Lower Santa Ynez River

Volume I Management Plan

Fish Management Plan

October 2, 2000

LOWER SANTA YNEZ RIVER FISH MANAGEMENT PLAN

Prepared by:

Santa Ynez River Technical Advisory Committee

with Technical Support by

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Prepared for:

Santa Ynez River Consensus Committee

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Photographs

Fish photo on the cover by Tom Taylor.

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EXECUTIVE SUMMARY

THE CACHUMA PROJECT AND FISHERIES MOU

The U.S. Bureau of Reclamation (Reclamation) operates the Cachuma Project (Project), a water supply storage reservoir on the Santa Ynez River. Lake Cachuma is formed by Bradbury Dam which was constructed from 1950-1953. The Project provides the primary water supply for southern Santa Barbara County and a portion of the Santa Ynez Valley. In addition to supplying water to water agencies, the Project also includes storage and later release of water for recharging groundwater resources in the Santa Ynez Valley. The Project yield and downstream water rights releases serve over 325,000 people in Santa Barbara County and over 38,000 acres of cropland in the Santa Ynez Valley. Water supplies from the Project support a multi-million dollar agricultural industry.

In addition to these municipal and agricultural beneficial uses, the Santa Ynez River also supports recreational uses such as fishing, boating and swimming and a variety of riparian, aquatic and estuarine ecosystems. These ecosystems include rare and endangered species of plants, fish, amphibians, and birds.

Bradbury Dam is located about 48.7 miles from the ocean. The dam divides the watershed in half, blocking upstream passage of spawning steelhead to the upper watershed.

The Project operations are under the continuing jurisdiction of the State Water Resources Control Board (SWRCB), which has requested recommendations for operational changes and management actions for maintenance of fisheries and other public trust resources in the Santa Ynez River downstream of Bradbury Dam (*i.e.*, lower Santa Ynez River). The framework for the fisheries program was established by the 1993 Fisheries Memorandum of Understanding (MOU).

Since 1993, a program of cooperative fisheries investigations and basin management planning has been underway in the Santa Ynez River. The planning process was initiated to respond to concerns about providing a reasonable balance in the allocation of Santa Ynez River water between public trust resources and consumptive uses and has focused on the Santa Ynez River basin downstream of Bradbury Dam. Participants in the program include Reclamation, local water agencies, Santa Barbara County, municipalities, state and federal resource agencies, environmental interest groups, and local landowners.

The MOU established two committees. The Consensus Committee, led by Reclamation, has addressed policy issues, and the Fisheries Technical Advisory Committee (SYRTAC), led by the California Department of Fish and Game (CDFG), has overseen the biological studies and analyses and provided technical input to the Consensus Committee. The MOU outlined a program of investigations and analyses to develop recommendations for long-term fishery management and project operations in the Santa Ynez River downstream of Bradbury Dam.

The SYRTAC was tasked with preparing a Fish Management Plan (Plan) for the lower Santa Ynez River. The Plan's goal is to identify, evaluate and implement management actions that will benefit fishery and aquatic based natural resources in the lower river. The Plan recommends specific management actions intended to improve conditions for native fishes, while avoiding adverse impacts to other species of special concern or habitat values. The Plan emphasizes actions that benefit southern California steelhead which were listed by National Marine Fisheries Service as endangered in 1997.

STEELHEAD AND THEIR HABITAT

Steelhead are the ocean-going (anadromous) form of rainbow trout. They are born in freshwater, emigrate to the sea as juveniles ("smolts") to mature, and return to freshwater to spawn as adults. Steelhead in the Santa Ynez River historically migrated to habitat in the upper watershed, primarily above Bradbury Dam, to spawn and rear. Access by anadromous fish to these historical spawning and rearing areas was completely blocked by the construction of Bradbury Dam.

Two steelhead observed in Hilton Creek. Photo by J. Southwick

Spawning adults usually return from January through April. Recent surveys suggest that, under current conditions, small numbers of steelhead can enter the Santa Ynez River to spawn, usually in the lower tributaries (Salsipuedes and El Jaro Creeks). In wetter years, juvenile production has also been observed in the mainstem and upper tributaries (Quiota and Hilton Creeks). Juveniles spend one to three years in freshwater before migrating to the ocean, usually between February and May. Landlocked steelhead that have

adopted a freshwater-resident life pattern still exist above dams in the upper watershed.

Hydrologic conditions and water supply availability in the Santa Ynez River basin vary both seasonally and across years. The majority of rainfall and runoff occurs in the winter and spring months. Spills over Bradbury Dam have occurred in 17 out of 48 years and usually end in the spring or early summer. Other than the area fed by the Lompoc Wastewater Treatment Plant, there is often little or no flow in segments of the mainstem river above and below Lake Cachuma and in the lower reaches of the tributaries below Bradbury Dam from summer until the onset of the rainy season. Even before construction of dams in the basin, portions of the mainstem below the dam dried during the summer (Shapovalov 1944). As a consequence, historically steelhead used the lower mainstem mainly as a migration corridor to reach spawning habitat in the mid and upper basin, and in portions of tributaries that maintained perennial flow. Below Bradbury Dam, tributaries on the south side are more likely to be perennial than those on the north side.

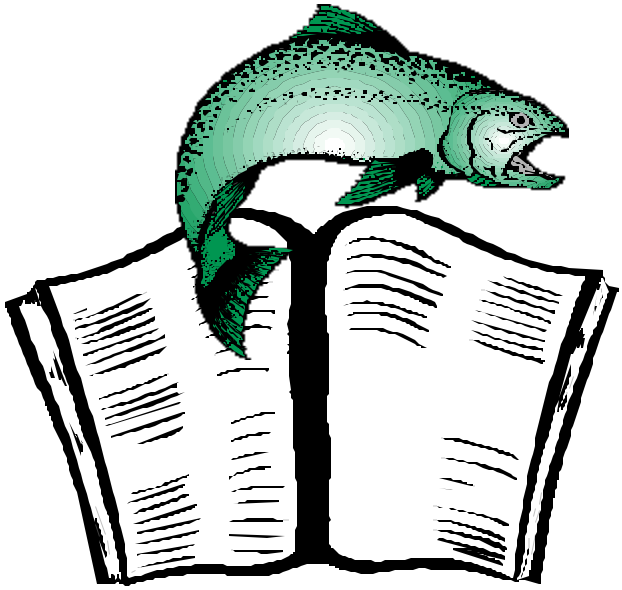
Studies have shown that summer water temperatures in the mainstem Santa Ynez River frequently exceed thermal criteria developed for rainbow trout/steelhead in more northerly streams. The frequency and magnitude of warm water temperatures increase further downstream from the dam. Monitoring during downstream water rights (WR 89-18) releases showed that water temperatures increased rapidly as flow moved downstream (at 3.4 miles below the dam and further), despite moderately high release rates of 50 cubic feet per second (cfs) and 135 cfs. In the tributaries, summer water temperatures regularly exceed these guidelines in the downstream portions of El Jaro, Salsipuedes, Nojoqui and Hilton creeks, yet rainbow trout/steelhead have survived under these conditions. Further study is required to determine if thermal criteria developed in northern climes are appropriate for southern steelhead.

THE PLAN

The Plan examines opportunities to maintain aquatic habitat to keep steelhead populations in good condition, and opportunities to improve habitat conditions in the lower Santa Ynez River and its tributaries. The Plan also evaluates and recommends flow- and non-flow-related actions that benefit public trust resources including other aquatic and riparian species. To achieve its objectives, the plan proposes management actions that provide a high benefit to fish or fish habitat, and are consistent with water supply availability, project facilities, access to private lands and competing demands for limited resources. The MOU participants are also presenting this consensus-based Fisheries Management Plan to SWRCB

for use in the fall 2000 water rights hearings to address fishery and public trust issues.

The Plan was developed from a wide range of potential management alternatives aimed at improving conditions for aquatic resources. Each of 48 alternatives was screened and ranked by SYRTAC members based on feasibility, biological benefits to fisheries resources, cost, likelihood of success, logistical constraints such as access to land, water operations, and institutional coordination. Hydrological and fisheries studies by SYRTAC provided technical understanding of the limitations, constraints and opportunities for applying the alternatives to the Santa Ynez River basin. Technical appendices provide full development and analysis of the management actions proposed in the Plan. The actions recommended in the Plan are consistent with those presented in CDFG's *Steelhead Restoration and Management Plan for California* (McEwan and Jackson 1996).



The recommended management actions are based upon an adaptive management strategy, enabling managers to respond to annual and seasonal variation in hydrologic conditions and water supply availability within the Santa Ynez River basin. This strategy allows Reclamation and the water agencies that contract for Cachuma Project water to implement measures on public lands and private property as opportunities become available. The majority of rainbow trout/steelhead habitat in the lower Santa Ynez River basin is located on private property. Phased implementation of specific project elements and management actions is included, based on access to lands and facilities. Implementation of actions will be accompanied by monitoring to evaluate performance of the action and to identify appropriate modifications, if needed.

The proposed management actions are designed to:

- Protect and improve instream habitat in the lower mainstem Santa Ynez River and tributaries downstream of Bradbury Dam;
- Create opportunities for successful migration, reproduction, and survival of anadromous steelhead; and
- Avoid adverse effects on other aquatic or riparian biological resources, including tidewater gobies, California red-legged frogs, southwestern arroyo toads, and California tiger salamanders.

The proposed management actions have been developed in concert with the need to deliver water supplies, provide for routine maintenance of existing facilities, and maintain groundwater recharge requirements as set forth in WR 89-18 (downstream water rights).

Reaches of the mainstem and tributaries below Bradbury Dam selected as having priority for habitat protection and improvement were identified based upon: (1) seasonal and annual instream flow patterns, (2) water temperature, (3) quality and suitability of existing habitat, (4) opportunities for habitat improvement, and (5) ownership of the subject habitat areas. Priority tributary habitats include Hilton Creek, El Jaro Creek, and Quiota Creek. Priority mainstem habitats include the reach between Hilton Creek and the Highway 154 Bridge, the reach between Bradbury Dam and Hilton Creek, and, in wet years and the year following a wet year, the mainstem down to Alisal Bridge.

RECOMMENDED ACTIONS

Recommended actions will benefit steelhead and other aquatic species both directly and indirectly by (1) creating new habitat within the lower Santa Ynez River and tributaries, (2) improving habitat conditions within the lower Santa Ynez River and tributaries, (3) improving access to important spawning and rearing habitat in the lower mainstem and its tributaries, and (4) increasing public awareness and support for beneficial actions on private land.

In addition to the proposed actions, a long-term monitoring program will be implemented to track trends in available habitat and rainbow trout/steelhead use of that habitat. This program is based on the existing SYRTAC long-term study plan and the actions proposed in this plan.

The recommended management actions include the following:

I. **Create New Habitat.** Actions to increase the availability and quality of habitat for steelhead and other aquatic resources include:

- Conjunctive use of mainstem rearing target flow releases and downstream water rights releases to extend the period of time each year when instream flows are present in Hilton Creek and the mainstem river. This action will provide improved summer rearing conditions and habitat protection for steelhead. Modifications to reservoir operations and surcharge levels will provide sustained target flows. Releases will be provided via the Hilton Creek supplemental watering system

to meet flow targets in the Santa Ynez River of 2.5 or 5 cfs at Highway 154 Bridge depending on reservoir elevation, or of 10 cfs at Highway 154 Bridge in years when the reservoir spills at least 20,000 acre feet (AF). In these wet years and the year following such a wet year, a flow target of 1.5 cfs at the Alisal Road Bridge will also be maintained. In critically dry years, when the reservoir elevation falls below 660 feet mean sea level (MSL), periodic releases will be made to refresh the Long Pool and Stilling Basin near Bradbury Dam. In these years, fish in Hilton Creek will be rescued and moved to mainstem habitat if necessary. Reclamation proposes to raise the full pool of the reservoir from the current 750 feet above MSL to 753 feet above MSL (*i.e.*, 3-foot surcharge). The additional water provided by the surcharge will support fish enhancement flows. This water will be available prior to implementation of the flow targets described above.

In order to implement the 3-foot surcharge, the flashboards on the Bradbury Dam spillway gates must be modified and there must be sufficient runoff to fill the additional space in the reservoir. Modification to allow an interim level surcharge, 1.8 feet, is complete. The modification will also accommodate the 3-foot surcharge once environmental review is complete. In the interim, modified rearing target flows at the Highway 154 bridge (1.5 and 2.5 cfs based on reservoir storage and 5 cfs in spill years) will occur until the 3-foot surcharge, required for implementation of the long-term target flows described above, is in place. In addition, refuge pools will be maintained in the Refugio and Alisal reaches during this interim period.

- Establish an Adaptive Management Account with 500 AF to provide a dedicated amount of water that can be released as necessary to maximize the biological benefit to aquatic resources downstream. This water can be used to further enhance Hilton Creek habitat, mainstem habitat, or fish passage releases.

- Modifications to lower Hilton Creek to provide additional new summer rearing habitat through establishment of a reliable water supply meeting specific water temperature and dissolved oxygen (DO) criteria; and construction of a 1,500-foot long channel extension, designed and managed specifically to provide steelhead spawning and rearing habitat (if determined to be feasible).

II. **Improve Existing Habitat.** Actions to increase the quality of habitat for the fishery downstream of Bradbury Dam include:

- Protection and enhancement of steelhead spawning and rearing habitat in tributaries through the establishment of conservation easements and/or leases, and implementation of habitat improvements along those easements, such as riparian planting, structural improvements to instream habitat, and bank stabilization. Currently, SYRTAC is working to protect up to 10 miles of stream in the El Jaro watershed. Additional enhancement actions will occur as opportunities to work with interested landowners arise.

- Structural improvements in mainstem pools and riparian planting along the mainstem to increase the amount and quality of suitable habitat.

III. **Improve Access to Habitat.** Actions to make new habitat available or existing habitat more accessible include:

- Establish a Fish Passage Account to provide a dedicated water supply to create additional migration opportunities for steelhead. In years when the reservoir surcharges to 3 feet, 3,200 AF of the surcharged water will be allocated to the Fish Passage Account. The water will be released in subsequent years to supplement the descending limb of naturally occurring storm hydrographs until there is no more water in the Account or the reservoir has surcharged again. Once the 1.8-foot surcharge is in place, interim Fish Passage Account allocations (2,500 AF) will occur prior to implementation of the proposed 3-foot surcharge.

- Modification of fish passage impediments in the tributaries to enhance the availability of habitat for steelhead spawning and rearing. A number of impediments have been identified and will be removed or modified to provide/improve passage on Hilton, Quiota, Salsipuedes, and El Jaro creeks. For example, improve passage over a partial impediment at the chute pool to increase access to approximately 2,400 feet of habitat upstream to the Highway 154 culvert; provide passage through the Highway 154 Culvert which acts as a complete barrier providing access to the upper reaches of the creek.

- Continue to investigate opportunities to provide passage for steelhead around Bradbury Dam.

IV. **Increase Public Awareness.** Actions to increase public awareness and support for beneficial actions on private land include:

- Public education and outreach will provide direct and indirect benefits to steelhead and other fish resulting from increased awareness by local landowners and the public of types of actions and land-use practices which will benefit native fish, and increased awareness and sensitivity regarding impacts to the steelhead population resulting from recreational and illegal harvest. This effort is anticipated to provide increased political support for obtaining additional funding for habitat improvement projects on the mainstem and tributaries, and opportunities to implement other actions designed to protect and improve steelhead habitat on private property.

- Provide Technical Assistance. Reclamation and the Member Units will provide technical assistance and assist in grant acquisition for voluntary actions to improve steelhead habitat on private land. Private landowners will also be assisted in securing funding for such actions through grant awareness programs. These programs will be supported through the public education and outreach program, to make landowners and the public aware of these resources.

IMPLEMENTATION

The proposed actions will be implemented in a phased approach. Those measures under the jurisdiction of Reclamation and/or the Member Units that do not require the construction or modification of facilities will be implemented immediately. A schedule for accomplishing measures requiring the construction of facilities has been established for actions on Reclamation property. Management actions that require the permission or participation of private landowners will be implemented in consultation with the landowners.

Management actions that can be implemented immediately (or as soon as weather conditions permit) include:

- surcharging the reservoir (0.75 feet) to support mainstem target flows (surcharge currently implemented);
- interim mainstem rearing target flows and conjunctive use with the downstream water rights releases to provide year-round habitat;
- supplemental watering of Hilton Creek to provide new summer rearing habitat using the existing gravity driven system (the pumping system is anticipated by 2002);

- fish rescue operations in Hilton Creek, if needed;
- long-term monitoring program; and
- implementation of a public education and outreach program.

The remaining management actions will be completed in accordance with the following timetable:

- flashboards enabling the proposed 3-foot surcharge that would provide 9,200 AF for fish enhancement releases: 3,200 AF for the Fish Passage Account; 500 AF for the Adaptive Management Account; and 5,500 AF dedicated to support mainstem target flows. (construction of the flashboard modification to allow the 1.8 foot surcharge [environmental review complete] and accommodate the 3 foot surcharge anticipated in 2001; environmental review complete for the 3 foot surcharge complete by 2004);
- pool habitat enhancement on public property in the near future (further site analysis is required);
- Hilton Creek cascade/chute fish passage project (in place by 2001) and Highway 154 Culvert fish passage project (in place by 2002);
- Hilton Creek channel extension (in place by 2004 if project is feasible);
- establishment of the Fish Passage Account: interim allocation of 2,500 AF with a 1.8 foot surcharge (anticipated by the first spill after 2001), or long-term allocation of 3,200 AF with the proposed 3-foot surcharge (the year of the first spill after environmental compliance is completed by 2004); and
- establishment of the Adaptive Management Account when the reservoir surcharges to the proposed 3 feet (scheduled for the first spill after environmental compliance is achieved, completion is anticipated in 2004).

Actions on private lands will be implemented within the constraints and schedules established by landowners, permitting processes, and funding availability. By 2001, the Member Units expect to obtain conservation easements and/or leases on properties in the El Jaro Creek drainage, which will create opportunities for enhancement and restoration of approximately 10 miles of upper El Jaro Creek and two tributaries of El Jaro Creek. Currently, the landowners and the Cachuma Operation and Maintenance Board (COMB) are conducting property appraisals and other investigations for conservation easements and/or leases.

The SYRTAC will continue to research mechanisms for allowing steelhead to migrate around Bradbury Dam. The SYRTAC has identified a number of technical and institutional challenges to providing safe passage to and from the upper river basin. These challenges must be addressed before implementation of this option.

LONG-TERM EVALUATION

The long-term goal of this Fish Management Plan is the protection and recovery of southern steelhead in the Lower Santa Ynez River. This Plan outlines a strategy that is expected to provide the habitat requirements needed to better support steelhead in the lower river. The plan should also help support the habitat requirements of many of the other riparian and aquatic species.

The SYRTAC acknowledges that the recovery of an endangered species is a slow process that will likely take decades. Many factors critical to the recovery of this anadromous species are beyond the control of Reclamation, the Member Units and the resource agencies responsible for their protection. Such factors include hydrological conditions (*e.g.,* droughts) and impacts to the species during its oceanic lifestage.

Measures to evaluate each of the recommended management actions are described on a action-by-action basis. Evaluation criteria include 1) meeting specified streamflow targets, 2) providing passage opportunities over migration impediments and barriers and 3) protecting and enhancing quantities of instream and riparian habitat. Additionally, an annual monitoring program will continue to provide data on adult migration and spawning and juvenile rearing. Environmental factors that affect such reproductive success will also be measured and correlated. These data will be analyzed for evidence of long-term trends, with the aim of determining if the management actions are providing the expected positive trend in steelhead use of the lower river.

This Plan is based upon an adaptive management strategy that allows the recommended actions to evolve as new information becomes available. An Adaptive Management Committee will be formed to evaluate the trends in steelhead use and, if necessary, recommend alternatives and revisions to the recommended actions outlined in this Plan. The trends will be evaluated at least annually and the results presented to the Consensus Committee which will be set up to guide the long-term process.

FUNDING

Reclamation and the Member Units will fund the actions recommended in this plan from the Cachuma Project Contract Renewal Fund and the Warren Act Trust Fund. These funds were established in 1996 during the contract renewal process to provide money for enhancement and watershed improvements. The funds come from an assessment on water

taken from the Cachuma Project and from the use of Lake Cachuma to store State Water Project water. In addition, the Santa Barbara County Water Agency is required to provide $100,000 annually for projects that may include conservation-type activities related to the Cachuma Project. It is estimated that in the future, approximately $300,000 per year will be dedicated to restoration activities.

In addition to these funds, Reclamation and the Member Units are seeking funds from other sources such as the State's Watershed Restoration and Protection Council, the CDFG's Fishery Restoration Grants Program, the California Coastal Salmonid Recovery Program, the National Fish and Wildlife Foundation, and the SWRCB's Non-Point Source Pollution Program to supplement funds available from local sources. The Member Units have been successful in obtaining outside funding for enhancement projects. To date, grants and additional funding totaling almost one million dollars have been approved by various funding agencies.

The Santa Ynez River Valley

1.0 INTRODUCTION

The Lower Santa Ynez River Fish Management Plan strives to balance resources among the competing demands of water supply, agriculture, local industry, and public trust resources. The Lower Santa Ynez River Fish Management Plan was developed in a consensus-based process by local, state and federal agencies, environmental groups, water users, landowners, and other interested parties. The goal is to protect and enhance habitat conditions for aquatic resources within the Santa Ynez River downstream of Bradbury Dam while accommodating existing water and land uses. The listing of southern steelhead under the Endangered Species Act underscores the need for a comprehensive plan for the basin. The Plan is based on the principles of adaptive management of activities that can be implemented by federal, state, and local governmental agencies, and voluntary participation of private landowners.

1.1 BACKGROUND

The U.S. Bureau of Reclamation (Reclamation) owns the Cachuma Project (Project), a water supply storage reservoir on the Santa Ynez River. Lake Cachuma is formed by Bradbury Dam which was constructed from 1950-1953. The Project provides the primary water supply for southern Santa Barbara County and a portion of the Santa Ynez Valley. In addition to supplying water to water agencies, the Project also includes capture and later release of water for recharging groundwater resources in the Santa Ynez Valley. The Project yield and downstream water rights releases serve over 325,000 people in Santa Barbara County and over 38,000 acres of cropland in the Santa Ynez Valley. Water supplies from the Project support a multi-million dollar agricultural industry.

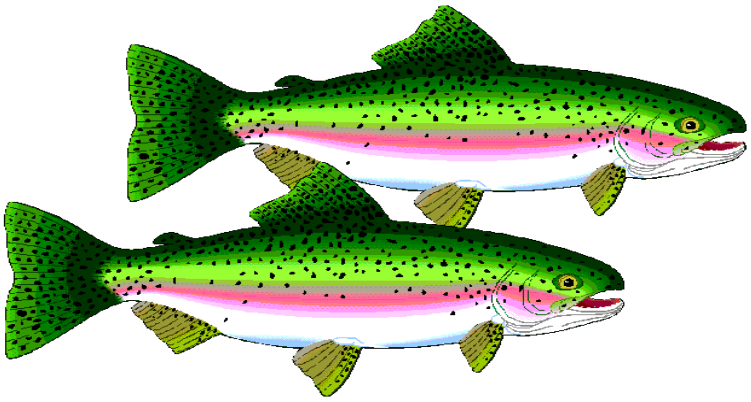
In addition to these municipal and agricultural beneficial uses, the Santa Ynez River also supports recreational uses such as fishing, boating and swimming and a variety of riparian, aquatic and estuarine ecosystems. These ecosystems include rare and endangered species of plants, fish, amphibians, and birds.

Bradbury Dam is located about 48.7 miles from the ocean. The dam divides the watershed in half, blocking upstream passage of spawning steelhead to the upper watershed.

Project operations are under the continuing jurisdiction of the State Water Resources Control Board (SWRCB), which has scheduled hearings in 2000 to address issues related to the use of Santa Ynez River water for the Cachuma Project (which mainly supplies users in a portion of the Santa Ynez Valley and the South Coast cities and communities of Santa Barbara,

Goleta, Montecito, and Carpinteria), water rights downstream of Bradbury Dam, and the protection of public trust resources. The SWRCB has requested recommendations for operational changes and management actions for maintenance of fisheries and other public trust resources in the river below Bradbury Dam (*i.e.*, lower Santa Ynez River). The Fish Management Plan for the Santa Ynez River (Plan) responds to the SWRCB's request and proposes management actions to preserve and enhance public trust resources in the lower Santa Ynez River.

Under SWRCB's encouragement, state, federal, and local agencies signed a memorandum of understanding (MOU) in 1994 for cooperation in research and fish maintenance on the Santa Ynez River downstream of Bradbury Dam. Since 1993, a program of cooperative fisheries investigations and basin management planning has been underway in the Santa Ynez River. The planning process was initiated to respond to concerns about providing a reasonable balance in the allocation of Santa Ynez River water between public trust resources and competing consumptive uses. By directive from SWRCB, the process has focused on the Santa Ynez River basin downstream of Bradbury Dam.



The framework for the fisheries program was established by the 1994 MOU, which established a Consensus Committee to oversee direction of the MOU and the Santa Ynez River Technical Advisory Committee (SYRTAC) to conduct cooperative studies of fish and habitat and to develop recommendations for habitat management.

The SYRTAC was tasked with using a consensus-based approach to prepare the Plan for the lower Santa Ynez River. The Plan recommends specific management actions intended to improve conditions for native fishes and other aquatic resources while avoiding adverse impacts to habitat values or other species of special concern. The Plan emphasizes actions that target southern California steelhead, which were listed by the National Marine Fisheries Service (NMFS) as endangered in 1997.

Partners in Cooperative Studies and Planning

MOU Signatories include:

- U. S. Bureau of Reclamation
- U. S. Fish and Wildlife Service
- California Department of Fish and Game
- Cachuma Conservation Release Board (Carpinteria Valley Water District, City of Santa Barbara, Goleta Water District, and Montecito Water District)
- Santa Ynez River Water Conservation District, Improvement District #1
- Santa Ynez River Water Conservation District
- Santa Barbara County Flood Control and Water Conservation District and Water Agency
- City of Lompoc

In addition to the MOU Signatories, the following organizations and agencies are participants in the SYRTAC:

- National Marine Fisheries Service,
- U. S. Forest Service,
- U.S. Dept. of Agriculture Natural Resources Conservation Service,
- California Trout,
- Santa Barbara Urban Creeks Council,
- Central Coast Regional Water Quality Control Board,
- Central Coast Water Authority,
- Santa Barbara County Fish and Game Commission,
- California Coastal Commission, and
- Santa Barbara citizens and local landowners.

1.2 OBJECTIVES

The goal of this Plan is to identify, evaluate, and recommend potential management actions that will benefit fish and other aquatic resources in the lower Santa Ynez River. Improving conditions for native fishes in general, and rainbow trout/steelhead in particular, while avoiding adverse impacts to other species of special concern or habitat values, is a management priority in the lower Santa Ynez River.

Constraints and Limitations

The opportunities for implementing management actions in the lower Santa Ynez River are constrained by several factors:

- high annual variability in precipitation and runoff,
- seasonal and annual instream flow patterns,
- water temperature,
- quality and suitability of existing habitat,
- opportunities for habitat improvement, and
- ownership of the subject habitat areas.

