for the Central Valley recovery planning domain and is in the process of identifying the historical and extant independent population structure of this ESU as well as the associated viability criteria for these populations.

The Team's assessment for the CV *O. mykiss* ESU addressed habitat areas within 67 occupied watersheds or CALWATER HSAs that occur in over 25 associated subbasins or CALWATER HUs. This assessment also included four HSAs that encompass the San Francisco-San Pablo-Suisun Bay complex which constitutes rearing and migration habitat for this ESU. This complex is treated as a separate unit in the following ESU description even though it is not a CALWATER HU. As part of its assessment, the Team considered the conservation value of each habitat area (or HSA) in the context of the productivity, spatial distribution, and diversity of habitat across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the CV *O. mykiss* ESU, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Tehama Subbasin (HU #5504)

The Tehama HU is located in the north central portion of the ESU and includes portions of the mainstem Sacramento River, the lower portions of two westside tributaries (Thomes and Stony Creeks), and the lower portions of three eastside tributaries (Mill Creek, Deer Creek, and Pine Creek). The HU encompasses an area approximately 1,119 mi^2 (2,887 km^2) and contains two HSAs, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 228 miles (365 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, and/or migratory habitat) and identified several management activities that may affect the PCEs, including agricultural and municipal water withdrawals, dam operations, diking activities, streambank stabilization for flood control, rangeland management, fish passage impediments, and urban development. Of the occupied HSA watersheds, the Team rated one as medium and one as high in conservation value (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Whitmore Subbasin (HU #5507)

The Whitmore HU is located in the north eastern portion of the ESU and includes portions of upper Battle Creek (North and South Forks), upper Bear Creek, and the Cow Creek watershed. The HU encompasses an area approximately 913 mi^2 (2,355km^2) and contains seven HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 177 miles (283 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, forest management, rangeland management, fish passage impediments, urban development, and hydropower diversions. Of these seven occupied watersheds, the Team rated two as having low conservation value, two as medium in conservation value, and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of this ESU.

Unit 3. Redding Subbasin (HU #5508)

The Redding HU is located in the northern most portion of the ESU and includes portions of the upper Sacramento River mainstem, westside tributaries including Cottonwood Creek (portions of both the Middle and South Forks) and Clear Creek, and the lower portions of several eastside tributaries (Cow Creek, Bear Creek, and lower Battle Creek). The HU encompasses an area of approximately 705 mi^2 (1,818 km^2) and contains two HSA watersheds, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 233 miles (373 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including dam operations and water storage for flood control, fish passage impediments, point and non-point source water pollution, gravel mining, agricultural water withdrawals, and rangeland management. The Team rated both occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of this ESU.

Unit 4. Eastern Tehama Subbasin (HU #5509)

The Eastern Tehama HU is located in the northeastern portion of the ESU and includes portions of several important watersheds including Mill Creek, Deer Creek, Antelope Creek, and the upper portion of Big Chico Creek. The HU encompasses an area of approximately 896 mi^2 (2,311 km^2) and contains ten HSA watersheds, six of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 151 miles (242 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forest management, rangeland management, fish passage impediments, road building and maintenance, and agricultural water withdrawals. Of the six occupied watersheds, the Team rated one as low, one as medium, and four as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible stream reaches in Upper

Deer Creek above Upper Deer Creek Falls may be essential for the conservation of this ESU. Historically, *O. mykiss* (steelhead) had access to this area when conditions allowed fish to pass the falls. A ladder was constructed in the late 1940s but it provides poor attraction and passage conditions and has been closed since 2001. Deer Creek currently supports a population of steelhead and improved passage conditions into this reach would increase the amount of spawning, rearing and migration habitat available to the ESU. We seek comment on whether this unoccupied habitat area should be proposed as critical habitat.

Unit 5. Sacramento Delta (HU #5510)

The Sacramento Delta HU is located in the central portion of the ESU and includes portion of the mainstem Sacramento River and the Deep Water Ship Channel. The HU encompasses an area of approximately 446 mi^2 (1,150km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 194 miles (310 km) of occupied riverine habitat in this HSA (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, point and non-point source water pollution, invasive/non-native species, diking activities, and streambank stabilization for flood control. The Team rated this watershed as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential to the conservation of the ESU.

Unit 6. Valley Putah-Cache Subbasin (HU #5511)

The Valley Putah-Cache HU is located in the southern portion of the Sacramento river basin includes a portion of the Yolo Bypass and portions of west side tributaries Putah, Ulatis, and Alamo Creeks. This HU encompasses an area of approximately 961 mi^2 (2,479 km^2) and contains three HSA watersheds, two of which are occupied. Portions of the occupied HSAs are outside the boundary of ESU and the unoccupied HSA is completely outside the ESU boundary. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 83 miles (133 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that the occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urban development, impediments to fish passage, and agricultural water withdrawals. The Team rated both occupied watersheds as having medium conservation value to the ESU (NMFS, 2004b).

Within this subbasin, the Team also concluded that unoccupied stream reaches in Middle Putah Creek from Solano Irrigation Dam to Monticello Dam may be essential to the conservation of this ESU. Steelhead are thought to have historically utilized the upper watershed above Monticello Dam. There is currently a very small opportunistic population of steelhead in Lower Putah Creek, but habitat conditions in this area are not suitable for spawning or rearing. The provision of fish passage past the Solano Irrigation Dam would provide access to suitable habitat for this ESU and efforts are currently underway to investigate the feasibility of providing passage beyond this dam. The Team concluded that this unoccupied area may be essential to conservation of the ESU because populations of steelhead in the Central Valley are constrained by the lack of accessible habitat and access to this area would provide cold water rearing and spawning habitat for this population. We seek comments on whether these unoccupied areas should be proposed as critical habitat.

Unit 7. American River Subbasin (HU #5514)

The American River HU is located in the eastern portion of the ESU and includes portions of upper Coon Creek, Doty Creek, and Auburn Ravine. This HU encompasses an area of approximately 1,642 mi^2 (4,236 km^2) and contains fifteen HSA watersheds, all of which are outside the range of the ESU, and only one of which is partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 20 miles of occupied riverine habitat in the occupied HSA (NMFS, 2004a). The Team concluded that the occupied watershed contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified urban development as the primary management activity that may affect the PCEs. The Team rated this occupied watershed as having medium conservation value (NMFS, 2004b) and did not identify any unoccupied habitat in this subbasin that may be essential for the conservation of the ESU.

Unit 8. Marysville Subbasin (HU #5515)

The Marysville HU is located in the central portion of the ESU and includes portions of the Feather and Yuba Rivers. This HU encompasses an area of approximately 417 mi^2 (1,076 km^2) and contains three HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 75 miles (120 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point and non-point water pollution, diking, streambank stabilization activities, dam operations and water storage for flood control, and fish passage impediments. The Team rated one occupied watershed as low in conservation value and two as having high conservation value to the ESU (NMFS, 2004b).

The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU. However, the Team did conclude that inaccessible stream reaches in the adjacent subbasin (in HU #5518) which contains the Upper Feather River above Oroville Dam may be essential to the conservation of this ESU. Specifically, the Team identified the following stream reaches above Oroville Dam that may be essential for conservation of this ESU: from Oroville Dam upstream along the West Branch of the Feather River to the vicinity of Kimshew Falls; along the North Fork of the Feather River upstream of the location of Lake Almanor; along the East Branch of the NF Feather River including Indian Creek and Spanish Creek; the South Middle Fork of the Feather River, and the South Fork of the Feather River upstream to the first natural impassible barrier. Both steelhead and spring-run chinook salmon historically occurred in the Upper Feather River prior to Pacific Gas and Electric's hydroelectric development in the North Fork watershed and the construction of Oroville Dam. Construction of Oroville Dam extirpated both the steelhead and spring-run chinook populations in this upper watershed. The Team concluded that spawning, rearing, an migratory habitat is available above Oroville Dam in these inaccessible stream reaches, but it is in better condition for steelhead than spring-run chinook salmon. The feasibility of providing fish passage past

Oroville Dam is currently being evaluated through the ongoing FERC relicensing process for this facility. The Team concluded this inaccessible habitat may be essential for the conservation of this ESU because the natural production of steelhead in the lower Feather River is limited by the substantial lack of suitable spawning and rearing habitat below Oroville Dam, and access to the unoccupied habitat above the dam would allow for expansion of the population in this watershed.

Unit 9. Yuba River Subbasin (HU #5517)

The Yuba River HU is located in the central and eastern portion of the ESU and includes part of the upper Yuba River watershed (Dry and Deer Creeks). This HU encompasses an area of approximately 1,436 mi² (3,704 km²) and contains sixteen HSA watersheds, most of which are outside the recognized ESU boundary; however, four of these watersheds are partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 22 miles (35 km) of occupied riverine habitat in these occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, and dam operations. The Team rated two of these watersheds as having low conservation value, and two as having high conservation value to the ESU (NMFS, 2004b).

The Team concluded that inaccessible stream reaches of the Upper Yuba River above Englebright Dam may be essential to the conservation of this ESU, including those upstream reaches on the North Yuba to New Bullards Bar Dam, on the Middle Yuba to Milton Dam, and on the South Yuba to Lake Spaulding. All three forks of the Upper Yuba River historically supported populations of spring chinook and steelhead (Yoshiyama *et al.*, 1995). The Team considered this area to be essential for conservation because it provides one of the largest areas of suitable habitat in the Central Valley that can be accessed by providing passage at one relatively small dam. The Lower Yuba is also considered to have a good "seed" population of both spring chinook and steelhead and both populations are considered relatively free of hatchery influence. A large, multi-million dollar study program is underway through the CALFED Ecological Restoration Program to evaluate the feasibility of restoring anadromous salmonid populations to the Upper Yuba River. We seek comment on whether this unoccupied habitat should be proposed as critical habitat.

Unit 10. Valley-American Subbasin (HU #5519)

The Valley-American HU is located in the central-eastern portion of the ESU and includes portions of the American River and lower Auburn Ravine. This HU encompasses an area of approximately 958 mi² (2,471 km²) and contains four HSA watersheds, only two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 190 miles (304 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, agricultural and municipal water withdrawals, point and non-point source water pollution, streambank stabilization activities, fish passage impediments, diking, urban development, and dam operations and water storage for flood control. The Team rated both occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential to the conservation of the ESU.

Unit 11. Colusa Basin Subbasin (HU #5520)

The Colusa Basin HU is located in the central portion of the ESU and includes portions of the mainstem Sacramento River, lower Butte Creek, the Butte Creek-Sutter Bypass and Little Chico Creek. This HU encompasses an area of approximately 2,767 mi² (7,138 km²) and contains five HSA watersheds, three of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 285 miles (456 km) of occupied riverine habitat, including the Sutter Bypass, in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, point and non-point water pollution, diking, fish passage impediments, streambank stabilization activities, wildlife habitat management, and invasive/non-native species management. The Team rated all three occupied watersheds as having high conservation value to the ESU (NMFS, 2004b) and did not identify any unoccupied habitat areas in this subbasin that may be essential to the conservation of the ESU.

Unit 12. Butte Creek Subbasin (HU #5521)

The Butte Creek HU is located in the northeastern portion of the ESU and contains portions of Butte Creek and Little Chico Creek. This HU encompasses an area of approximately 207 mi² (534 km²) and contains three HSA watersheds all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 38 miles (61 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urban development, rangeland management, agricultural water withdrawals, and hydroelectric water diversions. The Team rated two of these watersheds as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Upper Butte Creek above Centerville Dam upstream to Butte Meadow may be essential to the conservation of this ESU. It is uncertain whether this area was historically used by the steelhead, but resident rainbow trout were historically present and still occur above Centerville Diversion Dam. Spawning, rearing, and migration is present and thought to be in good condition. The Team believed this area may be essential for conservation because current spring-run chinook and steelhead spawning in this watershed is all below an elevation of 1,000 ft. High water temperatures in the lower portion of Butte Creek has led to significant spring-run chinook pre-spawning mortalities in recent years, and the Team concluded that improved fish passage over the Centerville Diversion Dam would increase the range for both the spring run chinook and steelhead ESUs, as well as reduce the risk of adult losses in the lower stream reaches. The Team expects that feasibility of passage at the Centerville Diversion Dam will be evaluated through the upcoming FERC relicensing process for the facility. We seek comment on whether this unoccupied habitat area should be proposed as critical habitat.

Unit 13. Ball Mountain Subbasin (HU #5523)

The Ball Mountain HU is located in the northwestern portion of the ESU and includes a portion of upper Thomes Creek and associated tributaries. This HU encompasses an area of approximately 334 mi^2 (862 km^2) and contains three HSA watersheds, only one of which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 41 miles (66 km) of occupied riverine habitat in the single occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including rangeland management, forestry management, agricultural water withdrawals, and municipal water withdrawals. The Team rated this single occupied watershed as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in the subbasin that may be essential for conservation of the ESU.

Unit 14. Shasta Bally Subbasin (HU #5524)

The Shasta Bally HU is located in the northwestern corner of the ESU and includes portions of SF Cottonwood Creek and Beegum Creek among others. This HU encompasses an area of approximately 905 mi^2 (2,335 km^2) and contains nine HSA watersheds, five of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 122 miles (195 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry management, rangeland management, road building and maintenance, hydroelectric power water diversions, water storage for flood control, dam operations, gravel mining, and fish passage impediments. Of the occupied watersheds, the Team rated three as having medium conservation value and two as having high conservation value for the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 15. North Valley Floor Subbasin (HU #5531)

The North Valley Floor HU is located in the southeastern portion of the ESU and includes portions of the Calaveras, Mokelumne, and Cosumnes Rivers. This HU encompasses an area of approximately 1,378 mi^2 (3,555 km^2) and contains five HSA watersheds, three of which are occupied by the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify about 190 miles (304 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, rangeland management, diking, channelization, streambank stabilization activities, and dam operations. Of these occupied watersheds, the Team rated one as low in conservation value, one as having medium conservation value, and one as having high conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible stream reaches of the Upper Mokelumne River above Comanche Dam up to Bald Rock Falls (which is 7 miles above Electra Dam) may be essential to the conservation of this ESU, as well as spring-run chinook salmon. Portions of this inaccessible habitat area extend into the Middle Sierra Subbasin (HU #5532). The Upper Mokelumne historically supported large runs of spring-run chinook salmon (Yoshiyama *et al.*, 1995), and since steelhead and spring-run chinook use similar habitats it is assumed this area also supported large runs of steelhead. Suitable habitat exists above Comanche Dam, but it has been altered by Comanche and Pardee reservoirs. The Team concluded that this area may be essential for conservation of the ESU because steelhead have been extirpated from the area above the dam and recovery of this ESU may require the re-establishment of multiple independent populations of steelhead throughout the Central Valley. We seek comment on whether these unoccupied habitat areas should be proposed as critical habitat.

Unit 16. Middle Sierra Subbasin (HU #5532)

The Middle Sierra HU is located in the eastern portion of the ESU and contains portions of the upper Cosumnes River watershed. This HU encompasses an area of approximately 1,424 mi^2 (3,674 km^2) and contains six HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only about 70 miles (112 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry management, agricultural water withdrawals, rangeland management, and urban development. Of these occupied watersheds, the Team rated all four as having low conservation value to the ESU (NMFS, 2004b). As discussed for Unit 15 (North Valley Floor Subbasin—HU #5531), inaccessible portions of the upper Mokelumne River which may be essential to the conservation of this ESU extend into this subbasin. The Team did not identify any other unoccupied areas in this subbasin that may be essential to the conservation of the ESU.

Unit 17. Upper Calavera Subbasin (HU #5533)

The Upper Calaveras HU is located in the eastern portion of the ESU and contains portions of the Calaveras River. This HU encompasses an area of approximately 362 mi^2 (934 km^2) and contains three HSA watersheds, only one of which is occupied by the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify only about 6 miles of occupied riverine habitat in the HSA (NMFS, 2004a). The Team concluded that occupied areas in this HSA watershed contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, gravel mining, and water storage for flood control. The Team rated this single occupied watershed as having high conservation value to the ESU (NMFS, 2004b) and did not identify any unoccupied areas in this subbasin that may be essential for conservation.

Unit 18. Stanislaus River Subbasin (HU #5534)

The Stanislaus River HU is located in the southeastern portion of the ESU and contains portions of the Stanislaus River. This HU encompasses an area of approximately 998 mi^2 (2,575 km^2 and contains eight HSA watersheds; however, only one is in the ESU and occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only about 3 miles of occupied riverine habitat in this HSA (NMFS, 2004a). The Team concluded that the occupied areas in this watershed contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, fish passage impediments, dam operations, and water storage for flood control. The Team rated this single occupied watershed as having high conservation value to the ESU (NMFS, 2004b).

Within this subbasin, the Team also concluded that inaccessible stream reaches in the Middle Stanislaus River from Goodwin Dam to New Melones Dam may be essential to the conservation of this ESU. The Stanislaus River historically supported a large population of spring-run chinook salmon and because steelhead utilize similar habitats it is likely that this River system also supported a large population of steelhead. Construction of Goodwin Dam blocked access of steelhead to those portions of the Stanislaus River above the Dam and largely extirpated this population. Recently, however, dam operations have provided conditions that allowed a few steelhead to spawn below Goodwin Dam. Suitable habitat is thought to exist above Goodwin Dam for steelhead and fish passage is considered feasible because of its low height. Based on preliminary technical recovery planning for ESUs in the central valley, recovery of this ESU will likely require the establishment of multiple independent steelhead populations particularly in the San Joaquin portion of the central valley. We seek comment on whether these unoccupied areas should be proposed as critical habitat for this ESU.

Unit 19. San Joaquin Valley Floor Subbasin (HU #5535)

The San Joaquin Valley Floor HU is located in the southeastern portion of the ESU and contains portions of the Merced, Tuolumne, and Stanislaus Rivers. This HU encompasses an area of approximately 1,932 mi^2 (4,985 km^2) and contains nine HSA watersheds, several of which occur outside of or partially outside of the geographic boundary of the ESU. Of these watersheds, seven are occupied and fish distribution and habitat use data compiled by NMFS biologists identify about 159 miles (254 km) of occupied riverine habitat (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, diking, fish passage impediments, streambank stabilization activities, and urban development. Of these occupied watersheds, the Team rated three as having medium conservation value and four as having high conservation value to the ESU (NMFS, 2004b).

Within this subbasin, the Team also concluded that inaccessible stream reaches in the Middle Tuolumne River (between LaGrange and New Don Pedro Dams) and the Middle Merced River (between Crocker-Huffman and Exchequer Dams) may be essential to the conservation of this ESU. Both rivers historically supported large populations of spring-run chinook salmon and because steelhead utilize similar habitat it is likely that these rivers also supported large populations of steelhead. Although current central valley steelhead populations are considered winter-run, habitat conditions in most San Joaquin basins, including the Tuolumne and Merced, may have historically supported summer steelhead (McEwan, 1996; Yoshiyama, 1996). With construction of LaGrange and Crocker-Huffman Dams, spring-chinook in both basins were extirpated, and most likely steelhead as well. Although steelhead cannot access the upper watersheds in the Tuolumne and Merced Rivers, dam operations in both watersheds have provided conditions allowing steelhead to spawn downstream of LaGrange and Crocker-Huffman Dams. The Team believes that suitable habitat conditions exist above LaGrange and Crocker-Huffman Dams and that there may be opportunities to provide fish passage at each facility. Based on preliminary technical recovery planning for ESUs in the central valley, it is likely that recovery of this ESU will require the establishment of multiple independent steelhead populations particularly in the San Joaquin portion of the central valley. We seek comment on whether these unoccupied areas should be proposed as critical habitat for this ESU.

Units 20 (Tuolumne River; HU #5536) and 21 (Merced River; HU #5537)

The Tuolumne River and Merced River HUs contain portions of the upper Tuolumne and Merced Rivers that are mostly or entirely outside the range of the ESU. These HUs contain eighteen HSA watersheds and over 2,800 miles (4,480 km) of streams (at 1:100,000 hydrography), but all are unoccupied by the ESU. The Team did not identify any areas in these subbasins that may be essential for the conservation of the ESU, and therefore, they were not considered further in the critical habitat designation process.

Unit 22. Delta-Mendota Canal Subbasin (HU #5541)

The Delta-Mendota Canal HU is located in the southernmost portion of the ESU and contains portions of the Delta-Mendota Canal. This HU encompasses an area of approximately 1,220 mi^2 (3,148 km^2) and contains two HSAs, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only about 50 miles of occupied riverine habitat in these HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, invasive/non-native species management, urban development, dredging, and point and non-point source water pollution. The Team rated these occupied watersheds as having medium and high conservation value, respectively, to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 23. Middle West Side Subbasin (HU #5542)

The Middle West Side Subbasin is located in the southwestern portion of the ESU in the San Joaquin basin. The HU contains four HSAs and approximately 509 miles (814 km) of streams (at 1:100,000 hydrography), but all are unoccupied by the ESU. The Team did not identify any habitat areas in this subbasin that may be essential for the conservation of the ESU, and therefore, they were not considered further in the critical habitat designation process.

Unit 24. North Diablo Range (HU #5543)

The North Diablo Range HU is located in the southwestern portion of the ESU in the south Delta. This HU encompasses an area of approximately 315 mi^2 (812 km^2) and contains only a single HSA which is partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 4 miles of occupied riverine/estuarine habitat in this HSA (NMFS, 2004a). The Team concluded the occupied areas in this HSA contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and water withdrawals, point and non-point source water pollution, and invasive/non-native species management. The Team rated this watershed as having medium conservation value to the ESU (NMFS, 2004b), and did not identify any unoccupied areas that may be essential to the conservation of the ESU.

Unit 25. San Joaquin Delta Subbasin (HU #5544)

The San Joaquin Delta HU is located in the southwestern portion of the ESU and includes portions of the south and central Delta channel complex. This HU encompasses an area of approximately 628 mi^2 (1,620 km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 276 miles (442 km) of occupied riverine and/or estuarine habitat in this HSA (NMFS, 2004a). The Team concluded that the occupied areas in this HSA contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water and municipal water withdrawals, entrainment associated with water diversions, invasive/non-native species management, and point and non-point source water pollution. The Team rated this HSA as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of this ESU.

Unit 26. Suisun Bay (HU #2207), San Pablo Bay (HU #2206) and San Francisco Bay (HU #s 2203 and 2204)

Portions of four HUs (2207, 2206, 2203, 2204) comprise the Suisun Bay-San Pablo-San Francisco Bay complex that is utilized by this ESU. These four HUs contain both estuarine habitat in the Bay complex as well as freshwater tributaries to the Bay complex, but only the 4 HSAs (HSAs: 220710, 220610, 220410, and 220312) that comprise the Bay complex are occupied by this ESU. These four HSAs encompass approximately 427 mi^2 (1,102 km^2) of estuarine habitat that serves as a rearing and migratory corridor providing connectivity between freshwater spawning, rearing, and migratory habitats for this ESU in the Sacramento-San Joaquin basin and the ocean. Collectively, these HSAs encompass an area of approximately 427 mi^2 (1,102 km^2). The Team concluded that these four HSAs were occupied and contained PCEs for migratory habitat that support this ESU, and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point and non-point source water pollution, diking, streambank stabilization activities, industrial development, invasive/non-native species, wetland/estuary management, and habitat restoration. Of these occupied HSAs, the Team rated one as having low conservation value (#220410) and three as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas that may be essential for the conservation as critical habitat for this ESU.

Application of ESA Section 4(b)(2)

The foregoing discussion describes those areas that are eligible for designation as critical habitat—the specific areas that fall within the ESA section 3(5)(A) definition of critical habitat, minus those lands owned or controlled by the DOD, or designated for its use, that are covered by an INRMP that we have determined in writing provides a benefit to the species. The application of section 4(b)(2) was a major concern of those commenting on the ANPR (68 FR 55926; September 29, 2003). Many commenters requested that we describe the process used—in particular the economic analysis—as part of our proposed rulemaking.

Specific areas eligible for designation are not automatically designated as critical habitat. Section 4(b)(2) of the ESA requires that the Secretary first considers the economic impact, impact on national security, and any other relevant impact. The Secretary has the discretion to exclude an area from designation if he determines the benefits of exclusion (that is, avoiding the impact that would result from designation), outweigh the benefits of designation. The Secretary may not exclude an area from designation if exclusion will result in the extinction of the species. Because the authority to exclude is discretionary, exclusion is not required for any areas.

In this proposed rule, the Secretary has applied his statutory discretion to exclude areas from critical habitat for several different reasons. To be consistent, we used CALWATER HSAs or watersheds for ESUs in California as the unit for exclusion in each case. However, the agency is asking for public comment on whether considering exclusions on a stream-by-stream approach would be more appropriate.

Impacts to Tribes

We believe there is very little benefit to designating critical habitat on Indian lands. Although there is a broad array of activities on Indian lands that may trigger section 7 consultation, Indian lands comprise only a minor portion (substantially less than 1 percent) of the total habitat under consideration for these seven California ESUs. Specifically, occupied stream reaches on Indian lands only occur within the range of the California Coastal chinook, Northern California *O. mykiss*, and Central California Coast *O. mykiss* ESUs, and these areas represent less than 0.1 percent of the total occupied habitat under consideration for these three ESUs. Based on our analysis, the remaining four ESUs did not contain any Indian lands that overlapped with occupied stream habitat. These percentages are likely overestimates as they include all habitat area within reservation boundaries.

There are several benefits to excluding Indian lands. The longstanding and distinctive relationship between the Federal and tribal governments is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiate tribal governments from the other entities that deal with, or are affected by, the Federal government. This relationship has given rise to a special Federal trust responsibility involving the legal responsibilities and obligations of the United States toward Indian Tribes and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights. Pursuant to these authorities lands have been retained by Indian Tribes or have been set aside for tribal use. These lands are managed by Indian Tribes in accordance with tribal goals and objectives within the framework of applicable treaties and laws.

In addition to the distinctive trust relationship for Pacific salmon in California and in the Northwest, there is a unique partnership between the Federal government and Indian tribes regarding salmon management. Indian tribes in California and the Northwest are regarded as "co-managers" of the salmon resource, along with Federal and state managers. This co-management relationship evolved as a result of numerous court decisions clarifying the tribes' treaty right to take fish in their usual and accustomed places.

The benefits of excluding Indian lands from designation include: (1) The furtherance of established national policies, our Federal trust obligations and our deference to the tribes in management of natural resources on their lands; (2) the maintenance of effective long-term working relationships to promote the conservation of salmonids on an ecosystem-wide basis; (3) the allowance for continued meaningful collaboration and cooperation in scientific work to learn more about the conservation needs of the species on an ecosystem-wide basis; and (4) continued respect for tribal sovereignty over management of natural resources on Indian lands through established tribal natural resource programs.

We believe that the current co-manager process addressing activities on an ecosystem-wide basis across three states is currently beneficial for the conservation of the salmonids. Because the co-manager process provides for coordinated ongoing focused action through a variety of forums, we find the benefits of this process to be greater than the benefits of applying ESA section 7 to Federal activities on Indian lands, which comprise much less than one percent of the total area under consideration for these ESUs. Additionally, we have determined that the exclusion of tribal lands will not result in the extinction of the species concerned. We also believe that maintenance of our current co-manager relationship consistent with existing policies is an important benefit to continuance of our tribal trust responsibilities and relationship. Based upon our consultation with the Round Valley Indian Tribes and the Bureau of Indian Affairs (BIA), we believe that designation of Indian lands as critical habitat would adversely impact our working relationship and the benefits resulting from this relationship.

Based upon these considerations, we have determined to exercise agency discretion under ESA section 4(b)(2) and propose to exclude Indian lands from the eligible critical habitat designation for these ESUs of salmonids. The Indian lands specifically excluded from critical habitat are those defined in the Secretarial Order, including: (1) Lands held in trust by the United States for the benefit of any Indian tribe; (2) land held in trust by the United States for any Indian Tribe or individual subject to restrictions by the United States against alienation; (3) fee lands, either within or outside the reservation boundaries, owned by the tribal government; and (4) fee lands within the reservation boundaries owned by individual Indians. The Indian tribes for which these exclusions apply in California include: Big Lagoon Reservation, Blue Lake Rancheria, Round Valley Indian Tribes, Laytonville Rancheria, Redwood Valley Rancheria, Coyote Valley Reservation, and Manchester—Point Arena Rancheria.

Impacts to National Security

As noted previously (see Military Lands section) the U.S. Marine Corps provided comments in response to the ANPR (68 FR 55926; September 29, 2003) regarding their INRMP for Camp Pendleton Marine Corps Base and potential impacts to national security for this facility, which is within the range of the southern California *O. mykiss* ESU. By letter, NMFS subsequently provided the DOD with information about the areas we were considering to designate as critical habitat for the seven ESUs in California (as well as the 13 ESUs in the Pacific Northwest) and, in addition to a request for information about DOD's INRMPs, requested information about potential impacts to national security as a result of any critical habitat designation. In response to the request concerning national security impacts, Camp Pendleton Marine Corps Base and the Vandenberg Air Force Base provided detailed information on such impacts. Both military agencies concluded that critical habitat designation at either of these sites would likely impact national security by diminishing military readiness. The possible impacts include: (1) Preventing, restricting, or delaying training or testing exercises or access to such sites; (2) restricting or delaying activities associated with space launches; (3) delaying response times for troop deployments and overall operations; and (4) creating uncertainties regarding ESA consultation (*e.g.*, reinitiation requirements) or imposing compliance conditions that would divert military resources. Also, both military agencies cited their ongoing and positive consultation history with NMFS and underscored cases where they are implementing best management practices to reduce impacts on listed salmonids.

The Teams assessing conservation values for the overlap areas of habitat and Camp Pendleton and Vandenberg AFB concluded that all of them were of high conservation value to the respective ESUs. The overlap areas, however, are a small percentage of the total area for the affected ESUs. Designating habitat on these two installations will likely reduce the readiness capability of the Marine Corps and the Air Force, both of which are actively engaged in training, maintaining, and deploying forces in the current war on terrorism. Therefore, we conclude that the benefits of exclusion outweigh the benefits of designation, and we are not proposing to designate these DoD sites as critical habitat.

We anticipate working with DOD to obtain and review any additional information regarding national security impacts to other military installations before issuing a final critical habitat designation for the seven ESUs that are the subject of this proposed rulemaking. We will analyze any information we receive and prepare findings that will be made available for public review and comment through a notice of availability in the **Federal Register**.

Other Potential Exclusions

As discussed above, in 2001 the Tenth Circuit issued a ruling in *NMCA*, which criticized the historic approach that FWS and NMFS had taken towards the economic analysis required in the critical habitat designation process. As a result of this ruling, both agencies engaged in a long-term process of reevaluating existing critical habitat designations consistent with the Tenth Circuit's ruling. NMFS's critical habitat designations for steelhead and salmon ESUs and FWS's designations for bull trout are the first to fully evaluate the economic impacts of the designations for aquatic species on a broad landscape scale. As a result, many of the critical issues faced by the two agencies are issues of first impression.

On October 6, 2004, the FWS issued a final rule designating critical habitat for the bull trout, a species in many respects co-extensive in distribution with listed salmon and steelhead ESUs in the Pacific Northwest. Necessarily, the FWS had to make determinations on many of these novel issues. The Secretary of the Interior found that a number of conservation measures designed to protect salmon and steelhead on Federal, state, tribal and private lands would also have significant beneficial impacts to bulltrout. Therefore, the Secretary of the Interior determined that the benefits of excluding those areas exceeded the benefits of including those areas as critical habitat.

The Secretary of Commerce has reviewed the bull trout rule and has recognized the merits of the approach taken by the Secretary of the Interior with these emerging issues. As a result, the Secretary of Commerce is considering the following exclusions because the benefits of exclusion may outweigh the benefits of inclusion and expects the final rule will include some or all of these exclusions. However, given the time constraints associated with this rule making and the broader geographic range of the potential salmon and steelhead designations in California and the Pacific Northwest, the Secretary of Commerce has not had an opportunity to fully evaluate all of the potential exclusions, the geographical extent of such exclusions, or compare the benefits of these exclusions to the benefits of inclusion. As a result, the proposed designations included in this rule generally represent an upper bound to the area that the Secretary is considering designating as critical habitat and do not include the following additional exclusions that the Secretary is considering:

A set of exclusions based on existing land management plans adopted and currently implemented by Federal agencies within the relevant geographic area: These plans are the Northwest Forest Plan, PACFISH and INFISH which are implemented by the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) in parts of California and the Pacific Northwest. The Secretary is considering excluding from critical habitat all Federal lands subject to these plans. We may make these exclusions on a fifth field watershed basis or a stream-by-stream basis and we invite comment on the appropriate method. Each of these plans is designed to provide very substantial conservation benefits to salmonid species including areas occupied by each of the seven California ESUs, while permitting provision of other multiple uses on those Federal lands to the extent compatible with the provisions of the plan. Imposing an overlay of critical habitat in these areas could threaten the provision of the other multiple used contemplated by these plans and potentially impede vital land restoration activities while potentially offering a negligible conservation benefit in light of the other existing conservation measures provided by the plans. The threat to forest restoration activities (forest thinning and brush clearing to reduce catastrophic fire risks), economic activities (e.g. grazing and timber production) and recreational uses on public lands may outweigh the benefit of a critical habitat designation in these areas.

Federal land managed by the Forest Service and BLM constitutes a relatively lesser proportion of the land ownership within the range of the seven California ESUs (4–25 percent) compared with private land (71–88 percent). However, the estimated annualized economic impacts attributable to section 7 consultations on Federal land management activities comprise a disproportionately large portion of the total annual costs for several of the California ESUs. This relationship is most pronounced for the California Coastal chinook and Northern California *O. mykiss* ESUs. For example, Federal lands comprise only 16 percent of the land ownership within the California Coastal chinook ESU, but approximately 77 percent of the annualized section 7 economic impacts are attributable to Federal land management. Similarly, Federal lands comprise only 18 percent of the land ownership within the Northern California *O. mykiss* ESU, but approximately 87 percent of the annualized section 7 economic impacts are attributable to Federal land management. Section 7 related economic impacts associated with Federal land management also constitute a significant portion of the total annual economic impact for the South-Central California Coast *O. mykiss* (44 percent) and Southern California *O. mykiss* (69 percent) ESUs.

An exclusion of areas covered by conservation commitments by state and private landowners: Another set of exclusions is based on conservation commitments by state and private landowners reflected in habitat conservation plans (HCPs) and cooperative agreements approved by NMFS. In California, we have not identified any state conservation commitments that would apply, but seek public comment on this issue. With regard to private lands, however, the HCP adopted by the Pacific Lumber Company would constitute such a commitment. Lands managed under the existing Pacific Lumber Company HCP are relatively limited in comparison to the broad geographic area addressed in this rulemaking, but do occur within the geographic range of the California Coastal chinook and Northern California *O. mykiss* ESUs. Several other HCPs are under development in California, but they have not yet been adopted and therefore their conservation benefits are uncertain.

An exclusion for intermingled lands: If a large part of a watershed is determined to warrant exclusion, the Secretary is considering excluding the entire watershed. For example, if a large proportion of a watershed consists of Federal land to be excluded based on an existing management plan, the entire watershed could be excluded. There may be little policy justification for designating non-Federal lands as critical habitat in a watershed dominated by excluded Federal lands. As noted above, Federal lands do not constitute a large portion of the land ownership in any of the seven California ESUs under consideration. However, there are areas within the range of each of the ESUs where Federal lands are more concentrated and intermingled non-Federal lands occur to a limited extent. Such conditions occur mainly in specific watersheds within the range of the California Coastal chinook, Northern California *O. mykiss*, South-Central California Coast *O. mykiss*, and Southern California *O. mykiss* ESUs.

Accordingly, NMFS specifically asks for public comment on the categories of exclusions discussed above. Specifically, NMFS requests comment on the benefits of excluding:

(1) Other Federal lands subject to protective management provisions for salmonids (*e.g.*, the Aquatic Conservation Strategy of the Northwest Forest Plan, PACFISH, or INFISH);

(2) Other state, tribal, or private lands subject to (or planned to receive) other forms of protective management for salmonids (*e.g.*, private land HCPs, State of California Forest Practices Act lands); and

(3) Other state, tribal, or private lands within watersheds containing a large proportion of Federal, state, tribal or private lands already subject to protective management measures.

Exclusions Primarily Based on Economic Impacts

In this exercise of discretion, the first issue we must address is the scope of impacts relevant to the 4(b)(2) evaluation. As discussed in the Previous Federal Action section, we are re-designating critical habitat for these seven ESUs in California because the previous designations were vacated. (*National Association of Homebuilders* v. *Evans*, 2002 WL 1205743 No. 00–CV–2799 (D.D.C.) (*NAHB*)). The *NAHB* Court had agreed with the reasoning of the Court of Appeals for the Tenth Circuit in *New Mexico Cattle Growers Association* v. *U.S. Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001). In that decision, the Tenth Circuit stated "[t]he statutory language is plain in requiring some kind of consideration of economic impact in the critical habitat designation phase." The Tenth Circuit concluded that, given the FWS' failure to distinguish between "adverse modification" and "jeopardy" in its 4(b)(2) analysis, the FWS must analyze the full impacts of critical habitat designation, regardless of whether those impacts are co-extensive with other impacts (such as the impact of the jeopardy requirement).

In re-designating critical habitat for these seven salmon and *O. mykiss* ESUs, we have followed the Tenth Circuit Court's directive regarding the statutory requirement to consider the economic impact of designation. Areas designated as critical habitat are subject to ESA section 7 requirements, which provide that Federal agencies ensure that their actions are not likely to destroy or adversely modify critical habitat. To evaluate the economic impact of critical habitat we first examined our voluminous section 7 consultation record for these as well as other ESUs of salmon. That record includes consultations on habitat-modifying Federal actions both where critical habitat has been designated and where it has not. We could not discern a distinction between the impacts of applying the jeopardy provision versus the adverse modification provision in occupied critical habitat. Given our inability to detect a measurable difference between the impacts of applying these two provisions, the only reasonable alternative was to follow the recommendation of the Tenth Circuit, approved by the *NAHB* court—to measure the co-extensive impacts; that is, measure the entire impact of applying the adverse modification provision of section 7, regardless of whether the jeopardy provision alone would result in the identical impact.

The Tenth Circuit's opinion only addressed ESA section 4(b)(2)'s requirement that economic impacts be considered. The Court did not address how "other relevant impacts" were to be considered, nor did it address the benefits of designation. Because section 4(b)(2) requires a consideration of other relevant impacts of designation, and the benefits of designation, and because our record did not support a distinction between impacts resulting from application of the adverse modification provision versus the jeopardy provision, we are uniformly considering coextensive impacts and coextensive benefits, without attempting to distinguish the benefit of a critical habitat consultation from the benefit that would otherwise result from a jeopardy consultation that would occur even if critical habitat were not designated. To do otherwise would distort the balancing test contemplated by section 4(b)(2).

The principal benefit of designating critical habitat is that Federal activities that may affect such habitat are subject to consultation pursuant to section 7 of the ESA. Such consultation requires every Federal agency to ensure that any action it authorizes, funds or carries out is not likely to result in the destruction or adverse modification of critical habitat. This complements the section 7 provision that Federal agencies ensure that their actions are not likely to jeopardize the continued existence of a listed species. Another benefit is that the designation of critical habitat can serve to educate the public regarding the potential conservation value of an area, and thereby, focus and contribute to conservation efforts by clearly delineating areas of high conservation value for certain species. It is unknown to what extent this process actually occurs and what the actual benefit is, as there are also concerns, noted above, that a critical habitat designation may discourage such conservation efforts.

The balancing test in section 4(b)(2) contemplates weighing benefits that are not directly comparable—the benefit to species conservation balanced against the economic benefit, benefit to national security, or other relevant benefit that results if an area is excluded from designation. Section 4(b)(2) does not specify a method for the weighing process. Agencies are frequently required to balance benefits of regulations against impacts; Executive Order 12866 established this requirement for Federal agency regulation. Ideally such a balancing would involve first translating the benefits and impacts into a common metric. Executive branch guidance from the Office of Management and Budget (OMB) suggests that benefits should first be monetized (*i.e.*, converted into dollars). Benefits that cannot be monetized should be quantified (for example, numbers of fish saved). Where benefits can neither be monetized nor quantified, agencies are to describe the expected benefits (OMB, Circular A–4, September 17, 2003 (OMB, 2003)).

It may be possible to monetize benefits of critical habitat designation for a threatened or endangered species in terms of willingness-to-pay (OMB, 2003). However, we are not aware of any available data that would support such an analysis for salmon. The short statutory time-frames, geographic scale of the designations under consideration, and the statute's requirement to use best "available" information suggests such a costly and time-consuming approach is not currently available. In addition, ESA section 4(b)(2) requires analysis of impacts other than economic impacts that are equally difficult to monetize, such as benefits to national security of excluding areas from critical habitat. In the case of salmon designations, impacts to Indian tribes are an "other relevant impact" that also may be difficult to monetize.

An alternative approach, approved by OMB, is to conduct a cost-effectiveness analysis. A cost-effectiveness analysis ideally first involves quantifying benefits, for example, percent reduction in extinction risk, percent increase in productivity, or increase in numbers of fish. Given the state of the science, it would be difficult to reliably quantify the benefits of including particular areas in the critical habitat designation. Although it is difficult to monetize or quantify benefits of critical habitat designation, it is possible to differentiate among habitat areas based on their relative contribution to conservation. For example, habitat areas can be rated as having a high, medium or low conservation value. The qualitative ordinal evaluations can then be combined with estimates of the economic costs of critical habitat designation in a framework that essentially adopts that of cost-effectiveness. Individual habitat areas can then be assessed using both their biological evaluation and economic cost, so that areas with high conservation value and lower economic cost might be considered to have a higher priority for designation while areas with a low conservation value and higher economic cost might have a higher priority for exclusion. While this approach can provide useful information to the decision-maker, there is not rigid formula through which this information translates into exclusion decisions. Every geographical area containing habitat eligible for designation is different, with a unique set of "relevant impacts" that may be considered in the exclusion process. Regardless of the analytical approach, section 4(b)(2) makes clear that what weight the agency gives various impacts and benefits, and whether the agency excludes areas from the designation, is discretionary.

Assessment of Economic Impacts

Assessment of economic impact generated considerable interest from commenters on the ANPR (68 FR 55926; September 29, 2003). A number of commenters requested that we make the economic analysis available as part of the proposed rulemaking, and some identified key considerations (*e.g.*, sector-specific impacts, direct and indirect costs, ecological services/benefits) that they believed must be taken into account. In a draft report, we have documented our conclusions regarding the economic impacts of designating each of the particular areas found to meet the definition of critical habitat for the seven ESUs addressed in this rulemaking (NMFS, 2004c). This report is available from NMFS (see ADDRESSES).

The first step was to identify existing legal and regulatory constraints on economic activity that are independent of critical habitat designation, such as Clean Water Act requirements. Coextensive impacts of the ESA section 7 requirement to avoid jeopardy were not considered part of the baseline. Given the uncertainty that existing critical habitat designations in California (*i.e.*, Sacramento River winter run chinook salmon, Central California Coast coho salmon, and Southern Oregon/Northern California coho salmon ESUs) will remain in place in their current configuration, we decided not to consider them.

Next, from the consultation record, we identified Federal activities that might affect habitat and that might result in a section 7 consultation. (We did not consider Federal actions, such as the approval of a fishery, that might affect the species directly but not affect its habitat.) We identified nine types of activities including: hydropower dams; non-hydropower dams and other water supply structures; Federal lands management, including grazing (considered separately); transportation projects; utility line projects; in-stream activities, including dredging (considered separately); activities permitted under Environmental Protection Agency's (EPA) National Pollution Discharge Elimination System; sand & gravel mining; and residential and commercial development. Based on our consultation record and other available information, we determined the modifications each type of activity was likely to undergo as a result of section 7 consultation (regardless of whether the modification might be required by the jeopardy or the adverse modification provision). We developed an expected direct cost for each type of action and projected the likely occurrence of each type of project in each watershed, using existing spatial databases (*e.g.*, the Corps 404(d) permit database). Finally, we aggregated the costs from the various types of actions and estimated an annual impact, taking into account the probability of consultation occurring and the likely rate of occurrence of that project type.

This analysis allowed us to estimate the coextensive economic impact of designating each "particular area" that was occupied by each ESU (*i.e.* each occupied CALWATER HSA watershed). Expected economic impacts from this analysis ranged from zero to several million dollars per occupied habitat area within the range of the seven ESUs addressed in this rulemaking. Where a watershed included both tributaries and a migration corridor that served other watersheds, we attempted to estimate the separate impacts of designating the tributaries and the migration corridor. We did this by identifying those categories of activities most likely to affect tributaries and those most likely to affect larger migration corridors.

Because of the methods we selected and the data limitations, portions of our analysis both under- and over-estimate the co-extensive economic impact of section 7 requirements. For example, we lacked data on the likely impact on flows at non-Federal hydropower projects, which would increase economic impacts. We also did not have sufficient information currently available allowing us to estimate the likely economic impact of a judicially-imposed ban on pesticide use near salmon-bearing streams. The EPA was recently enjoined from authorizing the application of a set of pesticides within a certain distance of "salmon supporting waters." We have completed a preliminary analysis of these impacts at the ESU level (NMFS, 2004c). Because of existing data limitations of the preliminary nature of the analysis, we determined not to use these estimates in the proposed designations. However, we believe the information presented in this preliminary consideration will aid public comment and assist in the development of a more complete examination of these impacts for the final rule. Finally, we did not have information about potential changes in irrigation flows associated with section 7 consultations. These impacts would increase the estimate of co-extensive costs. On the other hand, we estimated an impact on all activities occurring within the geographic boundaries of a watershed, even though in some cases activities would be far removed from occupied stream reaches and so might not require modification or even consultation. We intend to pursue information prior to issuing a final rule that will allow us to refine our estimates of economic impacts and better inform our analysis under section 4(b)(2).

In addition, we had no information on the costs of critical habitat designation that occur outside the section 7 consultation process, including costs resulting from state or local regulatory burdens imposed on developers and landowners as a result of a Federal critical habitat designation. We solicit information on these subjects during the public comment period.

Exclusion Process

In determining whether the economic benefit of excluding a habitat area (that is, an HSA watershed) might outweigh the benefit of designation to the species, we took into consideration a cost-effectiveness approach giving priority to excluding habitat areas with a relatively lower benefit of designation and a relatively higher economic impact. We believe it is reasonable at this stage of the analysis to assume that all areas containing physical or biological features essential to the conservation of the species are essential to the conservation of the species.

The circumstances of most listed ESUs can make a cost-effectiveness approach useful. Pacific salmon are wide-ranging species and occupy numerous habitat areas with thousands of stream miles. Not all occupied areas, however, are of equal importance to conserving an ESU. Within the currently occupied range there are areas that support highly productive populations, areas that support less productive populations, and areas that support production in only some years. Some populations within an ESU may be more important to long-term conservation of the ESU than other populations. Therefore, in many cases it may be possible to construct different scenarios for achieving conservation. Scenarios might have more or less certainty of achieving conservation, and more or less economic impact. Future applications of this methodology will strive to better distinguish the relative conservation value of habitat areas (*i.e.* HSA watersheds) eligible for designation, which should improve the utility of this approach.

We attempted to consider the effect of excluding areas, either alone or in combination with other areas, on the opportunities for conservation of the ESUs. We preferred exclusions in areas with a lower conservation value to those with a high conservation value. We also recognize that in practice a large proportion of all watersheds received a "high" conservation rating, making it difficult to establish priorities within that subgroup. In the second step of the process, we asked the Teams whether excluding any of the habitat areas identified in the first step would significantly impede conservation, recognizing that the breadth of available conservation measures makes such judgements necessarily subjective. The Teams considered this question in the context of all of the areas eligible for exclusion as well as the information they had developed in providing the initial conservation ratings. The following section describes the results of applying this process to each ESU. The results are discussed in greater detail in a separate report that is available for public review and comment (NMFS, 2004d). While the possible effect on conservation was useful information, it was not determinative in deciding whether to propose the exclusion of an area. The only determinative limitation is the statutory bar on excluding any area that "will result in the extinction of the species concerned."

Critical Habitat Designation

Not including any of the additional categories of potential exclusions identified above, we are proposing to designate approximately 11,668 mi (18,669 km) of riverine habitat and 947 mi² (2,444 km²) of estuarine habitat within the geographical areas presently occupied by the seven ESUs (Table 2). This proposal excludes approximately 1,109 mi (1,774 km) of occupied riverine habitat as a result of economic considerations, 36 mi (22 km) of occupied riverine habitat on Tribal lands, and 41 mi (66 km) of occupied riverine habitat on DOD lands. In addition, the proposal excludes approximately 229 mi² (591 km²) of estuarine habitat in San Francisco Bay. Some of these areas proposed for designation or exclusion overlap substantially with two or more ESUs. For example, the CC chinook and NC *O. mykiss* ESUs have similar geographic distributions in coastal watersheds north of San Francisco Bay, the CV spring-run chinook and CV *O. mykiss* ESUs have overlapping distributions in the Sacramento River watershed and Delta within the central valley, and the CV spring-run chinook, CV *O. mykiss*, and CCC *O. mykiss* ESUs have overlapping distributions in portions of the San Francisco-San Pablo-Suisun Bay estuarine complex. As described previously, NMFS is not proposing to designate Tribal lands with occupied habitat or DOD controlled lands with occupied habitat that are subject to INRMPs that benefit the listed ESUs. The net economic impacts (coextensive with ESA section 7) associated with the areas proposed for designation for all ESUs combined are estimated to be approximately $83,511,186. This estimate does not account for reductions that occur as a result of excluding Indian lands or military lands. Moreover, as discussed previously, we are soliciting comment on additional exclusions which, if adopted, would further reduce the estimate of coextensive costs.

The proposed designated habitat areas, summarized below by ESU, contain physical and biological features essential to the conservation of the species and that may require special management considerations or protection. Some of the areas proposed for designation are likely to be excluded in the final rule after consideration of the additional three categories of potential exclusions identified above.

TABLE 2.—APPROXIMATE QUANTITY OF PROPOSED CRITICAL HABITAT* AND OWNERSHIP WITHIN WATERSHEDS CONTAINING HABITAT AREAS PROPOSED FOR DESIGNATION

ESU	Streams (mi) (km)	Estuary habitat (sq mi) (sq km)	Federal	Tribal	State/local	Private
California Coastal Chinook	1,513 2,421	25 65	16.4	0.4	3.4	79.8
Northern California *O. mykiss*	2,989 4,782	25 65	18.8	0.5	3.7	77.1
Central California Coast *O. mykiss*	1,675 2,680	386 996	4.5	0.0	7.2	88.3
South-Central California *O. mykiss*	1,240 1,984	3 8	16.3	0.0	2.2	81.6
Southern California *O. mykiss*	784 1,254		25.0	1.0	2.4	71.6
Central Valley spring-run Chinook	1,150 1,840	254 655	12.1	0.0	3.3	84.5
Central Valley *O. mykiss*	2,317 3,707	254 655	8.6	0.0	3.1	88.3

*These estimates are the total amount proposed for each ESU. They do not account for overlapping areas proposed for multiple ESUs.

California Coastal Chinook Salmon ESU

There are 45 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into 8 larger subbasin units (or CALWATER HUs). Eight HSA watersheds received a low rating, 10 received a medium rating, and 27 received a high rating of conservation value to the ESU (NMFS, 2004b). Two estuarine habitat areas used for rearing and migration (Humboldt Bay and the Eel River Estuary) that are not CALWATER HSAs were also evaluated and received a high conservation value rating.

HSA watershed habitat areas in this ESU include approximately 1,638 mi (2,635 km) of occupied stream habitat and 25 mi² (65 km²) of occupied estuarine habitat (Humboldt Bay). Approximately 12 mi (19 km) of occupied stream habitat is within the boundaries of Indian reservations and proposed for exclusion. We have not calculated the potential reduction in estimated economic impact as a result of these Indian land exclusions, but expect it would be small given the small percentage of stream miles these exclusions represent (less than 0.1 percent of all occupied stream miles).

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 3. Of the areas eligible for designation, no fewer than approximately 113 stream miles (180 km) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, would be $11,651,723. The exclusions set forth in Table 3 would reduce the total estimated economic impact to $7,586,559. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates cost impacts could be reduced to about $3,200,000.

TABLE 3.—HSA WATERSHEDS OCCUPIED BY THE CALIFORNIA COASTAL CHINOOK SALMON ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed (HSA) name	Area proposed for exclusion
Unit 1. Eel River HU	111122	Bridgeville	Entire watershed.
	111171	Eden Valley	Entire watershed.
	111173	Black Butte River	Entire watershed.
	111174	Wilderness	Entire watershed
Unit 8. Russian River HU	111422	Santa Rosa	Entire watershed.

Northern California O. mykiss ESU

There are 50 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into seven larger subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Nine watersheds received a low rating, 14 received a medium rating, and 27 received a high rating of conservation value to the ESU (NMFS, 2004b). Two estuarine habitat areas used for rearing and migration (Humboldt Bay and the Eel River Estuary) that are not CALWATER HSAs were also evaluated and received a high conservation value rating.

HSA watershed habitat areas in this ESU include approximately 3,128 mi (5,005 km) of occupied stream habitat and 25 mi² (65 km²) of occupied estuarine habitat (Humboldt Bay). Approximately 23 mi (37 km) of stream habitat are within the boundaries of Indian reservations and are proposed for exclusion. We have not calculated the potential reduction in estimated economic impact as a result of these Indian land exclusions, but expect it would be small given the small percentage of stream miles these exclusions represent.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 4. Of the areas eligible for designation, no fewer than approximately 116 mi (185 km) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. Total potential estimated economic impact, with no exclusions, is $10,842,357. The exclusions set forth in Table 4 would reduce the total estimated economic impact to $6,688,254. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates the cost impact could be reduced to about $1,900,000.

TABLE 4.—HSA WATERSHEDS OCCUPIED BY THE NORTHERN CALIFORNIA O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/unit	Watershed code	Watershed name	Area proposed for exclusion
Unit 3. Mad River HU	110940	Ruth	Entire watershed.
Unit 5. Eel River HU	111150	North Fork Eel	Entire watershed.
	111163	Lake Pillsbury	Entire watershed.

Central California Coast O. mykiss ESU

There are 47 occupied HSA occupied watersheds within the freshwater and estuarine range of this ESU, including the Upper Alameda Creek watershed which supports a resident *O. mykiss* population that is proposed for listing. For ease of reference these watersheds have been aggregated into10 larger subbasin units (or CALWATER Hus) within which the HSA watersheds are nested. Fourteen HSA watersheds received a low rating, 13 received a medium rating, and 20 received a high rating of conservation value to the ESU (NMFS, 2004b). Five of these HSA watershed units comprise portions of the San Francisco-San Pablo-Suisun Bay complex which constitutes rearing and migratory habitat for this ESU.

HSA watershed habitat areas in this ESU include approximately 2,002 miles (3,203 km) of occupied stream habitat and 442 mi² (1,140 km²) of occupied estuarine habitat in the San Francisco Bay complex. Approximately 1.0 mi (2.0 km) of occupied stream habitat is within the boundaries of Indian reservations and proposed for exclusion. We have not calculated the potential reduction in estimated economic impact as a result of these Indian land exclusions, but expect it would be small given the small percentage of stream miles these exclusions represent.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the HSA habitat areas shown in Table 5. Of the areas eligible for designation, no fewer than approximately 326 mi (522 km) of stream habitat and 56 mi² (144 km²) of estuarine habitat in Suisun Bay (HSA 220710) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, is $9,327,996. The exclusions set forth in Table 5 would reduce the total estimated economic impact to $5,452,712. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands), indicates the cost impact could be reduced to approximately $5,000,000.

TABLE 5.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL CALIFORNIA COAST O. MYKISS ESU AND PROPOSED FOR FULL OR PARTIAL EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed name	Area proposed for exclusion
Unit 1. Russian River HU	111422	Santa Rosa	Entire watershed.
	111431	Ukiah	Tributaries.
Unit 5. Bay Bridges HU	220330	San Rafael	Entire watershed.
Unit 6. South Bay HU	220440	San Mateo Bayside	Entire watershed.
	220420	Eastbay Cities	Tributaries.
Unit 7. Santa Clara HU	220540	Guadelupe River	Entire watershed.
Unit 8. San Pablo HU	220620	Novato	Entire watershed.
	220660	Pinole	Entire watershed.
Unit 9. Suisun HU	220710	Suisun Bay	Entire unit.
	220721	Benecia	Entire watershed.
	220731	Pittsburg	Entire watershed.
	220733	Martinez	Entire watershed.

Watersheds for which tributaries only are excluded contain rearing/migration corridors necessary for conservation.

South-Central California Coast O. mykiss ESU

There are 30 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been organized into eight larger subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Six watersheds received a low conservation rating, 11 received a medium rating, and 13 received a high rating of conservation value to the ESU (NMFS, 2004b). One of these occupied watershed units is Morro Bay which is rearing and migratory habitat for those populations which spawn and rear in tributaries to the Bay. Of the 1,261 mi (2,018 km) of occupied riverine habitat and 3 mi^2 (8 km^2) of occupied estuarine habitat (Morro Bay) in the ESU, approximately 21 mi (34 km) are not proposed for designation because they are within lands controlled by the military (Camp San Luis Obispo and Camp Roberts) that have qualifying INRMPs.

As a result of the balancing process for economic impacts described above, the Secretary is not proposing to exclude any areas from the habitat that is eligible for designation. The total potential estimated economic impact of the designation, without exclusions, would be $10,084,293. However, as indicated above, the Secretary is considering a number of additional exclusions which may reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates the cost impacts could be reduced to about $4,300,000.

Southern California O. mykiss ESU

There are 37 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into eight subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Six HSA watersheds received a low rating, 6 received a medium rating, and 25 received a high rating of conservation value to the ESU (NMFS, 2004b).

There are 837 mi (1,339 km) of occupied stream habitat in the 37 HSA watersheds comprising this ESU. Of these, approximately 20 mi (32 km) occupied stream miles (30.0 km) occur on Vandenberg AFB and Camp Pendleton Marine Corps Base which are not proposed for designation because they are within lands controlled by the military that have qualifying INRMPs.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas shown in Table 6. Of the areas eligible for designation, no fewer than 33 mi (53km) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, would be $21,008,746. The exclusions set forth in Table 6 would reduce the total estimated economic impact to $12,716,386. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount for this ESU. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates that impacts could be reduced to about $3,600,000.

TABLE 6.—HSA WATERSHEDS OCCUPIED BY THE SOUTHERN CALIFORNIA O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed code	HSA watershed name	Area proposed for exclusion
Unit 1. Santa Maria River HU	331210	Guadelupe	Tributaries only.
	331230	Cuyama Valley	Entire watershed.
Unit 2. Santa Ynez HU	331430	Buelton	Tributaries only.
	331451	Santa Cruz Creek	Entire watershed
Unit 7. Calleguas HU	440811	East of Oxnard	Entire watershed.

Central Valley Spring-Run Chinook Salmon ESU

There are 37 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into 15 subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Four of these HSA watershed units comprise the San Francisco-San Pablo-Suisun Bay complex through which this ESU migrates to and from the ocean, and these HSAs were aggregated into a separate unit for descriptive purposes. Eight HSA watersheds received a low rating, 4 received a medium rating, and 25 received a high rating of conservation value to the ESU (NMFS, 2004b). Occupied habitat areas or HSA watersheds for this ESU include approximately 1,381 mi (2,212 km) of riverine habitat, in addition to approximately 427 mi^2 (1,102 km^2) of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 7. Of the areas eligible for designation, no fewer than approximately 231 mi (369 km) of stream habitat and 173 mi^2 (446 km^2) of estuarine habitat in San Francisco Bay are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, is $23,577,391. The exclusions set forth in Table 7 would reduce the total estimated economic impact to 16,787,737. However, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates the cost impact could be reduced to about $12,900,000.

TABLE 7.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL VALLEY SPRING-RUN CHINOOK SALMON ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed code	HSA watershed name	Area proposed for exclusion
Unit 2. Whitmore HU	550731	South Cow Creek	Entire watershed.
Unit 5. Sacramento Delta HU	551000	Sacramento Delta	Partial.
Unit 8. Yuba River HU	551713	Mildred Lake	Entire watershed.
Unit 9. Valley American HU	551921	Lower American	Entire watershed.
Unit 12. Ball Mountain HU	552310	Thomes Creek	Entire watershed.
Unit 13. Shasta Bally HU	552433	South Fork	Entire watershed.
Unit 14. No. Diablo Range HU	554300	No. Diablo Range	Entire watershed.
Unit 15. San Joaquin Delta HU	554400	San Joaquin Delta	Entire watershed.
Unit 16 South SF Bay HU	220410	South SF Bay	Entire unit.

Central Valley O. mykiss ESU

There are 67 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into 25 subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Four of these HSA watershed units comprise the San Francisco-San Pablo-Suisun Bay complex through which this ESU migrates to and from the ocean, and these HSAs were aggregated into a separate unit for descriptive purposes. Fourteen HSA watersheds received a low rating, 16 received a medium rating, and 37 received a high rating of conservation value to the ESU (NMFS, 2004b). Occupied habitat areas or HSA watersheds for this ESU include approximately 2,607 mi (4,171 km) of stream habitat, in addition to approximately 427 mi^2 (1,102 km^2) of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex.

As a result of the balancing process for economic impacts described above, the Secretary is proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 8. Of the areas eligible for designation, no fewer than approximately 290 mi (464 km) of stream and 173 mi^2 (446 km^2) of estuarine habitat in San Francisco Bay are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, is $29,187,888. The exclusions set forth in Table 8 would reduce the total estimated economic impact to $24,195,245. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates that economic impacts could be reduced to about $18,500,000.

TABLE 8.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL VALLEY O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed name	Area proposed for exclusion
Unit 5. Sacramento Delta HU	551000	Sacramento Delta	Partial watershed.
Unit 6. Valley-Putah Cache HU	551110	Elmira	Entire watershed.
Unit 8. Marysville HU	551510	Lower Bear River	Entire watershed.
Unit 9. Yuba River HU	551713	Mildred Lake	Entire watershed.
	551720	Nevada City	Entire watershed.
Unit 12. Butte Creek HU	552110	Upper Dry Creek	Entire watershed.

TABLE 8.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL VALLEY O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT—Continued

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed name	Area proposed for exclusion
Unit 15. North Valley Floor HU	553111	Herald	Entire watershed.
	553120	Lower Mokelumne	Partial watershed.
Unit 16. Middle Sierra	553221	Big Canyon Creek	Entire watershed.
	553223	NF Cosumnes	Entire watershed.
	553224	Omo Ranch	Entire watershed.
	553240	Sutter Creek	Entire watershed.
Unit 21. No. Diablo Range	554300	No. Diablo Range	Entire watershed.
Unit 23. So. SF Bay	220410	So. SF Bay	Entire unit.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7 of the ESA requires Federal agencies, including NMFS, to ensure that actions they fund, authorize, permit, or carry out do not destroy or adversely modify critical habitat. In agency regulations at 50 CFR 402.02, we define destruction or adverse modification as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to: Alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." However, in a March 15, 2001, decision of the United States Court of Appeals for the Fifth Circuit (*Sierra Club* v. *U.S. Fish and Wildlife Service*, 243 F.3d 434 (5th Cir. 2001), and an August 9, 2004 decision of the United States Court of Appeals for the Ninth Circuit (*Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife*, No. 03–35279, the courts have found the agencies' definition of destruction or adverse modification to be invalid. In response to this decision, we are reviewing this regulatory definition.

Section 7(a) of the ESA requires Federal agencies, including NMFS, to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is proposed or designated. Regulations implementing this provision of the ESA are codified at 50 CFR part 402. Section 7(a)(4) of the ESA requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat. Conference reports provide conservation recommendations to assist the agency in eliminating conflicts that may be caused by the proposed action. The conservation recommendations in a conference report are advisory.

We may issue a formal conference report if requested by a Federal agency. Formal conference reports include an opinion that is prepared according to 50 CFR 402.14, as if the species were listed or critical habitat designated. We may adopt the formal conference report as the biological opinion when the species is listed or critical habitat designated, if no substantial new information or changes in the action alter the content of the opinion (see 50 CFR 402.10(d)).

If a species is listed or critical habitat is designated, ESA section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Through this consultation, we would review actions to determine if they would destroy or adversely modify critical habitat.

If we issue a biological opinion concluding that a project is likely to result in the destruction or adverse modification of critical habitat, we will also provide reasonable and prudent alternatives to the project, if any are identifiable. Reasonable and prudent alternatives are defined at 50 CFR 402.02 as alternative actions identified during consultation that can be implemented in a manner consistent with the intended purpose of the action, that are consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that we believe would avoid destruction or adverse modification of critical habitat. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where critical habitat is subsequently designated and the Federal agency has retained discretionary involvement or control over the action or such discretionary involvement or control is authorized by law. Consequently, some Federal agencies may request reinitiation of consultation or conference with us on actions for which formal consultation has been completed, if those actions may affect designated critical habitat or adversely modify or destroy proposed critical habitat.

Activities on Federal lands that may affect these ESUs or their critical habitat will require ESA section 7 consultation. Activities on private or state lands requiring a permit from a Federal agency, such as a permit from the Corps under section 404 of the Clean Water Act, a section 10(a)(1)(B) permit from NMFS, or some other Federal action, including funding (*e.g.*, Federal Highway Administration (FHA) or Federal Emergency Management Agency (FEMA) funding), will also be subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat and actions on non-Federal and private lands that are not federally funded, authorized, or permitted do not require section 7 consultation.

Activities Affected by Critical Habitat Designation

Section 4(b)(8) of the ESA requires that we evaluate briefly and describe, in any proposed or final regulation that designates critical habitat, those activities involving a Federal action that may adversely modify such habitat or that may be affected by such designation. As noted in the *Special Management Considerations or Protection* section above, we received several comments on the ANPR (68 FR 55926; September 29, 2003) regarding activities potentially affected by a critical habitat designation.

A wide variety of activities may affect critical habitat and, when carried out, funded, or authorized by a Federal agency, require that an ESA section 7 consultation be conducted. Such activities include, but are not limited to, those described in the Species Descriptions and Area Assessments section. Generally these include water and land management actions of Federal agencies (*e.g.*, USFS, BLM, Corps, U.S. Bureau of Reclamation (BOR), the FHA, Natural Resource Conservation Service (NRCS), National Park Service (NPS), BIA, and the Federal Energy Regulatory Commission (FERC)) and related or similar actions of other federally regulated projects and lands, including livestock grazing allotments by the USFS and BLM; hydropower sites licensed by the FERC; dams built or operated by the Corps or BOR; timber sales and other vegetation management activities conducted by the USFS, BLM, and BIA; irrigation diversions authorized by the USFS and BLM; road building and maintenance activities authorized by the FHA, USFS, BLM, NPS, and BIA; and mining and road building/maintenance activities authorized by the State of California. Other actions of concern include dredge and fill, mining, diking, and bank stabilization activities authorized or conducted by the Corps, habitat modifications authorized by the FEMA, and approval of water quality standards and pesticide labeling and use restrictions administered by the EPA.