The Plan, therefore, identifies important reaches of the mainstem and tributaries for habitat protection and improvement. High priority is given to lower Hilton Creek (on Reclamation property) and the mainstem near Bradbury Dam (down to the Highway 154 Bridge). Habitat conditions in these areas are relatively good and water releases have more potential to benefit aquatic habitat. Priority is also given to enhancing habitat found in tributaries on the southern side of the valley. These tributaries, especially Hilton, Quiota, El Jaro, and Salsipuedes Creeks, often have perennial flow in their upper reaches and good habitat conditions.

The majority of rainbow trout/steelhead habitat in the lower Santa Ynez River basin is located on private property. Actions on private lands will be implemented only through voluntary participation by private landowners. Because of this constraint, first priority for implementation of the recommended actions will be given to those that are under the jurisdiction of Reclamation and/or the participating water agencies.

For most activities, coordination with, and review by, regulatory agencies (*e.g.*, NMFS, California Department of Fish and Game [CDFG], U. S. Fish and Wildlife Service [USFWS], and Army Corps of Engineers [ACOE]) will also be required prior to implementation. Coordinating with the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) will incorporate the long-term experience of this agency in working with private landowners to implement conservation practices and help identify funding sources for restoration activities.

1.3 LONG-TERM EVALUATION

The long-term goal of this Fish Management Plan is the protection and recovery of southern steelhead in the Lower Santa Ynez River. This Plan outlines a strategy that is expected to provide the habitat requirements needed to better support steelhead in the lower river. The plan should also help support the habitat requirements of many of the other riparian and aquatic species.

The SYRTAC acknowledges that the recovery of an endangered species is a slow process that will likely take decades. Many factors critical to the recovery of this anadromous species are beyond the control of Reclamation, the Member Units and the resource agencies responsible for their protection. Such factors include hydrological conditions (*e.g.*, droughts) and impacts to the species during its oceanic lifestage.

Measures to evaluate each of the recommended management actions are described on an action-by-action basis. Evaluation criteria include 1) meeting specified streamflow targets, 2) providing passage

opportunities over migration impediments and barriers and 3) protecting and enhancing quantities of instream and riparian habitat. Additionally, an annual monitoring program will continue to provide data on adult migration and spawning and juvenile rearing. Environmental factors that affect such reproductive success will also be measured and correlated. These data will be analyzed for evidence of long-term trends, with the aim of determining if the management actions are providing the expected positive trend in steelhead use of the lower river.

This Plan is based upon an adaptive management strategy that allows the recommended actions to evolve as new information becomes available. An Adaptive Management Committee will be formed to evaluate the trends in steelhead use and, if necessary, recommend alternatives and revisions to the recommended actions outlined in this Plan. The trends will be evaluated at least annually and the results presented to the Consensus Committee which will be set up to guide the long-term process.

Adaptive Management Strategy

The Plan is based upon an adaptive management strategy, which allows managers to:

- respond to annual and seasonal variation in hydrologic conditions and water supply availability;
- take advantage of opportunities to implement measures on public lands and private property as they arise;
- evaluate the result of implementation of the proposed actions; and
- recommend and implement appropriate modifications to the Plan based on these evaluations.

The Plan also includes phased implementation of specific project elements and management actions. A phased implementation period is needed to provide time to address environmental compliance issues, funding availability, and access to lands and facilities. Implementation of actions under this Plan will be accompanied by a long-term monitoring program to aid in the evaluation of actions.

Additional Information

Several appendices are attached to the Plan that provide more in-depth treatment of various issues and comments from participating organizations on the draft plan. The appendices include:

A. Management Alternatives Considered - A brief review of the full range of potential actions that SYRTAC considered and screened in the process of developing the Plan (SYRTAC 1998);

B. Flow-Related Fish Enhancement in the Mainstem;

C. Tributaries of the Santa Ynez River below Bradbury Dam;

D. Hilton Creek Enhancement;

E. Upper Basin Actions for the Protection and Enhancement of Southern Steelhead in the Santa Ynez River;

F. Molecular Genetic Population Structure in Steelhead/Rainbow Trout (*Oncorhynchus mykiss*) from the Santa Ynez River;

G. Review of Effects of Warm Water Temperature on Steelhead/ Rainbow Trout;

H. Comments on the Plan Public Review Draft; and

I. Long-Term Monitoring in the Lower Santa Ynez River.

2.0 OVERVIEW OF THE SANTA YNEZ RIVER WATERSHED

The Santa Ynez River watershed is approximately 900 square miles and has a Mediterranean climate. Large variations in annual rainfall can occur and the region has experienced wet and dry cycles that can persist for several years. There are three water supply reservoirs on the Santa Ynez River, the downstream-most is Lake Cachuma approximately 50 miles from the Pacific Ocean. Twenty-five species of fish inhabit the watershed including ten native species. Of the native species, the tidewater goby, an inhabitant of the lagoon, and the southern steelhead, an anadromous species, are endangered. In addition to the fish, 20 endangered or threatened plant and wildlife species are found here. In the lower watershed, higher quality habitat for steelhead is located in the first 10 miles of the mainstem downstream of Bradbury Dam and in several tributaries on the southern side of the basin.

Regional Setting

The Santa Ynez River watershed, located in central Santa Barbara County, California, is about 900 square miles in area (Figure 2-1). The Santa Ynez River flows west about 90 miles from its headwaters at 6,000 feet in the San Rafael Mountains to the Pacific Ocean. Bradbury Dam, which creates Lake Cachuma, is located 48.7 river miles from the ocean and divides the watershed nearly in half. Immediately upstream from Lake Cachuma, the river passes through a narrow trough between the mountains. Below Lake Cachuma, the river flows over broad alluvial floodplains. West of Buellton it flows through a narrow meandering stretch to the Lompoc Narrows and emerges onto the broad, flat Lompoc Plain. The river flows another 13 miles to the ocean. The width of the active channel ranges from approximately 40 feet near Bradbury Dam to more than 400 feet near the confluence with Alamo Pintado Creek. The actions described in this Plan focus on the mainstem downstream of Bradbury Dam and the south-side tributaries to the lower river (Figure 2-2).

Land Use

The watershed above Bradbury Dam is primarily undeveloped open space under the jurisdiction of the Los Padres National Forest and Reclamation which leases a portion of its land to Lake Cachuma County Park. Lands downstream of Bradbury Dam (lower watershed) are mainly in private ownership and fall under the jurisdiction of the County of Santa Barbara, with the exception of Vandenburg Air Force Base and the Lompoc Federal Penitentiary at and around the river's mouth. Existing land uses in the lower watershed include irrigated and non-irrigated agriculture, residential and urban areas (cities of Lompoc, Buellton, and

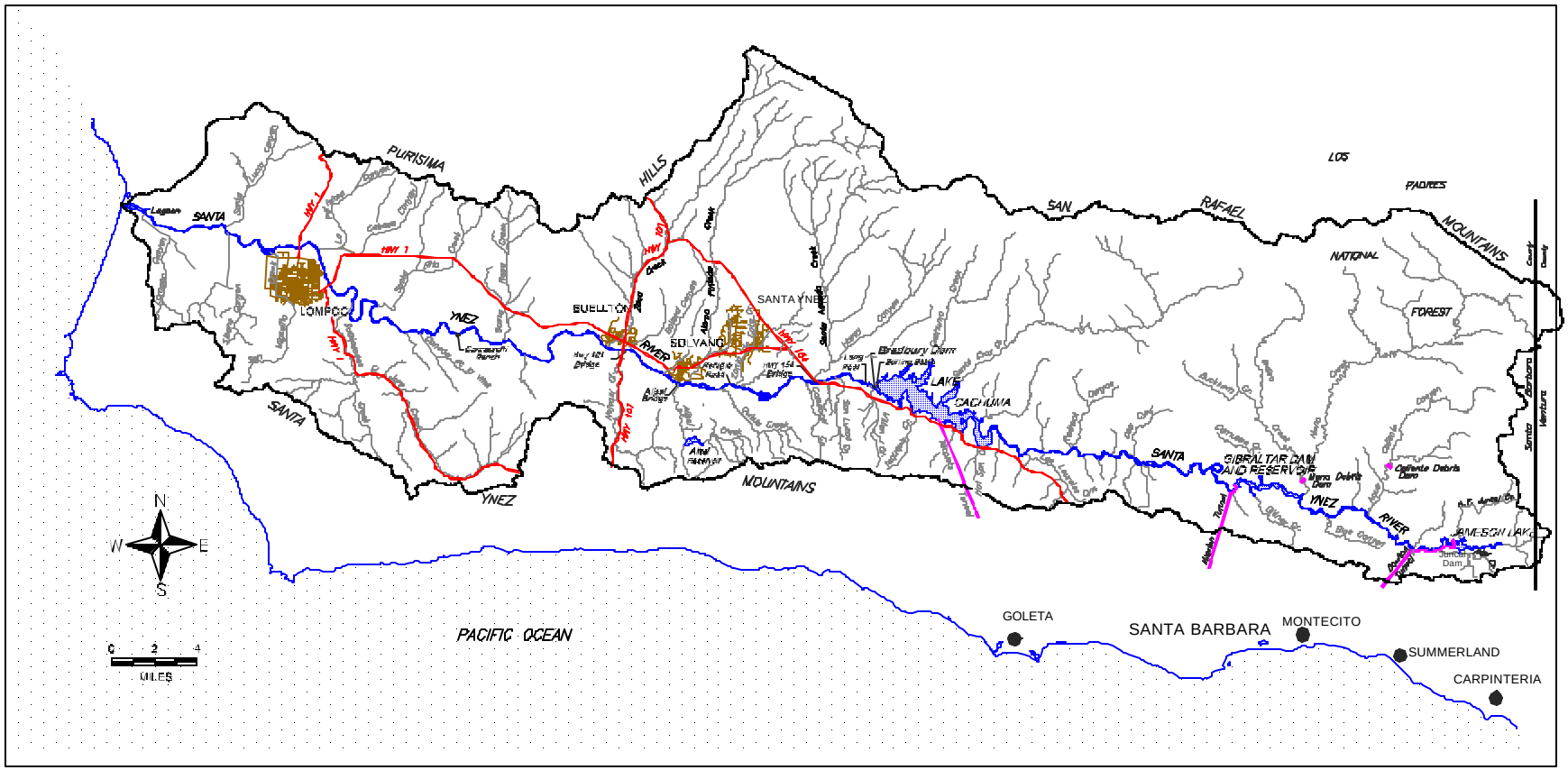


FIGURE 2-1 THE SANTA YNEZ RIVER WATERSHED

Higher Resolution

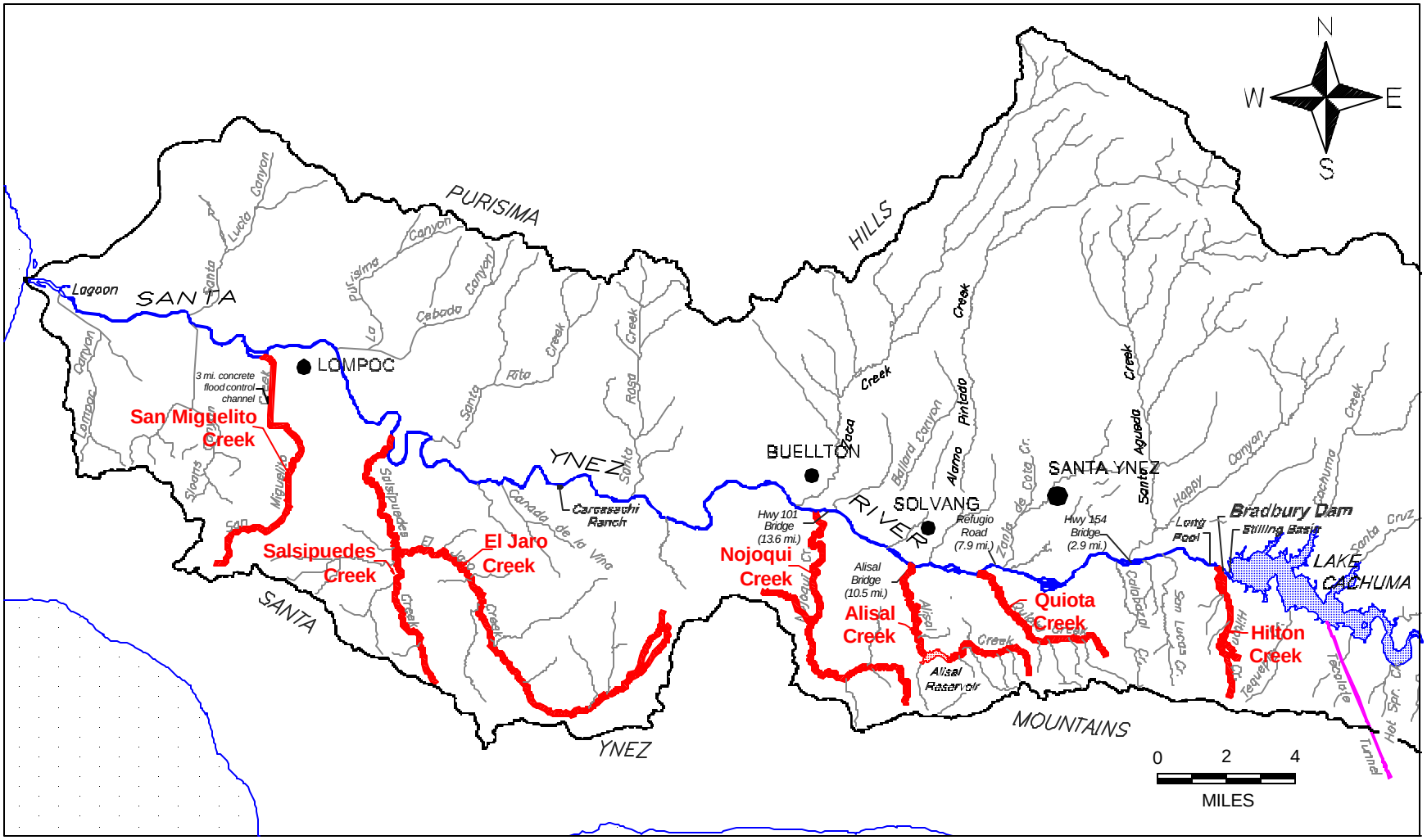


FIGURE 2-2 FOCUS OF AREAS FOR SYRTAC STUDY

Solvang), the federal prison, the Air Force Base, cattle grazing, undeveloped open space, and mineral extraction (quarries, surface mines, oil fields).

2.1 HYDROLOGY

Interannual Variation

The Santa Ynez River basin has a Mediterranean climate. Annual rainfall is twice as much in the upper watershed (29 inches average) as it is in the valley (14 inches average in Lompoc). Rainfall, streamflow, and water supply availability vary across both years and seasons. Large variations in annual rainfall can occur. For example, near Lake Cachuma precipitation has ranged from 11 inches (winter 1923-1924) to 66 inches (winter 1940-1941). Historical records show that the region has experienced wet and dry cycles that can last for several years. Figure 2-3 shows annual precipitation and the overall mean annual precipitation.

Seasonal Variation in Streamflow

Most of the rainfall occurs in winter, and the majority of runoff occurs in the winter and spring months (Figure 2-4). Spills over Bradbury Dam have occurred in 17 of 48 years (1953 to 2000) and usually end in the spring or early summer. Streamflow in the Santa Ynez River watershed is "flashy," rising and falling in response to precipitation. Streamflow is also seasonal, with high flows from winter storms and low or no flows in the summer. Even before construction of Bradbury Dam, much of the mainstem of the Santa Ynez River became intermittent or dried up during the summer months in many years (Shapovalov, 1944).

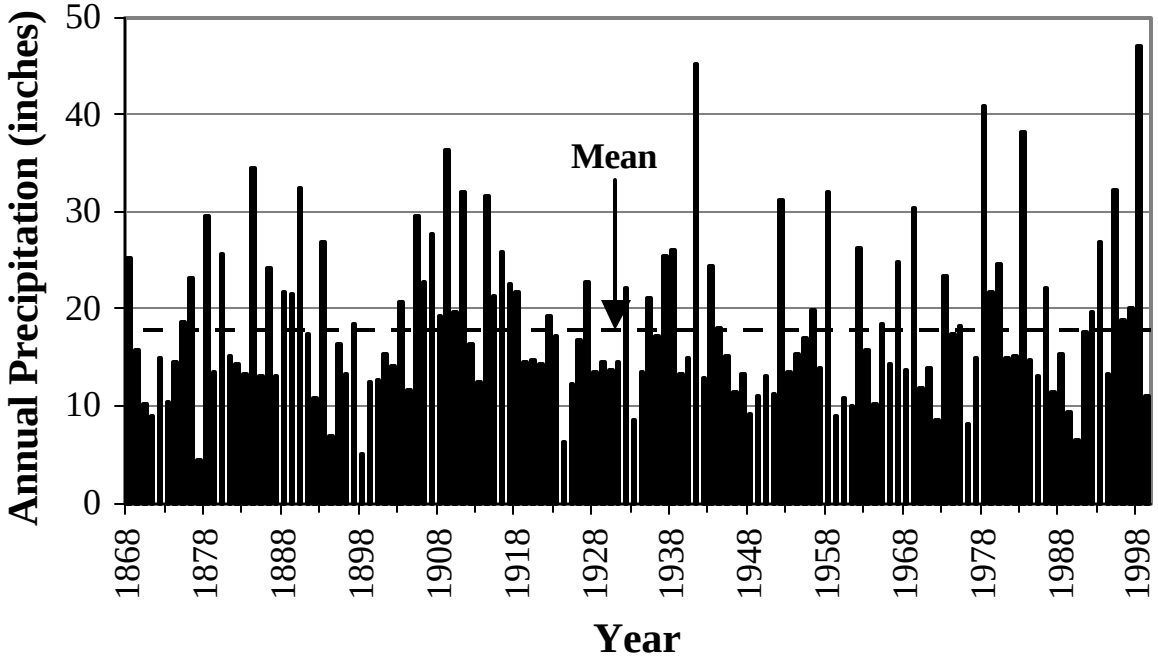


FIGURE 2-3 ANNUAL PRECIPITATION, CITY OF SANTA BARBARA, 1868 – 1999

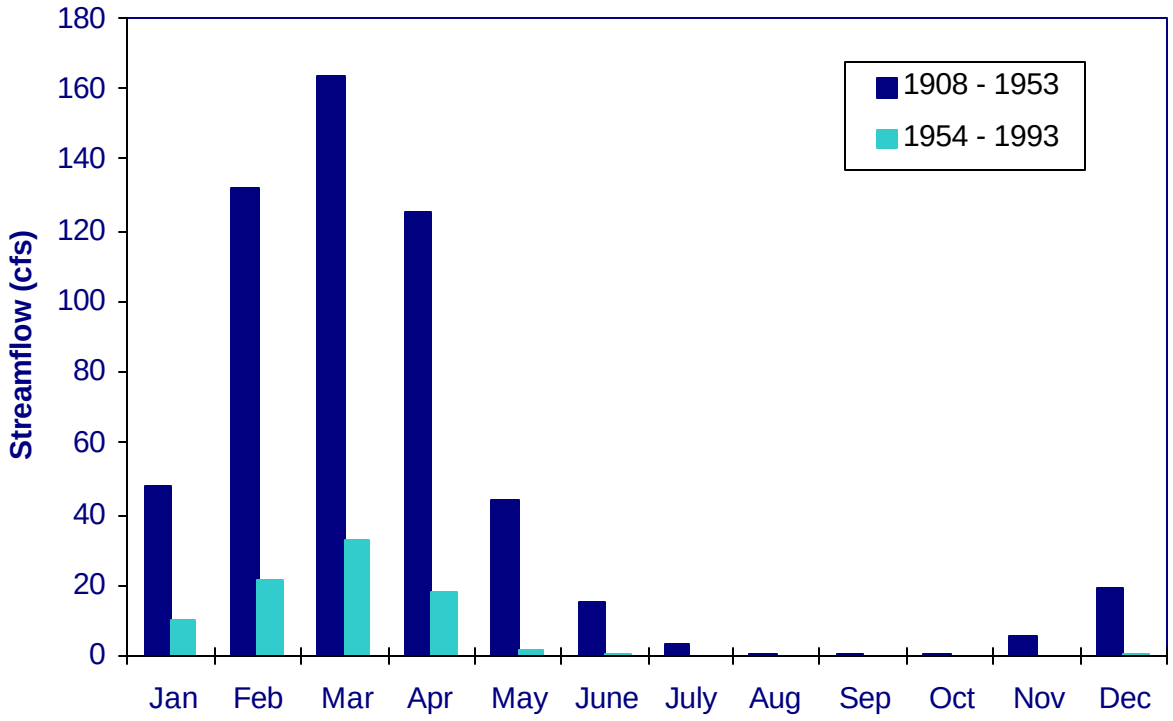


FIGURE 2-4 MEDIAN DAILY STREAMFLOW (CFS) IN THE LOWER SANTA YNEZ RIVER AT THE NARROWS (NEAR LOMPOC), BEFORE AND AFTER CONSTRUCTION OF BRADBURY DAM (50% OF MEASURED FLOWS WERE LOWER THAN THIS)

Water rights releases that are made in the summer months of most average and dry years provide mainstem flows downstream of Lake Cachuma. In addition, the secondarily treated effluent from the Lompoc Regional Wastewater Treatment Plant (3.5 to 5.4 cfs) creates continuous year round flow from the facility to the ocean.

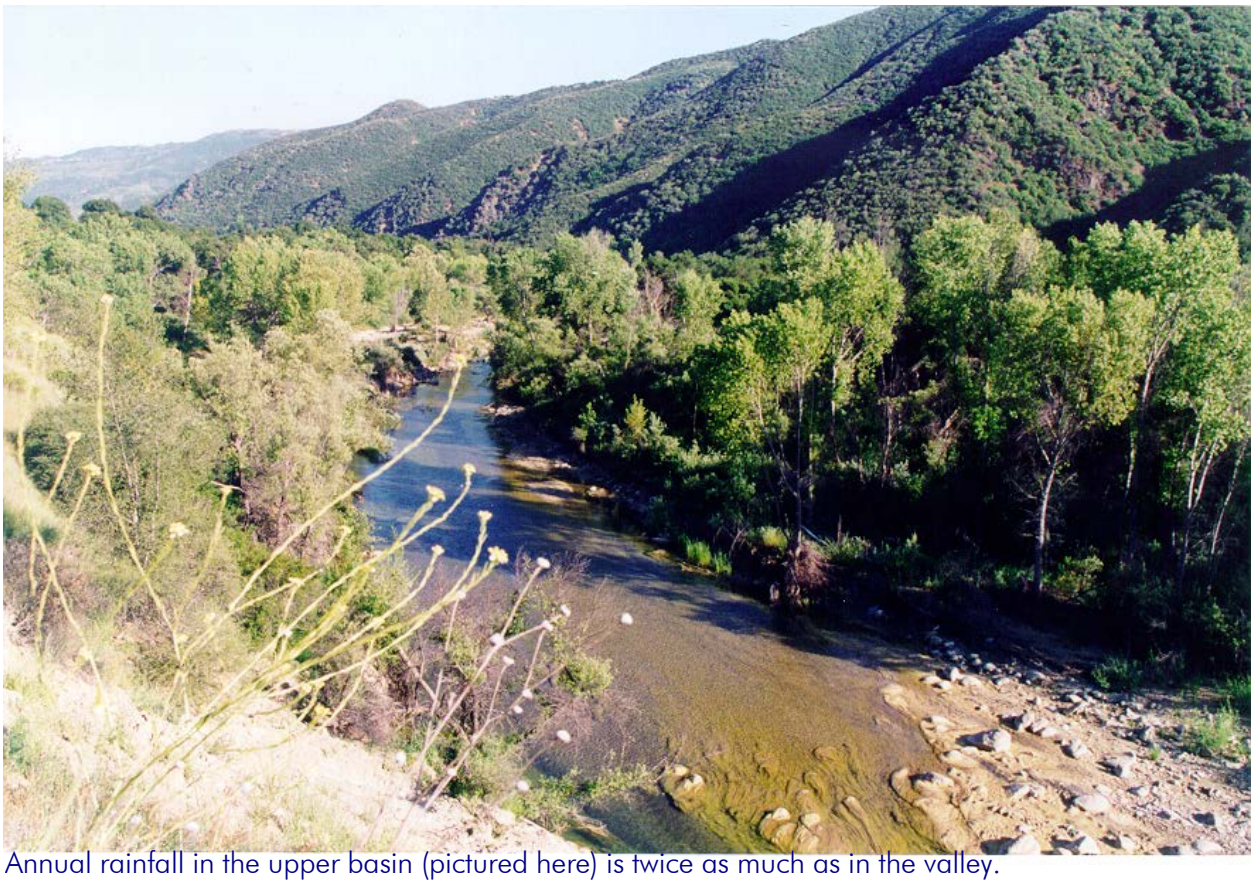
Tributaries

Several tributaries downstream of Bradbury Dam contribute significant flows to the lower Santa Ynez River (Figure 2-1). Flows in the tributaries are flashier than in the river because their watersheds are smaller. Tributaries on the north side of the lower watershed include Santa Agueda, Alamo Pintado, and Zaca creeks. Streams on the south side of the watershed originate at fairly high elevations on the cool and well-vegetated north-facing slopes of the Santa Ynez Mountains. These south-side streams include Hilton, Alisal, Quiota, Nojoqui, Salsipuedes, El Jaro, and San Miguelito creeks. The Salsipuedes-El Jaro system has the largest watershed. The upper reaches of many tributaries maintain flow much longer than the lower reaches; some have perennial flow.

Groundwater Basins

Groundwater storage is primarily recharged by streamflow and supplies water for irrigation, domestic, municipal and industrial uses through pumping. The principal sources of groundwater within the Santa Ynez River basin are (1) the Santa Ynez River alluvial deposits; (2) the Santa Ynez Upland groundwater basin; (3) the Buellton Upland groundwater basin; (4) the Santa Rita Upland groundwater basin; and (5) the Lompoc groundwater basin.

The Santa Ynez River crosses two groundwater basins downstream of Lake Cachuma: the Santa Ynez River alluvial deposits, located upstream of the Lompoc Narrows, and the Lompoc Plain, located downstream of the Narrows. Replenishment to the alluvial basin is by natural seepage from the river, seepage from tributaries, return flows and releases from Lake Cachuma to satisfy downstream water rights. Most of the percolation from the Santa Ynez River to the groundwater basin in the Lompoc Plain occurs between the Narrows and the Floradale Bridge. Groundwater provides 100% of the water supply in the Lompoc Basin (population over 50,000).



Annual rainfall in the upper basin (pictured here) is twice as much as in the valley.

2.2 WATER SUPPLY FACILITIES AND OPERATIONS

2.2.1 WATER SUPPLY FACILITIES

Upper Reservoirs

Three water supply reservoirs are located on the Santa Ynez River: Jameson, Gibraltar, and Cachuma (Figure 2-1). All of the reservoirs are used for water supply and are not designed for flood control purposes. Gibraltar Dam and Reservoir was constructed by the City of Santa Barbara in 1920. Jameson Reservoir was formed by the construction of Juncal Dam in 1930 by the Montecito Water District.