The Federal agencies that will most likely be affected by this critical habitat designation include the USFS, BLM, BOR, Corps, FHA, NRCS, NPS, BIA, FEMA, EPA, and the FERC. This designation will provide these agencies, private entities, and the public with clear notification of critical habitat designated for listed salmonids and the boundaries of the habitat. This designation will also assist these agencies and others in evaluating the potential effects of their activities on listed salmon and their critical habitat and in determining if section 7 consultation with NMFS is needed.

As noted above, numerous private entities also may be affected by this critical habitat designation because of the direct and indirect linkages to an array of Federal actions, including Federal projects, permits, and funding. For example, private entities may harvest timber or graze livestock on Federal land or have special use permits to convey water or build access roads across Federal land; they may require Federal permits to armor stream banks, construct irrigation withdrawal facilities, or build or repair docks; they may obtain water from federally funded and operated irrigation projects; or they may apply pesticides that are only available with Federal agency approval. These activities will need to be analyzed with respect to their potential to destroy or adversely modify critical habitat. In some cases, proposed activities may require modifications that may result in decreases in activities such as timber harvest and livestock and crop production. The transportation and utilities sectors may need to modify the placement of culverts, bridges and utility conveyances (*e.g.*, water, sewer and power lines) to avoid barriers to fish migration. Developments occurring in or near salmon streams (*e.g.*, marinas, residential, or industrial facilities) that require Federal authorization or funding may need to be altered or built in a manner that ensures that critical habitat is not destroyed or adversely modified as a result of the construction, or subsequent operation, of the facility. These are just a few examples of potential impacts, but it is clear that the effects will encompass numerous sectors of private and public activities. If you have questions regarding whether specific activities will constitute destruction or adverse modification of critical habitat, contact NMFS (see **ADDRESSES** and **FOR FURTHER INFORMATION CONTACT**).

Public Comments Solicited

We intend that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, comments or suggestions from the public, other concerned governments and agencies, the scientific community, industry, or any other interested party concerning this proposed rule are hereby solicited. Comments particularly are sought concerning:

(1) Maps and specific information describing the amount, distribution, and use type (*e.g.*, spawning, rearing, or migration) of salmon habitat in each ESU, as well as any additional information on occupied and unoccupied habitat areas;

(2) The reasons why any habitat should or should not be determined to be critical habitat as provided by sections 3(5)(A) and 4(b)(2) of the ESA;

(3) Information regarding the benefits of excluding lands covered by HCPs (ESA section 10(a)(1)(B) permits), including the regulatory burden designation may impose on landowners and the likelihood that exclusion of areas covered by existing plans will serve as an incentive for other landowners to develop plans covering their lands;

(4) Information regarding the benefits of excluding Federal and other lands covered by habitat conservation strategies and plans (*e.g.*, Northwest Forest Plan, PACFISH, etc.), including the regulatory burden designation may impose on land managers and the likelihood that exclusion of areas covered by existing plans will serve as an incentive for land user to implement the conservation measures covering the lands subject to those plans;

(5) Information regarding the benefits of designating particular areas as critical habitat;

(6) Current or planned activities in the areas proposed for designation and their possible impacts on proposed critical habitat;

(7) Any foreseeable economic or other potential impacts resulting from the proposed designations, in particular, any impacts on small entities;

(8) Whether our approach to critical habitat designation could be improved or modified in any way to provide for greater public participation and understanding, or to assist us in accommodating public concern and comments; and

(9) Whether specific unoccupied areas (*e.g.*, dewatered stream reaches, areas behind dikes or dams, above dams, etc) not presently proposed for designation may be essential to provide additional spawning and rearing areas for an ESU. In particular we are seeking information regarding unoccupied areas that may be essential for the conservation of the SC and CV *O. mykiss* ESUs, and the CV spring-run chinook ESU (see ESU Descriptions for specific unoccupied areas that may be essential for conservation and for which comments are being solicited).

If you wish to comment on this proposal, you may submit your comments and materials concerning this proposal by any one of several methods (see **ADDRESSES** section). The proposed rule, maps, fact sheets, and other materials relating to this proposal can be found on our Web site at *http://swr.nmfs.noaa.gov*. We will consider all comments and information received during the comment period on this proposed rule as we prepare our final rulemaking. Accordingly, the final decision may differ from this proposal.

Public Hearings

Joint Commerce-Interior ESA implementing regulations state that the Secretary shall promptly hold at least one public hearing if any person requests one within 45 days of publication of a proposed regulation to list a species or to designate critical habitat (see 50 CFR 424.16(c)(3)). Requests for public hearing must be made in writing (see **ADDRESSES**) by January 24, 2005. Details regarding the specific hearing locations and times will be posted on our Web site at *http://swr.nmfs.noaa.gov.* These hearings will provide the opportunity for interested individuals and parties to give comments, exchange information and opinions, and engage in a constructive dialogue concerning this proposed rule. We encourage the public's involvement in such ESA matters.

Peer Review

In accordance with an ESA policy published on July 1, 1994 (59 FR 34270), we will solicit the expert opinions of at least three appropriate independent specialists regarding this proposed rule. Given the varied considerations involved in making the proposed designations, we intend to solicit reviews from specialist(s) with biological expertise as well as specialist(s) with economic expertise in the geographic range of these ESUs. The purpose of such review is to ensure that the critical habitat designation is based on scientifically sound data, assumptions, and analyses. We will send these reviewers copies of this proposed rule immediately following publication in the **Federal Register**. We will invite them to comment, during the public comment period, on the specific assumptions and conclusions regarding the proposed designation of critical habitat.

In response to the ANPR (68 FR 55926; September 29, 2003) we received the names of two potential independent reviewers and will identify other candidates prior to or soon after publishing this proposed rule. We will announce the availability of comments received from these reviewers and the public and make them available via the internet as soon as practicable during or after the comment period but in advance of a final rule.

Required Determinations

Clarity of the Rule

Executive Order 12866 requires each agency to write regulations and notices that are easy to understand. We invite your comments on how to make this proposed rule easier to understand, including answers to questions such as the following: (1) Are the requirements in the proposed rule clearly stated? (2) Does the proposed rule contain technical jargon that interferes with its clarity? (3) Does the format of the proposed rule (grouping and order of the sections, use of headings, paragraphing, *etc.*) aid or reduce its clarity? (4) What else could we do to make this proposed rule easier to understand? You may send comments on how we could make this proposed rule easier to understand to one of the addresses identified in the **ADDRESSES** section or via e-mail to: *critical.habitat.swr@noaa.gov.*

Regulatory Planning and Review

In accordance with Executive Order 12866, this document is a significant rule and has been reviewed by the OMB. As noted above, we have prepared several reports to support the exclusion process under section 4(b)(2) of the ESA. The economic costs of the proposed critical habitat designations are described in our draft economic report (NMFS, 2004c). The benefits of the proposed designations are described in the Critical Habitat Analytical Review Team preliminary findings report (NMFS, 2004b). This document uses a biologically-based ranking system for gauging the benefits of applying section 7 of the ESA to particular watersheds. Because data are not available to express these benefits in monetary terms, we have adopted a cost-effectiveness framework, as outlined in our draft 4(b)(2) report (NMFS, 2004d). This approach is in accord with OMB's guidance on regulatory analysis (OMB Circular A–4, Regulatory Analysis, September 17, 2003). By taking this approach, we seek to designate sufficient critical habitat to meet the biological goal of the ESA while imposing the least burden on society, as called for by E.O. 12866.

In assessing the overall cost of critical habitat designation for the seven Pacific salmon and *O. mykiss* ESUs, the annual total impact figures given in the draft economic analysis (NMFS, 2004c) cannot be added together to obtain an aggregate annual impact. Because some watersheds are included in more than one ESU, a simple summation would entail duplication, resulting in an overestimate. Accounting for this duplication, the aggregate annual economic impact of the seven proposed critical habitat designations is $83,511,186 (in contrast to a $115,680,394 aggregate annual economic impact from designating *all* areas considered in the 4(b)(2) process for these ESUs). These amounts include impacts that are co-extensive with the implementation of the jeopardy standard of section 7 (NMFS, 2004c).

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (*i.e.*, small businesses, small organizations, and small government jurisdictions). We have prepared a draft regulatory flexibility analysis and this document (NMFS, 2004e) is available upon request (*see* **ADDRESSES**). This analysis estimates that the number of regulated small entities potentially affected by this proposed rulemaking ranges from 379 to 3,151, depending on the ESU. If the proposed areas are designated as critical habitat, the estimated co-extensive costs of section 7 consultation incurred by small entities are estimated to range from $1.6 million to $18.2 million depending on the ESU. As described in the analysis, we considered various alternatives for designating critical habitat for these seven ESUs. We considered and rejected the alternative of not designating critical habitat for any of the ESUs because such an approach did not meet the legal requirements of the ESA. We also examined and rejected an alternative in which all the potential critical habitat of the seven Pacific salmon and *O. mykiss* ESUs is proposed for designation (*i.e.*, no areas are excluded) because many of the areas considered to have a low conservation value also had relatively high economic impacts that might be mitigated by excluding those areas from designation. A third alternative we examined and rejected would exclude all habitat areas with a low or medium conservation value. While this alternative furthers the goal of reducing economic impacts, it is not sensitive to the fact that for most ESUs, eliminating all habitat areas with low and medium conservation value is likely to significantly impede conservation. Moreover, for some habitat areas the incremental economic benefit from excluding that area is relatively small. Therefore, after considering these alternatives in the context of the section 4(b)(2) process of weighing benefits of exclusion against benefits of designation, we determined that the current proposal for designating critical habitat (*i.e.*, designating some but not all areas with low or medium conservation value) provides an appropriate balance of conservation and economic mitigation and that excluding the areas identified in this proposed rulemaking would not result in extinction of the ESUs. It is estimated that small entities could save from $650,000 to $4.3 million in compliance costs, depending on the ESU, if the areas proposed for exclusion in this proposed rule are excluded from the designation.

Executive Order 13211

On May 18, 2001, the President issued an Executive Order on regulations that significantly affect energy supply, distribution, and use. Executive Order 13211 requires agencies to prepare Statements of Energy Effects when undertaking certain actions. This proposed rule may be a significant regulatory action under Executive Order 12866. We have prepared a draft analysis of the energy effects of critical habitat designation and this document (NMFS, 2004e; see Appendix G) is available upon request (see **ADDRESSES**).

Approximately 90 hydropower projects exist within the area covered by the seven ESUs addressed in this rulemaking. The projects range from very small ones with installed capacities considerably less than 5 MW to much larger projects ranging up to 196 MW installed capacity. Within California, the majority of hydropower project are private or State-owned and licensed by FERC. A smaller percentage of all projects are owned and operated by the Corps or BOR. Consultations on hydropower projects represent a relatively small percentage of the total section 7 consultations concerning listed salmon, but cost of project modification may be higher that for other activities. According to the economic analysis performed for the proposed designation (NMFS, 2004e), costs to hydropower projects associated with salmon section 7 actions are anticipated to be approximately 23 percent of the annual costs of overall section 7 statewide. The primary modifications resulting from section 7 include construction or improvements to fish passage facilities and programs, research and monitoring of water quality and fish passage efficiency, and other offsite mitigation efforts.

Two threshold tests were considered to determine whether critical habitat designation would have a "significant adverse effect on the supply, distribution, or use of energy": Reductions in electricity production in excess of 1 billion kilowatt-hours per year or in excess of 500 megawattts of installed capacity; and increases in the cost of energy production in excess of one percent. For both thresholds of the energy impacts analysis, the assessment concludes that the total impacts of salmon conservation/mitigation measures for hydropower projects may exceed the thresholds for determining that an adverse energy effect is significant. However, the assessment also concludes based on the agency's section 7 consultation history, that the total impacts of such conservation or mitigation overestimate the incremental impacts of critical habitat designation alone because there is strong evidence that consultation based on the jeopardy standard alone is capable of imposing significant impacts on such projects. Based on the energy impacts analysis, NMFS believes that the designation of critical habitat will not have impacts that exceed the thresholds identified above.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act, we make the following findings:

(a) This proposed rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute or regulation that would impose an enforceable duty upon State, local, tribal governments, or the private sector and includes both "Federal intergovernmental mandates" and "Federal private sector mandates." These terms are defined in 2 U.S.C. 658(5)–(7). "Federal intergovernmental mandate" includes a regulation that "would impose an enforceable duty upon State, local, or tribal governments" with two exceptions. It excludes "a condition of Federal assistance." It also excludes "a duty arising from participation in a voluntary Federal program," unless the regulation "relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority," if the provision would "increase the stringency of conditions of assistance" or "place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding" and the State, local, or tribal governments "lack authority" to adjust accordingly. (At the time of enactment, these entitlement programs were: Medicaid; AFDC work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement.) "Federal private sector mandate" includes a regulation that "would impose an enforceable duty upon the private sector, except (I) a condition of Federal assistance; or (ii) a duty arising from participation in a voluntary Federal program." The designation of critical habitat does not impose a legally binding duty on non-Federal government entities or private parties. Under the ESA, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities who receive Federal funding, assistance, permits or otherwise require approval or authorization from a Federal agency for an action may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply; nor would critical habitat shift the costs of the large entitlement programs listed above to State governments.

(b) Due to current public knowledge of salmon protection and the prohibition against take of these species both within and outside of the designated areas, we do not anticipate that this proposed rule will significantly or uniquely affect small governments. As such, a Small Government Agency Plan is not required.

Takings

In accordance with Executive Order 12630, the proposed rule does not have significant takings implications. A takings implication assessment is not required. The designation of critical habitat affects only Federal agency actions. The proposed rule will not increase or decrease the current restrictions on private property concerning take of salmon. As noted above, due to widespread public knowledge of salmon protection and the prohibition against take of the species both within and outside of the designated areas, we do not anticipate that property values will be affected by the proposed critical habitat designations. While real estate market values may temporarily decline following designation, due to the perception that critical habitat designation may impose additional regulatory burdens on land use, we expect any such impacts to be short term (NMFS, 2004c). Additionally, critical habitat designation does not preclude development of HCPs and issuance of incidental take permits. Owners of areas that are included in the designated critical habitat will continue to have the opportunity to use their property in ways consistent with the survival of listed salmon.

Federalism

In accordance with Executive Order 13132, this proposed rule does not have significant federalism effects. A federalism assessment is not required. In keeping with Department of Commerce policies, we requested information from, and coordinated development of, this proposed critical habitat designation with appropriate state resource agencies in California. The proposed designation may have some benefit to the states and local resource agencies in that the areas essential to the conservation of the species are more clearly defined, and the primary constituent elements of the habitat necessary to the survival of the species are specifically identified. While making this definition and identification does not alter where and what federally sponsored activities may occur, it may assist local governments in long-range planning (rather than waiting for case-by-case section 7 consultations to occur).

Civil Justice Reform

In accordance with Executive Order 12988, the Department of the Commerce has determined that this proposed rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the Order. We are proposing to designate critical habitat in accordance with the provisions of the ESA. This proposed rule uses standard property descriptions and identifies the primary constituent elements within the designated areas to assist the public in understanding the habitat needs of the seven salmon ESUs.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This proposed rule does not contain new or revised information collection for which OMB approval is required under the Paperwork Reduction Act. This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act

We have determined that we need not prepare environmental analyses as provided for under the National Environmental Policy Act of 1969 for critical habitat designations made pursuant to the ESA. See *Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied, 116 S.Ct. 698 (1996).

Government-to-Government Relationship With Tribes

The longstanding and distinctive relationship between the Federal and tribal Governments is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiate tribal governments from the other entities that deal with, or are affected by, the Federal Government. This relationship has given rise to a special Federal trust responsibility involving the legal responsibilities and obligations of the United States toward Indian Tribes and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights. Pursuant to these authorities lands have been retained by Indian Tribes or have been set aside for tribal use. These lands are managed by Indian Tribes in accordance with tribal goals and objectives within the framework of applicable treaties and laws.

Administration policy contained in the Secretarial Order: "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act" (June 5, 1997) ("Secretarial Order"); the President's Memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (50 FR 2291); Executive Order 13175; and Department of Commerce-American Indian and Alaska Native Policy (March 30, 1995) reflects and defines this unique relationship.

These policies also recognize the unique status of Indian lands. The Presidential Memorandum of April 29, 1994, provides that, to the maximum extent possible, tribes should be the governmental entities to manage their lands and tribal trust resources. The Secretarial Order provides that, "Indian lands are not Federal public lands or part of the public domain, and are not subject to Federal public lands laws."

In implementing these policies the Secretarial Order specifically seeks to harmonize this unique working relationship with the Federal Government's duties pursuant to the ESA. The order clarifies our responsibilities when carrying out authorities under the ESA and requires that we consult with and seek participation of, the affected Indian Tribes to the maximum extent practicable in the designation of critical habitat. Accordingly, we recognize that we must carry out our responsibilities under the ESA in a manner that harmonizes these duties with the Federal trust responsibility to the tribes and tribal sovereignty while striving to ensure that Indian Tribes do not bear a disproportionate burden for the conservation of species. Any decision to designate Indian land as critical habitat must be informed by the Federal laws and policies establishing our responsibility concerning Indian lands, treaties and trust resources, and by Department of Commerce policy establishing our responsibility for dealing with tribes when we implement the ESA.

Pursuant to the Secretarial Order we consulted with the affected Indian Tribes when considering the designation of critical habitat in an area that may impact tribal trust resources, tribally owned fee lands or the exercise of tribal rights. Additionally, one California Indian tribe and the BIA provided written comments that are a part of the administrative record for this proposed rulemaking.

We understand from the tribes and the BIA that there is general agreement that Indian lands should not be designated critical habitat. The Secretarial Order defines Indian lands as "any lands title to which is either: (1) Held in trust by the United States for the benefit of any Indian tribe or (2) held by an Indian Tribe or individual subject to restrictions by the United States against alienation." In clarifying this definition with the tribes, we agree that (1) fee lands within the reservation boundaries and owned by the Tribe or individual Indian, and (2) fee lands outside the reservation boundaries and owned by the Tribe would be considered Indian lands for the purposes of this proposed rule. (Fee lands outside the reservation owned by individual Indians are not included within the definition of Indian lands for the purposes of this rule.)

In evaluating Indian lands for designation as critical habitat we look to section 4(b)(2) of the ESA. Section 4(b)(2) requires us to base critical habitat designations on the best scientific and commercial data available, after taking into consideration the economic impact, the impact on national security and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude areas from a critical habitat designation when the benefits of exclusion outweigh the benefits of designation, provided the exclusion will not result in the extinction of the species. We find that a relevant impact for consideration is the degree to which the Federal designation of Indian lands would impact the longstanding unique relationship between the tribes and the Federal Government and the corresponding effect on Pacific salmon protection and management (See Other Relevant Impacts and Critical Habitat Designation sections). This is consistent with recent case law addressing the designation of critical habitat on tribal lands. "It is certainly reasonable to consider a positive working relationship relevant, particularly when the relationship results in the implementation of beneficial natural resource programs, including species preservation." *Center for Biological Diversity et al.* v. *Norton,* 240 F. Supp. 2d 1090, 1105); *Douglas County* v. *Babbitt,* 48 F3d 1495, 1507 (1995) (defining "relevant" as impacts consistent with the purposes of the ESA).

NMFS and many tribal governments in California currently have cooperative working relationships that have enabled us to implement natural resource programs of mutual interest for the benefit of threatened and endangered salmonids. Some tribes have existing natural resource programs that assist us on a regular basis in providing information relevant to salmonid protection throughout the region. Our consultation with the tribes and the BIA indicates that they view the designation of Indian lands as an unwanted intrusion into tribal self-governance, compromising the government-to-government relationship that is essential to achieving our mutual goal of conserving threatened and endangered salmonids.

At this time, for the general reasons described above, we anticipate that the ESA 4(b)(2) analysis will lead us to exclude all Indian lands with occupied habitat in our final designation for these seven ESUs of salmon and *O. mykiss*. Consistent with other proposed exclusions, any exclusion in the final rule will be made only after consideration of all comments received.

References Cited

A complete list of all references cited in this rulemaking can be found on our Web site at *http://swr.nmfs.noaa.gov* and is available upon request from the NMFS office in Long Beach, California (see **ADDRESSES** section).

List of Subjects in 50 CFR Part 226

Endangered and threatened species.

Dated: November 29, 2004.

William T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, we propose to amend part 226, title 50 of the Code of Regulations as set forth below:

PART 226—[AMENDED]

1. The authority citation of part 226 continues to read as follows:

Authority: 16 U.S.C. 1533.

2. Add § 226.211 to read as follows:

§ 226.211 Critical habitat for seven Evolutionarily Significant Units (ESUs) of salmon (Oncorhynchus spp.) in California.

Critical habitat is designated in the following counties for the following ESUs as described in paragraph (a) of this section, and as further described in paragraphs (b) through (e) of this section. The textual descriptions of critical habitat for each ESU are included in paragraphs (f) through (l) of this section, and these descriptions are the definitive source for determining the critical habitat boundaries. General location maps are provided at the end of each ESU description (paragraphs (f) through (l) of this section) and are provided for general guidance purposes only, and not as a definitive source for determining critical habitat boundaries.

(a) Critical habitat is designated for the following ESUs in the following counties:

ESU	State—Counties
(1) California Coastal Chinook	CA—Humboldt, Trinity, Mendocino, Sonoma, Lake, Napa, Glenn, Colusa, and Tehama.
(2) Northern California *O. mykiss*	CA—Humboldt, Trinity, Mendocino, Sonoma, Lake, Glenn, Colusa, and Tehama.
(3) Central California Coast *O. mykiss*	CA—Lake, Mendocino, Sonoma, Napa, Marin, San Francisco, San Mateo, Santa Clara, Santa Cruz, Alameda, Contra Costa, and San Joaquin.
(4) South-Central Coast *O. mykiss*	CA—Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo.
(5) Southern California *O. mykiss*	CA—San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange and San Diego.
(6) Central Valley spring-run Chinook	CA—Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Colusa, Yuba, Sutter, Trinity, Alameda, San Joaquin, and Contra Costa.
(7) Central Valley *O. mykiss*	CA—Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solona, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, Contra Costa.

(b) *Critical habitat boundaries.* Critical habitat includes the stream channels within the proposed stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 CFR 329.11). In areas for which the ordinary high-water line has not been defined pursuant to 33 CFR 329.11, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. Critical habitat in estuaries (e.g. San Francisco-San Pablo-Suisun Bay, Humboldt Bay, and Morro Bay) is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

(c) *Primary constituent elements.* Within these areas, the primary constituent elements essential for the conservation of these ESUs are those sites and habitat components that support one or more life stages, including:

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

(2) Freshwater rearing sites with:

(i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;

(ii) Water quality and forage supporting juvenile development; and

(iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

(3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

(4) Estuarine areas free of obstruction and excessive predation with:

(i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater;

(ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and

(iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

(d) *Exclusion of Indian lands.* Critical habitat does not include occupied habitat areas on Indian lands. The Indian lands specifically excluded from critical habitat are those defined in the Secretarial Order, including:

(1) Lands held in trust by the United States for the benefit of any Indian tribe;

(2) Land held in trust by the United States for any Indian Tribe or individual subject to restrictions by the United States against alienation;

(3) Fee lands, either within or outside the reservation boundaries, owned by the tribal government; and

(4) Fee lands within the reservation boundaries owned by individual Indians.

(e) *Land owned or controlled by the Department of Defense.* Additionally, critical habitat does not include the following areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a):

(1) Camp Pendleton Marine Corps Base;

(2) Vandenberg Air Force Base;

(3) Camp San Luis Obispo;

(4) Camp Roberts; and

(5) Mare Island Army Reserve Center.

(f) California Coastal Chinook Salmon (Oncorhynchus tshawytscha). Critical habitat is proposed to include the areas defined in the following units:

(1) Redwood Creek Hydrologic Unit 1107—*(i) Orick Hydrologic Sub-area 110710.* Outlet(s) = Redwood Creek (Lat −41.2997, Long −124.0917) upstream to endpoint(s) in: Boyes Creek (41.3639, −123.9845); Bridge Creek (41.137, −124.0012); Brown Creek (41.3986, −124.0012); Emerald (Harry Weir) (41.2142, −123.9812); Godwood Creek (41.3889, −124.0312); Larry Dam Creek (41.3359, −124.003); Little Lost Man Creek (41.2944, −124.0014); Lost Man Creek (41.3133, −123.9854); May Creek (41.3547, −123.999); McArthur Creek (41.2705, −124.041); North Fork Lost Man Creek (41.3374, −123.9935); Prairie Creek (41.4239, −124.0367); Redwood Creek (41.1367, −123.9309); Redwood Creek (41.2997, −124.0499); Tom McDonald (41.1628, −124.0419).

(ii) Beaver Hydrologic Sub-area 110720. Outlet(s) = Redwood Creek (Lat 41.1367, Long −123.9309) upstream to endpoint(s): Lacks Creek (41.0334, −123.8124); Minor Creek (40.9706, −123.7899).

(iii) Lake Prairie Hydrologic Sub-area 110730. Outlet(s) = Redwood Creek (Lat 40.9070, Long −123.8170) upstream to endpoint(s) in: Redwood Creek (40.7432, −123.7206).

(2) Trinidad Hydrologic Unit 1108—*(i) Big Lagoon Hydrologic Sub-area 110810.* Outlet(s) = Maple Creek (Lat 41.1555, Long −124.1380) upstream to endpoint(s) in: North Fork Maple Creek (41.1294, −124.0771); Maple Creek (41.1223, −124.0995).

(ii) Little River Hydrologic Sub-area 110820. Outlet(s) = Little River (41.0277, −124.1112) upstream to endpoint(s) in: South Fork Little River (40.9961, −124.0435); Little River (41.0463, −123.9818); Railroad Creek (41.0474, −124.0453); Lower South Fork Little River (41.003, −124.0081); Upper South Fork Little River (41.0163, −123.9939).

(3) Mad River Hydrologic Unit 1109—*(i) Blue Lake Hydrologic Sub-area 110910.* Outlet(s) = Mad River (Lat 40.9139, Long −124.0642) upstream to endpoint(s) in: Lindsay Creek (40.983, −124.0326); Mill Creek (40.9008, −124.0086); North Fork Mad River (40.8687, −123.9649); Squaw Creek (40.9426, −124.0202); Warren Creek (40.8901, −124.0402).

(ii) North Fork Mad River 110920. Outlet(s) = North Fork Mad River (Lat 40.8687, Long −123.9649) upstream to endpoint(s) in: Sullivan Gulch (40.8557, −123.9487); North Fork Mad River (40.8837, −123.9436).

(iii) Butler Valley 110930. Outlet(s) = Mad River (Lat 40.8449, Long −123.9807) upstream to endpoint(s) in: Black Creek (40.7547, −123.9016); Black Dog Creek (40.8334, −123.9805); Canon Creek (40.8362, −123.9028); Mad River (40.7007, −123.8642); Maple Creek (40.7928, −123.8742).

(4) Eureka Plain Hydrologic Unit 1110—*(i) Eureka Plain Hydrologic Sub-area 111000.* Outlet(s) = Mad River (Lat 40.9560, Long −124.1278); Jacoby Creek (40.8435, −124.0815); Freshwater Creek (40.8088, −124.1442); Elk River (40.7568, −124.1948); Salmon Creek (40.6868, −124.2194) upstream to endpoint(s) in: Bridge Creek (40.6958, −124.0795); Dunlap Gulch (40.7101, −124.1155); Elk River (40.7025, −124.1522); Freshwater Creek (40.7389, −123.9944); Gannon Slough (40.8628, −124.0818); Jacoby Creek (40.7944, −124.0093); Little Freshwater Creek (40.7485, −124.0652); North Branch of the North Fork Elk River (40.6878, −124.0131); North Fork Elk River (40.6756, −124.0153); Ryan Creek (40.7835, −124.1198); Salmon Creek (40.6438, −124.1319); South Branch of the North Fork Elk River (40.6691, −124.0244); South Fork Elk River (40.6626, −124.061); South Fork Freshwater Creek (40.7097, −124.0277).

(5) Eel River Hydrologic Unit 1111—*(i) Ferndale Hydrologic Sub-area 111111.* Outlet(s) = Eel River (Lat 40.6282, Long −124.2838) upstream to endpoint(s) in: Atwell Creek (40.472, −124.1449); Howe Creek (40.4748, −124.1827); Price Creek (40.5028, −124.2035); Strongs Creek (40.5986, −124.1222); Van Duzen River (40.5337, −124.1262).

(ii) Scotia Hydrologic Sub-area 111112. Outlet(s) = Eel River (Lat 40.4918, Long −124.0998) upstream to endpoint(s) in: Bear Creek (40.391, −124.0156); Chadd Creek (40.3921, −123.9542); Jordan Creek (40.4324, −124.0428); Monument Creek (40.4676, −124.1133).

(iii) Larabee Creek Hydrologic Sub-area 111113. Outlet(s) = Larabee Creek (40.4090, Long −123.9334) upstream to endpoint(s) in: Carson Creek (40.4189, −123.8881); Larabee Creek (40.3950, −123.8138).

(iv) Hydesville Hydrologic Sub-area 111121. Outlet(s) = Van Duzen River (Lat 40.5337, Long −124.1262) upstream to endpoint(s) in: Cummings Creek (40.5258, −123.9896); Hely Creek (40.5042, −123.9703); Yager Creek (40.5383, −124.1121); Unnamed (40.5383, −124.1121).

(v) Yager Creek Hydrologic Sub-area 111123. Outlet(s) = Yager Creek (Lat 40.5583, Long −124.0577) upstream to endpoint(s) in: Corner Creek (40.6189, −123.9994); Fish Creek (40.6392, −124.0032); Lawrence Creek (40.6394, −123.9935); Middle Fork Yager Creek (40.5799, −123.9015); North Fork Yager Creek (40.6044, −123.9084); Owl Creek (40.5557, −123.9362); Shaw Creek (40.6245, −123.9518); Yager Creek (40.5673, −123.9403).

(vi) Weott Hydrologic Sub-area 111131. Outlet(s) = South Fork Eel River (Lat 40.3500, Long −213.9305)

upstream to endpoint(s) in: Bridge Creek (40.2929, −123.8569); Bull Creek (40.3148, −124.0343); Canoe Creek (40.2909, −123.922); Cow Creek (40.3583, −123.9626); Cuneo Creek (40.3377, −124.0385); Elk Creek (40.2837, −123.8365); Fish Creek (40.2316, −123.7915); Harper Creek (40.354, −123.9895); Mill Creek (40.3509, −124.0236); Salmon Creek (40.2214, −123.9059); South Fork Salmon River (40.1769, −123.8929); Squaw Creek (40.3401, −123.9997); Tostin Creek (40.1722, −123.8796).

(vii) Benbow Hydrologic Sub-area 111132. Outlet(s) = South Fork Eel River (Lat 40.1932, Long −123.7692) upstream to endpoint(s) in: Anderson Creek (39.9337, −123.8933); Bear Pen Creek (39.9125, −123.8108); Bear Wallow Creek (39.7296, −123.7172); Bond Creek (39.7856, −123.6937); Butler Creek (39.7439, −123.692); China Creek (40.1035, −123.9493); Connick Creek (40.0911, −123.8187); Cox Creek (40.0288, −123.8542); Cummings Creek (39.8431, −123.5752); Dean Creek (40.1383, −123.7625); Dinner Creek (40.0915, −123.937); East Branch South Fork Eel River (39.9433, −123.6278); Elk Creek (39.7986, −123.5981); Fish Creek (40.0565, −123.7768); Foster Creek (39.8455, −123.6185); Grapewine Creek (39.7991, −123.5186); Hartsook Creek (40.012, −123.7888); Hollow Tree Creek (39.7316, −123.6918); Huckleberry Creek (39.7315, −123.7253); Indian Creek (39.9464, −123.8993); Jones Creek (39.9977, −123.8378); Leggett Creek (40.1374, −123.8312); Little Sproul Creel (40.0897, −123.8585); Low Gap Creek (39993, −123.767); McCoy Creek (399598, −123.7542); Michael's Creek (397642, −123.7175); Miller Creek (40.1215, −123.916); Moody Creek (399531, −123.8819); Mud Creek (398232, −123.6107); Piercy Creek (399706, −123.8189); Pollock Creek (40.0822, −123.9184); Rattlesnake Creek (397974, −123.5426); Redwood Creek (397721, −123.7651); Redwood Creek (40.0974, −123.9104); Seely Creek (40.1494, −123.8825); Somerville Creek (40.0896, −123.8913); South Fork Redwood Creek (397663, −123.7579); Spoul Creek (40.0125, −123.8585); Standley Creek (399479, −123.8083); Tom Long Creek (40.0315, −123.6891); Twin Rocks Creek (398269, −123.5543); Warden Creek (40.0625, −123.8546); West Fork Sproul Creek (40.0386, −123.9015); Wildcat Creek (399049, −123.7739); Wilson Creek (39841, −123.6452); Unnamed Tributary (40.1136, −123.9359); Unnamed Tributary (40.0538, −123.8293).

(viii) Laytonville Hydrologic Sub-area 111133. Outlet(s) = South Fork Eel River (Lat 39.7665, Long −123.6484)) upstream to endpoint(s) in: Bear Creek (39.6413, −123.5797); Cahto Creek (39.6624, −123.5453); Dutch Charlie Creek (39.6892, −123.6818); Grub Creek (39.7777, −123.5809); Jack of Hearts Creek (39.7244, −123.6802); Kenny Creek (39.6733, −123.6082); Mud Creek (39.6561, −123.592); Redwood Creek (39.6738, −123.6631); Rock Creek (39.6931, −123.6204); South Fork Eel River (39.6271, −123.5389); Streeter Creek (39.7328, −123.5542); Ten Mile Creek (39.6651, −123.451).

(ix) Sequoia Hydrologic Sub-area 111141. Outlet(s) = South Fork Eel River (Lat 40.3558, Long −123.9194) upstream to endpoint(s) in: Brock Creek (40.2411, −123.7248); Dobbyn Creek (40.2216, −123.6029); Hoover Creek (40.2312, −123.5792); Line Gulch (40.1655, −123.4831); North Fork Dobbyn Creek (40.2669, −123.5467); South Fork Dobbyn Creek (40.1723, −123.5112); South Fork Eel River (40.35, −123.9305); Unnamed Tributary (40.3137, −123.8333); Unnamed Tributary (40.2715, −123.549).

(x) Spy Rock Hydrologic Sub-area 111142. Outlet(s) = Eel River (Lat 40.1736, Long −123.6043) upstream to endpoint(s) in: Bell Springs Creek (39.9399, −123.5144); Burger Creek (39.6943, −123.413); Chamise Creek (40.0563, −123.5479); Jewett Creek (40.1195, −123.6027); Kekawaka Creek (40.0686, −123.4087); North Fork Eel River (39.9567, −123.4375); Woodman Creek (39.7639, −123.4338).

(xi) North Fork Eel River Hydrologic Sub-area 111150. Outlet(s) = North Fork Eel River (Lat 39.9567, Long −123.4375) upstream to endpoint(s) in: North Fork Eel River (39.9370, −123.3758).

(xii) Outlet Creek Hydrologic Sub-area 111161. Outlet(s) = Outlet Creek (Lat 39.6263, Long −123.3453) upstream to endpoint(s) in: Baechtel Creek (39.3688, −123.4028); Berry Creek (39.4272, −123.2951); Bloody Run (39.5864, −123.3545); Broaddus Creek (39.3907, −123.4163); Davis Creek (39.3701, −123.3007); Dutch Henry Creek (39.5788, −123.4543); Haehl Creek (39.3795, −123.3393); Long Valley Creek (39.6091, −123.4577); Outlet Creek (39.4526, −123.3338); Ryan Creek (39.4803, −123.3642); Upp Creek (39.4276, −123.3578); Upp Creek (39.4276, −123.3578); Willits Creek (39.4315, −123.3794).

(xiii) Tomki Creek Hydrologic Sub-area 111162. Outlet(s) = Eel River (Lat 39.7138, Long −123.3531) upstream to endpoint(s) in: Cave Creek (39.3925, −123.2318); Long Branch Creek (39.4074, −123.1897); Middle Fork Eel River (39.7136, −123.353); Outlet Creek (39.6263, −123.3453); Rocktree Creek (39.4533, −123.3079); Salmon Creek (39.4461, −123.2104); Scott Creek (39.456, −123.2297); String Creek (39.4855, −123.2891); Tomki Creek (39.549, −123.3613); Wheelbarrow Creek (39.5029, −123.3287).

(xiv) Lake Pillsbury Hydrologic Sub-area 111163. Outlet(s) = Eel River (Lat 39.3860, Long −123.1163) upstream to endpoint(s) in: Eel River (39.4078, −122.958).

(xv) Round Valley Hydrologic Sub-area 111172. Outlet(s) = Mill Creek (Lat 39.7398, Long −123.1431); Williams (39.8147, −123.1335) upstream to endpoint(s) in: Mill Creek (39.8456, −123.2822); Murphy Creek (39.8804, −123.1636); Poor Mans Creek (39.8179, −123.1833); Short Creek (39.8645, −123.2242); Turner Creek (39.7238, −123.2191); Williams Creek (39.8596, −123.1341).

(6) Cape Mendocino Hydrologic Unit 1112—*(i) Capetown Hydrologic Sub-area 111220.* Outlet(s) = Bear River (Lat 40.4744, Long −124.3881) upstream to endpoint(s) in: Bear River (40.3591, −124.0536); South Fork Bear River (40.4271, −124.2873).

(ii) Mattole River Hydrologic Sub-area 111230. Outlet(s) = Mattole River (Lat 40.2942, Long −124.3536) upstream to endpoint(s) in: Bear Creek (40.1262, −124.0631); Blue Slide Creek (40.1286, −123.9579); Bridge Creek (40.0503, −123.9885); Conklin Creek (40.3169, −124.229); Dry Creek (40.2389, −124.0621); East Fork Honeydew Creek (40.1633, −124.0916); East Fork of the North Fork Mattole River (40.3489, −124.2244); Eubanks Creek (40.0893, −123.9743); Gilham Creek (40.2162, −124.0309); Grindstone Creek (40.1875, −124.0041); Honeydew Creek (40.1942, −124.1363); Mattole Canyon (40.1833, −123.9666); Mattole River (39.9735, −123.9548); McGinnis Creek (40.3013, −124.2146); McKee Creek (40.0674, −123.9608); Mill Creek (40.0169, −123.9656); North Fork Mattole River (40.3729, −124.2461); North Fork Bear Creek (40.1422, −124.0945); Oil Creek (40.3008, −124.1253); Rattlesnake Creek (40.2919, −124.1051); South Fork Bear Creek (40.0334, −124.0232); Squaw Creek (40.219, −124.1921); Thompson Creek (39.9969, −123.9638); Unnamed (40.1522, −124.0989); Upper North Fork Mattole River (40.2907, −124.1115); Westlund Creek (40.2333, −124.0336); Woods creek (40.2235, −124.1574); Yew Creek (40.0019, −123.9743).

(7) Mendocino Coast Hydrologic Unit 1113—*(i) Wages Creek Hydrologic Sub-area 111312.* Outlet(s) = Wages Creek (Lat 39.6513, Long −123.7851)

upstream to endpoint(s) in: Wages Creek (39.6393, −123.7146).

(ii) Ten Mile River Hydrologic Sub-area 111313. Outlet(s) = Ten Mile River (Lat 39.5529, Long −123.7658) upstream to endpoint(s) in: Middle Fork Ten Mile River (39.5397, −123.5523); Little North Fork Ten Mile River (39.6188, −123.7258); Ten Mile River (39.5721, −123.7098); South Fork Ten Mile River (39.4927, −123.6067); North Fork Ten Mile River (39.5804, −123.5735).

(iii) Noyo River Hydrologic Sub-area 111320. Outlet(s) = Noyo River (Lat 39.4274, Long −123.8096) upstream to endpoint(s) in: North Fork Noyo River (39.4541, −123.5331); Noyo River (39.431, −123.494); South Fork Noyo River (39.3549, −123.6136).

(iv) Big River Hydrologic Sub-area 111330. Outlet(s) = Big River (Lat 39.3030, Long −123.7957) upstream to endpoint(s) in: Big River (39.3095, −123.4454).

(v) Albion River Hydrologic Sub-area 111340. Outlet(s) = Albion River (Lat 39.2253, Long −123.7679) upstream to endpoint(s) in: Albion River (39.2644, −123.6072); North Fork Albion River (39.2827, −123.607).

(vi) Navarro River Hydrologic Sub-area 111350. Outlet(s) = Navarro River (Lat 39.1921, Long −123.7611) upstream to endpoint(s) in: Navarro River (39.0534); Rancheria Creek (38.9689, −123.4169).

(vii) Garcia River Hydrologic Sub-area 111370. Outlet(s) = Garcia River (Lat 38.9455, Long −123.7257) upstream to endpoint(s) in: Garcia River (38.9160, −123.4900).

(8) Russian River Hydrologic Unit 1114—*(i) Guerneville Hydrologic Sub-area 111411.* Outlet(s) = Russian River (Lat 38.4507, Long −123.1289) upstream to endpoint(s) in: Austin Creek (38.5099, −123.0681); Mark West Creek (38.4961, −122.8489).

(ii) Austin Creek Hydrologic Sub-area 111412. Outlet(s) = Austin Creek (Lat 38.5099, Long −123.0681) upstream to endpoint(s) in: Austin Creek (38.5326, −123.0844).

(iii) Mark West Hydrologic Sub-area 111423. Outlet(s) = Mark West Creek (Lat 38.4961, Long −122.8489) upstream to endpoint(s) in: Mark West Creek (38.4526, −122.8347).

(iv) Warm Springs Hydrologic Sub-area 111424. Outlet(s) = Dry Creek (Lat 38.5861, Long −122.8573) upstream to endpoint(s) in: Dry Creek (38.7179, −123.0075).

(v) Geyserville Hydrologic Sub-area 111425. Outlet(s) = Russian River (Lat 38.6132, Long −122.8321) upstream.

(vi) Ukiah Hydrologic Sub-area 111431. Outlet(s) = Russian River (Lat 38.8828, Long −123.0557) upstream to endpoint(s) in: Feliz Creek (38.9941, −123.1779).

(vii) Forsythe Creek Hydrologic Sub-area 111433. Outlet(s) = Russian River (Lat 39.2257, Long −123.2012) upstream to endpoint(s) in: Forsythe Creek (39.2780, −123.2608); Russian River (39.3599, −123.2326).

(9) Maps of proposed critical habitat for the California Coast chinook salmon ESU follow:

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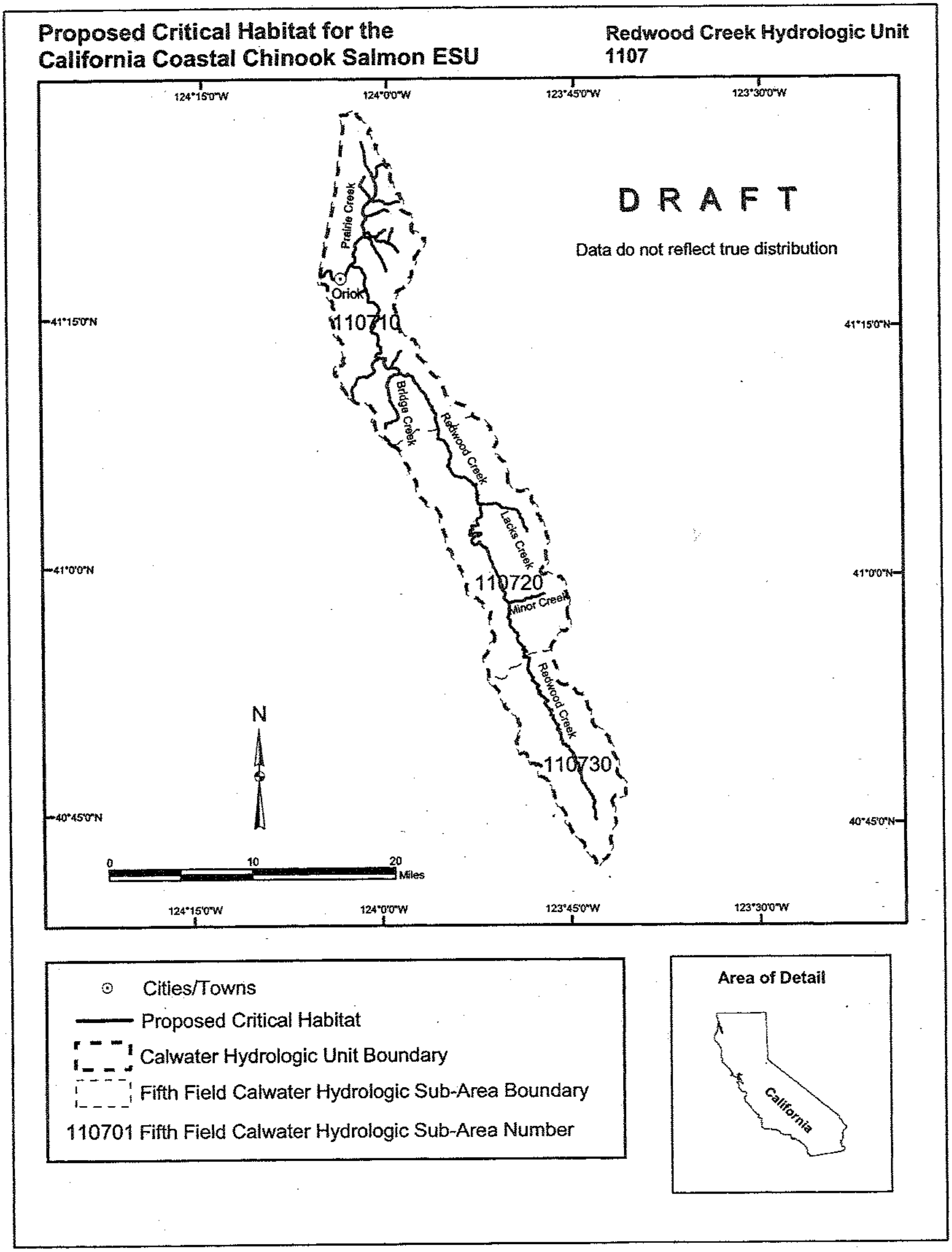
Proposed Critical Habitat for the
California Coastal Chinook Salmon ESU
Redwood Creek Hydrologic Unit
1107
DRAFT
Data do not reflect true distribution
124°15'0"W
124°0'0"W
123°45'0"W
123°30'0"W
41°15'0"N
41°0'0"N
40°45'0"N
Prairie Creek
Oriok
110710
Bridge Creek
Redwood Creek
Lacks Creek
110720
Minor Creek
Redwood Creek
110730
N
0
10
20
Miles
Cities/Towns
Proposed Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Appendix L-4

Range Extension for Steelhead Trout (67 FR 21586)

Office of Management and Budget control number, issued pursuant to the Paperwork Reduction Act. Consequently, fishermen are not required to notify the Regional Administrator prior to fishing in the closed area, but they must still meet the gear requirements.

Classification

This action has been determined to be not significant for purposes of Executive Order 12866.

The AA is taking this action in accordance with the requirements of 50 CFR 223.206(d)(2)(iv) to provide protection for endangered leatherback sea turtles from incidental capture and drowning in shrimp trawls. Leatherback sea turtles are occurring in high concentrations in coastal waters in shrimp fishery statistical zones 32 and 33. This action allows shrimp fishing to continue in the affected area so long as fishermen make the required gear modifications.

Pursuant to 5 U.S.C. 553(b)(B), the AA finds that there is good cause to waive prior notice and opportunity to comment on this action. As a sizeable concentration of leatherback turtles has been observed in an area fished by shrimp trawlers, it is extremely likely that interactions will occur. It would be impracticable to provide prior notice and opportunity for comment because providing notice and comment would prevent the agency from implementing the necessary action in a timely manner to protect the endangered leatherback.

Pursuant to 5 U.S.C. 553(d)(3), the AA finds that there is good cause not to delay the effective date of this rule for 30 days. Such delay would prevent the agency from implementing the necessary action in a timely manner to protect the endangered leatherback. Accordingly, the AA is making this temporary rule effective April 26, 2002 through May 10, 2002. This closure has been announced on the NOAA weather channel, in newspapers, and other media. Shrimp trawlers may also call (727)570–5312 for updated area closure information.

As prior notice and an opportunity for public comment are not required to be provided for this notification by 5 U.S.C. 553, or by any other law, the analytical requirements of 5 U.S.C. 601 *et seq.*, are inapplicable.

The AA prepared an Environmental Assessment (EA) for the final rule requiring TED use in shrimp trawls and the regulatory framework for the Leatherback Conservation Zone (60 FR 47713, September 14, 1995). Copies of the EA are available (see **ADDRESSES**).

Dated: April 26, 2002.

William T. Hogarth

Assistant Administrator for Fisheries, National Marine Fisheries.

[FR Doc. 02–10758 Filed 4–26–02; 4:30 pm]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 224

[Docket No. 001025296-2079-02; I.D. 072600A]

RIN 0648-AO05

Endangered and Threatened Species: Range Extension for Endangered Steelhead in Southern California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: NMFS has received new evidence of steelhead (*anadromous Oncorhynchus mykiss*) presence in two locations and spawning in one location south of the current range of the listed southern California steelhead Evolutionarily Significant Unit (ESU) which is currently Malibu Creek. Based upon this new information, and the possibility that anadromous *O. mykiss* may occur in other streams south of Malibu Creek if hydrologic and other habitat conditions are favorable, NMFS is now issuing a final rule under the Endangered Species Act (ESA) that redefines the geographic range of the listed anadromous *O. mykiss* population to include all steelhead and their progeny that occur in coastal river basins from the Santa Maria River (inclusive) to the U.S. - Mexico Border. NMFS has reassessed the status of anadromous *O. mykiss* throughout its redefined range in Southern California and concludes that the listed population continues to be endangered.

Within the redefined geographic range of *O. mykiss*, only anadromous, naturally spawned populations, and their progeny, which reside below naturally occurring and man-made impassable barriers (e.g., impassable waterfalls and dams) are listed.

DATES: Effective July 1, 2002.

ADDRESSES: Assistant Regional Administrator, Protected Resources Division, NMFS, Southwest Region, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802–4213.

FOR FURTHER INFORMATION CONTACT: Craig Wingert, 562–980–4021, or Chris Mobley, 301–713–1401.

SUPPLEMENTARY INFORMATION:

Previous Federal ESA Actions Related to the Southern California Steelhead ESU

In 1994, NMFS received a petition from the Oregon Natural Resources Council and numerous co-petitioners to list west coast steelhead (*Oncorhynchus mykiss*) populations under the ESA. In response to the petition, NMFS conducted a status review of west coast steelhead (Busby *et al.*, 1996) which identified 15 Evolutionarily Significant Units (ESUs) of steelhead in Washington, Oregon, Idaho, and California, and assessed their risk of extinction. One of these 15 ESUs was the Southern California steelhead ESU which was found to be at a high risk of extinction.

Based on this status review and a consideration of the listing factors in section 4(a)(1) of the ESA, NMFS proposed to list the Southern California steelhead as an endangered species in August 1996 (61 FR 41541). In August 1997, NMFS published a final rule listing this ESU as an endangered species (62 FR 43937). In the final rule, NMFS listed only the anadromous life form of *O. mykiss*, and, therefore, defined the listed Southern California steelhead population to include all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River in San Luis Obispo County (inclusive) to and including Malibu Creek in Los Angeles County. At the time of listing, NMFS believed Malibu Creek represented the southernmost extent of the range of anadromous *O. mykiss* in southern California.

On February 5, 1999, NMFS published a proposed critical habitat designation for 19 ESUs of threatened and endangered salmon and steelhead distributed throughout Washington, Oregon, Idaho, and California, including the endangered Southern California steelhead ESU (64 FR 5740). A final rule designating critical habitat for these 19 ESUs, including the Southern California steelhead ESU, was published on February 16, 2000 (65 FR 7764).

Although the critical habitat designation for Southern California steelhead is presently in effect, NMFS has recently sought approval from the U.S. District Court in the District of Columbia for a consent decree that would vacate critical habitat designations for Southern California steelhead and 18 other salmon/steelhead ESUs as a result of litigation filed against the agency by the National Association of Homebuilders. In conjunction with this action, NMFS also intends to undertake a new and more thorough analysis of critical habitat for these ESUs, including the economic impacts of any designation, that is consistent with the ESA and other recent Court decisions. Following completion of this analysis, NMFS intends to proceed with re-proposing critical habitat designations for these ESUs including the Southern California steelhead.

New Information on Steelhead Distribution South of Malibu Creek in Southern California

In 1999 and 2000, new information became available which indicated that the anadromous life form of *O. mykiss* (i.e. steelhead) or their progeny occurred in at least two coastal streams south of Malibu Creek (Topanga Creek and San Mateo Creek). This new information included observations of juvenile *O. mykiss* in Topanga Creek by a NMFS biologist and field and laboratory investigations conducted by the California Department of Fish and Game (CDFG) which demonstrated the presence and spawning of anadromous *O. mykiss* in San Mateo Creek (DFG, 2000). Based on this new information, NMFS published a **Federal Register** notice in December 2000 proposing to formally recognize that anadromous *O. mykiss* (or steelhead) ranged further southward in Southern California than was previously believed to be the case by extending the range of the listed population to San Mateo Creek (65 FR 79328). A detailed discussion of the new information upon which the range extension proposal was based is contained in the December 2000 **Federal Register** notice.

Since the range extension was proposed in December 2000, NMFS has obtained some additional new information on *O. mykiss* in San Mateo Creek which was considered in this final determination. Additional microsatellite and mitochondrial DNA (mtDNA) analyses were conducted by Jennifer Nielsen (U.S. Geological Service, Alaska Science Center in Anchorage, AK.) on tissue samples taken from 16 *O. mykiss* collected in San Mateo Creek in 1999 and 2000 (Nielson and Sage, 2002). All 16 fish that were analyzed shared the MYS5 haplotype that is found throughout the range of *O. mykiss* in California, but which is most commonly found in Southern California populations (Nielsen *et al.* 1994). This finding is consistent with previous genetic analysis reported for *O. mykiss* in San Mateo Creek (DFG, 2000) and cited in NMFS' proposed range extension (65 FR 79328). According to Nielsen and Sage (2002), this haplotype has not been found in their previous survey of hatchery *O. mykiss* strains in California, and, therefore, suggests an endemic population structure in San Mateo Creek. Secondly, the DFG has undertaken periodic field surveys in upper San Mateo Creek and Devil's Canyon since May 2000 which have documented the continued presence of *O. mykiss* in the watershed. In many instances, these surveys were carried out in conjunction with efforts to remove exotic species that might prey upon or compete with *O. mykiss*. Although these surveys were limited in scope and methodology, they documented the presence of *O. mykiss* through at least August 2001 in Devil's Canyon. Summaries of the DFG field surveys for *O. mykiss* and exotic species removal are contained in a series of file memoranda prepared by DFG staff.

NMFS has completed its review and analysis of all available information, including public comments that were received on the proposal. This final rule formally extends the range of the Southern California steelhead ESU and reaffirms that it continues to be an endangered species.

Summary of Comments Received in Response to the Proposed Range Extension Notice

The proposed range extension was published on December 19, 2000, with a 60-day comment period that closed on February 20, 2001. During this period, NMFS received numerous requests for a public hearing, as well as requests for additional time to comment on the proposal. As a result, NMFS re-opened the public comment period for 30 days on February 21, 2001, and held a public hearing in San Clemente, CA, on March 12, 2001. The re-opened public comment period closed on March 22, 2001.

Excluding hearing requests, a total of 63 written comments were received on the proposal from a broad range of agencies, non-governmental organizations, other groups, and private citizens. A total of 37 individuals provided oral comments at the public hearing. The vast majority of comments supported the proposal, although many urged NMFS to expand or modify its proposal. A limited number of comments were opposed to or neutral about the proposal. A summary of the comments on the proposal and NMFS' responses to those comments are presented below by specific issue.

Comments and Responses

Issue: Southern Boundary of Southern California Steelhead ESU

Comment 1: Many commenters argued that the southern boundary of the listed Southern California steelhead population (i.e. anadromous *O. mykiss*) should be extended to the southernmost extent of the species historical range rather than to just San Mateo Creek. Most argued this boundary should be the U.S.- Mexico border.

Response: NMFS has previously recognized that steelhead historically occurred naturally at least as far south as northern Baja California (NMFS, 1996; and 62 FR 43937). However, at the time the Southern California steelhead ESU was listed as an endangered species in 1997 the best available information indicated that persistent populations of anadromous *O. mykiss* did not occur in rivers or streams further south than Malibu Creek. As described in NMFS' proposed range extension (65 FR 79328) new information became available in 1999 and 2000 indicating that anadromous *O. mykiss* were occupying San Mateo Creek which is in northern San Diego County. Limited observational information also suggested that *O. mykiss* occurred in Topanga Creek.

NMFS' main objectives in proposing the range extension for Southern California steelhead were three-fold: First, to seek public comment on new information showing that the freshwater geographic range of anadromous *O. mykiss* extended south of Malibu Creek to at least San Mateo Creek; second, to seek public comment on NMFS proposal to consider the *O. mykiss* found south of Malibu Creek to be part of the listed Southern California steelhead ESU; and third, to ensure that anadromous *O. mykiss* occurring south of Malibu Creek, either as isolated individuals (e.g. Topanga Creek) or as populations (i.e. San Mateo Creek) would be protected under the ESA.

NMFS recognizes that habitat suitable for anadromous *O. mykiss* may occur in watersheds south of San Mateo Creek (e.g. San Onofre Creek and perhaps elsewhere) and that anadromous *O. mykiss* historically occurred further south than San Mateo Creek. For these reasons, and because anadromous *O. mykiss* may stray to streams south of San Mateo Creek just as they did to San Mateo Creek in 1997, NMFS intends to consider any anadromous *O. mykiss* that are found to occur in coastal streams and estuaries between the Santa Maria River and the U.S.- Mexico border to be part of the listed Southern California steelhead population unless there is evidence indicating they are unlisted resident forms or derived from hatchery rainbow trout populations.

As discussed elsewhere in this document, NMFS believes that anadromous *O. mykiss* do not presently occur further south than San Mateo Creek, and in only two locations between Malibu Creek and San Mateo Creek. However, the southern boundary of anadromous *O. mykiss* in Southern California is likely to vary over time as a result of variable and unpredictable rainfall patterns and freshwater habitat conditions, and the ability of the anadromous form to stray or colonize new habitats. As information becomes available in the future that a persistent population of anadromous *O. mykiss* occurs in any other streams south of Malibu Creek, NMFS will promptly inform the public by means of notification in the **Federal Register**.

Comment 2: A few commenters asserted that the proposed range extension was not justified and or was inappropriate because there is no information indicating that steelhead occur in those streams located between Malibu Creek and San Mateo Creek.

Response: NMFS disagrees. NMFS believes the best available information indicates that the *O. mykiss* in San Mateo Creek are the progeny of steelhead that originated from some other stream located within the geographic range of the Southern California steelhead ESU and spawned in that watershed in 1997. As noted elsewhere in this final notice, the best available information NMFS possessed at the time of listing in 1997 suggested that anadromous *O. mykiss* did not occur further south than Malibu Creek. Therefore, the new evidence indicating that anadromous *O. mykiss* now occupy San Mateo Creek constitutes a southern extension of the range for this listed life history form. The fact that anadromous *O. mykiss* do not generally occur in streams between Malibu Creek and San Mateo Creek has no bearing on whether or not the fish in San Mateo Creek are part of the listed Southern California steelhead ESU. As NMFS emphasized in the proposed range extension, the habitat conditions in virtually all of the streams located between Malibu Creek and San Mateo Creek (e.g. Los Angeles River, San Gabriel River, Santa Ana River, San Juan Creek, etc.) are highly modified, and, therefore, are not presently suitable for utilization by steelhead. Absent significant habitat restoration efforts, NMFS does not expect these rivers or streams to support steelhead in the future.

Issue: Critical Habitat

Comment 3: One commenter argued that unoccupied or highly modified habitat (specifically the Los Angeles, San Gabriel, and Santa Ana Rivers) would be very costly to restore, and, therefore, should be excluded from any future modification of the existing critical habitat designation for this ESU.

Response: The ESA requires NMFS to designate critical habitat or make revisions to critical habitat on the basis of the best scientific data available, but only after taking into consideration the economic impacts of specifying any particular area as critical habitat. Therefore, in making any future revisions to the existing critical habitat designation for the Southern California steelhead ESU, NMFS will consider the economic impacts of designating any additional habitat whether it is occupied by steelhead or not.

Unless NMFS' failure to designate specific areas as critical habitat will result in the extinction of a listed species, the ESA allows the agency to exclude areas from critical habitat if it is determined that the benefits of such an exclusion outweigh the benefits of specifying such an area as part of the critical habitat. Because virtually all of the freshwater habitat available to steelhead south of Malibu Creek (the current southern extent of critical habitat for this ESU) to at least San Mateo Creek is highly modified, and, therefore, unlikely to support steelhead without substantial habitat restoration, NMFS intends to carefully evaluate and weigh the benefits of designating these habitats as critical habitat or excluding them from any revised designation.

Comment 4: Many commenters argued that in conjunction with the range extension for this ESU, NMFS should be designating critical habitat for steelhead in all watersheds south of Malibu Creek, including San Mateo Creek, that are within the historic range of steelhead whether the habitat is occupied or not.

Response: In making its critical habitat designation for the endangered Southern California steelhead ESU in February 2000 (65 FR 7764), the agency concluded that all occupied and accessible river reaches and estuarine areas in coastal river basins ranging from the Santa Maria River southward to and including Malibu Creek were essential for the recovery of the ESU. This determination was made, in part, because these basins were thought to provide essential habitat features such as spawning, rearing, and migration habitat, food resources, sufficient water quality and quantity, and riparian vegetation. Also contributing to NMFS' determination was the fact that the coastal river basins in this geographic area were historically important for the ESU (e.g. Santa Ynez, Ventura, and Santa Clara Rivers), and many of the river basins, both large and small and in relatively close proximity to one another, continued to support anadromous *O. mykiss* though at low levels of abundance on the scale of both individual river basins and the entire ESU.

In contrast, the situation that currently exists for coastal river basins south of Malibu Creek is quite different. Recent information, as discussed elsewhere in this document, does demonstrate that anadromous *O. mykiss* occur in at least two coastal river basins south of Malibu Creek (i.e. San Mateo Creek and Topanga Creek). The population in San Mateo Creek was only re-established recently as a result of adults that strayed into the watershed and spawned in 1997, and the presence of *O. mykiss* in Topanga Creek may be transitory. There is no evidence that anadromous *O. mykiss* occupy any of the other coastal river basins between Malibu Creek and San Mateo Creek, and many of these basins are so highly modified that they can not support anadromous *O. mykiss*. Further, there is no evidence that any other coastal river basins south of San Mateo Creek, within the historic range of steelhead, currently support the anadromous life form of *O. mykiss*. Because only two coastal watersheds south of Malibu Creek support anadromous *O. mykiss*, including San Mateo Creek which is well separated from the remainder of the populations in the listed ESU, and virtually all other coastal watersheds south of Malibu Creek do not support this anadromous life history form, NMFS believes there is insufficient information at present to determine if all or some of the freshwater habitat south of Malibu Creek, whether occupied or unoccupied, is essential for the conservation of this ESU.

NMFS believes that a determination of how much habitat south of Malibu Creek is essential for the conservation of this ESU is best left to NMFS' technical recovery planning process because it will be closely linked to the development of biological recovery goals for this ESU. The development of biological recovery goals will be the first task of the NMFS' appointed technical recovery team that will be responsible for addressing the Southern California steelhead ESU, and this task will require an assessment of the population structure of the ESU, as well as an evaluation of how many populations of

Range extension includes Santa Ana River, but critical habitat not designed in S.A.R. Too highly modified to support steelhead.

O. mykiss, including both their geographic distribution and size, are necessary to achieve recovery of the entire ESU. If NMFS' recovery team concludes through this assessment process that recovery of this ESU will require anadromous *O. mykiss* populations and the habitat to support them in coastal river basins south of Malibu Creek, then NMFS will conduct the requisite economic analysis to determine if these areas should be incorporated into the existing critical habitat designation for this ESU.

Comment 5: Many commenters argued that NMFS should designate critical habitat above manmade barriers throughout the current and historic range of steelhead in this ESU in conjunction with the range extension.

Response: In February 2000, NMFS designated critical habitat for the Southern California steelhead ESU, which included all occupied and accessible freshwater habitat in watersheds ranging from the Santa Maria River southward to Malibu Creek, which was considered to be the current range of listed anadromous *O. mykiss* at that time. River reaches that were inaccessible to anadromous *O. mykiss* above specific manmade barriers (e.g. dams), however, were not included in the critical habitat designation. This approach was consistent with NMFS' previous determination to list only the anadromous life form of *O. mykiss* below manmade barriers.

While substantial amounts of habitat historically occupied by anadromous *O. mykiss* may occur above manmade barriers in some watersheds in the Southern California steelhead ESU (e.g. the Santa Ynez River, Ventura River, Santa Clara River), NMFS has not conducted an assessment to determine if all or some of these blocked habitat areas are currently essential for the recovery of this steelhead ESU. In addition, the agency has not performed the requisite economic analyses needed to designate blocked habitat areas that are unoccupied as critical habitat.

Comment 6: Several commenters argued that critical habitat should be designated for steelhead on Camp Pendleton Marine Corps Base and that NMFS should not exclude this habitat from any designation because of concerns about impacts to the military mission of the Base.

Response: As discussed previously, NMFS believes that any assessment of whether or not freshwater and estuarine habitat south of Malibu Creek is essential for recovery of this ESU, including San Mateo Creek which occurs in large part on Camp Pendleton, needs to be made in conjunction with the development of biological recovery goals for this ESU. If NMFS' recovery planning process concludes that specific freshwater and estuarine habitats south of Malibu Creek, including San Mateo Creek, are essential for recovery of the ESU, then NMFS will do the requisite economic analyses necessary to revise the existing critical habitat designation.

As specified in Section 4(b)(2) of the ESA, however, NMFS may exclude an area from a critical habitat designation if the benefits of such an exclusion outweigh the benefits of specifying the area as part of the designation, provided that excluding the area will not result in the extinction of the listed species for which the habitat is being designated. In making any future determination about designating critical habitat south of Malibu Creek, including the San Mateo Creek watershed on Camp Pendleton, NMFS will thoroughly evaluate whether or not any potentially designated areas may be excluded from the designation based on this weighing of benefits.

Comment 7: One commenter argued that NMFS failed to comply with the National Environmental Policy Act (NEPA) and prepare an economic analysis.

Response: The main objectives of NMFS' proposal were to recognize that the freshwater geographic range of anadromous *O. mykiss* extended further south than was previously thought to be the case, and to ensure that any anadromous *O. mykiss* occurring south of Malibu Creek were protected under the ESA. In effect, the proposal was intended to aimed at clarifying the geographic range of a previously listed population. Because NMFS' proposal dealt with the geographic revision of a presently listed ESU and did not propose any modification to the existing critical habitat designation, there was no statutory requirement for NMFS to prepare any economic analyses. If NMFS concludes that the existing critical habitat designation for this ESU should be revised in the future to include freshwater and estuarine habitats south of Malibu Creek, then the requisite economic analyses required by the ESA and our implementing regulations will be prepared. NMFS has previously determined that it is not necessary to prepare NEPA analyses for listing decisions or critical habitat designations made pursuant to the ESA (See NOAA Administrative Order 216-6).