Lake Cachuma

Lake Cachuma is the largest of the three reservoirs on the Santa Ynez River. The Cachuma Project was constructed from 1950-1953. Bradbury Dam, 48.7 river miles from the Pacific Ocean, impounds the reservoir. The dam is a 206-foot high (structural height is 279 feet) earth-fill structure with a 2,975-feet crest length set at elevation 766 feet mean sea level (MSL). The current normal full operating level of the reservoir is 750 feet MSL (with the gates closed). The storage capacity of Lake Cachuma, when constructed, was 204,874 acre feet (AF). Based on the 1990 silt survey, the reservoir capacity was reduced to 190,409 AF.

Lake Cachuma and Bradbury Dam

Cachuma Project Member Units

Reclamation manages the Cachuma Project and makes water deliveries to the Member Units. The Member Units include the City of Santa Barbara, Goleta, Montecito, and Carpinteria Valley water districts, and Santa Ynez River Water Conservation District, Improvement District #1 (ID #1). The operational yield of the Cachuma Project is about 25,714 AF per year, which allows for some delivery shortages during periods when the reservoir storage drops below 100,000 AF. The Cachuma Project is the primary water supply for Santa Barbara County, including the cities and communities of Santa Barbara, Goleta, Carpinteria, and Montecito, and a small portion of the Santa Ynez Valley. The Cachuma Project also releases water from Lake Cachuma to satisfy downstream water rights as a condition of the Project's SWRCB permit.

Central Coast Water Authority and SWP Deliveries

In 1997, deliveries of water from the State Water Project (SWP) were started to ID#1 and Lake Cachuma. As part of this project, the pipeline that formerly delivered the Cachuma Project entitlement to ID#1 was purchased and improved by the Central Coast Water Authority (CCWA)

to convey SWP water through the outlet works in the dam into the reservoir. This water is available for later conveyance to the South Coast. ID#1 will receive treated SWP water in exchange for ID#1's Cachuma Project entitlement.

Releases of CCWA Water

The CCWA pumping facility has a maximum capacity of 22 cfs. When a downstream release coincides with a SWP water delivery, SWP water is blended in the outlet works with Lake Cachuma water and released to the river. For environmental purposes, CCWA has agreed to guarantee a released water temperature of less than 18°C when SWP water is to be released into the river downstream of the dam. In addition, the SWP water will not comprise more than half of the water to be released into the river. CCWA water will not be released into the Santa Ynez River when there is continuous flow from the dam to the ocean during the months of December through June. This provision will protect smolts for potentially imprinting on non-Santa Ynez River basin water.

2.2.2 RESERVOIR OPERATIONS AND RELEASES

Reservoir operations and releases are covered in more detail in Appendix B, Flow-Related Fish Enhancement in the Santa Ynez River. This section provides an overview of these water operations.

Spills and Lake Levels

Reclamation has historically managed the lake level of Lake Cachuma at 750 feet or lower. The reservoir has spilled 17 times since its completion, most recently in 2000. A spill is a controlled discharge through spillway gates or the outlet works. Spills have ranged in duration from 27 to 179 days (median 87 days) and in magnitude from 1,068 AF in 1959 to 468,143 AF in 1969. In 1995, reservoir levels were dropped during seismic retrofitting with a 179-day spill of 354,402 AF. In 1998, 386,090 AF spilled over 168 days, ending in July.

Water Rights Releases and Groundwater Recharge

Water releases are made from Lake Cachuma to recharge groundwater basins to satisfy water rights of downstream users. This provides flow in the mainstem of the Santa Ynez River. The water rights releases are intended to percolate into the groundwater basin and provide water supply to the areas between Bradbury Dam and the Narrows ("Above Narrows Account" or ANA), and the Lompoc Valley ("Below Narrows Account" or BNA). The amount released annually in recent years has ranged from 4,792 AF (1990: all for the ANA) to 12,960 AF (1997: 9,522 AF for ANA, 3,438 AF for BNA).

Timing of Water Rights Release

Downstream water rights releases are not made in every year, but are generally made in average and dry years. In wet years, the groundwater basins are full and may not require recharge. In dry years, releases may

be made in late spring to replenish groundwater in the Santa Ynez area (upper reaches of ANA). In normal and some dry years, combined releases may be made in summer and fall to recharge both the above and below Narrows areas. Releases are made when the river channel is dry. Combined releases are generally made at an initial rate of 135-150 cfs for a period of 10 or 15 days until the water reaches Lompoc, then release rates are gradually reduced to 50-70 cfs for an extended period, depending on infiltration. Releases for the above Narrows area are shorter in duration and have lower initial rates than combined releases, but follow the same pattern.

Fish Reserve Account

Since 1993, releases for fish maintenance and studies have been made from the Fish Reserve Account, which was established by the 1993 MOU and by Water Rights Order 94-5 by the SWRCB. The Fish Reserve Account as originally established consisted of 2,000 AF of water dedicated to fish studies and maintenance. Water stored above an elevation of 750 feet in Cachuma was credited to this account. When the reservoir elevation did not exceed 750 feet, 2,000 AF from the minimum pool ("Dead Storage") was dedicated to the Fish Reserve Account. The purpose of the Fish Reserve Account was to provide water to conduct fisheries studies and improve habitat conditions. As discussed later in Section 3, the Fish Reserve Account will not be continued in its current form, however, releases will be made to meet target flows to maintain mainstem habitat.

Reservoir Surcharge

In wet years when the reservoir spills, the reservoir can currently be surcharged to 0.75 feet providing 2,300 AF of additional water. The 0.75 foot surcharge water will be dedicated to support the interim mainstem rearing target flow releases. Larger flashboards can be placed at the top of Bradbury Dam to allow a temporary rise in the reservoir's surface elevation. Environmental review is complete to allow a surcharge to 1.8 feet above the current full reservoir level at 750 feet above MSL. Construction of the flashboards to allow the 1.8 foot surcharge to be implemented will occur in 2001. These new flashboards will accommodate the 3 foot surcharge if and when environmental review for this level is complete (anticipated for 2004). In each case, sufficient runoff in the upper watershed is required to fill the reservoir and the additional space provided by the surcharge. The 1.8 foot surcharge will provide the water necessary to begin fish passage supplementation as described in Section 3, the Proposed Actions. The 3 foot surcharge will provide water (9,200 AF) to support long-term fish enhancement flows including the full Fish Passage Account allocation, the Adaptive Management Account, and the long-term mainstem rearing target flows recommended here-in.

Emergency Winter Operations

In very wet winters, such as 1998, the reservoir may fill early in the winter and increase the likelihood of large, potentially damaging runoff events in the subsequent months. During these winters, modified operations can minimize this risk. The modified operations move water through the release works and past the flood sensitive areas downstream before or after the anticipated peak reservoir inflow.

2.2.3 HYDROLOGICAL CONSIDERATIONS FOR FISH MANAGEMENT

Wet and Dry Cycles

Fish resources in the Santa Ynez River have persisted through the long-term cycles of wet and dry periods that the watershed has experienced. During wet periods, habitat values are high in the mainstem and in the tributaries. There appears to be an adequate water supply for all users in wet years, the reservoirs are full, and the groundwater basins are relatively full. Extended dry periods, such as the period between 1985 and 1993, result in poor habitat conditions as streamflow in the mainstem and tributaries dry. Ground water levels decline, and reservoir levels are low, creating shortages in water deliveries.

This Plan acknowledges that wet and dry periods will continue to occur, and opportunities to support aquatic habitat will vary with the hydrologic cycles. In wet years, tributary and mainstem habitat is accessible to migrating adult steelhead and of good quality. In dry years,

During extended dry periods, Lake Cachuma water levels may drop significantly.

there is a limited number of passage opportunities. Low flows in the tributaries can limit access to tributary habitat and this habitat is of lower quality in dry years. Therefore, in wet years when fish are more likely to be highly productive the Plan will seek to provide additional benefit by maintaining higher flows under these conditions. In drier years, therefore low production is anticipated and therefore the focus will be on maintaining those fish that are oversummering in the watershed.

Santa Ynez Hydrology Highlights

- Watershed is 900 square miles (483 square miles below Bradbury Dam). Headwater elevations reach 6,000 feet. The Santa Ynez River is 90 miles long, and Bradbury Dam is located approximately 49 miles from the ocean.
- Annual rainfall is double in the upper watershed (29 inches average, 60 inches maximum) than in the valley (14 inches average, 30 inches maximum in Lompoc).
- Streamflow is highly variable across seasons (winter storms and summer dry season) and years (wet years and drought cycles).
- The mainstem between Bradbury Dam and Lompoc typically dries up during the summer, leaving isolated pools of water. This occurred even before construction of the dam.
- Southside tributaries are more likely to retain surface flows during the summer than northside streams. Most tributaries dry up in the lower reaches.
- Downstream water rights releases are usually made from Bradbury Dam in average and dry years during the summer to recharge groundwater aquifers as far downstream as Lompoc.
- The Fish Reserve Account currently provides 2,000 AF per year for fish studies and habitat maintenance. The water is released from Bradbury Dam. The Fish Reserve Account will be replaced by the Conjunctive Use Program under the Plan
- Summer water releases from Bradbury Dam warm quickly as they flow downstream.
- The mainstem has a broad channel, with mostly sand bed and little riparian cover. The channel is more defined just below Bradbury Dam.

2.3 FISH AND WILDLIFE POPULATIONS

The Santa Ynez watershed provides habitat to a wide variety of fish and wildlife species. Twenty-five species of fish inhabit the Santa Ynez River watershed (Table 2-1) (ENTRIX 1995). Of these fishes, ten species are native to the Santa Ynez River, four in freshwater and six in the estuary. Fifteen fish species have been introduced to the watershed.

The arroyo chub, a California species of special concern, is one of these introduced species. While not native to the watershed, the Santa Ynez River population of arroyo chub is important to the continued existence of the species as a whole. This Plan addresses impacts to the arroyo chub as if it was a native species because of its special status.

Protected Species

Twenty-two endangered or threatened species occur within the basin (Woodward-Clyde 1995, CDFG 1998). These include four plant species, two fish species, three reptile or amphibian species, and 13 bird species (Table 2-2). In addition to the listed species, two aquatic species of special concern, present within the basin, are included in Table 2-2. Most of these species occur near the mouth of the river. Protected aquatic and riparian species that may be affected by the Plan include rainbow trout/steelhead, tidewater goby, California tiger salamander, California red-legged frog, arroyo toad, least Bell's vireo and southwestern willow flycatcher. Under the federal Endangered Species Act (ESA), NMFS has jurisdiction over steelhead, while USFWS has jurisdiction for all plants, wildlife, and other fishes.

2.3.1 FISH OF THE SANTA YNEZ RIVER

Native Fish

Ten fish species are native to the Santa Ynez River basin, four in freshwater and six in the estuary (Table 2-1). Two species are listed as federally endangered: steelhead and tidewater goby. Two of the freshwater species, steelhead and Pacific lamprey, are anadromous, meaning that they spawn in freshwater but spend their adult lives in the ocean. Below is a brief discussion of the life history and the distribution of each of the native fishes. Steelhead will be covered in a separate section because of their importance in the Plan.

Tidewater Goby

The tidewater goby is currently a federally listed endangered species although populations north of Orange County, including the population in the Santa Ynez River, have been proposed for delisting. The tidewater goby is a small estuarine fish, rarely exceeding 2 inches in length, that inhabits lagoons and the tidally influenced region of rivers from

TABLE 2 - 1 NATIVE AND INTRODUCED FISH COLLECTED AND/OR OBSERVED IN THE SANTA YNEZ RIVER WATERSHED STREAMS AND RESERVOIRS (ENTRIX, 1995)

Common Name	Scientific Name	Status	Location
Rainbow/steelhead trout	*Oncorhynchus mykiss*	N[1]	RATCL
Threespine stickleback	*Gasterosteus aculeatus*	N	RATCL
Prickly sculpin	*Cottus asper*	N	RATCL
Pacific lamprey	*Lampetra tridentata*	N	R
Arroyo chub	*Gila orcutti*	I[2]	RATCL
Fathead minnow	*Pimephales promelas*	I	RT
Mosquitofish	*Gambusia affinis*	I	RATCL
Smallmouth bass	*Micropterus dolomieui*	I	RACL
Largemouth bass	*Micropterus salmoides*	I	RATC
Bluegill	*Lepomis macrochirus*	I	RAC
Green sunfish	*Lepomis cyanellus*	I	RATC
Redear sunfish	*Lepomis microlophus*	I	RC
Black crappie	*Pomoxis nigromaculatus*	I	RC
White crappie	*Pomoxis annularis*	I	C
Channel catfish	*Ictalurus punctatus*	I	RAC
Black bullhead	*Ameiurus melas*	I	RATC
Threadfin shad	*Dorosoma petenense*	I	C
Goldfish	*Carassius auratus*	I	RAC
Carp	*Cyprinus carpio*	I	RAC
Tidewater goby	*Eucyclogobius newberryi*	N[1*]	L
Pacific herring	*Clupea harengus*	N	L
Topsmelt	*Atherinops affinis*	N	L
Shiner perch	*Cymatogaster aggregata*	N	L
Staghorn sculpin	*Leptocottus armatus*	N	L
Starry flounder	*Platichthys stallatus*	N	L
Brown trout	*Salmo trutta*	I	-[3]
Brook trout	*Salvelinus fontinalis*	I	-[3]
Walleye	*Stizostedion vitreum*	I	-[3]

[1]Endangered species under the ESA; *the tidewater goby has been proposed to be de-listed although no action has yet been taken.
[2]California species of special concern.
[3]Introductions of these species were unsuccessful according to CDFG Region 5 data.
R = Santa Ynez River below Bradbury Dam
A = Santa Ynez River above Lake Cachuma
T = Tributary Streams
C = Lake Cachuma
L = Santa Ynez River lagoon
N = Native species
I = Introduced species

TABLE 2-2 FEDERAL AND STATE LISTED THREATENED AND ENDANGERED SPECIES IN THE SANTA YNEZ RIVER BASIN

Species	Status	Locality and Habitat	Adversely Affected by Plan?
Plants			
Beach Layia *Layia carnosa*	FE	Coastal foredunes	No
Beach Spectaclepod *Dithyrea maritima*	CT, FC	Back slopes of coastal foredunes	No
La Graciosa Thistle *Cirsium loncholepis*	CT, FC	Brackish and freshwater wetlands near the coast. Previously reported at Surf and 2 miles inland. Not observed during 1994 surveys. Presumed extirpated.	No
Surf Thistle *Cirsium rhothophilum*	CT, FC	Coastal foredunes	No
Fish			
Steelhead Trout *Oncorhynchus mykiss* (Southern California ESU)	FE	Santa Ynez River and its tributaries downstream of Bradbury Dam.	No
Tidewater Goby *Eucyclogobius newberryi*	FE	Lagoon	Potential
Amphibians and Reptiles			
Arroyo Southwestern Toad *Bufo microscaphus californicus*	FE	Tributaries upstream of Lake Gibraltar	No
California Red-legged Frog *Rana aurora draytonii*	FT	Santa Ynez River upstream of Bradbury Dam and its tributaries; Zaca, Nojoqui, and Salsipuedes Creeks	Potential
California Tiger Salamander *Ambystoma californiense*	FE	Isolated ponds between Buellton and Lompoc, not on the mainstem.	No
Western Pond Turtle *Clemmys marmorata*	CS	Santa Ynez River up- and down-stream of Lake Cachuma, Salsipuedes Creek.	Unlikely
Two-Striped Garter Snake *Thamnophis hammondii*	CS	Santa Ynez River above Gibraltar Reservoir and immediately below Bradbury Dam; Nojoqui Creek	No

TABLE 2-2 FEDERAL AND STATE LISTED THREATENED AND ENDANGERED SPECIES IN THE SANTA YNEZ RIVER BASIN (CONTINUED)

Species	Status	Locality and Habitat	Adversely Affected by Plan?
Birds			
California Brown Pelican *Pelecanus occidentalis californicus*	CE, FE	Occasional transient found at mouth of Santa Ynez.	No
California Condor *Gymnogyps californianus*	CE, FE	Only 35 individuals in the wild. May be transient in the Project area.	No
Bald Eagle *Haliaeetus leucocephalus*	CE, FT	Lake Cachuma and at the river mouth.	No
American Peregrine Falcon *Falco peregrinus anatum*	CE, FE	Resident near Lake Cachuma. Winter migrants anywhere in the Project area, especially near the lagoon.	No
California Black Rail *Rallus longirostris obsoletus*	CT	One transient observed at mouth in 1981.	No
Light-footed Clapper Rail *Rallus longirostris levipes*	CE, FE	Not likely to occur in Project area.	No
Western Snowy Plover *Charadrius alexandrinus nivosus*	FT	7-12 nests on the beach near river mouth. Nests are placed in sand above the drift zone. Fairly common in winter.	No
California Least Tern *Sterna antillarum browni*	CE, FE	Lagoon frequented by adults and juveniles in August. Nesting occurs 2 miles north of mouth.	No
Western Yellow-billed Cuckoo *Coccyzus americanus occidentalis*	CE	Not likely to occur in Project area.	No
Southwestern Willow Flycatcher *Empidonax traillii extimus*	FE	Known to breed along the Santa Ynez River in the vicinity of Buellton and below Lompoc.	Unlikely
Bank Swallow *Riparia riparia*	CT	Unsubstantiated rumors of its occurrence along the Santa Ynez River.	No
Least Bell's Vireo *Vireo bellii pusillus*	CE, FE	Upper Gibraltar Reservoir/Mono Creek/Aqua Caliente; may be in the lower Santa Ynez River in the vicinity of Salsipuedes Creek.	Unlikely
Belding's Savannah Sparrow *Passerculus sandwichensis beldingi*	CE	Common near the river mouth, but thought to be hybridized.	No

FE Federally listed as Endangered
FT Federally listed as Threatened
FC Federal Candidate Species (formerly Category 1 candidates) Species that may be considered for listing as either Threatened or Endangered
CE California Endangered
CS California Special Concern
CT California Threatened

Primary source: Woodward-Clyde 1995

San Diego County to Del Norse County, California. It favors calm conditions which occur when the lagoon is closed (J. Smith, pers. comm.) and lives only about a year. Sampling by the SYRTAC (1994) collected tidewater gobies throughout the Santa Ynez River lagoon.

Tidewater gobies are bottom dwellers and are typically found at depths of less than 3 feet. Instream, they inhabit low-velocity habitats out of the main current (Moyle 1976). In a laboratory study, tidewater gobies were observed resting on the substrate or among aquatic vegetation (Wang 1986). Tidewater gobies may spawn at anytime of the year (Goldberg 1977 cited in Wang 1986), but spawning typically peaks in late April through early May (Swift *et al.* 1989). Spawning takes place in burrows dug 4-8 inches deep in coarse sand. Tidewater gobies have been reported to spawn at temperatures of 56-70°F and 64.4-71.6°F (Swift *et al.* 1989; Wang, 1986). Spawning takes place at fairly low to moderate salinities (5-10 parts-per-thousand [ppt] [Swift *et al.* 1989] and <14 ppt [Wang 1986]).

After hatching, the larval tidewater goby become planktonic (suspended in the water column) and are associated with aquatic plants in near-shore habitat (Wang 1986, Swift *et al.* 1989). Juvenile tidewater goby are benthic dwellers, similar to adults. Tidewater gobies were common in the Santa Ynez River lagoon in 1987 and 1993, and both young-of-the-year and adults have been collected (CDFG 1988, SYRTAC 1994).

Threespine Stickleback

Freshwater populations of threespine stickleback (*Gasterosteus aculeatus*) live in shallow, low-velocity habitats, often in association with aquatic plants. Spawning can occur from March through October (Wang 1986). Nests are built in beds of aquatic plants with sand substrates (Moyle 1976). Males construct shallow pits and fill these with strands of aquatic plants. They attract a female who lays her eggs in the nest. Spawning begins after water temperatures reach approximately 59°F, and eggs will hatch in 6-8 days at 64-68°F (Wang 1986). The male guards the nest until the fry emerge as free swimming organisms. The diet of threespine stickleback consists of small organisms living on plants and the stream bottom. Stickleback are mostly an annual species, but some individuals may survive for two to three years (Moyle 1976). Threespine stickleback inhabit the Santa Ynez River above and below Lake Cachuma and are found in the Salsipuedes/El Jaro Creek system.

Prickly Sculpin

The following life history description is based on Moyle (1976). Prickly sculpin (*Cottus asper*) can live in an extremely wide range of habitats. Prickly sculpin are known to live in freshwater and saltwater, in streams that are small, clear and cold, in rivers that are large, warm and turbid, and in lakes of all sizes, rich in nutrients or infertile. They can tolerate water temperatures up to at least 82°F. Prickly sculpin mature in their second, third or fourth year and spawn between February and June

(probably peaking in March and April in California). They are known to spawn at temperatures of 46.5-55.5°F. Spawning usually takes place under large flat rocks in areas of moderate current velocities. Males prepare the nest and guard the eggs until hatching. After hatching, the young larvae are often swept downstream to large pool or estuarine habitats. Here they live planktonically for three to five weeks. At the end of this period, they settle to the bottom and begin a general upstream movement. Prickly sculpin inhabit Lake Cachuma, the Santa Ynez River below the lake, and the lower reaches of Hilton and Salsipuedes Creeks.

Prickly Sculpin. Photo: North American Native Fishes Association

Pacific Lamprey

Pacific lamprey (*Lampetra tridentata*) are anadromous, spending four to seven years in freshwater and one to two years in the ocean. Spawning lamprey, like steelhead, are dependent on winter storms providing sufficient streamflow to open the mouth of the lagoon to the ocean, and to provide adequate streamflow to allow for upstream migration. Adult lamprey in the ocean are thought to remain near their natal streams (Moyle 1976). In the Santa Clara River, located to the south of the Santa Ynez River, adult lamprey were first observed at a fish ladder (approximately 8.5 miles inland from the coast) ten days after the sandbar at the mouth of the lagoon was breached (ENTRIX 1994). The Pacific lamprey spawning migration in the Santa Clara River began in February, peaked in March, and lasted through early May. Pacific lamprey build nests in gravel and rock substrates in areas of low velocity (Moyle 1976). Eggs and ammocoetes (young lamprey) have been collected in water temperatures ranging from 55.5-65°F. The freshwater residency of the young is spent typically as bottom dwellers, burrowed tail first in mud or sand, although they are known to swim up into the water column and migrate downstream (Moyle 1976). Adult lamprey are parasitic on larger fish, although their attacks are seldom fatal (Wang 1986). During their freshwater phase, lamprey feed on algae and organic matter on the stream bottom (Moyle 1976). Pacific lamprey inhabit the Santa Ynez River below Lake Cachuma and may inhabit the tributaries although none have been observed in tributary habitats.

Topsmelt

The following life history description is based on Wang (1986). Topsmelt (*Atherinops affinis*) can withstand a fairly wide range of salinities, ranging from relatively freshwater (0 ppt) to twice that of seawater (72 ppt). Topsmelt are found in nearshore areas and over open water, typically

near the surface of the water column. Topsmelt feed on crustaceans, diatoms, filamentous algae, detritus, chironomid larvae, and amphipods. Topsmelt are thought to spawn throughout the year in southern California at water temperatures above 50°F. Spawning occurs in vegetated areas. Hatching is reported to occur over a wide range of salinities, but the range was not presented. Topsmelt inhabit the Santa Ynez River Lagoon.

Pacific Herring

The following life history description is based on Wang (1986). Pacific herring (*Clupea harengus*) are a small schooling marine fish which enter estuaries and bays to spawn. Pacific herring spawn from late October through March. Spawning has been observed at water temperatures of 43-61°F, and larvae have been collected at temperatures of 64.5°F (which suggests spawning can occur at or near this temperature). Herring can also spawn over a wide range of salinities, ranging from 8 ppt to seawater (32 ppt). Herring eggs are adhesive and attach to a variety of substrate, including aquatic vegetation, rocks, pier pilings and sand. After spawning has been completed, adult Pacific herring return to their ocean feeding grounds. After hatching, young herring usually remain through the spring and summer in the estuary or bay in which they were spawned before migrating to the ocean in the fall. Herring produced in the Santa Ynez Lagoon would likely remain until the following winter when high streamflow reopened the sandbar.

Shiner Perch

The following life history description is based on Moyle (1976). Shiner perch (*Cymatogaster aggregata*) are common along the Pacific Coast and in estuaries. They have been collected in a wide range of salinities, ranging from 1 ppt to seawater (32 ppt), although they are generally rare at salinities below 9 ppt. Shiner perch feed on benthic amphipods and other invertebrates. Shiner perch inhabit the Santa Ynez Lagoon.

Staghorn Sculpin

Staghorn sculpin (*Leptocottus armatus*) are primarily a marine species; however, they frequently enter estuaries and the lower sections of coastal streams (seldom more than a mile upstream) (Moyle 1976). Their diet consists of amphipods and other benthic invertebrates. Staghorn sculpin inhabit the Santa Ynez lagoon.

Starry Flounder

Starry flounder (*Platichthys stellatus*) are primarily found in the marine environment, but have been known to swim up to 75 miles up coastal rivers (Moyle 1976). They are bottom dwellers, typically found over sandy or muddy bottoms. Their diet consists of a variety of benthic invertebrates. Starry flounder inhabit the Santa Ynez Lagoon.

Introduced Fish

Fifteen introduced species have populations in the watershed (Table 2-1). Most are game species or baitfish that were originally planted in Lake Cachuma but have since spread. Many of the game fish can prey on steelhead and other native species. Most notable among these are

largemouth and smallmouth bass, green sunfish, and black bullhead (a type of catfish). The Arroyo chub is a southern California minnow introduced from nearby streams and is a state species of special concern.

Arroyo Chub

The arroyo chub (*Gila orcutti*) was introduced into the Santa Ynez River drainage during the early 1930's. Arroyo chub are native to the Los Angeles, San Gabriel, San Luis Rey, Santa Margarita, and Santa Ana river systems, as well as San Juan Creek (Swift *et al*. 1990, Moyle *et al*. 1989, Moyle 1976). The arroyo chub has been introduced into several rivers and streams in southern California, including the Santa Ynez, Santa Maria, Cuyama and Mohave River systems, and Malibu, Arroyo Grande, and Chorro creeks (Moyle *et al*. 1989).

Arroyo Chub. Photo by Paul Barrett, USFWS

The arroyo chub is a relatively small, chunky minnow, typically less than 5 inches in length (Moyle 1976). Little information is available regarding the habitat requirements of arroyo chub. Arroyo chub prefer slow-moving sections of rivers with a sand or mud substrate (Moyle 1976), or standing waters in reservoirs (Greenfield and Deckert 1973). Arroyo chub evolved in a region with a widely fluctuating environment. Streamflow in their native streams can range from "muddy torrents" in the winter to clear intermittent brooks in the summer (Moyle 1976). Arroyo chub are adapted to survive in widely fluctuating water temperatures (with a maximum of at least 95°F) in their native rivers and streams (Castleberry and Cech 1986). Arroyo chub were observed in a pool in the Santa Ynez River which had a pre-dawn dissolved oxygen (DO) minimum level of approximately 1.6 ppm (SYRTAC 1994). Electrofishing and snorkel data collected by SYRTAC in 1993 found arroyo chub abundant in shallow pools, and relatively scarce in riffle and run habitats. However, they were not observed in pools inhabited by large predators (bass and sunfish). Greenfield and Deckert (1973) also reported a reduction in arroyo chub abundance in Twichell Reservoir as a result of centrarchid predation. Although the arroyo chub seems to prefer very low water velocities, they are apparently adapted to surviving relatively high winter flows. Arroyo chub are found throughout the Santa Ynez River watershed.