Issue: Biology and Ecology of Steelhead

Comment 8: Many commenters asserted that "resident" rainbow trout (resident *O. mykiss*) occurring both above and below dams or other barriers within the "historic range" of the species should be part of the listed Southern California steelhead ESU.

Response: NMFS' December 2000 proposed range extension dealt only with the anadromous form of *O. mykiss*, for which new distributional information was available, and did not address the status of resident forms above and below barriers. The relationship of resident forms to the anadromous form and the status of resident forms under the ESA is the subject of pending litigation.

Comment 9: Camp Pendleton questioned the long-term sustainability or viability of the steelhead population in San Mateo Creek in light of the variable rainfall, streamflow, and other habitat conditions for steelhead in Southern California. They also expressed concerns about the costs of maintaining habitat for a population that might not be viable in the long-term.

Response: The long-term persistence of steelhead in San Mateo Creek may be uncertain given its distance from potential source populations, the highly variable rainfall conditions in southern California that influence access to this watershed, and other factors affecting *O. mykiss* within the watershed. However, the steelhead in San Mateo Creek should not be viewed as an independent population or subpopulation that is unconnected to other steelhead populations or subpopulations in southern California. In contrast, the steelhead in San Mateo Creek should be viewed as part of a larger meta-population unit that is comprised of many other populations or subpopulations occupying other streams in the ESU, and it is the viability of this larger population unit that is most important. Individually, the production capability of small coastal streams in this ESU such as San Mateo Creek may be relatively small compared to larger, perennial river systems that are more productive and can support larger populations, but collectively both the small and large systems in the ESU provide a means to ensure a greater diversity of populations and/or subpopulations in the larger meta-population unit. In addition, the smaller systems provide for range expansion and recovery after drought or other perturbations that reduce population numbers. The utilization of larger numbers of both small and large scale habitats by anadromous *O. mykiss* increases the likelihood of the long-term persistence of the ESU. The fact that the *O. mykiss* population in San Mateo Creek is derived from anadromous parents that entered the watershed and spawned indicates that adult steelhead can still utilize this system when conditions allow them to do so, and this underscores the need to protect the habitat values that still exist and provide for steelhead utilization of the system.

Comment 10: One commenter questioned whether specific populations of landlocked *O. mykiss* (i.e. Pauma Creek and Sweetwater Creek) would be part of the listed Southern California steelhead ESU, and, therefore, protected under the ESA as a result of this proposal.

Response: NMFS' December 2000 proposed range extension dealt only with the anadromous form of *O. mykiss*, for which new distributional information was available, and did not address the status of landlocked populations of resident forms. NMFS and FWS are currently engaged in discussions regarding this issue.

Comment 11: One commenter questioned why San Onofre Creek, which has steelhead habitat but does not currently support a steelhead population, was not specifically included in the range extension.

Response: The main objectives of NMFS' proposed range extension were three-fold: First, to notify the public that there was new information showing that the freshwater geographic range of anadromous *O. mykiss* extended south of Malibu Creek to at least San Mateo Creek; second, to notify the public that NMFS considered the *O. mykiss* found south of Malibu Creek to be part of the listed Southern California steelhead population; and third, to ensure that anadromous *O. mykiss* occurring south of Malibu Creek, either as isolated individuals or as populations would be protected under the ESA.

As discussed in the proposed rule, the new information that is available suggests that anadromous *O. mykiss* only occur as far south as San Mateo Creek. Although San Onofre Creek is located in close proximity to San Mateo Creek and does have habitat that could be utilized by anadromous *O. mykiss*, there is no evidence indicating that anadromous *O. mykiss* currently inhabit the San Onofre Creek watershed. Since the proposed range extension addressed only the distribution of listed anadromous *O. mykiss* rather than habitat that may potentially be utilized by this life history form, San Onofre Creek was not specifically included in the proposed range extension.

However, NMFS recognizes that suitable habitat may occur in watersheds south of San Mateo Creek (e.g. San Onofre Creek) and that anadromous *O. mykiss* historically occurred further south than San Mateo Creek. For these reasons, and because anadromous *O. mykiss* may stray to streams south of San Mateo Creek and occupy them when habitat conditions allow them to do so, NMFS will consider any anadromous *O. mykiss* found south of San Mateo Creek to be part of the listed ESU unless there is evidence indicating they are non-listed resident forms or are derived from hatchery rainbow trout populations. Because the southern extent of the range of anadromous *O. mykiss* may vary over time rather than remain fixed as a result of variable rainfall and other habitat conditions and the ability of the life form to stray from natal streams, NMFS has decided not to delineate a specified southern boundary for this ESU in this final determination.

Issue: Recovery and Management of Southern California Steelhead

Comment 12: One commenter indicated that a recovery plan is needed for the Southern California steelhead ESU and that any such plan must include the recently discovered San Mateo Creek population and any other steelhead populations that occur south of Malibu Creek.

Response: NMFS agrees that a recovery plan is needed for the endangered Southern California steelhead ESU. Within the next 6 months, NMFS is committed to establishing a recovery team to develop biological recovery goals that will provide the framework for identifying and evaluating the management and other measures that need to be implemented to achieve recovery of the ESU. As part of developing the biological recovery goals for this ESU, the recovery team will investigate the population structure of this ESU and then identify the number, size, and spatial distribution of populations and subpopulations that are needed over the geographic range of the ESU to achieve recovery. In making this assessment, the recovery team will take into consideration all steelhead populations within the ESU including the San Mateo Creek population, as well as fish that may occur further south. As discussed elsewhere in this notice, NMFS expects the recovery team to also evaluate whether or not *O. mykiss* populations above barriers, as well as the habitat that supports these populations, are necessary for recovery.

Comment 13: One commenter urged formulation of a recovery plan that restores historically occupied streams in Orange and San Diego Counties.

Response: It is premature to conclude that all historically occupied streams south of Malibu Creek in Orange and San Diego counties will need to be restored to achieve recovery of the Southern California steelhead ESU. The determination of how much historically occupied habitat, if any, must be restored to achieve recovery of this ESU is closely related to the development of biological recovery goals for this ESU. As discussed elsewhere in this document, the development of biological recovery goals will require an assessment of the population structure of the ESU and an evaluation of how many populations, including their size and spatial distribution, are necessary to achieve recovery. If the recovery planning process determines that recovery of this ESU will require the restoration of habitat and establishment of populations in currently unoccupied areas south of Malibu Creek, then a key component of the recovery planning effort will be to identify specific unoccupied streams that need to be restored and to lay out the measures needed to achieve that restoration.

Comment 14: One commenter advocated the development and implementation of a comprehensive restoration plan for steelhead and its habitat in San Mateo and San Onofre Creeks, both of which are located on Camp Pendleton.

Response: NMFS supports the development of a restoration plan for San Mateo and San Onofre Creeks. As discussed in the proposed rule, California voters passed a State-wide initiative that provided $800,000 for the restoration of these two creeks to support native fish species such as steelhead, three-spine stickleback, and arroyo chub. The California Coastal Conservancy controls these funds and is in the process of working with a wide range of agencies and organizations including the Cleveland National Forest, Camp Pendleton Marine Corps Base, FWS, DFG, NMFS, and environmental groups to develop and implement a restoration plan for these watersheds which focuses on key limiting factors. NMFS anticipates that this plan will focus on addressing the control of exotic plants, the control of exotic fish species which compete with and/or prey upon steelhead and other native species, and the possible restoration of habitat. In addition to this larger planning and restoration effort, NMFS expects to work closely with Camp Pendleton through section 7 of the ESA to evaluate, and if necessary to modify, its programs for protecting and managing these watersheds.

Comment 15: Camp Pendleton commented that it has been a good steward and manager of the San Mateo

Creek watershed, which functions principally as a migratory corridor, and that they are implementing management measures to protect this watershed and its associated riparian habitat.

Response: NMFS recognizes that the lower portion of San Mateo Creek which passes through Camp Pendleton serves mainly as a migration corridor. NMFS also recognizes that Camp Pendleton has worked closely with the FWS to develop and implement a riparian management program to protect FWS-listed species that are riparian dependent. Although this riparian management program was developed for FWS-listed species, the program likely provides benefits to steelhead and its habitat as well. As discussed previously, NMFS expects to engage Camp Pendleton in an ESA section 7 consultation that will evaluate the effects of its activities, including implementation of its riparian management strategy for San Mateo Creek, on steelhead and its habitat. If new or modified management measures are needed to protect and conserve steelhead and its habitat on Camp Pendleton, they will be developed through this section 7 process.

Comment 16: Camp Pendleton raised concerns about possible conflicts between steelhead protection and management on the Base and its ability to carry out the Base's training and national security mission.

Response: NMFS is sensitive to the need for Camp Pendleton to be able to carry out its military and national security missions. Nevertheless, it is important for Camp Pendleton, as a Federal agency, to fulfill its obligations under the ESA and ensure that their operations and activities do not jeopardize the continued existence of Southern California steelhead. NMFS is committed to working closely with Camp Pendleton through section 7 of the ESA to ensure that both goals can be met: the military and national security missions of Camp Pendleton and the conservation of steelhead and its habitat. Camp Pendleton has considerable experience dealing with the management of FWS-listed species that occupy habitat on the Base, including the development of a riparian management strategy and program for riparian dependent species in the San Mateo Creek watershed which is used by steelhead. This past experience demonstrates that the protection and conservation of ESA-listed species can be achieved in a manner that is compatible with the military mission of the Base. NMFS is confident that the protection and conservation of steelhead and its habitat on Camp Pendleton can also be achieved in a manner that is compatible with the military and national security missions of the Base.

Comment 17: Camp Pendleton committed to fulfilling all of its obligations under the ESA for the management of steelhead if further genetic testing demonstrated that the *O. mykiss* found in San Mateo Creek were steelhead and not hatchery trout plants.

Response: NMFS is confident that Camp Pendleton will fulfill its ESA section 7 obligations to ensure that the Southern California steelhead ESU is not jeopardized, as well as its further obligations under the ESA to promote steelhead conservation. As discussed elsewhere in this document, the results of additional genetic analysis (mtDNA) conducted on 16 tissue specimens by Dr. Jennifer Nielson demonstrated that all the sampled juvenile fish had the MYS5 haplotype carried by native coastal *O. mykiss* and were not of hatchery origin.

Issue: Sufficiency of Available Data

Comment 18: Several commenters opposed the proposed range extension and argued that there was insufficient data to conclude that the *O. mykiss* in San Mateo Creek are steelhead and part of the Southern California ESU. Some commenters argued that additional data needs to be collected to confirm NMFS's proposal and that in the interim any final determination should be delayed.

Response: NMFS recognizes that the proposed range extension was based on a limited amount of information; however, section 4(b)(1)(A) of the ESA requires that NMFS make any determinations about listing solely on the basis of the best available scientific and commercial data. At the time of the range extension proposal, NMFS believed it had the best available information and that the available information supported a conclusion that the juvenile *O. mykiss* in San Mateo Creek were the progeny of anadromous *O. mykiss* that had strayed from another stream in the Southern California steelhead ESU. In addition, NMFS believed it was important to formally recognize that the range of anadromous *O. mykiss* extended further south than was thought to be the case so that the public and potentially affected parties were aware that this life history form occurred south of Malibu Creek, at least to San Mateo Creek, and so that fish south of Malibu Creek would be protected under the ESA. Since NMFS proposed the range extension for anadromous *O. mykiss*, further genetic analysis has been conducted by Dr. Jennifer Nielsen on tissues samples from an additional 16 juvenile fish collected in 1999 and 2000. The results of this analysis demonstrate that all tested fish carried the mtDNA haplotype (MYS5) which is found most commonly in steelhead from southern California. This finding is consistent with the results of the more limited genetic analysis conducted originally by DFG and upon which the proposed range extension was in part based. NMFS believes it has used the best available information to make its determination, and that any further delay in protecting anadromous *O. mykiss* found south of Malibu Creek under the ESA is not consistent with the agency's obligation to protect and conserve this endangered population.

Comment 19: A few commenters speculated that the *O. mykiss* found in San Mateo Creek were actually hatchery trout planted by DFG or trout that had escaped from ponds stocked by private landowners with in-holdings in Cleveland National Forest.

Response: As discussed elsewhere in the response to comments, the available mtDNA data for all fish that have been tested to date (2 prior to NMFS' proposal and 16 after the proposal) shows that they carried the mtDNA haplotype (MYS5) which is most commonly found in southern California steelhead populations. This haplotype has not been found in any hatchery or domestic trout populations; thus, NMFS concludes that the juvenile *O. mykiss* found in San Mateo Creek are derived from native southern California steelhead and are not the result of domestic trout planting.

Comment 20: One commenter questioned whether the *O. mykiss* in San Mateo Creek are part of the Southern California ESU.

Response: As discussed in the proposed range extension, NMFS believes the available information (e.g. proximity of San Mateo Creek to nearest extant populations of southern California steelhead, mtDNA data demonstrating presence of a haplotype most common in Southern California steelhead populations, and otolith microchemistry data) all points to a conclusion that adult steelhead strayed into San Mateo Creek from elsewhere in Southern California and successfully spawned in 1997. As such, the *O. mykiss* in San Mateo Creek are progeny of anadromous *O. mykiss* (or steelhead) and should be part of the listed population. The additional mtDNA analysis performed by Dr. Jennifer Nielson is consistent with the original mtDNA analysis and reinforces this conclusion.

Comment 21: One commenter questioned the validity of the Southern California steelhead ESU as a definable unit, as well as the overall ESU concept NMFS has developed and its applicability to steelhead on the west coast.

Response: NMFS disagrees with the commenter and believes that its ESU policy is scientifically sound and that the west coast steelhead ESUs, as defined, are consistent with the agency's stated policy.

NMFS has published a policy describing how it will apply the ESA definition of "species" to anadromous salmonid species such as *O. mykiss* (see 56 FR 58612, November 20, 1991). More recently, NMFS and FWS published a joint policy, which is consistent with the NMFS policy, regarding the definition of DPSs (see 61 FR 4722, February 7, 1996). The earlier policy is more detailed and applies specifically to Pacific salmonids, therefore it has been used by NMFS for all of its west coast salmonid ESU determinations, including those for west coast steelhead (see 61 FR 41541 and 62 FR 43937). This policy states that one or more naturally reproducing salmonid populations will be considered distinct, and, therefore, a "species" under the ESA if they represent an ESU of the biological species. To be considered an ESU, a population must satisfy two criteria: (1) It must be reproductively isolated from other population units of the same species, and (2) it must represent an important component of the evolutionary legacy of the biological species. The first criterion, reproductive isolation, need not be absolute but must have been strong enough to permit evolutionarily important differences to occur in different population units. The second criterion is met if the population contributes substantially to the ecological or genetic diversity of the species as a whole. Guidance on how this policy should be applied is contained in a NOAA Technical Memorandum entitled: "Definition of 'Species' under the ESA: Application to Pacific Salmon" (Waples 1991). A more detailed discussion of steelhead ESU boundaries and the factors NMFS considered in defining these ESUs, including the Southern California steelhead ESU, is provided in the proposed and final listing determinations for west coast steelhead (61 FR 41541; 62 FR 43937). In making these ESU determinations, NMFS relied on genetic, ecological, life history, and habitat related information.

Issue: Factors Contributing to Decline or Risk

Comment 22: One commenter asserted that the Foothill Corridor is a "threat" to the San Mateo Creek steelhead population and that NMFS' proposal did not adequately acknowledge this risk factor.

Response: NMFS acknowledges that it did not explicitly discuss the Foothill Corridor project, which is currently in the planning stages, as a possible threat to the destruction, modification, or curtailment of steelhead habitat in San Mateo Creek. NMFS is well aware of this project and has been coordinating with the Federal Highway Administration (FHA) as part of the environmental review process which is currently ongoing for the project. NMFS recognizes that the project could have some potential impacts on the San Mateo Creek watershed depending upon which project alternative is selected and how the project is designed, constructed, operated, and mitigated. NMFS will continue to coordinate with FHA as the NEPA documentation for the project is prepared and provide comments and recommendations as appropriate. Because this project has the potential to impact anadromous *O. mykiss* in San Mateo Creek, as well as the watershed itself, NMFS expects that FHA will initiate an ESA section 7 consultation with us to ensure that construction and operation of the project does not jeopardize anadromous *O. mykiss* and that any impacts are minimized.

Issue: Economic Effects

Comment 23: One commenter asserted that expanding the range of the listed ESU would create economic burdens or impacts on local agencies, particularly in those areas where anadromous *O. mykiss* do not occur in watersheds between Malibu Creek and San Mateo Creek. For this reason, the commenter argued that NMFS should not expand the range of the ESU.

Response: NMFS does not believe that the range extension will cause economic impacts in those watersheds where anadromous *O. mykiss* do not presently occur. In the proposed range extension, NMFS made it clear that anadromous *O. mykiss* were only thought to occur in two streams south of Malibu Creek (i.e., San Mateo Creek and Topanga Creek), and that all other streams and watersheds had been so highly modified that they no longer contained habitat suitable for supporting anadromous *O. mykiss*. Issue: Administrative Process

Comment 24: One commenter criticized NMFS for failing to make all of the data underlying its range extension proposal available for public review.

Response: NMFS described all of the information supporting the proposed range extension in the **Federal Register** publication announcing the proposal (65 FR 79328). The **Federal Register** document also identified NMFS' points of contact for futher information, and directed interested parties to request further information or references from the Southwest Region's Assistant Regional Administrator or the identified point of contact. All information upon which the proposed range extension was based was readily available on request and at least one party did request the information.

Comment 25: One commenter believed NMFS should extend the public comment period to provide greater opportunity for public comment and review of the available information supporting the proposed range extension.

Response: The original comment period for the proposed range extension was 60 days. NMFS did extend the public comment period an additional 30 days, both to provide the public with additional opportunity to review the proposed extension and develop comments, as well as to accommodate a public hearing which was held in San Clemente, CA.

Comment 26: Many commenters requested that NMFS hold one or more public hearings to take public testimony on the proposed range extension.

Response: In response to many such requests, NMFS did schedule a public hearing in San Clemente, CA. This hearing location was selected because it was in close proximity to San Mateo Creek which was the focus of the proposed range extension. The selection of this location resulted in a well attended hearing and provided an opportunity for 37 individuals to provide comments. To accommodate this hearing, NMFS extended the public comment period an additional 30 days.

Revised Geographic Range of Listed Southern California Steelhead

In August 1997, NMFS listed the Southern California steelhead ESU as an endangered species (62 FR 43937). Although this ESU was broadly described as occupying all coastal rivers from the Santa Maria River southward to the southern extent of the species range, the final regulation more specifically defined the listed population as all naturally spawned populations of steelhead (i.e. anadromous *O. mykiss*), and their progeny, which occupied rivers and streams from the Santa Maria River in San Luis Obispo County, CA (inclusive) to Malibu Creek in Los Angeles County, CA (inclusive). Although Malibu Creek was identified as the southernmost stream supporting a persistent, naturally spawning population of anadromous *O. mykiss* based on the best available information, NMFS acknowledged in both the proposed (61 FR 41541) and final listing determinations that there was some limited anecdotal information that the anadromous life form may occasionally occur as far south as the Santa Margarita River.

As described in NMFS' December 19, 2000, proposed range extension for listed Southern California steelhead (65 FR 79328), new information was collected and analyzed by the California Department of Fish and Game (DFG) in 1999 and 2000 (DFG 2000) that indicated anadromous *O. mykiss* spawned and were rearing in San Mateo Creek which is located approximately 100 miles (161.3 kilometers (km)) further south than Malibu Creek which had previously been identified as the southernmost coastal stream supporting *O. mykiss* The San Mateo Creek watershed arises in the Cleveland National Forest and flows in a southwesterly direction to the Pacific Ocean just south of San Clemente in northern San Diego County. Much of the lower portion of San Mateo Creek flows through the Camp Pendleton Marine Corps Base. Approximately 6-7 miles (9.7-11.3 km) are accessible to anadromous *O. mykiss* in the mainstem and tributaries. According to information in Titus *et al.* (in press), Woelfel (1991), and DFG (2000), San Mateo Creek was an important steelhead-producing stream prior to 1950 and evidently supported a local sport fishery of both juveniles and adults. More recently, however, Nehlsen *et al.* (1991) classified the San Mateo Creek steelhead population as extinct.

Although this new information is limited, it is the best available information, and it indicates that adult steelhead entered San Mateo Creek and successfully spawned in 1997. The juvenile progeny of those spawning adults were observed by DFG during its field investigations in the spring and summer of 1999. More recent information from DFG in May 2000 suggests that *O. mykiss* still occupy portions of San Mateo Creek and may have successfully spawned again since 1997. The limited genetic information presented by DFG (DFG, 2000) suggests that the juvenile *O. mykiss* found in 1999 have close genetic affinities to native southern California steelhead and are not the result of domestic trout planting. More recently, Dr. Jennifer Nielsen has completed mtDNA analysis of an additional 16 tissues samples from *O. mykiss* collected in San Mateo Creek in 1999 and 2000. The results of this analysis indicate that all sampled fish carried the MYS5 haplotype which is found most commonly in southern California steelhead. Since there is no evidence of a resident trout population or recent evidence of steelhead presence in San Mateo Creek (DFG, 2000; Titus *et al.*, in press; Lang *et al.*, 1998), NMFS believes the adult steelhead which successfully spawned in 1997 were strays from another watershed elsewhere in the Southern California steelhead ESU. Based on the information collected by DFG (DFG, 2000), the new genetic data analysis performed by Dr. Jennifer Nielsen, and a review of all comments on the proposed range extension, NMFS concludes that the *O. mykiss* population in San Mateo Creek is part of the listed Southern California steelhead population.

The Malibu Creek and San Mateo Creek watersheds are separated by approximately 100 miles (161.3 km). Therefore, inclusion of the San Mateo Creek steelhead population in the Southern California ESU raises the question of whether or not steelhead occur or may be present in those watersheds located between Malibu Creek and San Mateo Creek. Based on information reported by Titus *et al.* (in press), steelhead were historically reported in several watersheds between Malibu Creek and San Mateo Creek (i.e., Los Angeles River, San Gabriel River, Santa Ana River, and San Juan Creek), but are now extinct as a result of major habitat modification or habitat blockage associated with flood control, urban development, and other factors. Given the existing habitat conditions in these highly modified river systems, NMFS does not believe they are currently suitable for steelhead utilization, and, therefore, are highly unlikely to support steelhead absent major restoration efforts.

Information regarding the current presence of *O. mykiss* in other streams between Malibu Creek and San Mateo Creek is lacking with the exception of a recent observation of fish in Topanga Creek which is approximately 4 miles (6.5 km) south of Malibu Creek. Titus *et al.*, (in press) indicated that *O. mykiss* were observed in Topanga Creek in 1979 and in the early 1990s. In April 2000, an adult *O. mykiss* was reported in Topanga Creek. A NMFS' biologist conducted a site visit and confirmed the presence and identification of two *O. mykiss* ranging from 14-20 inches (359-573 mm) in total length. Both fish were observed in a relatively deep pool (4 ft (1.2 meters (m))deep) located about 1 mile (1.7 km) upstream of the confluence with the ocean. Based on the existing habitat conditions and the size of the fish, it is unlikely that they spent their entire life cycle in Topanga Creek. Since there is no evidence of any stocking of rainbow trout in Topanga Creek, it is most likely that these fish originated from some other stream within the ESU. The nearest streams known to support steelhead are Malibu Creek and Arroyo Sequit, both of which are located only a few miles north of Topanga Creek.

NMFS recognizes that habitat suitable for anadromous *O. mykiss* may occur in watersheds south of San Mateo Creek (e.g. San Onofre Creek and perhaps elsewhere) and that anadromous *O. mykiss* historically occurred further south than San Mateo Creek. For these reasons, and because anadromous *O. mykiss* may stray to streams south of San Mateo Creek just as they did to San Mateo Creek in 1997 during years of high rainfall, NMFS will consider all anadromous *O. mykiss* that are found to occur in coastal streams, including estuarine habitat, between Malibu Creek and San Mateo Creek or further south of San Mateo Creek to be part of the listed Southern California steelhead population unless there is evidence indicating they are non-listed resident forms or are derived from hatchery rainbow trout populations. Because the southern boundary of anadromous *O. mykiss* in Southern California is likely to vary over time given highly variable and uncertain rainfall patterns and habitat conditions, NMFS is not delineating a specific stream as the southern boundary for the listed population in this final rule. Instead, the final rule indicates that the listed *O. mykiss* population extends from the Santa Maria River to the southern extent of the species range. As discussed previously, however, NMFS does not believe that anadromous *O. mykiss* presently occur further south than San Mateo Creek. If information becomes available in the future that a persistent population of anadromous *O. mykiss* exists further south than San Mateo Creek, NMFS will promptly inform the public by means of notification in the **Federal Register**.

Status of Southern California Steelhead ESU

The Southern California steelhead ESU was listed as an endangered species in August 1997 (62 FR 43937). As discussed in the final listing determination, this ESU is considered to be at a high risk of extinction based on the results of NMFS' west coast steelhead status review (Busby *et al.*, 1996) and in a subsequent status update (NMFS, 1997).

Historically, steelhead occurred as far south as northern Baja California. Titus *et al.*, (in press), as cited in the final listing determination, concluded that all steelhead populations south of Malibu Creek in Los Angeles County were extinct. Estimates of pre-1960s abundance for several rivers in this ESU (i.e. Santa Ynez, Ventura, Santa Clara, Malibu Creek) suggest that individual steelhead populations numbered in the thousands of individuals. Published abundance estimates for the Ventura and Santa Clara Rivers, for example, ranged from 4,000-6,000 and 7,000-9,000 fish, respectively. At the time of NMFS' final listing determination in 1997, the total run size for several streams in the ESU (e.g., Santa Ynez, Ventura River, Santa Clara River, Malibu Creek) was estimated to number fewer than 200 individuals each (Titus *et al.*, in press). Recent information regarding steelhead abundance for the Santa Ynez, Ventura, and Santa Clara Rivers suggests that the abundance estimates made at the time of the final listing determination were probably high.

NMFS' primary concerns about this ESU at the time of listing were the widespread and dramatic declines in abundance relative to historical levels, and the major reduction in the species range. Given the extremely low abundance estimates and the associated risk associated with demographic and genetic variability in small populations, the long-term persistence or sustainability of this ESU in the future was a critical concern to NMFS. In addition, NMFS was concerned that the restricted spatial distribution of the remaining populations placed the ESU as a whole at risk because of reduced opportunities for re-colonization of streams suffering local population extinctions. NMFS concluded that the principal factors responsible for the decline of steelhead populations within this ESU were water diversions and extraction, habitat blockages and degradation, agricultural activities, and urbanization. Little new information regarding the abundance of steelhead in this ESU has been collected since NMFS' final listing determination in 1997, with the exception of limited data collected as a result of monitoring efforts in the Santa Ynez and Santa Clara Rivers. These data are not comprehensive enough to estimate population sizes, but they do indicate that these steelhead populations in Southern California continue to be very small.

As discussed previously in this document, NMFS has concluded that the *O. mykiss* population in San Mateo Creek is part of the Southern California ESU based on the available information. Based on the information compiled and analyzed by DFG (DFG, 2000), the juvenile *O. mykiss* population found in San Mateo Creek in 1999 appeared to be very small and was likely produced by a limited number of adults that strayed into the watershed and spawned in 1997. Given the small number of fish found in San Mateo Creek, the absence of any other naturally reproducing populations of steelhead in those streams occurring between Malibu Creek and San Mateo Creek, and the extremely low abundance estimates for all other populations within the ESU, NMFS concludes that the Southern California steelhead ESU continues to be at a high risk of extinction.

Summary of Factors Affecting the Species

Section 4(a)(1) of the ESA and NMFS' implementing regulations (50 CFR part 424) set forth procedures for listing species. The Secretary of Commerce (Secretary) must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or education purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

In conjunction with its proposed listing determination for west coast steelhead ESUs in 1996, NMFS prepared a report summarizing the factors leading to the decline of west coast steelhead, including the Southern California steelhead ESU. This report was entitled: "Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead" (NMFS, 1996). This report concluded that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of west coast steelhead ESUs. The report specifically identified destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary causes for the decline of steelhead on the west coast.

NMFS (1996) identified several specific factors that contributed to the decline of steelhead populations in the Southern California ESU as it was defined in the proposed and final listing determinations, including: habitat blockages, water diversion and extraction, urbanization, agriculture, and recreational harvest. McEwan and Jackson, 1996; and Titus *et al.*,(in press) also cited extensive loss of habitat due to water development, impassible dams, and de-watering of portions of rivers as the principal reasons for the decline of steelhead in Southern California. Habitat problems resulting from water development include inadequate flows, flow fluctuations, blockages (partial and full), and entrainment (McEwan and Jackson, 1996). These factors for decline are discussed in more detail in NMFS (1996), McEwan and Jackson (1996), and in NMFS' 1997 final listing determination (62 FR 43937). Although NMFS has been working to address impacts to this endangered ESU through sections 7 and 10 of the ESA since it was listed in 1997, these same factors continue to adversely affect the small steelhead populations which persist in the watersheds ranging from the Santa Maria River southward to the southern extent of this life form's range.

As discussed previously, NMFS has decided not to delineate a specific stream as the southern boundary for the listed anadromous *O. mykiss* population in this final rule because the southern boundary of this life form is likely to vary over time due to variable and unstable climatic, hydrographic, and freshwater habitat conditions, and the ability of this life form to naturally stray from its natal streams. Nevertheless, the currently available information indicates that anadromous *O. mykiss* do not occur in coastal streams south of San Mateo Creek. Accordingly, the following discussion focuses only on those factors affecting anadromous *O. mykiss* within the geographic area that extends from Malibu Creek southward to and including San Mateo Creek.

1. The Present or Threatened Destruction, Modification, or Curtailment of Steelhead Habitat or Range

With the exception of the recent observations of fish in San Mateo Creek and Topanga Creek, anadromous *O. mykiss* populations south of Malibu Creek are thought to be extirpated due to habitat destruction or blockages associated with urbanization and flood control (Titus *et al.*, in press), although extensive monitoring has not been conducted to assess their presence. For example, steelhead access and use of the Los Angeles River is currently precluded by the presence of flood control structures throughout much of its lower reach such as the concrete lining of the river channel and the dam at the Sepulveda Flood Control Basin. The lower reaches of the San Gabriel River are highly urbanized with the channel modified for flood control, and the river is impounded further upstream. The Santa Ana River is similarly modified for flood control and flows largely consist of effluent from water treatment plants except in the rainy season. Because of these limited flows and restricted releases from Prado Dam, fish habitat is limited in the lower Santa Ana River. San Juan Creek, a much smaller stream in southern Orange County, is also channelized for flood control in its lower reach (approximately 2-3 miles (3.2-4.8 km)) and other potential barriers to upstream movement also exist.

San Mateo Creek was once thought to be an important production area for steelhead in San Diego County (Nehlsen *et al.*, 1991; DFG, 2000). As summarized in Titus *et al.*, (in press), steelhead appear to have been most abundant in the San Mateo Creek watershed prior to 1950. After 1950, there are many fewer observations of steelhead and none after the early 1980s until fish were found there in 1999. For example, Woelfel (1991) found no steelhead or resident trout in San Mateo Creek during surveys in 1987-88. Similarly, Lang *et al.*, (1998) failed to observe or capture any steelhead during surveys in 1995, 1996, and 1997. The steelhead population in San Mateo Creek was probably reduced by natural episodes of sediment input from within the watershed. However, increased groundwater extraction in the lower creek area since the mid-1940s may also have contributed to reducing the ability of steelhead to use the system as they historically did (DFG, 2000; Titus *et al.*, in press; Lang *et al.*, 1998). Riparian vegetation has been lost, stream channel width has increased, and surficial flow has been reduced or eliminated during most of the year. Accordingly, the migration corridor for immigrating adult and emigrating juvenile steelhead has become unreliable. Human-caused fires farther upstream have also resulted in large sediment input that has filled pools and contributed sediment to the lagoon at the river mouth, both of which are important rearing habitat for juvenile steelhead. Although habitat conditions in the lower river may not always be conducive to adult or juvenile passage, Lang *et al.*, (1998) and DFG (2000) have identified upstream spawning and rearing habitat which can be used by steelhead if sufficient stream flows allow for adult passage.

2. Overutilization for Commercial; Recreational, Scientific, or Education Purposes

NMFS' review of factors affecting west coast steelhead concluded that harvest was a factor contributing to the decline of the Southern California steelhead ESU (NMFS, 1996). According to McEwan and Jackson (1996), steelhead in most streams in Santa Barbara, Ventura, and Los Angeles Counties were until the early 1990s subject to the most liberal angling regulations anywhere in the State of California. Most streams in southern California were regulated by the general regulations of the Southern Sport Fishing District (which includes Santa Barbara, Ventura, Los Angeles, Orange, and San Diego counties) which allowed fishing year-round with a five-fish daily bag limit. The only streams with special protective regulations were the Ventura River and Malibu Creek.

Because steelhead populations in southern California had declined to such critically low population levels by the early 1990s, the California Fish and Game Commission (Commission) adopted more restrictive angling regulations for some streams (Santa Ynez River, Ventura River, Santa Clara River, and Gaviota Creek) in 1994. These more stringent regulations included: (1) a reduction in the fishing season from year round to the Saturday before Memorial Day through December 31; (2) a zero bag limit; and (3) a requirement that anglers use artificial lures with barbless hooks. In 1996, these same regulations were adopted by the Commission for the anadromous reaches of all coastal streams in southern California. Within the coastal area extending south of Malibu Creek to San Mateo Creek, these same regulations are now in effect for the following streams: Topanga Creek, San Juan Creek, and San Mateo Creek. Given the extremely low numbers of juvenile steelhead that were found in San Mateo Creek, and the possible sporadic occurrence of small numbers of steelhead in other streams, recreational angling may continue to be a risk to steelhead in some streams south of Malibu Creek.

3. Disease or Predation

Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous west coast river systems, thereby increasing the level of predation experienced by steelhead and other salmonids (NMFS, 1996). Exotic fish species that are potential predators of *O. mykiss* are known to occur in San Mateo Creek and other watersheds (San Onofre Creek, Santa Margarita River) on Camp Pendleton (Lang *et al.*, 1998). According to Lang *et al.*, (1998) brown bullhead dominated the fish assemblage in San Mateo Creek, with both adults and juveniles observed in perennial pools. Other species observed in the San Mateo Creek watershed include mosquito fish, adult and juvenile green sunfish, bluegill, and largemouth bass. One Channel catfish, which is a known predator of steelhead, was found dead in the upper San Mateo Creek in a portion of the Cleveland National Forest (Lang *et al.*, 1998). Brown trout have been stocked in San Mateo Creek (last time in the mid 1980s), but they were not observed during the most recent surveys (Lang *et al.*, 1998).

Mosquito fish were introduced for mosquito abatement and are found in most Camp Pendleton waters. This species has taken over the niche of the native three-spine stickleback which is often an important prey item for salmonids; thus, it could possibly serve as a prey item for steelhead in San Mateo Creek. Green sunfish dominated the San Mateo Creek lagoon in the late 1980s and early 1990's according to Swift (1994) and were the only fish found in perennial pools in the upper watershed and Devil Canyon in the late 1980's, suggesting that they may have displaced residual steelhead during the drought period (Woelfel, 1991). In other California streams (i.e., Malibu Creek and Carmel River) green sunfish were found to prey on juvenile trout (Swift, 1975; Greenwood, 1988; cited in Woelfel, 1991), and in San Clemente Reservoir on the Carmel River, green sunfish outcompeted trout for benthic food (Greenwood, 1988).

The control of exotic fish species in the San Mateo Creek watershed, both on Camp Pendleton and in Cleveland National Forest, is considered critical to reducing impacts to steelhead in that watershed (DFG, 2000; Lang *et al.*, 1998). Lang *et al.*, (1998) recommended implementation of measures to contain exotic fish species in small lakes and ponds where recreational fishing occurs, in conjunction with efforts to control in-river propagation of exotics using Rotenone, electro-shocking, seining, or other means in perennial pools during summer low flows.

4. Inadequacy of Existing Regulatory Mechanisms

Virtually all of the San Mateo Creek watershed is located on Federal land managed by the Cleveland National Forest and the Camp Pendleton Marine Corps Base. San Mateo Creek originates in the Cleveland National Forest and flows in a southwesterly direction through Camp Pendleton to the Pacific Ocean just south of San Clemente, CA. Within the San Mateo Creek watershed, the majority of spawning and rearing habitat is upstream from Camp Pendleton within the Cleveland

National Forest. That portion of San Mateo Creek on Camp Pendleton serves primarily as migratory habitat for adults and juveniles.

That portion of the San Mateo Creek watershed located on Cleveland National Forest land has not been greatly altered by human activity over the past 50 years (Woelfel, 1991). Forest lands in the watershed have remained natural and undeveloped over this period although there are a few private property in-holdings which have had limited development. Woelfel (1991) reviewed water use on these private in-holdings and concluded that stream flows in the watershed were not significantly altered. According to Woelfel (1991), one of the main activities of the Cleveland National Forest has been the protection of vegetation and water resources in its various watersheds through the prevention of forest fires. In part, this effort was intended to protect and manage forest vegetation so that water resources were retained and water quality remained high.

The lower portion of San Mateo Creek watershed, which flows through Camp Pendleton, may have been impacted by base activities according to Woelfel (1991). Woelfel (1991) suggested that groundwater extraction to support base military training operations and on-base agriculture has led to stream channel de-watering or reduced channel flows, loss of riparian vegetation, and increased erosion, and that military training operations, including accidental fires caused by live ammunition use, may have contributed to erosion problems in the watershed. The cumulative effect of groundwater extraction, reduction or loss of riparian vegetation, stream channel morphology changes, and accelerated erosion is that steelhead may have reduced opportunities for both upstream and downstream migration. Camp Pendleton has developed a programmatic management plan for protecting and conserving riparian dependent species that occur on the Base which includes the San Mateo Creek watershed. NMFS expects to work with Camp Pendleton to evaluate the effectiveness of this plan in protecting steelhead.

5. Other Natural or Human-Made Factors Affecting Continued Existence of Steelhead

Natural climatic conditions have exacerbated the problems associated with degraded and altered riverine and estuarine habitats. Persistent drought conditions have reduced already limited spawning, rearing and migration habitat. Climatic conditions appear to have resulted in decreased ocean productivity which, during more productive periods, may help offset degraded freshwater habitat conditions (NMFS, 1996). Efforts Being Made to Protect the Southern California Steelhead ESU

In conjunction with its west coast steelhead status review, NMFS reviewed a wide range of protective efforts for west coast steelhead and other salmonids, ranging in scope from regional strategies to local watershed initiatives. NMFS has summarized some of the major efforts in a document entitled "Steelhead Conservation Efforts: A Supplement to the Notice of Determination for West Coast Steelhead under the Endangered Species Act" (NMFS, 1996c).

In the coastal area extending from Malibu Creek southward to San Mateo Creek, steelhead-specific conservation efforts are currently very limited. The FWS recently completed an assessment of habitat distribution and restoration potential on the Camp Pendleton Marine Corps Base (Lang *et al.*, 1998; and DFG, 2000). Over the past 2 years, the DFG has made several qualitative assessments of steelhead presence in the San Mateo Creek watershed and has also undertaken several efforts to remove exotic predators from pools know to contain steelhead which are located in that portion of the watershed which occurs in the Cleveland National Forest.

In addition, efforts are currently underway on the development of restoration plans for San Mateo Creek and San Onofre Creek, both of which are located on Camp Pendleton, to support native fish species including the unarmored three-spine stickleback, arroyo chub, and steelhead. This restoration planning effort is expected to focus on control of exotic plants, control of exotic fish species which compete with and/or prey upon steelhead and other native species, restoration of streambed pools, channels, and stream banks, and the reintroduction of native plants and possibly native fish species. Several agencies and private organizations, including the Cleveland National Forest, Camp Pendleton Marine Corps Base, FWS, DFG, Trout Unlimited, San Diego Trout, and the Coastal Conservancy, are participating in development of this program. NMFS strongly supports this effort and will continue to participate in its development and implementation.

In addition to this restoration planning which is directed specifically at San Mateo and San Onofre Creek restoration, additional funding is potentially available for habitat restoration in other coastal watersheds in Southern California through DFG's Habitat Restoration Grant Program. For the past 3 years NMFS has transferred at least $9.0 million annually from its Pacific Coast Salmon Recovery Fund to the State of California for use in this Grant Program. A Memorandum of Understanding between NMFS and the State of California governs the expenditure of these funds, some of which have already been allocated for the habitat restoration projects within the geographic range of the endangered Southern California steelhead ESU.

Final Determination

Based on the best scientific information available at the time of listing in 1997, NMFS concluded that the Southern California steelhead ESU, as it was then defined (i.e., Santa Maria River to and including Malibu Creek), was in danger of extinction and should be listed as an endangered species (621 FR 43937). This determination was based on the fact that steelhead had already been extirpated from much of its historic range in southern California, the extremely low abundance of extant steelhead populations, and the continued threats to the species from widespread habitat degradation and loss, water diversions and extraction, and other factors. As discussed previously in this document, there is no new information indicating that steelhead populations occurring in watersheds ranging from the Santa Maria River to Malibu Creek have increased in abundance since the ESU was listed in 1997, and populations in this geographic area continue to be threatened by the same factors that existed at the time of listing.

Steelhead are almost completely extirpated from coastal watersheds south of Malibu Creek, with the exception of their recent observations in Topanga Creek and San Mateo Creek, and they occur only sporadically or in extremely low abundance in those streams. As discussed previously, most of the coastal rivers and streams south of Malibu Creek are highly impacted or modified and no longer support steelhead. Where steelhead have recently been found in San Mateo Creek, there are potential threats to their existence from land management activities on Cleveland National Forest and the Camp Pendleton Marine Corps Base.

Based on a review of the currently available information regarding the status of steelhead in the redefined Southern California ESU, as well as a consideration of the factors affecting steelhead throughout this geographic area, NMFS concludes that Southern

California steelhead ranging from the Santa Maria River to the southern extent of this life form's range continue to be endangered. As was the case in NMFS' 1997 listing determination, only the anadromous form of *O. mykiss* (i.e. steelhead and their progeny) ranging from the Santa Maria River to the southern extent of this life form's range is listed.

As discussed previously in this document, the currently available information indicates that anadromous *O. mykiss* or their progeny have only been found in two watersheds located south of Malibu Creek (Topanga Creek and San Mateo Creek). NMFS believes that steelhead have been extirpated from virtually all other streams and rivers between Malibu Creek and San Mateo Creek, including the Los Angeles River, San Gabriel River, Santa Ana River, and San Juan Creek, because viable habitat is extremely limited or no longer exists as a result of habitat degradation. For these reasons, NMFS does not expect that steelhead will be found to occupy these watersheds in the future absent major restoration efforts. Nevertheless, if steelhead or their progeny are found to occur in any stream or river between Malibu Creek and San Mateo Creek, NMFS will consider those fish to be part of the listed populations, and, therefore, protected under the ESA. Because anadromous *O. mykiss* may potentially stray to streams south of San Mateo Creek when hydrological and other habitat conditions are favorable, NMFS will also consider steelhead or their progeny that occur south of San Mateo Creek to be part of the listed ESU unless there is evidence to indicate they are non-listed resident forms or derived from hatchery rainbow trout populations.

Prohibitions and Protective Measures

Section 9 of the ESA prohibits certain activities that directly or indirectly affect endangered species. These prohibitions apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. Section 9 prohibitions apply automatically to endangered species such as Southern California steelhead throughout its freshwater, estuarine, and marine range.

Sections 7(a)(2) and 7(a)(4) of the ESA require Federal agencies to consult with NMFS to ensure that activities they authorize, fund, or conduct are not likely to jeopardize the continued existence of a listed species or a species proposed for listing, or adversely modify critical habitat or proposed critical habitat. Federal agencies and actions that may be affected by the revision of the Southern California steelhead ESU and its critical habitat designation are the U.S. Forest Service (USFS) and their management and regulatory activities in Cleveland National Forest, the U.S. Marine Corps and its operation and management of Camp Pendleton Marine Corps Base, and the Corps of Engineers (COE) and its issuance of permits under the Clean Water Act.

Sections 10(a)(1)(A) and 10(a)(1)(B) of the ESA provide NMFS with authority to grant exceptions to the ESA's "take" prohibitions. Section 10(a)(1)(A) scientific research and enhancement permits may be issued to entities (Federal and non-Federal) for scientific purposes or to enhance the propagation or survival of a listed species. NMFS has issued section 10(a)(1)(A) research/enhancement permits for listed salmonids, including Southern California steelhead, to conduct activities such as trapping and tagging and other research and monitoring activities.

Section 10(a)(1)(B) incidental take permits may be issued to non-Federal entities conducting activities which may incidentally take listed species so long as the taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. The types of activities potentially requiring a section 10(a)(1)(B) incidental take permit include the operation and release of artificially propagated fish by state or privately operated and funded hatcheries, state regulated angling, academic research not receiving Federal authorization or funding, road building, grazing, and diverting water onto private lands.

NMFS Policies on Endangered and Threatened Fish and Wildlife

On July 1, 1994, NMFS and FWS published a policy in the **Federal Register** (59 FR 34272) indicating that the agencies would, to the maximum extent practicable at the time a species is listed, identify those activities that will not be considered likely to result in violations of section 9, as well as activities that will be considered likely to result in violations. NMFS believes that, based on the best available information, the following actions will not result in a violation of section 9 with regard to Southern California steelhead:

1. Possession of steelhead which are acquired lawfully by permit issued by NMFS pursuant to section 10 of the ESA, or by the terms of an incidental take statement pursuant to section 7 of the ESA.
2. Federally funded or approved projects that involve activities such as military operations, agriculture, grazing, mining, road construction, discharge of fill material, stream channelization or diversion for which section 7 consultation has been completed, and when activities are conducted in accordance with any terms and conditions provided by NMFS in an incidental take statement accompanying a biological opinion.
3. Incidental take of steelhead authorized through a section 10(a)(1)(B) permit which occurs in the course of an otherwise lawful activity.

Activities that NMFS believes could potentially harm Southern California steelhead, and, therefore, may violate the section 9 take prohibitions of the ESA include, but are not limited to:

1. Land-use activities that adversely affect steelhead habitat (e.g., agriculture, water extraction, recreational activities, road construction in riparian areas and areas susceptible to mass wasting and surface erosion).
2. Destruction/alteration of steelhead habitat, such as removal of woody debris or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow.
3. Discharges or dumping of toxic chemicals or other pollutants (e.g., sewage, oil, gasoline) into waters or riparian areas supporting steelhead.
4. Violation of discharge permits.
5. Pesticide applications.
6. Collecting or handling of steelhead. Permits to conduct these activities are available for purposes of scientific research or to enhance the propagation or survival of the species.
7. Introduction of non-native species likely to prey on steelhead or displace them from their habitat.

These lists are not exhaustive. They are intended to provide some examples of the types of activities that might or might not be considered by NMFS as constituting a prohibited take of Southern California steelhead. Questions regarding whether specific activities may constitute a violation of the section 9 take prohibitions, and general inquiries regarding prohibitions and permits, should be directed to NMFS (see **ADDRESSES**).

Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the maximum extent prudent and determinable, NMFS designate critical habitat concurrently with a determination that a species is endangered or threatened. In accordance with this requirement, NMFS designated freshwater and estuarine critical habitat for the endangered

Southern California steelhead ESU in February 2000 that ranges from the Santa Maria River southward to and including Malibu Creek (65 FR 7764).

NMFS believes there is insufficient information at present to determine if all or some of the freshwater habitat south of Malibu Creek, whether occupied or unoccupied, is essential for the conservation of this ESU because only two coastal watersheds south of Malibu Creek are currently known to support anadromous *O. mykiss*, including San Mateo Creek which is well separated from the remainder of the populations in the listed ESU. Prior to making any determination regarding the modification of the existing critical habitat designation, NMFS intends to complete an analysis of the full range of habitat, both occupied and unoccupied, that is essential for the conservation and recovery of this ESU. NMFS expects that this effort will be conducted in conjunction with the development of biological recovery goals for this ESU by a NMFS appointed recovery team.

In conjunction with these efforts, NMFS intends to work with Federal land managers in the San Mateo Creek watershed (i.e. Camp Pendleton Marine Corps Base and Cleveland National Forest) to review and evaluate their existing land management and habitat protection programs to determine the extent to which they protect steelhead and their habitat in the San Mateo Creek watershed.

References

A complete list of all cited references is available upon request (see **ADDRESSES**).

Classification

National Environmental Policy Act

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in Pacific Legal Foundation v. Andrus, 675 F. 2d 825 (6th Cir. 1981), NMFS has concluded that ESA listing actions are not subject to the environmental assessment requirements of the National Environmental Policy Act (NEPA). See NOAA Administrative Order 216-6.

Executive Order 12866 and Regulatory Flexibility Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act are not applicable to the listing process. In addition this final rule is exempt from review under Executive Order 12866.

Paperwork Reduction Act

This final rule does not contain a collection-of-information requirement for purposes of the Paperwork Reduction Act.

Executive Order 13132 - Federalism

In keeping with the intent of the Administration and Congress to provide continuing and meaningful dialogue on issues of mutual State and Federal interest, NMFS has conferred with state and local government agencies in the course of assessing the status of this ESU, and considered, among other things, state and local conservation measures. State and local governments have expressed support for both the conservation of this ESU and for those activities which affect it. NMFS staff have had discussions with various government agency representatives regarding the status of this ESU and have sought working relationships with them in order to promote restoration and conservation of this and other ESUs.

List of Subjects in 50 CFR Part 224

Administrative practices, and procedure, Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Dated: April 18, 2002.

William T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set forth in the preamble, 50 CFR part 224 is amended as follows:

PART 224—ENDANGERED MARINE AND ANADROMOUS SPECIES

1. The authority citation for part 224 continues to read as follows:

Authority: 16 U.S.C. 1531-1543; and 16 U.S.C. 1361 *et seq.*

2. In § 224.101, paragraph (a) is revised to read as follows:

§ 224.101 Enumeration of endangered marine and anadromous species.

* * * * *

(a) *Marine and anadromous fish.* Shortnose sturgeon (*Acipenser brevirostrum*); Totoaba (*Cynoscian macdonaldi*); Snake River sockeye salmon (*Oncorhynchus nerka*); Southern California steelhead (*Oncorhynchus mykiss*), which includes all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River, San Luis Obispo County, CA (inclusive) to the U.S. - Mexico Border; Upper Columbia River steelhead (*Oncorhynchus mykiss*), including the Wells Hatchery stock and all naturally spawned populations of steelhead (and their progeny) in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S. - Canada Border; Upper Columbia River spring-run chinook salmon (*Oncorhynchus tshawytscha*), including all naturally spawned populations of chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington, and the Chiwawa River (spring run), Methow River (spring run), Twisp River (spring run), Chewuch River (spring run), White River (spring run), and Nason Creek (spring run) hatchery stocks (and their progeny); Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*).

* * * * *

[FR Doc. 02–10773 Filed 4–30–02; 8:45 am]

BILLING CODE 3510–22–S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 622

[I.D. 010302D]

RIN 0648–AL86

Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Comprehensive Sustainable Fishery Act Amendment to the Fishery Management Plans of the U.S. Caribbean

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of agency action.

SUMMARY: NMFS has disapproved the Comprehensive Amendment Addressing Sustainable Fishery Act Definitions and Other Required Provisions of the Magnuson-Stevens Act in the Fishery Management Plans of the U.S. Caribbean (Comprehensive SFA Amendment) submitted by the Caribbean Fishery Management Council (Council). Under the procedures of the Magnuson-Stevens

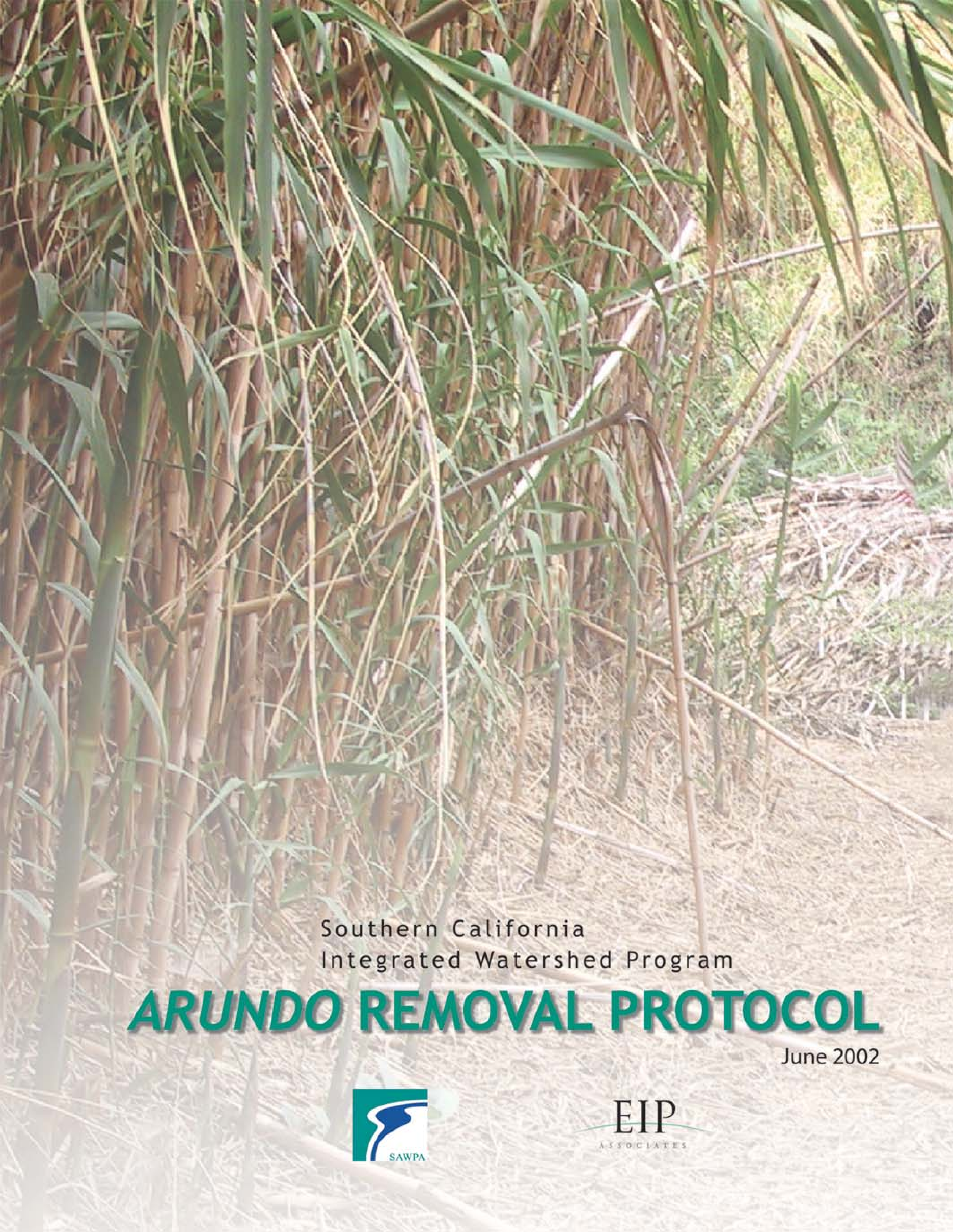
Appendix L-5

Arundo Removal Protocol

ESA

Appendix C

Arundo Removal Protocol



Southern California
Integrated Watershed Program

ARUNDO REMOVAL PROTOCOL

June 2002

SAWPA

EIP ASSOCIATES

Southern California Integrated Watershed Program

ARUNDO REMOVAL PROTOCOL

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June 2002

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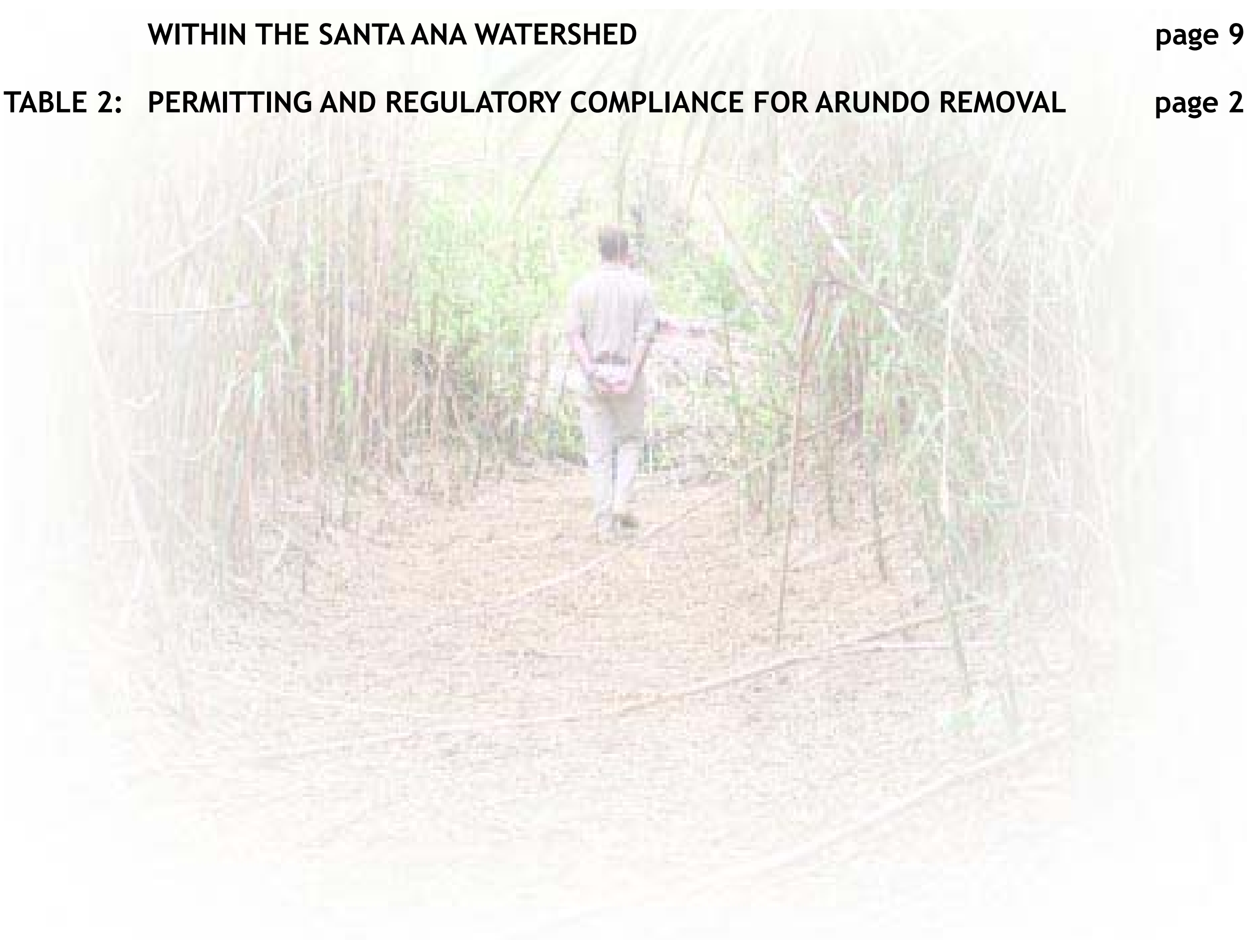


Acknowledgements

Kerwin Russell of the Riverside-Corona Resource Conservation District leading a Team Arundo field trip, April 2002
Photo courtesy of EIP Associates

Operating within the Santa Ana Watershed, Team *Arundo* is recognized throughout the State of California as a leader in *Arundo* removal efforts. A number of agencies and organizations compose Team *Arundo*, including the Santa Ana Watershed Association of Resource Conservation Districts (SAWA), the Riverside County Parks and Open Space District, the Riverside County Flood Control District, the Orange County Water District, the Orange County Public Facilities and Resources Department, the Monsanto Company, and the Orange County Conservation Corps. Historically, The Nature Conservancy has also been a part of Team *Arundo*. The foresight and leadership of these groups have proven instrumental in elevating the need for *Arundo* removal to an issue of statewide importance. Without the efforts of Team *Arundo* members to secure funding, acquire permits, and develop various methodologies, there would be no need for this *Arundo* Removal Protocol. This protocol, compiled with input from Team *Arundo* members, documents *Arundo* removal as practiced in the Santa Ana Watershed.

In addition, the individuals and groups that directly contributed to the development of this Arundo Removal Protocol deserve recognition and thanks. Seven groups completed Arundo Removal Questionnaires, including Mark Biloki of the Riverside County Flood Control and Water Conservation District, Rick Stroup, Robert Van Geitzen, and George Patino of the Orange County Conservation Corps, Kerwin Russell and Shelli Lamb of the Riverside-Corona Resource Conservation District (representing SAWA), Dennis Washburn, a subcontractor to the Inland Empire West Resource Conservation District, Dan Bogan of the Riverside County Regional Park and Open Space District, Kelly Schmoker and Wanda Smith of the California Regional Water Quality Control Board (Region 8), and Bill Neill of Riparian Repairs (Los Angeles County). Dick Zembal of the Orange County Water District, Gayle Holyoak of the San Jacinto Resource Conservation District, and Ann Croissant of the San Gabriel Mountains Regional Conservancy also provided comment in response to the questionnaires. Kerwin Russell of the Riverside-Corona Resource Conservation District provided valuable input on the final draft of the Protocol. Ron Baxter at the Riverside County Regional Park and Open Space District also reviewed the final draft.

Arundo Removal Program Background

Proposition 13, also known as the Costa-Machado Water Act of 2000, included the Southern California Integrated Watershed Program (SCIWP) (California Water Code Sections 79104.20 through 79104.34), which provided funding for local assistance grants to be administered by the Santa Ana Watershed Project Authority (SAWPA). This funding, which is contingent upon appropriation by the State Legislature to the State Water Resources Control Board (SWRCB), is to be spent on projects to rehabilitate and improve the Santa Ana River Watershed. One component of the SCIWP is the removal of invasive plant species within the Watershed, primarily giant reed or wild cane (*Arundo donax*). The SAWPA Commission has allocated approximately $20 million to several agencies and organizations for an *Arundo* Removal Program within the Watershed. These agencies and organizations, collectively known as "Team *Arundo*," include the Santa Ana Watershed Association of Resource Conservation Districts (SAWA), the Riverside County Parks and Open Space District, the Riverside County Flood Control District, the Orange County Water District, the Orange County Public Facilities and Resources Department, and the Orange County Conservation Corps.

This document outlines the history of the problem of *Arundo* invasion, the current state of the removal efforts within the Watershed, and presents a blueprint for future removal within the Watershed. It details specific procedures used by Team *Arundo*. This document fulfills requirements of the SWRCB, and may be used by other groups removing *Arundo* throughout the State.

Specifically, the *Arundo* Removal Program (ARP) will remove *Arundo* and other invasive species, thereby helping to achieve the following SCIWP goals:

- Remove non-native plants and create new open space and wetlands
- Conserve water, use water efficiently, and capture and manage storm water
- Plan and implement a flood control program to protect agricultural operations and adjacent property and to assist in abating the effects of waste discharges into waters of the State

Riparian channel infested with *Arundo*

Photo courtesy of SAWPA

SECTION ONE
Introduction to the Problem

Biology of Arundo donax

Of the many non-native species that have invaded the riparian forests of Southern California, *Arundo donax* (giant reed) is particularly problematic due to its ability to rapidly invade and colonize new areas and outcompete native species. Spanish settlers originally introduced *Arundo* to Southern California more than 150 years ago to be used for erosion control, as a food source for pigs and goats, and as thatch roofing for homes. *Arundo* is still sold commercially as a bank stabilizing ornamental species throughout the United States. However, the California Department of Food and Agriculture (CDFA) has commenced the regulatory process to add eleven species, including *Arundo*, to the CDFA Noxious Weed List. If CDFA does list *Arundo* as a noxious weed, which is expected by 2003, individual counties may draft ordinances preventing the sale or transfer of *Arundo*. These county ordinances are subject to State approval and are based on several criteria such as the presence of an active removal program. (Barbara Hass, CDFA, 2002, personal communication). The California Exotic Pest Plant Council places *Arundo* on its "List A: Most Invasive Wildland Pest Plants."

Arundo: Monotypic stand of *Arundo donax*
Photo courtesy of SAWPA

Commercial uses of *Arundo* include paper pulp and cellulose for rayon manufacture. Since *Arundo* is difficult to harvest and transport due to its bulk, wood is generally more suitable for paper-making. However, groups within the European Union and other parts of the world are currently studying *Arundo* growth and productivity to determine its suitability for production as a biomass crop for energy, paper pulp, and construction of building materials (Biological Materials for Non-food Products, 2000). In addition, Nile Fiber, a company in California, spent five years on research and development to determine the commercial viability of *Arundo* as an alternative to wood pulp. Although not yet in production, Nile Fiber claims to have produced the first commercial run of bleached *Arundo* pulp. The company is now actively seeking *Arundo* for its operations and may establish *Arundo* plantations throughout the United States (‹http://www.nilefiber.com› 2002). *Arundo donax* culm, or hollow, jointed stalk, has also been used to make reeds for woodwind musical instruments, and historical evidence of this use can be traced back 5,000 years. It is interesting to note that at least some of the frequent references to "reeds" in the Bible allude to *Arundo donax* (Perdue 1958).

Arundo is a genus of tall perennial reed-like grasses (Family: Poaceae) that includes six species native to warmer climates of Europe, Asia, and Africa. Although *Arundo* is thought to have originated in freshwaters of eastern Asia, extensive cultivation has occurred throughout Asia, southern Europe, North Africa, and the Middle East for thousands of years (Bell 1997). *Arundo* is a hydrophilic (water-loving) plant that grows within the riparian zone of lakes, streams, rivers, and in other moist soils. It requires moist soils and large amounts of water to sustain its high growth rates of up to 2 inches per day, using more that 528 gallons of water per year for each meter of standing *Arundo* (Bell 1997). This water uptake rate roughly equates to three times the amount of water used by native southern California riparian vegetation (Zembal and Hoffman 2000).

Arundo is capable of spreading rapidly throughout a watershed once it becomes established. Although *Arundo* may produce a large inflorescence, North American *Arundo* plants are not known to produce viable seeds, as seedlings have not been observed in the field (Dudley 2000) (Jackson 2002, personal communication). Reproduction within North America occurs vegetatively, either by rooting of stem fragments or by underground rhizome extension of a colony. For the most part, stems with no basal material are less likely to root, but under laboratory conditions fresh cut *Arundo* stems will form roots at nodes (Dudley 2000). Since *Arundo* will form roots after cutting, it is important to properly dispose of cut *Arundo* prevent reinfestation after *Arundo* removal. Disposal methods are discussed in Sections IV and V.

Distribution and Removal Efforts of *Arundo donax* in Santa Ana Watershed

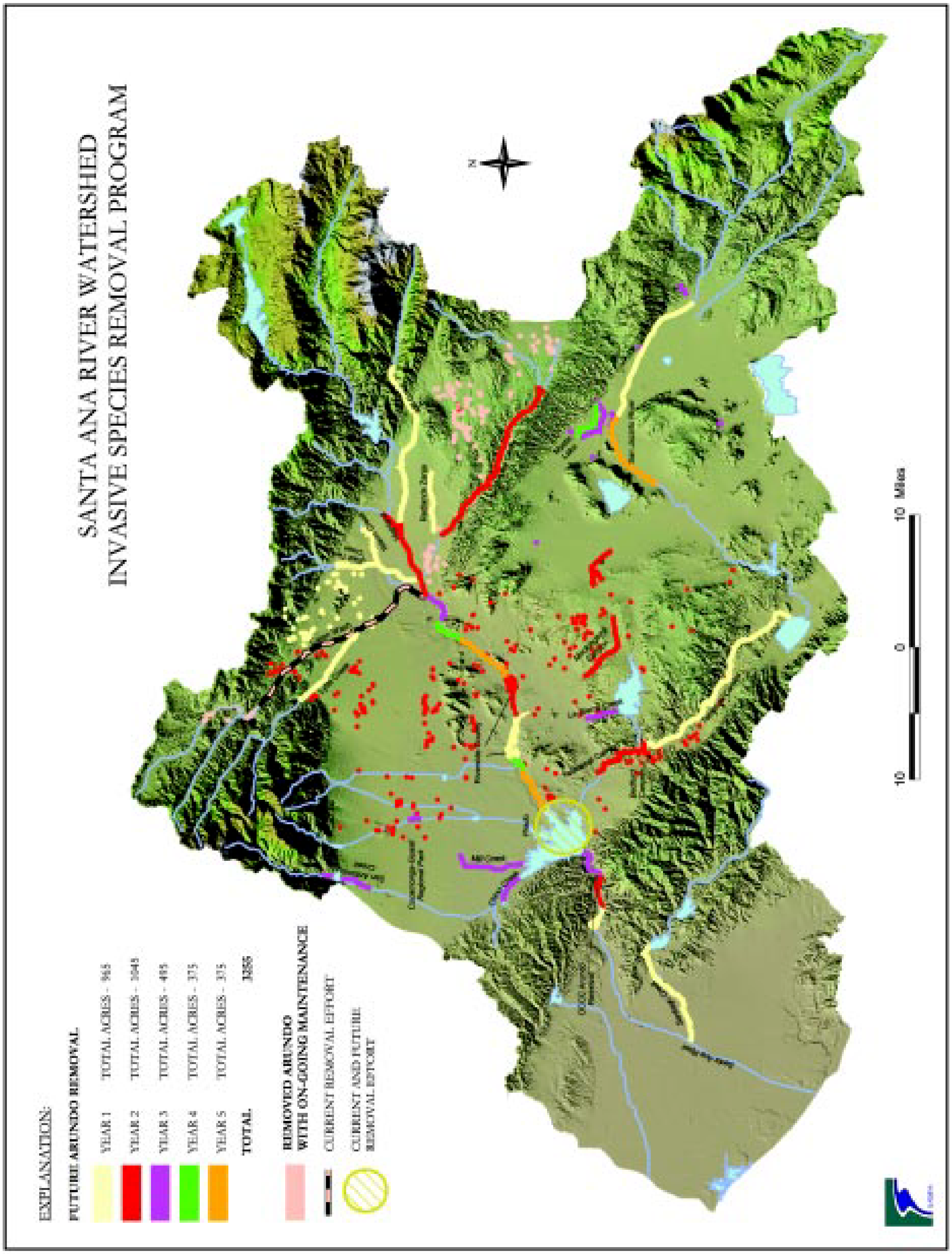
Encompassing approximately 2,650 square miles and flowing over 100 miles from the San Bernardino Mountains to the Pacific Ocean, the Santa Ana River Watershed is the largest coastal stream system in Southern California. The Watershed includes urban, rural, and forested landscapes within large areas of western San Bernardino, Riverside, and Orange Counties, and a small portion of Los Angeles County. *Arundo* infestation within the Watershed is extensive (see Figure 1) and removal efforts began in 1988.

The numerous parties making up Team *Arundo* are clearing *Arundo* from many areas, including the upper tributaries of the Watershed. Table 1 lists *Arundo* distribution and historical specific removal efforts within the Watershed, as described by Neill and Giessow (2001). Appendix A provides further information. By providing necessary funding, the SCIWP *Arundo* Removal Program will greatly accelerate *Arundo* removal efforts within the Watershed.

SCIWP Arundo Removal Program

Although funding for the SCIWP *Arundo* Removal Program (ARP) has been secured for a duration of at least three years, the planning horizon for removing *Arundo* exceeds five years, with the expectation that additional funding will be procured for future work. A preliminary plan for the timing of *Arundo* removal through the ARP has been established, but exact locations and removal agencies are flexible and subject to change.

Through ARP funding the Riverside County Regional Park and Open Space District will remove *Arundo* from the Santa Ana River between the Mission Inn Boulevard Bridge and the Hidden Valley Wildlife Area during the first two years. SAWA will remove *Arundo* from the San Jacinto River, Redlands Zanja, Mill Creek (East Valley), Santa Ana River Phase I area, East Twin Creek, and Warm Creek during the first year. SAWA will remove *Arundo* from Highland, San Timoteo Creek, Juniper Flats, Mockingbird Canyon, Bedford Canyon, and the Santa Ana River Phase II area during the second year. During the third year, SAWA will remove *Arundo* from Mill Creek (Inland Empire West), La Sierra Creek, Mystic Lake, San Antonio Creek, and Cucamonga-Guasti Regional Park. Additionally, SAWA plans to remove further *Arundo* from Mystic Lake and the Santa Ana River during the fourth year and from the San Jacinto River and the Santa Ana River during the fifth year. The Orange County Public Facilities & Resources Department may remove *Arundo* from the Santa Ana River canyon in the Yorba Linda area during the first three years, from Weir Canyon Road to the Orange County line. The Orange County Conservation Corps may remove *Arundo* from Featherly Park in Orange County during the second year of the program. Another agency, likely the Orange County Water District or SAWA, will remove *Arundo* from the upper Watershed and isolated tributaries in San Bernardino and Riverside Counties. In addition, the Riverside County Flood Control District will remove *Arundo* through the ARP (SCIWP Project Authorization Package, EIP Associates 2001).



Future SCIWP *Arundo* removal within the Santa Ana Watershed
Graphic supplied by SAWPA

Table 1: Distribution of *Arundo donax* and Past Removal Efforts Within the Santa Ana Watershed

SOURCE: Neill and Giessow, 2001 and RCRCD, 2002, personal communication

Watershed Zone	Location	*Arundo* Abundance/ Acres Removed	Removal Agency/ Organization	Removal Timeframe
Cajon Wash	Lost Lake and below Highway 38	Abundant to scattered	Inland Empire West Resource Conservation District (RCD)	1999–2000
San Bernardino Area	Downstream areas of Waterman Canyon, Hot Springs Creek, and East Twin Creek	Continuous stands, except along City Creek, where *Arundo* is absent in National Forest to Highland Boulevard, below which scattered clumps are present.	N/A	N/A
San Timoteo Canyon	Near Highway 60 below the City of Beaumont	11 miles of riparian corridor cleared near Alessandro Road, plus most of Live Oak Canyon cleared through Yucaipa	East Valley RCD	1996–2000
Riverside Area	Various	1 mile cleared Near Van Buren Bridge. 7 acres removed at Fairmount Park, 16 acres removed at Alessandro, 10 acres removed at Castle View, 25 acres removed at Woodcrest, 5 acres removed at La Sierra Creek, 16 acres removed at Golden Star Creek	Riverside County Parks and Riverside-Corona RCD	1993–2001
San Jacinto River	San Jancinto Valley below Saboba Reservation	*Arundo* absent from Idyllwild and Nationall Forest land.	San Jacinto Basin RCD and Washburn Grove Management	1998–2001
Temescal Canyon	Downstream from Lake Elsinore and Lake Corona.	*Arundo* absent from Walker Canyon. *Arundo* becomes present below Lake Corona and near El Cerrito. Quarter mile reach cleared near El Cerrito	Glenn Lukos and Associates and Canyon Landscaping	1997–1998
Prado Basin	Along River Road Bridge	30 acres removed above River Road Bridge	Riverside-Corona RCD	1993–2002
Santa Ana Canyon	Near Featherly Regional Park	60 acres removed on north side of Featherly Park. *Arundo* remains in central part of flood channel	Orange County staff and Orange County Conservation Corps	1989–2000
Carbon Canyon	Along Carbon Creek	2 acres removed along Carbon Creek. No *Arundo* within Telegraph Canyon in Chino Hills State Park	Chino Hills State Park staff and Chino Fire Dept.	2000
Santiago Creek	Silverado Canyon area	2 miles private property cleared along Silverado Creek. *Arundo* present in Modjeska Canyon	Silverado Canyon residents and County staff	1997–1998
Aliso Creek	Whiting Ranch Park	2 sections of Aliso Creek cleared in Whiting Ranch Park	Orange County employees	Late 1990s
Arroyo Trabuco	Holy Jim Canyon and O'Neill Regional Park	Upper two miles in O'Neill Park cleared. Much *Arundo* in Holy Jim Canyon.	County staff	2000–2001
San Juan Creek	Caspers Regional Park, San Juan Capistrano	Hot Springs area cleared. Area between La Novia Ave. and I-5 cleared but not maintained, and *Arundo* has reinvaded.	Orange County staff and prison crews	1995, 1997–1998

Other Invasive Species

In addition to *Arundo*, team members may remove other invasive species while undertaking *Arundo* removal activities. These species include, but are not limited to, castor bean (*Ricinus communis*), artichoke thistle (*Cynara cardunculus*), tree or wild tobacco (*Nicotiana glauca*), tamarisk or saltcedar (*Tamarix* sp.), tall whitetop (*Lepidium latifolium*), and tree of heaven (*Ailanthus altissima*). These species disrupt natural ecosystems by competing with native flora for limited resources and generally providing poor quality habitat for native fauna. Removing any exotic species, including *Arundo* and other species, must follow applicable permit conditions.

SECTION TWO

Consequences of *Arundo donax* Invasion

Currently, more than 95% of the historic riparian habitat in the southern part of California has been lost to agriculture, development, flood control, and other human-related impacts (Zembal and Hoffman 2000). However, the greatest threat to the remaining riparian corridors is the invasion of exotic plant species, primarily *Arundo*. As a result of past and present introductions, its ability to colonize new areas relatively easily, and its ability to outcompete native species, *Arundo* has infested nearly every drainage system in the southwestern United States (Brotherson and Field 1987).

Arundo readily invades riparian channels, particularly disturbed areas, is very competitive, is difficult to control, and does not provide significant food or nesting habitat for native animals (Bell 1993). *Arundo* competes with native species, such as willows (*Salix* sp.), mulefat (*Baccharis* sp.), and cottonwoods (*Populus* sp.) that provide nesting habitat for threatened and endangered species such as least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii*), and countless other native species. *Arundo* inhibits seedling recruitment of native riparian species, outcompetes established native species, and uses massive amounts of water that would otherwise be available to native plants and surrounding areas (Frandsen and Jackson 1997).

Ecosystem Dynamics

Disturbance within the river floodplain has favored the fast-growing *Arundo* over native riparian vegetation. This acreage increases each year in response to annual flood events, fires, and other ecological perturbations. *Arundo* readily invades native riparian communities at any stage of succession, not only by invading after floods and fires. Because of these characteristics, once *Arundo* becomes established in a riparian area, it alters the ecosystem by redirecting the succession of the community towards pure stands of *Arundo*.

Riparian channel infested with *Arundo*

Photo courtesy of SAWPA

Landscape near Hidden Valley Wildlife Area: April 2002 fire cleared an estimated 250 acres of *Arundo*
Photo courtesy of Riverside County Park and Open-Space District

Risk of Fire

Arundo is highly combustible, increasing fire frequency and intensity. The pervasion of *Arundo* throughout the Santa Ana Watershed greatly increases the risk of catastrophic fire. Extensive stands of *Arundo* pose a risk to natural resources, homes, and bridges and other infrastructure, forcing public fire agencies to respond to this ever-increasing threat (Zembal and Hoffman 2000). A single fire in April 2002 swept through approximately 250 acres of riverbed near Martha McLean Anza Narrows Park in Riverside County. Although the cause of the fire was unknown, "the flames [were] fed by the riverbed jungle of dry, hollow, *Arundo* cane, which burns quickly and with a loud popping noise that one resident said sounded like a machine gun" (Danelski, 2002). One and half months after the fire, the burned Arundo had resprouted to about 3 feet (Frandsen, 2002, personal communication).

Flooding issues

By virtue of its great biomass, rapid growth, and dense, interconnected root masses, *Arundo* poses a substantial flood management problem. Floodwaters strip portions of the standing crop of *Arundo* and root masses from the substrate and these mats combine with trash and other debris to form substantial debris dams. In contrast, native riparian species tend to bend rather than break during high flows, greatly reducing the amount of vegetative debris washed downstream. Heavy rains wash debris dams of *Arundo* downriver, pushing mats of dense roots and stalks against bridge abutments. These mats can damage the abutments, clog river channels, and re-direct river flows, thereby flooding adjacent lands (Zembal and Hoffman 2000).

For example, Riverside County's River Road Bridge near Norco was damaged twice within 3 years, causing almost $1 million in damage. This bridge is an important transportation corridor for County residents. During a flooding event in March 1995, *Arundo* and other debris washed down the Santa Ana River, knocking the bridge off of its supports and leaving it floating in the river. The River Road Bridge was closed for three months, requiring $700,000 in repair work. Further flooding damage occurred in February 1998 when *Arundo*, tree trunks, and sand flowed downstream with the floodwaters, knocking three sections of the bridge off their foundations. This time, damage cost approximately $260,000 to repair. The Riverside County Board of Supervisors subsequently authorized $8 million to construct a new River Road Bridge (McBride 1998). Furthermore, as these large quantities of *Arundo* move downstream, they eventually find their way to the ocean, and subsequently wash up on local beaches. The annual clean up of this debris costs the public millions of dollars each year (Zembal and Hoffman 2000).

Large stands of *Arundo* that line extensive sections of the river can also separate the river from its floodplain. The bank stabilization that results from *Arundo*'s extensive root system alters the natural meandering of the river, reduces the frequency of seasonal wetland inundation, and reduces the interaction of the river with its floodplain (Johnson, et al. 1995). The loss of seasonal flooding significantly alters the size and function of floodplain wetlands, reduces habitat for wetland species, and alters riverine nutrient dynamics (Bayley 1995).

Decreases in Water Quality and Quantity

Arundo absorbs a great deal of water through its roots, effectively removing much water from the available supply. Ideally, native plants that require less water will replace *Arundo*. As previously mentioned, it is estimated that native vegetation uses one-third of the water used by *Arundo*. For example, the removal of every 1,000 acres of *Arundo* and subsequent recovery of native vegetation will yield a water savings of approximately 3,800 acre-feet per year. This is enough to supply almost 20,000 urban residents with water annually (Zembal and Hoffman 2000).

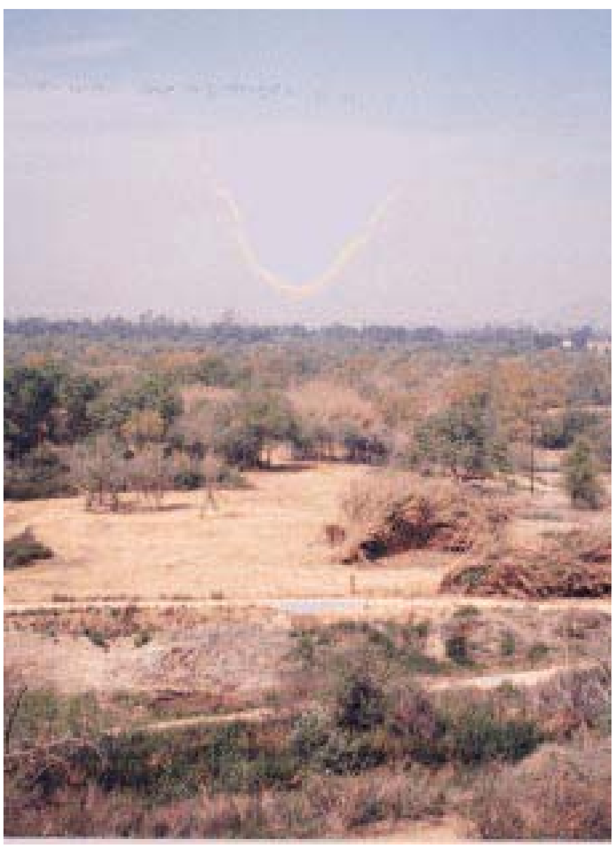
Extensive stands of *Arundo* along rivers lack the dense foliage canopy of native riparian forests. As a result, near-shore stream habitats lack the shade offered by the native vegetation's canopy, and water temperatures are several degrees higher than under natural conditions. Higher water temperatures have a direct negative impact on native stream fishes, such as the Arroyo chub (*Gilia orcutti*) and the threatened Santa Ana sucker (*Catostomus santaanae*). Higher temperatures not only increase algal growth and lower oxygen concentration within the water, they can also lead to increased algal photosynthetic activity that has been found to increase pH levels within the shallower sections of the river. Increases in pH can facilitate the chemical conversion of ammonium (NH_4^+) salts to the toxic non-ionized ammonia form (NH_3), resulting in reduced water quality for both aquatic organisms and downstream users (Bell 1993).

SECTION THREE

Benefits of Removal of *Arundo donax*

Because this exotic plant alters ecosystem dynamics and interrupts and redirects succession, the removal of *Arundo* from the Watershed offers numerous direct and indirect benefits to landowners, land managers, public agencies, and other Watershed residents. These benefits include reduction in risk of flooding and fire, improvements in water quality, increased water conservation, and restoration of habitat for native species, including several threatened and endangered species.

With the elimination of large stands of *Arundo*, intense fires and the associated high risk to life and property will become less frequent and the costs associated with fire fighting will decrease.



Arundo removal site at Hidden Valley Wildlife Area
Photo courtesy of Riverside County Park and Open-Space District

Arundo elimination would further result in a lowered risk of public/personal property damage. Complete control and eradication of *Arundo*, rather than annual maintenance mowing, would result in substantial annual savings to both the residents of the Watershed and the flood management agencies.

Riparian vegetation serves as critical habitat for many state and federally listed threatened and endangered species, such as the least Bell's vireo. Suitable habitat for listed species within the Watershed has been reduced by development by as much as 95% and *Arundo* has replaced over 50% of the remainder. Preventing the spread of *Arundo* will preclude the further deterioration of habitat for many of the sensitive, threatened, and endangered riparian species. As areas of *Arundo* are removed and converted back to native riparian habitat, rare species will be able to expand their populations throughout the Santa Ana River Watershed. Replacing these stands of exotics with native riparian vegetation will, in time, result in sufficient overhanging foliage to provide the necessary cooler water temperatures, bank cover, and improved water quality needed to protect populations of native fish species and other aquatic organisms.

In addition, *Arundo* removal would result in more in-stream water for both residents of the Watershed and the native aquatic organisms. Given that the costs associated with providing imported water to residents will only increase over time, the savings to the water suppliers, and ultimately to the Watershed residents, would be substantial (Zembal and Hoffman 2000).

SECTION FOUR

Arundo Removal Methods

This section generally describes available *Arundo* removal methods, not all of which are used within the Santa Ana Watershed. The next section, "*Arundo* Removal Procedures within the Santa Ana Watershed," details removal methodology of Team *Arundo*.

Available Methods

Removal of *Arundo* can be accomplished by a variety of methods. Each method differs in cost, time, and can be specific to certain areas or types of infested habitat. Removal methods include mechanical removal, chemical control, and biological control, in addition to a comprehensive integrated weed management (IWM) approach. Prevention of further invasion or reinfestation should also be considered in conjunction with removal methods.

Mechanical Removal

Mechanical removal involves two primary methods: either the removal of *Arundo* plants from the substrate or the cutting of *Arundo* plants. The physical removal of *Arundo* plants from the substrate can include hand pulling, hand tools (i.e., pick-axe, shovel), digging, and/or mechanized tools (i.e., mowers, weed eaters, chippers, bulldozers). Removal of the plants from the substrate is effective in killing the plant, however, this method is limited in its use due to the high labor cost and associated slow speed. This method is also disadvantageous due to adverse environmental effects, such as disruption of the substrate, interference with soil fauna and increased potential for erosion. Cutting plants by mechanical methods of removal includes the use of chainsaws, a hydro-axe, shredder, or other heavy machinery. If the entire *Arundo* culm and root are not removed, the plant will resprout. Therefore, mechanical cutting should be performed in conjunction with herbicide application and/or further cutting as described below.

Hydro-Ax: Arundo removal equipment used by Inland Empire West Resource Conservation District (also used to clear fire breaks, as shown in this photo). *Photo courtesy of Inland Empire West Resource Conservation District*

Chemical Removal

Chemical removal of *Arundo* is another proven method of clearing areas of infestation. Treatment requires application (either foliar spray or cut-stump) of a broad-spectrum herbicide at specific times during the year to ensure adequate uptake by the plant's root system. However, the types of herbicides that can be used in wetland areas are limited, and currently the only herbicides approved for wetland use by the EPA, CalEPA, and the State Water Resources Control Board are certain glyphosate-based products, such as Aquamaster™[1] and Rodeo®[2] herbicides. Glyphosate is of relatively low toxicity to mammals, birds, and fish; however, the surfactants used in some formulations of glyphosate are toxic to aquatic organisms. Therefore, only some glyphosate formulations containing less toxic surfactants are approved for use in aquatic and wetland ecosystems. Glyphosate experiences limited movement in the environment as it binds readily to soil particles, which minimizes risk of soil leaching and entering nearby water bodies. Current interpretation of a recent circuit court ruling requires that use of herbicides on or within water bodies in California requires a National Pollution Discharge Elimination System (NPDES) permit as well as a water quality monitoring program under the Clean Water Act regulations.

[1]Aquamaster™ is a registered trademark of the Monsanto Company

[2]Rodeo® is a registered trademark of the Dow Chemical Company

When *Arundo* is removed from an area of sufficient distance from the water, other herbicides have been used, such as Roundup Pro®[1] herbicide, which is also glyphosate-based but not registered for aquatic use. Stalker®[2], which is Imazapyr-based and also not registered for aquatic use, has been used by at least one Team *Arundo* member on small-scale eradication of castor-bean, tree tobacco, and saltcedar away from water bodies.

The most effective chemical treatment method involves the foliar application of a glyphosate herbicide during summer and fall (June to November) after the period of most active growth in the spring/early summer, but before the plant goes into dormancy (Jackson 2002). During this period, the plant translocates nutrients through the phloem into its root mass most actively. The herbicide is moved through the phloem to the active growing points throughout the root mass. Since glyphosate cannot penetrate woody material, the herbicide must be applied to the leaves or cut stem of the *Arundo* plants. Specific permit requirements must be followed with respect to herbicide application, and the timeframe for application may require adjustment for certain circumstances. For example, the US Army Corps of Engineers Regional General Permit 41 (See Appendix E), which authorizes the removal of invasive, exotic plants in Southern California, specifically prohibits the application of herbicides in partially infested stands from March 15 to September 15. Cut-stem and foliar application is permitted year-round in fully infested stands. See permit for definitions of fully and partially infested stands, as well as further instructions regarding *Arundo* removal activities.

Several methods of herbicide application have proven effective. For large areas of infestation (greater than 80% canopy cover), aerial spraying is a very quick and cost-effective method of application. Special spray nozzles produce very fine droplets of highly concentrated herbicide that limit the amount of over spray and minimize the amount of herbicide required (Zembal and Hoffman 2000). Aerial spraying is particularly advantageous after a fire. However, no Team *Arundo* members currently practice aerial spraying. Herbicide applicators utilizing aerial application must comply with supplemental herbicide label requirements and Federal Aviation Administration requirements.

Arundo Disposal

Cut *Arundo* may be removed from treatment areas through burning, chipping, or vehicular transportation. The removal of the cut cane is important due to the untreated cane's ability to re-root and colonize new areas either at the site or downstream (if washdown occurs). Although burning is the most cost effective method to dispose of the dead cane, Team *Arundo* members do not burn cane due to environmental considerations and requirements for AQMD permits. Cutting, chopping, and chipping is the most common method of disposal, with Team *Arundo* members using this method to dispose of 80% to 100% of the cut biomass. If chipped and left on site, pieces of cane should be chipped to about ¼ inch to 1 inch to prevent repsrouting. Other uses for *Arundo*, including fiber, may be developed, which would reduce the need for disposal.

Chipping of *Arundo* by Inland Empire West Resource Conservation District
Photo courtesy of Inland Empire West Resource Conservation District

[1]Roundup Pro® is a registered trademark of the Monsanto Company

[2]Stalker® is a registered trademark of the American Cyanimid Company

Biological Control

Currently, there are no known biological agents that have proven effective for *Arundo* control, and consequently this method is not used within the Santa Ana Watershed. However, several insects are known to feed upon *Arundo*, including green bug (*Schizaphiz graminum*), and two lepidopterans, *Phothedes dulcis* and *Diatraea saccharalis* (Hoshovsky 1986). Unfortunately, little is known about the effects of any of these species on *Arundo* growth or reproduction because, as *Arundo* is grown as a commercial crop in many parts of the world, intentional introduction of pathogens and pests would not be prudent. Also, because of *Arundo*'s agricultural use, little work has been done to identify potential biological control agents. Within southern California, other means of biological control have been considered, including grazing by Angora goats. Used for small-scale control of other exotic weeds in California (Daar 1983), some organizations have considered experimenting to determine if grazing by these goats would be effective at reducing *Arundo* biomass. It should be noted that grazing animals cannot eliminate the roots or rhizomes and therefore can only act as a biomass reduction agent rather than a method of elimination.

Integrated Weed Management

A final, comprehensive strategy, integrated weed management (IWM), combines the above methods to control *Arundo*. IWM is defined in the federal Noxious Weed Act as, "a system for the planning and implementation of a program, using an interdisciplinary approach, to select a method for containing or controlling undesirable plant species or groups of species using all available methods, including education, prevention, physical or mechanical methods, biological control agents, herbicide methods, and general land management practices." IWM uses a multidisciplinary approach to minimize the impact of control actions on the non-target environment and public health while maximizing the effectiveness of practical control methods.

IWM includes "cultural methods" of exotic species invasion prevention, which involve the modification of human behavior both within and around the area of infestation. Recreational, economic, and urban land uses that contribute to the introduction and proliferation of invasive species are discouraged by this method (Duncan and Carrigan 1992). Within the Santa Ana Watershed, behavioral modifications include altered planting practices that encourage the use of native plant species for landscaping, rather than *Arundo* or other exotic species. Other native or less invasive species can be substituted for bank stabilization and aesthetic purposes.

Best Management Practices

With any of these methods, it is critical to apply Best Management Practices (BMPs) and Best Available Technologies (BATs) to all applicable stages of the removal method. In fact, permit conditions require the implementation of BMPs. BMPs are methods that protect environmental quality or reduce environmental impacts from *Arundo* removal activities. BMPs are most often implemented at the time work on an individual activity is conducted in the field; however, they also can be implemented at the time of planning or design. Common BMPs include post-removal bank stabilization, revegetation, and sediment traps when mechanized removal is performed (Caulk, et al. 2000). BATs are new and evolving technologies and/or methods that aid and enhance *Arundo* removal efforts. BATs that have been effectively used in exotic species management include invasive weed databases, Geographical Information Systems (GIS), and Global Positioning Systems (GPS) that help identify, map, and store the locations of *Arundo* within the landscape.

Arundo Removal Procedures within the Santa Ana Watershed

This section details the actual practice of Team *Arundo* for removal activities within the Santa Ana Watershed. SAWPA, through their consultants, EIP Associates, distributed an *Arundo* Removal Questionnaire to Team *Arundo* members. Seven groups, including Riverside County Flood Control and Water Conservation District, Orange County Conservation Corps, Riverside-Corona Resource Conservation District, Inland Empire West Resource Conservation District, Riverside County Regional Park and Open Space District, California Regional Water Quality Control Board (Region 8), and Riparian Repairs (Los Angeles County) each completed questionnaires. Orange County Water District and San Jacinto Resource Conservation District both deferred to the answers supplied by Riverside County Resource Conservation District.

The Integrated Weed Management (IWM) approach most closely describes Team *Arundo*'s methodology, although they have not yet incorporated all aspects of this approach. Team *Arundo* combines mechanical control and chemical control, and strives to incorporate elements from IWM such as landowner and nursery education. Landowner education is important to discourage landowners from planting new *Arundo* in their yard adn to encourage them to eradicate current stands, while nursery education is important because it is still legal to sell *Arundo* within California.

Mechanical Removal on the Santa Ana River

Team *Arundo* utilizes a variety of removal methods, depending on patch size and relative ground cover of *Arundo*. Typically, *Arundo* is removed from larger and fully infested patches using tractor-powered equipment such as hammer-flail, hydro-axe, chipper/shredder, and articulating arm. Chainsaws and hand tools are used for smaller patches, or when sensitive native species are present and intermixed with *Arundo*. Hand tools include loppers, machetes, brush axes, and brush cutters. Rather than completely remove *Arundo* plants (including roots) from the substrate, Team *Arundo* members will cut the stalks. Therefore, herbicide application is necessary because experience has shown that mechanical removal alone is not effective. Within the Santa Ana Watershed, herbicide is applied by hand, either by foliar spraying or using the "cut-stem" (also known as "cut-stump") approach, or a combination of elements from both approaches.

Arundo removal equipment used by Inland Empire West Resource Conservation District
Photo courtesy of Inland Empire West Resource Conservation District

Full Foliar Spraying

Full foliar spraying takes place when the cane is fully grown and up to 30 or 40 feet tall. Spraying is accomplished by using either trucks or all terrain vehicles (ATVs) mounted with 100- to 300- gallon spray tanks, smaller four-wheel drive vehicles equipped with 15- to 50-gallon tanks, or backpack sprayers with 3- to 5-gallon tanks. The pressure sprayers are usually fitted with cone TeeJet® or similar nozzles. When foliar spraying, Team *Arundo* herbicide applicators will dilute the glyphosate-based herbicide to a rate range of 1% to 5% for mature stalks and a rate range of 1% to 8% for immature stalks, as indicated by labeling requirements. All herbicide application is performed according to label specifications; indeed, it should be noted that it is a violation of Federal law to use an herbicide in a manner inconsistent with its labeling. *Arundo* that has been subjected to full foliar spraying is usually left in place.

Cut Stem

The "cut-stem" or "cut-stump" approach involves hand cutting the *Arundo* stalks, and then applying a glyphosate-based herbicide to the cut within 2 to 3 minutes to ensure adequate uptake of the herbicide before the plant seals the cut. Herbicide applicators apply a 50% to 100% solution of a glyphosate-based herbicide, in accordance with labeling requirements for this approach. Herbicide applicators typically use a finger-trigger spray bottle or backpack sprayer for this method. Although this approach requires more time and labor than foliar spraying, it is highly efficacious and significantly reduces both the amount of herbicide used and the potential for over-spray. All herbicide material is delivered to the target areas of each plant, reducing potential environmental problems.

Typically, successful control of *Arundo* requires three to four herbicide applications to re-growth during the first year following initial cutting. Overall, the rate of growth should drop by 30% after each application during the first year, leaving a 10% growth rate by the fourth application. Before the first application, resprout should reach a height of two to four feet. Resprout is monitored either monthly or biweekly, as needed. The site should then be left undisturbed until the second herbicide application, which should occur after new growth has sprouted. Typically, a second cut would be performed. Following the second cut, the area should be monitored for additional resprouting, and third and fourth applications should be performed if needed. Within the second year, the growth rate generally slows such that only 1- 2% of the area requires maintenance..

Combination of Mechanical Removal and Foliar Spraying

As an alternative method, Team *Arundo* members will chip or cut *Arundo* stalks, then return two to four weeks later when the plants are between two and four feet tall to apply a foliar spray solution of a glyphosate-based herbicide. The primary advantages of this method is that the amount of herbicide used on the fresh growth is greatly reduced from that used on the 30 to 40 foot tall *Arundo* stalks (as with full foliar spraying), and that herbicide coverage is better when the stalks are shorter and of a uniform size. One drawback associated with this method is that cutting the stalks induces the plant to re-enter the growth stage, thereby causing it to translocate less of the herbicide to the roots and rhizomes. However, as with previously described methods, supplemental treatments are generally required in *Arundo* removal, and total root kill is almost never achieved with a single application of herbicide when the plants are already established (Zembal and Hoffman 2000).

Arundo Disposal within the Santa Ana Watershed

As previously mentioned, cut *Arundo* may be removed from treatment areas through burning, chipping, or vehicular transportation. The removal of the cut cane is important due to the untreated cane's ability to re-root and colonize new areas either at the site or downstream (if washdown occurs). Cutting, chopping, and chipping is the most common method of disposal, with Team *Arundo* members using this method to dispose of 80% to 100% of the cut biomass. Pieces of cane that are cut or chopped into larger pieces may only be left on-site during the dry season in order to avoid regeneration or washdown and colonization of downstream areas. If chipped small enough, however, chipped cane can be left on-site as mulch. When chipped to pieces between ¼ inch and 1 inch in size, pieces of cane pose little threat of regenerating and/or forming debris dams downstream. Transportation of the cut biomass to areas outside of the channel is an option of last resort. The labor and cost involved is very high and local landfills tend to refuse the cuttings. Team *Arundo* members only transport about 1% to 5% of cut *Arundo* to off-site locations. Within the State of California, disposal of *Arundo* by use in commercial enterprise is still in the experimental stage and is not widely used (Nile Fiber Pulp and Paper 2002, personal communication).

Additives used within the Santa Ana Watershed

Team *Arundo* members will add adjuvants to tank mixtures prior to spraying. Adjuvants are materials that aid in the application of herbicides, and include non-ionic surfactants, dyes, and seed oils. The rate ranges must be in accordance with herbicide label instructions for adjuvant use. These additives include the following:

- **Non-ionic surfactants:** Used to increase the effectiveness of the herbicide, used to provide more uniform coverage by decreasing surface tension of spray solutions, thus aiding in penetration (e.g., LI 700®, Pro-Spreader®).

- **Seed oil:** Spray adjuvant designed to replace non-ionic surfactants, serves similar functions of decreasing surface tension and aiding in penetration (e.g., MSO seed oil®, Can-hance seed oil®).

- **Dyes:** Used to aid in uniform spraying, dyes mark the areas that have been sprayed with herbicide, helping applicators to avoid skipping areas or overlapping spray efforts (e.g., Bulls-eye®).

Chipping of *Arundo* by Inland Empire West Resource Conservation District
Photo courtesy of Inland Empire West Resource Conservation District

SECTION FIVE

Process After Removal

Customarily, treated sites on the Santa Ana River are left to reseed or revegetate naturally with mulefat, willow, cottonwood, and native forbs. Natural regeneration plays the dominant role in the maintenance of native riparian vegetation where natural flood processes still operate. Individual willows cast thousands of wind and water-borne seeds, and the river deposits enough of them in suitable growing sites to keep this dynamic habitat in constant regeneration. This is the natural state in slow driven ecosystems. Furthermore, in most areas where *Arundo* has been removed, it has been intermixed with native trees and shrubs that grow expansively with the reduced competition, eventually filling any voids (Zembal and Hoffman 2000).

Post *Arundo* removal: Successful riparian restoration in San Timoteo Canyon

Photo courtesy of EIP Associates

Generally speaking, revegetation following *Arundo* removal within the Santa Ana Watershed is unnecessary and counter-indicated. Revegetation is expensive, time-consuming, and often unsuccessful. In few cases, it could be desirable to plant cuttings or rooted material; selective planting may help reduce *Arundo* re-infestation by helping native plants establish and outcompete the non-native plants. However, in such a large, dynamic riparian community as the Santa Ana River Watershed, extensive replanting should not be necessary. In fact, revegetation efforts on the Santa Ana River over the past 20 years have been largely problematic and unsuccessful in the long term. The river has removed planted trees and shrubs through scour and sediment deposition, or the planted trees have been replaced by giant reed (Zembal and Hoffman 2000).

Areas should be replanted with native species on a case-by-case basis and only under particular circumstances. Revegetation may be desirable, for example, if *Arundo* removal occurs in an area with very unstable banks that require immediate erosion control or if the *Arundo* removal site is highly visible and aesthetics is an important consideration. Typically, when Team *Arundo* does revegetate, they use willow, mulefat, cottonwood, or elderberry. One Team *Arundo* member recommends waiting to revegetate until fall-spring of the second year after removal. As previously mentioned, proper herbicide application should result in a slowing of *Arundo* growth rate to 1-2% of the area by the second year. This lower treatment area means that remaining *Arundo* will have limited ability to compete with the native species, resulting in a more productive revegetation effort.

SECTION SIX

Permit and Regulatory Compliance for *Arundo* Removal

Applicable permits and regulatory compliance are measures identified in this section. While implementing the *Arundo* Removal Program, specific programs and measures discussed herein must be followed. Obtaining current permits and adhering to the permit requirements are the individual responsibility of each Team *Arundo* member.

See Table 2 for a listing of required permits and regulatory compliance. According to federal law, herbicide applicators must comply with the label requirements and instructions for each herbicide used. Appendix C contains the labels and material safety data sheets (MSDS) for herbicides commonly used for *Arundo* removal within the Santa Ana Watershed. The MSDS provides information to supplement label requirements, such as toxicity and ecological data.

▪ Table 2: Permitting And Regulatory Compliance Required For Arundo Removal Within The State Of California

Law Or Regulation	Regulating Agency	Applicable Document	Type Of Permit Required
Federal Insecticide, Rodenticide, and Fungicide Act (FIFRA)*	US Environmental Protection Agency	Herbicide product label and MSDS sheet	No permit needed; herbicide applicators must comply with herbicide labels
National Pollution Discharge Elimination System NPDES*	State Water Resources Control Board	Water Quality Order No. 2001-12-DWQ: Statewide NPDES Permit for Discharges of Aquatic Pesticides to Surface Waters of the United States	This General Permit applies to entire State of California. However, General Permit users must file a Notice of Intent to Comply with the Terms of the NPDES General Permit
California Food and Agricultural Code *	California Department of Pesticide Regulation	Qualified Applicator's License and/or Qualified Applicator's Certificate	Statewide, a permit is needed only for restricted use materials (glyphosate is not a restricted use material. However, confirm with local County Agricultural Commissioners as local regulations can vary).
California Environmental Quality Act (CEQA)	Governor's Office of Planning and Research, State Clearinghouse	Categorical Exemption	Individual; SCIWP Arundo removal occurs under Categorical Exemption filed by SAWPA
California Fish and Game Code Section 1603	California Department of Fish and Game	Lake or Streambed Alteration Agreement	Individual (agencies removing Arundo must negotiate this permit)
Federal Clean Water Act, Section 401	California Regional Water Quality Control Board	Clean Water Act Section 401 Water Quality Certification	Individual (agencies removing Arundo must negotiate this permit)
Federal Clean Water Act, Section 404	US Army Corps of Engineers	Regional General Permit No. 41 for Removal of Invasive, Exotic Plants	General Permit No. 41 covers Southern California (Los Angeles District)

*Applies only to *Arundo* removal involving herbicide application

Federal Insecticide, Fungicide, and Rodenticide Act

Of three federal laws that regulate pesticide use in the United States, the primary law is the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA requires that all pesticides sold or distributed in the U.S. be registered with the Environmental Protection Agency (EPA). Although EPA oversees pesticide registration, individual states have the enforcement responsibility to regulate pesticide use. Each state must demonstrate that its regulations equal or exceed those of EPA, or risk losing their enforcement authority. The State of California does have strict regulations, requiring that pesticides be registered under the California system before use within this state (Tu, et al. 2001). For Santa Ana Watershed *Arundo* removal efforts, no specific permit is required under this law. However, herbicide users must follow label requirements.

The California Department of Pesticide Regulation (DPR) and the County Agricultural Commissioners (CACs) regulate the sale and use of pesticides in California. However, glyphosate-based herbicides are not restricted use materials and do not require use permits. The DPR's role in the permit process is to conduct scientific evaluations of potential health and environmental impacts and provide commissioners with information in the form of suggested permit conditions. DPR's suggested permit conditions reflect the minimum measures necessary to protect people and the environment. CACs use this information in their evaluation of local conditions to set site-specific limits in permits. Local CACs can require permits for non-restricted use materials.

DPR also issues Qualified Applicator's Licenses and Qualified Applicator's Certificates to individuals that use or supervise the use of State restricted use herbicides within the State (Department of Pesticide Regulation 2001). Although glyphosate is not a State restricted use herbicide, each Team Arundo member agency removing *Arundo* and applying herbicides has individuals with these permits on staff.

National Pollution Discharge Elimination System and Pesticide Permits

On March 12, 2001, the Ninth Circuit Court of Appeals ruled that discharges of pollutants from the use of aquatic pesticides to waters of the United States require coverage under a National Pollution Discharge Elimination System (NPDES) permit (*Headwaters, Inc. v. Talent Irrigation District*). The *Talent* decision was issued just prior to the major season for applying aquatic pesticides (spring/early summer). Because of the serious public health, safety, and economic implications of a delay in such applications, the State Water Resources Control Board (SWRCB) developed a General Permit on an emergency basis in order to provide coverage for broad categories of aquatic pesticide use in California. This permit, which was authorized on July 19, 2001, expires on January 31, 2004 (SWRCB 2001). Agencies applying herbicides under the General Permit must file a Notice of Intent to Comply with the Terms of the Statewide General NPDES Permit for Discharges of Aquatic Pesticides to Surface Waters of the United States.

Coverage under this General Permit is available to public entities for the application of aquatic pesticides for resource or pest management into waters of the United States. This coverage is based on the provisions of the SWRCB's *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (the State Implementation Policy, or SIP), which allows categorical exceptions from meeting priority pollutant criteria/objectives for resource or pest management control measures conducted by public entities. The General Permit is available to all public entities regardless of legal structure, including mutual water companies, public water purveyors, investor-owned utilities, and homeowners' associations (SWRCB 2001).

The General Permit covers the uses of properly registered and applied aquatic pesticides. The General Permit does not cover indirect or non-point source discharges from agricultural or other applications of pesticides to land that may be conveyed in storm water or irrigation runoff, nor does it cover applications of pesticides that are not registered for use on aquatic sites (SWRCB 2001). The General Permit requires that the dischargers must comply with all pesticide label instructions, DPR and the Department of Health and Safety (DHS) regulations, and any Use Permits issued by the CACs. It also specifies the mandatory steps that must be followed to identify and implement appropriate Best Management Practices (BMP) that are designed to maximize efficacy of control efforts and minimize adverse impacts to the environment. These steps are:

1. *Preliminary Site Evaluations.* The discharger will conduct a site inspection to verify the need for treatment, options to treatment (including non-toxic and less toxic alternatives), and suitability of the site for treatment.
2. *Alternative Control Measures.* The discharger will evaluate other available BMPs and alternative control measures to determine if there are feasible alternatives to the selected aquatic pesticide application project that could reduce potential water quality impacts.
3. *Secondary Site Evaluations and Pre-Treatment Monitoring.* Prior to pesticide application, the discharger will determine the type and intensity of treatment needed on a per site basis. This evaluation will include measurement and analysis of indicators (e.g., slope, vegetation coverage, water level) to provide information on potential efficacy and water quality impacts to the application site as well as downstream locations that may be impacted by movement of the chemical through the watercourse.
4. *Treatment.* Immediately prior to treatment, the discharger will examine a series of indicators and modify treatment plans accordingly. These indicators may include day length, precipitation, recreational activity, sunlight, tidal water exchange, water depth, water flows, water turbidity, and wind. If this examination indicates a potential for reduced control efficacy and/or heightened water quality impacts, the treatment will be rescheduled.
5. *Post-treatment.* The discharger will assess control efficacy and water quality impacts. The results of this assessment will be evaluated by the discharger to refine project operations through an adaptive management process (SWRCB 2001).

Pesticide applications subject to the General Permit must be consistent with the pesticide label instructions (as required by Federal law) and any Use Permits issued by the CACs. The General Permit also requires that the dischargers comply with the Monitoring and Reporting Program (MRP) that is incorporated as Attachment B of the General Permit. Dischargers are required to submit technical and monitoring reports as directed by the appropriate Regional Water Quality Control Board's Executive Officer. The MRP requires that the dischargers develop and implement Monitoring Plan (Plans) to:

1. Document compliance with the requirements of the General Permit;
2. Support the development, implementation, and effectiveness of BMPs; and
3. Demonstrate the full restoration of water quality and protection of beneficial uses of the receiving waters following completion of resource or pest management projects.
4. Identify and characterize aquatic pesticide application projects conducted by the discharger.

5. Assure that projects are monitored that are representative of all pesticides and application methods used by the discharger.

Dischargers must comply with these requirements either individually or by joining with other dischargers to participate in one or more Regional Pesticide Monitoring Program(s) (SWRCB 2001).

The agencies involved in the *Arundo* Removal Program (ARP) within the Santa Ana River are responsible for removing *Arundo* in accordance with the SWRCB's General Permit requirements for *Arundo* removal within the Santa Ana Watershed. They are also responsible for filing a Notice of Intent to Comply with the Terms of the Statewide General NPDES Permit for Discharges of Aquatic Pesticides to Surface Waters of the United States.

Endangered Species Issues

The Endangered Species Act (ESA) regulates a wide range of activities affecting plants and animals designated as endangered or threatened. By definition, an endangered species is any animal or plant listed by regulation as being in danger of extinction throughout all or a significant portion of its geographical range. A threatened species is any animal or plant that is likely to become endangered within the foreseeable future throughout all or a significant portion of its geographical range. Without a special permit, the "take" of any of these federally listed species, or their habitat, is prohibited by federal law. The term "take," as defined by the ESA, means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct. Furthermore, the term "harm" is defined by the USFWS as "an act, which actually kills or injures wildlife. Such act may include significant habitat modifications or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering." (50 CFR §17.3)

Santa Ana Sucker: federally threatened species native to the Santa Ana River
Photo courtesy of SAWPA

Within the Santa Ana River Watershed there are ten federally and/or state listed species that could be affected by activities associated with the ARP. Of these, two are plants, the Santa Ana River woolly star (*Eriastrum densifolium*) and slender-horned spine flower (*Dodecahema leptoceras*); one fish, the Santa Ana sucker (*Catostomus santaanae*); one amphibian, the arroyo toad (*Bufo californicus*); three birds, the least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii*), and bald eagle (*Haliaeetus leucocephalus*); two mammals, the San Bernardino kangaroo rat (*Dipodomys merriami parvus*) and Stephen's kangaroo rat (*Dipodomys panamintinus*), and one insect, the Delhi Sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*). Because pure stands of *Arundo* do not provide habitat for these native species, the elimination of this low-quality habitat, as proposed by the ARP, would benefit these species through the management and restoration of lands previously occupied by *Arundo*.

While implementing the ARP, species-specific United States Fish and Wildlife Service and/ or California Department of Fish and Game protocols for listed species are employed. Specifically, listed species are avoided during *Arundo* removal activities to avoid adverse impacts and specific permits have not been obtained for each endangered or threatened species.

Additional Permits Needed

Removal of invasive exotic plants in riparian areas requires at least three additional State and federal permits from resource agencies: a Clean Water Act Section 401 water quality certification issued by the California Regional Water Quality Control Board, a Lake or Streambed Alteration Agreement issued by the California Department of Fish and Game, a Clean Water Act Section 404 permit issued by the US Army Corps of Engineers. Appendix B includes copy of each permit, with specific requirements for each permit. These requirements must be followed as part of this *Arundo* Removal Protocol. Removing *Arundo* in accordance with permit requirements is the responsibility of each Team *Arundo* member.

The California Regional Water Quality Control Board, Santa Ana Region issues a Clean Water Act Section 401 water quality certification. The permit covers removal of *Arundo*, tamarisk, castor bean, tobacco, and thistle within Santa Ana River Reaches #3, #4, and #5 (from Prado to Seven Oaks Dam) and tributaries draining to these reaches. This permit requires users to prepare a Stormwater Pollution Prevention Plan including site-specific Best Management Practices. Permit uses are also required to submit an annual monitoring plan to the RWQCB by December 31 of each year, including a summary of the areas of invasive plant removal that year, methods of removal, areas scheduled for plant removal for the next year, and results of the monitoring program.

The California Department of Fish and Game (CDFG) issues Lake or Streambed Alteration Agreements pursuant to Section 1603 of the California Fish and Game Code. CDFG requires notification of any proposed project that may impact a river, stream, or lake, including the removal of vegetation or wood from a stream. Lake or Streambed Alterations are prepared subsequent to noticing and include impact minimization measures. Team *Arundo* members are responsible for adhering to all impact minimization measures.

To fulfill the US Army Corps of Engineers' Clean Water Act Section 404 permit requirements, Team *Arundo* operates under Regional General Permit Number 41, which authorizes the mechanized removal of invasive, exotic plants from waters of the U.S. including wetlands. This permit, which expires on August 17, 2003, applies to Los Angeles, Orange, Riverside, San Diego, Imperial, Ventura, Santa Barbara, Mono, Inyo, and San Luis Obispo counties.

CEQA Compliance

In order to achieve compliance with the California Environmental Quality Act (CEQA), the Santa Ana Watershed Project Authority (SAWPA) filed a Categorical Exemption on July 24, 2001. The exemption was filed with the State of California Governor's Office of Planning and Research, as well as the Clerk-Recorders in Orange, Riverside, and San Bernardino Counties. The exemption was based on CEQA Guidelines Section 15307, Actions by Agencies for Protection of Natural Resources. The *Arundo* Removal Program is exempt from CEQA as an action taken by SAWPA (authorized by the SWRCB as the Program Manager of Proposition 13 funds) to ensure the enhancement of a natural resource, namely, riparian habitat and water resources of the Santa Ana Watershed (*Notice of Exemption: Arundo Removal Program for the Santa Ana River* 2001). No agencies, organizations, or individuals commented upon or challenged the Categorical Exemption. Groups removing Arundo within the Santa Ana Watershed work under this Categorical Exemption; other groups would need to address CEQA compliance on an individual basis.

SECTION SEVEN

Quality Assurance

Team *Arundo* members generally perform their own quality assurance. Typically, each agency or organization's field supervisor, foreman, or project manager is responsible for recording and storing treatment and monitoring documents. Team *Arundo* members provide training and continuing education for field crew and new employees; these programs vary widely for each member. In addition, the SCIWP funding included a small fund for quality assurance, which will be performed by SAWPA and their consultants, EIP Associates. Under SCIWP contracts, once an agency has undertaken *Arundo* removal in an area, it is responsible for keeping the area free of *Arundo* for a period five years. However, individual agencies' requirements are often more strict; some require removal areas to remain *Arundo* free in perpetuity.

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Appendix L-6

Santa Ana Sucker
Conservation Program

DRAFT CONSERVATION PROGRAM
FOR THE SANTA ANA SUCKER (*Catostomus santaanae*)
WITHIN THE SANTA ANA RIVER WATERSHED

Revision Date: February 24, 2003

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DRAFT: FEBRUARY 24, 2003

I. BACKGROUND AND PURPOSE

During the past 30 years, the status of the Santa Ana sucker (*Catostomus santaannae*, "sucker") has declined throughout much of its historic range. Today, this fish only occurs in limited reaches of the Los Angeles, San Gabriel, Santa Ana, and Santa Clara rivers. Owing to this decline in status, on January 26, 1999, the U.S. Fish and Wildlife Service (Service) proposed listing the sucker as a federally threatened species within its native historic range of the Los Angeles, San Gabriel, and Santa Ana river systems (64 *Federal Register* 3915). The final rule listing the sucker as a federally threatened species was published on April 12, 2000 (65 *Federal Register* 19686).

The sucker resides in the Santa Ana River (SAR) from the Rialto Drain entrance downstream to the rubber dam near Imperial Highway. Flows in the SAR are primarily comprised of municipal and industrial tertiary treated wastewater as well as seasonal precipitation and rising groundwater.

In the spring of 1999, an informal group of concerned local, regional, State, and Federal agencies formed the Ad-Hoc Santa Ana Sucker Discussion Team (Discussion Team) to assist in reconciling economic activities with the conservation of the sucker and to identify and implement conservation measures that would contribute to the survival and recovery of the sucker, primarily within the SAR watershed. Research priorities and funding sources were identified, and a three-phase, coordinated effort was initiated and completed during 1999 and 2000. These initial scientific studies concentrated on physiochemical variables, including organic and inorganic tissue analysis, migration patterns, predatory fish relationships and tributary analysis.

As an outgrowth of these studies, the Discussion Team proposed a Conservation Program (the Program) for the sucker, for an initial term of five years, commencing on the effective date of the Memorandum of Agreement (MOA) signed by the agencies participating in the Program. The Program was developed using a conservation plan authored by San Marino Environmental Associates (SMEA 1999) and funded by the Participants that are local agencies concerned with the conservation of the sucker. In conjunction with development of the Conservation Program, the Discussion Team has continued to fund several studies completed by SMEA and others.

The Program's purpose is to promote the conservation (i.e., survival and recovery) of the sucker, while providing the necessary authorization, pursuant to the Endangered Species Act of 1973 (Act), as amended, to allow for the incidental take of a limited number of suckers that is anticipated to occur when the participating agencies implement their Covered Activities. Covered Activities include operation, maintenance, repair, and reconstruction of existing projects and facilities (e.g., rebuilding existing levees for water conservation, constructed wetlands, and flood control) and the continuation of existing programs for flood control, water conservation, water treatment and discharge, protection of transportation routes, and wildlife conservation. The Program will promote sucker conservation by implementing necessary research, restoring and creating habitat, and instituting measures to avoid or minimize adverse effects to suckers during the implementation of Covered Activities.

Since the mid-1970's, formal water conveyance programs have added positive flows to the SAR. In essence, the SAR has been and will continue to be used as a water conveyance facility where surplus water is discharged into the river for conveyance downstream for beneficial use. For example, after the completion of the State Water Project in 1973, flows of high quality State water have periodically been introduced into the SAR via San Antonio Wash, which discharges into Prado Basin. Flows from this water conveyance program do not exceed 150 cubic feet per second and are purchased by the Orange County Water District (OCWD) for percolation in Orange County. Another example is the Arlington Desalter that was constructed by the Santa Ana Watershed Project Authority (SAWPA) in the early 1990s in the City of Riverside. The Arlington Desalter discharges highly treated groundwater at a rate of 10 cubic feet per second (cfs) into the SAR. In 2001, the Desalter discharged 4,848 acre feet of water into the SAR. OCWD also utilizes this water for percolation. More recently, OCWD and the San Bernardino Municipal Water District (SBMWD) entered into an agreement where up to 10,000 acre feet annually of high quality groundwater is discharged into the SAR upstream of the Rapid Extraction and Infiltration (RIX) Facility. As this water percolates to the groundwater basin, the RIX facility will pump an amount of groundwater equal to the amount that was percolated for conveyance downstream to OCWD. In another agreement, OCWD and Western Municipal Water District of Riverside County entered into a contract where 7,000 acre feet annually of high quality groundwater will be discharged into the SAR via the Riverside Canal at a rate of approximately 100 cfs. Thus, the SAR currently serves as a water conveyance facility and will likely continue this function as population increases and water supplies become more scarce.

New activities proposed by the participants, as described in Section IV(H) below, may also be Covered Activities if the Service determines that the anticipated effects associated with those activities were sufficiently addressed in the Program's biological opinion and incidental take statement. The biological opinion issued in connection with the Program and its MOA will assess effects of ongoing activities and, to the extent possible, anticipated new activities. The biological opinion will also take into consideration conservation benefits resulting from the Program. Any new activity that is determined to be not sufficiently addressed in the Program's biological opinion shall require further consultation under Section 7 of the Act. For example, the construction of new hardbank stabilization structures, a new Prado Basin water conservation program, or the construction of new wetlands or other facilities are examples of new activities that are not considered Covered Activities under this Program. Determinations on incorporating new activities, and associated impact minimization and avoidance measures, into the program will be made through the process used to adopt Annual Operating Plans.

Determinations on incorporating new activities, and associated impact minimization and avoidance measures, into the program will be made through the process used to adopt Annual Operating Plans. For example, new projects requiring further consultation include a new Prado Basin water conservation program, or the construction of new wetlands.

Some incidental take of suckers may occur in the course of carrying out the Covered Activities despite the impact minimization measures being proposed by the Participants. Implementation of the Program's research and habitat improvement measures may also result in some incidental take of suckers, even though the purpose of these actions is to contribute to the species' survival and recovery. Section 9 of the Act prohibits the "take" (e.g., harm, harassment, pursuit, injury, kill) of federally listed wildlife. "Harm" is further defined to include habitat modification or degradation where it kills or injures wildlife by impairing essential behavioral patterns including breeding, feeding, or sheltering. Take incidental to otherwise lawful activities can be authorized under sections 7 (Federal consultations) and 10 (habitat conservation plans) of the Act, or through a special rule under section 4(d) of the Act for federally threatened species. The Participants need incidental take authorization to exempt them from the existing section 9 prohibitions against take of suckers stemming from their Program's Covered Activities and conservation efforts.

Another purpose of the Program is to move towards a broad and robust conservation program within the watershed for wildlife habitat and water quality conservation in accordance with the SAR Watershed Memorandum of Understanding signed by local, State and Federal agencies, including the Department of Interior, in September 2000 and to support and supplement regional Habitat Conservation Plans (HCPs) as defined under section 10 of the Act such as the one currently being developed by Riverside County. To this end, with the approval of the Participants, the Program may include coordination with other conservation programs to address additional species and elements of the riverine ecosystem.

The final goal of the Program is to conserve the sucker in the watershed of the SAR in a comprehensive and integrated effort. This effort is needed to reverse the decreasing trend in status, restore and/or create habitat and hydrological conditions that are essential for long-term survival and recovery, and minimize the potential adverse effects from ongoing Covered Activities by the Participants.

II. PROGRAM ELEMENTS

A. Participants and the Discussion Team

Participants are defined as agencies or individuals that agree to abide by the Program and MOA and provide financial support to the Program.

The Participants for the initial term (200# - 200#) include the following seven agencies:

$ City of Riverside Regional Water Quality Control Plant

$ The Rapid Extraction and Infiltration (RIX) Facility which is operated by City San Bernardino Municipal Water Department and owned by the Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Facility
$ Orange County Water District
$ Orange County Public Facilities and Resources Department
$ Riverside County Flood Control and Water Conservation District
$ Riverside County
$ San Bernardino County Flood Control District

The Discussion Team is comprised of representatives of state and local flood control districts, departments, and resource agencies. Additionally, members of the scientific community also participate. The Discussion Team members for the 2000#-200# Plan year include the following:

$ U.S. Fish and Wildlife Service
$ California Department of Fish and Game
$ Santa Ana Watershed Project Authority (SAWPA)
$ Orange County Water District
$ Orange County Flood Control District
$ Riverside County Flood Control District
$ Riverside County
$ San Bernardino County Flood Control District
$ City of San Bernardino Municipal Water Department
$ City of Riverside (Riverside Water Quality Control Plant)
$ San Marino Environmental Associates
$ Dr. Camm Swift

B. Coverage for Incidental Take of the Sucker

The Program consists of research and adaptive management activities that are developed through an Annual Operating Plan and the Participant's Covered Activities including a set of agreed-upon measures that will be implemented to avoid or minimize adverse effects to the sucker resulting from the Covered Activities. A formal consultation will be done on these elements prior to the effective date of this Program, pursuant to section 7 of the Act, to assess effects on the sucker and other federally listed species. If it is determined that the Program will not jeopardize the continued existence of the sucker and other federally listed species, then some anticipated level of incidental take stemming from the implementation of the Covered Activities and sucker conservation efforts will be authorized and the Participants will be exempt from section 9 prohibitions against take as long they adhere to the Program and the incidental take statement.

The effects of some of the Covered Activities on other federally listed species and designated critical habitats have already been addressed in biological opinions previously issued by the Service. Appendix A provides information regarding these existing biological opinions.

The Covered Activities and measures included within the Program may be revised during annual reviews by the Participants and the Service. When Program modifications or new activities are proposed, the Service will determine through the Annual Operating Plan approval process if they can be included as Covered Activities as addressed in the Program's biological opinion and incidental take statement. If it is determined that the proposed changes may substantively alter effects to the sucker, then reinitiation of formal Section 7 consultation, pursuant to the Act, will be required if the Participants decide to formally propose the changes.

C. Program Administration

The Program is established for a term of five years (Initial Term), commencing the effective date of the MOA. Each year, the Participants and the Service shall prepare and approve an Annual Operating Plan for the coming year as well as evaluate and refine long-term (i.e., five years out) goals and objectives for research and adaptive management. Thus the Program will be "evergreen" in nature, with annual updates to the five-year strategic plan. Annual Operating Plans will commence on September 1st of each year and expire on August 31st of the following year. Proposed Annual Operating Plans for the coming year will be submitted to the Discussion Team by July 31st and shall be approved by the Participants and the Service by August 31st. In the event that an Annual Operating Plan is not approved by August 31st, the Program may be terminated by the Service or the Participants upon 60 days written notice. An Annual Operating Plan may be revised if necessary in the same manner as it was originally approved. In addition, as part of the Program, a draft "Conservation Plan" for the sucker will be prepared by the end of the Initial Term. This Conservation Plan may prove integral to future development of a Recovery Plan for the Sucker.

Notwithstanding the foregoing, without the approval of an affected Participant, neither the Participants nor the Discussion Team:

a. May amend the Program or make determinations that would increase the funding required of such affected Participant; or

b. Restrict the right of an affected Participant to terminate its participation in the Program.

The Discussion Team, Participants, and the Service will conduct the Program in an open, public, and collaborative manner with the affected constituency of agencies and interests, including, but not limited to the biologists for the various agencies that have participated in the development of the Program. They will continue to conduct monthly meetings, open to the public, on the progress of the Program and with respect to any proposed revisions or extensions. Additionally, Participants must also comply with all applicable Federal and State regulations, including the Act, National Environmental Policy Act (NEPA), California Endangered Species Act (CESA), California Environmental Quality Act (CEQA), Migratory Bird Treaty Act (MBTA), and Bald and Golden Eagle Protection Act.

The Program will be formally administered by the Participants based upon the majority action of the Participants in consultation with the Discussion Team. The Participants may select one or more public agencies to administer the Program or elements thereof. Among other things, an Administrator may be authorized by the Participants to engage scientists, consultants, and other subcontractors to undertake elements of an approved Annual Operating Plan. At this time, the Santa Ana Watershed Project Authority (SAWPA), a joint powers agency of the five major water districts within the watershed, has been appointed the Administrator of the Program subject to further action of the Participants.

The Participants shall not be obligated or liable with respect to the carrying out of the Program, including, but not limited to, the acts of the Administrator or contractors engaged by the Administrator, in excess of the funds provided or committed to. With respect to the Program, there is no partnership, joint venture or agency relationship among or with respect to the Participants or any Participant and the Administrator. In administering the Program or any element thereof, the Administrator shall act as an independent contractor and shall take responsibility with respect to the contracts, services arrangement and engagements entered into by it.

D. Funding Obligations

The Program will be funded at a minimum of $125,000 per year, commencing with the effective date of the MOA, and may increase as provided in the Annual Operating Plan for subsequent years. Each of the Annual Operating Plans will commence on September 1st of each year and end on August 31st of the following year. For the 2002 Plan year, seven agencies within the Santa Ana River Watershed have agreed to abide by the terms of the Memorandum of Agreement and will be participating financially in the Program. Although these Participants are responsible for funding the Program, other sources, including private, State and Federal funding will be solicited to augment funding from the Participants.

Unless otherwise directed by the Participants, funds for the Program will be deposited into and held in a dedicated fund (Conservation Fund) administered by the SAWPA. Funds will only be disbursed in accordance with an approved Program and budget. The expenditure of Program funds from the Conservation Fund will require approval of the Service, which will be accomplished through the approval of the Annual Operating Plan and budget.

Pursuant to this agreement, the Participants will deposit the specified amounts in the Conservation Program Fund on presentation of invoice by SAWPA. The Participants and the Service agree that the Program Administrator will provide an Annual Operating Plan accomplishment report as defined in Section II(E).

DRAFT: FEBRUARY 24, 2003

E. Reporting Requirements

Annual reports of the previous year's research and management accomplishments will be prepared by the Program Administrator. This report will be provided to the Discussion Team and the Service by December 31st of each year. The report will include two components.

The Research and Adaptive Management portion of the report will include the following information: (1) a list and brief summary of significant actions that were accomplished; (2) results and evaluation of monitoring and surveys completed as part of the research aspect of the Program; (3) location, amount and success of habitat restoration efforts if any, (4) population estimates or percent occupied habitat, (5) new and additional information concerning type of habitat occupied and reproductive biology, (6) analysis of information obtained in the previous year's research (7) assessment of the status of the sucker in the SAR and (7) recommendations for future research efforts.

The Covered Activities portion of the report will include the following information: (1) a brief summary of significant actions that were accomplished; (2) estimates of the amount of habitat disturbed and disturbance type (i.e., permanent, temporary); (3) observations of listed species or their sign onsite or in the vicinity of instream activities; (4) known or likely occurrences of incidental take; (5) updates on the implementation and completion of the Covered Activities (e.g., any water diversions or de-watering of river sections that were conducted),and any anticipated changes in the project description or implementation schedule; (6) any other pertinent data concerning success in meeting conservation measures outlined in the Program or biological opinion, and an explanation of failure to meet such measures, if any; (7) any anticipated new activities including an assessment of anticipated effects to the sucker and any minimization measures and (8) recommendations.

F. Termination of Participation

Any Participant may terminate its participation upon 90 days prior written notice to the other Participants and to the Service. Upon termination by a Participant, the terminated Participant shall have no further obligation except for funds already deposited with SAWPA or for reasonably unavoidable costs and expenses. The terminated Participant shall no longer be covered by the Biological Opinion and incidental take statement for this Program. The Participant may engage the Service in consultation for their activities through Section 7 or Section 10 of the Act as appropriate.

The Program may be terminated in the event that if, by the commencement of any Plan year, the Participants have failed to approve an Annual Operating Plan and budget for that year. In addition, the Program may be terminated at any time prior to the end of the term (including approved extensions) upon 90 days prior written notice with two-thirds approval of the Participants. If the Program is terminated, then it is expected that each Participant would initiate consultation for their project as appropriate with the Service.

The Service would review *annually or as needed* the normal/covered activities for consistency with the biological opinion. If the Service determines that the activities of an individual Participant's are no longer in accord with their project description, the Service would notify that Participant and the Army Corps of Engineers in writing and if appropriate, request reinitiation of consultation.

III. RESEARCH AND ADAPTIVE MANAGEMENT

A. Planning Guidelines

The Program's Research and Adaptive Management component will be planned across a five-year time frame. Each year, the Participants and the Service will prepare and approve a detailed plan for research and management activities that will be a part of the Program's Annual Operating Plan (see Program Administration section). The detailed plan will include specific studies, monitoring projects or habitat improvement projects that will be implemented in the coming year. These studies or habitat improvement projects must include a short description of the proposed measures. This description must include the purpose and need for the project, location, sucker abundance if any, and a detailed plan that will provide a method for evaluating the success of this project. Habitat restoration on the Santa Ana River will be a learning process, and information gained from previous projects should be used to prepare more effective habitat restoration projects in the future.

During the first two years, the program will focus at least 80 percent of the effort on research, and the remaining effort on monitoring and habitat restoration. Research will include studies investigating the biology and ecology of the species. In particular, migration, reproductive patterns, recruitment patterns and essential habitat elements will be assessed. Results from these studies will be incorporated into the Program and move the focus of the Program towards habitat restoration and monitoring. Within five years of Program initiation, the Service envisions that a majority of the effort will be focused on habitat restoration and monitoring.