Largemouth Bass

The following life history description is based on Stuber *et al.*, (1982). Largemouth bass (*Micropterus salmoides*) primarily live in lakes and ponds, or in very low velocity habitats (pools and backwaters) in rivers. In rivers, current velocities of ≤0.2 fps (feet per second) are considered optimal, and velocities above .66 fps are considered unsuitable for adult and juvenile largemouth bass. Largemouth bass are often associated with aquatic plants or other types of structures in which they can hide and/or

ambush their prey. Because they are sight feeders, they prefer relatively clear water.

Largemouth bass prefer water temperatures between 75-86°F for optimal growth. Growth is reduced at temperatures below 59°F and above 97°F. DO levels above 8 ppm are considered optimal. Growth is reduced at DO levels below 4 ppm. DO levels below 1 ppm are considered lethal. Largemouth bass are intolerant of high turbidities, preferring levels of suspended solids to be <25 ppm.

Water temperatures for spawning and incubation are considered optimal between 68-70°F, with a range of 55-79°F. Largemouth bass will spawn on a variety of substrates, including gravel (the preferred substrate), sand, mud, roots and vegetation. Largemouth bass spawn in depths ranging from 0.5-24.5 feet, but nests are typically constructed in 3-6 feet of water. During spawning, stable water surface elevations in reservoirs are preferred. For river dwelling bass, current velocities of 1.3 fps may result in mortality of embryos.

For young bass (fry), shallow, warm water (80-86°F) with abundant cover in the form of aquatic vegetation and/or woody debris is optimal. For river dwelling fry, current velocities should be <0.13 fps. Juvenile and adult largemouth bass feed on large invertebrates and fish. Largemouth bass inhabit Lake Cachuma, the Santa Ynez River above and below the lake, and the lower portion of the Salsipuedes/El Jaro Creek system.

Smallmouth Bass

The following life history description is based on Edwards *et al.*, (1983). Smallmouth bass (*Micropterus dolomieui*) prefer large, clear lakes, and clear streams and rivers. Smallmouth bass are strongly associated with cover, preferring dark areas. In rivers, smallmouth bass prefer pools and deep areas with very low water velocities.

The preferred water temperature for adult and juvenile smallmouth bass is 68-89°F, and optimal water temperature for growth was reported as 79-84°F. Smallmouth bass require DO levels of at least 6 ppm for optimal growth.

Smallmouth bass usually spawn at depths of 1-3 feet. Substrates used for spawning usually consist of gravel or sand, but mud, roots or large boulders may be used. Nests are usually built near cover objects. Because nests are typically built in shallow water, declining surface water levels may reduce spawning success.

Fry inhabit shallow, preferably warm water (77-84°F), with rocks or vegetation for cover. Fry in rivers require very low current velocities, being unable to maintain their position in currents greater than 0.66 fps. Juvenile and adult smallmouth bass feed on large invertebrates and fish.

Smallmouth bass inhabit Lake Cachuma and the Santa Ynez River above and below the lake.

Bluegill

The following life history description is based on Stuber *et al.*, (1982) and Moyle (1976). Bluegill (*Lepomis macrochirus*) live primarily in lakes, ponds, sloughs and other quiet water habitats. They are often associated with rooted aquatic plants in which they take shelter and feed. Bluegill can live in a wide range of temperatures and DO levels, but optimal growth occurs at water temperatures and DO levels between 71.6-89.6°F and 4-8 ppm, respectively. Bluegill spawn in the spring at water temperatures between 62.5-70°F. Spawning substrate can consist of gravel, sand or mud, and the nests are built in shallow water. After emerging from the nest, young bluegill typically move into shallow water with aquatic plant beds serving as cover. As bluegill fry grow to approximately .5 inches total length, they move out over deeper water or return to the aquatic plant beds along the shoreline. Bluegill are opportunistic predators and will feed on plankton, insects and other invertebrates and small fish. Bluegill inhabit Lake Cachuma and the Santa Ynez River above and below the lake.

Green Sunfish

The following life history description is based on Stuber *et al.*, (1982). Green sunfish (*Lepomis cyanellus*) inhabit quiet, low-velocity habitat in streams and in lakes and ponds. Green sunfish are usually closely associated with aquatic plants, or other types of dense cover.

The optimal water temperature for adult and juvenile green sunfish has been reported as 82.8°F. If possible, green sunfish will avoid temperatures above 87.8 or below 78.8°F. DO levels are presumed to be optimal at levels greater than 5 ppm, and lethal levels are ±1.5 ppm. Green sunfish abundance is positively correlated with moderate turbidities.

Green sunfish usually spawn in May and June, beginning when water temperatures exceed 66°F. They prefer sand and gravel as a spawning substrate. Nests are generally built in depths ranging from 0.15-1.15 feet. Optimal temperatures for spawning and embryo development range from 68-80.6°F. The upper and lower temperature limits for spawning to occur are 87.8 and 66.2°F, respectively. For fry, optimal temperatures range from 64.4-78.8°F. In stream environments, fry seek areas with velocities <0.26 fps, and prefer <0.16 fps. The diet of green sunfish consists of larger invertebrates and small fish. Green sunfish inhabit Lake Cachuma, the Santa Ynez River above and below the lake, and the lower reaches of the Salsipuedes/El Jaro Creek system.

Redear Sunfish

The following life history description is based on Moyle (1976). Redear sunfish (*Lepomis microlophus*) typically inhabit ponds, lakes and river backwaters with depths greater than 6 feet where aquatic vegetation is abundant. Redear sunfish spawn throughout the summer at temperatures

from 72-75°F. Redear sunfish will utilize sand, gravel or mud to build their nests. Spawning usually occurs at depths of 6-10 feet. The diet of redear sunfish consists of snails and other bottom-dwelling invertebrates. Redear sunfish inhabit Lake Cachuma and the Santa Ynez River downstream of the lake.

White Crappie

The following life history description is based on Edwards *et al.*, (1982). White crappie (*Pomoxis annularis*) are typically found in warm, turbid lakes, reservoirs, and river backwaters. White crappie are schooling fish, and are often found around logs or boulders in 4-13 feet of water. Spawning is initiated in April or May when temperatures are between 55.4-68°F. Nests are built in or near areas of aquatic plants. A hard clay substrate is preferred, and nests are constructed at depths ranging from 0.3-13.7 feet but typically less than 3 feet deep. Adult white crappie typically feed on fish, but they also feed on zooplankton (particularly crappie under 5 inches), and aquatic insects. White crappie inhabit Lake Cachuma.

Black Crappie

The following life history description is based on Moyle (1976). Black crappie (*Pomoxis nigromaculatus*) are typically found in warm, clear lakes and reservoirs. Black crappie are schooling fish, and are often found around aquatic plants, logs, or other submerged objects. Spawning is initiated in March or April when temperatures are between 57-62.5°F. Nests are built in or near areas of aquatic plants. A hard clay substrate is preferred, and nests are typically constructed in less than 3 feet of water. Adult black crappie typically feed on fish, but they also feed on zooplankton (particularly crappie under 5 inches), and aquatic insects. Black crappie inhabit Lake Cachuma and the Santa Ynez River below Bradbury Dam.

Threadfin Shad

The following life history is based on Moyle (1976). Threadfin shad (*Dorosoma petenense*) prefer the open surface waters of reservoirs, lakes and ponds as well as the backwater area of rivers. In reservoirs, threadfin shad are often found near the steep dam walls and stream inlets in waters less than 60 feet deep. Threadfin shad are planktonic feeders that can tolerate waters as cold as 7-9°C (45-48°F) but prefer warmer waters. Spawning occurs during the summer when temperatures rise above 21°C (70°F) and usually peaks in June. Spawning occurs in and around floating or partially submerged logs, aquatic vegetation, and other structures. Threadfin shad are often preyed upon by centrarchids and are known to school near the water surface as a defense. In the Santa Ynez River system, threadfin shad are found only in Lake Cachuma.

Channel Catfish

The following life history description is based on McMahon and Terrell (1982) and Moyle (1976). Channel catfish (*Ictalurus punctatus*) can tolerate a wide variety of habitat conditions, ranging from clear, rapidly flowing,

warmwater streams to large reservoirs. Channel catfish are tolerant of low DO levels (as low as 1-2 ppm), but their growth rate is higher at levels above 3 ppm. Channel catfish are also tolerant of high temperatures (reportedly up to 100°F). Channel catfish are spring spawners, generally spawning between late May and mid-July. Optimal temperature for spawning is approximately 83°F, but spawning has been reported at temperatures ranging from 70-84°F. Channel catfish typically spawn at depths of 8-12 feet in cave-like sites, such as old muskrat burrows, undercut banks or log jams. The diet of channel catfish consists of invertebrates and fish. Channel catfish inhabit Lake Cachuma, and the Santa Ynez River above and below the lake.

Black Bullhead

The following life history description is based on Moyle (1976). Black bullhead (*Ameiurus melas*) typically inhabit ponds, lakes, reservoirs, and pool or backwater areas of streams and rivers. In streams and rivers, they prefer warm, turbid waters with muddy substrates and low current velocities. During the day, adult bullheads are typically closely associated with aquatic plants or other types of cover. Black bullhead are very temperature tolerant, withstanding temperatures up to 95°F. Black bullhead spawn in the spring when water temperatures exceed 68°F. Preferred substrates or the depths at which they spawn were not reported. Their diet consists of aquatic insects, crustaceans, mollusks, and occasionally fish. Black bullhead inhabit Lake Cachuma, the Santa Ynez River above and below the lake, and the lower parts of the Salsipuedes/El Jaro Creek system.

Fathead Minnow

The following life history description is based on Moyle (1976). Fathead minnows (*Pimephales promelas*) can survive in a wide variety of habitats but seem to proliferate best in pools of small muddy streams and ponds. They tolerate a wide range of environmental conditions, including high alkalinities, low DO, high organic pollutants, high turbidities, and water temperatures exceeding 30°C. Fathead minnows are relatively poor competitors, and are mostly found in association with beds of aquatic vegetation when they occur with other species. They are mainly bottom browsers, feeding on filamentous algae, diatoms, small invertebrates, and organic matter. In addition to variable growth rates and age of sexual maturity, fathead minnows are repeated spawners, which contributes to their success in fluctuating environments. Fathead minnows inhabit the Santa Ynez River below Bradbury Dam and its tributaries.

Mosquitofish

The following life history description is based on Moyle (1976). Mosquitofish (*Gambusia affinis*) can tolerate a wide range of habitats and environmental conditions. They have been reported in brackish sloughs, warm ponds, lakes and streams, and seem to do particularly well in shallow, often stagnant ponds and the edges of lakes and streams where temperatures are high (up to 37°C). Mosquitofish tend to stay close to or

within aquatic vegetation. They are omnivores and opportunists, feeding on whatever organisms are most abundant. They have a high reproductive rate, and can spawn repeatedly. Mosquitofish inhabit Lake Cachuma, the Santa Ynez River above and below the lake, and tributary creeks.

Goldfish

The following life history description is based on Moyle (1976). Goldfish (*Carassius auratus*) are usually most abundant in warm, oxygen-deficient ponds and sloughs with dense aquatic vegetation. They feed primarily on algae and phytoplankton, but also consume zooplankton, organic detritus and aquatic macrophytes. Goldfish are repeated spawners with varying growth rates, requiring temperatures of 15-23°C. They are known to hybridize with carp, producing fertile offspring. Goldfish inhabit Lake Cachuma and the Santa Ynez River above and below the Lake.

Carp

The following life history description is based on Moyle (1976). Carp (*Cyprinus carpio*) are most abundant in warm, turbid and eutrophic waters with dense aquatic vegetation. They can tolerate a wide range of environmental conditions, including temperatures between 4-34°C, very high turbidities, and low DO concentrations. Carp are omnivores and bottom feeders, consuming aquatic insects, algae and aquatic plants. Their feeding behavior contributes to high turbidities and uprooted aquatic plants, negatively affecting the habitat availability for other aquatic species. Carp spawn in spring and early summer, as the water warms to 15°C, and their growth rates vary considerably with summer water temperatures. Carp inhabit Lake Cachuma and the Santa Ynez River above and below the Lake.

2.3.2 RAINBOW TROUT/STEELHEAD

Resident of Streams and Ocean

Coastal rainbow trout (*Oncorhynchus mykiss*) are native to the Santa Ynez River. Coastal rainbow trout exhibit two distinctive life history strategies (Figure 2-5). Resident rainbow trout live their entire lives in freshwater. Anadromous steelhead are born in freshwater, emigrate to the ocean to rear to maturity, and then return to freshwater to spawn. It is common to find populations exhibiting both life history strategies within the same river system. Individuals exhibiting one life history strategy can produce offspring that exhibit the other strategy. Juveniles of rainbow trout and steelhead are indistinguishable except when steelhead juveniles smolt, typically during February through May.

Current and Historic Distribution

Historically, steelhead migrated to the upper watershed to spawning and rearing habitat in perennial tributaries and the upper mainstem. The majority of the mainstem dried during the summer months except for a spring-fed portion near Solvang (Shapovolov 1944). Steelhead are

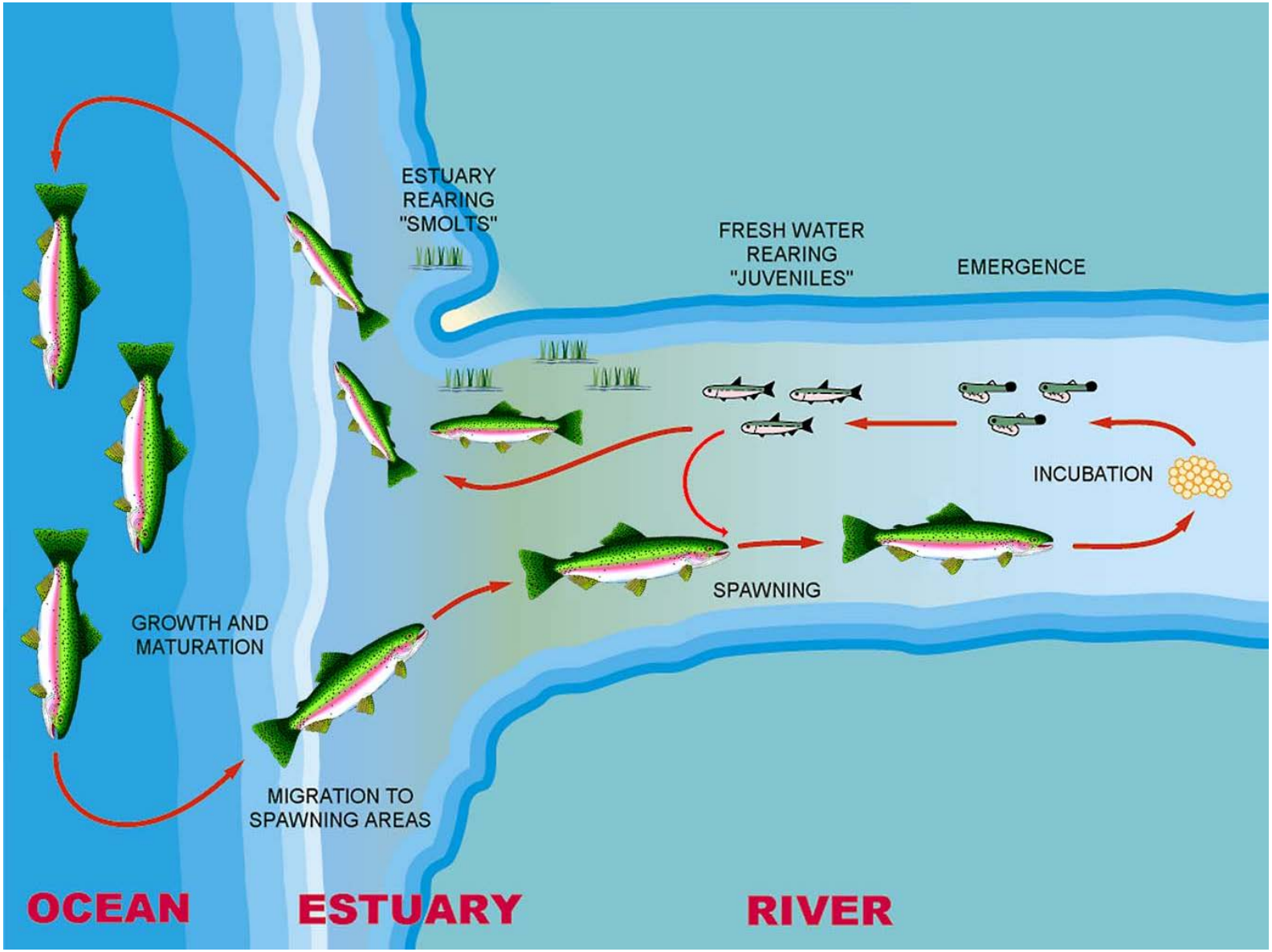


FIGURE 2-5 TROUT LIFE CYCLE (GRAPHIC COURTESY OF SONOMA COUNTY WATER AGENCY)

currently limited to the mainstem and the accessible portion of its tributaries below Bradbury Dam. Prior to the dam's construction, steelhead likely used the mainstem below Bradbury Dam mainly for passage to more favorable spawning and rearing areas that now lie above Bradbury Dam, (but below Gibraltar Dam, which was constructed in 1920) (Shapovalov 1944). In wet years before Bradbury's construction, spawning could occur in the mainstem from Solvang to Gibraltar (ENTRIX 1995). The area below and just above the dam's current location typically had intermittent flow or went dry in summer, which limited rearing opportunities.

SYRTAC studies conducted from 1993 to 2000 have documented rainbow trout/steelhead in both the mainstem Santa Ynez River and in several tributary streams below Bradbury Dam (Figure 2-6). These studies have occurred in conjunction with releases from the Fish Reserve Account. SYRTAC observations have been made during wet and average water years and therefore these results probably do not reflect distribution in dry years. The results show that rainbow trout/ steelhead are found in the mainstem near the dam (Highway 154 Reach) and that their presence falls off with increasing distance downstream. Rainbow trout/ steelhead are also found in a number of south-side tributaries. The data also that these fish are more widely distributed and more abundant in wet years than average years (SYRTAC 1997b, 1998a, 2000). Please see Appendices B and C for more detail of fish use of the mainstem and tributaries, respectively.

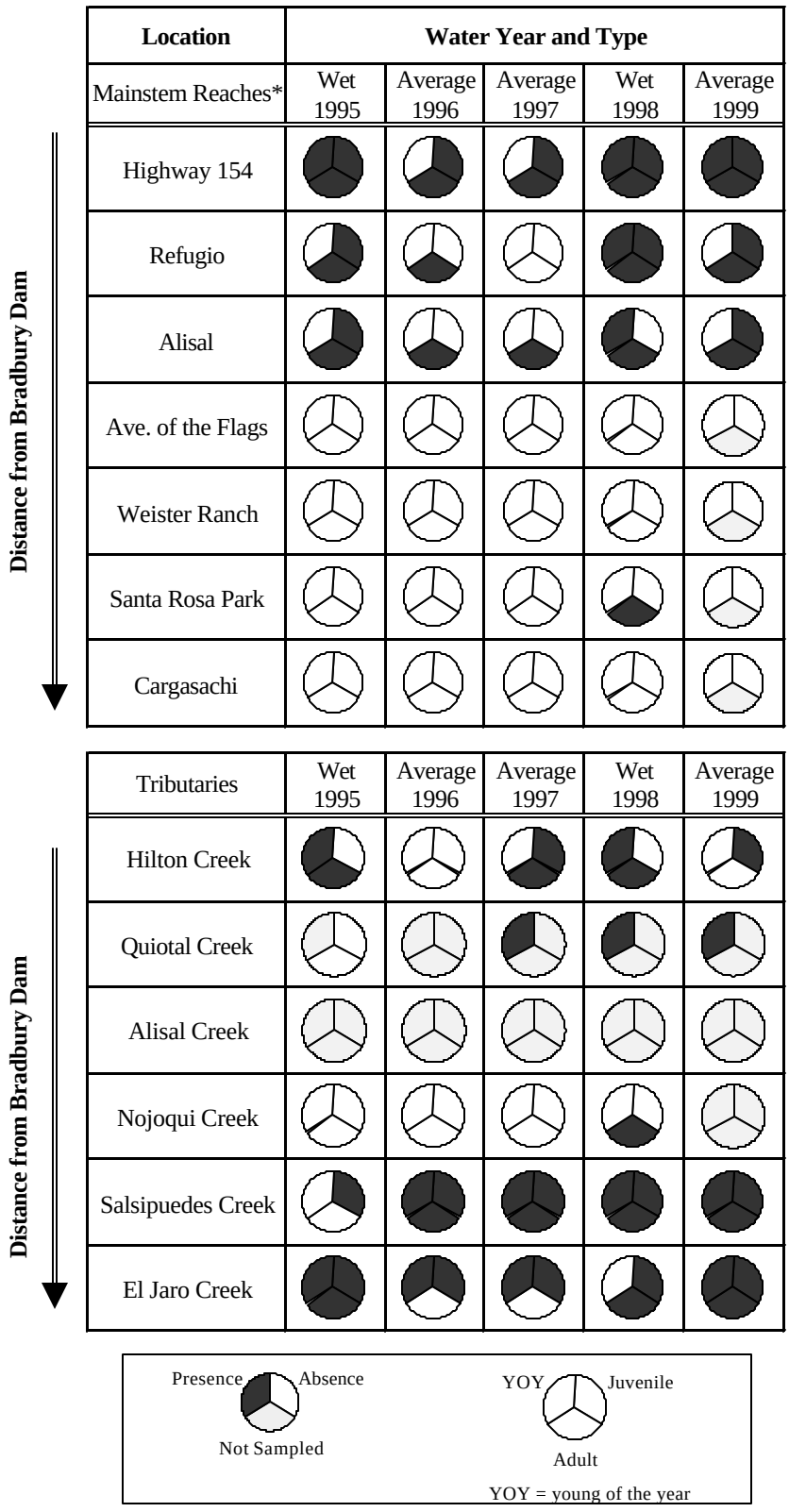
Life History and Habitat Requirements

Adult Migration & Spawning

The timing of different life stages of steelhead in the Santa Ynez River is shown in Figure 2-7. Adult steelhead migrate from the ocean to spawn mainly January through April. Upstream migration requires sufficient streamflow to breach the sandbar at the river mouth and to allow passage in the river. In dry years, passage can be impeded by low flows at critical locations (*e.g.*, riffles). Steelhead typically migrate upstream when streamflows rise during a storm event. The eggs are laid in a nest (redd) in gravel. Fish prefer gravels that are free of fine sediment to promote water circulation around the incubating eggs. After spawning, adult steelhead may return to the ocean (about 30% of adults). Unlike most salmonids, steelhead may return to spawn in later years.

Growth of Juveniles

Steelhead and rainbow trout juveniles are indistinguishable, both in appearance and in habitat use. Young-of-the-year often utilize riffle and run habitat during the growing season and move to deeper, slower water during the high flow months (Baltz and Moyle 1984). Larger fish (yearlings or older) use heads of pools for feeding. Pools provide over-summer refugia for trout in small streams during low flow conditions. A second strategy is to rear in a lagoon (Clanton 1940, Shapovalov 1940, Shapovalov and Taft 1954). Juveniles feed on invertebrates (Moyle 1976).



Data from SYRTAC 1997b, 1998a, 2000, and other data

See Table 2-3 for mainstem reach definitions

FIGURE 2-6 PRESENCE/ABSENCE OF RAINBOW TROUT/STEELHEAD IN THE LOWER SANTA YNEZ RIVER BASIN

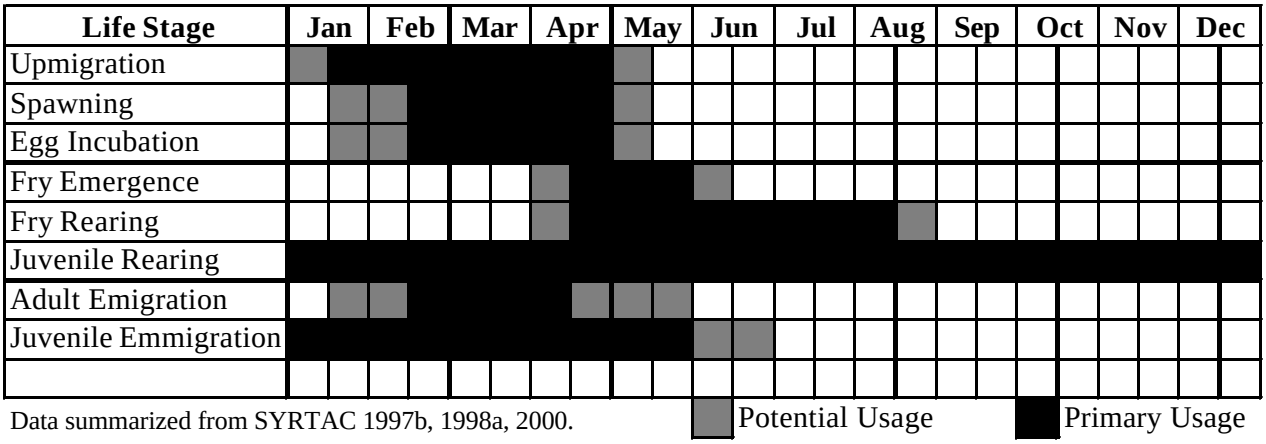


FIGURE 2-7 TIMING OF STEELHEAD LIFE STAGES IN THE SANTA YNEZ RIVER

Outmigration of Smolts

Steelhead may spend one to several years in freshwater before emigrating to the ocean. Typically, however, southern California steelhead migrate to the ocean as 1 or 2 year olds (5-10 inches long). The juvenile outmigration period is typically February through May, but the timing of migration is dependent upon streamflows. Juveniles undergo physiological changes that adapt them to a life in saltwater, and become "smolts."

Age at Maturity

Resident rainbow trout may reach maturity and spawn in their second year of life, although the time of first spawning is generally in their third or fourth year.

Water Temperature Tolerances

A temperature of 20°C (68°F) for daily average water temperatures has been used in central and southern California by CDFG to evaluate the suitability of stream temperatures for rainbow trout. This level represents a water temperature below which reasonable growth of rainbow trout may be expected. Data in the literature suggests that temperatures above 21.5°C (71°F) result in no net growth or loss of condition in rainbow trout (Hokanson *et al.* 1977) [Appendix G]. Maximum daily water temperatures greater than 25°C (77°F) were used to indicate potentially lethal conditions (Raleigh *et al.* 1984). These levels are only general guidelines, however, since much of the scientific data have been derived from fish from northern localities. Rainbow trout/steelhead in the Santa Ynez River may have higher tolerances, and therefore daily average temperatures of 20°C (68°F) and 22°C (71.6°F) were used to examine relative habitat suitability. In general, fish in warmer water require more food and oxygen because their metabolism increases with temperature (Brett 1971, Fausch 1984).

Santa Ynez Fish Facts

- Native California fishes include rainbow trout/steelhead, threespine stickleback, prickly sculpin, Pacific lamprey, arroyo chub (not native to Santa Ynez basin), and tidewater goby (lagoon only).
- Southern steelhead (below Bradbury Dam) and tidewater goby are listed as federally endangered species.
- Introduced fishes include warmwater species such as largemouth bass, smallmouth bass, sunfish, channel catfish, and black bullhead.
- Steelhead are the oceangoing form of rainbow trout. Juveniles spend one to three years growing in freshwater before migrating to the ocean. After one to two years in the ocean, adults return to spawn in freshwater, usually between January and April in the Santa Ynez River system.
- Steelhead historically used the lower mainstem mainly as a migration corridor to the tributaries and the upper basin above Bradbury Dam, where headwater streams provided spawning and year-round rearing habitat.
- Historical spawning habitat was found in the mainstem above Solvang and in lower river tributaries (Shapovalov 1946).

2.3.3 WILDLIFE

Wildlife

Implementation of the Plan may affect wildlife species that use riparian habitat; although, it is anticipated that such impacts would be positive, as activities that are helpful to fish and aquatic resources (*e.g.*, riparian enhancement) would be supportive of most riparian wildlife. Species protected under the ESA that may be affected include the California red-legged frog, California tiger salamander, least Bell's vireo, southwestern willow flycatcher, and southwestern arroyo toad. In addition, the southwestern pond turtle and the two-striped garter snake, both candidate species in California, may be affected by the Plan.

California Red-Legged Frog

The California red-legged frog (*Rana aurora draytonii*) is a federal threatened species. The following description is taken primarily from Woodward-Clyde (1995). California red-legged frogs are confined strictly to aquatic habitat, such as creeks, streams, and ponds, and occur primarily in areas having pools 2-3 feet deep with dense emergent or shoreline vegetation. Although they may move between breeding pools and foraging areas, they rarely leave the dense cover of the riparian corridor. California red-legged frogs breed from November to March when eggs are attached to emergent vegetation. Eggs hatch within 6-14 days, and metamorphosis generally occurs from July to September. Red-

legged frogs are omnivorous and will eat other animals including other amphibians and small mammals. Major predators include introduced fish, bullfrogs, and native garter snakes, all of which occur in the mainstem of the Santa Ynez River below Lake Cachuma.

California red-legged frogs occur above Bradbury Dam in the Santa Ynez River and a number of tributaries. Below Bradbury Dam, they have been found in Zaca, Nojoqui, and Salsipuedes Creeks (Jennings 1993, Woodward-Clyde 1995), as well as along the mainstem immediately upstream of the lagoon. Frog habitat exists in the mainstem below Bradbury Dam, but frogs have only been observed near Santa Rosa Park. Predatory fish and bullfrogs are common downstream of Bradbury Dam.

Southwestern Arroyo Toad

The arroyo southwestern toad (*Bufo microscaphus californicus*) is a federal endangered species. Arroyo southwestern toads are typically found in upper streams where they breed in pools generally less than 1 foot deep with minimal current and a gently sloping shoreline, and where bordering vegetation is absent or set back from the margins of the pool. Adults use nearby sandy terraces for burrowing and may forage in live oak flats along the river floodplain. Activity begins after the first winter rains, generally between January and March. Males may begin calling as early as March but usually begin in April. Females are ready to deposit clutches by May and can continue until mid-June. Eggs hatch in four to five days and metamorphosis occurs from June through July as the breeding pools become drier. Sub-adults are ready to disperse by fall and like the adults, become inactive over the winter when they burrow into sandy terraces. Between late summer and mid-winter, toads may emerge from their burrows to soak in nearby creeks and rivers. Adults typically feed during the night on snails, beetles, and other insects, and may occasionally eat the young of their own species. The above description is taken from Woodward-Clyde (1995).

Populations of the arroyo southwestern toad exist in the upper portions of the Santa Ynez River above Gibraltar Dam. The species is not known to inhabit any of the tributaries flowing into Lake Cachuma and is not known to occur below Bradbury Dam, although pools that meet breeding requirements occur there (Woodward-Clyde 1995).

California Tiger Salamander

The Santa Barbara County population of the California tiger salamander (*Ambystoma californiense*) is a federally endangered species. Tiger salamanders inhabit low elevation (below 1,000 feet) vernal pools and ephemeral ponds that are associated with coastal scrub, grassland, and oak savannah vegetation communities (Shaffer *et al.* 1993). The salamanders commonly use small mammal burrows found near (within 1.2 miles) breeding ponds. During the fall and winter rains, salamanders migrate from their burrows to the ponds. The number of eggs laid by

female California tiger salamanders ranges from 400-1,300 per breeding season and can be laid singly or in groups. Eggs are attached to structures in the ponds; aquatic vegetation is most commonly used. The adult salamanders return to the upland burrows after spending one to eight weeks in the breeding ponds. Males typically arrive first and reside in the pond longer than females.

Larvae hatch from the eggs in 10-14 days and typically feed on algae, small crustaceans, and mosquito larvae for about six weeks and then turn to larger prey. California tiger salamander larvae metamorphose and leave the breeding ponds approximately 60-94 days after hatching (Feaver 1971). In pools that dry more quickly, metamorphosis occurs more quickly. Before the ponds dry completely (typically by late spring or early summer) the metamorphosed juveniles migrate to small mammal burrows. Both the juveniles and the adult salamanders estivate during the dry summer period in the burrows. In Santa Barbara County, the California tiger salamander is located in and about vernal pools in the Santa Maria, Los Alamos, and Santa Rita Valleys.

Southwestern Pond Turtle

The Southwestern pond turtle (*Clemmys marmorata pallida*) is a species of special concern. Southwestern pond turtles live primarily in freshwater rivers, streams, lakes, ponds, vernal pools, and seasonal wetlands but also seem to have some tolerance for slightly brackish conditions. They may live in intermittent streams where permanent pools exist (Woodward-Clyde 1995). The species requires slowly moving water and appropriate basking sites such as logs, banks, or other suitable areas above water level. The hatchling period is a particularly vulnerable state, and requires shallow water (less than 30 cm) and abundant emergent vegetation (Woodward-Clyde 1995). At lower elevations in southern California, the southwestern pond turtle may be active throughout the year, but in colder locations it may undergo periods of hibernation, either under water or in burrows on land. Food consists primarily of small to moderately-sized invertebrates, especially insects and crayfish, but vegetation, small fish, and carrion may also be consumed (Woodward-Clyde 1995).


Southwestern Pond Turtle. Photo by: Jeff Lovich

While little is known about reproduction, mating probably occurs between May and September, and eggs are laid from May through August (Woodward-Clyde 1995). Females appear to become reproductively active at about eight years of age. Because females mature

relatively late, and bullfrogs and largemouth bass are predators on hatchling turtles, populations may become heavily biased toward older individuals. In the relatively mild climate of central and southern California, pond turtles may spend extended periods on land away from water (Woodward-Clyde 1995).

Habitat for the southwestern pond turtle exists throughout the Santa Ynez River watershed including the mainstem below Bradbury Dam (Woodward-Clyde 1995). Turtles have been observed in Salsipuedes Creek and in the mainstem downstream of Buellton to the Long Pool just below Bradbury Dam (Woodward-Clyde 1995).

Two-Striped Garter Snake

The two-striped garter snake is a species of special concern. This snake is typically found near slowly moving creeks and streams, ponds, and coastal lagoons where water is permanent and tadpoles, frogs, and small fish are present as a prey base. Snakes are often found in areas of barren soil or short grass near the aquatic sites, and individuals may use large boulders for basking (Woodward-Clyde 1995). Snakes may be active during the day or night. Little is known about the life history of the two-striped garter snake. Females give birth from mid to late summer, and by October individuals may move to adjacent upland areas where they apparently hibernate in rodent burrows or under logs or boulders (Woodward-Clyde 1995).

The two-striped garter snake is reported to occur in the upper Santa Ynez River above Gibraltar Reservoir and just downstream of Bradbury Dam (Woodward-Clyde 1995). Suitable habitat for the species occurs elsewhere downstream and is especially abundant in the area around Buellton. Lack of permanent water upstream from Buellton may limit the existence of the two-striped garter snake in this portion of the river (Woodward-Clyde 1995).

Southwestern Willow Flycatcher

The southwestern willow flycatcher (*Empidonax traillii extimus*) is a state and federally endangered species. Habitat for this bird includes riparian zones along rivers, streams, or other wetlands where dense growths of willows and other riparian vegetation are present. These riparian communities provide nesting and foraging habitat. This species has experienced substantial habitat loss over much of its range and has also been subject to brood parasitism by the brown headed cowbird (*Molothrus ater*). Nests are built in thickets of trees or shrubs more than 3 meters in height with dense foliage. Narrow riparian zones are not selected as nesting or singing habitats. This sub-species almost always nests where there is surface water or saturated soil present. Males establish territories in mid-May, and nesting occurs in late May through August. This species is insectivorous, foraging within and above the dense riparian vegetation. There are two known breeding populations

along the Santa Ynez River: one located about 1 mile west of Buellton and a second located near the prison in Lompoc.

Least Bell's Vireo

Least Bell's vireo (*Vireo bellii pusillus*) is a state and federally endangered species. These birds have declined due to loss of habitat and cowbird nest parasitism. Most nests are constructed at a height of 3-8 feet near the edge of a thicket in riparian scrub or riparian forests, 30-650 feet away from the nearest edge of water (Olson and Gray 1989). Populations occur above Gibraltar Dam, and may occur on the Santa Ynez River near Salsipuedes Creek.

Least Bell's Vireo

2.4 HABITAT CONDITIONS

2.4.1 SYRTAC STUDIES

A stream's potential to support rainbow trout/steelhead and other aquatic resources depends on the quantity and quality of physical habitat. Habitat conditions have been assessed in the lower Santa Ynez River and its tributaries where access was granted by landowners (ENTRIX 1995, SYRTAC 1997b, 1998a, 2000). Habitat suitability depends on the life history and physical requirements of a particular species. Steelhead are the most sensitive fish species in the Santa Ynez River system because the species requires three healthy environments (the river and its tributaries, the lagoon, and the ocean) in order to complete its life history. Actions by Reclamation and the Member Units can affect the freshwater rearing phase. Because of this requirement, and because the steelhead are endangered, streams were assessed for potential steelhead habitat.

Studies of Stream Habitat

Accessible stream reaches were surveyed in the lower basin to determine the amount and quality of different habitat types:

- Riffle: generally, shallow to moderately deep with swift flowing, turbulent water; typically contains partially exposed rocks which create shifting flow directions.
- Run: generally, moderately deep with swift and straight flowing water; relatively flat with no major obstacles (*e.g.*, boulders) which change flow direction and break surface tension.
- Pool: generally deeper than riffles with flat, slower flowing water.

These different habitat types have varying potentials for supporting fish. Habitat types have different hydraulic characteristics and different species and life stages of fish vary in their preference for these characteristics. Other important habitat features such as water quality, substrate, cover, instream vegetation, and riparian canopy were also measured.

Water Temperature

Water temperature is another important factor in habitat suitability. During the summer, some areas experience warm water temperatures that can be stressful or lethal to fish, especially cold water species like rainbow trout/steelhead. Temperature monitoring has been conducted at stations along the mainstem and in selected tributaries (see Appendix B for mainstem results and Appendix C for the tributary data). Three temperature levels have been used to evaluate habitat conditions within the lower Santa Ynez River. Daily average temperatures of 20°C (68°F) and 22°C (71.6°F) were used to examine relative habitat suitability to sustain a growing rainbow trout/steelhead population. Maximum daily

water temperatures greater than 25°C (77°F) were used to indicate potentially lethal conditions for rainbow trout/steelhead.

A review of existing literature suggests that the incipient lethal temperature of steelhead from warm water environments is about 26°. Appendix G, *Review of Effects of Warm Water Temperature on Steelhead/Rainbow Trout*, provides a discussion of steelhead temperature tolerances.

Most other fish species in the Santa Ynez River have higher water temperature tolerances than rainbow trout/steelhead, and continue to experience population growth at water temperatures exceeding 22°C. The above mentioned temperature levels serve as guidelines to indicate general seasonal and spatial trends where water quality conditions may be a concern, but the levels were not used to rule out particular reaches. Cool water refuge can exist along the mainstem in deep pools or pools with cool water upwelling. Temperature models have also been used to examine how water warms as it moves downstream from Bradbury Dam.

Algae present during summer season on the lower Santa Ynez River.

Dissolved Oxygen

Fish also require suitable concentrations of dissolved oxygen (DO) in the water. Algae that grows and accumulates during the summer can use a lot of oxygen in respiration during the night, thereby depressing DO levels by morning. Periodic monitoring of day-night fluctuations was done in the mainstem.

2.4.2 SANTA YNEZ RIVER BELOW BRADBURY DAM

Opportunities to enhance conditions in the mainstem Santa Ynez River are limited to a few miles just below Bradbury Dam. Further downstream below Solvang and Buellton, the mainstem usually has insufficient flow and poor physical habitat conditions for rainbow trout/steelhead. In general, water temperatures are elevated and canopy cover decreases and becomes minimal about 3-10 miles downstream from the dam. Several reaches have been delineated based on geomorphology, as well as opportunities for management (Table 2-3).

TABLE 2 - 3 REACHES IN THE LOWER MAINSTEM SANTA YNEZ RIVER

Reach Name	Landmarks	Reach Length (miles)	Miles below Bradbury Dam
Highway 154	Bradbury Dam down to Highway 154 Bridge	2.9	0
Refugio	Highway 154 Bridge down to Refugio Road	5	2.9
Alisal	Refugio Road down to Alisal Bridge in Solvang	2.6	7.9
Avenue of the Flags	Alisal Bridge in Solvang down to Avenue of the Flags Bridge in Buellton	3.1	10.5
Buellton to Lompoc	Buellton to Highway 1 Bridge in Lompoc (includes Weister and Cargasachi study sites)	23.9	13.6
Below Lompoc	Highway 1 Bridge in Lompoc to old 35th Street Bridge	8.3	37.5
Lagoon	Above old 35th Street Bridge to mouth of river	2.5	45.8

The Highway 154 Reach, which extends 2.9 miles downstream from Bradbury Dam, has a more confined channel than reaches further downstream, as well as better riparian cover in general. Streamflow during the summer can become intermittent or non-existent, with only isolated pools, between the Highway 154 Bridge and the Lompoc Wastewater Treatment Plant. Substrate close to the dam is dominated by cobbles. Downstream about 3-10 miles from the dam, the substrate is gravel and cobbles, with fine sediments in the pools. Downstream of Buellton, the river channel is very broad. Near Lompoc, the channel becomes braided with sand or smaller gravel substrates.

Water temperature within the lower Santa Ynez River follows a general seasonal pattern that correlates with air temperature: increasing during the spring, cool near the dam and in the Long Pool, and increasing rapidly in the first 3 miles downstream of Bradbury Dam. Surface water temperatures in the Refugio and Alisal reaches often exceed 20°C as a daily average, and 25°C as a daily maximum during July and August, and the high temperatures sometimes extend into September in the Alisal Reach (SYRTAC 1997b, 1998a, 2000). These temperatures are satisfactory for the introduced warmwater species and are at the upper range for sustaining the rainbow trout/steelhead population.

Stratification and upwelling of cool water occurs in some moderate to deep pools in the Refugio and Alisal reaches. These pools provide important cool-water refuge. Rainbow trout/steelhead collect in these pools during the warmest months. Pools, particularly deep pools, provide habitat for juvenile and older age classes of rainbow trout/steelhead, largemouth bass and sunfish. In general, pools decline in relative abundance and in depth as one moves downstream.

The SYRTAC identified two key mainstem reaches to be managed for rainbow trout/steelhead habitat requirements. The most promising reach of stream is the Highway 154 reach because temperatures are good near Bradbury Dam, shading is fair to moderate, and the stream channel generally provides good rainbow trout/steelhead habitat. It may be possible to maintain good conditions down to the Highway 154 Bridge (2.9 miles below the dam). The next most promising area includes the Refugio and Alisal reaches (2.9-10.5 miles below the dam). Although warm water temperatures and lack of riparian cover are a concern for rainbow trout/steelhead in this area, it may be possible to enhance instream habitat conditions in wet years. Rainbow trout/steelhead were able to survive and grow in these reaches in 1998, an extremely wet year.

A more complete description of the habitat conditions and fish use for the mainstem from Bradbury Dam to the lagoon is provided in Appendix B.

2.4.3 TRIBUTARIES BELOW BRADBURY DAM

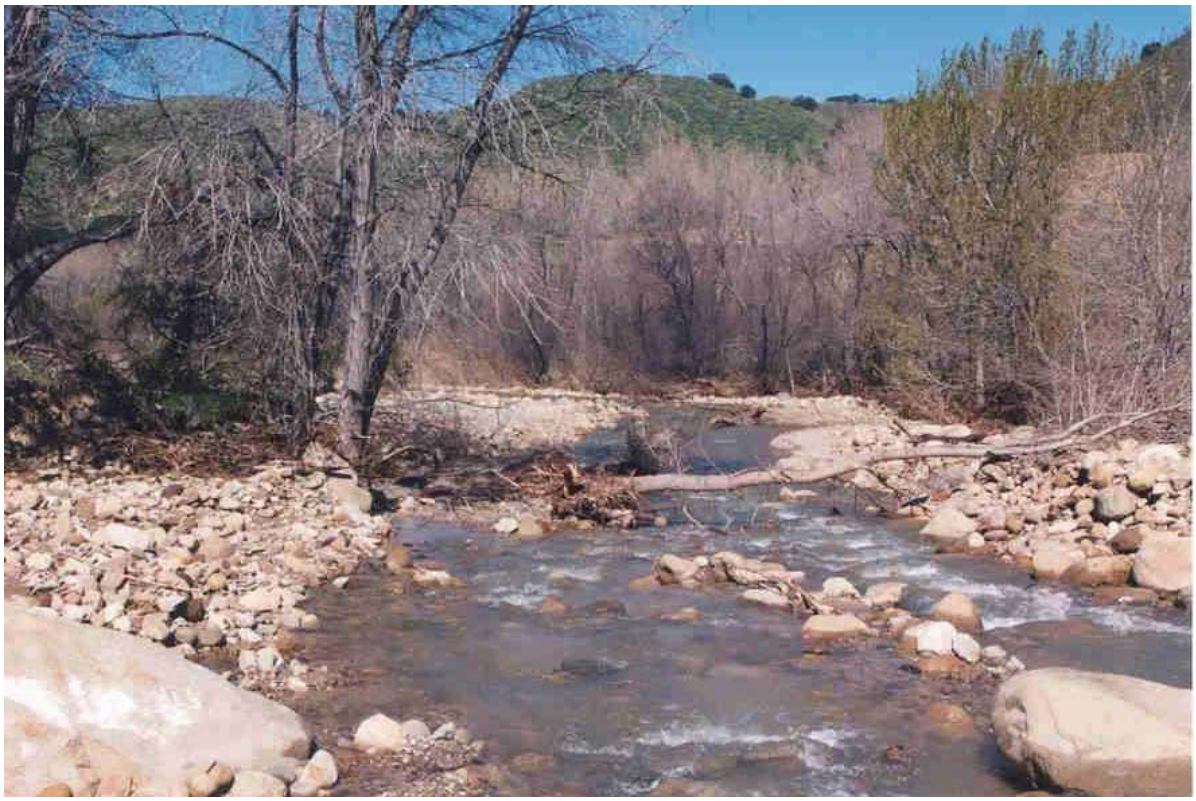
The tributaries on the south side of the lower basin offer better potential for fish habitat than those on the north side. South side streams originate at fairly high elevations on the cool and well-vegetated north-facing slopes of the Santa Ynez Mountains. Several streams have perennial flow in their upper reaches, although during summer most go dry in their lower reaches during years with average rainfall. By contrast, tributaries on the north side do not retain summer flows and thus, are too dry to support rainbow trout/steelhead. Starting at Bradbury Dam and moving to the ocean, the tributaries of interest are:

- Hilton Creek;
- Quiota Creek;
- Alisal Creek;
- Nojoqui Creek;
- Salsipuedes and El Jaro creeks; and
- San Miguelito Creek.

Figures 2-8 through 2-13 present a summary of the habitat characteristics of these tributaries.

QUICK FACTS
Hilton Creek

Number of *O. mykiss* Observed (1995-1999)	***Present to Common*** *(1,496 in 1995-1999 surveys-1,429 YOY, 38 JUV, 34 ADULT; trapping in 1995, 1997, 1998 yielded 68 U/S migrants and 17 D/S*
Estimated Watershed Area	***4 sq. mi.***
Estimated Stream Length	***3.8 miles*** *(Lower-0.3 mi., Upper-3.5 mi.)*
Estimated Stream Gradient	***HIGH*** *(Lower-11.7%, Upper-8.1%)*
Percent Canopy (Avg)	***1 to 25*** *(Range:0 to 100; many with 0)*
Total Distance Habitat Typed (ft)	***2,935*** *(Access above BOR land is restricted by private property)*



The lower reach of Hilton Creek on Reclamation Property.

FIGURE 2-8 SUMMARY OF HILTON CREEK HABITAT ATTRIBUTES

Summary of Habitat Attributes
Hilton Creek (Lower)

	Pool	Riffle	Run
Quantity	11	25	20
Distance (ft)	295.5	1764	875
Distance (%)	10.1	60.1	29.8
Avg Depth (ft)	1.7	0.7	0.9
Avg Max. Depth (ft)	2.6	1.2	1.4
Avg Instream Shelter (%)	50 to 75	25 to 75	25 to 75
Avg Canopy (%)	25 to 75	0 to 100	0 to 100
Dominant Shelter Components	Boulders and whitewater elements; aquatic and terrestrial vegetation, bedrock ledges, lg. woody debris	Whitewater and boulders; some aquatic and terrestrial vegetation, bedrock ledges, sm. woody debris	Boulders and whitewater; some bedrock ledges, aquatic and terrestrial vegetation, sm. woody debris

Temperature Data
(Lower Hilton Ck. only)

Year	Ave. Daily Mean	Days Exceed 20°C	Daily Max.	Days Exceed 25°C
Lower Hilton (near SYR confluence)				
1995	**17.8**	**33**	**26.3**	**5**
1996	**13.8**	**0**	**20.7**	**0**
1997	**14.5**	**0**	**16.6**	**0**
1998	**15.7**	**30**	**25.7**	**14**
Lower Hilton (below cascade/chute)				
1995	**16.8**	**2**	**24.3**	**0**
1997	**15.8**	**0**	**18.5**	**0**
1998	**16.0**	**14**	**27.7**	**19**
Mid-Hilton (upstream Reclamation property line)				
1998	**16.3**	**0**	**21.1**	**0**
1999	**16.5**	**21**	**28.7**	**11**

Lower (near confluence) monitoring conducted in1995 (April thru August), 1996 (March to mid-June), 1997 (April to mid-July), 1998 (March to October).
Lower (below cascade/chute) monitoring conducted in 1995 (May thru August), 1997 (mid-August to mid-September), 1998 (April to August).
Mid (Reclamation boundary) monitoring conducted in 1998 (mid-June to mid October), 1999 (mid-June to mid-November).

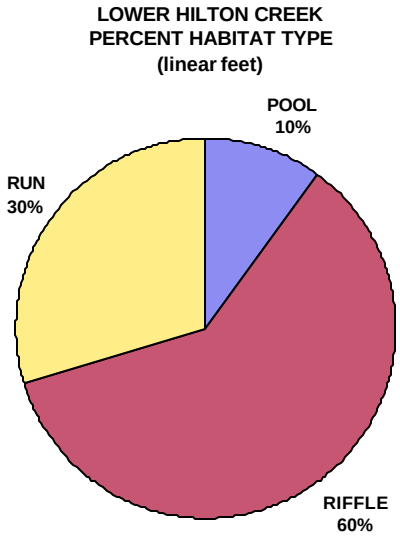


FIGURE 2-8 SUMMARY OF HILTON CREEK HABITAT ATTRIBUTES (CONTINUED)

QUICK FACTS
Quiota Creek

Number of *O. mykiss* Observed (1995-1999)	***Generally Common*** *(No sampling or trapping conducted 1995-1999; based on bank observations at selected crossings)*
Estimated Watershed Area	***6.32 sq. mi.***
Estimated Stream Length	***6.4 miles***
Estimated Stream Gradient	***HIGH*** *(5.9%)*
Percent Canopy (Avg)	***50*** *(Range: 25 to 75)*
Total Distance Habitat Typed (ft)	***602*** *(not fully surveyed due to private property access)*

Quiota Creek

FIGURE 2-9 SUMMARY OF QUIOTA CREEK HABITAT ATTRIBUTES

Summary of Habitat Attributes
Quiota Creek

	Pool	Riffle	Run	Glide
Quantity	5	3	5	1
Distance (ft)	192	115	315	88
Distance (%)	31.9	19.1	52.3	14.6
Avg Depth (ft)	1.5	0.36	0.61	0.38
Avg Max. Depth (ft)	2.6	0.85	1	0.8
Avg Instream Shelter (%)	25 to 50	75	25 to 75	75
Avg Canopy (%)	25 to 100	75 to 100	50 to 100	100
Dominant Shelter Components	Boulders, bedrock ledges, root masses; some undercut banks, sm. woody debris and aquatic vegetation	Root masses and boulders; some sm. & lg. woody debris, and terrestrial vegetation	Root massess, terrestrial vegetation, undercut banks, and terrestrial vegetation	Sm. woody debris, root masses, and terrestrial/aquatic vegetation

Temperature Data

No water quality monitoring conducted during the survey period.