B. Initial Research Accomplishments (September 1, 2000-August 31, 2001)

The Program's initial research agenda was developed by the Discussion Team, the SMEA Conservation Program and the Participants. Accomplishments from that initial work include the following:

- Determined that suckers reproduce in the SAR between March and June;

- Determined the photoperiod and water temperature in which suckers reproduce in the SAR;

$ Located breeding habitat in Sunnyslope Creek, Rialto Drain, and portions of the SAR and obtained detailed descriptions of the breeding habitat characteristics including water velocity, water depth, stream width, substrate size and stream structure;

$ Determined the number of individuals that breed at the known reproductive sites;

$ Determined the characteristics of migration, including timing and direction, and measured the environmental correlates of migration, including flow, temperature, and photoperiod.

$ Produced a progress report documenting and describing activities from the previous fiscal year.

C. Continuing Program

1. Information Needs/Research

$ The SBMWD, operator of the RIX Facility by agreement with the Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Authority (Authority), owner, and the Service will participate in a study to determine adverse effects, if any, of discharge shutdowns on Santa Ana suckers. After consultation with the Service, SBMWD retained a qualified biologist familiar with the biology of the species to conduct the study. SBMWD staff, sucker biologists and the Service will participate in study design and implementation. Funding for the sucker biologists and the study will be withdrawn from Program funds.

$ Continue the mark and recapture studies that were began in June 2001and use these to refine population estimates.

$ Prepare and implement a study that will adequately assess the status of the sucker population between Prado Dam and Imperial Highway. This study should include the following goals: (1) establish the portions of stretch occupied by sucker, (2) discover whether reproduction is occurring in this portion of the SAR, and if so, where and (3) find out if suckers are moving into this stretch from the portion of the SAR upstream of Prado Dam.

$ Additional research may be performed with the agreement of the Discussion Team.

2. Recovery Implementation

$ Prepare and implement a detailed habitat enhancement plan that includes the following aspects: (1) specific location and amount of area to be enhanced, (2) if not already known, provide an estimate of the number of suckers that currently occupy potential enhancement sites, (3) type of enhancement, (4) monitoring needs and (5) description of success criteria.

$ Identify other potential enhancement sites.

3. Monitoring

$ Monitor population size and structure between Prado Dam and Mission Street Bridge.

$ Monitor the number of breeding individuals on identified reproductive sites and the number of juveniles produced.

4. Information/Education

$ Sponsor/host a one day outreach/information seminar for agencies and interested parties regarding the scientific data and conservation plan strategies regarding the sucker.

5. Long-term Goals and Objectives (2006-2007)

- Develop successful habitat enhancement methods.
- Establish a standard procedure and database for population trend analysis.
- Identify and map occupied sucker habitat within the SAR.
- Establish an exotic species removal program. This should be done in coordination with other agencies restoration efforts on the SAR.

IV. COVERED ACTIVITIES AND IMPACT MINIMIZATION MEASURES

What follows are the specific Covered Activities (sections A-G) that are included in the Program. Covered Activities can be performed by independent contractors. Future new activities may be included in the Program if they fit into the categories of actions identified in section H below and are approved by the Service.

A. Riverside County Flood Control and Water Conservation District

Activity: Maintenance of Flood Control Structures, Flood Capacity and Low Flow Channels within the Santa Ana River

Purpose: The SAR conveys a substantial quantity of flow that deposit sediments producing sandbars, which in turn cause these flows to meander. When these flows run immediately adjacent to the groins and levees that protect adjacent industrial, commercial and residential property they jeopardize the structural integrity of the levees and groins. The low flows of the SAR will be allowed to meander no closer than 100 feet from the end of the groins. The RCFCD also removes sediment from and mows along the Sunnyslope Creek outlet and storm drains that enter the SAR. The RCFCD controls the vegetation within the Santa Ana River by mowing and application of approved herbicides to impede the growth of invasive plant species that dominate this area. The purpose of these activities is to ensure that the facility continues to function at the design capacity and that the tributary flows are not obstructed.

Location: The low flow channel maintenance, mowing and sediment removal activities will occur from 0.5 miles upstream of Main Street/Riverside Avenue Bridge to approximately 1.5 miles downstream of Mission Street Bridge

Specific Actions Covered:

Levee and Groin Protection: If river flows encroach within the groin buffer zone, they will be relocated by excavating a channel and, if necessary, constructing berms to realign flows away from levees and groins. The depth and width of the former low flow channel will be maintained when excavating the new channel. After suckers have been removed and flowing water no longer exists in the stretch of river from which water has been diverted, the RCFCD will fill the area with sediment free of trash, debris and vegetation.

Sediment Removal: The removal or spreading of localized sediment deposits or sandbars where the active flow of the river is not affected can be accomplished during any time of the year. This activity will be accomplished by maintenance crews using a backhoe, excavator, and dump truck. Any equipment used in this activity will be staged in the yard or on top of the levees or away from the active flow of the SAR. When this activity affects the active flow of the SAR it will only be completed between August and December.

Vegetation Mowing and Treatment: On both sides of the SAR, mowing operations occur for about two weeks once a year. These operations are done by RCFCD crews or mowing contractors using track and rubber tire mowing equipment. Within two weeks of mowing, the non-native vegetation is sprayed with an herbicide that has been approved for use in aquatic environments by the Environmental Protection Agency.

Channel Maintenance at Sunnyslope Creek: Sediment and vegetation will be removed as needed from the concrete portion of Sunnyslope Creek. Mowing is performed along approximately 50 feet of the grouted riprap outlet on Sunnyslope Creek, which begins 1,200 lineal feet southwest of Rio Road.

RCFCD Minimization Measures:

As a Participant of the Program, the RCFCD agrees to implement the following measures during their Covered Activities to avoid or minimize effects to suckers:

i. Flood control activities within the SAR will be conducted between August and December.

ii. Low flows in the SAR will be allowed to meander so long as the flows are kept 100 feet away from the end of constructed groins.

iii. The treatment of vegetation will only be accomplished with aquatic-approved chemicals such as Rodeo, and employees will receive training in the correct method of chemical application.

iv. During the spawning season, vegetation will not be mowed or chemically treated within a 10-foot buffer on either side of the active river flow to ensure that refugia created by vegetation will not be removed. However, outside of the spawning season, vegetation may be mowed and invasive species may be chemically treated with approved chemicals.

v. Mowing equipment will be moved across the river: (a) only as needed to perform necessary maintenance, (b) only in areas that the Service has identified as non-sensitive habitat, and (c) only outside of the sucker's spawning season (March 15 through June 15).

vi. Necessary maintenance of Sunnyslope Creek will be scheduled so that it occurs outside of the sucker's spawning season (March 15 - June 15).

vii. Maintenance activities will not be conducted within the earthen portion of Sunnyslope Creek downstream of the ungrouted riprap outlet.

viii. A qualified biologist is defined for the remainder of this document as an individual that has been approved by the Service. Approval is dependent upon the submission of the names, any permit numbers, résumés, and at least three references of people who are familiar with the relevant qualifications of the proposed biologist to the Service at least 15 days prior to the initiation of the defined activities. Proposed activities shall not begin until the biologist has been approved by the Service.

ix. Prior to diverting water or de-watering a reach of the river, a qualified biologist will implement and oversee the execution of the diversion, survey and relocation efforts, and construction monitoring of the project site. Diversions and dewatering will be done in a manner that minimizes the stranding of suckers. The affected reach(es) will be surveyed for fishes throughout the duration of the project using seining, traps, or electrofishing, as necessary. Captured suckers will be retained in river water in insulated, aerated, and covered containers. Temperature, dissolved oxygen levels and fish behavior (e.g., fish gulping at surface may indicate overcrowded conditions and subsequent low dissolved oxygen levels) will be recorded once an hour until relocation to ensure the optimum water quality is maintained. The physical condition of the suckers will be recorded including gender if detectable from external examination and the presence of external parasites or lesions. Suckers will be relocated within four hours of capture to appropriate areas in the vicinity of the affected reach(es) or other locations specified by the Service. Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fish that are captured should be retained in river water in insulated, aerated, and covered containers, as necessary. These fish will be relocated as soon as possible to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by the Service. Any exotic fish that are captured should not be released back into affected reach(es) or other areas supporting native fish.

x. The RCFCD will ensure that habitat of similar type, quantity and quality (i.e., gravel/cobble substrate) will be replaced in any new channels constructed to divert water from encroaching on groins. The amount of habitat lost and subsequently replaced will be kept to a minimum.

xi. To minimize impacts to the sucker following the initial re-channelization of low flows away from the groins and levees, the RCFCD will monitor the status and location of the active flows each year after the rainy season ends on April 30th. If it is determined that the active flows have begun to encroach into the 100-foot wide buffer area, the District proposes to redirect the flows towards the center by placing rip-rap along the banks, thereby redirecting the flows towards the center. This work will only occur if and when necessary and outside of the spawning season of any given year.

xii. Sandbags or rip-rap will be placed at the primary point of diversion and at other areas throughout the reach(es) that are susceptible to erosion caused or exacerbated by the diversion, so as to reduce local erosion, sedimentation, and siltation. Silt curtains will be used in construction zones, as necessary, to minimize increases in turbidity within the reach(es) and adjoining downstream river reaches.

xiii. If the low flow channel continues to meander towards the groins and threaten their stability, the RCFCD in consultation with the Service will incorporate adaptive management strategies in developing a plan that will further minimize effects to the sucker.

B. Riverside County

Activity: Maintenance of Flood Control Structures, Flood Capacity and Low Flow Channels within the Santa Ana River

Purpose: Sand miners have been contracted by Riverside County to excavate sand in the vicinity of River Road Bridge to provide freeboard under and around the bridge so that it will not be damaged during high SAR flows. This activity is needed only until a new bridge is constructed for River Road. A new bridge is anticipated to be completed by December 2006.

Location: The activity area extends from approximately 700 feet downstream of River Road bridge to 1000 feet upstream of the bridge to a depth of up to 13 feet in the Santa Ana River.

Specific Actions Covered:

<u>Berm Construction and Sediment Excavation</u>: An excavation area that is 600 feet wide and between 700 and 1,400 feet long will be maintained by constructing temporary sand berms. These sand berms will divert river flows around the excavation area. Sand will be removed from the excavation area using heavy machinery. Water that seeps into the excavation area will be pumped out of the area enclosed by sand berms into the main river flow.

Riverside County Minimization Measures:

As a Participant of the Program, the Riverside County agrees to implement the following measures during their Covered Activities to avoid or minimize effects to suckers:

i. Prior to diverting water within a reach of the river (i.e., building the sand berms around the excavation areas), a qualified biologist will implement and oversee (1) the execution of the diversion, (2) survey and relocation efforts, and (3) construction monitoring of the project site. Diversions and dewatering must be accomplished in a manner that minimizes the stranding of or harm to suckers. The affected reach(es) should be surveyed for fishes throughout the duration of the project using seining, traps, or electrofishing, as necessary. Captured suckers should be retained in river water in insulated, aerated, and covered containers. Temperature, dissolved oxygen levels and fish behavior (e.g., fish gulping at surface may indicate overcrowded conditions and subsequent low dissolved oxygen levels) will be recorded each hour until relocation to ensure the optimum water quality is maintained. The physical condition of the suckers will be recorded including gender if detectable from external examination and the presence of external parasites or lesions. Suckers will be relocated within four hours of capture to appropriate areas in the vicinity of the affected reach(es) or other locations specified by the Service. Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fish that are captured will be retained in river water in insulated, aerated, and covered containers, as necessary. The fish should be relocated as soon as possible to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by the Service. Any exotic fish that are captured will not be released back into affected reach(es) or other areas supporting native fish

ii. Limit construction of sand berms to between September 1 and April 30 of each year. If between May 1 and August 31, Riverside County informs the Service that the River Road Bridge is imminently threatened by high river flows that also destroy existing sand berms, Riverside County can rebuild the sand berms as soon as possible.

C. San Bernardino County Flood Control District

Activity: Maintenance of flood control structures, flow capacity, and low flow channels within the Santa Ana River (SAR).

Purpose: To protect property adjacent to the SAR from damage or loss caused during storm events. This is done by keeping flows controlled down the center of the SAR, maintaining the capacity of low-flow channels, and preventing erosion of levees. The SBCFCD proposes to provide this protection annually by removing sediment and vegetation within a 150-foot-wide, 2-3-foot-deep, low-flow channel for approximately 4 miles. Additional vegetation control beyond the 150-foot low flow channel may occur every few years on an as needed basis to prevent the capacity of the river from diminishing. The patches of mature riparian vegetation on either side of the river may be trimmed and the understory thinned. All exotic vegetation will be removed in phases annually within the four-mile river reach.

Location: These activities occur on the SAR between Tippecanoe Avenue, in the City of Redlands, and Riverside Avenue, in the City of Colton. Certain activities will also occur within the following tributaries of the SAR: Reche Canyon, Warm Creek, Twin Creek and San Timoteo Creek.

Specific Actions Covered:

<u>Low-flow channel maintenance</u>: A 150-foot-wide, low-flow channel will be maintained following the channel alignment from previous years, near the center of the SAR wash, along a 3.8-mile stretch between Tippecanoe Avenue and La Cadena Avenue. To minimize disturbance to the mature vegetation located downstream of La Cadena Avenue, the centerflow (150 ft) will follow the natural, meandering, watercourse to the Rialto Channel confluence. The low-flow channel will be excavated by the SBCFCD operations, using scrapers and dozers that will travel along the low-flow channel. Excess sediment will be placed in locations outside of the river and will be removed by private contractors.

<u>Tributary channel maintenance</u>: SBCFCD will remove sediment and vegetation to meet design grade specifications, on an as needed basis, from Reche Canyon, Warm Creek, Twin Creek, and San Timoteo Creek, up to 1000 feet along each tributary upstream of its confluence with the SAR. Exotic vegetation (e.g., giant reed) will also be removed from these tributaries. The Rialto Channel is considered by the SBCFCD to present a significant flood control risk due to its adjacency to the Rapid Extraction and Filtration (RIX) Facility. If floods overtop the banks of Rialto Channel, it could threaten the integrity of the RIX Facility's wastewater treatment ponds. Therefore, SBCFCD proposes to annually clear vegetation from the eastern bank and the main channel of Rialto Drain, while keeping the western bank vegetated. The vegetation control will be performed by the SBCFCD, using a boom mower. Once the vegetation is cut, it will be hand sprayed with an approved and permitted herbicide.

<u>Emergency Levee Maintenance</u>: The only maintenance activities anticipated between Rialto Drain confluence with the SAR and Riverside Avenue are periodic grading of the north levee road top and emergency repairs of the north levee. Emergency repairs would

consist of importing material and backfilling blowouts in the levee from the top of the levee road. Equipment will not be required to enter the river to conduct emergency repairs to the north levee, unless repairs to the toe of the slope become necessary.

SBCFCD Minimization Measures:
As a Participant of the Program, the SBCFCD agrees to implement the following measures during their Covered Activities to avoid or minimize effects to suckers:

i. No vegetation clearing or sediment removal will occur along SAR between Rialto Drain and Riverside Avenue.

ii. Sand and gravel mining operators will be required to maintain machinery outside of the riverbed.

iii. Sediment and vegetation removal will be done outside of the sucker's spawning season (March 15 - June 15).

iv. Activities within the Rialto Channel will be limited to non-spawning periods.

v. Phase sediment removal if possible.

vi. Remove and relocate suckers prior to sediment removal operations.

vii. Remove sediment in limited sections of the channel.

viii. Implement best management practices in wetted river channels to reduce turbidity.

The SBCFCD will also continue to implement the following conservation measures as a result of a previous consultation (1-6-97-F-32, April 30, 1999) on effects to other listed species:

The effects from the loss of willow habitat within the river channel will be minimized by removal of non-native vegetation within the project area. The exotic removal program will not impede or preclude passive or active native plant revegetation of the area. to A program to control/prevent trespass of off-highway vehicles into the project area will be implemented. Gravel and mining operations will be required to prevent silts and other pollutants from entering the channel. Vegetation removal will be done outside of bird nesting seasons to reduce harm and harassment to the listed bird species.

D. Orange County Flood Control District, County of Orange Public Facilities and Resources Department

Activity: Maintenance of Flood Control Structures, Flood Capacity and Low Flow Channels within the Santa Ana River

Purpose: Flood control activities are required to maintain flood control protection, provide for public safety, encourage recreation, and protect and/or restore fish and wildlife habitat features. All operation and maintenance activities of the lower SAR and Prado Dam and Basin will be in accordance with the Corps Operation and Maintenance Manual and the SAR Canyon Habitat Management Plan. All routine operations and maintenance activities are performed by the County of Orange Public Facilities and Resources Department (OCPFRD) or its authorized contractor, under the general authority of the Flood Control Act.

Location: Flood control activities are routinely conducted along 16.4 miles of river between the Orange/Riverside County line and Imperial Highway

Specific Actions Covered:

Arundo Control/Vegetation Management: Removal of giant reed will be performed by yearly cuttings and applications of herbicide that has been approved for use in the aquatic environment by the Environmental Protection Agency until the rhizome dies. This process takes at least three years, with eradication achieved by five years. Vegetation control will not require staff to enter the active flow of the SAR. Arundo removal will be divided into three reaches or phases. Phase 1 is located between the Orange County line and Gypsum Canyon Road bridge. Phase 2 is located from Gypsum Canyon Road bridge to Weir Canyon Road bridge. Phase 3 is located between Prado Dam to the Orange County line. If possible, the native material will be allowed the maximum amount of time to establish itself before the storm season. Exotics may be phased out with native planting and continued weeding. Dead plant material such as tree stumps will only be removed if there is high possibility of being washed into the channel, due to their value in erosion control. Other vegetation management activities include irrigation for planting until it is established and trimming when needed for fire safety and along trails.

Flood control structure maintenance: Structural maintenance and repair work includes repair of concrete side drains and headwalls, maintenance of recreational trail improvements, and maintenance and repair of water control gates and/or devices. Storm-related damage will be repaired by restoration of displaced riprap sections, eroded areas, and damaged slope paving. Areas where the OCPFRD is required to maintain the grouted riprap stabilization structures extend from approximately one mile upstream of Weir Canyon Road to Ball Road on the northern bank of the SAR and approximately 0.9 miles upstream of Gypsum Canyon Road down to Ball Road on the southern bank of the SAR.

Low-flow channel maintenance: Routine activities will include silt removal, flow restoration and redirection, and debris or obstruction removal when necessary. Periodic inspections by seasonal storm and security patrols should ensure quick reaction with appropriate measures to maintain the flood channel. Service roadways for the channel will also be maintained to ensure a safe travel surface and proper drainage flow toward center.

OCPFRD Minimization Measures:

As a participant of the program, the OCPFRD will implement the following measures during their Covered Activities to minimize the effects of the activities to the sucker and human environment as long as it is in accordance with the Corps' Operation and Maintenance Manual for the lower SAR:

i. Sediment will not be removed within the SAR reach between Imperial Highway and Prado Dam.

ii. The treatment of vegetation will only be accomplished with aquatic-approved chemicals such as Rodeo, and employees will receive training in the correct application of these chemicals.

iii. Activities within the active flow of the SAR will incorporate best management practices to decrease turbidity.

iv. Activities within the active flow of the SAR will occur only on an as needed basis.

v. Sandbags or rip-rap will be placed at the primary point of diversion and at other areas throughout the reach(es) that are susceptible to erosion caused by or exacerbated by the diversion so as to reduce local erosion, sedimentation, and siltation. Silt curtains should be used in construction zones, as necessary, to minimize increases in turbidity within the reach(es) and adjoining downstream river reaches.

E. City of Riverside (Regional Water Quality Control Plant)

Activity: Maintenance of Flood Control Structures, Flood Capacity and Low Flow Channels within the Santa Ana River

Purpose: Tertiary treated flow from the plant is conveyed to wetlands via an earth and sand channel instead of a pipeline because the substrate is sand 150 feet down to bedrock and thus does not provide stability needed for pipeline placement. A portion of this channel, approximately 2000 feet in length (depending on the course of the river) is protected by a sand dike directly adjacent to the river. The dike is a barrier between effluent flow and the "natural" river flow. This dike is washed out by storm flows from the SAR and associated storm drainages six to ten times a year. When the dike is breached by floods or otherwise compromised, it is rebuilt with sand from the main channel using a tracker dozer after storm waters recede.

Location: This dike begins approximately 1000 feet west of the Van Buren Boulevard Bridge and extends approximately another 2000 feet.

Specific Actions Covered:

<u>Dike maintenance</u>: The work is performed by the agricultural leaseholder of the adjacent County Parks lands. The dozer is driven from their facility to the dike by way of an established dirt road. The dozer enters the river and moves accumulated sand from the far side of the river to re-establish the dike. The reconstruction process typically takes between 5 and 40 hours depending on the severity of the storm event and the resulting damage to the dike.

City of Riverside Minimization Measures:

As a Participant of the Program, the City of Riverside agrees to implement the following measures during their Covered Activities to avoid or minimize effects to suckers:

i. The City of Riverside will remove suckers from the project site by sweeping the area with seine nets or other means prior to conducting maintenance or rebuilding activities on the sand dike between May 1st and September 30th of each year. Instream activity must be accomplished in a manner that minimizes the stranding of suckers. Individuals responsible for seining in the project area will be provided training by the Service in the proper handling of seine nets. They will also be trained in fish identification and capture, retention and relocation techniques.

If suckers are captured, they will be retained in river water in insulated, aerated, and covered containers. Temperature, dissolved oxygen levels and fish behavior (e.g., fish gulping at surface may indicate overcrowded conditions and subsequent low dissolved oxygen levels) will be recorded once an hour until relocation to ensure the optimum water quality is maintained. The physical condition of the suckers will be recorded including gender if detectable from external examination and the presence of external parasites or lesions. Suckers will be relocated within four hours of capture to appropriate areas in the vicinity of the affected reach(es) or other locations specified by our agency. Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fishes that are captured should be retained in river water in insulated, aerated, and covered containers, as necessary. The fish will be relocated as soon as possible to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by the Service. Any exotic fish that are captured should not be released back into affected reach(es) or other areas supporting native fish.

ii. The effectiveness of the capture and relocation minimization measure will be evaluated between October 1st and January 1st of the following year. Should these minimization measures not appear effective at removing suckers from the project vicinity (i.e., suckers continue to be present during activities), alternative minimization measures must be provided. Conversely, should the minimization measure show that suckers are not present in this area during the prescribed time of year, these measures will not be required for the City of Riverside activities within the SAR.

F. City of San Bernardino Municipal Water Department (Rapid Infiltration & Extraction Facility)

Activity: Wastewater Treatment Plant Operation and Maintenance

Purpose: The RIX facility provides treatment equivalent to conventional tertiary processes. Several safeguards that ensure compliance with the National Pollutant Discharge Elimination System (NPDES) permit as issued by the California Regional Water Quality Control Board (RWQCB) permit are built into the operational plan for the facility.

Location: The City of San Bernardino Municipal Water Department (SBMWD) operates a Rapid Infiltration and Extraction (RIX) Facility located adjacent to the SAR near the San Bernardino and Riverside County borders.

Specific Actions Covered:

Temporary Plant Shutdowns:	If any of the safeguards indicate that a non-compliant situation might occur, the facility is automatically shut down and cannot be restarted until the situation causing the warning message is corrected. This can lead to down times of 20 minutes to several hours where no water is discharged. Shutdowns that result in periods of no discharge also occur due to routine maintenance on facilities, training, or power failures.
Water Quality Sampling:	The RIX facility samples water quality for temperature and dissolved oxygen and pH within the SAR on a weekly basis. This requires that they cross the SAR on a daily basis to collect samples. Quarterly they grab water from the SAR for laboratory analysis.
Piezometer Maintenance:	Twelve piezometers that measure water level have been installed around the border of the RIX facility between La Cadena Avenue and Riverside Avenue in the river channel. Readings must be obtained from these devices on a regular basis. The frequency of crossings will be determined and described in the operations and maintenance plan for the RIX facility. The monitoring and the maintenance of these devices result in river crossings by vehicle in non spawning season and by walking during spawning seasons. Vehicles will cross the river driving slower than five miles per hour.

SBMWD Minimization Measures:

The operators of the RIX facility have agreed to implement the following measures as a Participant of the Program:

i. The SBMWD will perform maintenance activities outside of sucker spawning season (March 15 through June15) to the maximum extent possible.

ii. The SBMWD and the Service will participate in a study to determine adverse effects, if any, of discharge shutdowns on Santa Ana suckers. SBMWD retained a qualified contractor, who is acceptable to the Service and familiar with the biology of the species, to conduct the study. SBMWD staff, sucker biologists and the Service will participate in study design and implementation. Funding for the sucker biologists and the study will be withdrawn from Program funds. The final study results will trigger a meeting involving SBMWD, the Authority and the Service. The study results will be used to determine (1) if conservation measures are necessary, (2) design effective minimization measures, if any are needed, and (3) determine the funding mechanism for minimization measures, if any are needed. The commitment to the Program will not require the SBMWD or the Authority to violate Federal or State laws or regulations, limit the SBMWD's or the Authority's ability to appeal minimization measures recommended by the Service, or limit the right of the SBMWD or the Authority to sell recycled water from the RIX facility.

G. Orange County Water District

Action: Maintenance of Constructed Wetlands for Water Treatment

Purpose: OCWD maintains a sand dike that diverts 50 percent of the flow of the SAR into constructed wetlands. The diversion is an earthen berm that is comprised of approximately 1,800 cubic yards of fill positioned across the river and measures approximately 30-feet long, 20-feet wide, and 6 to 10-feet high. Maintenance of the wetland ponds involves annual reconstruction of levees, berms, and roads.

Location: The diversion into the constructed wetlands in the Prado Basin is located just west or downstream of the River Road Bridge, just southwest of the City of Norco and the Riverside County line.

Specific Actions Covered:

Dike maintenance and reconstruction: The diversion is constructed from onsite materials after the winter rains and between storms, up to 6 times per year. Culverts are placed at the bottom of the dike to allow 50 percent of the flow to continue along the river channel and to accommodate fish passage.

Maintenance of wetland ponds: The ponds are dried out on a three-year rotation to reduce the coverage by rushes and cattails and as needed for repairs of the water conveyance system of ditches, weirs, pipes, and culverts.

Minimization Measures:

As a Participant of the Program, the OCWD agrees to implement the following measures during their Covered Activities to avoid or minimize effects to suckers:

i. A qualified biologist will implement and oversee the execution of survey and relocation efforts within the project site. Instream activity must be accomplished in a manner that minimizes the stranding of or harm to suckers, therefore suckers will be captured and relocated to a previously designated area upstream of this activity. Prior to the seining and relocation effort, a blocking net will be placed immediately upstream of the project area. Captured suckers should be retained in river water in insulated, aerated, and covered containers. Temperature, dissolved oxygen levels and fish behavior (e.g., fish gulping at surface may indicate overcrowded conditions and subsequent low dissolved oxygen levels) should be recorded once an hour until relocation to ensure the optimum water quality is maintained. The physical condition of the suckers should be recorded including gender if detectable from external examination and the presence of external parasites or lesions. Suckers will be relocated within four hours of capture to appropriate areas in the vicinity of the affected reach(es) or other locations specified by the Service. Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fish that are captured should be retained in river water in insulated, aerated, and covered containers, as necessary. The fish should be relocated as soon as possible to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by the Service. Any exotic fish that are captured should not be released back into affected reach(es) or other areas supporting native fish.

ii. The OCWD will install fish screens or other mechanisms approved by the Service to minimize the movement of suckers into the wetland ponds. The OCWD will also establish return passage from the diversion channel to the main SAR channel.

iii. The OCWD will establish upstream and downstream fish passage at the diversion dike within the main SAR channel by redesigning the culvert system or providing a gravel-cobble fish bypass. Any redesign of the culverts or the design of a bypass must be approved by the Service.

Activity: Groundwater Recharge

Purpose: The OCWD has been capturing and percolating river water since 1933 with a system of earthen “T” levees and off-stream percolation “lakes.” The purpose of the “T” levees is to maximize percolation rates into underground aquifers by forcing the water through a maze-like system, thus slowing flow and enlarging the surface area over which the water flows. The “T” levees must be rebuilt after major storm events.

Location: These activities occur in Orange County between the first rubber dam in the SAR downstream of Imperial Highway and Ball Road in the City of Anaheim, a distance of approximately 6 miles and covering a 1,000-acre area.

Specific Actions Covered:

<u>Levee construction and maintenance</u>: A bulldozer enters the SAR through various access

roads and pushes sand from the bottom into a three-foot levee. Depending on the number of storm events, the levees are rebuilt two to five times during the winter from November through March.

Sediment removal: The OCWD also continually maintains the river channel downstream of the second rubber dam by periodically removing about a half inch of sediment from the river bottom with a bulldozer.

Minimization Measures:

As a Participant in the Program, the OCWD will implement the following additional measures during their Covered Activities to minimize the effects of the activities to the sucker and human environment:

i. The OCWD and the Service in coordination with the Program and other Participants will design and implement a research program that will assess the abundance of the sucker in the stretch of the SAR between Prado Dam and the drop structure downstream of Imperial Highway. This study will identify sites that can be accessed and provide appropriate conditions for surveys (i.e., shallow, low flow, appropriate substrate, etc.). Upon completion of the study the OCWD will initiate appropriate action to reduce adverse effects to the sucker. These actions could be removal and relocation of suckers, establishment of a fish barrier and/or habitat restoration.

ii. Immediately after high flows, suckers that have been washed down the lower reaches of the river below the Imperial Highway rubber dam will be captured and physically transported to a site designated by the Service. A qualified biologist will implement and oversee the execution of survey and relocation efforts within the project site. Captured suckers should be retained in river water in insulated, aerated, and covered containers. Temperature, dissolved oxygen levels and fish behavior (e.g., fish gulping at surface may indicate overcrowded conditions and subsequent low dissolved oxygen levels) should be recorded once an hour until relocation to ensure the optimum water quality is maintained. The physical condition of the suckers should be recorded including gender if detectable from external examination and the presence of external parasites or lesions. Suckers will be relocated within four hours of capture to appropriate locations specified by the Service. Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fish that are captured should be retained in river water in insulated, aerated, and covered containers, as necessary. The fish should be relocated as soon as possible to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by the Service. Any exotic fish that are captured should not be released back into affected reach(es) or other areas supporting native fish.

H. Future Program Participants and Activities

New activities proposed by the participants may be added to the list of Covered Activities if the Service determines that the anticipated effects associated with those activities were sufficiently addressed in the Program's biological opinion and incidental take statement. The biological opinion issued in connection with the Conservation Program and its MOA will assess effects of ongoing activities and, to the extent possible, anticipated new activities. The biological opinion will also take into consideration conservation benefits resulting from the Program. Any new activity that is determined to adversely affect suckers in a manner not sufficiently addressed in the Program's biological opinion, shall require separate consultation under Section 7 or Section 10 of the Act, as appropriate. For example, a new activity could be the inclusion of water conveyance activities, such as the addition of flow to the SAR. As the human population increases and water supplies become more scarce, the utilization of the SAR as a water conveyance facility is expected to increase. However, neither the construction of hardbank stabilization facilities or withdrawals of water as a result of water conveyance activities would be included as Covered Activities under this Program.

The Covered Activities categories are described below. The minimization measures for each of the Covered Activities that prospective Participants must agree to implement will be more fully defined after the Participant provides a project description specific to their activities. Additional minimization measures may vary depending on the intensity, frequency and geographic location of the activity. The prospective Participant's activity may be included as part of the activities covered under the Program after they have provided a formal written request.

Category I: Maintenance of existing flood control structures and recharge basins.

Existing flood control structures are defined to include levees, groins, riprap bank stabilization structures, drop structures and grade stabilizers. Maintenance does not include the construction of new flood control structures. Maintenance of existing flood control structures include repairing or replacing rip-rap where it has been destroyed through floods, erosion or vandalism and replacing compromised dikes in the same location. Maintenance of recharge basins will consist of rebuilding or repairing levees after storm events or after they have been otherwise compromised.

A second aspect of maintenance can be the modification or replacement of hard bank stabilization structures and drop structures, when they fail or are otherwise compromised, with equal or less impactive structures. Possible modifications or replacements include providing bank stabilization by adding riparian vegetation, changing the slope of the bank to reduce the probability for slope failure, implementing soil bioengineering, maintaining or returning the floodplain to an undeveloped state or modifying channel width. Drop structures may also be modified by providing fish passageways to improve connectivity for the sucker.

General minimization measures for Category I activities:

1. The Participant must remove and relocate suckers prior to and during instream activities occurring in stretches of the SAR that have known concentrations of sucker. A qualified biologist will implement and oversee the execution of survey and relocation efforts within the project site. Instream activity must be accomplished in a manner that minimizes the stranding of or harm to suckers, therefore suckers will be captured and relocated to a previously designated area upstream of this activity. Prior to the seining and relocation effort, a blocking net will be placed immediately upstream of the project area. Captured suckers should be retained in river water in insulated, aerated, and covered containers. Temperature, dissolved oxygen levels and fish behavior (e.g., fish gulping at surface may indicate overcrowded conditions and subsequent low dissolved oxygen levels) should be recorded once an hour until relocation to ensure the optimum water quality is maintained. The physical condition of the suckers should be recorded including gender if detectable from external examination and the presence of external parasites or lesions. Suckers will be relocated within four hours of capture to appropriate areas in the vicinity of the affected reach(es) or other locations specified by the Service. Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fish that are captured should be retained in river water in insulated, aerated, and covered containers, as necessary. The fish should be relocated as soon as possible to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by the Service. Any exotic fish that are captured should not be released back into affected reach(es) or other areas supporting native fish.

2. Activities within areas of particularly sensitive habitat, including the unimproved portion of Sunnyslope Channel, Rialto Drain, and any other areas defined by the Program to be particularly important to the survival and recovery of the sucker will require additional minimization measures or may be prohibited.

Category II: Low flow channel maintenance

To maintain capacity of the low flow channel, sediment may be periodically removed from the existing low flow channels.

General Minimization Measures for Category II activities:

1. Avoid sediment removal during spawning season.

2. Use best management practices to reduce turbidity during instream activities.

3. Participate through funding or other measures in preparing a sediment management plan for the SAR.

4. The Participant must remove and relocate suckers prior to and during instream activities occurring in stretches of the River that have known temporal and/or spatial concentrations of sucker. A qualified biologist will implement and oversee the execution of survey and relocation efforts within the project site. Instream activity must be accomplished in a manner that minimizes the stranding of or harm to suckers, therefore suckers will be captured and relocated to a previously designated area upstream of this activity. Prior to the seining and relocation

effort, a blocking net will be placed immediately upstream of the project area. Captured suckers should be retained in river water in insulated, aerated, and covered containers. Temperature, dissolved oxygen levels and fish behavior (e.g., fish gulping at surface may indicate overcrowded conditions and subsequent low dissolved oxygen levels) should be recorded once an hour until relocation to ensure the optimum water quality is maintained. The physical condition of the suckers should be recorded including gender if detectable from external examination and the presence of external parasites or lesions. Suckers will be relocated within four hours of capture to appropriate areas in the vicinity of the affected reach(es) or other locations specified by the Service. Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fish that are captured should be retained in river water in insulated, aerated, and covered containers, as necessary. The fish should be relocated as soon as possible to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by the Service. Any exotic fish that are captured should not be released back into affected reach(es) or other areas supporting native fish.

5. Sediment removal and other low flow channel maintenance activities within the unimproved portion of Sunnyslope Channel, Rialto Drain, and any other areas defined by the Program to be particularly important to the survival and recovery of the sucker of the SAR may be prohibited due to the sensitive nature of the habitat and the likelihood of extreme detrimental effects to the sucker.

Category III: Exotic vegetation removal

The removal of exotic vegetation is likely important for the recovery of the sucker within the SAR. There are ongoing efforts within the SAR watershed to remove exotic vegetation, and in particular, giant reed, (*Arundo donax*). These existing programs should be implemented in a coordinated manner to ensure the most effective removal and the least disturbance to the SAR and the sucker.

General Minimization Measures for Category III activities:

1. Avoid disturbance to vegetation along the riverbanks between March and August.

2. In areas where non-native species form monotypic stands, it may be necessary to plant native vegetation.

Category IV: Operation and Maintenance of Wastewater Treatment Plants

As human population growth continues, wastewater treatment plants will likely be constructed and contribute water to the SAR. These wastewater treatment plants may be beneficial to the sucker as treated wastewater contributes to the perennial flow of the SAR. Although the construction of wastewater treatment plants will not be included in the Program, the operation and maintenance of wastewater treatment plans can be incorporated into the Program.

General Minimization measures for Category IV activities:

1. Ensure water quality levels appropriate to the sucker in the SAR. Water quality standards will be consistent with those required by the California Regional Water Quality Control Board, Santa Ana Region. The Service will work with the California Regional Water Quality Control Board, Santa Ana Region to ensure that those standards are consistent with the conservation of the sucker.

Category V: Operation and Maintenance of Created Wetlands

Constructed wetland are commonly used to remove excess nitrogen from the system and provide wildlife values. Wetlands provide beneficial habitat for birds and other riparian dependent species. The operation and maintenance of wetlands are routine activities that can be covered under the Program. The construction of new wetlands will not be included as a covered activity.

General Minimization Measures for Category V activities:

1. Maintain constructed wetlands so that breeding grounds for non-native predators and competitors of native fish are minimized.

2. Ensure that the influent and effluent channels to and from constructed wetlands have mechanisms to reduce immigration to the wetlands by the sucker and emigration of non-native predators and competitors into the main river channel.

Conservation measures to avoid and minimize potential adverse effects to the sucker during the proposed Covered Activities, including funding to increase the scope and/or extent of Program activities, must be reviewed and approved by the Service. The prospective Participant must commit to transferring the agreed-upon funds to the Program account prior to commencing or re-commencing the proposed Covered Activity.

The Conservation Program may incorporate future Participants as a part of their Section 7 consultation or Section 10 HCP with the Service. Participants, the Service, and the Discussion Team must agree to their participation and the Agreement must be offered and signed by the prospective Participant prior to the conclusion of any subsequent section 7 consultation.

V. APPENDIX

A. Relevant Biological Opinions and Concurrence Letters

Biological Opinion FWS-SB-2371.2, River Road Sand Mining Biological Opinion, Riverside County, California, April 30, 2002.

Amendment to Biological Opinion, FWS-SB-2371.3, Amendment to River Road Sand Mining Biological Opinion, Riverside County, California, May 15, 2002.

Concurrence Letter, 1-6-96-I-318, Consultation on the River Road Bridge Protection Project, Santa Ana River, Prado Basin, Riverside County Transportation Department, Riverside County, California, September 19, 1996.

Biological Opinion 1-6-97-F-32, Regional General Permit Authorization to Conduct Routine Channel Maintenance Along the Santa Ana River, San Bernardino County, California, April 30, 1999.

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USFWS Biological Opinion (FWS-SB-909.6) for USACE Prado Basin, Reach 9, Norco Bluffs EIS/EIR, 2001

ESA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
2730 Loker Avenue West
Carlsbad, California 92008

In Reply Refer To:
FWS-SB-909.6

DEC 05 2001

Colonel Richard G. Thompson
District Engineer
U.S. Army Corps of Engineers, Los Angeles District
P.O. Box 532711
Los Angeles, California 90053-2325

Attn: Ruth Villalobos and Hayley Lovan, Environmental Planning Branch

Re: Biological Opinion on the Prado Mainstem and Santa Ana River Reach 9 Flood Control Projects and Norco Bluffs Stabilization Project, Orange, Riverside, and San Bernardino Counties, California

Dear Colonel Thompson:

This document transmits our biological opinion based on our review of the proposed Prado Mainstem, Norco Bluffs, and Santa Ana River Reach 9 flood control and bank stabilization project, and its effects on federally threatened and endangered species and their critical habitats, in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The biological opinion considers the possible effects of the proposed action on the federally threatened Santa Ana sucker (*Catostomus santaanae,* "sucker"), endangered least Bell's vireo (*Vireo bellii pusillus*, "vireo") and its designated critical habitat, and endangered southwestern willow flycatcher (*Empidonax traillii extimus*, "flycatcher"). Your August 14, 2000, letter requesting the initiation of formal consultation on the revised project was received by us on August 16, 2000.

Your request for consultation did not include the federally threatened bald eagle (*Haliaeetus leucocephalus*). As many as four bald eagles were present within the action area during the winter of 2000-2001. All four eagles were detected within pond and marsh habitats in the central and northern portions of the Prado Basin (i.e., outside of the proposed construction areas). To ensure compliance with pertinent State and Federal statutes protecting the bald eagle, your agency has agreed to avoid any project-related activities that would result in "take" (per the prohibitions prescribed by the Bald Eagle Protection Act) or adversely affect the species (per the regulations implementing section 7 of the Act). Specifically, your agency has indicated that "... [i]n an attempt to avoid even ... minor impacts [to the species], the Corps [U.S. Army Corps of Engineers] will survey for bald eagles immediately prior to fall/winter construction near flowing water, and for golden eagles prior to initiating activities at Borrow Area #2. If eagles are foraging in the vicinity, the Corps will coordinate with the Contracting Officer Representative and FWS [U.S. Fish and Wildlife Service] to develop appropriate avoidance measures" (Corps 2001a). Based on the best scientific information available, and the above-mentioned avoidance measures that will be implemented as part of the project description, we concur with your determination that the proposed action is not likely to adversely affect the bald eagle. As a result, this species will not be considered further in this biological opinion.

Though the federally listed arroyo toad (*Bufo microscaphus californicus*) and California red-legged frog (*Rana aurora draytoni*) are known from the Santa Ana River watershed, neither species was detected in the proposed action area during focused surveys in 1997, 1998, and 1999 (Corps 2000). Therefore, we concur with your determination that the proposed action is not likely to adversely affect these species. As a result, these species will not be considered further in this biological opinion.

Subsequent to the transmittal of the biological assessment (BA) for the project, critical habitat for the coastal California gnatcatcher (*Polioptila californica californica*, "gnatcatcher") was designated (65 *Federal Register* 63680). A small portion of this designated critical habitat occurs in the proposed project for Reach 9 (Component C). As indicated in the Supplemental Environmental Impact Statement (SEIS; Corps 2000), approximately 0.9 acres of upland scrub ("manufactured" coastal sage scrub) will be temporarily disturbed for vehicle access, and 1.5 acres of coyote brush scrub will be permanently destroyed during bank stabilization. The SEIS and BA concluded that this vegetation is unlikely to provide suitable habitat for the gnatcatcher, and that the proposed action is not anticipated to have any measurable effect on the species. Therefore, your agency concluded that "... the small impact on unsuitable vegetation would not adversely modify the gnatcatcher's designated critical habitat."

Though the proposed action will alter approximately 0.9 acres of designated critical habitat with primary constituent elements for the gnatcatcher, this alteration will not adversely affect the proper functioning of this critical habitat as a corridor connecting gnatcatcher occurrences in Los Angeles, Orange, Riverside, and San Bernardino counties. We reached this finding based on the following reasons: 1) the proposed action will only affect a small fraction of the designated critical habitat in this linkage; 2) temporarily disturbed primary constituent elements will be restored following construction in the area; and 3) nearby annual grassland sites (e.g., construction borrow areas) within the project area will be restored with primary constituent elements following construction activities.

This biological opinion was prepared in large part using the following information:

- 1988 Phase II GDM on the Santa Ana River Mainstem Including Santiago Creek; Main Report & Supplemental Environmental Impact Statement. U.S. Army Corps of Engineers, Los Angeles District, Los Angeles, California (Corps 1988);

- Biological opinion and conference (#1-6-88-F-6) dated June 22, 1989, on the Santa Ana River Project in San Bernardino, Riverside, and Orange counties; U.S. Fish and Wildlife Service; Laguna Niguel, California (U.S. Fish and Wildlife Service 1989);

- July 2000 Supplemental Draft Environmental Impact Statement and Project Draft Environmental Impact Report for Prado Basin and Vicinity, including Stabilization of the Bluff Toe at Norco Bluffs (State Clearinghouse No. 97071087). Planning Division, Environmental Resources Branch, U.S. Army Corps of Engineers, Los Angeles District. Drafted by Larry Munsey International, Tustin, California (Corps 2000);

- July 2000 Draft Biological Assessment, Santa Ana River Improvements in the Prado Basin and Vicinity Including Stabilization of the Bluff Toe at Norco Bluffs, Riverside, San Bernardino, and Orange Counties. Prepared for the U. S. Fish and Wildlife Service by the U. S. Army Corps of Engineers, Los Angeles District, Planning Division, Environmental Resources Branch, Los Angeles, California;

- Amendment (#1-6-88-F-6-R1) dated September 19, 2000, to the biological opinion and conference on the Santa Ana River Project in San Bernardino, Riverside, and Orange counties; U.S. Fish and Wildlife Service, Carlsbad, California;

- September 26, 2000, letter commenting on the DSEIS/DEIR from the Department of Interior to the U.S. Army Corps of Engineers, Los Angeles District (Interior Letter);

- November 1, 2000, letter providing comments on the draft biological assessment from the U.S. Fish and Wildlife Service, Carlsbad, California;

- March 12, 2001, letter from the U.S. Fish and Wildlife Service, Carlsbad, California to the U.S. Army Corps of Engineers, Los Angeles District;

- May 29, 2001, letter from the U.S. Army Corps of Engineers, Los Angeles District, to the U.S. Fish and Wildlife Service, Carlsbad, California (Corps 2001a);

- June 13, 2001, transmittal from the U.S. Army Corps of Engineers, Los Angeles District, to the U.S. Fish and Wildlife Service, Carlsbad, California (Corps 2001b);

- September 19, 2001, transmittal (Final Comments on Preliminary Biological Opinion) from the U.S. Army Corps of Engineers, Los Angeles District, to the U.S. Fish and Wildlife Service, Carlsbad, California (Corps 2001c);

- September 10, 2001 transmittal (GIS-Assisted Analysis to Identify Impacts to Riparian Vegetation From Controlled Releases from the Prado Dam, September 9, 2001) from the U.S. Army Corps of Engineers, Los Angeles District, to the U.S. Fish and Wildlife Service, Carlsbad, California (Corps 2001d);

- September 23, 2001, letter from the County of Orange, Public Facilities and Resources Department to the Corps of Engineers regarding the Santa Ana River Habitat Management Plan (County of Orange 2001);

- October 10, 2001 transmittal (table of "Areal Extent of Vegetation to be Removed in Reach 9 and Prado Basin") from the U.S. Army Corps of Engineers, Los Angeles District and County of Orange, to the U.S. Fish and Wildlife Service, Carlsbad, California (Corps 2001g);

- A "Summary of Agreed-upon Conservation Measures for Prado Dam/Norco Bluffs/Reach 9 Projects along the Santa Ana River" prepared by our agencies, County of Orange, and California Department of Fish and Game (CDFG) during September 25-27, 2001 (Agency Agreement 2001);

- November 6, 2001, transmittal (Comments on 10/25/01 Draft Biological Opinion) from the U.S. Army Corps of Engineers, Los Angeles District and County of Orange, to the U.S. Fish and Wildlife Service, Carlsbad, California (Corps 2001e);

- November 19, 2001, transmittal (Comments on 11/16/01 Draft Biological Opinion for Prado and Vicinity) from the U.S. Army Corps of Engineers, Los Angeles District and County of Orange, to the U.S. Fish and Wildlife Service, Carlsbad, California (Corps 2001f);

- Relevant biological literature (see "Literature Cited and References" section herein);

- Telephone conversations, electronic mail messages, and meetings with personnel from your agency, CDFG, County of Orange, Orange County Water District (OCWD), and other interested parties; and

- Field investigations, information in our files, and other sources of information.

A complete administrative record of this consultation is on file in our office.

Consultation History

The proposed construction and operations of Prado Dam were originally evaluated as part of the Santa Ana River Project ("Mainstem"), which is designed to provide urban flood protection to growing communities in Orange, Riverside, and San Bernardino counties. The Mainstem project extends approximately 75 miles along the Santa Ana River from the upper canyon in the San Bernardino Mountains downstream to its confluence with the Pacific Ocean at Newport Beach, Orange County, California. The project is designed to provide various levels of flood protection ranging from 100 to 190 years for areas most susceptible to damages from flood flows. Once completed, the Mainstem project will afford increased flood protection for millions of residents and businesses and prevent estimated damages of nearly $15 billion from future flooding.

The Mainstem project includes the following components: 1) construction of Seven Oaks Dam in the upper Santa Ana River canyon to control a 350-year flood event at the dam site; 2) delineation of the 100-year floodway and floodway fringe from the reach between Seven Oaks Dam and Prado Dam, with local authorities managing this area in accordance with guidelines established by the Federal Emergency Management Agency; 3) modifications to the existing Federal flood control levees at Mill Creek to restore their original Standard Project Flood level of protection; 4) construction of a 100-year level of flood protection channel on the Oak Street Drain in the City of Corona; 5) modifications to the existing Prado Dam to provide a 190-year level of protection; 6) channel improvements along Santiago Creek in Orange County to provide 100-year-level flood protection; 7) construction of the lower Santa Ana River channel to provide 190-year level flood protection; and 8) enhancement of 84 acres of degraded marshland at the mouth of the Santa Ana River for endangered species and the restoration of 8 acres of marshland for wildlife habitat.

In 1980, your agency completed the Final Environmental Impact Statement (EIS) for the Mainstem project and adopted an alternative that would not adversely affect federally listed species. Thus, formal consultation under section 7 of the Act was not initiated with our agency, and no biological opinion was prepared. However, a different construction method for the project was proposed several years later, when your agency selected a contractor to widen the lower reach of the Santa Ana River mouth between the cities of Huntington Beach and Newport Beach. As a result, your agency prepared a SEIS and Phase II General Design Memorandum for the Mainstem project in 1988, and informal consultation with our agency was initiated to develop measures that would avoid adverse effects to federally listed species, including the endangered California least tern (*Sterna antillarum browni*, "least tern") that nests next to the mouth of the Santa Ana River. This consultation concluded with a determination that the proposed project, including the implementation of conservation measures (e.g., construction practices/guidelines), was not likely to adversely affect the least tern. These conservation measures were subsequently implemented during the widening of the lower reach of the Santa Ana River, and monitoring of least tern nest sites confirmed that the construction did not adversely affect the least tern.

Environmental impacts and mitigation associated with raising Prado Dam and other associated modifications, including flood control improvements in Reach 9 of the Santa Ana River, were originally addressed as part of the SEIS and Phase II GDM (Corps 1988). However, the stabilization of the bluff toe at Norco Bluffs was not addressed because it is a more-recent component of the Mainstem project. Subsequent to the preparation of the SEIS, it was determined that the proposed construction work associated with raising Prado Dam, modifying the spillway and constructing new outlet works, as well as the future operation of the dam, would have an adverse effect on the vireo (BA, page 1-1).

We initiated formal consultation on the proposed Mainstem project with your agency under section 7 of the Act in 1988. Five endangered species were initially considered: vireo, bald eagle, peregrine falcon (*Falco peregrinus anatum*), Santa Ana River woolly-star (*Eriastrum densifolium* spp. *sanctorum*, "woolly-star), and slender-horned spineflower (*Dodecahema leptoceras*, "spineflower"). Based on the findings presented in the 1988 biological assessment, the Mainstem project was anticipated to have no effect on the bald eagle, peregrine falcon, or spineflower. The biological assessment determined that the woolly-star and vireo would be affected by operation of Seven Oaks Dam and Prado Dam, respectively. The "may affect" determination for the woolly-star was attributed to the loss of suitable habitat as a result of the reduction of sediment and post-dam fluvial dynamics due to the operation of Seven Oaks Dam.

The "may affect" determination for the vireo was based on the modifications to Prado Dam and resulting operational effects; specifically, the increased duration and extent of inundation of suitable habitat occurring within the reservoir. Other effects to vireos within the Prado Dam project area may include elevated noise levels directly or indirectly associated with the construction of the dam and the use of haul roads and borrow sites.

The proposed raising of Prado Dam and other associated modifications, including flood control improvements in Reach 9 of the Santa Ana River, were originally evaluated as part of the Mainstem project in our biological opinion (#1-6-88-F-6) dated June 22, 1989. Based on the findings presented in the 1988 biological assessment, we concurred that the proposed project was not likely to adversely affect the bald eagle, peregrine falcon, or spineflower. We concluded in the biological opinion that the raising of Prado Dam, enlarging the basin, and modifying the channel downstream of the dam would result in the permanent loss of 133 acres of habitat for the vireo, but would not jeopardize the continued existence of this species.

When the original biological opinion (#1-6-88-F-6) for the Mainstem project was issued on June 22, 1989, the flycatcher and sucker were not listed as federally endangered and threatened species, respectively, under the Act. The flycatcher was listed as a federally endangered species on February 27, 1995 (59 *Federal Register* 10693). The sucker was listed as a federally threatened species on April 12, 2000 (65 *Federal Register* 19686).

Construction of the Mainstem project was initiated in 1990 and various components have been phased over time based on budget approval and appropriations, engineering requirements, safety, and environmental scheduling windows (e.g., to avoid impacts to breeding activities of listed species). Your agency has completed the 100-year floodway delineation and construction of Seven Oaks Dam, Mill Creek levees, Oak Street drain, enhancement of the Santa Ana River salt marsh, Reaches 1-3a of the San Timoteo Creek Flood Control Project, and Reaches 1-8 and 10 of the lower Santa Ana River channel.

In a letter dated May 11, 2000, your agency requested our concurrence that ongoing construction activities for the Mainstem project between Weir Canyon Road and Imperial Highway (i.e., Reach 8) were not likely to adversely affect the sucker. On August 4, 2000, we responded via letter that we could not concur with this determination, and requested that your agency reinitiate formal consultation on the Mainstem project to address project-related effects to the sucker. The subsequent amendment (#1-6-88-F-6-R1) to the original biological opinion, which was issued on September 19, 2000, evaluated the potential adverse effects of remaining construction activities along Reach 8 to the sucker. These activities included the following: 1) re-diverting flows back to the north bank by breaching the temporary berm that had been constructed along the channel invert centerline; 2) filling "gaps" in the concrete drop structures and grouted stone stabilizers to establish the final invert design grade; and 3) paving the top of the north levee. We concluded in the amendment that the proposed activities would result in the incidental take of suckers present in Reach 8, but would not jeopardize the continued existence of this species. Construction in Reach 8 has since been completed.

Your August 14, 2000, letter requesting the reinitiation of formal consultation regarding activities associated with raising Prado Dam and other modifications, including flood control improvements in Reach 9 of the Santa Ana River, was received by us on August 16, 2000. On September 26, 2000, the Department of Interior (Department) provided written comments to your agency on the Draft Environmental Impact Statement and Project Draft Environmental Impact Report (DSEIS/DEIR) and the disclosed, potential, substantial impacts associated with the implementation of the revised project. In that letter, the Department concurred that most of the proposed individual flood control project components within the Prado Basin were previously disclosed in two documents released by your agency in 1988: 1) the Phase II General Design Memorandum (GDM); and 2) Phase II GDM SEIS. However, the Department noted that these documents are now 13 years old and, therefore, could not have adequately disclosed, evaluated, or minimized project-related effects to a variety of fish and wildlife species, habitats, and landscapes that have significantly changed in official status, quality, or distribution since 1988.

Furthermore, the Department concluded that the proposed stabilization of the Norco Bluffs and all but one of the Santa Ana River Reach 9 levee and bank protection projects located downstream from the dam were new project features that had never been disclosed or evaluated pursuant to requirements of the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). Components of the proposed project that your agency has identified as new or modified since completion of the 1988 Phase II GDM include the following (Corps 2001a, b): 1) Norco Bluffs toe stabilization; 2) Prado Petroleum Tank Farm levee; 3) Alcoa Aluminum Plant dike (modified design); 4) River Road floodwall; 5) River Road dike; 6) California Institute for Women dike (modified design); 7) Yorba Slaughter Adobe protection; 8) embankment protection for upper and lower portions of Highway 91, Green River Housing Estate, and Car Wash and Strip Mall; 9) Green River Mobile Home Park levee (modified design); and 10) low-flow channel protection for Highway 91 at Green River Golf Course.

In addition, the Department expressed concern for the uncompensated loss of tributary waters containing habitat occupied by the vireo, as well as the potential loss of a viable wildlife corridor. In response to these concerns, your agency indicated that you "... do not concur that this project, with mitigation, would result in any uncompensated loss of biological resources or tributary waters" (Corps 2001b).

The formal consultation process continued with information exchanges and formal meetings with our agencies and the local sponsors (i.e., the County of Orange, County of Riverside, and County of San Bernardino) on the project on the following dates: November 7, 2000; November 21, 2000; January 9, 2001; and March 14, 2001. In a letter dated March 12, 2001, to your agency, we recommended specific measures to offset or avoid substantial, potential, project-related impacts to the sucker. At the March 14, 2001, meeting and by means of a March 29, 2001, electronic mail message, we emphasized our concerns regarding proposed, project-related impacts to the sucker, vireo, and flycatcher and the absence of specific conservation measures to avoid or minimize adverse effects to those species. During the March 14, 2001, meeting, we also discussed means to ensure connectivity and unimpaired wildlife movement within the action area. A subsequent meeting was conducted on May 22, 2001. On May 29, 2001, we received further clarification of the project description from your agency.

On June 1, 2001, we received correspondence from your agency (Corps 2001a) that contained information necessary to further refine the project description and the conservation measures that would be undertaken to avoid or minimize adverse effects to federally listed species. We provided a draft project description incorporating this information for your review on June 7, 2001. Your staff provided comments on this draft on June 13, 2001 (Corps 2001b). Subsequent to a review of these comments, we prepared a document containing a revised project description and analysis of the potential effects of the proposed action. We submitted this document to your staff for review on July 30, 2001. Meetings on August 2, 2001; August 13, 2001; August 15, 2001; August 23, 2001; and August 30, 2001, were convened to discuss project-related issues and to further develop the project description.

During a meeting on September 10, 2001, our agencies further discussed measures to minimize adverse effects to federally listed species and their habitats in the action area. On September 19, 2001, we received your comments on our July 30, 2001, revised project description and analysis of the potential effects of the proposed action (Corps 2001c). These comments included clarifications of previously disclosed project features and conservation measures.

On September 25, 26, and 27, 2001, our agencies met with the CDFG, County of Orange, and Orange County Flood Control District to finalize the project description and develop a comprehensive list of conservation measures to avoid or minimize project-related effects to federally listed species entitled "Summary of Agreed-upon Conservation Measures for Prado Dam/Norco Bluffs/Reach 9 Projects along the Santa Ana River, September 25-27, 2001" (Agency Agreement 2001). This document represented a joint understanding between our agencies, CDFG, and the Orange County Flood Control District regarding additional conservation measures for the vireo, flycatcher, sucker, and yellow-billed cuckoo (*Coccyzus americanus*) that would be added to the project description for the proposed project. Acreages of disturbance and compensation were estimated based on the best available project designs. It was agreed by all parties that if impacts were later reduced, then compensation would also be commensurably reduced (Agency Agreement 2001).

The draft Biological Opinion was sent to the Corps on October 26, 2001. The Corps provided comments dated November 5 and November 6, 2001, on the draft Biological Opinion. During a conference call on November 1, 2001, the Corps agreed that the master recreation plan (as referred to in the comments dated November 6, 2001, from the Corps) would require a separate consultation if the plan would affect any federally listed species. Therefore, any activities arising from the master recreation plan are not part of this proposed action and therefore will not be exempt from the takings prohibitions set forth under Section 9 of the Act.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Prado Dam is located just downstream of the convergence of Chino Creek, Cucamonga/Mill Creek, and Temescal Creek. These creeks combine with the Santa Ana River to drain the largest watershed in southern California (BA, page 2-2). The area affected by components of the proposed project includes the Prado Basin, which is defined here to encompass the impoundment area below 566 feet elevation. The Basin includes: 1) the Santa Ana River upstream of the dam to Norco Bluffs (located just downstream of the Interstate Highway 15 crossing); 2) the lower reaches of three major tributaries to the Santa Ana River (i.e., Chino Creek, Mill/Cucamonga Creek, and Temescal Creek), and 3) Reach 9 of the Santa Ana River from the dam downstream to Weir Canyon, a distance of 7.4 miles (11.2 kilometers) (BA, page 1-1, Exhibits 1 and 2). The Prado Basin comprises more than 11,500 acres (4,650 hectares), of which 4,100 acres (1,660 hectares) are riparian habitat (mostly willow woodland; BA, page 2-6). The following description of the revised project components is derived primarily from the BA and subsequent clarifications provided by your agency (Corps 2001a, b). For a more-detailed description of the proposed action, please refer to these documents.

Your agency, in concert with the counties of Orange, San Bernardino, and Riverside, proposes to raise the existing top of Prado Dam and spillway, increasing the capacity of the reservoir behind the dam (BA, page 1-1). Associated improvements include the construction of a new intake structure and outlet conduits in the dam. The new outlet works will include channelization from the base of the dam to the gauging station drop structure. The modified dam will have a controlled outflow capacity of 30,000 cubic feet per second (cfs). Proposed ancillary features (e.g., new dikes and floodwalls, intermittent levee and bank protection) to prevent flooding of low-lying facilities around the perimeter of the basin and protect structures up- and down-stream of the dam include the following: 1) Norco Bluffs toe stabilization; 2) a dike at the Prado petroleum storage facility; 3) a dike at the Corona Sewage Treatment Plant; 4) a dike at the Alcoa Aluminum Plant on Rincon Road; 5) a dike and floodwall at the National Housing Tract adjacent to the homes on Greenbriar Avenue and Meadowview Street; 6) a floodwall along River Road just south of the Santa Ana River; 7) a dike (River Road Dike) approximately 2,000 feet east of Hellman Avenue and north of River Road; 8) two dikes at the California Institute for Women; 9) a floodwall at the Yorba-Slaughter Adobe; 10) a borrow site between the Pomona Rincon Road and Highway 91 (in three sections); 11) a borrow site at the terminus of Cucamonga Avenue on the north side of the Basin; 12) an auxiliary dike and floodwall from the spillway to Auto Center Drive; 13) embankment protection for upper and lower portions of Highway 91, Green River Housing Estate, and Car Wash and Strip Mall; 14) a levee at the Green River Mobile Home Park; 15) low-flow channel protection for Highway 91 at the Green River Golf Course; and 16) various haul routes along existing roads, including one along the old Pomona Rincon Road (BA, page 2-2; Corps 2001a, b).

The Norco Bluffs component of the project is located along an approximate 1.54-mile (2.5-kilometer) reach of the Santa Ana River near the northwest boundary of the City of Norco. The project area is approximately 8 miles (13 kilometers) north of Prado Dam and about 40 miles (64 kilometers) southeast of Los Angeles. The flood plain within the Norco Bluffs project area is dominated by giant reed (*Arundo donax*), an invasive plant that gradually has displaced many of the dense stands of native willows that were once present in the area. However, large patches of willows remain in a few areas and are primarily concentrated near the north bank and on the south bank near the staging area and lower portion of the haul road (BA, page 2-4).

The site of the proposed toe stabilization at Norco Bluffs is located along the southern bank of the Santa Ana River, southwest of Interstate 15, and comprises three reaches that are classified as Zones 3, 4, and 5 for the purposes of this project. Zone 3 is located downstream of Hamner Avenue Bridge. Zones 4 and 5 are located immediately downstream of Zone 3 in succession. A temporary construction road will extend along the entire length of the zones. In addition, this road will extend approximately 1,440 feet (440 meters) to a 2.7 acres (1.1 hectares) staging area. Along the access road will be five turnaround areas and seven scour gauges, four of which will be within the turnarounds (BA, page 2-1).

Project features along Reach 9 of the Santa Ana River will consist of intermittent levee and bank protection. Reach 9 comprises the portion of the Santa Ana River extending from the base of Prado Dam downstream to the Weir Canyon drop structure at the Weir Canyon bridge crossing. The upper 2.5 miles (4.0 kilometers) of Reach 9 is in Riverside County, with a small portion at Green River Golf Course in San Bernardino County. Downstream of the Green River Golf Course, Reach 9 is in Orange County (BA page 2-2). Reach 9 of the Santa Ana River supports approximately 315 acres (127 hectares) of wetland habitats, of which 238 acres (96 hectares) is cottonwood woodland and savannah, willow riparian, and mixed riparian habitats (predominantly cottonwood and willow; BA, page 2-6).

Bank stabilization projects will be undertaken at several locations within Reach 9. Construction will occur in the following locations (see SEIS, Corps 1988, for station locations): 1) the Highway 91 embankment between Stations 1588+00 and 1607+00; 2) the Green River Housing Estate between Stations 1515+00 and 1572+00; 3) the Green River Mobile Home Park between Stations 1500+00 and 1513+00; 4) the Green River Golf Course between Stations 1440+00 and 1490+00; 5) the Highway 91 embankment between Stations 1284+00 and 1303+00; and 6) the car wash and strip mall between Stations 1227+00 and 1233+00 (BA, page 2-2). Most utilities within the Santa Ana Canyon will be protected in place, with the exception of the sewer at Station 1609+80 and the Santa Ana River Interceptor Line. Both of these utilities will either be relocated or protected in place (BA, page 3-3; Corps, 2001e).

A detailed project description is provided in Section 2.5 of the SEIS and Section 3.4 of the BA. Vegetation clearing is scheduled to begin in February 2003 and construction is expected to continue through 2007. Delays in real estate acquisition could result in an extended construction period. Construction equipment will include, but will not be limited to, scrapers, loaders, dozers, backhoes, cranes, and trucks.

In conjunction with the raising of Prado Dam, the Orange County Flood Control District will be responsible for acquiring all property or obtaining a flood easement between the 556-feet (169-meter) and 566-feet (172.5-meter) elevation line, the upper limits of which encompass the toe of the bluff at Norco Bluffs (BA, page 1-1).

The water control manual for operations of the modified dam will be prepared after construction is completed. A copy of the manual will be provided to our agency at that time (Corps 2001a). Target water surface elevations and discharges associated with the existing and post-project conditions are summarized in Tables 2 and 3. Though the operations and maintenance of Prado

Dam will be turned over to the local sponsors following the completion of the proposed project, your agency will provide continued oversight of Prado Dam operations. Thus, we understand that any changes in operations or maintenance cannot occur without your agency's approval (Corps 2001a).

Conservation Measures

As part of the project description for the original biological opinion (#1-6-88-F-6; June 22, 1989) regarding the Mainstem project, your agency agreed to restore 133 acres of riparian forest to compensate for impacts resulting to the vireo from the construction of haul roads and berm placements and the periodic loss and disruption of a total of 133 acres of habitat between 490 and 500 feet elevation due to inundation (1989). Also, the County of Orange provided $450,000 to fund a vireo monitoring and management program in the Prado Basin and environs (Letter dated May 20, 1992, from Elayne Rail of the County Orange, Environmental Management Agency, to the Corps).

This initial commitment to restore 133 acres of riparian habitat was apparently later superseded by a 1994 Cooperative Agreement between and among the OCWD, the Department of Interior, and your agency (Corps 2001a, c). In 1994, the OCWD and your agency proposed to implement seasonal water conservation to an elevation of 505 feet within the Prado Basin (as indicated in the project description of biological opinion #1-6-95-F-28) that would adversely affect many of the same acres of riparian habitat for the vireo that were evaluated in the 1989 biological opinion regarding the Mainstem project. Because the water conservation activities were implemented prior to the Prado Basin portion of the Mainstem Project, and the estimated cost of restoration of 133 acres of upland habitat within the Prado Basin to riparian vegetation was higher than anticipated, the OCWD agreed to contribute $1,000,000 to the Santa Ana Watershed Association of Resource Conservation Districts (Trust Fund) in lieu of restoring the previously mentioned 133 acres. The monetary contribution was to be used for the removal of exotic species along the Santa Ana River and its tributaries, and the restoration of riparian habitat for the vireo and other species.

The 1988 SEIS required that 1,100 acres of post-project flood plain in the Santa Ana River canyon be acquired or kept in public ownership and managed for open space and wildlife habitat values (County of Orange 2001). The acquisition and management of these lands was intended to offset adverse impacts to wildlife to a level of non-significance, and was to be implemented prior to the completion of construction. Since the circulation of the SEIS, Orange County has begun to acquire lands within the post-project, 100-year flood plain from Prado Dam to Weir Canyon Road bridge for flood plain management. Approximately 789 acres of land within the floodplain have been obtained in fee title. These lands total approximately 1,100 acres and will be operated and maintained for open space and wildlife habitat in accordance with the *Santa Ana River Canyon Habitat Management Plan* (County of Orange 2000). This plan was developed by your agency and the Orange County Flood Control District in consultation with numerous public resource agencies including the Service and CDFG, citizens, and public interest groups at the Federal, State and local levels. The Local Sponsors are responsible for implementing management commitments for the habitat resources and flood plain within their respective jurisdictions. Though an estimated 1,233 acres of the Santa Ana River Canyon are currently held in public domain, including 789 acres of floodway and 444 acres of non-floodway property, a golf course in the floodway has not yet been purchased (Corps 2001c).

The primary management commitment of the *Santa Ana River Canyon Habitat Management Plan* is the retention of existing habitat as permanent open space. The local sponsors are responsible for implementing management commitments for the habitat resources and flood plain within their respective jurisdictions. The *Santa Ana River Canyon Habitat Management Plan* (County of Orange 2000; Volumes I, II, and III) provides a detailed list of commitments, reference maps, and supporting documentation, including biological surveys.

Per commitments made in the EIS for the 1980 Phase I GDM and the 1988 EIS for the Phase II GDM , the objectives of commitments related to flood control and water resources within the *Habitat Management Plan* area are to maintain and protect existing facilities and not change or modify the natural streambed and flood plain (Corps 2001a). In addition, the *Habitat Management Plan* area will be allowed to revegetate through natural processes following storm events, and flow rates and water quality will be monitored (Corps 2001a).

As part of the proposed project-related activities, your agency and/or your agents and sponsors have agreed to implement the following measures to avoid or minimize effects to the vireo and its designated critical habitat, flycatcher, sucker, and yellow-billed cuckoo, which is a State-listed species and a Federal candidate species (Agency Agreement 2001; BA; Corps 2001a, b, c). Acreages of disturbance and compensation were estimated based on the best available project designs. If less acreage is actually disturbed, then compensation will be commensurably reduced (Agency Agreement 2001):

<u>Temporary Disturbance of Riparian/Wetland Habitat (excluding unvegetated perennial stream)</u>

- Successfully restore each acre of riparian vegetation that is temporarily disturbed during construction-related activities. Keep all temporarily disturbed areas free of exotic plants until riparian vegetation is re-established. If the site(s) have not begun to recover within 5 years (i.e., 50 percent of the disturbed areas are not vegetated with young riparian vegetation), then the site(s) will be replanted with cuttings from native riparian species.

- Non-riparian areas that are temporarily disturbed will be maintained free of exotic plants for 8 years.

- Contribute sufficient funds to the Trust Fund to remove one acre of giant reed from the upper Santa Ana River watershed and/or action area for each acre of riparian/wetland vegetation that is temporarily disturbed during construction-related activities; actively monitor and manage this acreage until riparian habitat is completely restored; and maintain this acreage *Arundo*-free for the life of the project.

- Conduct brown-headed cowbird (*Molothrus ater*, "cowbird") removal trapping at a minimum of 5 sites in the Norco Bluffs area and 15 sites in the Reach 9 for at least 7 years during and following construction. Alternatively, a cash contribution will be made to the Trust Fund for the equivalent amount of cowbird trapping in the upper Prado Basin and Reach 9. Trapping will occur during the vireo and flycatcher egg-laying season (March 15 to July 30). This effort is intended to supplement on-going cowbird trapping activities elsewhere in the Prado Basin;

Permanent Loss of Non-riparian Habitat Within the Flood Plain

- Successfully create one acre of flood plain within the action area for each acre of non-riparian habitat that is permanently destroyed or isolated from the flood plain during construction-related activities (estimated total of destroyed or isolated non-riparian habitat is approximately 24 acres, excluding unvegetated perennial stream, Corps 2001g). These areas will be kept free of exotic plants for 8 years.

  OR

  Contribute sufficient funds to the Trust Fund to remove 3 acres of giant reed from the upper Santa Ana River watershed and/or action area for each acre of non-riparian habitat that is permanently destroyed or isolated from the flood plain during construction-related activities; actively monitor and manage this acreage; maintain this acreage *Arundo*-free for the life of the project; and conduct cowbird removal trapping in the vicinity of the restored habitat for the life of the project.

  Note: A combination of these alternatives can be used to fulfill the requirements of this conservation measure.

Permanent Loss of Riparian Habitat

- Successfully create 3 acres of riparian vegetation within the action area for each acre of riparian vegetation that is permanently destroyed or isolated from the flood plain during construction-related activities.

  OR

  Contribute sufficient funds to the Trust Fund to remove 5 acres of giant reed from the upper Santa Ana River watershed and/or action area for each acre of riparian vegetation that is permanently destroyed or isolated from the flood plain during construction-related activities; actively monitor and manage this acreage; maintain this acreage giant reed-free for the life of the project; and conduct cowbird removal trapping in the vicinity of the restored habitat for the life of the project.

  Note: A combination of these alternatives can be used to fulfill the requirements of this conservation measure.

General Habitat Creation/Restoration Measures, Mitigation Option for Permanent Impacts

- Creation activities will be initiated as soon as project activities within the creation area are completed. Restoration activities will be initiated immediately following the completion of project activities within the restoration area. Creation and restoration activities will occur during the non-breeding season for vireos (if adjacent to occupied vireo habitat).

- Creation and restoration of riparian habitat will be considered successful when the following target/threshold objectives are met: 1) a minimum of 30 percent absolute ground cover of native plant species; 2) less than 10 percent absolute ground cover of exotic plant species; 3) the absolute ground cover of native species must be represented by, at least, five dominant or co-dominant plant species; 4) the recruitment of native plant seedlings must be documented to occur within the replanted areas; 5) a positive trend in the diversity and absolute ground cover of native plant species must be observed based on appropriate statistical analyses that account for natural, year-to-year variations; and 6) the structure and composition of the revegetated area is statistically similar (i.e., not significantly different) to habitat occupied by vireos in the vicinity. Alternatively, riparian revegetation efforts can be considered successful if the habitat is occupied by a breeding pair of vireos, flycatchers, and/or yellow-breasted chats (*Icteria virens*). In addition, habitat must sustain itself for 2 consecutive years without supplemental water.

- All acres of created or restored riparian habitat will be protected in perpetuity through proper legal instruments for the conservation of Federal and State listed species and their habitats.

- Prior to the creation of habitat for the vireo, sufficient funds will be contributed to the OCWD, Trust Fund, or other organization approved by the CDFG and our agency to conduct cowbird removal trapping in the vicinity of the created riparian habitat for the life of the project. Program specifics (e.g., number and locations of traps) will be determined in conjunction with permitting processes for the CDFG and our agency.

- If funding is available, then your agency will make a lump sum payment to the Trust Fund prior to the initiation of project-related activities that disturb habitat for federally listed species. Alternately, during the first year of construction, funds will be contributed to the Trust Fund within one year of the initiation of construction activities. Afterwards, contributions to the Trust Fund will occur prior to construction of individual project features. If for whatever reason the Trust Fund becomes insolvent at a future date and is unable to continue exotic species removal (e.g., giant reed, cowbirds) and monitoring and management activities in the upper Santa Ana River watershed and/or action area, then your agency will transfer remaining funding and/or resources to another administrator/contractor or otherwise ensure that the proposed conservation measures are continued for the life of the project. Any funds contributed above and beyond the amounts prescribed herein may be credited as compensation for the effects of future projects.

- Ensure that the administrator of the Trust Fund identifies and delineates on well-labeled maps the specific areas in the upper Santa Ana River watershed and/or action area from which giant reed will be removed, and riparian vegetation restored, using funding contributed by your agency for the proposed action. These areas must be approved by the local sponsors, CDFG, and our agencies. An annual report will be required that addresses the following information: 1) accomplishments during the previous year; 2) what is anticipated to be accomplished during the upcoming year; 3) results of monitoring and management; 4) updated mapping that delineates areas in the upper Santa Ana River watershed and/or action area from which giant reed has been removed; and 5) an itemized financial accounting/report.

- Request that the administrator of the Trust Fund identify those acres within the San Timoteo Creek system within which giant reed was previously removed using the $1,000,000 contributed by the OCWD in lieu of restoring 133 acres of riparian habitat in the Prado Basin. This acreage must be actively monitored and managed until riparian habitat is completely restored, and then maintained giant reed-free for the life of the project.

<u>Maintenance and Management of Riparian Habitat Downstream of Prado Dam</u>

- Prior to initiating construction-related activities in Reach 9, quantify and delineate the existing riparian habitat in this reach. Provide an accounting of the amount of habitat that is being, or has been, used for other mitigation projects.

- Prior to initiating construction-related activities downstream of Prado Dam, provide written documentation that 1,233 acres of land, including 789 acres of land within the flood plain along the Santa Ana River as depicted in Figure 1, have been obtained in fee title and protected via conservation easement, deed restriction, or other protection mechanism to provide for the conservation of the vireo and other Federal and State listed species. The County of Orange will provide additional information concerning the status of the *Habitat Management Plan* area and a map of the area delineating vegetation types, acreages, and land use activities (including potential recreational uses and areas where the conservation of listed species and their habitats will be the primary land use).

- Maintain the baseline acreage of riparian vegetation within the *Habitat Management Plan* area as averaged over 10 years. The current estimate of riparian vegetation is between 350 and 380 acres.

- Vegetation mapping will occur every 10 years to document long-term trends and monitor post-flood recovery. Actions will be taken to re-establish the baseline if post-flood recovery does not occur within 10 years or does not meet the criteria that will be established in the *Habitat Management Plan*.

- Within one year after initiation of construction activities, finalize a *Habitat Management Plan* for the areas where your agency and/or the local sponsors have legal rights/jurisdiction. The *Habitat Management Plan* will be coordinated with the CDFG and our agency, provide assurances of funding, and address how the baseline amount of riparian habitat will be maintained or increased. Your agency and the local sponsors have agreed to gain consensus with our agency and the CDFG throughout the development and implementation of the *Habitat Management Plan*. The *Habitat Management Plan* will define the composition and structure of the management oversight committee and the explicit decision-making process. The *Habitat Management Plan* will include rules for timely resolution of disagreements to avoid biologically costly delays in management responses, "trigger points" for implementing management actions and a clearly defined mechanism (e.g., consensus among agencies; one agency with full authority) for modifying the trigger points.

- At a minimum, the *Habitat Management Plan* will address the following: 1) measurable conservation goals that clearly articulate a measurable standard, desired state, threshold value, amount of change, or trend that you are striving to achieve for the particular species; 2) measurable sampling objectives; 3) quantitative monitoring methodologies; 4) a strategy to determine the effectiveness and feasibility of possible alternate management, restoration, and/or translocation methods; 5) a strategy to evaluate the proposed monitoring and quantitatively establish the existing status (i.e., baseline) of covered species; 6) well-defined initial management thresholds (i.e., triggers) and a range of alternate, feasible responses; 7) an explicit process for evaluating monitoring data; 8) a defined management committee and decision-making process for implementing management responses (i.e., explicitly defined feedback loops that link implementation and monitoring to a decision-making process and, thereby, result in appropriate changes in management); and 9) reporting requirements, contents, and review procedures.

- The Corps will consult with the Service prior to initiating any actions that have not been explicitly defined as part of this project and may affect federally listed species or designated critical habitat. Actions that have not been defined as part of this project include, but are not limited to, the development of recreational trails, the protection or relocation of the Santa Ana River Interceptor (SARI) line, and the maintenance of existing or planned utilities.

<u>General Conservation Measures for the Vireo and Flycatcher</u>

- Construction-related activities will not occur in the eastern third of borrow site #1A during April 29 to September 25 during each calendar year or at any other time while flycatchers are present in habitats adjacent to the borrow site in the southern portion of the Prado Basin.

- A monitoring program will be developed and implemented at Norco Bluffs and in Reach 9 that entails surveys for the vireo during spring and early summer of the year prior to construction and, also, during the year of construction. Construction activities will be monitored to assure that vegetation is removed only in the designated areas. Riparian areas not to be disturbed will be flagged.

- Vegetation clearing associated with project construction will take place only during periods when the vireo and flycatcher are not nesting (August 15 through February 28).

- Vegetation trimming and clearance within Prado Basin required for haul road maintenance and upkeep will be done when the vireo and flycatcher are not present.

- To the maximum extent practicable, haul routes and staging areas will be located outside of the flood plain (e.g., along bike trails, levees, and roads). Bank protection in Reach 9 will occur only in those locations that would otherwise be jeopardized by 30,000 cfs flows.

- To the extent that construction and hauling of embankment materials must take place during the vireo nesting season, noise curtains will be employed to shield nesting vireos from excessive noise generated by construction vehicles and equipment entering and leaving the construction sites at Norco Bluffs and at the upper Highway 91 embankment and Green River Housing Estate in Reach 9.

- Noise barriers will also be constructed by February 28 of each year during construction in or near habitat for the vireo and/or flycatcher. For example, a noise barrier will be installed at the extreme downstream end of the access road to Norco Bluffs to shield nesting vireos from excessive noise generated by construction vehicles and equipment entering and leaving the staging area. Also, noise barriers will be installed along the perimeter of Borrow Site 1A to address potential noise impacts at that locale. Furthermore, a dirt berm will be placed between Borrow Sites 1 and 2 and adjacent habitat for the vireo to abate construction noise.

- During construction, riparian vegetation adjacent to de-watering areas will be monitored. Supplemental water will be added to this vegetation as necessary to avoid water stress.

- To reduce fire hazards, a water truck will always be present during construction activities. Construction activities will comply with the fire prevention and protection practices set forth in your agency's Safety and Health Requirements Manual (EM 385-1-1). The provisions of EM 385-1-1 will be incorporated into all construction specifications, and the contractor will be required to prepare a fire prevention and protection plan for the construction project.

- Excavated materials will be backfilled over the toe stabilization structures. The contractor will replace surface material and re-grade disturbed soft-bottomed substrate areas, in particular the low-flow river channel, to replicate pre-project conditions. Your agency will continue to coordinate with us to develop and improve measures for re-establishing habitat values within the construction area.

Specific Conservation Measures for the Sucker:

- Re-design the drop structure and associated baffles at the gauging station below Prado Dam to minimize the risk of injury or death owing to collision and not reduce connectivity. If this re-design results in additional disturbances to habitat, then your agency will contribute funds to the Trust Fund at a 1:1 ratio of disturbed to restored habitat for each additional acre affected.

- Implement a "trap and haul" program to periodically trap suckers from existing pools downstream of existing drop structures (i.e., impediments or barriers to upstream movement) and transport and release the fish in favorable habitat upstream (e.g., upstream of the Prado Dam reservoir). Your agency has agreed to meet with the CDFG, our agency, and other experts on the species to design an efficient, cost-effective program. Non-native predators of the sucker that are caught during trapping bouts will be destroyed rather than released. This conservation measure is intended to provide "out-of-kind" compensation for the destruction of 1,850 feet of unvegetated perennial streambed habitat (i.e., current outlet structure) for the sucker.

- Successfully restore each acre of perennial stream that is temporarily disturbed during construction-related activities. Restoration will include: 1) replacement of pre-construction substrates and microhabitat features; 2) maintenance or re-establishment of natural channel morphology (e.g., stream meanders, pool-riffle complexes); 3) maintenance or re-establishment of perennial flows; and 4) verification that the structure and composition of the restored area is similar to pre-construction conditions. A conceptual habitat restoration plan will be reviewed and approved by our agency prior to initiating construction activities that will affect perennial stream habitat for the sucker.

- Create and/or enhance one acre of perennial stream habitat within the Santa Ana River or its tributaries for each acre of unvegetated perennial stream that is temporarily or permanently disturbed during construction-related activities (estimated total of disturbed habitat is approximately 13.2 acres 9.0 acres of permanent effects and 4.2 acres of temporary effects]). A conceptual habitat creation plan will be reviewed and approved by our agency prior to initiating construction activities that will affect perennial stream habitat for the sucker. Creation/enhancement activities could include but are not limited to the following:

    - The development of pool-riffle complexes by placing clusters of various sized boulders within the river channel to provide limited cover and areas of reduced water velocity.

    - The creation of potential spawning/larval habitat downstream of Prado Dam. For example, San Marino Environmental Associates identified Aliso Creek, which is a tributary downstream of Prado Dam within Chino Hills State Park, as a possible restoration site for sucker spawning habitat in their *Conservation Program for the Santa Sucker in the Santa Ana River, Southern California, December 1999.*

- The creation of lateral stream habitats (i.e., very shallow areas along the stream margin with little current) that are apparently essential for the survival of larval suckers.

- Roughen the surface of the low flow portion of the concrete-lined outlet channel and revegetate along both sides of the channel with native trees.

- During construction, the construction contractor will implement measures to control sedimentation, including recontouring, sandbagging, sediment basins, and other appropriate erosion control measures developed on a site-specific basis.

- To minimize adverse effects to the sucker, your agency will ensure that the construction contractor diverts the stream channel away from the initial project construction area. The construction area will then be de-watered to lower the water table. Discharge will be directed into a stilling basin and allow flow through existing vegetation and into the river downstream of the construction area. Ground water will be introduced into the stream as necessary to avoid excess turbidity.

- Prior to diverting any water or de-watering a reach of the river, biologists approved by our agency will conduct a preliminary survey of the affected reach(es) to assess the probability of capturing suckers, potential hazards to survey personnel, and to identify areas within the reach(es) that are most likely to contain suckers. Prior to initiating any activities associated with the diversion and/or de-watering, your agency and/or your representative will submit for our review and approval a complete, detailed, comprehensive description of these actions and conservation measures necessary to minimize any adverse effects to the sucker. This document should also include the results and recommendations of the preliminary biological survey of the affected reach(es).

  A qualified sucker biologist will implement and oversee the execution of the diversion, survey and relocation efforts, and construction monitoring of the project site. Diversions and dewatering must be accomplished in such a manner to prevent the stranding or harm of suckers. The affected reach(es) will be surveyed for fishes throughout the duration of the project using seining, traps, or electrofishing, as necessary. Captured suckers will be retained in river water in insulated, aerated, and covered containers, as necessary. Temperature, dissolved oxygen, and observation of fish behavior will be recorded once per hour until suckers have been relocated. Captured suckers will be measured, weighed, sexed, and relocated to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by our agency. The physical condition of the suckers will be recorded including the presence of external parasites or lesions. Suckers should be relocated to appropriate areas in the vicinity of the affected reach(es) or other locations specified by the Service within four hours of capture.

Any Santa Ana speckled dace (*Rhinichthys osculus* spp.), arroyo chubs (*Gila orcutti*), or other native fish that are captured will be retained in river water in insulated, aerated, and covered containers, as necessary. The fish will be relocated to appropriate areas in the vicinity of the affected reach(es) or other locations as specified by our agency. Any exotic fish that are captured will not be released back into affected reach(es) or other areas supporting native fish.

- River diversion activities within the Norco Bluffs area will occur between August and December to reduce disturbance to the spawning and nursery habitat for suckers. Additionally, construction activities within Reach 9 will be performed between August 15 and February 28, thereby avoiding the majority of the sucker spawning season.

- The banks along the new outlet channel will be planted with native non-riparian vegetation to provide a partial canopy over the channel.

General Conservation Measures to Maintain Wildlife Movement Through the Action Area:

- Native plant species will be used to revegetate disturbed upland areas.

- The area between the dam and the downstream end of the new outlet channel will be revegetated, thereby providing additional cover for any wildlife that may be attempting to cross through that area. If necessary, the vehicle bridge over the outlet channel may be modified to be more conducive for wildlife crossing. Native upland vegetation could be planted at the approaches to the bridge, and soil could be placed on the surface.

- Place soil on the face of the dam along the western end near State Route 71 to provide a more natural surface and allow for enhanced wildlife movement over the structure. Native grasses and other shallow-rooted vegetation will be planted on this surface.

- Construction of the upper Highway 91 bank stabilization and the outlet channel will occur only during daylight hours to minimize disturbance to wildlife species that move primarily at night.

Instead of noise reduction or abatement measures proposed in the Agency Agreement (2001), the Corps (2001f) has proposed the following:
"For construction activities within or adjacent to occupied vireo or flycatcher habitat, the following measures shall be implemented to reduce or avoid noise impacts:

1. Prior to the commencement of construction activities, ambient noise levels will be measured at 50 feet and 100 feet from the proposed boundaries of the construction sites and recorded in a graphic format.

2. Sound walls shall be constructed at the boundary of the proposed construction site and/or haul route prior to March 1. Sound walls will probably consist of ½"-thick,

8'-high plywood sheets. The construction contractor may use other materials or procedures that attenuate sound to acceptable levels, defined below.

3. Where ambient noise is less than 60dBA and it is determined that construction-related noise levels may exceed 60dBA: monitoring shall be conducted at 50 feet and 100 feet from the sound wall, or at the boundary of occupied habitat (if habitat areas are more than 100 feet from the construction site), to ensure that construction-related noise does not exceed 60dBA within these areas. If construction noise levels exceed authorized limits, the contractor shall modify the sound barriers, equipment, or procedures (including construction schedules) as necessary to meet these conditions.

4. Where pre-construction ambient noise is greater than 60dBA: monitoring shall be conducted at 50 feet and 100 feet from the sound wall, or at the boundary of occupied habitat (if habitat areas are more than 100 feet from the construction site), to ensure that construction does not result in a significant increase over ambient conditions (i.e., noise level increases shall not exceed 5dBA over ambient.) If construction noise levels exceed authorized limits, the contractor shall modify the sound barriers, equipment, or procedures (including construction schedules) as necessary to meet these conditions.

5. Sound curtains and noise monitoring shall <u>not</u> be required at the following locations:

a) Reach 9 haul route to the lower Highway 91 bank stabilization construction area, from Crystal Drive. The proposed haul route is on top of the levee on the south side of the river; the levee road is not wide enough to accommodate both construction traffic and a sound barrier. Noise would be intermittent, as only 30-35 round trips per day are expected to be required during construction of this feature.

b) Dam and outlet channel. Construction vehicles and equipment used for raising the dam will be working adjacent to and above the outlet channel. To be effective, a sound wall would have to span the channel (to block the sound of vehicles driving along the base of the dam) and reach the height of the dam itself (as vehicles and equipment reach progressively higher elevations up the face of the dam). As this is not feasible, and because this area is already subject to sound intrusion from SR71, additional construction impacts are considered insignificant and unavoidable.

6. The area behind the dam, around the new outlet works, may still be inundated on March 1. This could preclude establishment of a sound barrier in this area prior to the nesting season. In that case, a sound barrier will be placed around the perimeter of the cleared area as soon as conditions are dry enough to permit construction.

A partial summary of compensation measures proposed by your agency is provided in Table 4.

Least Bell's vireo

The least Bell's vireo is a neotropical, migratory, insectivorous songbird that nests and forages almost exclusively in riparian woodland habitats in California and northern Baja California, Mexico (Garrett and Dunn 1981, Gray and Greaves 1981, Miner 1989, AOU 1998). A draft recovery plan (U.S. Fish and Wildlife Service 1998) provides information regarding the description, taxonomy, life history, habitat requirements, behavior, and population demographics of this subspecies.

Least Bell's vireos generally begin to arrive from their wintering range in southern Baja California and, possibly, mainland Mexico to establish breeding territories by mid- to late-March, though a singing vireo was detected on territory on March 2, 1994 (Garrett and Dunn 1981; Salata 1983a, b; Hays 1989; Pike and Hays 1992; U.S. Fish and Wildlife Service, unpublished data). The large majority of the breeding vireos typically depart their breeding grounds by the third week of September, and only a few Bell's vireos are found wintering in California or the United States as a whole (Barlow 1962; Nolan 1960; Garrett and Dunn 1981; Ehrlich *et al.* 1988; Salata 1983a, b; Pike and Hays 1992).

Least Bell's vireo nesting habitat typically consists of riparian woodlands with well-developed overstories, understories, and low densities of aquatic and herbaceous cover (Zembal 1984; Zembal *et al.* 1985; Hays 1986, 1989; Salata 1983a; RECON 1988). The understory frequently contains dense subshrub or shrub thickets. These thickets are often dominated by sandbar willow (*Salix hindsiana*), mule fat (*Baccharis salicifolia*), young individuals of other willow species, such as arroyo willow (*Salix lasiolepis*) or black willow (*S. gooddingii*), and one or more herbaceous species (Salata 1983a, b; Zembal 1984; Zembal *et al.* 1985). Significant overstory species include mature arroyo willows and black willows. Occasional cottonwoods (*Populus* spp.) and western sycamore (*Platanus racemosa*) occur in some vireo habitats, and there additionally may be locally important contributions to the overstory by coast live oak (*Quercus agrifolia*).

Though the least Bell's vireo occupies home ranges that typically range in size from 0.5 to 4.5 acres (Regional Environmental Consultants 1988), a few may be as large as 7.5 acres (U.S. Fish and Wildlife Service 1998). In general, areas that contain relatively high proportions of degraded habitat have lower productivity (hatching success) than areas that contain high quality riparian woodland (Jones 1985, RECON 1988, Pike and Hays 1992).

The vireo was historically described by multiple observers as common to abundant in the appropriate riparian habitats from as far north as Tehama County, California, to northern Baja California, Mexico (Grinnell and Storer 1924, Willett 1933, Grinnell and Miller 1944, Wilbur 1980). The past, unparalleled decline of this California landbird species (Salata 1986, U.S. Fish and Wildlife Service 1986) has been attributed, in part, to the combined, perhaps synergistic effects of the widespread and relentless destruction of riparian habitats, habitat fragmentation, and brood-parasitism by cowbirds (Garrett and Dunn 1981).

Reductions in vireo numbers in southern California and the San Joaquin and Sacramento Valleys were evident by the 1930s and were "apparently coincident with increase of cowbirds which heavily parasitize this vireo" (Grinnell and Miller 1944). Widespread habitat losses fragmented most remaining populations into small, disjunct, and widely dispersed subpopulations. The historic loss of wetlands (including riparian woodlands) in California has been estimated at 91 percent (Dahl 1990). Much of the potential habitat remaining is infested with alien plants (e.g., giant reed) and exotic animals (e.g., cowbirds).

During the past decade, the vireo has begun to recover at selected locales (e.g., Prado Basin) within its range owing to relatively intensive recovery efforts. Approximately 2,000 vireo territories were detected within California during 2000 (U.S. Fish and Wildlife Service, unpublished data). The largest population of vireos continues to be located on Marine Corps Base, Camp Pendleton in San Diego County. In recent years, the populations of vireos at Camp Pendleton and the Prado Basin collectively represented approximately 60 percent of all known territories within California and the United States as a whole.

Habitat fragmentation negatively affects abundance and distribution of neotropical migratory songbirds, in part by increasing incidence of nest predation and parasitism (Whitcomb *et al.* 1981, Small and Hunter 1988). Also, vireos are sensitive to many forms of human disturbance including noise, night lighting, and consistent human presence in an area. Excessive noise can cause vireos to abandon an area. Greaves (1989) hypothesized that the lack of breeding vireos in apparently suitable habitat was due to human disturbances (e.g., bulldozers, off-highway vehicles, and hiker travel). He further suggested that buffer zones between natural areas and surrounding degraded and disturbed areas could be used to increase the suitability of some habitat for vireos.

Habitat destruction and brood-parasitism by the cowbird continue to be the primary threats to the survival and recovery of this species. Riparian woodland vegetation containing both canopy and shrub layers, combined with adjacent upland habitats, are essential to the conservation of the vireo. The following activities continue to destroy or degrade habitat for vireos: 1) removal of riparian vegetation; 2) invasion of exotic species (e.g., giant reed, cowbird); 3) thinning of riparian growth, especially near ground level; 4) removal or destruction of adjacent upland habitats used for foraging; 5) increases in human-associated or human-induced disturbances; and 6) flood control activities, including dams, channelization, water impoundment or extraction, and water diversion. The draft recovery plan for the vireo identified two major causes of decline: 1) habitat loss and degradation; and 2) cowbird-nest parasitism. Recovery efforts are focused on addressing these two issues.

Because of the documented, drastic decline in abundance and distribution, the vireo was listed as an endangered species by the State of California in 1980. The vireo subsequently was listed as a federally endangered species by our agency on May 2, 1986 (51 *Federal Register* 16474). Critical habitat for this species, which includes all riverine and flood plain habitats with appurtenant riparian vegetation in the Prado Basin below the elevation of 543 feet upstream on the Santa Ana River to the Norco Bluffs project area and beyond to the vicinity of the Van Buren Boulevard crossing, was designated on February 3, 1994 (59 *Federal Register* 4845).

Southwestern willow flycatcher

The southwestern willow flycatcher is a relatively small, insectivorous (passerine) songbird that is one of five subspecies of the willow flycatcher (Hubbard 1987, Unitt 1987, Browning 1993). Although previously considered conspecific with the alder flycatcher (*Empidonax alnorum*), the willow flycatcher is distinguishable from that species by morphology (Aldrich 1951), song type, habitat use, structure and placement of nests (Aldrich 1953), eggs (Walkinshaw 1966), ecological separation (Barlow and MacGillivray 1983), and genetic distinctness (Seutin and Simon 1988).

The breeding range of the southwestern willow flycatcher includes southern California, southern Nevada, Arizona, New Mexico, and western Texas (Hubbard 1987, Unitt 1987, Browning 1993). The species may also breed in southwestern Colorado, but nesting records are lacking. Past records of breeding in Mexico are few and confined to extreme northern Baja California and Sonora (Unitt 1987, Howell and Webb 1995). Willow flycatchers winter in Mexico, Central America, and northern South America (Phillips 1948, Ridgely 1981, AOU 1983, Stiles and Skutch 1989, Ridgely and Tudor 1994, Howell and Webb 1995).

Breeding southwestern willow flycatchers are often present and singing on territories in mid-May (exceptionally in late April in southern California). Flycatchers are generally gone from breeding grounds in southern California by late August (The Nature Conservancy 1994) and are exceedingly scarce in the United States after mid-October (Garrett and Dunn 1981).

The flycatcher breeds in riparian habitats along rivers, streams, and other wetland habitats where dense growths of willows (*Salix* spp.), coyote-bush (*Baccharis* spp.), arrowweed (*Pluchea sericea*), buttonbush (*Cephalanthus occidentalis*) [not found in southern California], or other plants of similar structure and configuration are present. The flycatcher nests in thickets of trees and shrubs approximately 13 to 23 feet (4 to 7 meters) or more in height with dense foliage from approximately 0 to 13 feet (0 to 4 meters) above ground. Overstories are often present in occupied habitats and composed of willows or cottonwoods or, in some portions of the species' range, tamarisks (*Tamarix*, spp.) (Phillips 1948, Grinnell and Miller 1944, Whitmore 1977, Hubbard 1987, Unitt 1987, Whitfield 1990, Brown 1991, U.S. Fish and Wildlife Service 1993, 1995). Nesting flycatchers generally prefer areas with surface water nearby (Bent 1960, Stafford and Valentine 1985, Harris *et al.* 1986).

All three resident subspecies of the willow flycatcher (*E. t. extimus*, *E. t. brewsteri*, and *E. t. adastus*) were once considered widely distributed and common within California wherever suitable habitat existed (Grinnell and Miller 1944). The historic range of *E. t. extimus* in California apparently included all lowland riparian areas of the southern third of the State. Nest and egg collections indicate the bird was a common breeder along the lower Colorado River near Yuma in 1902 (T. Huels, University of Arizona, *in litt.*). Willett (1933) considered the bird to be a common breeder in coastal southern California. Most recently, Unitt (1987) concluded that the southwestern willow flycatcher was once fairly common in the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County.

Throughout the known range of the flycatcher, occupied riparian habitats have been, and remain, widely separated by vast expanses of relatively arid lands. However, the species has suffered the extensive loss and modification of these cottonwood-willow riparian habitats due to due to grazing, flood control projects, and other water or land development projects (Klebenow and Oakleaf 1984, Taylor and Littlefield 1986, Unitt 1987, Dahl 1990, U.S. Fish and Wildlife Service 1995). Estimated losses of wetlands between 1780 and the 1980's in the American southwest are as follows: California (91 percent); Nevada (52 percent); Utah (30 percent); Arizona (36 percent); New Mexico (33 percent); and Texas (52 percent) (Dahl 1990). Changes in riparian plant communities have resulted in the reduction, degradation, and elimination of nesting habitat for the flycatcher, curtailing the ranges, distributions, and numbers of western subspecies, including *E. t. extimus* (e.g., Klebenow and Oakleaf 1984, Taylor and Littlefield 1986, Unitt 1987, Ehrlich *et al.* 1992).

The species is also impacted by a variety of other factors, including brood parasitism by cowbirds (Unitt 1987; Ehrlich *et al.* 1992; U.S. Fish and Wildlife Service 1993, 1995). Parasitism rates of flycatcher nests have ranged from 50 to 80 percent in California (Whitfield 1990; M. Whitfield and S. Laymon, unpublished data) to 100 percent in the Grand Canyon in 1993 (U.S. Fish and Wildlife Service 1993). Mayfield (1977) concluded that a species or population might be able to survive a 24 percent parasitism rate, but that much higher losses "would be alarming." In any case, a composite of all current information indicates continuing declines, poor reproductive performance, and continued threats to most of the extant populations of flycatchers (e.g., Brown 1991; U.S. Fish and Wildlife Service 1992; Whitfield and Laymon (Kern River Research Center, *in litt.*, 1993); U.S. Fish and Wildlife Service 1993, 1995; U.S. Fish and Wildlife Service, unpublished data).

Available information suggests that the abundance and distribution of breeding flycatchers in California have declined substantially, such that only small, disjunct nesting groups remain (e.g., Unitt 1987, U.S. Fish and Wildlife Service 1995). Status reviews or analyses conducted before the listing of the flycatcher considered extirpation from California to be possible in the foreseeable future (Garrett and Dunn 1981, Harris *et al.* 1986). Unitt (1987) reviewed historical and contemporary records of the flycatcher throughout its range and determined that the species had declined precipitously during the last 50 years. He argued that the flycatcher was faring poorly throughout much of its breeding range and postulated that the "total population of the subspecies is well under 1,000 pairs; I suspect that 500 is more likely" (see also Monson and Phillips 1981, Garrett and Dunn 1981, U.S. Fish and Wildlife Service 1995). Despite recent, relatively intensive surveys in much of the historic range of the species, the United States population is now estimated at 900 to 1,100 pairs (U.S. Fish and Wildlife Service, unpublished data, 2001). The species is apparently extirpated or exceedingly rare in Mexico (Howell and Webb 1995).

Only six permanent breeding sites for the flycatcher remain in California. Only the populations along the Kern and San Luis Rey rivers contain 20 or more nesting pairs. Despite the virtual elimination of impacts from livestock grazing to the large and important flycatcher population on the south fork of the Kern River (Harris *et al.* 1986, Whitfield 1990), numerical declines in the population levels were observed in 1991 and 1992. Fortunately, increases in nesting success were realized in 1992 and 1993. These increases were attributed to removing cowbird eggs or nestlings found in southwestern willow flycatcher nests and cowbird trapping (Whitfield and Laymon, Kern River Research Center, *in litt.*, 1993). The Kern River population consisted of 23 pairs in 1999 [U.S. Geological Survey, Biological Resources Division (USGS/BRD), unpublished data]. Forty-seven pairs were detected along the upper San Luis Rey River in 1999 where cowbird numbers have also been reduced by trapping (USGS/BRD, unpublished data).

Although four other nesting groups were known in southern California in 1996, all but one of these consisted of four or fewer nesting pairs in recent years (U.S. Fish and Wildlife Service, unpublished data). A total of 104 pairs of southwestern willow flycatchers were recorded in California in 1996, and the available data indicate that approximately 100 pairs were present in the state in 1998 (U.S. Fish and Wildlife Service, unpublished data). More intensive survey efforts in 1999 resulted in the detection of 160 territories that contained 117 confirmed pairs (U.S. Fish and Wildlife Service/U.S. Geologic Survey, Biological Resources Division, unpublished data).

The southwestern willow flycatcher was listed as a federally endangered species throughout its range on February 27, 1995 (59 *Federal Register* 10693). Breeding willow flycatchers are listed as endangered by the States of California and Arizona. As identified in the Draft Recovery Plan for the southwestern willow flycatcher (U.S. Fish and Wildlife Service 2001), the conservation needs of the species include preventing the loss of flycatcher habitat, habitat restoration, cowbird trapping, and research designed to evaluate the efficacy of measures intended to minimize or reduce impacts.

Santa Ana sucker

The sucker is a small, short-lived member of the Catostomidae family that is endemic to the Los Angeles, San Gabriel, and Santa Ana rivers. The sucker was listed as a federally threatened species on April 12, 2000 (65 *Federal Register* 19686). Critical habitat was not designated at that time because the biological needs of the sucker were not sufficiently known to identify areas essential for conservation. The sucker is designated a "species of special concern" by the State of California.

Historically, the sucker occupied the Los Angeles, San Gabriel, and Santa Ana rivers from near the Pacific Ocean to their uplands (Swift *et al.* 1993). Though the sucker was described as common in the 1970s (Moyle 1976), recent surveys indicate that the species has experienced declines throughout most of its range (Moyle *et al.* 1995, Swift *et al.* 1993) and persists in isolated, remnant populations. Approximately 70 to 80 percent of the sucker's historic range in the Los Angeles, San Gabriel, and Santa Ana rivers has been destroyed.

The sucker only occupies portions of Big Tujunga Creek between the Big Tujunga and Hansen dams along the Los Angeles River. Recent surveys indicate that the sucker is relatively rare downstream of the Big Tujunga Dam, including the vicinities of Delta Flat and Wildwood but relatively abundant near Stoneyvale (Wickman 1996).

The sucker is found only in the west, east, and north forks of the San Gabriel River above the Morris Dam. In the west fork, Haglund *et al.* (1992, 1995, 1996) found the sucker from the Cogswell Reservoir to the confluence of the north and west forks. In the east fork, the sucker was observed during surveys by Saiki (2000) and Knowles (1999b). The California Department of Fish and Game detected suckers in the north fork just above its confluence with the west fork, sections of the west fork, and one section of the east fork (Deinstadt 1997). The east fork appeared to have the highest relative abundance, followed by sections of the west and north forks. The population of suckers in the north fork is small, and the population in the west fork appears to be declining.

The sucker occupies reaches of the Santa Ana River between the City of San Bernardino and the vicinity of Anaheim. During 1999 and 2000, the sucker was collected between the Rapid Infiltration and Extraction (RIX) facility in Colton and Prado Dam and was relatively abundant in the upstream portions of this reach (Swift 2001). Baskin and Haglund (2001) detected eight adult and two juvenile suckers downstream of Prado Dam between Weir Canyon Road and the Imperial Highway. Chadwick and Associates (1996) hypothesized that tributaries are the primary source of suckers for the Santa Ana River population because abundances were highest in these areas during their surveys. However, Swift (1999) detected a relatively low abundance of suckers in only four tributaries (i.e., Rialto drain, Sunnyslope Creek, Evans Lake drain, and Anza Park drain).

There is a population of suckers in the Santa Clara River that is thought to be introduced, although this presumption is based on the absence of the species from early collections rather than any documented records of introduction (Bell 1978). Portions of this population have apparently hybridized with the Owens sucker (*Catostomus fumeiventris*; Hubbs *et al.*, 1943) and, as a result, this population is not included within the range of the native sucker.

The sucker is fairly general in its habitat requirements, occupying both low-gradient, lowland reaches and high-gradient, mountain streams where water temperatures are less than 22° Celsius. However, the sucker appears to fair best in small to medium streams with higher gradients, clear water, and coarse substrates, such as the East Fork of the San Gabriel River. Flowing water is essential, but flows can range from slight to swift. The sucker can tolerate seasonal turbidity, but Saiki (2000) found that their relative abundance is negatively correlated with turbidity.

The sucker is typically associated with gravel, cobble, and boulder substrates, although it is also found over sand and mud substrates. *Catostomus* spp. produce demersal, adhesive eggs that are thought to be adapted to spawning habitat with boulders, cobble, and gravel rather than shifting sands or mud (Moyle 1976). Saiki (2000) found the sucker to be most common near cobble, boulders, and man-made structures in the San Gabriel River. During sampling in the Santa Ana River, Swift (1999) found that suckers comprised 38 percent of the catch in a habitat dominated by gravel and cobble, but only 2 percent of the catch in a habitat dominated by shifting sands. Conversely, no suckers were present in the Chino Creek, a tributary of the Santa Ana River, where gravel and cobble comprised a majority of the substrates. Water quality may have been reduced at that site, thus accounting for the lack of the sucker (Swift 1998).

The sucker feeds mostly on algae, diatoms, and detritus scraped from rocks and other hard substrate. Aquatic insects comprise only a small component of their diet (Greenfield *et al.* 1970). They have a relatively short life span of three to four years, but reach sexual maturity in one year and have high fecundity. For example, the fecundity of 6 females, ranging in size from 3.1 inches (78 millimeters) to 6.2 inches (158 millimeters), was 4,423 to 16,151 eggs (Greenfield *et al.* 1970). Spawning generally occurs from late March to early July, with the peak occurring in late May and June (Greenfield *et al.* 1970, Swift 2001).

Although little is known about sucker movements, other species in the Catostomidae family are known to be highly vagile and undertake spawning migrations (Tyus and Karp 1990). For example, juveniles of another species of mountain sucker, *Catostomus platyrhynchus,* swim downstream and then move back upstream to spawn (Moyle 1976). It is not known if the sucker follows this pattern; however, Swift (2000c) reported that juveniles detected downstream of River Road in the Santa Ana River were likely the progeny of adults reproducing upstream. These suckers may need to return upstream to spawn.

Information on population dynamics of the sucker is lacking. However, high frequency fluctuations between periods of low and high abundance may be characteristic of their populations owing to the unpredictable fluvial systems they inhabit. Arid regions of California are subject to considerable environmental variation, particularly in year-to-year precipitation that occurs primarily as winter rains. Unpredictable flood events and/or droughts may contribute to catastrophic decreases in sucker abundance by transporting them downstream past barriers to movement that essentially preclude any future contribution to the breeding population. Conversely, unpredictable droughts may contribute to decreases in sucker abundance by stranding them in isolated pools where ambient conditions become unsuitable or they can be extirpated by predation. Though the sucker's high intrinsic reproductive rate should enable it to quickly repopulate once environmental conditions become more favorable (Moyle 1976), rapid decreases in abundance render small populations even more susceptible to chance extinctions; especially if unfavorable environmental conditions persist or reoccur before the populations can recover.

Few estimates of age-specific survival rates, age structures, sex ratios, or dispersal rates are available from populations of the sucker. Age classes of suckers in the San Gabriel River were normally distributed between zero and four years old during 1984 and 1994. In 1987 and 1995, however, young-of-the-year were preponderant and older age classes were lacking (Haglund and Baskin 1995, 1996). Density estimates in the Santa Ana River during winter of 1999 and 2000 were 0.02 to 1 fish per meter (Swift 2001). Density estimates in the San Gabriel River during 1997 were 0.03 to 0.13 fish per meter (Hernandez 1997).

Threats that may have contributed to the decrease in the status of the sucker include the following: 1) destruction and degradation of habitat through urbanization, channelization and other flood control structures, water diversion and withdrawal, suction dredging, reductions in water quality, and other activities; 2) direct loss of suckers due to water diversions; 3) competition and predation from introduced non-native competitors and predators; and 4) loss of connectivity (65 *Federal Register* 19686).

The construction of flood control and water diversion structures associated with urbanization has resulted in conversion of sucker habitat to unsuitable concrete-lined storm drains in the lower-most reaches of the Los Angeles, San Gabriel, and Santa Ana rivers (Mount 1995) and a substantial loss of habitat in the upper portions of these rivers and their tributaries. These structures have also contributed to the dewatering of extensive reaches of these rivers and their tributaries, thereby eliminating additional habitat for the sucker. For example, the Big Tujunga Creek Dam has eliminated flows along most of the Big Tujunga Creek during late summer and autumn of dry years. During these periods, the sucker is restricted to an approximate 1-mile (1.6 kilometer) stretch of the creek.

Historically, the Los Angeles, San Gabriel, and Santa Ana rivers flowed perennially throughout their length (McGlashan 1930). However, the withdrawal of ground and surface water has de-watered extensive portions of these rivers that now remain dry during non-flood periods, unless the discharge of treated wastewater effluent sustain flows (e.g., Santa Ana River downstream of the RIX facility). For example, surface flows along the Santa Ana River upstream of the City of Riverside have long been diverted to provide water for communities in western San Bernardino and Riverside counties. Though records from the 1940's (Anonymous 2000) indicate that the sucker was once a common resident in this reach, no suckers have been detected within the upper Santa Ana River in recent years (Jones & Stokes Associates 1997).

Remaining habitat for sucker is often degraded by a variety of factors, including sedimentation, ephemeral water flow, reduced water quality, and the presence of invasive species. Degraded habitat conditions may contribute to reduced growth, fecundity, and survival of suckers due to loss of prey items, reduction in foraging efficiency, and lack of nursery areas (Gibson 1994). High turbidity is strongly correlated with lower relative abundance of suckers, possibly owing to a reduction in the availability of prey (e.g., loss of light for algal photosynthesis) and/or the inability of suckers to detect prey items in turbid waters (Saiki 2000).

Most of the existing flow in the lower Santa Ana River during the summer months is derived from treated wastewater discharged into the stream channel, primarily from the RIX treatment facility in Colton. Flows from this facility are reduced or terminated periodically when malfunctions cause reductions in discharge quality that exceed standards required by the State Regional Water Quality Control Board. The temporary reduction or termination of flows significantly reduce the amount of habitat available to suckers and could potentially strand them in dewatered sections of the stream. Also, because much of the Santa Ana River is maintained through treated water, contaminants within the treated water may adversely affect the sucker. Saiki (2000) reported that suckers inhabiting the Santa Ana River had significantly higher concentrations of dichlorodiphenyltrichloroethylene (DDT) and trans-Nonachlor than those in the San Gabriel River. Conversely, concentrations of arsenic and mercury were significantly higher in suckers inhabiting the San Gabriel River. However, all of these concentrations were lower than those found in a variety of freshwater species throughout the United States (Saiki 2000).

Recreational activities have contributed to the degradation of habitat for the sucker via erosion of stream banks, destruction of vegetation, and release of untreated human waste and other refuse. Off-highway vehicle activity may physically increase erosion and sedimentation and alter channel morphology. In addition, recreational suction dredging occurs in all counties occupied by the sucker. Suction dredging removes all substrates smaller than the diameter of the intake nozzle and deposits them as large, unstable piles just downstream from the dredge. As a result, suction dredging can locally increase turbidity, change channel topography, and decrease the abundance of aquatic insects (Harvey and Lisle 1998). Also, suction dredging appears to have significant negative effects to the early life stages (i.e., eggs, larvae, fry) that could pass through a suction dredge and be killed or injured (Harvey and Lisle 1998). For example, Griffith and Andrews (1981) found mortality rates of up to 100 percent for eggs and fry of cutthroat trout (*Oncorhynchus clarki*) and rainbow trout (*O. mykiss*) that passed through a suction dredge.

The introduction of exotic species may eliminate or reduce the abundance and distribution of native species via predation, competition, and ecosystem alteration (Moyle 1996). Infestations of the invasive giant reed have degraded extensive areas of habitat for the sucker by forming monotypic stands of marsh and slow moving aquatic habitats. Although giant reed may provide cover and a possible source of food for the sucker, it's overall effects are likely more detrimental than beneficial (Baskin and Haglund 1999).

Moyle and Yoshiyama (1992) concluded that introduced brown trout (*Salmo trutta*) contributed to the extirpation of the sucker from the upper Santa Ana River in the San Bernardino Mountains. In addition, flood control and water diversion structures have contributed to conditions that are favorable to many predators and competitors of the sucker, including the common carp (*Cyprinus carpio*), largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), green sunfish (*Lepomis cyanella*) and tilapia (*Oreochromis mossambicus*). Saiki (2000) reported that the relative abundance of the sucker was negatively correlated with the relative abundances of common carp and largemouth bass. Hence, the ponding of water (e.g., settling ponds, inundation pools for dams) essentially creates areas that are unsuitable for the sucker and serve as population sinks.

Flood control and water diversion structures on the Los Angeles, San Gabriel, and Santa Ana rivers have also reduced the status of the sucker by imposing barriers that preclude or impede movements within populations. Within the Santa Ana River, the sucker population is bisected by Prado Dam, which effectively blocks the movement of fish upstream. Hence, larvae or juveniles that move downstream of Prado Dam are lost from the upstream portion of the breeding population. The Hansen Dam on the Big Tujunga Creek and the San Gabriel River Dam may contribute to similar effects. Smaller barriers such as gauging stations, culverts and drop structures also impede movements of suckers along each of these rivers. For example, suckers washed downstream of the Weir Canyon drop structure along the Santa Ana River during high flows are effectively removed from the breeding population. The importance for upstream migration for the sucker is not known at this time. However, it is apparent that spawning is rare below Prado Dam and appears to be concentrated between Mission Boulevard and Rialto Drain well upstream of Prado Dam. Therefore, providing upstream passage to the sucker may be important to improving reproduction for this species. (relocation projects)

All remaining populations of the sucker are at risk due to their small size. Most of the lowland river habitats have been destroyed, and the remaining populations of the sucker are low in numbers, with the exception of the population in the San Gabriel River. Although the sucker is, in places, locally common in what remains of their native range, the total population size of any one of these remaining populations is still relatively small. Small populations have a higher probability of extinction than larger populations because their low abundance renders them susceptible to stochastic (random, naturally occurring) events such as inbreeding, the loss of genetic variation, demographic problems like skewed variability in age and sex ratios, and catastrophes such as floods, droughts, or disease epidemics (Lande 1988, Saccheri *et al.* 1998).

Another factor that renders populations of the sucker vulnerable to stochastic events is isolation, which often acts in concert with small population size to increase the probability of extinction for populations. Altered fluvial processes and impediments to movement have fragmented the historic range of the sucker such that remaining reaches of occupied habitat now function independently of each other. Isolated populations are more susceptible to extirpation by accidental or natural catastrophes because their recolonization has been precluded. Hence, the extirpation of remnant populations during local catastrophes will continue to become more probable as development and barriers further constrict remaining populations.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present effects of all Federal, State, or private actions and other human activities in the action area. Included in the environmental baseline are the anticipated effects of all proposed Federal projects in the action area that have undergone section 7 consultation and the effects of State and private actions which are contemporaneous with the consultation in progress.

The action area encompasses areas that would either be directly or indirectly affected by the proposed action, and not merely the immediate area involved in the action. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area as determined by our agency. For reasons that will be explained and discussed in the "Effects of the Action" section, we have described the action area in this consultation to include the Prado Dam and its ancillary features (e.g., interior dikes, spillway, outlet works); the Prado Flood Control Basin upstream of the dam, including Norco Bluffs zones 3, 4, and 5; and Reach 9 of the Santa Ana River downstream of the dam (see BA, page 1-2); and other areas adjacent to the Santa Ana River that may be directly or indirectly affected by construction activities. Because our action area is a biological determination that must incorporate direct, indirect, and interrelated/interdependent effects to listed species and their habitats, our action area may differ from the scope of analysis used by your agency under the National Environmental Policy Act as defined in Paragraph 7(b) of Appendix B of 33 CFR 325.

Least Bell's vireo

The vireo population in the Prado Basin and contiguous reaches of the Santa Ana River and Mill and Chino creeks has been actively studied and managed for the past 16 years. Annual monitoring is conducted to estimate abundance and distribution, breeding chronology, reproductive success, and nest site preferences. Also, cowbirds present in vireo home ranges were routinely monitored, and modified Australian crow traps were deployed throughout the basin and the adjacent Santa Ana River in an attempt to control this brood-parasitic species.

Vireos nesting in the Prado Basin area demonstrate a strong preference for nesting and foraging in willows and mule fat (The Nature Conservancy 1997, Pike and Hays 2000). Fifty-four percent of all nests in 1997 for which data were available ($n = 239$) were placed in various willow species, whereas 40 percent were found in mule fat (The Nature Conservancy 1997).

Survey efforts indicate that the population of vireos in the Prado Basin has increased significantly from approximately 164 pairs in 1995 to a minimum of 320 pairs during the 2001 breeding season (James Pike, personal communication to Loren Hays, July 16, 2001). This population continues to be the second largest overall and the largest by far north of San Diego County. The preliminary data derived from studies during the 2001 breeding season suggest that there were a minimum of 430 vireo territories (that contained approximately 320 vireo mated pairs) within the Prado Basin and environs (James Pike, personal communication to Loren Hays, July 16, 2001). The corresponding data obtained in the Prado Basin and environs during the 2000 breeding season indicated that there were then at least 357 territorial male vireos, 281 of which were paired (Pike and Hays 2000). Of the 336 territorial male vireos that were detected within the Prado Basin study area in 1999, 224 of these were found to be paired (Pike and Hays 1999). By contrast, 270 pairs were recorded in 1998, 195 pairs were detected in 1996, and 164 pairs were located in 1995 (Pike and Hays 1998). The reason for the substantial decrease in the number of breeding pairs from 1998 to 1999 remains unknown.

A minimum of 649 known fledged young were detected within the study area during the 2000 breeding season (Pike and Hays 2000), which was a 33 percent increase over the corresponding total (489) in 1999. Nesting success was 57 percent in 1999 and 71 percent in 2000, both of which exceeded the corresponding figures for 1997 (50 percent) and 1998 (41 percent; Pike and Hays 1999, 2000). Though the number of fledglings per breeding pair averaged 2.2 and 2.5 in 1999 and 2000, respectively, recruitment remained lower than the 1988 to 1991 average of 3.1 fledglings per breeding pair. In recent years, significantly fewer pairs have elected to renest after successfully fledging young on their first attempt (Pike and Hays 1999, 2000).

The two primary threats to the vireo in the Prado Basin and environs are habitat loss and degradation and cowbird-nest parasitism. Recovery objectives and current range-wide management efforts are focused on addressing these two issues (U.S. Fish and Wildlife Service 1998). For example, 2,587 cowbirds were trapped and removed from habitats for the vireo and flycatcher within the Prado Basin and environs during year 2000, and an additional 2,300 cowbirds were removed during 1999. Almost certainly as a result, the rate of cowbird parasitism on vireo nests decreased to an all-time, observed low of eight percent during the 2000 breeding season (Pike and Hays 2000).

Researchers of vireos within the Prado Basin and environs have detected several apparently well-incubated clutches of vireos that failed to produce a single viable nestling (Hays 1989). Entire clutches failed to hatch in three cases, and all vireo nestling young failed to survive in two other instances during the early part of the 1988 breeding season. In 1994, four full clutches failed to hatch. One apparently infertile female is thought to be responsible for two of these clutches. In 1997, a vireo nestling with a deformed upper mandible was observed in a nest (Pike and Hays 2000). Such abnormalities are often the expressed result of exposure to environmental contaminants.

Abnormalities that often are attributable to toxic levels of various pollutants were detected in invertebrate specimens collected within the Prado Basin. Specifically, crayfish (*Procambius clarkii*) with abnormal appendages have been found, and several Chinese river clam (*Corbicula fluminea*) specimens exhibited shell ring patterns that indicated irregular growth (U.S. Fish and Wildlife Service, unpublished data). Also, several age classes of Chinese river clams appeared to be missing from the aquatic habitats that were surveyed. This phenomenon may be the result of episodic, lethal exposures to toxic substances. Most importantly, preliminary data derived from the toxicological testing of abandoned vireo eggs from the Prado Basin have revealed the presence of dichlorodiphenylethylene (DDE), a metabolite of DDT, in concentrations that could cause eggshell thinning (U.S. Fish and Wildlife Service, unpublished data).

The Draft Recovery Plan for the vireo (U.S. Fish and Wildlife Service 1998) calls for the protection and management of riparian and adjacent upland habitat in each identified population/metapopulation site (including the Santa Ana River) and a reduction of threats to the extent that: 1) the species no longer needs significant human intervention to survive; or 2) if human intervention is necessary, "... perpetual endowments are secured for cowbird trapping and exotic plant (*Arundo*) control in riparian habitat occupied by least Bell's vireos."

Critical habitat for the vireo includes all riverine and flood plain habitats with appurtenant riparian vegetation in the Prado Basin below the elevation of 543 feet and upstream along the Santa Ana River through the Norco Bluffs area to the vicinity of the Van Buren Boulevard crossing. The action area contains a minimum of 3,500 acres of riparian habitats supporting the primary constituent elements of critical habitat. This critical habitat functions as a core area for resident vireos that is essential for the conservation of this species. Activities that could adversely affect these primary constituent elements were previously described in the "Status of the Species" section of this document.

Southwestern willow flycatcher

The Prado Basin population is one of only 6 permanent southwestern willow flycatcher breeding sites that now exist in California. Despite 16 consecutive years of cowbird management and habitat conservation efforts within the Prado Basin, only 5 flycatcher home ranges were detected within the Prado Basin during the 2001 breeding season. The preliminary data derived from studies during the 2001 breeding season (U.S. Fish and Wildlife Service, unpublished data) indicate that only three of the territorial birds were found to be paired and that only three flycatcher young were fledged within the action area. Only one pair of flycatchers was detected during the 2000 breeding season, and apparently only two flycatcher young were fledged in the Prado Basin at that time (Pike and Hays 2000). By contrast, five flycatcher home ranges were detected within the Prado Basin during the 1999 breeding season. Pairs were eventually found in three of these home ranges. Two of the three pairings resulted in successful breeding, producing a total of five fledglings (Pike and Hays 1999).

In 1997, the first flycatcher of the breeding season at the Prado Basin was detected on May 7 and the last (a juvenile) was noted on September 10. In 1998, the first flycatcher of the breeding season was detected on May 4 and the last was noted on August 9. Flycatchers in the Prado Basin virtually always nest near surface water or saturated soil (The Nature Conservancy 1994). All known territories have been situated in relatively close proximity to water-filled creeks or channels. In addition, territories have usually included overgrown clearings with varying amounts of nettles and at least a few moderately tall, often dense willows. Of the five flycatcher nests found in 1996, two were placed in arroyo willow, one was found in a red willow (*Salix laevigata*), one was placed in a sandbar willow, and one was placed in a tamarisk. Both nests discovered during the 1997 season were in arroyo willows. Nests have been placed as low as 2.0 feet (0.61 meters) above ground level.

Though flycatcher home ranges have been detected throughout much of the surveyed portions of the Prado Basin, successful breeding prior to 1996 had been detected only in North Basin and West Basin (Chino Creek). From 1996 to 1998 and again in 2000 and 2001, however, the only successful breeding occurred in the South Basin.

Though trapping and removal efforts of cowbirds have reduced nest parasitism and increased reproductive success of vireos in the Prado Basin, similar results have not been demonstrated for the flycatcher. The lack of a demonstrated relationship may reflect the low abundance of flycatchers in the basin or, alternatively, that some other factor(s) are limiting the population.

Although the unauthorized destruction of habitat within the action area has largely been curtailed, it has not ceased. During 1998, 1999, and 2000, lessees from your agency apparently mowed or cleared as part of projects unrelated to the Santa Ana River Project more than 3 acres of riparian habitat suitable for the vireo and flycatcher within the basin adjacent to Chino Creek. In addition, operations and maintenance work completed for your agency in late 1998 resulted in the clearing of less than one acre of riparian habitat suitable for the vireo and flycatcher. Also, during autumn 1999 approximately 2 acres of vireo habitat was destroyed or degraded in conjunction with the construction of roads, apparently on OCWD property, in the western portion of the Basin. Most recently, a total of 7 ponds in the lower basin was created without apparent authorization. Staff in your Operations and Regulatory branches are currently working with us to address these issues.

No flycatcher home ranges have been detected in either Reach 9 of the Santa Ana River or in the Norco Bluffs project areas (BA; U.S. Fish and Wildlife Service, unpublished data).

The primary threats to flycatcher within the action area essentially are those identified as impacting the vireo. The Draft Recovery Plan for the southwestern willow flycatcher (U.S. Fish and Wildlife Service 2001) calls for a minimum of 50 territories within the designated Santa Ana management unit and protection from identified threats to assure maintenance of the population over time.

Santa Ana sucker

The sucker has lost approximately 70% of its native range in the Santa Ana River. However, the portions of the Santa Ana River occupied by the sucker constitute approximately 60% of the entire remaining native range of the species. Recent survey information for suckers within the action area is presented in Table 1.

In the mid 1980's, Fisher (1999) reported observing numerous suckers at Imperial Highway. In Reach 9, researchers caught 5 suckers in 1991, one sucker in 1996, and 5 suckers in 1998 (Chadwick and Associates 1996, Swift 1998). The area downstream of the first drop structure downstream of Prado Dam contained appropriate habitat for sucker, including rocky to gravelly substrate, slow to moderate flowing water, and a mean depth of 19.7 inches (50 centimeters; Swift, 1998). Thus, the relatively low density of suckers is apparently not due to a lack of habitat. In recent surveys, ten adult suckers were caught between Weir Canyon Road and Imperial Highway (Baskin and Haglund 2001).

Between the Hamner Avenue crossing of the Santa Ana River (just upstream of the Norco Bluffs construction site) and the Prado Dam, researchers caught 3 fish in 1991, 76 fish in 1997, 22 fish in 1998, 5 fish in 1999, and 3 fish in 2000 (Chadwick and Associates 1996; Swift 1997, 1998, 1999, 2001). All 76 fish caught in the Norco Bluffs area in 1997 were between 0.8 and 2.8 inches (20 and 70 millimeters) in length. Therefore, Swift (1997) hypothesized that this area was a nursery for the sucker. However, the substrate was mostly shifting sand and provided low food resources. Additionally, the presence of invasive competitors such as fathead minnow may limit the availability of diatoms and epiphytic green algae to the sucker. The fish caught in this area during other years were adults or the length information was not provided. It appears that this area may provide appropriate habitat to the sucker in some years.

The causes of sucker decline in the proposed project area are attributed to habitat degradation and destruction, increase in invasive species and loss of connectivity in recent years. Habitat quality and quantity has been reduced by increased turbidity and sedimentation upstream of the Prado Dam, and the construction and maintenance of flood control structures. Increased turbidity reduces the available light needed for photosynthetic processes for algae and visibility for prey searching. Sedimentation reduces available spawning habitat and food sources by covering favorable cobble and gravel substrate. The installation of hard bank stabilization structures along various areas of the Santa Ana River has also contributed to losses of habitat. These hard bank stabilization structures reduce habitat quality and quantity by reducing bank vegetation and increasing flow, thus encouraging the removal of larger-sized substrate. Habitat quality is further reduced by bank stabilization structures that remove pool-riffle complexes.

The status of the sucker in the action area has likely been adversely affected by increased predation and competition from invasive species. Banks stabilization structures, the Prado Dam reservoir, and the construction of wetlands have provided excellent habitat for invasive predatory and competitive species such as largemouth bass, channel catfish, carp, bluegill, green sunfish and mosquitofish (*Gambusia affinis*). Swift (2001) reported that carp and channel catfish were most common downstream of the Prado Dam, and green sunfish and largemouth bass rarely strayed from deep pools and slow-moving aquatic habitats. However, Baskin (2001) hypothesized that large numbers of mosquitofish observed in the mouth of the Sunnyslope Creek may be preying on recently spawned larval suckers.

As suckers are washed down the river, they are unable to return upstream due to the presence of several barriers. Four existing drop structures are present downstream of Prado Dam that probably prevent suckers from passing upstream due to their height and design. Additionally, Prado Dam almost certainly impedes passage, especially during low flows in the dry season and high flows and subsequent ponding upstream of the dam during flood seasons. Upstream of Prado Dam, the diversion at River Road provides another barrier. This diversion is a 12- to 36-inch (30- to 91-centimeter), earthen dam that diverts 70 percent of the water to wetlands managed by the Orange County Water District. The remaining water is diverted through culverts beneath the dam to the main river channel. Upstream of the culverts, water is ponded and provides habitat for exotic predators and competitors. Suckers are likely not able to swim upstream through the fast flowing water exiting the culverts and, should they succeed, then they must pass through ponds. The importance of upstream migration has been demonstrated for several species of lake suckers, including the cui-ui sucker (*Chasmistes cujus*), Sacramento sucker (*Catostomus occidentalis*), and Modoc sucker (*Catostomus microps*) (Moyle 1976; Stewart Reid, U.S. Fish and Wildlife Service, Klamath Falls, Oregon, personal communication to Lucy Caskey, April, 2001). Where fish passage has been constructed for the lake suckers, fish locks have been successful in passing 150,000 to 700,000 suckers per day (Brant Mefford, Bureau of Reclamation, Denver, Colorado personal communication to Lucy Caskey, March, 2001).

The relatively low density of suckers downstream of Prado Dam may be due to several factors, including a lack of recruitment in this portion of the river due to the small amount of suitable spawning habitat, relatively high density of exotic predators, and loss of habitat from the installation of flood control features (e.g., drop structures, bank stabilization, and low flow channels).

Because the status of the sucker is precarious and declining, long-term conservation depends on the implementation of the following conservation measures: 1) protection of remaining populations to ensure that they are independently viable with stable or increasing abundance and recruitment; 2) maintenance or restoration of adequate perennial flows necessary to support and create viable habitat in each river and tributary occupied by the sucker, including reaches that are currently dewatered; 3) maintenance or restoration of connectivity of habitat in each river and tributary occupied by the sucker, including the removal or modification of existing barriers to movement; 4) maintenance of water quality suitable for the sucker; and 5) removal of exotic species that degrade habitat and/or reduce the status of the sucker through predation or competition.

Habitats that are currently degraded could be improved in a number of ways. Naturally sinuous river channels should be encouraged throughout the historic range of the sucker, and ponded water should be reduced to a minimum and/or managed in such a way as to discourage entry by the sucker. In addition, water management plans and/or legal agreements should be developed to maintain relatively adequate perennial flows in all rivers, particularly in the Santa Ana River where RIX facility shutdowns could strand the sucker in shallow pools. Furthermore, restoring flow to dry reaches with appropriate substrate could provide adequate habitat to support the reintroduction of suckers. In addition to flow, turbidity should be reduced through appropriate dam modifications, and the scope and intensity of recreational activities that adversely affect the sucker and its habitat should be limited. Habitat for sucker may also be improved by adding coarse material and boulders to the substrate. In areas where other listed species are not present, nursery habitats should be created and maintained by clearing emergent non-native vegetation and, if necessary, modifying stream banks to create shallow stream bank areas. Once habitat is created, it should be protected from human-induced high flows (e.g., dam releases) that could scour gravel and cobble substrate. One possible measure that could dissipate these high velocity flows is the installation of relief channels. Relief channels are constructed to divert high flows away from the main channel. An example of a relief channel is at the confluence of Sespe Creek and Santa Clara River. This relief channel appears to support a population of suckers, arroyo chubs and sticklebacks (Baskin and Haglund 1999).