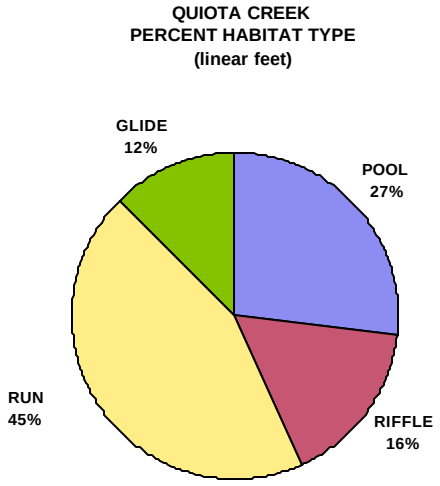
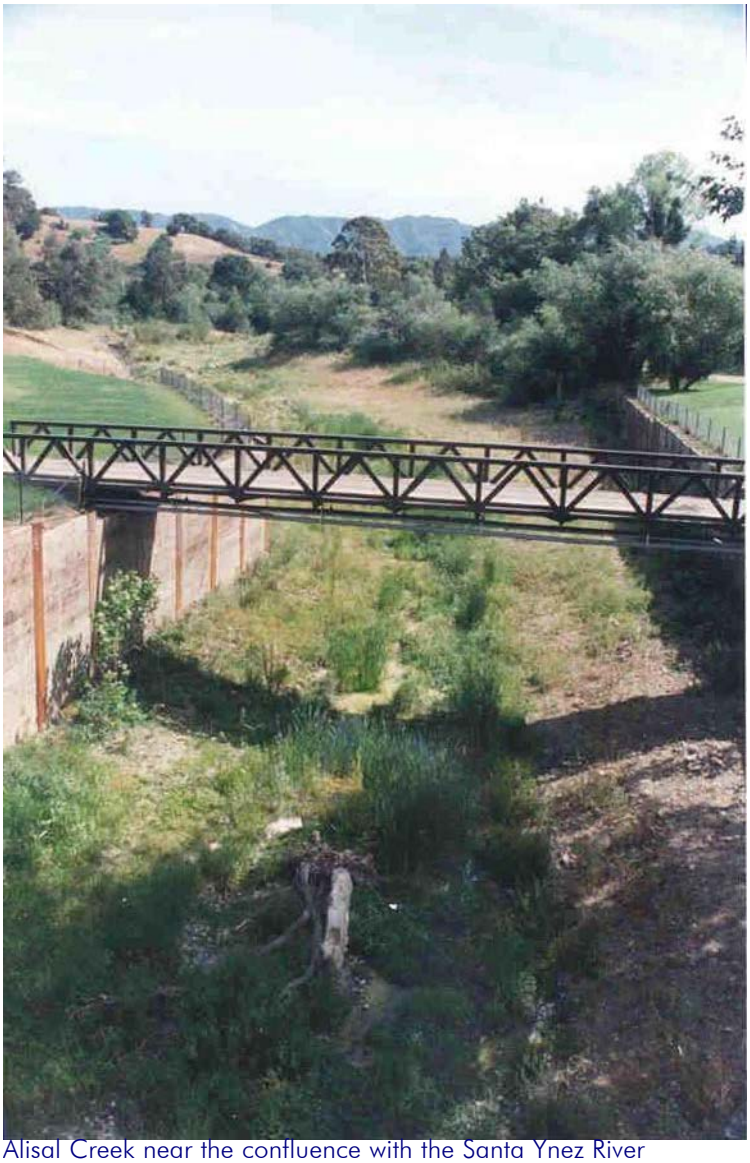


FIGURE 2-9 SUMMARY OF QUIOTA CREEK HABITAT ATTRIBUTES (CONTINUED)

QUICK FACTS
Alisal Creek

Number of *O. mykiss* Observed (1995-1999)	***Present, but in low numbers*** *(Based on bank observations. No sampling conducted in 1996-1999 due to access; trapping in 1995 yielded 2 U/S migrants. Common above reservoir.)*
Estimated Watershed Area	***11.6 sq. mi.***
Estimated Stream Length	***5.6 miles*** *(Below reservoir-3.6 mi.; Above reservoir-2 mi.)*
Estimated Stream Gradient	***MODERATE*** *(Below reservoir-Low; Above reservoir-High)*
Estimated Canopy	***GOOD*** *(excellent above reservoir)*
Total Distance Habitat Typed (ft)	***0*** *(not habitat typed due to private property access)*



Alisal Creek near the confluence with the Santa Ynez River

FIGURE 2 - 10 SUMMARY OF ALISAL CREEK HABITAT ATTRIBUTES

Summary of Habitat Attributes
Alisal Creek

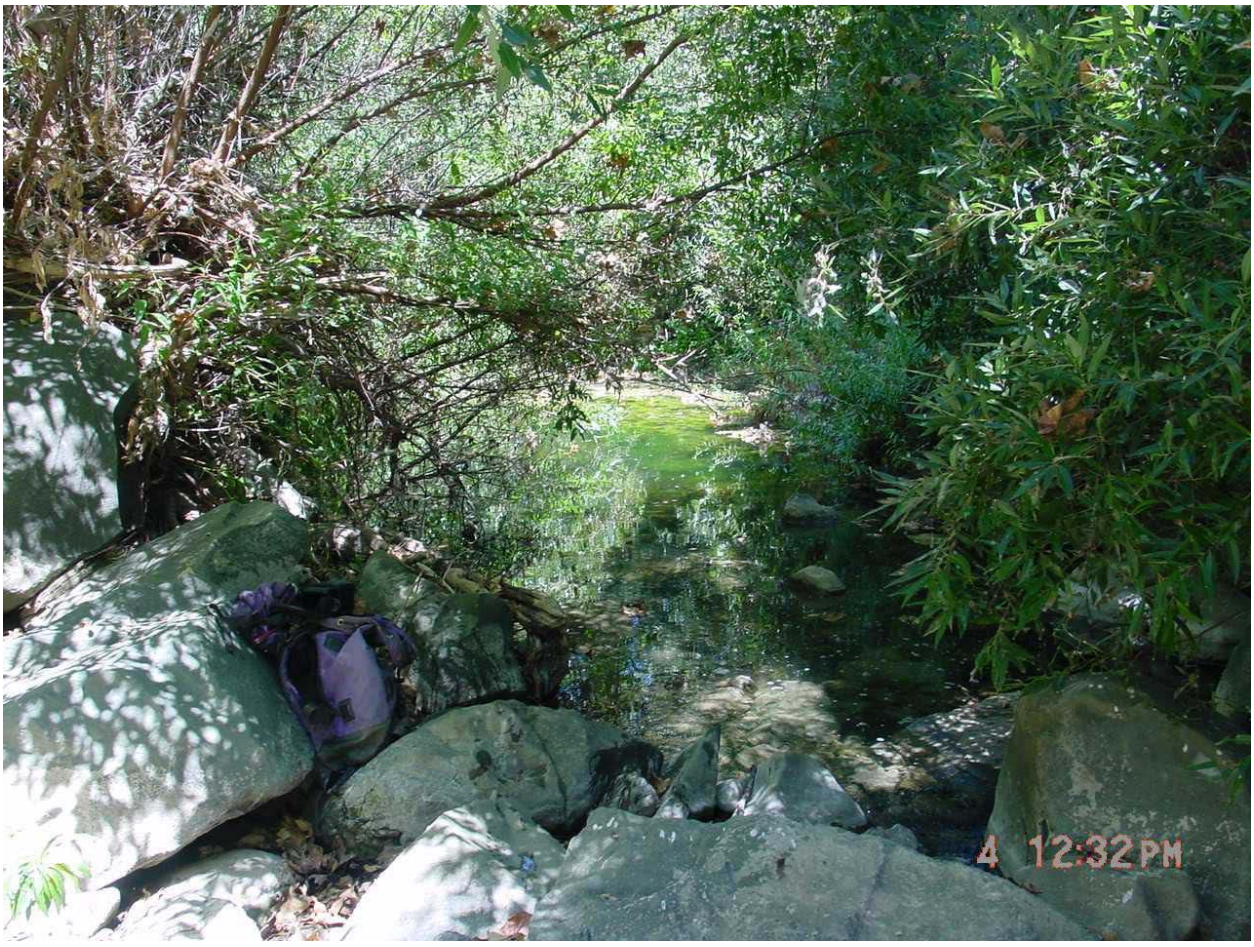
- **Alisal Reservoir dam blocks fish passage to upper Alisal Creek.**
- **Habitat conditions below reservoir are fair with little dry season flow.**
- **Habitat conditions above reservoir are very good above reservoir with perennial flow.**
- **Resident rainbow trout spawn and rear in the upper creek and have been observed to be common to abundant.**
- **Below reservoir oversummering habitat is poor due to low flow.**
- **Habitat conditions and fish utilization below reservoir have not been assessed due to private property access.**
- **No water quality (temperature & DO) monitoring conducted during the survey period.**

ALISAL CREEK
PERCENT HABITAT TYPE
(linear feet)

FIGURE 2-10 SUMMARY OF ALISAL CREEK HABITAT ATTRIBUTES (CONTINUED)

QUICK FACTS
Nojoqui Creek

Number of *O. mykiss* Observed (1995-1999)	***Generally Absent*** *(1 Adult Observed in 1998 survey; 1998 trapping yielded 2 U/S migrants and 1 D/S migrant)*
Estimated Watershed Area	***15.1 sq. mi.***
Estimated Stream Length	***8 miles***
Estimated Stream Gradient	***LOW*** *(1.4%)*
Percent Canopy (Avg)	***1 to 50*** *(Range: 0 to 100)*
Total Distance Habitat Typed (ft)	***16,382***



Nojoqui Creek

FIGURE 2-11 SUMMARY OF NOJOQUI CREEK HABITAT ATTRIBUTES

Summary of Habitat Attributes
Nojoqui Creek

	Pool	Riffle	Run	Glide
Quantity	14	34	42	15
Distance (ft)	670	2478	10620	2614
Distance (%)	4.1	15.1	64.8	16
Avg Depth (ft)	2.3	0.7	1	1.2
Avg Max. Depth (ft)	3.5	1.3	2	2.3
Avg Instream Shelter (%)	0 to 100	25 to 100	50 to 75	25 to 50
Avg Canopy (%)	0 to 50	0 to 75	0 to 50	0 to 50
Dominant Shelter Components	Aquatic vegetation (lower) and root masses, boulders, terrestrial vegetation, undercut banks (upper); sm. & lg. woody debris	Whitewater, aquatic vegetation (lower), boulders (upper); terrestrial vegetation	Aquatic vegetation (lower/upper) and boulders, terrestrial vegetation (upper); lg. woody debris and root masses (upper)	Aquatic vegetation (lower/upper), terrestrial vegetation (upper); undercut banks/bedrock ledges (upper) and sm. woody debris (upper)

Temperature Data

Year	Ave. Daily Mean	Days Exceed 20°C	Daily Max.	Days Exceed 25°C
1997	<19	0	<19	0
1998	17.8	84	27.0	33
1999	17.1	5	25.4	1

Unknown monitoring period in 1997; 1998 monitoring includes January-February and mid-May to November; 1999 monitoring April to mid-August.

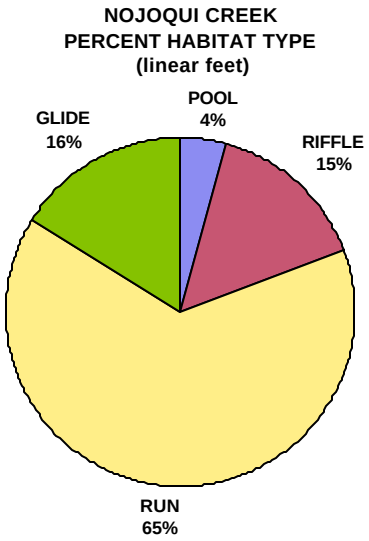


FIGURE 2-11 SUMMARY OF NOJOQUI CREEK HABITAT ATTRIBUTES (CONTINUED)

QUICK FACTS
Salsipuedes & El Jaro Creeks

Number of *O. mykiss* Observed (1995-1999)	***Present to Common*** *(703 in 1995-1999 surveys- 211 YOY [many present but not sampled], 399 JUV, 93 ADULT; trapping yielded 77 U/S migrants and 46 D/S migrants -lower Salsipudes Ck. only)*
Estimated Watershed Area	***47.1 sq. mi.***
Estimated Stream Length	***21.5 miles*** *(Lower Salsipuedes-4 mi., Upper Salsipuedes-5 mi., El Jaro-12.5 mi.)*
Estimated Stream Gradient	***LOW*** *(Lower Salsipuedes-0.3%, Upper Salsipuedes-3.3%, El Jaro-1.3%)*
Percent Canopy (Avg)	***1 to 25*** *(Range: 0 to 50)*
Total Distance Habitat Typed (ft)	***23,490***

El Jaro Creek just above the confluence with Salsipuedes Creek.

FIGURE 2 - 12 SUMMARY OF SALSIPUEDES - EL JARO CREEK HABITAT ATTRIBUTES

Summary of Habitat Attributes
Salsipuedes & El Jaro Creeks

	Pool	Riffle	Run	Glide
Quantity	19	31	43	14
Distance (ft)	905	2278	16995	3312
Distance (%)	3.9	9.7	72.3	14.1
Avg Depth (ft)	2.2	0.9	1.2	1.1
Avg Max. Depth (ft)	4.6	2.5	3	3.3
Avg Instream Shelter (%)	25 to 50	50 to 75	25 to 75	0 to 50
Avg Canopy (%)	0 to 25	25	25	25
Annual Fish Quantity (Avg)	128.3	12	82.3	2.3
Dominant Shelter Components	Undercut banks, bedrock ledges, boulders, aquatic vegetation, whitewater, sm. woody debris, terrestrial vegetation	Whitewater, boulders, aquatic vegetation, terrestrial vegetation, bedrock ledges	Aquatic vegetation, undercut banks/bedrock ledges, boulders, terrestrial vegetation, sm. woody debris	Aquatic vegetation, undercut banks/bedrock ledges, terrestrial vegetation, sm. woody debris

Temperature Data

Year	Ave. Daily Mean	Days Exceed 20°C	Daily Max.	Days Exceed 25°C
Lower Salsipuedes Creek				
1996	**19.3**	**76**	**27.6**	**53**
1997	**16.0**	**87**	**27.4**	**24**
1998	**18.4**	**79**	**39.4**	**78**
1999	**16.8**	**52**	**34.4**	**48**
Upper Salsipuedes Creek				
1996	**14.2**	**0**	**21.6**	**0**
1997	**14.5**	**0**	**22.8**	**0**
1998	**15.2**	**14**	**27.3**	**2**
1999	**15.6**	**2**	**30.7**	**2**
El Jaro Creek				
1996	**20.0**	**83**	**28.1**	**27**
1997	**16.1**	**45**	**26.5**	**9**
1998	**16.5**	**74**	**27.7**	**40**
1999	**17.4**	**23**	**28.8**	**22**

Lower Salsipuedes - monitoring conducted in1996 (May-October), 1997 (January-June; mid-August thru December), 1998 (early January; mid-April to November), 1999 (February to November).
Upper Salsipuedes monitoring conducted in 1996 (May-June; November-December), 1997 (January-December), 1998 (January-October), 1999 (April-October).
El Jaro monitoring conducted in 1996 (May to November), 1997 (early January ; mid-February thru December), 1998 (January to November), 1999 (April to November).

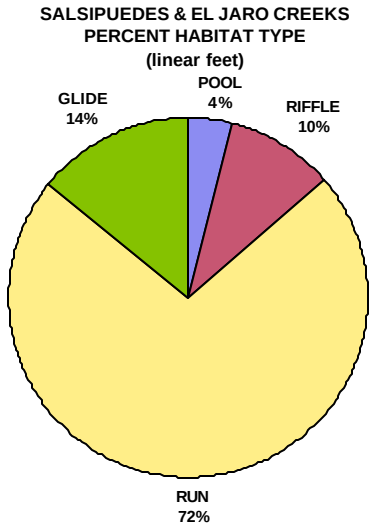


FIGURE 2-12 SUMMARY OF SALSIPUEDES - EL JARO CREEK HABITAT ATTRIBUTES (CONTINUED)

QUICK FACTS
San Miguelito Creek

Number of *O. mykiss* Observed (1995-1999)	***Present to Common*** *(Based on bank observations. No sampling conducted in 1995-1999; trapping in 1997 and 1999 yielded 4 D/S migrants.)*
Estimated Watershed Area	***11.6 sq. mi.***
Estimated Stream Length	***9 miles***
Estimated Stream Gradient	***MODERATE*** *(Lower-0.9%, Middle-1.9%, Upper-4.9%)*
Estimated Canopy	***GOOD*** *(above lower 3 mi.-concrete flood control channel)*
Total Distance Habitat Typed (ft)	***0*** *(not habitat typed)*

A 3 mile long concrete box culvert confines the lower reaches of San Miguelito Creek

Habitat is found in the upper reaches of San Miguelito Creek

FIGURE 2 - 13 SUMMARY OF SAN MIGUELITO CREEK HABITAT ATTRIBUTES

Summary of Habitat Attributes
San Miguelito Creek

- **Upper portion of San Miguelito Ck. may have been stocked by CDFG in the past.**
- **Lower 2 miles from the confluence is concrete box culvert with several drop structures and considered impassable**
- **Above the culvert there are additional passage barriers and drop structures.**
- **Resident rainbow trout spawn and rear in the upper creek and have been observed to be relatively abundant.**
- **Spawning and rearing habitat is fair to good above the passage barriers.**
- **Estimated that 70% is run habitat with good canopy and instream shelter complexity.**

Temperature Data

Year	Ave. Daily Mean	Days Exceed 20°C	Daily Max.	Days Exceed 25°C
1997	16.0	57	25.6	12
1998	15.1	0	21.5	0
1999	15.1	2	28.2	1

Monitoring conducted in 1997 (March-July, & December), 1998 (March-July, & September to November) and 1999 (April to November).

SAN MIGUELITO CREEK
PERCENT HABITAT TYPE
(linear feet)

FIGURE 2-13 SUMMARY OF SAN MIGUELITO CREEK HABITAT ATTRIBUTES (CONTINUED)

The tributary reaches in the lower basin fall into four general categories:

- reaches that have good to excellent rainbow trout/steelhead habitat and support existing rainbow trout/steelhead populations;
- reaches that have good to excellent habitat, but do not currently support an anadromous steelhead population because of downstream passage impediments;
- reaches that have fair habitat and with appropriate enhancement efforts or passage impediment removals could support new or larger populations of rainbow trout/steelhead;
- reaches where conditions are too poor to support rainbow trout/steelhead (*e.g.*, portions of tributaries which go dry or have major passage impediments).

The enhancement objectives of the SYRTAC for the tributaries are:

- to protect tributary habitat that is in good condition and currently supports fish;
- to enhance aquatic habitat in areas with fair conditions;
- to enhance fish passage to suitable habitat on tributaries.

A review of each of the lower basin tributaries is provided in Appendix C, including an assessment of current habitat conditions, water quality and flow patterns, presence of rainbow trout/steelhead, and the enhancement potential for each tributary. Prioritization of the tributaries and tributary actions are described in Section 3.3.1 and Appendix C.

2.4.4 FISH HABITAT CONCLUSIONS

Each species has specific habitat requirements that vary by lifestage. Habitat quality is judged against those requirements. Steelhead need different habitat conditions for spawning than for rearing.

Habitat quality can vary annually depending on rainfall. In wet years, habitat quality is high, and good conditions are more widespread (*i.e.*, perennial flows are present further down tributaries, and more of the mainstem has surface flows). It is worth noting that SYRTAC assessments are based on studies conducted during a relatively wet period for the Santa Ynez River. Potential spawning and rearing habitat for rainbow trout/steelhead in the lower basin was studied because of the need for restoration efforts for this species.

Spawning Habitat

Good spawning habitat for rainbow trout/steelhead can be found in Hilton Creek and mid-to-upper Quiota Creek (Figure 2-14). Spawning habitat in Salsipuedes and El Jaro creeks is moderate, due to the presence of fine sediments and sand in the stream, with some areas of good habitat. Rainbow trout/steelhead consistently spawn in these tributaries. Good habitat exists above passage impediments in San Miguelito and Alisal creeks.

Spawning has been observed in the mainstem directly downstream of Bradbury Dam in 1993 and 1998. Downstream of the Highway 154 Reach, spawning activity is scarce. Evidence of spawning was found near Refugio Road in 1999, and young-of-the-year have been documented here in 1995 and 1998, very wet rain years. In addition, spawning was observed and young-of-the-year found in habitat directly downstream of Alisal Bridge in 2000.

Rearing Habitat

Good quality rainbow trout/steelhead rearing habitat can be supported in the mainstem between Bradbury Dam and the Highway 154 Bridge (Figure 2-15). The Refugio and Alisal reaches of the mainstem have poor rearing habitat conditions in general, although refuge pools in these reaches are valuable. There is some opportunity for enhancement in these two mainstem reaches. In general, rearing habitat is unavailable downstream of the Alisal Reach in the mainstem. In addition to mainstem habitat, a number of the south-side tributary streams provide oversummering habitat. High quality rearing habitat is located in Quiota Creek, upper Salsipuedes Creek, and, with flow enhancement, in lower Hilton Creek. Fair quality habitat exists El Jaro and lower Salsipuedes creeks, and above impassible barriers in Alisal and San Miguelito creeks. While Nojoqui Creek appears to have some good habitat elements, the lack of fish suggests otherwise. Lower Quiota, lower Nojoqui, and lower Alisal creeks have poor habitat and often little or no flow to support oversummering fish.

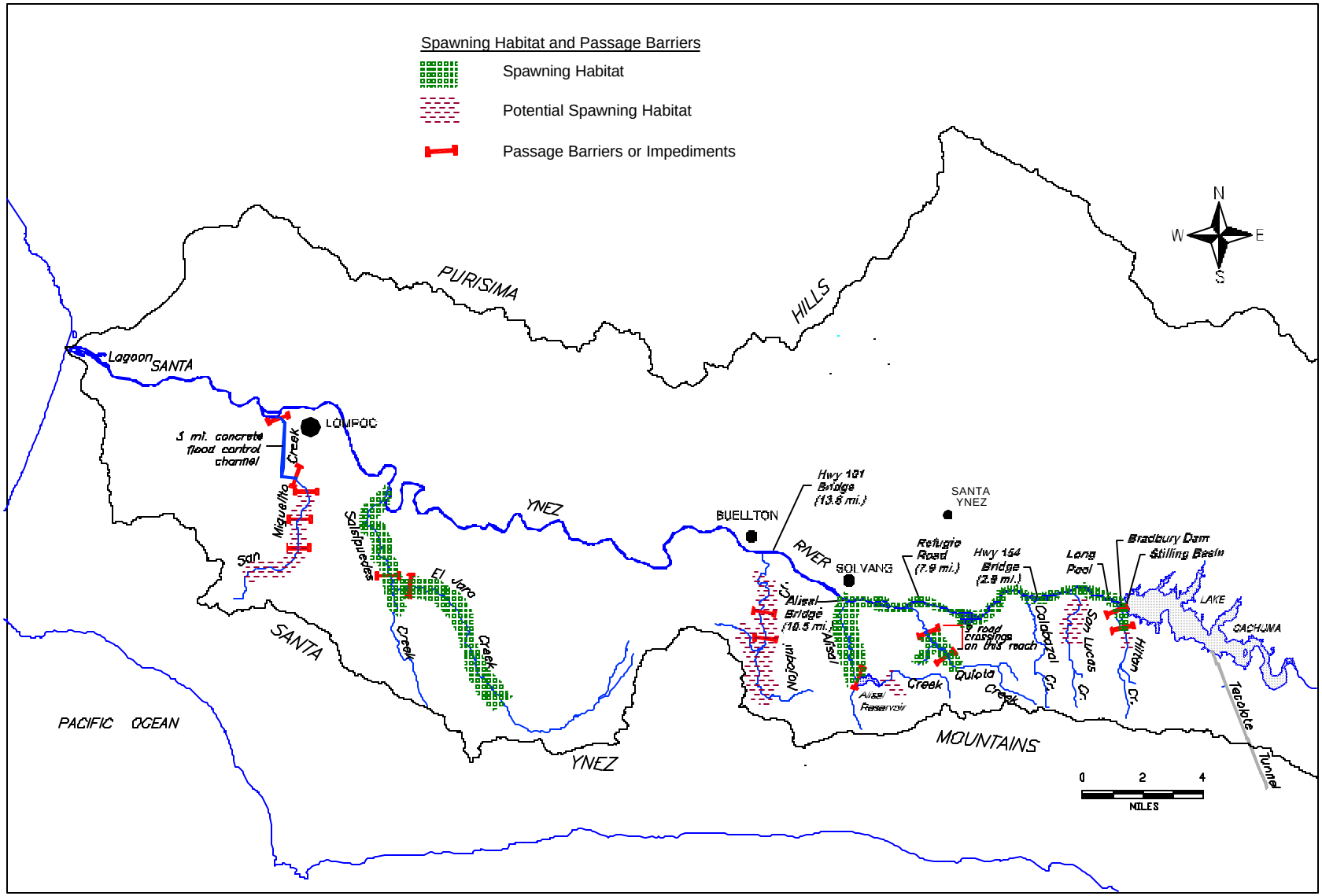


FIGURE 2-14 POTENTIAL SPAWNING HABITAT FOR RAINBOW TROUT/STEELHEAD IN THE LOWER SANTA YNEZ RIVER

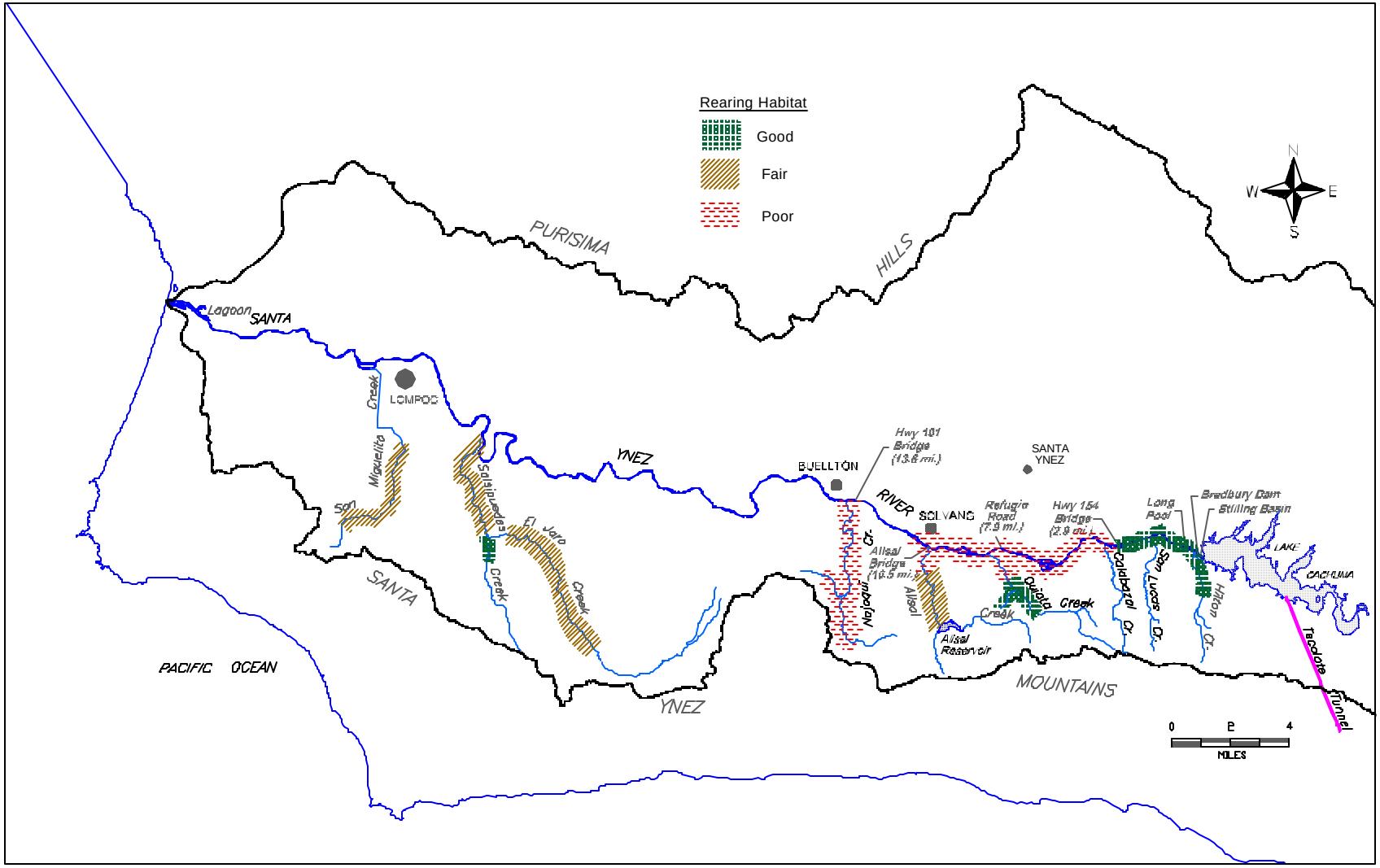


FIGURE 2-15 POTENTIAL SUMMER REARING HABITAT FOR RAINBOW TROUT/STEELHEAD IN THE LOWER SANTA YNEZ RIVER

Santa Ynez Aquatic Habitat Highlights

- Summer conditions of warm water temperatures and low or no streamflow are typical in the mainstem and the lower reaches of most tributaries.
- Rainbow trout/steelhead habitat quality in the mainstem decreases with distance downstream from Bradbury Dam. Habitat conditions are good between Bradbury Dam and the Highway 154 Bridge (2.9 miles). In wet years, fair habitat conditions may extend down to Solvang (10.5 miles).
- Southside tributaries provide fair to good habitat for rainbow trout/steelhead spawning and rearing (Figures 2-14 and 2-15).
    - Although they are low gradient streams, Salsipuedes and El Jaro creeks consistently support spawning and rearing. The lower reach of Salsipuedes could be improved with more riparian cover and bank protection.
    - Hilton Creek supports spawning in years with good winter runoff, but the lower reach dries during the summer. Flow supplementation and some habitat enhancement in the lower reach could sustain rearing fish.
    - Habitat conditions in Nojoqui appear to be of fairly high quality above a small reach that dries near the mainstem Santa Ynez River. However, very little rainbow trout/steelhead use has been observed here.
    - The upper reaches of San Miguelito, Alisal and Quiota creeks have good habitat potential. Passage is a problem in all three creeks. Lower Quiota Creek is degraded from grazing.
- Closure of the sandbar at the river's mouth regulates access for steelhead, both adult spawners entering and juvenile smolts leaving. Juveniles may potentially rear in the lagoon, although evidence is lacking.
- In the mainstem Santa Ynez River, pools with upwelling and/or stratification provide the only oversummering habitat available for rainbow trout/steelhead downstream of the Highway 154 Reach.