An exotic species program should be implemented to remove vegetation such as the giant reed and competitors and predators of the sucker such as the green sunfish, largemouth bass, carp, and channel catfish. Such a program would improve habitat for the sucker by reducing the amount of slow moving or standing water created by large stands of giant reed and by decreasing the presence of exotic fish. Removal of invasive fish species is usually completed by chemical or mechanical means such as the use of seines, nets, and traps. Mechanical means would be the most effective and least harmful to the native fish species in the Santa Ana River.

Barriers that preclude or impede the movements of suckers should be removed or modified (e.g., installation of fish passage structures) so that individuals are no longer lost to the breeding population and can colonize currently unoccupied areas. Several types of fish passage are available including fish locks, vertical slot structures, and fish rock passageways. Vertical slot structures have been successful for the cui-ui sucker in the Truckee River, and natural fish passageways are being constructed for the Modoc sucker in a Pit River tributary (Stewart Reid, personal communication to Lucy Caskey, April, 2001). The darting speed of small suckers is estimated to be 4 body lengths per second (e.g., a 6-inch-long sucker would have darting speed of 2 feet per second) (Stewart Reid, personal communication to Lucy Caskey, April, 2001). However, the swimming speed and affinities of the sucker and other similar species should be examined more closely so that appropriate passageways can be constructed.

Because few specifics are known about the life history strategies, population dynamics, and habitat affinities of the sucker, research and monitoring should be initiated immediately. The Santa Ana Sucker Discussion Team has funded initial studies of the distribution, habitat affinities, and potential effects of contaminants, turbidity, and exotic species on the sucker population in the Santa Ana River. Additional studies should be funded to investigate additional areas and variables. Also, goals should be clearly defined for all measures implementing conservation needs, and the success of conservation efforts must be assessed through quantitative and qualitative monitoring.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by or result from the proposed action, and are later in time, but are still reasonably certain to occur.

Activities associated with, or resulting from, the proposed action could adversely affect the vireo, flycatcher, and/or sucker in the following manner: 1) direct removal and/or disturbance of habitat occupied by these species during construction; 2) increased degradation of habitat downstream of the dam owing to more-frequent, higher-rate discharges; 3) disturbance from noise and vibration effects during construction; 4) increased degradation of habitat in the reservoir pool owing to more-frequent, higher-elevation pooling of water and, in turn, inundation effects to habitat occupied by these species; 5) increased invasion of exotic species due to disturbance of habitats and land use activities within the expanded reservoir pool area that are favorable to these species; 6) increased potential for accidental spillage and dispersal of environmental contaminants that could contribute to reduced recruitment; 7) increased disturbance from human presence during and following construction, restoration, operation and maintenance activities; 8) increased risk of fires during and following construction, restoration, operation and maintenance activities; and 9) increased impediments to wildlife movement through the area that could reduce the status of the vireo and flycatcher by reducing ecological function in the Prado Basin and contribute to mesopredator release. Each of these categories of adverse effects are discussed in detail in the following sections.

Direct removal and/or disturbance of habitat during construction: Approximately 52.5 acres of riparian habitats, all of which contain the primary constituent elements of critical habitat for the vireo, will be destroyed or disturbed as result of the construction of the project. The Norco Bluffs stabilization footprint will destroy 1.81 acres of cottonwood-willow riparian, 5.86 acres of willow riparian, and 0.31 acres of riparian scrub (Corps 2000, Table 3-2, page 3-6). Construction activities associated with raising the dam and associated flood control structures (e.g., levees) would result in the direct loss of 18.3 acres of willow woodland and herbaceous riparian in the Prado Basin (Corps, 2001g). The Reach 9 project component will result in the disturbance of 26.3 acres of riparian habitat, including the permanent removal of 8.8 acres and temporary removal of 17.5 acres of nesting and foraging habitat for vireos (i.e., cottonwood-willow riparian woodland and riparian scrub; BA, Table 9).

This habitat removal is anticipated to adversely affect a minimum of 24 pairs of vireos (BA, page 4-14) and, possibly, as many as 31 vireo territories based on surveys conducted during the 2001 breeding season (James Pike, personal communication to Loren Hays, June 5, 2001). This permanent and temporal loss of habitat for the vireo could result in a decrease in their abundance and recruitment that affects population dynamics for a period longer than 5 years. Also, the value and function of these riparian areas could be degraded for more than 5 years because of the uncertainties associated with riparian revegetation and the time necessary to re-establish functional and mature habitats.

A total of 9.0 acres of perennial stream occupied by the sucker will be permanently destroyed as a result of the construction of a toe stabilization structure at Norco Bluffs and flood control improvements to Prado Basin and Reach 9 (Corps, 2001g). Another 4.2 acres of streambed will be temporarily disturbed by construction activities in these areas (Corps, 2001g). In 1997, Swift collected 76 juvenile suckers within Zone 3 and Zone 4 of Norco Bluffs. Although spawning habitat may be limited in this area, shallow sandy margins have been documented as nursery areas for juvenile suckers (Swift 2001). Additionally, suckers have been detected in Reach 9 between Prado Dam and Imperial Highway during surveys conducted between 1991 and 2000 (Baskin and Haglund, 2001). Degradation of potential spawning habitat due to construction and the establishment of new flood control structures in Reach 9 of the Santa Ana River would represent a significant adverse effect to the population because suckers depend solely on appropriate habitat between Prado Dam and Weir Canyon Road to spawn. Increased turbidity and sedimentation would reduce available habitat by covering cobble and gravel with sediment. Hard flood control structures such as those described in the BA and SEIS for Reach 9 increase flow velocities, exacerbate downstream bank erosion, and lead to channel narrowing and bed degradation. Furthermore, hard bank stabilization measures redirect flows so that shallow sand habitats are reduced. These habitats are particularly important as nursery areas to the larval and early juvenile stages of the sucker (Swift 2001). The loss of any riparian vegetation decreases habitat diversity within the river by reducing the amount of root systems and woody debris in the system. The construction of a new levee and the increase in toe depth to protect a golf course will decrease available habitat to the sucker by reducing appropriate substrate, removing vegetation, and decreasing water quality. As a result, we anticipate that the proposed destruction and degradation of habitat could contribute to decreased reproduction, survival, and recruitment by the sucker owing to a decrease in the availability of appropriate substrate, food sources, vegetation, and water quality.

To minimize the potential effects of removal and/or disturbance of habitat to the vireo, flycatcher, and sucker, your agency and the local sponsors have proposed to avoid the use of the northeastern portion of borrow area #1A near known flycatcher nesting locations during flycatcher breeding season and restore and/or replace riparian and non-riparian habitats (including perennial stream) disturbed during the project. If temporarily disturbed areas do not naturally revegetate within a five-year monitoring period, then your agency has agreed to replant each area with cuttings from native riparian species and ensure successful restoration. Non-riparian areas that are temporarily disturbed will be maintained free of exotic plants for 8 years. Restoration of perennial stream habitat will include the replacement of pre-construction substrates and microhabitat features, re-establishment of natural channel morphology, re-establishment of perennial flows, and verification that the structure and composition of the restored area is similar to pre-construction conditions. In addition, for each acre of habitat that is disturbed, additional habitat will be created and/or funds will be contributed to the Trust Fund as outlined in the project description to increase the existing baseline of habitat available to these species in the upper Santa Ana River watershed and/or action area; actively monitor and manage this habitat until it is completely restored; and maintain this habitat *Arundo*-free for the life of the project.

Though habitat restoration and creation are rarely, if ever, successful in replacing lost riparian functions or values (Sudol 1996), we anticipate that the proposed restoration and creation efforts will ensure that the baseline of riparian and other flood plain habitat will be maintained or increased during the life of the project. In addition, contributions to the Trust Fund could exceed $8,000,000 if your agency exercises this option to minimize project-related effects (see "Conservation Measures" section of this document). These contributions would help ensure that the Trust Fund remains solvent for the life of the project and continues exotic plant removal and wildlife and habitat management programs throughout the Santa Ana River Watershed. These measures would also minimize the potential adverse effects to designated critical habitat for the vireo by maintaining the function of riparian habitat within the Prado Basin and environs for a core population of vireos.

<u>Increased degradation of habitat downstream of the dam owing to more-frequent, higher-rate discharges from the dam</u>: Additional impacts to habitat for the vireo, flycatcher, and sucker will result from re-sizing the dam outlet works to provide increased discharge capability. The upsizing of the dam outlet works will increase the capacity of discharges from 5,000 cfs to 8,760 cfs for a 25-year flood, from 5,000 cfs to 18,500 for a 50-year flood, and from 22,200 cfs to 30,000 for a 100-year flood (Corps 2001c, d). Your agency originally anticipated that these increased discharge rates could destroy or seriously damage at least 282 acres of riparian woodland habitat downstream from the dam and would be catastrophic for vegetation loss (DSEIS/DEIR, page S-4).

More-recent, fixed-bed modeling efforts by your agency estimate that relatively little riparian habitat will be adversely affected by the proposed increase in discharge rates and frequency (Corps 2001c, d). Approximately 37.7 acres would be exposed to high-velocity flows >10 feet per second during a 30,000 cfs flow event, whereas 86.1 acres would be exposed to moderate velocities of 6 to 10 feet per second, and 145.5 acres would experience low, "non-damaging" velocities of <6 feet per second. Comparatively, 9.5 acres of riparian vegetation would be subjected to flows >10 feet per second at discharges of up to 18,200 cfs, and no riparian vegetation would be subjected to such flows at discharges ≤5,000 cfs (Corps 2001d). Also, your agency maintains that significant damage to riparian habitat downstream from the dam would occur only rarely because sustained discharges exceeding 10,000 cfs would be rare. As an example, a release rate of 30,000 cfs is not achieved until the water surface elevation reaches 540 feet (Table 2). Since the existing Prado Dam was completed in 1941, the maximum recorded water surface elevation has been 528 feet (Corps 1994; Joe Evelyn, U.S. Army Corps of Engineers, personal communication to Loren Hays, September 26, 2001).

The proposed re-sizing of the dam outlet works to increase the capacity of discharges is reasonably certain to contribute to the degradation of downstream habitat for the sucker over time. Suckers depend on gravel substrate because they scrape algae off of rocks for sustenance and use these areas for spawning. Although it is not known if suckers spawn in this area, they have been detected in Reach 9. It is reasonably certain that discharges in the range of 5,000 to

10,000 cfs will mobilize gravels, alter the river substrate, and decrease the availability of spawning habitat and food resources for the sucker downstream of Prado Dam. This substrate is unlikely to be replaced at a rate commensurate with its loss owing to the barrier to gravel transport imposed by the dam. Spawning habitat would also be lost due to increased sedimentation. The loss of any spawning habitat downstream of the Prado Dam could significantly limit reproduction by the sucker because there is little possibility for these fish to return to upstream spawning sites owing to the barrier imposed by the dam. Even an infrequent, high-rate discharge event that reduces available spawning or larval habitat and, thereby, contributes to a decrease in recruitment could decrease the status of these species for years owing to persistent effects (i.e., time lags) on local population dynamics.

The areas of the Santa Ana River that will be most vulnerable to habitat degradation, which includes substrate and vegetation removal from increased frequency and flows, include the section/sections:

- immediately adjacent to and downstream of the Car Wash and Strip Mall Protection (Figure 2-1, Corps 2001d),
- between the strip mall protection and the Lower Highway 91 Embankment (Figure 2-1, Corps 2001d),
- immediately adjacent to and downstream of the Lower Highway 91 Embankment,
- the unchannelized streambed between the Lower Highway 91 Embankment and the Green River Golf Course (Figure 2-2, Corps 2001d),
- immediately adjacent to Low Flow Channel at Green River Golf Course (Figure 2-3, Corps 2001d),
- the river channel near the Green River Mobile Home Park (Figure 2-3, Corps 2001d),
- the section immediately adjacent to and upstream of Green River Housing Estate (Figure 2-3, Corps 2001d), and
- immediately adjacent to and downstream of Upper Highway 91 Embankment (Figure 2-3, Corps 2001d).

These areas are expected to experience flows greater than 6 fps during high flood flows of 18,200 cfs and greater (Corps 2001d). Flows greater than 6 fps are expected to destroy larger vegetation such as trees and shrubs and thus can be reasonably expected to disturb gravel and cobble substrate.

Impacts to sucker from the increased flow and frequency include sweeping suckers from areas where there is great constriction and no refugia past Weir Canyon Bridge into Reach 8 and beyond of the Santa Ana River, loss of spawning habitat, and loss of food resources. Since there are no known spawning locations between Prado Dam and Weir Canyon Bridge, it is difficult to assess impacts to reproduction. Survival could be significantly reduced for any existing sucker population as food resources would be would be anticipated to decrease. Additionally, any suckers swept past the drop structure downstream of Weir Canyon Bridge would be moved to habitats that are less conducive to their survival. For example, between Weir Canyon Bridge and Imperial Highway Bridge, there is less canopy and refugia, and the river is highly fragmented by three drop structures. After Imperial Highway Bridge, water flow is extremely reduced, and little or no canopy and habitat, including appropriate substrate, exists. Therefore, it is likely any suckers swept below Weir Canyon would be lost to the known sucker populations.

To minimize the potential effects of increased degradation of habitat downstream of the dam, your agency and the local sponsors have proposed to maintain and manage more than 1,100 acres in the Santa Ana River Canyon for wildlife values, including an estimated 789 acres of flood plain and an additional 444 acres of non-flood plain properties that are currently held in public domain and dedicated for open space/habitat purposes (County of Orange 2001). Upon approval of the Prado Dam Project Cooperation Agreement, which is anticipated to occur during February 2002, the local sponsors anticipate proceeding with the proposed purchase of an additional estimated 290 acres of the Santa Ana River Canyon flood plain that is privately owned (County of Orange 2001).

The Habitat Management Plan prepared for these public lands has not been completed or adopted. However, your agency and the local sponsors have agreed to finalize the proposed plan or equivalent within one year of the initiation of construction in coordination with our agency and, subsequently, obtain approval from our agency and implement the plan immediately thereafter to appropriately conserve listed species within Reach 9 of the River. The local sponsors have indicated that, under any circumstances, the approved Habitat Management Plan will be implemented in full upon the conclusion of construction in the Santa Ana River Canyon (County of Orange 2001). In the interim local sponsors have committed to maintain open space that is under their direct control in a manner that is consistent with the intent of the Habitat Management Plan (County of Orange 2001). The Habitat Management Plan restricts commercial and residential development within the 1,100 acres of the Habitat Management Plan area, and conserved lands are to be managed in the future in such a way as to promote the conservation of listed species. Although there are no ordinances, easements, or other commitments that would require the avoidance of projects and activities that are inherently inconsistent with listed species and wildlife conservation in the Habitat Management Plan area, any future activities that may affect federally listed species will require consultation. The Habitat Management Plan must guarantee that the baseline amount of riparian vegetation will be maintained.

The draft Habitat Management Plan provided to us on August 20, 2001, is not adequate to ensure that the baseline riparian and other habitat for listed species is maintained in the action area downstream of the dam. For example, there are few details regarding the decision making process of the Management Committee, no apparent reporting requirements, and no detailed management and enforcement responsibilities. As currently proposed, the proposal to restore habitat is limited to riparian areas and will be done only as mitigation requirement for County projects. Moreover, we understand that the exotic plant (giant reed) removal program, which was formerly incorporated into the Habitat Management Plan, has now been removed from the plan and is now considered "... to be a 'betterment' or separate program for mitigation credit purposes" (County of Orange 2001). In addition, the restoration that will be conducted under the program is not defined and criteria determining which areas should be restored has not yet been provided. Moreover, the plan should address the restoration of habitats downstream from the dam if project-enabled discharges unexpectedly cause the destruction or degradation of substantial riparian habitat elements downstream from the dam. However, it is anticipated that the purchase and management of the Santa Ana River flood plain and other habitat restoration measures within the action area will be implemented over time to moderate any damage incurred.

Increased discharge rates may wash suckers past Weir Canyon, where they would not be able to return upstream past the several existing drop structures. These suckers would be lost to any breeding population downstream of Prado Dam because there is no known spawning habitat downstream of Weir Canyon.

To minimize the effects of increased discharge rates and frequencies to the sucker, your agency will design and implement an efficient, cost effective trap and haul program in coordination with the Service, CDFG and other experts. This program should reduce the number of suckers permanently lost from the bottom population below Prado Dam. This program will also contribute to removing non-native predators and competitors of the sucker from the system.

Additional barriers/impediments to movement and the likely elimination of upstream movement through the outlet works: Though the existing Prado Dam may impede the upstream movement of suckers during most conditions, it is still possible that suckers occasionally pass upstream through the outlet works. Also, it may be economically and technically feasible to establish a passageway through the existing dam that would provide connectivity for the sucker and allow upstream as well as downstream movements along the Santa Ana River (Jim Stowe, Fish and Wildlife Service, Portland, Oregon, personal communication to Lucy Caskey, September, 2001). The proposed raising of the dam and outlet works will worsen this situation somewhat by essentially precluding passage through the dam and making it less feasible to establish a passageway in the future.

Connectivity between the upstream and downstream segments of the sucker population along the Santa Ana River may be essentially precluded by cementing over (i.e., eliminating) the existing outlet works and cement lining approximately 3,129 feet (1 kilometer) of stream habitat from the new outlet works through the first downstream drop structure (i.e., gauging station). Cement-lined channels do not offer the refugia that natural rivers provide (e.g., boulders, shallow pools, gravel). As a result, suckers moving through the outlet channel will be vulnerable to predation. Also, a smooth substrate reduces the ability of suckers to swim against the current (Brant Mefford and Stewart Reid, personal communications to Lucy Caskey, March and April 2001). Typically, suckers hug a roughened substrate where downstream velocity is low or nonexistent as they swim upstream. Additionally, the concrete channel could result in increased water temperatures during the summer months to a level beyond the lethal limit for the sucker.

The proposed modification of the existing drop structure at the gauging station to include baffles at the downstream end also poses a significant mortality risk to the sucker (R2 Resource Consultants Inc. 1998). Baffles act as energy dissipaters by significantly increasing turbulence. Currently, the drop structure consists of large and small rocks providing varying degrees of roughness. Roughness of the substrate provides eddies and back-currents that could reduce the downstream velocity to near zero and, as a result, minimize injuries to suckers moving downstream. By comparison, the proposed addition of baffles would increase the vulnerability of suckers moving downstream to injury and death as they are tumbled through the baffle rows.

To minimize these effects, your agency has agreed to "roughen" the cement-lined outlet channel to emulate a natural gravel-cobble streambed. Also, native vegetation will be planted adjacent to the channel to provide as much canopy cover as possible. In addition, your agency has agreed to re-design the drop structure such that the risk of injury and/or mortality to the sucker is minimized.

Harassment from noise and vibration effects during construction: In the absence of specific measures to abate noise and fugitive dust during construction, as many as 90 pairs of vireos could be adversely affected in the Prado Dam project area, as would all 24 pairs in Reach 9 (BA, pages 4-17 and 4-18). Noise and vibration are potentially harmful to bird species that have acute senses of hearing (Gunn and Livingston 1974, Dooling 1978, Knudsen 1978, Fay and Feng 1983, RECON 1988, Pike and Hays 1992). Dufour (1980) identified four major categories of noise effects on wildlife: 1) auditory physiological; 2) nonauditory physiological; 3) behavioral; and 4) masking (i.e., interference with the reception of auditory signals because of interfering environmental noise). Though masking and behavioral considerations are of primary concern with regards to the proposed project, Dooling (1987) indicated that "as studies with humans have shown, noise has other deleterious effects [other than masking] and there is no reason to think that noise would not effect animals in the same way." Fletcher *et al.* (1971) reported that detrimental noise effects may decrease the chances for survival of birds, or even lead to their death. For example, Gunn and Livingston (1974) reported that a bird population exposed to helicopter disturbances and human activity suffered (in contrast to the control population) lower hatching and fledging success and increased rates of nest abandonment and the premature disappearance of nestlings. Also, Woolf *et al.* (1976) concluded that prenatal auditory stimulation can affect the development and, therefore, the physiology of an avian embryo inside an egg.

Masking may be most detrimental to small perching birds like the vireo where excess sound can interfere with the perception of important, relevant auditory signals (Miller 1974). Whether a vireo receives potentially vital auditory information depends on such noise parameters as environmental attenuation, signal to noise ratios, and discrimination of the receiver given the background noise. The pertinent biological literature suggests that birds use their sense of hearing to locate their young and mates, to establish and defend territories, and to locate and evade predators (Scherzinger 1970). Shen (1983) observed that the ability of a bird to detect vibration may be crucial for sensing approaching predators, particularly if the birds are sleeping. Thus, the life of a vireo may depend upon its detection of an alarm call given by another vireo (or other species) that warns of the approach of potential predators.

Masking noise may also affect the breeding behaviors of affected birds. Dr. R. Dooling, bioacoustics expert from the University of Maryland, concluded that if "noise masks vireo song for the human (at some given distance) then it probably also significantly masks vireo song for the vireo" (personal communication to Loren Hays, 1987). Dooling continued that "the human almost certainly does better than the vireo in hearing a signal in noise around 2 to 4 kilohertz; probably about twice as good." Given Dooling's remarks concerning the relative acuities of human and vireo hearing, and the importance of hearing for the essential behaviors (e.g., breeding, feeding) of the vireo and flycatcher, unabated masking noise during construction could adversely affect the status of birds in, or adjacent to, the action area.

To minimize potential noise and vibration impacts to the vireo and flycatcher, your agency has agreed to a number of substantive measures (see "Conservation Measures," above), to ensure, in most all cases, that: 1) noise does not exceed 60 dBA within vireo habitat or, 2) noise does not exceed established baseline levels if said levels are above 60 dBA. The measures proposed should significantly reduce the likelihood of noise impacts to vireos and preclude impacts to flycatchers.

<u>Increased degradation of habitat in the reservoir pool owing to more-frequent, higher-elevation pooling of water and, in turn, inundation effects to habitat occupied by these species</u>: With and without-project inundation levels and durations were compared to determine if the project would result in "prolonged inundation of vireo critical habitat or an increased potential for flooding of vireo nests following rare late spring storms". Your agency has maintained that the proposed flood control project would not cause significant increases in inundation elevations or dwell times within habitat for vireos behind the dam owing to the increased discharge capacity of the outlet works (Corps 2001c). Also, your staff has indicated that the dam will continue to be operated primarily for flood control purposes, and that during late winter water will not be held longer or at higher elevations behind the dam in anticipation of water control activities up to 505 feet elevation following March 1. In addition, your agency maintains that any increases in inundation under future conditions will be the result of parameters (e.g., sedimentation and watershed development) not related to the proposed project or increased water conservation activities subject to consultation under section 7 of the Act.

While we agree that the increased discharge capacity of the reconstructed dam could, under certain circumstances, reduce both the elevation and dwell time of water pooled behind the dam, it seems evident that the inundation of all (wetland/riparian and upland) habitats up to an elevation of 566 feet will be enabled by the project and that the dwell time of impounded waters at all elevations could be increased. In addition, it is reasonably certain that the project will effectively enable or facilitate increased watershed development and, eventually, increase the overall deposition of sediments behind the dam. As an example, the current water control manual (Corps 1994) provides for a range of release rates at all elevations from the debris pool to the elevation of the spillway (and above). Given that a stated objective of the manual is to accommodate water conservation whenever possible, the much larger post-project potential reservoir pool, and resulting decreased flood risk associated with storing water at higher elevations, it seems reasonable to conclude that the project will induce occasional, incremental damage to habitats occupied by the vireo and, possibly, the flycatcher. The increased storage of water during the later winter and spring growing seasons could result in the degradation of riparian habitat and the understory that vireos require for nesting and/or increased nest inundation. Although termed "rare" (BA, page 4-11), March and April rains and runoff associated with snow melt have occurred frequently since 1995 (including 2001) and resulted in the inundation of riparian habitat up to an elevation of 505 feet during the flycatcher and vireo breeding seasons.

Consistent with your agency's analysis, we anticipate that the project-enabled, increased pooling of water during winter months when Prado Dam is operated for flood control (October 1 to February 28) is not likely to directly threaten individual vireos or flycatchers because these species are typically not present in the project area during this time period. Vireos typically arrive in the Prado Basin and southern California from their wintering grounds in mid to late March, with territory establishment and nesting taking place from March through late July (Pike and Hays 1999). Dispersal of fledglings and mature adults typically occurs in August and September. Flycatchers typically arrive in the Prado Basin later than vireos and leave earlier. As a result, vireos and flycatchers are only rarely detected in the Basin during October 1 to March 15 (Pike and Hays 1999).

During the 2000 breeding season, vireos successfully bred at an approximate elevation of 488 feet within the Prado Basin (James Pike, personal communication to Loren Hays, March 2001) and in 1999, approximately 27 percent of the male vireo territories in Prado basin were at an elevation of 505 feet or less (Corps, 2001h). Willow riparian habitats occur between an elevation of 488 feet and the vicinity of the base of the dam at elevation 460 feet. In the absence of a revised water control manual, the larger storage capacity behind the dam enabled by the proposed project will allow the pooling of water to elevations of 566 feet. As a result, riparian habitat associations used by the vireo and flycatcher for nesting in the action area could be subject to the deleterious effects of inundation (e.g., kill embryos/nestlings; loss of understory).

Though March and April rains were evaluated as "rare" in the BA (page 4-11), such rains have occurred frequently during these months since 1995 (see historic Corps telemetry data at www.spl.usace.army.mil); resulting in periodic inundations of vireo and flycatcher habitat up to an elevation of 505 feet during the flycatcher and vireo breeding seasons. The raising of Prado Dam will increase the capacity of flood control pool and enable changes in operation of the dam that could prolong the length of time that habitat for the vireo and flycatcher below 505 feet is inundated. For example, during the 1998 breeding season, authorized water conservation resulted in the holding of water at or above an elevation of 505 feet from February 25 until May 31, during which time habitats below that elevation were entirely unavailable to vireos and flycatchers.

Though the effects of flooding on riparian habitat are relatively difficult to quantify, a project-related increase in the capacity to store water behind Prado Basin in concert with water conservation efforts may result in the following effects: 1) vegetation mortality (i.e., reduction in the aerial extent of willow riparian habitat); 2) reduction in species diversity, as plants intolerant of flooding are reduced within the basin; and 3) structural changes within the habitat, especially a loss of shrubby understory. The primary effects to the vireo include a reduction in the carrying capacity of the action area due to decreased availability of habitat and, also, a reduction in recruitment due to decreased foraging and nesting locations.

Given the previously mentioned potential effects of inundation, we remain concerned that the dwell time of impounded waters at all elevations behind the dam could be increased and contribute to further degradation of riparian habitats in the Basin. However, we have not anticipated any change from existing conditions based on your commitments to operate the dam per the water control manual. Thus, the proposed flood control project is not anticipated to cause significant increases in inundation elevations or dwell times within habitat for vireos owing to the increased discharge capacity of the outlet works (Corps 2001c). In turn, we will evaluate the degradation of habitat by waters impounded behind the dam during reinitiation(s) of this biological opinion and/or ongoing and future consultations under section 7 of the Act regarding proposals to increase water conservation activities in the basin.

Increased invasion of exotic species due to disturbance of habitats and land use activities within the expanded reservoir pool area that are favorable to these species: Any project-related creation and maintenance of conditions that favor exotic plants and animals could decrease the status of the vireo, flycatcher, and sucker. The increase and spread of alien plants such as giant reed is continuing in the Santa Ana River watershed, including the Prado Basin. Undisturbed areas vegetated with native species are much more resistant to invasion by this and other alien plants. Areas directly affected or disturbed by construction activities are likely to accommodate, sustain, and facilitate the spread of non-native plants within the project area. The alteration of the landscape within the project area and associated establishment and dispersal of select non-native plants likely will impact, and could overwhelm, native habitats in the project area and environs. Invasive exotic plants could be established in riparian and upland areas impacted by construction, maintenance, or operations activities associated with the project. Stands of giant reed, castor bean, and other invasive, noxious non-native plants provide little habitat for the vireo and flycatcher. The vast majority of vireo nests within the Prado Basin and elsewhere have been placed in native trees and shrubs (Pike and Hays 2000).

To minimize the risk of invasion by exotic plant species, your agency has agreed to keep all temporarily disturbed riparian areas free of exotic plants until riparian vegetation is re-established. If the site(s) have not begun to recover within 5 years (i.e., 50 percent of the disturbed areas are not vegetated with young riparian vegetation), then the site(s) will be replanted with cuttings from native riparian species. Also, non-riparian areas that are temporarily disturbed will be maintained free of exotic plants for 8 years.

The disturbance or removal of existing riparian and upland vegetation can result in the creation of cowbird foraging habitat or increase cowbird parasitism events due to the fragmentation of nesting habitat (Askins 2000). Cowbirds prefer feeding in open areas such as those created by human alterations of the landscape (Garrett and Dunn 1981). There is a relatively high density of cowbirds in the Prado Basin and contiguous reaches of the Santa Ana River, possibly owing to the rather close juxtaposition of host-rich riparian habitats and expansive feeding areas in and around nearby dairies, livestock operations, urban, and agricultural fields (Zembal *et al.* 1985, Hays 1987, Lowther 1993, Pike and Hays 1999).

Because the rate of parasitism of vireo nests in the Prado Basin was as high as 100 percent prior to the inception of current management efforts (Zembal *et al.* 1985), any project-related feature that creates conditions favorable to cowbirds in, or immediately adjacent to Prado Basin, Norco Bluffs, or Santa Ana River Reach 9 project areas would likely decrease the reproductive success of vireos in the absence of management. However, the cowbird trapping and removal efforts proposed by your agency, in conjunction with ongoing efforts by the OCWD should effectively reduce the incidence of parasitism to the vireo or flycatcher in the Prado Basin, based on the results of several recent publications that demonstrated the efficacy of cowbird trapping programs at increasing the reproductive success for the vireo (Kus 1999, Whitfield and Sogge 1999, Whitfield *et al.* 1999, Pike and Hays 2000, Powell and Steidl 2000). Your proposed trapping efforts will also reduce cowbird-related impacts to vireos in and adjacent to the Reach 9 and Norco Bluffs project areas during the 7-year period trapping is implemented.

Increased potential for accidental spillage and dispersal of environmental contaminants that could contribute to reduced recruitment: The potential spillage and/or dispersal of contaminants (e.g., crude oil, fuel, petroleum products, solvents) within the action area as result of the construction or implementation of the project could have significant, adverse consequences to breeding vireos. Given that the bioaccumulation of toxic substances may cause reproductive failures in vireos, as discussed in the "Environmental Baseline" section, the discharge, dispersal, and accumulation of potentially toxic environmental contaminants associated with construction and implementation of residential housing and commercial projects could adversely affect the vireo and flycatcher by decreasing recruitment and, in turn, abundance.

The discharge or dispersal of environmental contaminants from the proposed project would likely contain various pollutants, including petroleum hydrocarbons, that have been shown to induce morphological defects in larval fish (Bodammer 1993). As a result, these pollutants could adversely affect the growth and survival of larval suckers.

The best management practices and conservation measures incorporated into the project description should decrease the likelihood of accidental spillage and dispersal of environmental contaminants during the construction.

Increased harassment from humans during and following construction: Increased human presence in and near occupied habitats in the proposed project areas in the Prado Basin and Santa Ana River associated with construction, project implementation, and maintenance activities can affect the abundance and distribution of vireos, in part, because they often react strongly to the close approach of humans, particularly when nestling or fledgling young are also present. As a result, unnecessary human disturbances may threaten vireo nesting success (Salata 1987b). Research has also documented that the presence of humans at or near cowbird traps compromises the success of trapping efforts because predators and cowbirds may both be capable of "homing in" on agitated vireos and subsequently destroy nearby nests (The Nature Conservancy 1997).

Prior to initiating construction activities, it may be necessary to remove suckers from certain portions of the river and deposit them in area(s) approved by our agency. Any suckers that are not captured during survey and relocation efforts may be stranded and consequently harmed during proposed water diversions. Stranding in pools increases the vulnerability of the sucker to predation due to lack of refugia and to poor water quality conditions as water temperatures and ammonia levels increase and dissolved oxygen levels decrease. Also, any fish captured and relocated during the project may be stressed during handling and transport and/or be subject to greater risk of disease.

To minimize these effects, your agency has committed to implementing best management practices and specific conservation measures (e.g, removal and handling of suckers) during construction, implementing cowbird trapping during and following construction, and consulting with our agency regarding the upcoming Recreation Master Plan for the Prado Basin, including a portion of the action area.

Increased risk of fires during and following construction: The project area is in a high to extreme fire hazard zone; especially during summer when vireos and flycatchers are present. A major uncontrolled fire that spreads rapidly through these lands due to the nature of the terrain and current absence of onsite substantial abatement facilities and personnel could result in substantial, and perhaps catastrophic, direct or indirect consequences to a variety of fish and wildlife resources, including the vireo, flycatcher, and their designated critical habitats. Fires have regularly affected upland and riparian habitats within the project area, including large tracts of habitat occupied by the vireo. The most-recent fire in the northern part of the Prado Basin during September 2000 destroyed habitat occupied by two pairs of vireos during the breeding season. Previous fires in the action area have destroyed hundreds of acres of upland vegetations and impacted vireo-occupied riparian habitat along Chino Creek, Mill Creek, and the south Prado Basin. In the absence of specific measures to prevent and/or minimize the effects of such fires, it is likely that project-related, induced, or facilitated fires could individually or collectively destroy or degrade habitats occupied by federally listed species. Even one project-induced fire that is beyond the capabilities of a single water truck and/or local firefighting authorities coming from distant stations could have devastating effects on any or all of the listed species.

To minimize these potential effects, your agency has indicated that one or more water trucks will always be present during construction activities and that projects must comply with the fire prevention and protection practices set forth in the Corps' Safety and Health Requirements Manual (EM 385-1-1; Corps 2001a).

Increased impediments to wildlife movement through the area that could reduce the status of the vireo and flycatcher by reducing ecological function in the Prado Basin and contribute to mesopredator release: Your agency concluded that no significant impacts to wildlife corridors will occur in conjunction with the project, based on the following rationale (Corps 2001a): 1) the proposed project will not result in any obstruction of canyon linkages, culverts, or underpasses; 2) the interior dikes surrounding Prado Basin are primarily in agricultural land adjacent to urbanized areas and will not create any impediment to wildlife movement within the basin or between Prado Dam and surrounding open areas; 3) raising the dam and spillway by 20 feet will not significantly affect the ability of wildlife to cross over these structures because the existing slope and type of surface material will not change; and 4) the project will result in little surface intrusion into the channel.

However, this assessment contrasts with statements in the DSEIS/DEIR (Corps 2000, page 3-43) indicating that is unlikely that wildlife will continue to move freely in the face of substantially enlarged or newly created movement barriers (e.g., dam, spillway, dikes, outlet conduits), devegetated areas resulting from construction or increased outlet flows, or in construction areas that are thoroughly disturbed by, and occupied by, humans. Furthermore, a recent study (Lyren

2001) indicates that there is significant wildlife movement in the vicinity of the existing dam both across and under State Route 71, in part, because reach 9 of the Santa Ana River serves as an important corridor for wildlife movement. Thus, it appears that the construction and operation of substantially enlarged flood control infrastructure at the juncture of the Prado Basin and Reach 9 likely will impact wildlife movement in the project area, including between and among the Prado Basin, Chino Hills State Park, and along the Santa Ana River both upstream and downstream from the dam.

The persistence of the vireo in the Prado Basin is likely due, at least in part, to the extent of available riparian habitats, relatively large size of the entire Prado Basin/Chino Hills/adjacent Santa Ana River ecosystem, and overall ecological diversity accommodated therein. Though this ecosystem is essentially surrounded by urban and suburban landscapes, it retains a relatively high degree of function and integrity.

The DSEIS/DEIR prepared for the proposed projects (Corps 2000) provides a recent, informative discussion pertaining to wildlife corridors and their importance in maintaining functional ecosystems. In the absence of habitat linkages that allow movement to adjoining open space areas, wildlife species such as the larger and more mobile mammals will not likely persist over time in fragmented or isolated habitat areas (MacArthur and Wilson 1967, Soule 1987, Harris and Gallagher 1989, Bennett 1990). In addition, species richness in fragmented habitats may be reduced due to spatial heterogeneity (Preston 1962, MacArthur and Wilson 1987) and some species within the fragments may become extinct after isolation (Berger *et al.* 1991). Habitat fragments simply may not be large enough to support viable populations of some species, which may be extirpated due to the expressed effects of environmental or demographic stochasticity (Shaffer 1981, Gilpin and Soule 1986).

Fragmentation may further erode ecosystem function by contributing to the establishment of exotic species at the expense of native species. For example, Suarez *et al.* (1998) concluded that exotic Argentine ants (*Linepithema humile*), which have been conclusively implicated as a nest predator of the vireo, successfully outcompete native ant species in fragmented habitats in coastal southern California. These authors determined that Argentine ant activity was negatively correlated with the distance to the nearest urban edge and positively correlated with the amount of exotic vegetation. They noted further that the presence of Argentine ants was likely dependent on human-mediated disturbance such as water runoff from developed areas, and that Argentine ants were able to aggressively overwhelm colonies of native ant species or otherwise monopolize shared resources.

Numerous studies have revealed that overall nest success of songbirds in the United States is depressed in habitat fragments or edges due to the individual or combined effects of nest parasitism by the cowbird, nest depredation, and, possibly, documented reductions in insect prey (Askins 2000). With regard to depredation, classic fragmentation studies by Soule *et al.* (1988) and Crooks and Soule (1999) concluded that the decline of top predators in fragmented landscapes could lead to the "release" of smaller predators that, in turn, strongly limit populations of prey species. This "mesopredator release" has been implicated in the decline and extinction of prey species worldwide (Willis and Eisenmann 1979; Matthiae and Stearns 1981;

Whitcomb *et al.* 1981; Sergeant *et al.* 1983; Wilcove *et al.* 1986; Soule *et al.* 1988; Terborgh 1988; Sovoda *et al.* 1995; Crooks and Soule 1999, Haas and Crooks 1999).

Mountain lions (*Felis concolor*), bobcats (*Felis rufus*), and coyotes (*Canis latrans*) are the top (i.e., "keystone") predators within the Chino Hills/Prado Basin ecosystem (Beier 1995, Haas and Crooks 1999). Of these species, mountain lions are by far the rarest and, not coincidentally, the most sensitive to habitat fragmentation (see Beier 1993). Coyotes remain the most common of the keystone predatory species and are most responsible for the prevention or amelioration of mesopredator release that is prompted by habitat fragmentation.

Wildlife corridors and linkages mitigate the effects of this fragmentation as follows (Corps 2000): 1) allowing animals to move between remaining habitats, which allows depleted populations to be replenished and promotes genetic exchange; 2) providing escape routes from fire, predators, and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or local species extinction; and 3) serving as travel routes for individual animals as they move within their home ranges in search of food, water, mates and other needs (Noss 1983; Farhig and Merriam 1985; Simberloff and Cox 1987; Harris and Gallagher 1989). Corridors and linkages additionally allow the recolonization of disturbed areas and promote the survival of native species that are otherwise outcompeted by more aggressive non-native species in fragmented habitats (Harris and Gallagher 1989 as cited in Corps 2000). Murphy *et al.* (1990) argued that though the need for corridors for large mammals is intuitive, functional corridors may be necessary to conserve invertebrate species as well.

In general, to function appropriately, corridors and linkages should be sufficiently isolated from human disturbance to avoid disruption of animal movements between larger patches of habitat. The relative value of a corridor or linkage is also largely dependent on its width. Linkages must be wide enough to provide a suitable environment that supports wildlife species during sustained periods, not only during dispersion. Topography and vegetation are probably as important as length in determining quality and, hence, width of corridors or linkages (Henein and Merriam 1990; Beier and Lowe 1992). For example, mountain lions cross freeways not through the best-designed underpass but rather through the underpass that is best aligned with a major drainage (P. Beier, University of Northern Arizona, Flagstaff, Arizona, unpublished data).

The action area and the interconnected, adjacent Chino Hills State Park and Cleveland National Forest comprise a regionally significant ecological area that retains a relatively high degree of diversity and ecological function. In addition to federally listed and proposed avian species already mentioned in this biological opinion, the action area supports the white-faced ibis (*Plegadis chihi*), least bittern (*Ixobrychus exilis*), burrowing owl (*Speotyto cunicularia*), Cooper's hawk (*Accipiter cooperi*), yellow warbler (*Dendroica petechia*), yellow-breasted chat (*Icteria virens*), common ground dove (*Columbina passerina*), marsh wren (*Cistothorus palustris*), Swainson's thrush (*Catharus ustulatus*), blue grosbeak (*Guiraca caerulea*), lazuli bunting (*Passerina amoena*) and grasshopper sparrow (*Ammodramus savannarum*) (Garrett and Dunn 1981). As a result, the maintenance of wildlife corridors and associated connectivity within the Chino Hills/Prado Basin/adjacent Santa Ana River is essential to preserving, over time, the ecological integrity and function that sustains the local population of vireos, flycatchers, and a vast array of other sensitive species that are rare or absent throughout the remainder of western Riverside and San Bernardino counties, and southern California as a whole. Without appropriate provisions to maintain wildlife movement the proposed project could significantly impact the ecological function of the action area over time and, in turn, reduce the status of populations of the vireo and flycatcher.

To minimize these effects, your agency has proposed to revegetate disturbed upland areas with native plant species, vegetate the area between the dam and the downstream end of the new outline channel, modify the vehicle bridge over the outlet channel for wildlife crossing, as necessary, place soil on top of the dam along the western end near State Route 71 to allow for enhanced wildlife movement over the structure, and limit construction of the upper Highway 91 bank stabilization and the outlet channel to daylight hours to minimize disturbance to wildlife species that move primarily at night.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

We are unaware of any future, non-Federal actions that are reasonably certain to occur within the action area and may affect the vireo, flycatcher, and/or sucker.

CONCLUSION

After reviewing the current status of the vireo, flycatcher, and sucker, environmental baselines for the action area, effects of the proposed action, and the cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of these species or adversely modify critical habitat for the vireo. Our conclusion is based on the following findings:

1) Adequate conservation measures will be implemented to minimize project-related effects and maintain the baseline of habitat, abundance, and distribution for each species along the Santa Ana River.

2) Direct effects to flycatchers and their occupied habitats will be avoided.

3) The proposed habitat restoration and/or creation efforts will ensure that the function of designated critical habitat as an essential core area for resident vireos is maintained within the action area.

4) The proposed action will not contribute to any significant increases in inundation elevations or dwell times within habitat for the vireo behind the dam.

1. Thirty-one pairs of vireos residing downstream of the Prado Dam owing to the loss or degradation of habitat resulting from construction or implementation of the project.

2. An unquantifiable number of suckers that may be missed during pre-construction capture efforts and subsequently stranded in de-watered sections of the Santa Ana River in the following areas: 1) 2,000-foot reach along the upper State Highway 91 embankment in Reach 9; 2) 550-foot reach along the car wash and strip mall area in Reach 9; 3) 5,500-foot reach along the low flow channel at Green River Housing Estates in Reach 9; 4) 1,850-foot reach immediately downstream of Prado Dam (i.e., from the old outlet works to the confluence with the new outlet channel); and 5) 2,578-foot reach within Zone 3 of the Norco Bluffs area. Based on the best available scientific information, we anticipate that this number will be less than 5 suckers downstream of the dam and 10 suckers upstream of the dam.

3. An unknown number of suckers that may be captured, removed, and relocated during pre-construction survey, de-watering, and/or diversion efforts. Based on the best available scientific information, we anticipate that this number will be less than 10 suckers downstream of the dam and 20 suckers upstream of the dam.

4. An unknown number of suckers that may be removed and relocated during each trap and haul event. Based on the best available scientific information, we anticipate that the number will be less than 10 suckers per event.

We do not anticipate the incidental take of any flycatchers from the proposed action.

EFFECT OF THE TAKE

In the biological opinion, we determined that this level of anticipated take is not likely to result in jeopardy to the vireo, flycatcher, or sucker; or adverse modification of designated critical habitat for the vireo.

REASONABLE AND PRUDENT MEASURES

We believe the following reasonable and prudent measures are necessary and appropriate to minimize the effects of incidental take of the vireo and sucker:

1. Your agency and/or the local sponsors will ensure that adverse effects to the vireo and sucker resulting from the implementation of the proposed action are minimized to the maximum extent practicable.

2. Your agency and/or the local sponsors will monitor and report on compliance with, and the effectiveness of, project avoidance and minimization measures.

5) Riparian habitat and/or perennial stream substrate downstream of the dam will only rarely (e.g., 50- to 100-year flood events) be adversely affected by the proposed increase in discharge rates and frequencies from the dam, and your agency and/or the local sponsors will contribute to the restoration of habitat within the action area that is degraded by these large-scale events.

6) Although project-related activities could substantially affect habitat connectivity and wildlife corridors within the action area, your agency has committed to revegetating the area below the dam to provide habitat for wildlife and maintain a wildlife movement corridor over the dam.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are nondiscretionary and must be undertaken by your agency and/or the local sponsors, as appropriately defined in your scope of analysis, in order for the exemption in section 7(o)(2) to apply. Your agency has a continuing duty, subject to your jurisdictional authority, to regulate the activity situated within your scope of analysis and covered by this incidental take statement. Within this scope of analysis, if your agency fails to assume and implement the terms and conditions or fails to require the local sponsors to adhere to the terms and conditions through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. Outside your agency's scope of analysis, if the local sponsors fail to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. To monitor the impacts of incidental take, your agency and/or the local sponsors must report the progress of the action and its impact on the species to our agency as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

We anticipate that the following take in the form of harm or harassment, as defined in 50 CFR § 17.3, could occur during the life of the proposed project:

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, your agency and/or the local sponsors and their agents must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1.1 Prior to vegetation clearing or ground-disturbing activities of areas with habitat for federally listed species, provide our office with the name(s), address(es), and phone number(s) of a field contact representative responsible for overseeing compliance with protective measures for the listed species, and any biological monitor(s) contracted for project implementation. The field contact representative and biological monitor(s) will report all associated project activities that may be in violation of the terms and conditions of the biological opinion, or activities that may result in the unanticipated incidental take of federally listed species to the project manager and/or other personnel with the authority to halt/suspend such activities for as long as necessary to resolve the situation through consultation with this office.

1.2 Ensure that a biological monitor approved by this office is present prior to and during all activities that result in the clearing or grading of habitat for federally listed species (or areas adjacent to such habitat) to minimize the amount of disturbance by detecting any individuals or sign of these species occurring within the project area, assuring restrictive markers are obeyed, and conservation measures and best management practices are followed.

1.3 Notify us at least 5 days prior to the initiation construction activities and, at least, 5 days prior to the completion of construction activities. Photo-document the pre- and post-construction condition of the sites in areas that have habitat for listed species.

1.4 Ensure that the limits of construction are marked prior to ground-disturbing activities and clearly visible to personnel on foot and heavy equipment.

1.5 Each employee, contractor, or subcontractor involved in project construction (including temporary, contractors, and subcontractors) will be briefed on the following information prior to working within or near areas that may affect federally listed or proposed species: 1) general types and locations of sensitive habitats and federally listed and proposed species that may occur in the action area; 2) measures that will be taken to avoid and minimize incidental take during construction activities; 3) location of conservation and protected areas within the action area; 4) reporting procedures for observations of federally listed and proposed species; 5) reporting procedures for incidents involving the take or potential for take of listed and proposed species; 6) information regarding whom to contact at this office to report non-compliance with the conservation measures in the biological opinion and terms and conditions of the incidental take statement (or other potential violations of the Act); and 7) applicable permit conditions stipulated by the CDFG and/or other regulatory agencies.

1.6 The use of rodenticides, herbicides, insecticides, or other chemicals that could potentially harm federally listed species will be prohibited.

1.7 Ensure that crude oil, petroleum products, and/or any other toxic substances or hazardous materials are not stored and/or dispensed within habitats for federally listed species within the action area that would be inundated or dispersed by water during the construction or implementation of the project. No equipment that is determined to be leaking fuel or other fluids will be used in the project area. No mechanized equipment will be used within 10 feet of any pipelines or other infrastructure transporting or containing crude oil or petroleum, or petroleum products. The project area will be inspected prior to, and during, the implementation of the project to ensure that habitat areas are free from petroleum products and contaminant spills.

1.8 The taking and use of cuttings from willow riparian, riparian scrub, marsh, or aquatic habitats will be prohibited except from areas that will be temporarily or permanently disturbed (as described in the project description) or with the prior approval of our agency and the CDFG. Also, all water conveyance infrastructure in restoration areas and their environs will be constructed and operated to avoid the flooding of vireo habitat in the action area. Likewise, imported water (including water used for irrigation) will not be allowed to flood or otherwise degrade existing or replacement habitats.

1.9 Any habitats not within the authorized construction footprints that are disturbed or destroyed during project-related activities will be immediately reported to us and replaced or restored as deemed appropriate by our agency and the CDFG based on the scope and intensity of the unauthorized incursion. Potential project-induced impacts include, but are not limited to, fire, deposition or dispersal of environmental contaminants, and high velocity discharges that result in the degradation or destruction of downstream habitat not anticipated in this biological opinion. In addition, the location and extent of all habitat that is destroyed, degraded, or otherwise adversely affected by activities associated with the project that were not identified in the project description, or occur in areas not anticipated to be affected by the proposed project, will be disclosed immediately to our agency for possible reinitiation of consultation.

1.10 To minimize the likelihood of unauthorized human incursions into the action area and unanticipated adverse effects to federally listed species, restrict the use of roads to accommodate only project-related traffic along haul roads or other conveyances access into project sites to authorized personnel during the construction or implementation phases of the project. All roads created during construction will be successfully restored following construction to appropriate wetland or upland habitats (using the success criteria outlined in the project description). Restored roads will be fenced or gated off to prevent ingress into restored areas.

1.11 Develop and implement methods and measures to protect created and restored habitat areas and their environs from attracting or propagating exotic predators (e.g., rats, bullfrogs, mosquitoes, exotic plants). Ensure that trash, other dumped debris, abandoned vehicles, equipment, or other potential exotic species and mosquito habitats and shelter are removed from habitat restoration/creation areas. Ensure that site mitigation and monitoring plans contain measures to prevent the onsite establishment of exotic plant species, thus preventing their dispersal into the remainder of the action area.

1.12 Ensure that all lands in designated restoration and/or creation areas (including wildlife corridors) are not used for any purpose that would change or otherwise interfere with their value as wildlife habitat or a wildlife corridor (e.g., erect permanent or temporary structures, night lighting, or facilitate the ingress of domestic animals, exotic animals, or non-native plants).

2.1 During construction activities, submit quarterly reports that summarize environmental compliance activities completed during the previous three calendar months to our office within 10 days of the end of the 3-month period. The first quarterly report will be submitted 3 months after the initiation of construction activities and subsequent reports will be prepared for any 3-month period during which construction activities occur.

At a minimum, each quarterly report should include the following information: 1) a listing of areas and activities monitored during the reporting period; 2) dates and attendees of worker environmental awareness training; 3) estimates of habitat disturbed, by vegetation type and disturbance type (i.e., permanent, temporary); 4) any observations of listed species or their sign onsite or in the vicinity of construction activities; 5) known occurrences of incidental take; 6) a summary of pre-construction surveys; 7) information on captured animals, including their capture and condition; 8) information on released animals including the results of monitoring (e.g., survival, cause of death); 9) updates on the implementation and completion of the proposed action, to include construction and monitoring activities planned for the following quarter and any anticipated changes in the project description or implementation schedule; 10) non-compliance/incident reports and the resolution of each reported situation; 11) information regarding the monitoring and effectiveness of revegetation and restoration activities; 12) any other pertinent data concerning the your agency's success in meeting conservation measures outlined in the project description of the biological opinion or the terms and conditions of the incidental take statement, and an explanation of failure to meet such measures, if any; 13) an evaluation of the efficacy of the conservation measures and terms and conditions at avoiding and minimizing incidental take; and 14) pertinent recommendations. The reports will include high-quality, well-labeled maps or GIS coverages that depict the precise location(s) of project activities to date, the location of known, suspected, or potential biological resources (including nests) on or near construction areas, the location of observations of listed species or their sign on or near construction areas, and a delineation of the major vegetation communities on and immediately adjacent to construction activities. All maps will have a title, date, scale, legend, and north arrow.

2.2 Submit an annual report that summarizes how the project is in compliance with the reasonable and prudent measures and terms and conditions of the biological opinion to our office annually by February 1 of the following year, for the duration of construction of the project. Each report will summarize the information contained in the quarterly reports for that year.

2.3 Submit an annual habitat restoration/creation report that describes efforts during the previous calendar year to our office by February 1 each year, until all temporarily disturbed areas are successfully restored as habitat for the vireo or sucker and all habitat creation obligations are successfully fulfilled. At a minimum, each report will include the following information: 1) a description of the restoration and/or creation activities (including revegetation and exotic species removal) and when they were conducted; 2) a description of the existing conditions of restoration and/or creation sites, including descriptions of vegetation composition, weed species and erosion problems; 3) qualitative and quantitative monitoring data related to proposed performance standards; 4) weather conditions and the response of restoration and/or creation areas to changes in weather conditions; 5) any observations of listed or proposed species or their sign on restoration and/or creation areas; 6) a discussion of any problems encountered during restoration and/or creation; and 7) remedial measures (e.g., weed control, trash removal) that were implemented to correct problems or deficiencies.

2.4 Prior to initiating restoration and/or creation activities, submit a restoration/creation plan to our agency and the CDFG for approval. The restoration/creation must, at a minimum, include the following components: 1) plant material and seed mix; 2) planting and seeding methods; 3) salvage methods for vegetation and topsoil; 4) preparation of sites and implementation of planting; 5) proposed monitoring schedule; and 6) remediation measures to be implemented if initial restoration efforts are unsuccessful. Restoration and creation activities will be conducted between September 15 and March 15 of each calendar year unless specifically authorized to do otherwise by our agency and the CDFG. If it is necessary to conduct weeding or other restoration/creation activities outside of this period, then authorizations from our agencies must be obtained in advance to preclude the unauthorized take of federally listed species (which is increasingly likely as the restored/created habitat matures).

2.5 Notify our agency and CDFG via written report when restoration and/or creation efforts in a given area are deemed successful by your agency based on the success criteria in the project description. Each report must include quantitative evidence that the structure and composition of the revegetated area is statistically similar (i.e., not significantly different) to habitat occupied by vireos in the vicinity or other willow woodland habitats with understory as characterized by Zembal *et al.* (1985) and Zembal (1986). If the success criteria have been completely satisfied, then our agency will concur in writing that restoration and/or creation requirements for that given area have been successfully attained.

2.6 With prior notification, ensure that personnel from our agency, the CDFG, and/or other regulatory agencies are given the right and means to access and inspect lands within the action area under the legal right/jurisdiction of your agency and/or the local sponsors for compliance with the project description and the terms and conditions of the biological opinion during the implementation of the proposed action.

2.7 At least 30 days prior to initiating construction activities within or near habitat(s) for federally listed species, submit, in writing, to our agency and the CDFG, the name(s), any State and Federal permit numbers and experience, resumes, and at least 3 references of all biologists that might need to monitor, capture, handle, and/or relocate federally listed species. References must be familiar with the relevant qualifications of the proposed biologist. The Service will provide approval of biologists within seven days of receipt. Proposed activities shall not begin until an authorized biologist has been approved by our agency and/or the CDFG, as appropriate.

2.8 Prior to the commencement of construction, develop and provide to our agency and the CDFG for review and approval a plan that enables wildlife movement and habitat connectivity commensurate with baseline conditions. This plan will include specific measures to clarify or augment general proposals made to date (see "Conservation Measures" section of this document) and provide for established baseline movements and concentrations of keystone predators (e.g., coyotes, bobcats) within the action area. In particular, measures will be taken to accommodate and facilitate the movement of predators across the newly-constructed (and significantly higher) dam and spillway and from access points on either side of the new outlet structures (unless measures are taken to provide for the free passage of predators across a bridge constructed over the outlet channel east of State Route 71). In addition, measures will be taken to provide for wildlife movement over each constructed berm or dike and upland environments that are disturbed as a result of construction if 1) wildlife movement occurs, or potentially could occur, within the footprint of the specific proposed project feature or devegetated upland area and 2) the constructed feature or devegetated area would interfere with wildlife movement. Consistent with the description of the proposed action and constituent conservation measures, upland areas disturbed and subsequently replanted with native habitat elements will be returned to open space use and designations upon completion of construction activities.

2.9 Prior to initiating construction activities in areas within or near habitats for federally listed species, provide our agency and the CDFG with a written document that details which alternative conservation measures, or combinations thereof (see "Conservation Measures" section of the project description), will be implemented to fulfill your commitments to compensate for the permanent loss of riparian and non-riparian habitat within the flood plain. The document should also identify potential areas for restoration or creation of habitat for the vireo and existing areas of conservation (i.e., restoration, creation) resulting from previous consultations or other mechanisms. In addition, document should identify potential areas for restoration or creation of habitat for the sucker, as well as the type of restoration/creation (e.g., spawning habitat, pool-riffle complexes) that may be implemented in each area.

2.10 Prior to completing construction activities associated with the new outlet works, develop and submit to our agency and the CDFG for review and approval a plan to quantitatively monitor the effects of increased rates and frequencies of discharges from the dam to habitat for the vireo and sucker at various distances downstream from the endpoint of the outlet channel.

2.12 The *Habitat Management Plan* must incorporate the most recent and best biological data available into the management design of the *Habitat Management Plan* area.

2.13 Within one working day of discovering a dead, injured, or sick federally listed species, notify Larry Farrington of our Law Enforcement Division at (301) 328-6307 and either Loren Hays (birds) or Lucy Caskey (fish) of our office at (760) 431-9440. Written notification to both offices must be made within 5 calender days and include the date, time, and location of the animal(s), and any other pertinent information. The location where the animal(s) were found should be marked in an appropriate manner and photographed. Care must be taken in handling sick or injured animals to ensure effective treatment and care. Injured animals should be transported to a qualified veterinarian. Should any treated animals survive, our office should be contacted regarding the final disposition of the animals. Dead specimens should be sealed in an appropriately sized container and refrigerated to preserve biological material in the best possible state.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. With implementation of these measures, we anticipate that only a portion of the animals identified in the incidental take statement will actually be taken. We will not refer the incidental take of any federally listed, migratory bird, including the vireo, for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein. If, during the course of the action, the level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. Your agency must immediately provide an explanation of the causes of the taking and review with this office the need for possible modification of the reasonable and prudent measures.

Unless otherwise specified, the implementation and execution of all preceding terms and conditions will begin immediately upon the issuance of this biological opinion and continue for the life the project and/or the term and condition has been fully implemented and executed. The Federal action agency is ultimately responsible for the implementation of all preceding terms and conditions in the event of the financial or institutional incapacity of the local sponsors or their agents to perform them.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We recommend your agency consider implementing the following recommendations to further the conservation of the vireo, flycatcher, and/or sucker:

1. Conduct an annual assessment of the effects of inundation (e.g., dwell time and elevation) to the vireo, sucker, and their habitats for the life of the dam. This assessment should include baseline information such as the distribution and elevation of all vireo nests during each monitoring season for which data has been collected (i.e., approximately the past 16 years).

2. To the extent practicable, restore and protect all habitats consisting of native plant communities and natural physical features in the Prado Basin, Santa Ana River Reaches 8 and 9, and the Norco Bluffs Area. During the past 16 years, habitat within known vireo home ranges was destroyed or degraded as a result of livestock grazing, off-road vehicle activity, stream diversions, unauthorized dredge and fill operations, incursions of heavy equipment (including bulldozers, mowing machines, and road graders), fires, oil spills, and vandalism. All such activities should be strictly prohibited, curtailed to the extent possible, and/or appropriately compensated. Past losses of habitat that can be traced to the responsible parties should be appropriately prosecuted or remediated. Because habitat for the vireo and flycatcher has been only rarely created successfully, the avoidance of impacts to existing habitat is of paramount importance.

3. To the extent practicable, remove all invasive/exotic biota from riparian habitats in the Prado Basin. The existing cowbird management program should be continued and expanded to maximize the reproductive success of the vireo, flycatcher, and other sensitive avian species. Also, the control of invasive, exotic plants such as giant reed and castor bean must continue if riparian habitats are to provide the elements necessary to accommodate the vireo, flycatcher, and a large variety of other sensitive animal taxa over time.

4. Human presence and activities should be restricted within and near habitat for the vireo and flycatcher. Much of the Prado Basin continues to be used for illegal hunting and recreational shooting. Spent cartridges, freshly broken skeet, and the carcasses of animals that had obviously been shot were found throughout most of the Prado Basin in 1986 and, to lesser extents, each year from 1987 to 2000. Target shooting in or near habitats occupied by vireos may threaten individual birds (or their breeding attempts). Also, cowbird traps have been repeatedly vandalized in recent years in scattered locales throughout the Prado Basin. Moreover, the presence of humans at or near cowbird traps appears to compromise the success of trapping efforts. Although the installation of "No Trespassing" signs and/or the creation of berms near occupied vireo habitats near Temescal Creek and the South Basin locale were apparently responsible for a reduction in the foot and vehicular traffic within wetland habitats at those locales, further measures to restrict or curtail unauthorized human activities (including paint ball games, illegal hunting and the destruction or theft of traps) are necessary.

Specifically, we recommend that your agency erect a gate where Butterfield Drive becomes Clearwater Drive within the City of Corona lease. The purpose of this gate would be to bar access to a dirt parking area that has become the site of trash dumping, the abandonment of automobiles, and other apparently illicit activities. A fence should also be constructed along the remainder of Clearwater Lane to prevent vehicles from traversing the agricultural field and thus circumventing the existing gate.

In addition, we recommend that your agency erect fencing or other equivalent barriers around or below the highway turnouts along State Route 71 adjacent to lower Chino Creek vireo habitat. These turnouts are commonly used for trash-dumping (including hundreds of automobile tires) and unauthorized access points for human and automobile traffic. In 1996, two cowbird traps on Lower Chino Creek were closed after being vandalized by persons who apparently had driven into the Pardo Basin from the northernmost of the three State Route 71 turnouts.

Moreover, we recommend that your agency post "No Trespassing" signs every 15 feet (50 meters) around the perimeter of key vireo and flycatcher breeding areas. Particular areas of concern are the turnouts along State Route 71, the northern border of vireo habitat along lower Chino Creek, Clearwater Lane and Rincon Street in Corona, and along the forest edge adjacent to Prado Regional Park in Chino. "Critical Wildlife Habitat" signs recently posted by the OCWD appear to be effective and are recommended for use in conjunction with "No Trespassing" designations. Although such signs are unlikely to dissuade all potential trespassers, they would remove any ambiguity that exists as to where access is restricted or prohibited.

4. A long-term plan for restoring sucker habitat within the Santa Ana River, including Reach 8, should be developed and implemented to address the creation of stream meanders, pool-riffle complexes, upstream and downstream fish passage throughout the reach, reestablishment of riparian vegetation, and other conservation needs. Your agency should regularly participate in the monthly meetings of the Adhoc Sucker Discussion Team.

5. An aquatic exotic species removal program should be developed and implemented for areas directly or indirectly affected by the construction and/or operation of Prado Dam and its associated reaches, including any areas of created and/or restored habitat. A comprehensive plan for exotic species removal in perpetuity should be reviewed and approved by our agency. The plan should outline management actions and an implementation schedule and include funding assurances for implementation and monitoring.

6. The installation of low-flow rock passageways, vertical slot structures, fish locks, or other similar methods that provide fish passage through or around drop structures in the Santa Ana River should be developed and implemented. The U.S. Bureau of Reclamation has successfully installed various types of passages for other species of suckers on the

Colorado, Yellowstone, and Truckee Rivers (Brant Mefford, personal communication to Lucy Caskey, March 9, 2001). The velocity of flow in which the sucker can maintain direction and movement should be investigated so that appropriate fish passage systems could be established at each of the drop structures between Prado Dam and Imperial Highway.

7. A sediment transport study should be developed and implemented in cooperation with other local, State, and Federal agencies. The sediment transport study should incorporate historical and current data, and evaluate the effectiveness of the Santa Ana River as a sediment transport system. The study should address the excess sedimentation that occurs upstream of Prado Dam and the sediment deficit downstream of Prado Dam. The results of this study would be used to develop measures that would attempt to return the Santa Ana River to a fully functioning sediment transport system.

In order for that office be kept informed of actions that either minimize or avoid adverse effects or that benefit federally listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the proposed action as specified in your request for formal consultation. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Any questions or comments should be directed to Loren Hays or P.J. White of my staff at (760) 431-9440.

Sincerely,

Karen A. Evans

Karen A. Evans
Assistant Field Supervisor

Enclosures

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TABLE 1- WITHOUT-PROJECT OPERATION FOR PRADO DAM : Target Water Surface Elevations (WSE) and Associated Discharges
(Source: Corps 2001a [Table 1])

Water Surface Elevation (Feet)	Discharges (cfs)		Comments & Notations
	1 October - 28 February (Winter Flood Season)	1 March to 30 September (Non-Flood Season)	
460 - 490 (Debris Pool)	0 – 600	0 - 600	The debris pool is allowed to fill prior to the flood control releases in order to prevent debris from entering and plugging the outlet works. There are no seasonal restrictions for inundation of this pool. Releases set equal to OCWD's recharge capacity.
490 - 494 (Buffer Pool)	200 - 600* 200 - 2,500**	200 - 600	The release rate is coordinated with OCWD to maximize the conservation of water through ground water recharge. A minimum release of 200 cfs is required except for temporary release cutbacks to facilitate OCWD's reconstruction of in-stream diversion dikes. Releases set equal to OCWD's recharge capacity.
494 - 505	2,500 - 5,000	350 - 650***	Pre-releases up to 5,000 cfs are made to try and keep water surface from exceeding elevation 505 ft during the non-flood season. Beginning 1 March, the maximum allowable WSE is increased from 494 ft to 505 ft by 10 March.
505 - 520	2,500 - 5,000****	350 - 5,000****	
520 - 543	5,000****	5,000****	Reservoir stages above 520 ft require the maximum scheduled release of 5,000 cfs. Should dispatched river monitors observe significant downstream channel damages, the 5,000 cfs release may be cut back.
543 - 544.3 (Controlled Spillway Flow)	5,000****	5,000****	Flood control releases through the outlet works are reduced as the reservoir pool level rises above the spillway crest so as to maintain outflow from spillway plus outlet works at a maximum outflow of 5,000 cfs.
544.3 and above (Uncontrolled Spillway Flow)	5,000 or greater	5,000 or greater	All outlet gates are closed at reservoir pool levels of 544.3 ft and above. Under the extremely remote circumstance that the dam embankment is in danger of overtopping, the outlet gates would be opened to lessen the possibility of dam failure. The maximum design release from the outlet works is 17,000 cfs.