3.0 PROPOSED MANAGEMENT ACTIONS

Opportunities for enhancing aquatic habitat and fish populations depend on physical habitat conditions, water availability, access to habitat by fish, and permission to access property or easements for implementation. The key actions include flow-related measures to manage and sustain summer streamflows in the upper mainstem and Hilton Creek, supplementation of fish passage flows, enhancement and protection of physical habitat, and modification of impediments to fish passage. Other actions that were evaluated include use of native rainbow trout/steelhead for stocking programs in the upper basin and passage for adults and juveniles around Bradbury Dam. Because much of the lower basin is in private ownership, a public education and outreach program will be implemented to foster voluntary participation by landowners in restoration efforts and support by the general public. Finally, a long-term monitoring program will be implemented to help assess habitat availability and long-term trends in steelhead use.

3.1 PROPOSED MANAGEMENT ACTIONS

The SYRTAC described a comprehensive range of potential alternatives for managing fishery resources of the lower Santa Ynez River in the Management Alternatives Report (SYRTAC 1998b) and evaluated the merits of each alternative according to the biological benefits provided and constraints for successful implementation. The complete list of potential alternatives considered is provided in Appendix A.

The recommended management actions are based upon an adaptive management strategy, enabling managers to respond to annual and seasonal variation in hydrologic conditions and water supply availability within the Santa Ynez River basin. This strategy also allows Reclamation and the Member Units to implement measures on public lands and private property as opportunities become available.

The proposed management actions emphasize rainbow trout/steelhead because the species is listed as a federally endangered species. Actions to benefit rainbow trout/steelhead are designed to have either no impact or beneficial impacts on other native species. While the proposed actions are not designed to aid introduced species, the actions are not expected to have any significant, negative impacts on these species.

The majority of rainbow trout/steelhead habitat in the lower Santa Ynez River basin is located on private property. Phased implementation of specific project elements and management actions is included, based on access to lands and facilities. Actions that require access to private lands or easements held by other agencies will be implemented only if access is

granted by the appropriate entity. A public outreach program will be integral to fostering voluntary participation in these restoration efforts. Implementation of actions will be accompanied by monitoring to evaluate performance of the action and to identify appropriate modifications, if needed.

The proposed management actions are designed to:

- protect and improve instream habitat within the mainstem Santa Ynez River and tributaries downstream of Bradbury Dam;
- create opportunities for successful migration, reproduction and survival of anadromous steelhead trout; and
- avoid adverse effects on other aquatic or riparian biological resources, including the listed species such as tidewater gobies, California red-legged frogs, southwestern arroyo toads, California tiger salamander, and other native and introduced species.

The proposed management actions have been developed in concert with the need to deliver water supplies, provide for routine maintenance of existing facilities, and maintain groundwater recharge requirements as set forth in WR 89-18 (downstream water rights).

3.1.1 TYPES OF ACTIONS

Recommended actions will benefit the native Santa Ynez River fishes in general, and steelhead in particular, both directly and indirectly by (1) creating new habitat within the lower Santa Ynez River and tributaries, (2) improving habitat conditions within the lower Santa Ynez River and tributaries, (3) improving access to important spawning and rearing habitat in the mainstem and tributaries, and (4) increasing public awareness and support of beneficial actions on private land.

In addition to the proposed actions, a long-term monitoring program will be implemented to track changes in the rainbow trout/steelhead population and their habitat. This program is based on the existing SYRTAC long-term study plan and the actions proposed in this plan.

The recommended management actions include the following.

I. **Create New Habitat.** Actions to increase the availability and quality of habitat for steelhead and other aquatic resources include:

- Conjunctive use of reservoir releases with downstream water rights releases to maintain specific flow targets will maintain and protect fish and habitat in the mainstem reaches near Bradbury Dam;

Conjunctive Use

- Modifications to lower Hilton Creek to provide additional, new summer rearing habitat by providing a reliable water supply and by constructing a 1,500-foot long channel extension if it is determined to be feasible;

Hilton Creek Enhancement

- Creating an Adaptive Management Account with 500 AF of water that can be used to provide habitat in Hilton Creek and the mainstem, or to augment passage flow releases.

Adaptive Management Account

II. **Improve Existing Habitat.** Actions to increase the quality of habitat for steelhead include:

- Protection and enhancement of steelhead spawning and rearing habitat in tributaries through the establishment of conservation easements and/or leases and implementation of habitat improvements such as riparian planting, structural improvements to instream habitat, and bank stabilization; and

Tributary Habitat Enhancement

- Structural improvements in mainstem pools and riparian plantings to increase the amount and quality of suitable habitat.

Mainstem Habitat Enhancement

III. **Improve Access to Habitat.** Actions to provide or improve access to existing habitat:

- Establish a Fish Passage Account to provide a dedicated water supply to create additional migration opportunities for steelhead; and

Fish Passage Account

- Modification of fish passage impediments associated with road crossings in the tributaries to enhance the availability of habitat for steelhead spawning and rearing.

Fish Passage Impediments

- Continue to investigate opportunities to provide passage for steelhead around Bradbury Dam.

Study Upper Basin Access

IV. **Increase Public Awareness.** Actions to increase public awareness and support for beneficial actions on private land include:

- Public education and outreach to increase awareness by local landowners and the public of types of actions and land-use practices which will benefit aquatic resources. This action may

Public Education and Outreach

also include the deterrence of poaching by posting a fish moratorium and publicizing citations; and

- Provide Technical Assistance and assist in funding acquisition for voluntary actions to improve steelhead habitat on private land.

Provide Technical Assistance

3.1.2 CONSTRAINTS AND LIMITATIONS

As reviewed in Section 2, potential management actions in the lower Santa Ynez River are constrained by existing hydrologic conditions, water supply operations, and land use. These include:

- The Santa Ynez River watershed has high inter- and intra-annual variability in precipitation and runoff, with extremely wet and extended drought periods. The majority of rainfall and runoff occurs in the winter and early spring months. Even in high flow years, there is often no flow or very low flow in the mainstem of the Santa Ynez River, both above and below Lake Cachuma and in the lower reaches of the tributaries from July until the onset of the rainy season.

Variable Rainfall and Streamflows

- The availability of suitable aquatic habitat is limited within the mainstem river as a function of water temperature gradients and habitat characteristics downstream of Bradbury Dam. The temperature of water released from Lake Cachuma warms quickly as it moves downstream, especially in summer.

Constraints on Habitat Quality

- The Santa Ynez River has many existing uses and obligations to supply water to surrounding communities, and water supplies are limited. Lake Cachuma is the principal water supply for 200,000 people along the South Coast. The Santa Ynez Valley also depends on the river and groundwater to provide water supplies to several cities and to agriculture.

Limited Water Supply

- Downstream water rights releases made to recharge the groundwater below Bradbury Dam can be variable. The releases are generally made during normal and dry years between June and October. During wet years, no water rights releases may be needed because spills over the dam and tributary flows are sufficient to recharge the groundwater.

Water Rights Releases

- The majority of the Santa Ynez River Valley below Bradbury Dam and its tributaries is in private ownership. Several conservation measures that would benefit fisheries require access to private land. These measures can only be undertaken with the permission and concurrence of the landowner. The successful implementation of

Private Property

these conservation measures will need a public outreach and technical support program.

Multiple Land Uses

- The lands next to the Santa Ynez River and along the tributaries support agriculture and are becoming more urbanized. The river channel and associated riparian vegetation has been altered by various land uses.

Exotic Species

- Non-native fish (bass and catfish) prey upon native fishes and hatchery rainbow trout (which have entered the lower river during Bradbury Dam spill events) compete with and may interbreed with native rainbow trout/steelhead for available habitat in the Santa Ynez River.

3.1.3 OPPORTUNITIES FOR IMPLEMENTATION

Since a substantial amount of the Santa Ynez River and its tributaries downstream of Bradbury Dam are on privately owned lands, the proposed actions have been grouped according to the opportunities for implementation (Table 3-1):

- actions that can be implemented directly by Reclamation and other participating agencies; and

- actions that require cooperation between agencies and private landowners.

The following sections describe each management action, presenting the 1) objective, 2) biological need that is being addressed, 3) project description, and 4) considerations for implementation. Details of the proposed management actions are provided in Appendix B (Flow Related Fish Enhancement in the Santa Ynez River), Appendix C (Tributaries of the Santa Ynez River Below Bradbury Dam), Appendix D (Hilton Creek Enhancement), and Appendix I (Long-Term Monitoring in the Lower Santa Ynez River).

TABLE 3 - 1 OPPORTUNITIES FOR IMPLEMENTATION OF PROPOSED ACTIONS.

Actions That Reclamation or the Water Agencies Can Implement	
Habitat Enhancement (mainstem below Bradbury Dam and Hilton Creek)	• Conjunctive uses of mainstem rearing target flow releases with downstream water rights releases • Passage flow supplementation (including reservoir surcharge) • Creation of the Adaptive Management Account to provide a dedicated volume of water to be managed for increased fishery benefit • Hilton Creek enhancement: supplemental water supply, lower channel extension, and passage impediment modification • Fish rescue operations • Mainstem pool habitat enhancement on Reclamation property
Education	• Public education and outreach program
Actions Requiring Cooperation with Other Agencies or Private Landowners	
Tributaries Below Bradbury Dam	• Stream habitat enhancement and protection • Passage impediment modification
Mainstem Below Bradbury Dam	• Stream habitat enhancement and protection
Genetic Protection of Native Stocks	• Use southern steelhead stocks for ongoing stocking programs above Bradbury Dam
Increase Smolt Production	• Downstream transport of outmigrating juveniles from the upper basin

3.2 RECLAMATION OR WATER AGENCIES' ACTIONS

3.2.1 CONJUNCTIVE USE OF WATER RIGHTS AND MAINSTEM REARING RELEASES

Objective

To improve summer rearing habitat conditions for rainbow trout/ steelhead and other fish in the mainstem (from Bradbury Dam down to Highway 154 and Alisal) and in lower Hilton Creek through water releases from the Lake Cachuma.

Biological Need

Summer habitat for fish is limited in the lower mainstem Santa Ynez River (SYRTAC 1997b, 1998a, 2000). Prior to construction of Bradbury Dam and under historic operating conditions, portions of the mainstem below Bradbury Dam typically went dry during the summer (Shapovolov 1944, 1946). Under existing project operations, the river was dry in the summer and fall and habitat was limited to isolated pools. Accumulated algae within the pools can cause DO to fall below critical levels during the night (SYRTAC 1997b). The benefits achieved from additional flows will depend on the time of year and hydrologic conditions. Benefits can include increased amount of aquatic habitat, reduced water temperatures in reaches close to the dam, and improved DO conditions from flushing of accumulated algae. Additional instream flows would also promote the growth of riparian vegetation, thereby increasing shading, habitat complexity, and food supply.

Project Description

To provide additional rearing habitat, target flows will be established at two locations in the mainstem. The target flow levels will be met by a combination of natural flow and releases from Lake Cachuma. The releases will be made primarily through the Hilton Creek supplemental water supply system (described in Section 3.2.4 and Appendix D) and/or the dam outlet works (downstream water rights releases). Continuous flow will be provided during all but the driest (2%) years to the Highway 154 Bridge (2.9 miles below Bradbury Dam). In very wet years (spills greater than 20,000 AF) and the year following such a wet year, flow will be maintained at the Alisal Road Bridge (mile 10.5). Releases made to meet the target flows will be conjunctively operated with the downstream water rights releases (described below). When releases are being made for water rights, the water from this source will be used to meet the mainstem target

Dry conditions within the Refugio Reach downstream of the Highway 154 Bridge.

flows. Releases will be adaptively managed to improve habitat conditions and build the rainbow trout/steelhead population during wet years, while reducing release levels to maintain fishery resources in dry years. Mainstem rearing target flow releases are replacing the existing Fish Reserve Account. Water will be released as necessary to meet the established target flow levels as described below. A more complete description of this action is provided in Appendix B.

Priority Reaches

Priority mainstem reaches have been established based on the quality of existing physical habitat, results of water temperature monitoring and modeling, and the likelihood for successful protection and improvement of steelhead populations. The target flows have been designed based on these priorities.

1st Priority: Hilton Creek

Hilton Creek provides good structural habitat conditions below the dam. Rainbow trout/ steelhead have been observed spawning and rearing in Hilton Creek until the natural flow dries up in the early summer. The lack of summer flow results in the loss of fish production in lower Hilton Creek. Water releases into Hilton Creek through the supplemental watering system (described in Section 3.2.4 and in Appendix D) will provide year-round habitat in the lower reaches.

2nd Priority: Mainstem from Hilton Creek to Highway 154

The reach of the mainstem from the confluence with Hilton Creek to the Highway 154 Bridge is given second priority for releases. This portion of the mainstem has the most suitable habitat structure for steelhead rearing. The Highway 154 Reach is also the area where water temperatures can be maintained below stressful or potentially lethal levels for steelhead on a reliable basis.

3rd Priority: Mainstem from the Dam to Hilton Creek

The mainstem reach from Bradbury Dam to Hilton Creek is given third priority because of the larger benefit to be gained by releasing water down Hilton Creek, which is much better habitat for steelhead. In wet years, when flow releases may total 10 cfs (depending on natural contribution to flow), approximately half the water will be released to the Stilling Basin to support habitat in this area. Under these conditions, this area would be expected to support larger steelhead (>150 mm) that can avoid predation by introduced exotic species such as bass and catfish.

4th Priority: Highway 154 Bridge to Solvang

Fourth priority will be given to the area from Highway 154 to the Solvang area (Refugio and Alisal reaches), and flow targets will be established in this reach in certain years and under certain hydrologic conditions. Pools, particularly in the reach between Bradbury Dam and the Alisal Bridge, are important refuge habitat for juveniles and adults during low flow periods. Such pools retain cooler water (through upwelling and stratification) during the warm summer months. Although temperature studies suggest that summer flow releases will not improve overall temperature conditions beyond the Highway 154 Bridge, flow regimes

that would allow over-summering pools to exist under various hydrologic conditions will be considered.

Mainstem Rearing Target Flows

Highway 154 Target Flows

In wet years, when Lake Cachuma spills at least 20,000 AF, releases will be made to maintain flows between the dam and the Highway 154 Bridge (including Hilton Creek) at 10 cfs. In years when the reservoir has a small spill (<20,000 AF spill) or does not spill at all, but has at least 120,000 AF in storage, the target flow will be 5 cfs. When Lake Cachuma storage is below 120,000 AF, the target flow at the Highway 154 Bridge will be 2.5 cfs. Based on the results of modeling the conjunctive operations, flows at the Highway 154 Bridge would *meet or exceed* 2.5 cfs about 98% of the time, 5 cfs about 77% of the time, and 10 cfs about 39% of the time (Santa Ynez River Hydrologic Model [SYRHM] results for water years 1918-1993, see Appendix B for more detail). If storage recedes to less than 30,000 AF, 30 AF per month will be reserved to provide refreshing flows to the Stilling Basin and Long Pool immediately below Bradbury Dam. These very dry conditions have occurred only three times in the last 76 years.

Alisal Bridge Target Flows

In addition to Highway 154 Bridge targets, flow targets will be established at the Alisal Road Bridge approximately 10.5 miles downstream from Bradbury Dam. In years when the Lake Cachuma spill amount exceeds 20,000 AF and steelhead are present in the Alisal Reach, a target flow of 1.5 cfs will be maintained. A 1.5 cfs target will also be maintained in the year immediately following such a spill year if steelhead are present. Based on the results of the SYRHM, flows at the Alisal Bridge would *meet or exceed* 1.5 cfs about 75% of the time.

TABLE 3-2 MAINSTEM REARING TARGET FLOWS

Lake Cachuma Storage	Reservoir Spill?	Target Flow	Target Site
> 120,000 AF	Spill > 20,000 AF	10 cfs	Highway 154 Bridge
> 120,000 AF	Spill > 20,000 AF	1.5 cfs*	Alisal Road Bridge
> 120,000 AF	Spill < 20,000 AF or No Spill	5 cfs	Highway 154 Bridge
< 120,000 AF	No Spill	2.5 cfs	Highway 154 Bridge
< 30,000 AF	No Spill	Periodic release; ≤ 30 AF per month	Stilling Basin and Long Pool
> 30,000 AF	Spill < 20,000 AF or No Spill	1.5 cfs*	Alisal Road Bridge**

*When rainbow trout/steelhead are present in the Alisal Reach.
**This target will be met in the year immediately following a >20,000 AF spill year.

Conjunctive Operation with Water Rights Releases

Releases will be made for downstream water rights. Mainstem targets will be met through conjunctive use of reservoir releases and water rights releases. Conjunctive use will result in year-round good quality habitat flow in the upper mainstem and Hilton Creek. This conjunctive operation will occur through coordination among Reclamation, the Member Units,

the Adaptive Management Committee, and SYRWCD, which have committed to participate in conjunctive use operations. Water releases can be made from the Bradbury Dam outlet and/or the Hilton Creek supplemental watering facility (described in Section 3.2.4 and Appendix D).

Downstream Water Rights Releases

Releases are made from Bradbury Dam to meet downstream water rights requirements (WR 89-18), typically during the late spring and/or summer and early fall and with flow patterns designed to recharge the alluvium between the dam and Lompoc Narrows and the Lompoc groundwater basin. Downstream water rights releases are typically not made in wet years because the aquifers have been sufficiently recharged by heavy winter rains. Water rights releases are usually made between July and October. Releases are only made when flow is discontinuous between Bradbury Dam and the Pacific Ocean indicating that there is available storage space in the groundwater aquifers. At least 10,000 AF of de-watered storage must exist in the above Narrows basin prior to a water rights release. In addition, when releases are made, release rates are maintained such that water disappears in the lower reaches of the Santa Ynez River channel. Thus, water rights releases do not create a continuous channel to the ocean nor are releases made when continuous flow exists.

Ramp Down of Releases

Releases will be managed to avoid stranding of rainbow trout/steelhead and other fishes. Water rights releases will be ramped down such that flow at Highway 154 is 5 or 2.5 cfs, at which point ongoing releases will be made as needed to meet the mainstem target flow. The ramp down schedule is provided in Table 3-3.

TABLE 3 - 3 RAMP-DOWN SCHEDULE FOR DOWNSTREAM WATER RIGHTS RELEASES.

Release Rate (cfs)	Maximum Ramping Increment (cfs)	Minimum Ramping Frequency
> 90	25	4 hours
90 - 30	10	4 hours
30 - 10	5	4 hours
10 - 5	2.5	4 hours
5 - 3.5	1.5	4 hours
3.5 - 2.5	1	4 hours

Hilton Creek Watering System

Water releases for the conjunctive use operation will be made primarily through the Hilton Creek supplemental watering facility (described in detail in Section 3.2.4 and Appendix D). The Hilton Creek facility is designed to deliver water from Lake Cachuma to three releases points:

two in Hilton Creek and one in the Stilling Basin (mainstem). The designed capacity of this system is 10 cfs. Releases for downstream water rights will be made using the Bradbury Dam outlet works although a portion of these releases, up to 10 cfs, may go through the Hilton Creek facility.

Flow Monitoring

Habitat maintenance flow targets have been established at the Highway 154 Bridge, where there was formerly a U.S. Geological Survey (USGS) gaging station. A number of options for monitoring the Highway 154 target flow compliance are being explored. The Member Units are in discussion with CalTrans, which has an easement at the Highway 154 Bridge, to allow access for gage installation and monitoring. Until the gage is in place, monitoring of the flow level at the Highway 154 Bridge will occur weekly when flows have receded to the target flow levels using a standard methodology. In addition, a staff gage or other marking device may be used once weekly monitoring for no less than one rearing season has occurred to establish the relationship between the marker and flow. Flows in the Alisal Reach will likely be monitored by the USGS Solvang gage. Modifications to this gage will be necessary to improve its ability to monitor low flows. If the residual pool depth must be maintained in the interim period in the Refugio and Alisal Reaches, a staff gage installed these pools will be monitored weekly.

Considerations for Implementation

The ability to manage the combined releases from Bradbury Dam to the mainstem varies substantially among years in response to variation in factors such as precipitation and runoff, reservoir storage, and downstream need. The ability to implement the mainstem rearing target flows depends upon achieving the proposed 3-foot reservoir surcharge instead of the existing 0.75-foot surcharge. The additional water provided by the surcharge will support fish enhancement flows. This water will be available prior to implementation of the flow targets described above.

Reservoir Surcharge

Reclamation plans to construct the spillway gate modifications required for implementing either the 1.8 or 3 foot surcharge next year (2001). It is anticipated that it may take longer for the environmental review and compliance to be complete for the proposed 3-foot surcharge and thus for implementation of the mainstem target flow releases described above. Temporarily raising the lake surface elevation to 753 feet MSL will require disclosure of potential effects on the human environment, including flooding of some county park facilities, and effects on sensitive resources such as oak trees (NEPA compliance). CEQA review will be completed by this fall as it is included in the Environmental Impact Report (EIR) being completed for the SWRCB Cachuma Project water rights hearing. Reclamation anticipates that resolution of the environmental compliance issues can be achieved no later than 2004,

allowing the reservoir to surcharge to the 3-foot level during the first spill event following compliance.

Interim Targets

Until the 3-foot surcharge water is available, interim target flow levels will be in place. These levels are structured similarly to the long-term target flows. A target of 5 cfs will be established at the Highway 154 Bridge in years when the reservoir spills at least 20,000 AF. In years when there is a weak spill (<20,000 AF) or no spill, the Highway 154 target flow will be determined at the start of each month based on reservoir storage: 2.5 cfs when storage is greater than 120,000 AF and 1.5 cfs when storage is less than 120,000 AF. Periodic releases to refresh the Stilling Basin and Long Pool will be made when storage is less than 30,000 AF.

Alisal Road targets will not be set during the interim period however the residual pool depth will be maintained in refuge pools in the Refugio and Alisal reaches. The residual pool depth is defined as the difference between the elevation of the deepest point in the pool and the elevation of the lowest point of the crest (outlet depth) that forms the pool's hydraulic control. These pools will be maintained during the interim period during spill years (spill >20,000 AF), the year immediately following a spill year, and only when steelhead are present in the pool habitat. Maintenance of the residual pool depth is designed to provide habitat space for the rainbow trout/ steelhead inhabiting these habitats and also to improve water quality (high water temperatures are typically found in these reaches during the summer). There are a number of uncertainties regarding this action, therefore monitoring and evaluation of the action and the maintained habitat will be a focus of the Adaptive Management Committee.

Table 3-4 summarizes the proposed allocation of water under the current, interim, and long-term phases of project implementation.

3.2.2 FISH PASSAGE SUPPLEMENTATION

Objective

To create additional migration opportunities in the mainstem for steelhead to reach the tributaries near Bradbury Dam.

Biological Need

Steelhead, like the other anadromous salmonids, are born in freshwater and live there for generally one or two years before migrating to the sea. While at sea, they grow to sexual maturity and then return to the stream in which they were born to spawn. If passage from the ocean to their

TABLE 3-4 ALLOCATION OF SURCHARGED WATER UNDER THE PROPOSED IMPLEMENTATION PHASES

Surcharge Level	Account/Use	Surcharge Allocation (AF)	Total Amount in Surcharge Years (AF)
0.75 foot (current)	Mainstem Rearing Target Flow Releases*	2,300	2,300
1.8 foot (interim)	Mainstem Rearing Target Flow Releases*	3,000	5,500
	Fish Passage Account	2,500	
3.0 foot (long-term)	Mainstem Rearing Target Flow Releases*	5,500	9,200
	Fish Passage Account	3,200	
	Adaptive Management Account	500	

*There is no account for the mainstem rearing target flows. The allocation in surcharge years will be dedicated to support the target flows year-round, however additional water will be released as needed to meet the targeted flow level. These releases replace the Fish Reserve Account as established in the MOU and WR 94-5.

spawning grounds is prevented, the steelhead cannot complete its lifecycle nor spawn the next generation. Bradbury Dam and the storage of water in Lake Cachuma act to decrease the number of passage opportunities that were historically provided in the mainstem river (see Appendix B for a more detailed analysis).

Project Description

For the purpose of supplementing passage flows, Reclamation will dedicate a specific volume of water to a Fish Passage Account in the Lake Cachuma. The Fish Passage Account is dedicated to providing water for additional migration opportunities for both up- and down-migrant steelhead. An experimental program for supplementing existing storm flow has been developed and is described below. The Fish Passage Account water will be released in January through May to extend the receding limb of naturally occurring storm hydrographs once the sandbar at the mouth of the river has been naturally breached. Water will be released to supplement passage beginning in the year following the surcharge year, and in subsequent years until the balance of the passage account is exhausted or the reservoir has surcharged again. The passage releases are experimental and therefore will be adaptively managed based on the water in the Fish Passage Account, prior passage opportunities, water year type, and migrant trapping data. In addition, Reclamation and the Member Units will work with NMFS to further refine this program to improve the benefit of the passage releases.