Notes:
1. Source for this table is the 1994 Water Control Manual (WCM). For a complete discussion please refer to the WCM.
2. Water conservation refers to the water storage activities currently approved for Prado Dam and Basin. It does not include any on-going water conservation studies.
3. Releases greater than 800 cfs can damage OCWD's in-channel sand diversion dikes.

* No storm forecast. Operated for water conservation.
** Storm forecasted.
*** Running average equal or greater than 500 cfs.
**** The WCM allows for releases greater than 5,000 cfs if conditions warrant.

TABLE 2 - WITH-PROJECT OPERATION FOR PRADO DAM
Target Water Surface Elevations (WSE) and Associated Discharges
(Source: Corps 2001a [Table 2])

Water Surface Elevation (Feet)	Discharges (cfs)		Comments & Notations
	1 October - 28 February (Winter Flood Season)	1 March to 30 September (Non-Flood Season)	
460 - 490 (Debris Pool)	0 - 600	0 - 600	The debris pool is allowed to fill prior to the flood control releases in order to prevent debris from entering and plugging the outlet works. There are no seasonal restrictions for inundation of this pool. Releases set equal to OCWD□s recharge capacity.
490 - 494 (Buffer Pool)	200 - 600* 200 - 2,500**	200 - 600	The release rate is coordinated with OCWD to maximize the conservation of water through ground water recharge. A minimum release of 200 cfs is required except for temporary release cutbacks to facilitate OCWD□s reconstruction of in-stream diversion dikes. Releases set equal to OCWD□s recharge capacity.
494 - 505	2,500 - 5,000	350 - 650***	Pre-releases up to 5,000 cfs are made to try and keep water surface from exceeding elevation 505' during the non-flood season. Beginning 1 March, the maximum allowable WSE is increased from 494' to 505' by 10 March.
505 - 510	2,500 - 5,000****	350 - 5,000****	
510 - 540	5,000 - 30,000	5,000 - 30,000	A release rate of 30,000 cfs is not achieved until WSE reaches 540 ft.
540 - 563	30,000	30,000	
563 - 567.4 (Controlled Spillway Flow)	30,000	30,000	Flood control releases through the outlet works are reduced as the reservoir pool level rises above the spillway crest so as to maintain outflow from spillway plus outlet works at a maximum outflow of 30,000 cfs.
567.4 and above (Uncontrolled Spillway Flow)	30,000 or greater	30,000 or greater	All outlet gates are closed at reservoir pool levels of 567.4 ft and above.

Notes:
1. Source for this table is the 1988 Phase II GDM, Hydrology Appendix.
2. Water conservation refers to the water storage activities currently approved for Prado Dam and Basin. It does not include any on-going water conservation studies.
3. Releases greater than 800 cfs can damage OCWD□s in-channel sand diversion dikes.

* No storm forecast. Operated for water conservation.
** Storm forecasted.
*** Running average equal or greater than 500 cfs.
**** The WCM allows for releases greater than 5,000 cfs if conditions warrant.

TABLE 3 -POOL AND OUTFLOW DYNAMICS WITHOUT- & WITH-PROJECT AT PRADO DAM
(Source: Corps 2001a [Table 3])

Recurrence Interval	Without-Project[1] Outflow (cfs)			With-Project[2] Outflow (cfs)		
	Max. Outflow (cfs)	Max. WSE (ft)	Inundated Area (ac) [Duration (days)][3]	Max. Outflow (cfs)	Max. WSE (ft)	Inundated Area (ac) [Duration (days)][3]
2-year	2,100	494.36	1,117	2,410	494.36	1,117
5-year	5,000	496.20	1,250	5,000	496.21	1,250
10-year	5,000	501.22	1,744	5,000	501.23	1,744
25-year	5,000	516.98	3,467 [4]	8,710	515.96	3,346 [4]
50-year	5,000	531.56	5,118 [11]	18,500	528.12	4,626 [11]
100-year	18,200	545.32	6,846 [18]	30,000	541.10	6,306 [18]

[1] *Without-Project*: Refers to the existing Prado Dam and the associated water conservation and flood control operations that are implemented in accordance with the 1994 Water Control Manual and subsequent revisions stipulated in the Biological Opinion for the Prado Dam Water Conservation & Supply (USFWS 2000).
[2] *With-Project*: Includes all of the Phase II Prado Dam improvements, including raising the embankment and spillway, and expansion of the outlet works.
[3] Time to drain to 505.0' (with 200 cfs baseflow) from a single 24 hour storm.

Source: 1994 Water Control Manual and Phase II GDM, USACE (1988).

TABLE 4 - PARTIAL LIST OF CORPS OF ENGINEERS BIOLOGICAL COMMITMENTS

Prado Dam-Norco Bluffs-Reach 9; Santa Ana River Mainstem Project (SARP)
Orange, Riverside, San Bernardino Counties, California (Derived from Table 5, Corps 2001b)

COMPONENT A; NORCO BLUFFS STABILIZATION

Type and Quantity of Resource/Species Impacted	Mitigation Measure	Action, Schedule and Timing of Mitigation Measure	Source(s) of Requirement	Complete (✓)
Bald/Golden Eagles	Survey for bald eagles immediately prior to fall/winter construction near flowing water, and for golden eagles prior to initiating activities at Borrow Area #2. If eagles are foraging in vicinity, coordinate with Contracting Officer Representative and FWS to develop avoidance measures.	Perform surveys, develop site-specific avoidance measures during construction.	2000 SEIS/R	❑
	Phased use of Borrow Area #2	Input into P&S and inspections during construction.		❑
Least Bell's Vireo and Critical Habitat Per 2000 Calculations Impacts same as riparian woodlands.	Perform protocol surveys for vireo and flycatcher in the spring and summer prior to construction.	In spring/summer prior to commencement of construction, develop and implement a monitoring program that entails surveys for vireo and flycatcher.	2000 SEIS/R. ESA and MBTA.	❑
	Limit grubbing and clearing of riparian vegetation to non-breeding season (16 August through 28 February)	Input into P&S and EC inspections during construction.		❑
	Conduct cowbird trapping during project construction and 5 years following project completion. Trapping shall consist of 5 monitored traps during the period 15 March to 30 July. Or, make cash contribution to Trust Fund.	Develop cowbird trapping program, scope of work prior to commencement of construction. Fund and perform trapping during and following construction.		❑
	Between 16 August and 28 February, erect a noise barrier along the access/haul roads that are within 1000 feet of known or suitable vireo habitat.	Input into P&S and EC inspections during construction. Include location of known vireo territories on construction drawings/plans.		❑

TABLE 4: COMPONENT A; NORCO BLUFFS STABILIZATION (Continued)

Type and Quantity of Resource/Species Impacted	Mitigation Measure	Action, Schedule and Timing of Mitigation Measure	Source(s) of Requirement	Complete (✓)
Southwestern Willow Flycatcher and Critical Habitat	Perform protocol surveys for vireo and flycatcher in the spring and summer prior to construction.	In spring/summer prior to commencement of construction, develop and implement a monitoring programs for vireo and flycatcher.	2000 SEIS/R. ESA and MBTA.	❑
	Limit grubbing and clearing of riparian vegetation to non-breeding season (16 August through 28 February)	Input into P&S and EC inspections during construction.		❑
	Conduct cowbird trapping for a period of 1 year during project construction and 5 years following project completion. Trapping shall consist of 5 monitored traps during the period 15 March to 30 July. Or, make cash contribution to Trust Fund for cowbird trapping.	Develop cowbird trapping program, scope of work prior to commencement of construction. Fund and perform trapping during and following construction.		❑
	Between 16 August and 28 February, erect a noise barrier along the access/haul roads that are within 1000 feet of known or suitable flycatcher habitat.	Input into P&S and EC inspections during construction. Include location of known flycatcher territories on construction drawings/plans.		❑
Santa Ana Sucker Per 2000 Calculations: Perennial Stream: Direct, Perm: 0.72 Direct, Temp: 0.69	In areas where dewatering is taking place, groundwater shall be introduced into the river system d/s of the construction area in such a way as to avoid turbidity, based on the conditions of the required dewatering permit.	Input into P&S and EC inspections during construction.	2000 SEIS/R, ESA.	❑
	Control sedimentation by recontouring, sandbagging and use of other erosion control measures.	•Input into P&S and EC inspections during construction.		❑
	•At water diversion locations, the areas shall be blocked off and seined for fish. All captured fish shall be relocated upstream of the diversion.	•Input into P&S and EC inspections during construction. Fund an on-site permitted biologist to perform seining and relocation activities.		❑
	• Vegetation/streambed impacts will be mitigated as described above (see Riparian Woodland column).	•Monetary contribution to trust fund concurrent with construction, and on-site weed abatement for 5 years following construction.		❑

TABLE 4: COMPONENT B; PRADO DAM, INTERIOR DIKES, OUTLET WORKS, AND SPILLWAY

Type and Quantity of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement for Mitigation Measure	Status Complete (✓)
Shrub/Grasslands Per 1988 Calculations Borrow Areas: 590 ac Outlet: 2.6 ac Hwy 71 dike: 9.1 ac	• Esthetic Treatment Plan. Stockpile topsoil from dike sites and borrow areas and reuse it. Seed and maintain d/s sides of dikes with forbs and grasses. Esthetically reshape borrow areas and reseed with native shrubland, native wetland or geese foraging species, as appropriate. Scarify haul roads when retired from use.	• Update Resource Use Plan prior to future recreation plans.	1988 SEIS. USFWS, CDFG and public concerns. FWCA.	❑
Per 2000 Calculations Borrow Areas: 590 ac Outlet: 2.6 ac Hwy 71 dike: 4.1 ac	• Change land use category of 32 acres to category 1 (lowest use). Protect mitigation area.	• Provide input to O&M manual prior to completion of construction. See also Esthetic Treatment mitigation measure below for more detail.	1988 SEIS	❑
Canada Geese Per 1988 Calculations Direct, Temp: 430 ac (Borrow Area #2)	• Phased use of Borrow Site #2 (divided into 3 sections and each section will be used until no additional suitable material is left or is practicable to remove).	• Input to, and review of P&S during design phase; EC (Environmental Coordinator) inspections during construction period.	1988 SEIS. USFWS, CDFG and public concerns. FWCA.	❑
Per 2000 Calculations Same	• Esthetic Treatment Plan. Each section of Borrow Site #2 will be restored as soon as possible after completion of activities between 15 October and 15 January. Restoration will include recontouring, respreading salvaged topsoil, fertilization, and seeding with appropriate seedmix(es).	• Input into P&S during design and EC inspections during construction. Monitor hydroseeding after construction.	1988 SEIS	❑
Oak Woodlands Per 1988 Calculations Direct, Perm: 5 ac (84 trees) Per 2000 Calculations None.	• Establishment of new oak woodlands near Prado Regional Park; replace 84 trees impacted by Hwy. 71 dike at 4:1 ration. Irrigate and protect trees. *NOTE: This measure is no longer warranted due to SR 71 Dike redesign which eliminated all impacts to existing oak woodlands.*	• Confirm proposed site, design site and provide input into P&S. Flag trees prior to construction, perform EC inspections during construction and provide input to O&M manual. *(No longer required.)*	1988 SEIS. USFWS, CDFG, public concerns. FWCA. 2000 SEA.	N/A

TABLE 4: COMPONENT B; PRADO DAM, INTERIOR DIKES, OUTLET WORKS AND SPILLWAY (Continued)

Type and Quantity of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement for Mitigation Measure	Status Complete (✓)
Riparian Woodlands ***Per 1988 Calculations*** Direct, Perm: 19.5 Direct, Temp: 17.5 ac Indirect: 30 ac (inundation) *Note: Riparian Woodlands includes:* *- cottonwood-willow* *- riparian scrub* *- Arundo/riparian scrub*	• Avoid impacts to sycamore trees along north edge of Borrow Area #1	• Input into P&S and EC inspections during construction.		☐
	• Construction activities will be monitored to avoid disturbance to riparian woodland habitat that is to be protected in place.	• Input into P&S, flagging prior to grubbing and clearing operations commence, and EC inspections during construction. Corps and Local Sponsors to fund an on-site biological monitor during construction	1988 SEIS. FWCA	☐
	• Implement erosion control measures during construction of the Alcoa Plant Dike, such as sandbagging.	• Input into P&S to minimize erosion at Alcoa Plant Dike	2000 SEIS/R.	☐
	• Monitor riparian vegetation adjacent to dewatering areas to document signs of plant stress. Supplemental water shall be added to stressed vegetation, as necessary.	• Input into P&S and EC inspections during construction.	2000 SEIS/R.	☐
				☐
Bald/Golden Eagles Per 1988 Calculations No Affect Per 2000 Calculations May affect, not likely to adversely affect	Survey for bald eagles immediately prior to fall/winter construction near flowing water, and for golden eagles prior to initiating activities at Borrow Area #2. If eagles are foraging in vicinity, coordinate with Contracting Officer Representative and FWS to develop avoidance measures.	Perform surveys, develop site-specific avoidance measures during construction.	2000 SEIS/R	☐
	Phased use of Borrow Area #2 (see Canada Geese mitigation measure)	Input into P&S and inspections during construction.		☐

TABLE 4: COMPONENT B; PRADO DAM, INTERIOR DIKES, OUTLET WORKS AND SPILLWAY (Continued)

Type and Quantity of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement for Mitigation Measure	Status Complete (✓)
Least Bell's Vireo and Critical Habitat <u>Per 1988 Calculations</u> Direct, Perm: 19.5 Direct, Temp: 17.5 ac Indirect: 30 ac (inundation)	• Limit grubbing and clearing of riparian vegetation to non-breeding season (16 August through 28 February)	• Input into P&S and EC inspections during construction.	1995 SEA	☐
	• Between 16 August and 28 February, erect a noise barrier along the access/haul road east and southeast of the dam along the southwestern border of the basin to shield nesting vireos from excessive noise (greater than 60 decibels) during construction.	• Input into P&S and EC inspections during construction. Include location of known vireo territories on construction drawings/plans.	2000 SEIS/R	☐
	• At Borrow Sites 1 and 2 construct dirt berms along the perimeters that border the willow riparian forest to minimize noise effects on vireos.	• Input into P&S and EC inspections during construction. Include location of known vireo territories on construction drawings/plans.	2000 SEIS/R. USFWS, CDFG, State Parks, and public concerns. ESA, FWCA, MBTA.	☐
	• Set aside $450,000 for a monitoring program for the vireo and a management program for its pests	• Prior to construction, develop a scope of work, set up funding mechanism, and monitor annual reports.	2000 SEIS/R	☐
			1988 SEIS	✓

TABLE 4: COMPONENT B; PRADO DAM, INTERIOR DIKES, OUTLET WORKS AND SPILLWAY (Continued)

Type and Quantity of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement for Mitigation Measure	Status Complete (✓)
Southwestern Willow Flycatcher and Critical Habitat <u>Per 1988 Calculations</u> N/A	• Limit grubbing and clearing of riparian vegetation to non-breeding season (16 August through 28 February)	• Input into P&S and EC inspections during construction.	2000 SEIS/R	❑
	• Between 16 August and 28 February, erect a noise barrier along the access/haul road east and southeast of the dam along the southwestern border of the basin to shield nesting flycatchers from excessive noise (greater than 60 decibels) during construction.	• Input into P&S and EC inspections during construction. Include location of known flycatcher territories on construction drawings/plans.	2000 SEIS/R. USFWS, CDFG, State Parks, and public concerns. ESA, FWCA, MBTA.	❑
	• At Borrow Sites 1 and 2 construct dirt berms along the perimeters that border the willow riparian forest to minimize noise effects on vireos.	• Input into P&S and EC inspections during construction. Include location of known flycatcher territories on construction drawings/plans.	2000 SEIS/R	❑
Santa Ana Sucker <u>Per 1988 Calculations</u> N/A <u>Per 2000 Calculations</u> Temporary affect from dewatering during construction in vicinity of dam and outlet channel.	• In areas where dewatering is to take place, groundwater shall be introduced into the river system d/s of the construction area in such a way as to avoid turbidity, based on the conditions of the required dewatering permit	• Input into P&S and EC inspections during construction.	2000 SEIS/R. ESA	❑
	• Control sedimentation by recontouring, sandbagging and use of other erosion control methods.	• Input into P&S and EC inspections during construction.		❑
	• At water diversion locations, the areas shall be blocked off and seined for fish. All captured fish shall be relocated upstream of the diversion.	• Input into P&S and EC inspections during construction. Fund an on-site permitted biologist to perform seining and relocation activities.		❑
	• Vegetation/streambed impacts have been mitigated as described above (see Riparian Woodland column).	•Monetary contribution to trust fund concurrent with construction, and on-site weed abatement for 5 years following construction.		❑

TABLE 4: COMPONENT C; REACH 9 IMPROVEMENTS

Type and Quantity of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement for Mitigation Measure	Status Complete (✓)
General Wildlife <u>Per 1988 Calculations</u> Limited discussion. Impacts would occur primarily in ruderal habitat. <u>Per 2000 Calculations</u> Less than significant impacts to non-sensitive wildlife.	• Maintenance of approximately 1,100 acres of post-project 100-yr floodplain acquired in the canyon for open space and wildlife habitat values. Agricultural lands acquired in fee will not be leased back for agriculture. *(Mitigation is for all lower Santa Ana River project elements.)*	• Prior to completion of construction, provide input into O&M manual and complete real estate purchase agreements.	Phase I GDM, 1988 SEIS. FWCA	✓
		• Prepare Habitat Management Plan	Phase 1 GDM, 1988 SEIS.	✓
Riparian Woodland <u>Per 1988 Calculations</u> See General Wildlife. A few scattered willows would be affected	• Construction activities will be monitored to avoid disturbance to riparian woodland habitat that is to be protected in place.	• Corps, Local Sponsors, USFWS, CDFG to develop joint MOU for Trust Fund	2000 SEIS/R	❑
	• Monitor riparian vegetation adjacent to dewatering areas to document signs of plant stress. Supplemental water shall be added to stressed vegetation, as necessary.	• Input into P&S and EC inspections during construction. Fund an on-site biological monitor during construction.	2000 SEIS/R	❑
		• Input into P&S and EC inspections during construction.		❑

TABLE 4: COMPONENT C; REACH 9 IMPROVEMENTS (Continued)

Type and Quantity of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement for Mitigation Measure	Status Complete (✓)
Bald/Golden Eagles <u>Per 1988 Calculations</u> No Affect <u>Per 2000 Calculations</u> May Affect, not likely to adversely affect	• Survey for bald eagles immediately prior to fall/winter construction near flowing water, and for golden eagles prior to initiating activities at Borrow Area #2. If eagles are foraging in vicinity, coordinate with Contracting Officer Representative and FWS to develop avoidance measures.	• Perform surveys, develop site-specific avoidance measures during construction.	2000 SEIS/R	❑
	• Phased use of Borrow Area #2 (see Canada Geese mitigation measure)	• Input into P&S and inspections during construction.	2000 SEIS/R	❑
Least Bell's Vireo and Critical Habitat <u>Per 1988 Calculations</u> N/A	• Perform protocol surveys for vireo and flycatcher during the spring and summer prior to construction.	• Prior to commencement of construction, develop and implement a monitoring (survey) program for vireo and flycatcher.	2000 SEIS/R. ESA and MBTA.	❑
	• Limit grubbing and clearing of riparian vegetation to non-breeding season (16 August through 28 February)	• Input into P&S and EC inspections during construction.	2000 SEIS/R and MBTA	❑
Note: area of impact is the same as for flycatcher.	• Conduct cowbird trapping for 2 years during project construction and 5 years following project completion. Trapping shall consist of 15 monitored traps during the period 15 March to 30 July.	• Develop cowbird trapping program (scope of work) prior to commencement of construction. Fund and perform trapping during and following construction.	2000 SEIS/R and MBTA	❑
	• Between 16 August and 28 February, erect a noise barrier along the access/haul roads and construction zones that are within 1000 feet of known or suitable vireo habitat.	• Input into P&S and EC inspections during construction. Include location of known vireo territories on construction drawings/plans.	2000 SEIS/R and MBTA	❑

TABLE 4: COMPONENT C; REACH 9 IMPROVEMENTS (Continued)

Type and Quantity of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement for Mitigation Measure	Status Complete (✓)
Southwestern Willow Flycatcher and Critical Habitat 1988 Calculations N/A *Note: area of impact is the same for vireo*	• Perform protocol surveys for vireo and flycatcher during spring and summer prior to construction.	• Prior to commencement of construction, develop and implement a monitoring program that entails surveys for vireo and flycatcher.	2000 SEIS/R. ESA and MBTA.	❑
	• Limit grubbing and clearing of riparian vegetation to non-breeding season (16 August through 28 February)	• Input into P&S and EC inspections during construction.	2000 SEIS/R	❑
	• Conduct cowbird trapping for a period of 2 year sduring project construction and 5 years following project completion. Trapping shall consist of 15 monitored traps during the period 15 March to 30 July.	• Develop cowbird trapping program, scope of work prior to commencement of construction. Fund and perform trapping during and following construction.	2000 SEIS/R	❑
	• Between 16 August and 28 February, erect a noise barrier along the access/haul roads and construction zones that are within 1000 feet of known or suitable flycatcher habitat.	• Input into P&S and EC inspections during construction. Include location of known flycatcher territories on construction drawings/plans.	2000 SEIS/R	❑

TABLE 4: COMPONENT C; REACH 9 IMPROVEMENTS (Continued)

Type and Quantify of Resource or Species Impacted	Mitigation Measure	Proposed Action and Timing of Implementation (Who, When and Where)	Source of Requirement of Mitigation Measure	Status Complete (✓)
Santa Ana Sucker <u>Per 1988 Calculations</u> N/A <u>Per 2000 Calculations</u> approx. 7.2 river miles	• In areas where dewatering is to take place, groundwater shall be introduced into the river system d/s of the construction area in such a way as to avoid turbidity, based on the conditions of the required dewatering permit	• Input into P&S and EC inspections during construction.	2000 SEIS/R. ESA	❑
	• Control sedimentation by recontouring, sandbagging and use of other erosion control methods.	• Input into P&S and EC inspections during construction.	2000 SEIS/R	❑
	• At water diversion locations, the areas shall be blocked off and seined for fish. All captured fish shall be relocated upstream of the diversion.	• Input into P&S and EC inspections during construction.	2000 SEIS/R	❑
	• For construction of Hwy. 91 bank stabilization and Green River Housing Estates bank stabilization, discharges from Prado Dam shall be reduced to the maximum extent practicable and a temporary low flow channel will be cut to divert the flow past the area of construction.	• Input into P&S and EC inspections during construction. Fund an on-site permitted biologist to perform seining and relocation activities.	2000 SEIS/R	❑
	• Vegetation/streambed impacts will be mitigated as described above (see Riparian Woodland column).	• Input into P&S and EC inspections during construction.	2000 SEIS/R	❑

Table 5. Santa Ana Sucker Survey Results, Santa Ana River and Project Action Area.

REACH/YEAR	RESULTS	REFERENCE
Reach 8: 1986/1987	Positive for suckers (numerous individuals near Imperial Highway). At this time, River was less channelized and supported more riparian vegetation.	Robert Fisher, pers. comm., 1999
Reach 8: 1991	2 (29 and 146 mm total length) at Imperial Highway	Chadwick and Associates 1996
Reach 8: 1995	53 (mean total length 52 mm, total length range 32-190 mm)	Chadwick and Associates 1996
Reach 8: 1996	1 (83 mm total length)	Chadwick and Associates 1996
Reach 8: 1998/1999	Negative for suckers at Imperial Highway	Mike Saiki, pers. comm.., 2000
Reach 8: 2000	10 (mean total length)	Baskin and Haglund 2001
Prado Dam to Weir Canyon Road: 1996	5 (35.4 mm mean total length)	Guisti, CADFG, 1996
Weir Canyon Road: 1996	1 (196 mm total length)	Chadwick and Associates 1996
Reach 9, Gypsum Canyon Road: 1998	5	Swift 1998
Northwest of Corona Airport: 1998	16	Swift 1998
300-400 m downstream of River Road: 1998	1	Swift 1998
Downstream of River Road Diversion: 1999	3	Swift 1999
Downstream of River Road: 1999	1	Swift, March 2000

Table 5. Santa Ana sucker survey results, Santa Ana River and project action area (continued).

Downstream of River Road: 2000	1	Swift March, 2000
Below River Road Diversion: 2000	1 (within 30-40 mm)	Swift May, 2000
500-700 m upstream of River Road: 1998	1	Swift 1998
100 meters upstream of River Road Diversion: 1999	1	Swift 1999
Upstream of River Road mining operation: 2000	3	Swift May, 2000
Norco (SAR 8): 1991	3 (74 mm mean total length)	Chadwick and Associates 1996
Norco Bluffs, Zone 4: 1997	76 (total length range 20-70 mm)	Swift 1997
50-750 meters downstream of Hamner Avenue, Zone 3: 1998	4	Swift 1998

Table 6. Areal Extent of Vegetation to be Removed within Project Area*

	Riparian Vegetation		Non Riparian Vegetation**		Arundo		Perennial Stream		Soft Bottom Unvegetated	
Channel Improvement Feature	Permanent Removal (ac)	Temporary Removal (ac)	Permanent Removal (ac)	Temporary Removal (ac)	Permanent Removal (ac)	Temporary Removal (ac)	Permanent Removal (ac)	Temporary Impact (ac)	Permanent Impact (ac)	Temporary Impact (ac)
REACH 9										
Upper Hwy 91 Bank Stabilization	1.4	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green River Estate Bank Stabilization	3.7	7.7	0.7	1.1	0.0	0.0	0.7	1.1	0.0	0.0
Green River Mobile Home Park Levee	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green River Golf Course Low-Flow Channel	1.2	0.0	0.2	1.1	0.0	0.0	0.0	0.6	0.2	0.5
Lower Hwy 91 Bank Stabilization	1.4	4.2	1.2	1.1	0.1	0.2	1.0	0.9	0.1	0.0
Car Wash/Strip Mall Bluff Stabilization	0.6	2.2	0.1	0.9	0.0	0.0	0.1	0.9	0.0	0.0
Totals	8.8	17.5	2.2	4.2	0.1	0.2	1.8	3.5	0.3	0.5
PRADO BASIN										
Outlet Works	11.9	--	6.5	--	0.0	--	6.5	--	0.0	--
Auxiliary Dike and Floodwall	0.6	--	0.0	--	0.0	--	0.0	--	0.0	--
Alcoa Aluminum Plant Dike	1.5	--	0.0	--	0.0	--	0.0	--	0.0	--
Borrow Site 1	2.6	--	0.0	--	0.0	--	0.0	--	0.0	--
Borrow Site 2	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
Haul Roads	1.7	--	0.0	--	0.0	--	0.0	--	0.0	--
Totals	18.3	0.0	6.5	0.0	0.0	0.0	6.5	0.0	0.0	0.0

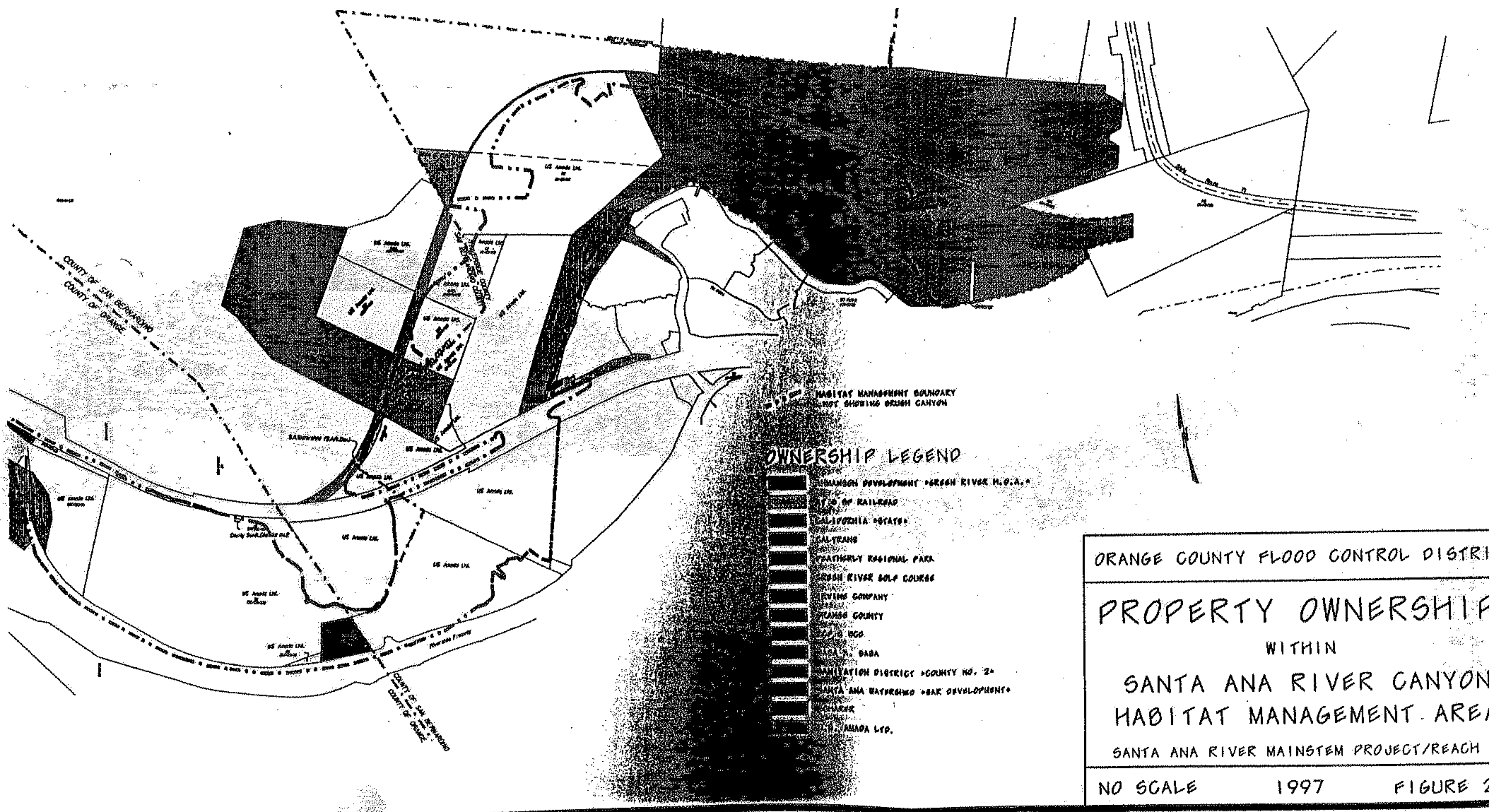
Table 6. Areal Extent of Vegetation to be Removed with Project Area (Continued)

	Riparian Vegetation		Non Riparian Vegetation		Arundo		Perennial Stream		Soft Bottom Unvegetated	
Channel Improvement Feature	Permanent Removal (ac)	Temporary Impact (ac)	Permanent Removal (ac)	Temporary Impact (ac)	Permanent Removal (ac)	Temporary Impact (ac)	Permanent Removal (ac)	Temporary Impact (ac)	Permanent Impact (ac)	Temporary Impact (ac)
NORCO BLUFFS**										
Zone 3	2.2	2.0	3.6	6.4	2.9	5.7	0.7	0.7	0.0	0.0
Zone 4	0.5	0.8	4.7	5.1	2.7	4.1	0.0	0.0	2.0	1.0
Zone 5	0.3	1.0	6.9	5.4	5.8	5.4	0.0	0.0	1.1	0.0
Temporary Access Road Zone 5 Stablization to Staging Area	0.0	0.7	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Permanent Access Road from Side Canyon at Zones 4 and 5 Interface	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3/4 Interface Side Drainage	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4 Side Drainage	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4/5 Interface Side Drainage	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 5 Side Drainage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals	3.4	4.5	15.3	17.3	11.4	15.6	0.7	0.7	3.1	1.0

* Data in table derived from Corps of Engineers, *in litt.*, October 10, 200.

** Non Riparian Vegetation includes the following categories only: Arundo, Perennial Stream, and Soft Bottom Unvegetated.

*** Norco Bluffs data originate from the SEIS (Corps 2000) Tables 4-3 and 4-4 on pages 4-13 and 4-14. The "Willow Riparian," "Riparian Scrub," and "Cottonwood-Willow Riparian" categories from those tables have been combined in this table. In addition, this table does not contain data from the "Annual Grassland" and "Eucalyptus" categories as identified in the SEIS.


COUNTY OF SAN BERNARDINO
COUNTY OF ORANGE
HABITAT MANAGEMENT BOUNDARY
NOT SHOWING BRUSH CANYON
OWNERSHIP LEGEND
CALIFORNIA (STATE)
CALTRANS
GREEN RIVER GOLF COURSE
ORANGE COUNTY
ORANGE COUNTY FLOOD CONTROL DISTRI
PROPERTY OWNERSHIF
WITHIN
SANTA ANA RIVER CANYON
HABITAT MANAGEMENT AREA
SANTA ANA RIVER MAINSTEM PROJECT/REACH
NO SCALE
1997
FIGURE 2

Figur 1

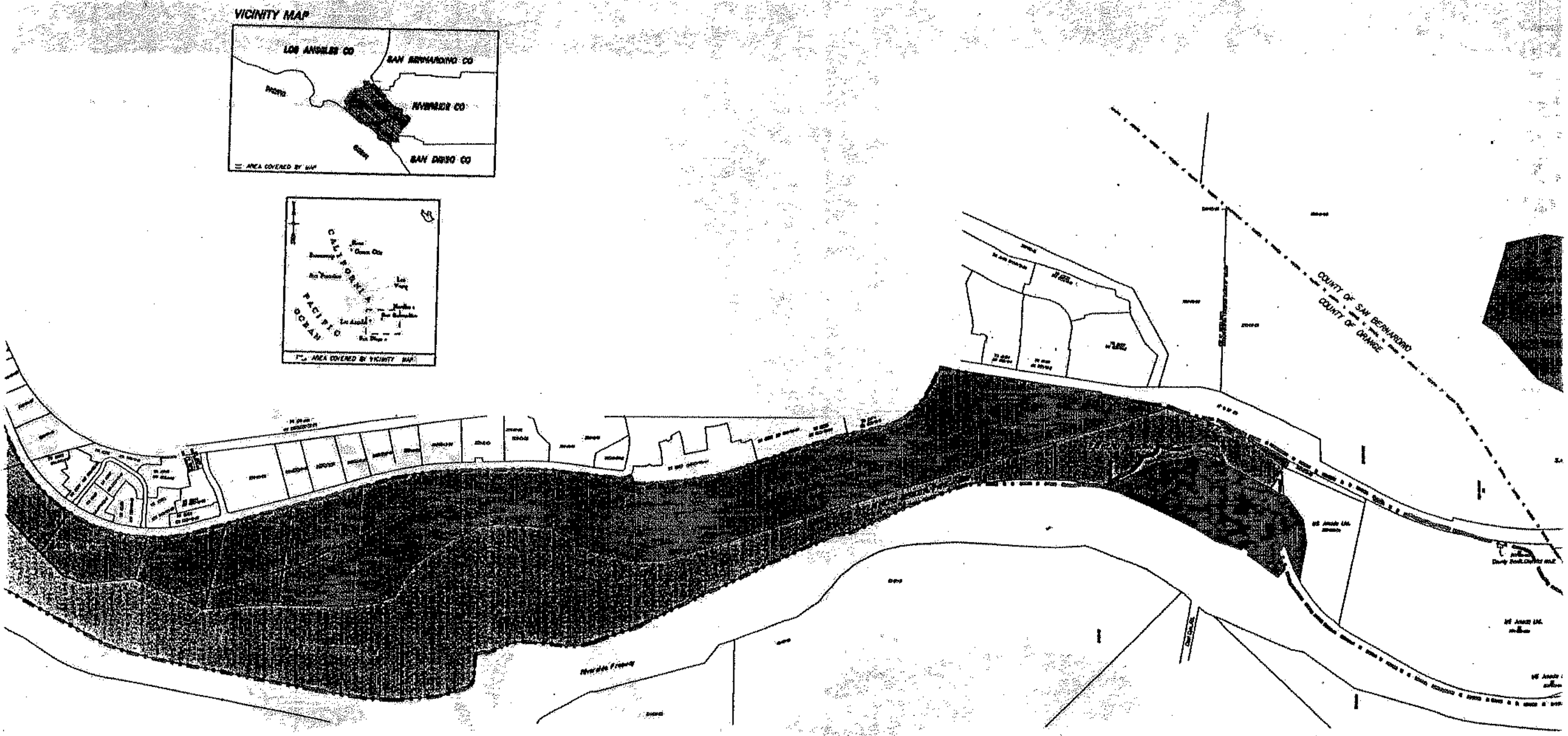


Figure 1 Cont.

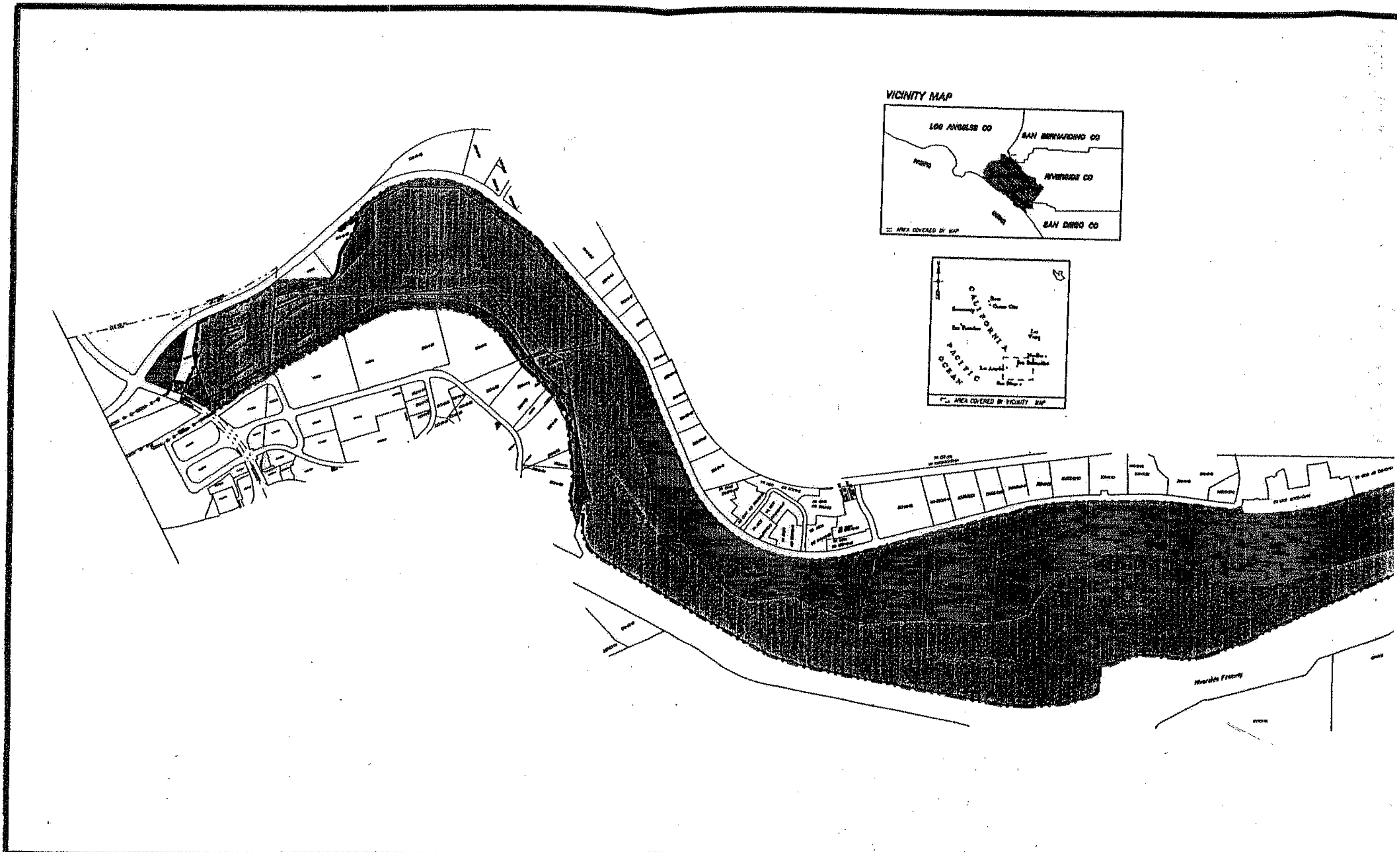

VICINITY MAP
LOS ANGELES CO
SAN BERNARDINO CO
RIVERSIDE CO
SAN DIEGO CO
AREA COVERED BY MAP
CALIFORNIA
PACIFIC OCEAN
AREA COVERED BY VICINITY MAP
Riverside Freeway

Figure 1 C

Appendix L-8

USFWS Biological Opinion (FWS-OR-1304.8) for USACE Reach 2 Channel Excavation EA, 2002

ESA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92009

In Reply Refer To:
FWS-OR-1304.8

DEC 22 2003

Ruth Bajza Villalobos
Los Angeles District
U.S. Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Re: Biological Opinion for Santa Ana River Mainstem Project (SARP) Lower Santa Ana River Reach 2 Channel Excavation to Design Grade, Orange County, California.

Dear Ms. Villalobos:

This document transmits our biological opinion based on our review of the Lower Santa Ana River Reach 2 Channel Excavation to Design Grade and its effects on the federally endangered least Bell's vireo (*Vireo bellii pusillus*, "vireo") in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). While critical habitat for the vireo has been designated, it does not occur in the project area. The proposed project includes the removal of accumulated sediment and vegetation from the Fairview Channel Confluence (Station 150.32) upstream to Station 194.00, between Adams Avenue and the 405 Freeway in Orange County, California. This biological opinion addresses both the current proposed activity and future vegetation management and dredging activities in the Santa Ana River Reach 2. The initial project will be conducted by the U.S. Army Corps of Engineers (Corps), and future sediment removal and vegetation clearing will be conducted by the County of Orange (County). Your request for formal consultation was received on May 13, 2003.

This biological opinion is based on information provided in the Supplemental Environmental Assessments received on April 1, 2002, and August 14, 2003, correspondences, electronic mail, telephone conversations, field investigations, meetings, and other sources of information. A complete administrative record of this consultation is on file at the Carlsbad Fish and Wildlife Office (CFWO).

CONSULTATION HISTORY

The U.S. Fish and Wildlife Service (Service) issued a biological opinion for the Santa Ana River Mainstem Project (SARP) on June 22, 1989. However, the 1989 biological opinion did not directly address impacts to vireo in Reach 2 associated with project implementation or ongoing maintenance activities. Impacts to vireo in Reach 2 were not addressed because the riparian resources along Reach 2 were not sufficient to support the vireo at the time the opinion was prepared and because the Corps anticipated constructing the channel as a solid concrete structure instead of a soft-bottom channel that could support riparian vegetation.

A draft Supplemental Environmental Assessment (DSEA) addressing impacts associated with Reach 2 channel excavation was received by the CFWO on April 1, 2002. On May 1, 2002, the Service responded to the DSEA and recommended surveys be conducted for the vireo and federally endangered southwestern willow flycatcher (*Empidonax traillii extimus*, "flycatcher"). These surveys were conducted in the summer of 2002, and a single calling vireo was observed in Reach 2 during the surveys. Therefore, initiation of formal consultation regarding potential effects of the proposed project on the vireo was requested by the Corps on July 3, 2002. On August 23, 2002, the Service responded, requesting additional information including a written report describing the results of vireo and flycatcher surveys and an updated vegetation survey. The Corps supplied the information requested and again requested initiation of formal consultation on May 5, 2003. On June 5, 2003, the Service responded, initiating formal consultation. On April 21 and August 14, 2003, respectively, the Service received draft and final versions of a Supplemental Environmental Assessment describing potential effects associated with using additional staging areas.

On September 25, 2003, representatives from the Corps and the County met with representatives from California Department of Fish and Game (CDFG) and the Service to discuss potential minimization and restoration measures that could be incorporated into the proposed project. On October 5, 2003, the Service sent the Corps an electronic mail requesting an extension of formal consultation until the project description had been finalized with CDFG and the Service. On October 29 and November 14, 2003, the parties again met to discuss the proposed project, and on November 14, 2003, the project description was finalized.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to remove vegetation and excavate Reach 2 of the Santa Ana River to re-establish design grade between the confluence of Fairview Channel (Station 150.32) and Station 194.00 (upstream of Adams Avenue), a distance of about 4,400 feet. Vegetation removal and excavation would be accomplished by using bulldozers, scrapers, dumptrucks, and dredging equipment. Dredged material will be transported using pipes or dumptrucks along designated paths on either side of the Santa Ana River and deposited on the beach or in Newport Beach groin field, depending on the amount of sediment in the material. The project is expected to take 8-10 months to complete. Three staging areas will be established. The first is located on the seaward side of Pacific Coast Highway. The second extends along the west bank of the Santa Ana River between Cliff Drive and Cynthia Drive in Huntington Beach. The third staging area is located on the east bank of the Santa Ana River just north of the Santa Ana River marsh.

Future maintenance would include annual mowing of vegetation in the fall and occasional dredging to remove accumulated sediment. Sediment would be allowed to accumulate to the upper grade limit line established in the Operation and Maintenance Manual. Once sediment deposition exceeds this limit, the sediment will be removed to design grade (4.5 to 7 feet above Mean Sea Level in Reach 2). The anticipated dredging/sediment removal frequency for Reach 2 is about once every 18 years, but the actual frequency could vary substantially, depending on storm events and other factors that affect deposition and scour.

Conservation/Minimization Measures

1) Prior to removing accumulated sediment, vegetation will be removed outside the period from March 1 to September 15, which will avoid most of riparian bird nesting season.

2) Between March 1 and August 15, there will be no construction-related activity (e.g., staging areas, hauling of material, access to the river channel) on the east bank of Reach 1 since riparian vegetation used by breeding vireos is just east of Reach 1.

3) Between March 1 and August 15, equipment shall not encroach within 100 feet of the east levee between Stations 34.00 and 150.32 of Reach 1. This will create a minimum 300-foot buffer between all construction-related activity on the channel bottom and riparian vegetation to the east.

4) Between March 1 and September 2, there will be no construction-related activity from Station 34.00 to the Pacific Ocean to avoid potential impacts to foraging areas for the federally endangered California least tern (*Sterna antillarum browni*).

5) Cattails, sedges, and other non-woody native wetland plants that establish in the channel after the initial construction will be left in place as long as the channel's flood capacity is not diminished. Annual mowing of vegetation (if necessary) will be conducted between August 15 and March 1, which will avoid most of the nesting season for birds using this habitat.

6) Routine maintenance will include the annual removal of any non-native, invasive vegetation (such as arundo and cocklebur) that establishes in the river channel after construction.

7) Seventeen acres of riparian habitat will be restored/enhanced through the removal of arundo and/or created at an appropriate location subject to approval by CDFG and CFWO.

   a. For the portion of the restoration that is accomplished through arundo removal, the Corps will contribute $50,000 per acre to the Orange County Water District on behalf of the Santa Ana Watershed Association of Resource Conservation Districts (SAWA). Funds shall be transferred within one year of initiation of construction activities to remove the arundo and actively monitor and manage this acreage to ensure that it remains free of arundo. The specific areas from which arundo will be removed in association with the proposed project will be identified on well-labeled maps and submitted to CFWO and CDFG for approval. The Corps will ensure that the arundo removal is completed as described. A report that addresses the following information will be submitted annually:

i. Accomplishments during the previous year;
ii. Accomplishments anticipated for the upcoming year;
iii. Results of the monitoring and management;
iv. Updated mapping that delineates areas in the Santa Ana River watershed and/or action area from which arundo has been removed;
v. An itemized financial report.

b. For the portion of the restoration that is completed through habitat creation, the restoration will be initiated within one year following initiation of project activities in the action area. A restoration plan, including precise restoration locations, methodology, and quantitative performance criteria, will be submitted to CDFG and CFWO for approval before restoration is initiated.

STATUS OF THE SPECIES

Least Bell's vireo

The least Bell's vireo is a small, olive-gray migratory songbird that nests and forages almost exclusively in riparian woodland habitats (Garrett and Dunn 1981, Gray and Greaves 1981, Miner 1989). Bell's vireos as a group are highly territorial (Barlow 1962, Fitch 1958, Salata 1983a) and are almost exclusively insectivorous (Chapin 1925, Miner 1989).

Vireo nesting habitat typically consists of well-developed overstories, understories, and low densities of aquatic and herbaceous cover (Zembal 1984, Zembal et al. 1985, Hays 1986a, 1986b, Hays 1989, Salata 1983a, RECON 1989). The understory frequently contains dense subshrub or shrub thickets. These thickets are often dominated by sandbar willow (*Salix hindsiana*), mule fat (*Baccharis salicifolia*), young individuals of other willow species such as arroyo willow (*Salix lasiolepis*) or black willow (*S. goodingii*) and one or more herbaceous species (Salata 1983a, 1983b, Zembal 1984, Zembal et al. 1985). Significant overstory species include mature arroyo willows and black willows. Occasional cottonwoods (*Populus* sp.) and western sycamore (*Platanus racemosa*) occur in some vireo habitats, and coast live oak (*Quercus agrifolia*) may provide locally important overstory. Sites supporting vireos are on average wider and have a higher degree of vertical stratification, with large amounts of tree and shrub cover, and comparatively little herbaceous cover or open area (RECON 1989).

Vireos generally begin to arrive from their wintering range in southern Baja California and establish breeding territories by mid-March to late March (Garrett and Dunn 1981; Salata 1983a, 1983b; Hays 1989; Pike and Hays 1992). Vireos typically return to established breeding territories year after year (Greaves and Labinger 1997, Salata 1983b). In a study on the San Diego River (Beck 1996), a banded population of vireos generally returned year after year with only minor adjustments in territory location. A large majority of the breeding vireos in the Prado Basin typically depart their breeding grounds by the third week of September and only a few Bell's vireos are found wintering in California or the United States as a whole (Barlow 1962, Nolan 1960, Ehrlich et al. 1988, Garrett and Dunn 1981, Salata 1983a, 1983b, Pike and Hays 1992).

The least Bell's vireo occupies home ranges that typically range in size from 0.5 to 4.5 acres (RECON 1989). In general, areas that contain relatively high proportions of degraded habitat likely have lower productivity (hatching success) than areas that contain high quality riparian woodland (Jones 1985, RECON 1989, Pike and Hays 1992). In some areas, vireos will also use adjacent upland habitats for foraging (Salata 1983a, Kus and Miner 1988). Females select the nest sites (Pitelka and Koestner 1942, Barlow 1962) and both sexes participate in nest construction. Nests are typically constructed in the fork of a tree or shrub branch within 1 meter (3 feet) of the ground. Average clutch sizes range from 3.1 to 3.9 eggs. Both parents share in incubation and feeding, and continue to care for the young for at least two weeks after fledging. Territorial boundaries may be relaxed after the chicks fledge; however, fledglings generally remain in the territory or its vicinity for most of the season.

Long-term averages of productivity based on fledglings per pair range between 1.8 and 3.2. However, productivity is much lower when calculated as the number of fledglings per egg laid, which ranged from 0.37 to 0.75, reflecting the differential intensity of pressures such as egg predation, nestling predation, cowbird parasitism and other sources of nest failure (Service 1998).

Historically described by multiple observers as common to abundant in the appropriate riparian habitats from as far north as Tehama County, California, to northern Baja California, Mexico (Grinnell and Storer 1924, Willett 1933, Grinnell and Miller 1944, Wilbur 1980), the vireo now occupies a small fraction of its former range (Goldwasser et al. 1980, Service 1998) and remains a rare and local species in most of its existing range. Widespread habitat losses have fragmented most remaining populations into small, disjunct, widely dispersed subpopulations. The remaining birds are concentrated in San Diego and Riverside counties with vireo numbers increasing in Orange County. The entire known United States population in 1996 consisted of approximately 1,500 breeding pairs.

The decline of this California species (Salata 1986, Service 1998) has been attributed, in part, to the combined, perhaps synergistic effects of the widespread destruction of riparian habitats and brood-parasitism by the cowbird (Garrett and Dunn 1981). Because of this documented, drastic decline, the least Bell's vireo was listed as an endangered species by the State of California. Subsequently, the vireo was listed as endangered by the Fish and Wildlife Service on May 2, 1986 (51 FR 16474). The Fish and Wildlife Service designated critical habitat for this species on February 3, 1994 (59 FR 4845). However, the proposed project is not located in an area designated as critical habitat for the vireo.

As a direct or indirect result of urbanization, all of the drainages in Orange County have, to varying degrees, been impounded, channelized, or otherwise adversely affected. Preparations for anticipated El Niño-driven storm events in 1997-1998 resulted in the clearing of hundreds of acres of stream-course vegetation in Los Angeles County, and to a lesser extent, Orange County. However, patches of suitable, important vireo habitat remain throughout the lower and middle elevations in both counties. Notable among these patches in Orange County are Arroyo Trabuco, Bonita Canyon/Creek, Cañada Gobernadora, Carbon Canyon, Huntington Central Park, Laguna Reservoir, Mason Park/Sand Canyon Wash and Reservoir, Peters Canyon, Prima Deshecha Cañada Creek, Rattlesnake Reservoir, San Diego Creek, San Joaquin Marsh, Santa Ana River, Santiago Creek/Villa Park Flood Control Basin, and Segunda Deshecha Cañada Creek.

Most or all of the remaining habitat patches in Orange County were almost certainly occupied historically by vireos (Coues 1903, Hoffman 1927, Grinnel and Miller 1944) prior to the precipitous decline of this once abundant species (Garrett and Dunn 1981). These habitat patches have been selectively and gradually reoccupied by vireos only recently, following sustained and relatively intensive management efforts that have included cowbird trapping programs in the Prado Basin, San Joaquin Hills, Lomas de Santiago, Santa Ana Mountains, Chino Hills, Coto de Caza, Talega and elsewhere. The return of successful vireo nesting within the county was first documented in 1991 at Mason Park, and subsequent surveys have indicated that nesting vireo continue to appear in habitat that was recently unoccupied (Gallagher 1997, Harmsworth Associates 1998, Service unpublished data). The closely spaced habitat patches in Orange County are likely important "stepping stones" to the continuing expansion and full recovery of the species.

Ongoing threats to the vireo include loss of habitat and brood parasitism by cowbirds. Loss of habitat has occurred as a result of development in the floodplain and flood control projects and as a result of invasion by arundo, a non-native invasive species in riparian habitats that has eliminated and degraded large areas of potential vireo habitat.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress.

According to 50 CFR § 402.02 pursuant to section 7 of the Act, the "action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area. We have described the action area to be the Santa Ana River and its immediately surrounding environs.

The Santa Ana River and its surrounding environs support a large number of vireo, including the population in Prado Basin, which is the largest population north of San Diego County. In 2001, an estimated 320 pairs were observed in the basin (James Pike, personal communication to Loren Hays, July 16, 2001). Upstream of the Prado Basin, there is riparian habitat of varying quality up extending up into the San Bernardino Mountains. In 2002, 56 pairs were observed, patchily distributed in the Santa Ana River and its tributaries upstream of the Prado Basin (Hoffman and Zembal 2002). Downstream of Prado Dam, there is riparian habitat between the dam and Weir Canyon Road, and an estimated 29 pairs of vireos were observed in this region in 2002 (Hoffman and Zembal 2002). Between Weir Canyon Road and Reach 2, the river is in a concrete channel and does not support any riparian vegetation. Reach 2 contains rip-rap along the river banks, but the bottom of the channel is soft-bottomed, and riparian vegetation has grown in the channel bottom since the SARP was completed.

Existing vegetation in Reach 2 includes approximately 6.74 acres of native riparian vegetation (primarily willows and mulefat), 11.93 acres of mixed native riparian and non-native species (including tamarisk, palm trees, and arundo), and 11.07 acres of primarily non-native species. Reach 2 also contains 4.0 acres of wetlands (cattails, bulrush, and sedge), and 7.45 acres of open water, mud, and sand. The vegetation in Reach 2 is estimated to be suitable to support three to four pairs of breeding least Bell's vireo (Griffith Wildlife Biology 2002). The amount of riparian vegetation has been increasing since the Santa Ana River Mainstem project was completed and, without the proposed project, would continue to grow and mature and become better habitat for the vireo. However, the native species would continue to face competition from the non-native invasive species and all of the vegetation in Reach 2 would be subject to periodic disturbance due to flooding and scouring. In addition, between ten and twenty cowbirds were consistently observed in Reach 2 during vireo surveys in 2002. Therefore, brood parasitism would likely be a threat for any vireos attempting to breed in Reach 2.

The area on either side of Reach 2 is almost entirely developed, and no suitable vireo habitat has been identified in these areas. There is suitable vireo habitat patchily distributed along the east side of Reach 1, including the area surrounding Victoria Pond, which was restored in association with the Santa Ana River Mainstem project.

Focused surveys for vireo were conducted within the project area in 2002. An unpaired male least Bell's vireo was observed foraging and calling in the Reach 2 vegetation at a single date in 2002 (Griffith Wildlife Biology 2002). In 2002, there were four vireo territories observed in riparian vegetation adjacent to Reach 1 of the Santa Ana River, less than a mile downstream from Reach 2. Neither Reach 2 nor the previously identified vireo habitat along Reach 1 was surveyed in 2003, but vireos consistently return to the locations where they previously established territories. Therefore, it is possible that the vireo that was observed in 2002 or offspring from vireos in the surrounding area established or attempted to establish a breeding territory in Reach 2 in 2003.

The Corps' implementation of the SARP has resulted in greater habitat quality for the vireo and other riparian species than was originally anticipated. For example, remaining undeveloped land in the flood plain between Weir Canyon Road and Prado Dam, which includes an estimated 350-380 acres of riparian habitat, was conserved by the Corps to minimize/offset impacts associated with the SARP, and in the biological opinion for the SARP, it was estimated that all of the vegetation in this area would be removed every ten years by flooding. However, based on more recent calculations, it is now estimated that only about 124 acres of riparian habitat will be removed every 50 years. In addition, under the original plans for the SARP, Reach 2 was anticipated to be constructed with a concrete bottom that would have precluded vegetation entirely. Thus, although the removal of riparian vegetation and ongoing maintenance of Reach 2 was not addressed in the 1989 biological opinion for the SARP, the "as-built" conditions in the lower Santa Ana River are more favorable for the vireo than was anticipated in 1989.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action, are later in time, and still reasonably certain to occur.

The proposed project, including ongoing maintenance, would permanently remove the approximately 6.74 acres of native riparian vegetation (willows and mulefat) and 11.93 acres of mixed native riparian and non-native species (including tamarisk, palm trees, and arundo), all of which could potentially be utilized by vireo. Based on 2002 surveys, the habitat in Reach 2 is likely utilized by between zero and one pair of breeding vireo. In addition, the project would remove 11.07 acres of primarily non-native species and 4.0 acres of wetlands (cattails, bulrush, and sedge), which would generally be unsuitable vireo habitat. The riparian habitat in Reach 2 would be replaced by a combination of bare sand, mudflats, cattails and bulrushes, interspersed with a combination of native and non-native early successional riparian species, which would be removed annually. The mudflats, bare sand, and cattail/bulrush habitat would provide foraging habitat for shore birds and other species but would not be suitable habitat for vireo.

Vireos typically return to established breeding territories year after year (Greaves and Labinger 1997, Salata 1983, Beck 1996). If a pair of vireo became established in Reach 2 in 2003, it will be forced to completely abandon its territory and seek and potentially compete for suitable habitat offsite. The nearest riparian/wetland habitat to Reach 2 is the habitat along the east side of Reach 1, less than a mile away. Most of the suitable habitat along Reach 1 is already utilized by breeding vireo pairs. Vireos shifted or displaced from their territories will experience decreased fitness due to increased energy and time spent on competing for and/or finding a new territory. This search for, and establishment of, a new territory would likely result in a delay in the initiation of nest building, fewer nesting attempts per season, a reduced clutch size per attempt, and an overall reduction in reproductive output. If displaced birds cannot find suitable habitat to forage and shelter in, we anticipate that they will experience increased rates of predation or otherwise die or be injured.

Because restoration will be initiated up to a year after the project is initiated, and restoration activities will take time to be successful, there will be a temporary loss of habitat value associated with the proposed project.

Birds rely on auditory signals in the form of songs, and alarm or scolding calls, to establish and defend territories, attract a mate, feed and care for young at the nest, and to locate and evade a potential predator (e.g., Scherzinger 1979). Construction and the use of heavy equipment can result in noise and vibration impacts which are thought to be potentially harmful to a variety of bird species (Gunn and Livingston 1974, RECON 1989, Pike and Hays 1992).

RECON (1989) estimated that noise levels above 60 dBA Leq from March 1 to September 15 may impact vireo reproductive success. While vireos often continue to occupy areas subject to noise levels above 60 dBA, one study has documented significantly reduced reproductive success due to noise impacts (U.S. Marine Corps 1995). It is expected that above some yet unknown noise threshold, vireos abandon an otherwise suitable habitat area. Greaves (1989) hypothesized that the lack of breeding vireos in apparently suitable habitat is due to human disturbances (e.g., bulldozers, off-highway vehicles, and hiker travel). We have used 60 dBA Leq hourly as a practical threshold above which significant impacts to the vireo might occur as described above. Therefore, the construction activity during the vireo breeding season has the potential to disturb nesting vireo.

Conservation Measures

The restoration/enhancement of seventeen acres of riparian vegetation (mixed willow and mulefat) through arundo removal and/or habitat creation will provide additional habitat for vireo breeding and foraging.

The portion of the restoration that is conducted through arundo removal will be beneficial because arundo is an invasive species that displaces native riparian vegetation but provides little habitat value for the vireo. Arundo has invaded large stretches of the Santa Ana River, and only dedicated arundo removal programs have proven effective in stopping its spread. The removal of arundo and maintenance of the habitat to ensure that it remains arundo free should allow the native riparian vegetation to become re-established, thus restoring habitat for vireo breeding and foraging.

The portion of the restoration that is completed through habitat restoration will be beneficial because, upon completion, habitat creation will provide additional foraging and breeding habitat for existing vireo pairs, increasing the likelihood that they will successfully reproduce or serving as breeding habitat for new vireo pairs. The habitat restoration or creation will be conducted in the vicinity of existing breeding vireo pairs, increasing the likelihood that it will be utilized in the near future. Upon completion, it is estimated that the seventeen acres of restored/enhanced habitat could support up to four additional breeding pairs of vireo, supplementing the important population along the Santa Ana River.

Construction activity during the breeding season is proposed as part of the project, but adjacent to Reach 2, there is no riparian vegetation that could support nesting vireo. Adjacent to Reach 1, construction-related activity between March 1 and August 15 will be at least 300 feet from potential vireo habitat. Typically, a 500-foot buffer between normal construction activity and vireo habitat is sufficient to ensure that noise levels remain below 60 dBA Leq hourly. In this case, although construction activities could be as close as 300 feet from riparian vegetation, the activity will be at the bottom of a large channel with high rip-rap walls, and the riparian habitat is outside the channel, over 100 feet from the edge of the bank. Therefore, it is anticipated that noise levels in the riparian vegetation will remain below 60 dBA Leq hourly for most of the vireo breeding season.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

We are unaware of any non-Federal actions affecting vireo that are reasonably certain to occur in the action area considered by this opinion.

CONCLUSION

After reviewing the current status of the least Bell's vireo, the environmental baseline for the action area, effects of the proposed action, and cumulative effects, it is our biological opinion that the proposed action will not jeopardize the continued existence of the least Bell's vireo. We reached this conclusion because:

1. It is possible that the vireo observed in Reach 2 in 2002 returned in 2003 and established a breeding territory. If there was a single breeding pair in Reach 2 in 2002, this pair would be one of many along the Santa Ana River and one of several along the lower Santa Ana River, so the proposed project will not significantly reduce the species' overall number, distribution, or reproductive potential.

2. The direct loss of suitable riparian/wetland habitat for the vireo and represents a small proportion of these habitats found within this species' range. Following the restoration/enhancement of seventeen acres of riparian vegetation, the proposed project will result in no net loss of native riparian vegetation in the action area.

3. Measures will be incorporated to minimize effects to the vireo during their breeding season.

4. Since Reach 2 will be kept free of woody riparian vegetation, vireo are not anticipated to be impacted by future annual vegetation clearing conducted in the channel.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Harm is further defined by us to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. We defined harass as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the Corps and the County for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps and the County fail to assume and implement the terms and conditions the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of the incidental take, the Corps and/or the County must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)]

AMOUNT OR EXTENT OF TAKE

We anticipate that up to one pair of least Bell's vireos will be taken as a result of the proposed project. Incidental take would be in the form of harm as defined in 50 CFR § 17.3, due to the direct loss of foraging and breeding habitat. These individuals will be displaced from their territories and will be delayed in the initiation of, or prevented from, nest building, resulting in fewer nesting attempts, a reduced clutch size per attempt, and an overall reduction in reproductive output. If displaced birds cannot find suitable habitat to forage and shelter in, we anticipate that they will experience increased rates of predation or otherwise die or be injured.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURE

We believe the following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take on the least Bell's vireo.

The Corps and County will minimize the effects of the project on the vireo.

TERM AND CONDITION

To be exempt from the prohibitions of section 9 of the Act, the Corps and the County must comply with the following term and condition which implements the reasonable and prudent measure described above. This term and condition is non-discretionary.

The Corps and the County will ensure implementation and compliance with all onsite minimization measures described in this biological opinion.

We believe that no more than one pair of least Bell's vireo will be incidentally taken as a result of the proposed action. The reasonable and prudent measure, with its implementing term and condition, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. We will not refer the incidental take of any federally listed migratory bird, including the least Bell's vireo, for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein. If during the course of the action, the amount or extent of the incidental take limit is reached, the Corps or the County shall immediately notify this office in writing as required by 50 CFR 402.14(I). If the incidental take limit is exceeded, the Corps or the County should immediately cease the activity resulting in the take, and reinitiate consultation with us. The Corps or the County should provide an explanation of the causes of the taking.

Disposition of Sick, Injured, or Dead Specimens

This office is to be notified within three working days should any endangered or threatened species be found dead or injured as a direct or indirect result of the implementation of this project. Notification must include the date, time, and location of the carcass, and any other pertinent information. Dead animals should be marked in an appropriate manner, photographed, and left on-site. Injured animals should be transported to a qualified veterinarian. Should any treated animals survive, this office should be contacted regarding the final disposition of the animals. The office contact person is the CFWO staff biologist for Orange County, who may be contacted at the letterhead address or at (760) 431-9440.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The recommendations provided here do not necessarily represent complete fulfillment of the Corps' responsibility for these species, pursuant to section 7(a)(1) of the Act.

We recommend that a portion of the riparian habitat restoration/enhancement be in the form of habitat creation in the immediate vicinity of Reach 2 of the Santa Ana River.

REINITIATION NOTICE

This concludes formal consultation on the SR138 realignment project as outlined in materials submitted to us. As provided in 50 CFR §402.16 reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; and (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. Any questions or comments should be directed to Jonathan Snyder of my staff or me at (760) 431-9440.

Sincerely,

Jill Terp
for

Karen A. Goebel
Assistant Field Supervisor

cc:
Don Chadwick, CDFG
Laura Crum, CDFG
Lance Natsuhara, County of Orange

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