Allocation and Accounting

The Fish Passage Account will be filled in years when the reservoir surcharges and released in subsequent years to enhance passage opportunities by augmenting the storm hydrographs. The Fish Passage Account will be allocated 3,200 AF of water in years when the reservoir surcharges to 3 feet. Fish Passage Account water stored in Lake Cachuma will not diminish by evaporation or seepage losses. Any unused portion of the Fish Passage Account will be carried over to following years until the reservoir surcharges again. In the event of a spill, the Fish Passage Account will be reset to a new allocation of 3,200 AF. If only a partial surcharge is possible, less than 3 feet, then the Fish Passage Account would receive the surcharge amount in excess of the 1.8-foot surcharge, plus any carryover in the account with the total not to exceed 3,200 AF. Simulations with the Santa Ynez River model indicate that when the reservoir spills, the surcharge space between 1.8 and 3 feet is completely filled; although in theory, a partial surcharge is possible.

Passage Supplementation Criteria

Releases for fish passage supplementation will be made in years following a surcharge year until all of the water in the Fish Passage Account has been released. Releases will be made to augment most storms in January through May. The first storm in January may not be supplemented as it will recharge the watershed in preparation of future releases. A 'storm' occurs when flows at the Solvang reach 25 cfs, which is the flow criteria that allows adult steelhead to pass critical riffles in the Alisal Reach (ENTRIX 1998). The storm hydrograph will continue to rise from 25 cfs and will eventually peak. Once the storm is over, the event hydrograph will then begin to recede. When the storm peak recedes to 150 cfs at Solvang, then the releases from the Fish Passage Account will commence.

Supplementation will take the form of extending the descending limb of storm events (from the 150 cfs trigger point) such that the storm recession at a location downstream of Bradbury Dam (Alisal Bridge, Solvang) mimics the shape of the recession upstream of Lake Cachuma (calculated from historical data). The combination of instream flows and Fish Passage Account releases will provide 14 days or more of passable flows. In the event that a storm does not produce flows of 150 cfs at Solvang, then releases of up to 150 cfs will be made from the Fish Passage Account to reach this flow level, and subsequent releases will be made to produce the targeted recession curve shape. The passage flow supplementation criteria were designed to provide additional passage opportunities for steelhead to reach the good quality habitat in the mainstem and tributaries near Bradbury Dam (*i.e.*, above the Alisal Reach). The passage supplementation criteria are described in detail in Appendix B.

Adaptive Management

The protocol set forth above will be used to supplement passage flows and will be monitored closely to provide information to the Adaptive Management Committee (discussed in Section 5.6). As data are gathered on passage releases and fish movement within the system, modifications to the release scenario might be made. Generally, modifications within the range of the adaptive management program will be designed to enhance fish migration. Such modifications may include changing the trigger flow level, changing the definition of a storm, and selecting to boost storm peaks that are less than 150 cfs to different levels. Releases in the month of May might also be modified as more outmigrant information is developed.

Considerations for Implementation

Water for the Fish Passage Account will be provided by the proposed 3-foot reservoir surcharge. Currently Lake Cachuma can only be surcharged to 0.75 feet therefore modifications to the spillway gates will be necessary prior to implementing the Fish Passage Account. In addition, operating criteria have to be put in place for monitoring peak storm flows at Solvang and concurrent releases at Bradbury Dam for the purpose of implementing the passage flow supplementation.

Interim Account

As described in Section 3.2.1, the Bradbury Dam flashboards will be modified next year (2001) to accommodate a surcharge. However, the reservoir can only be surcharged to the 1.8 foot level until the environmental review for 3-foot surcharge is completed (anticipated by 2004). Reclamation has already completed the environmental review on an intermediate surcharge level (1.8 feet) and will implement this intermediate surcharge as soon as possible (spring 2002 or the first spill thereafter). With the water available from the 1.8-foot surcharge, an interim allocation to the Fish Passage Account (2,500 AF) will be made. This interim allocation will occur in surcharge years until the 3-foot surcharge is implemented. Table 3-4 summarizes allocation of surcharged water under different scenarios.

3.2.3 ADAPTIVE MANAGEMENT ACCOUNT

Objective

To provide the Adaptive Management Committee (described in Section 5.6) with the resources to take advantage of opportunities where additional releases would increase the biological benefit to the downstream aquatic resources.

Biological Need

The Santa Ynez River system is still under study, and new information about many of the operations proposed in this document will be gathered over the course of implementing and monitoring these measures. It is likely that opportunities will arise where small amounts of additional

water could provide a substantial biological benefit in this adaptive management program.

Project Description

An Adaptive Management Account will be established within Lake Cachuma. The Account will contain water that the Adaptive Management Committee can use to provide additional benefits to steelhead and their habitat.

Adaptive Management Account

The Adaptive Management Account will allocate 500 AF of water in years when the reservoir surcharges to the 3-foot level. The Adaptive Management Account will not experience evaporation or seepage losses, and the unused portion will be carried over to the next year. In the event of a spill, the Adaptive Management Account will receive a new allocation to fill the account up to 500 AF from the surcharged water.

Account Releases

The Adaptive Management Account will be used at the discretion of the Adaptive Management Committee to increase the biological benefit to steelhead and their habitat as opportunities arise. The account water can be used to increase releases for mainstem rearing, to provide additional flows to Hilton Creek, or to provide additional water for passage flow supplementation. For instance, perhaps the last storm of the season was the first week in May and that storm was supplemented by water from the Fish Passage Account. However, monitoring data from trapping is demonstrating that a number of smolts are attempting to outmigrate but are having difficulty because of low flows in the mainstem. Water from the Adaptive Management Account could be released to provide additional flow for these fish.

Considerations for Implementation

The Adaptive Management Committee is tasked with managing the flow related releases discussed in this Plan. The Adaptive Management Account provides resources to the management team to further enhance the downstream fishery. NMFS has required at 30 working day review period and approval of any Adaptive Management Committee decisions that are expected to affect steelhead (NMFS 2000) (the 30-day period is waived prior to the ability to surcharge to 3 feet). The water to be allocated to the Adaptive Management Account is provided by the proposed 3-foot surcharge and thus the Account will not be in place until the surcharge is complete and the water from it, available (there is no interim account) (Table 3-4). See "Considerations for Implementation" for either the mainstem target flows or passage supplementation (or Appendix B) for a more detailed discussion of the surcharge implementation.

3.2.4 HILTON CREEK HABITAT ENHANCEMENT AND FISH PASSAGE

Objective

To create additional perennial spawning and rearing habitat for rainbow trout/steelhead in Hilton Creek and to improve passage to upstream habitat.

Biological Need

In general, the lower Santa Ynez system lacks summer habitat. Hilton Creek is a small intermittent stream located just downstream of Bradbury Dam. The lower reach goes dry, usually in the early part of the summer. SYRTAC studies have documented, during wet years, the migration of adult rainbow trout/steelhead into Hilton Creek, spawning activity, and successful production of fry. Usually, however, the fry are lost when the stream dries up and they are stranded or forced to move downstream to the mainstem Santa Ynez River, where they are vulnerable to introduced predatory fish.

Project Description

Because lower Hilton Creek is within the jurisdictional authority of Reclamation and because it naturally supports good steelhead habitat, it presents an excellent opportunity to provide significant benefits to rainbow trout/steelhead through a variety of enhancement measures (Figure 3-1) [described in greater detail in Appendix D] including:

- flow augmentation from Lake Cachuma via a supplemental watering system;
- construction of a 1,500-foot extension channel at the lower end of Hilton Creek; and
- construction of upstream passage facilities at two passage impediments.

Supplemental Watering System

Augmenting the natural flows in Hilton Creek to support spawning and rearing habitat is a high priority for the conjunctive use operation. A supplemental water system has been constructed to provide a dependable year-round source of cool water to enhance stream habitat for rearing steelhead in lower Hilton Creek, currently a seasonally intermittent stream. Flow augmentation is feasible due to the creek's proximity to the reservoir.

System Operation

The supplemental watering system (Figure 3-1) will operate by both gravity feed (system in place) and a pumping system (in place in 2002). Gravity driven operation provides flow at higher lake elevations. The pump system will operate at lower lake elevations. Having both the gravity-flow and pump system will ensure consistent water deliveries to Hilton Creek. This facility is designed to have a capacity of 10 cfs from all three release points but actual capacity will depend on the pump, facilities, and lake level. In addition a flexible intake will be added to the Lake Cachuma intake (anticipated in 2001) so that cool water can be

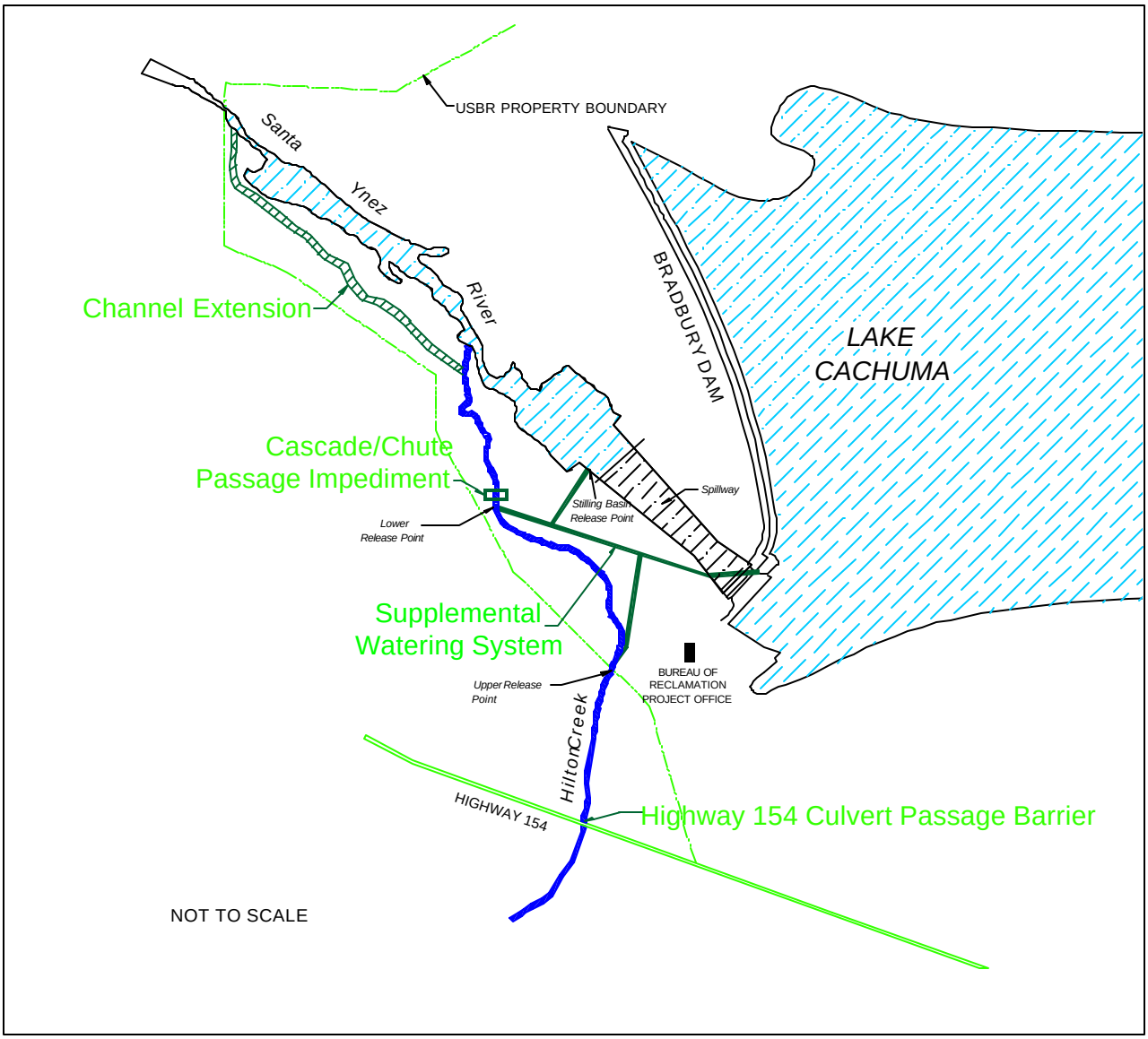


FIGURE 3-1 HILTON CREEK ENHANCEMENT PROJECT SITES.

The Hilton Creek spawning pool shown before (left) and after (right) augmentation utilizing the supplemental watering system.

delivered through the system. The temperature of released water will not exceed 18°C.

Release Levels

Releases through the watering system will be managed by the Adaptive Management Committee. Some or all of the releases made to meet the mainstem target flows will be made via Hilton Creek. Releases into Hilton Creek will be made to maintain flows generally between 2 and 5 cfs depending on the water year type, natural flow in Hilton Creek, and the amount of water stored in the lake. A 2 cfs minimum flow in Hilton Creek will be maintained once the pump system is installed thus creating the ability to water the lower reach in 98% of years (NMFS 2000). The Adaptive Management Committee may decide to modify this minimum flow, although the decision must be approved by NMFS. Data to determine the flow versus habitat quantity in lower Hilton Creek will be collected to assist in system evaluations.

Management of Releases

The facility has three delivery points, two in Hilton Creek that can be used to maximize habitat availability and minimize water warming, and one to the Stilling Basin to provide improved water quality conditions

when necessary (Figure 3-1). Releases will be primarily made from the upper release point in most years. Release location and magnitude (*e.g.*, flow rates at the three release points) will be adaptively managed based on variables such as fish use, water temperature, water loss, and natural flow in the system. Monitoring of Hilton Creek will occur to provide information to the Adaptive Management Committee (Appendix I – Long-term Monitoring in the Santa Ynez River). NMFS will be contacted immediately if water releases fail for any reason (NMFS 2000).

Hilton Channel Extension

The benefits of the supplemental watering system will be leveraged by creating an additional stream channel that can also be watered if the project is determined to be feasible (see Appendix D for greater detail). The lower reach of the Hilton Creek channel will be modified to provide additional fishery habitat within an extension, approximately 1,500 feet long. The channel extension will be constructed on Reclamation property and will approximately parallel the Santa Ynez River before joining the river at the Long Pool. The channel extension will be designed with a series of pools, riffles, and a winding main water channel and will be built to accommodate flows of up to 15 cfs. The existing channel will be used as an overflow channel to convey flows greater than 15 cfs to the Santa Ynez River. Migrating adult rainbow trout/steelhead will be able to enter Hilton Creek through either the high flow channel or the channel extension.

Channel Alignment

The SYRTAC evaluated two possible alignments for the channel extension (Figure 3-2). One uses a portion of a relic overflow channel with a riparian corridor of mature sycamore, which has the advantage of already having a well-developed riparian canopy (Alignment B). The second possible alignment is closer to the mainstem Santa Ynez River and would be constructed across the alluvial floodplain (Alignment A). Based on data on groundwater levels, potential seepage loss, potential water temperatures, and long-term maintenance requirements, Alignment B has been selected as the preferred alternative. Appendix D provides a detailed description of the selection criteria, data analysis and outstanding issues to be addressed prior to implementation of the channel extension.

Passage in Hilton Creek

Improving passage at the rocky cascade and bedrock chute (located about 1,380 feet upstream of the confluence with the Santa Ynez River) will enhance access to approximately 2,800 feet of stream up to the Highway 154 Culvert (1,600 feet of this stream reach is on Reclamation property). Construction of this project is scheduled for Fall 2001. The cascade is too high for steelhead to pass because of the shallow chute pool at its base and the velocity barrier formed by the bedrock chute above it. Passage at the cascade will be improved by installing a control structure at the downstream end of the chute pool. This will make the chute pool deeper

Cascade & Chute Passage

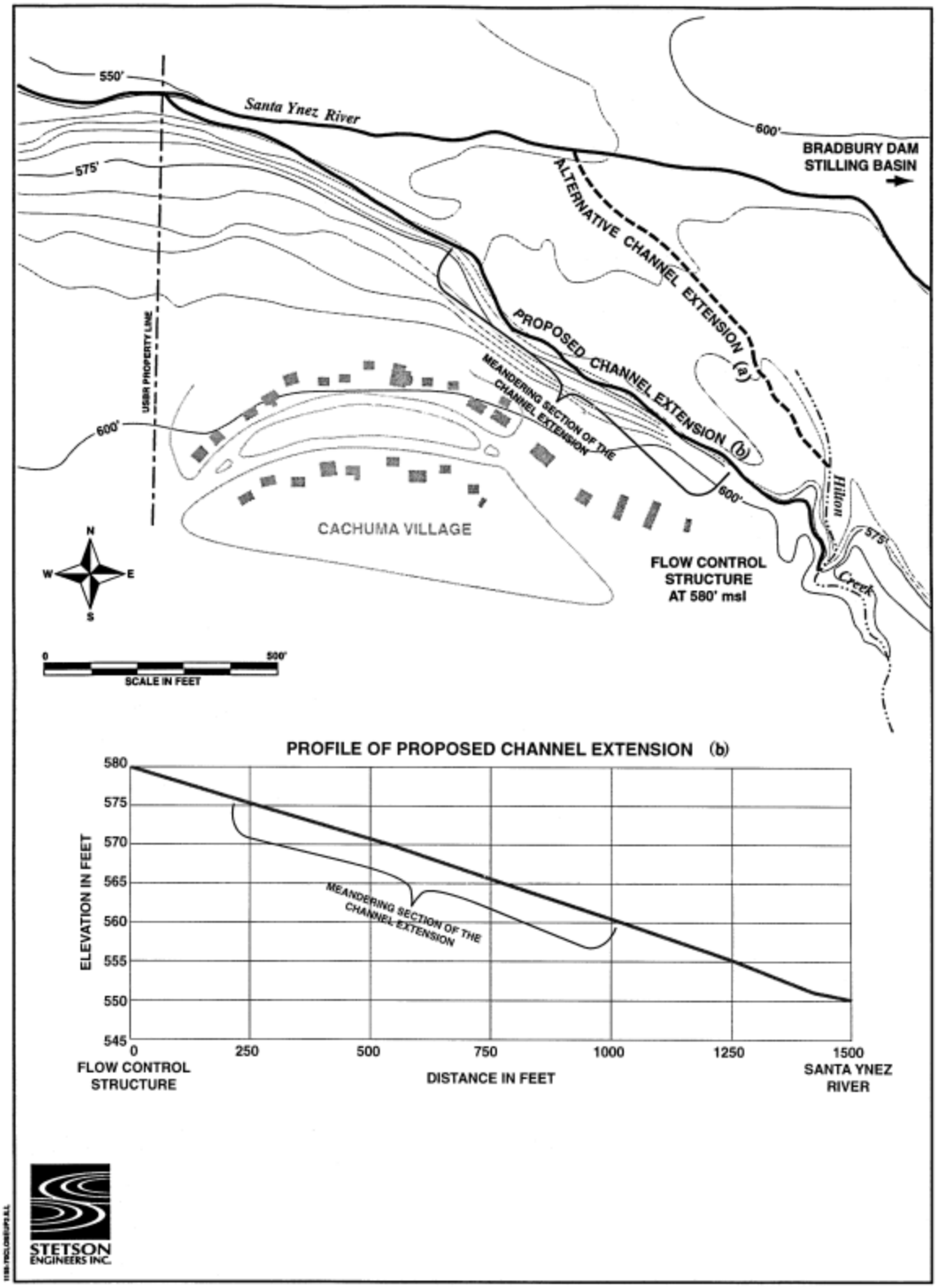


FIGURE 3-2 POSSIBLE ALIGNMENTS FOR CHANNEL EXTENSION.

and reduce the height of the cascade. In addition, a small resting pool will be excavated at the top of the cascade. Finally, several concrete boulder-like structures will be installed in the bedrock chute to slow down flows and increase water depth. These structures will create pockets in which migrating fish can briefly rest. The specific design has been developed in consultation with fish passage experts from NMFS and CDFG. Appendix D provides a detailed description of this project.

Computer-enhanced photographs indicating the location of proposed bed elements to enhance fish passage in Hilton Creek.

Highway 154 Culvert

The Highway 154 Culvert is a complete passage barrier. It is anticipated that the culvert will be modified by CalTrans to facilitate fish passage at high flows. The passage structure design is still in the preliminary stage but will likely involve raising the water surface elevation and roughening the culvert surface to reduce the water velocity and increase depth. The final design is being developed in consultation with CalTrans, USFWS, NMFS and CDFG engineers.

Considerations for Implementation

With the exception of the Highway 154 Culvert project, the majority of Hilton Creek included in these conservation measures is located on lands owned and controlled by Reclamation, and thus implementation does not require access to private lands. Work on the Highway 154 Culvert will be confined to the CalTrans maintenance easement. Cooperation and concurrence with the adjacent landowner will be addressed. Permitting of the projects will involve completion of an Environmental Assessment or other NEPA document, compliance with CEQA, consultation with NMFS and USFWS, and coordination with CDFG. Section 404 (Clean Water Act) permits, which are necessary for construction in a waterway, will be obtained from ACOE; Streambed Alteration Agreements will be completed with CDFG; and Water Quality Certifications will be completed with the Regional Water Quality Control Board.

The proposed fish passage enhancement to the Highway 154 Culvert.

3.2.5 FISH RESCUE

Objective

To reduce mortalities of endangered steelhead/rainbow trout associated with declining water levels, adverse water temperatures or DO levels in Hilton Creek, and, on a case-by-case basis, in other areas of the Santa Ynez River basin. This will be done by relocating fish to more suitable habitat.

Biological Need

While the supplemental water supply system will provide flow to Hilton Creek in most years, it may be impossible to provide summer and fall streamflow in dry or critically dry years when the lake level falls to below 660 feet. In addition, fish may be at risk of stranding should the Hilton Creek supplemental watering facility fail due to mechanical or human error. In the past, fish have been restricted to isolated pools as flows in Hilton Creek declined. In these pools, rainbow trout/steelhead were vulnerable to: (1) predation by both fish and birds; (2) exposure to elevated water temperatures; and (3) desiccation. Under these circumstances it may become imperative to move fish residing in Hilton Creek to more suitable habitat if they are to survive. We refer to this type of operation as a Fish Rescue.

Hydrologic analysis indicates that flow supplementation via the Hilton Creek system will not be possible in 2% of water years. During these drought years, it is likely that the river mouth would not open during the winter; and thus, there would be no spawning in Hilton Creek by

anadromous steelhead, although resident rainbow trout may still spawn there. Additionally, juvenile steelhead from the previous year may still reside in the stream, if there has not been enough flow to cue them to emigrate.

Project Description

Fish rescue operations were successfully conducted in Hilton Creek in 1995 and 1998. The specific protocols developed in 1998 provide a template for coordination and cooperation between the Adaptive Management Committee, CDFG, NMFS, Reclamation, and USFWS.

Initiation of Rescue

The fish rescue plan for Hilton Creek has two parts: (1) monitoring to determine when a fish rescue should be initiated; and (2) protocols for capture and transfer of fish. Monitoring of flow, water temperatures, and DO within Hilton Creek will provide the primary information on when a rescue operation should be considered. If flow seems likely to be substantially diminished or temperature approaches stressful levels, then the Adaptive Management Committee, CDFG, NMFS, Reclamation, and USFWS will consult to determine if a fish rescue should be implemented.

Relocation Sites

A successful fish rescue operation depends on the availability of a suitable relocation site for the fish. Likely relocation areas will be investigated to determine if they have favorable conditions (adequate streamflow, temperature, and DO). If a suitable relocation area is available, a survey of fry/juvenile density would be performed, to determine if there is any available space for more fish. The most likely relocation site is the Long Pool, the mainstem between Bradbury Dam and the Long Pool, and certain tributary reaches below Bradbury Dam.

Removal of Predatory Fish

To minimize predation losses of relocated young-of-the-year rainbow trout/steelhead, warmwater fish (largemouth and smallmouth bass, catfish, bullheads) may be removed from the receiving site if they are abundant. These fish can increase the mortality rates of young rainbow trout/steelhead both directly through predation, and indirectly by forcing young fish to occupy less suitable areas where they may have slower growth rates, lower fitness, or be exposed to other predators. Predator removal could provide localized benefits to native fish in the mainstem pools, although these benefits would be temporary because of recolonization from other areas (other stream reaches and/or Lake Cachuma).

Predators will be selectively removed from key pools using nets, traps, and possibly electrofishing. The primary methods would be fyke nets (also called box traps) in larger pools and runs, and seine nets in smaller pools or areas. Captured native fishes will be returned to the stream. The operations will be conducted by fishery biologists or volunteers directly supervised by a fishery biologist.

Capture and Transfer of Fish

Operations would occur in the morning when water temperatures are coolest and would cease when the stream becomes too warm. Fish would be captured using seines and nets as much as possible and electrofishing in areas where nets are not effective. Fish would be held and transported in cool aerated water, and the temperature of transport water and release water would be equalized prior to release.

Considerations for Implementation

Fish rescue and predator control operations would be undertaken on a case-by-case basis in consultation with the Adaptive Management Committee, CDFG, NMFS, Reclamation, and USFWS. Fish rescue operations could also be conducted in other stream reaches that are drying and/or have stressful temperatures that are not on Reclamation property. The decision to conduct fish rescues in these areas would be made on a case-by-case basis based on the landowner's permission and in consultation with the resource agencies.

3.2.6 LONG-TERM MONITORING PROGRAM

Objective

To develop technical information about the status of aquatic habitat and fishery use in the lower Santa Ynez River watershed that can be used in the adaptive management and evaluation of the actions recommended in this Plan.

Biological Need

In 1993, there was insufficient information on the status of the habitat and fishery resources in the lower watershed to establish management objectives. Since then, the cooperative effort outlined in the MOU has been gathering such information and has used it to create and evaluate the recommendations described in this Plan. In order to determine the success of individual projects and the overall Plan, and to provide the Adaptive Management Committee with the information needed to successfully manage the proposed projects, a long-term monitoring plan is included as an action in the Plan. In addition, the technical information provided by the long-term monitoring program will be useful for NMFS in the preparation of the recovery plan for the endangered southern steelhead.

Project Description

The long-term monitoring program is based on the study plan developed by SYRTAC to provide much of the technical information used to develop this document. The Project Biologist will notify NMFS of any plans for changes in the monitoring methods or locations (NMFS 2000). A detailed description of the actions included in the long-term monitoring program are described in Appendix I. Below is a brief outline of the types of monitoring that will be continued.

Types of Monitoring

Water Quality Monitoring

Water quality monitoring will be used as a variable to determine habitat quality (temperature and dissolved oxygen) in the mainstem, tributaries, lagoon, and Lake Cachuma. The data will provide information on both diurnal variations and longitudinal gradients (*i.e.*, distance from Bradbury Dam along the mainstem) within the system"

Fishery Surveys

Fishery surveys will occur in both the mainstem habitats and in tributary habitats where access is available. These studies include migrant trapping to determine the timing of migration for both up- and downstream migrants and the number of migrating adults and juveniles. This information will be useful to determine if the rainbow trout/steelhead fish use trends are changing and also provide information that will help the Adaptive Management Committee determine (1) if the passage supplementation releases are providing additional benefit and (2) how releases might be modified to increase this benefit. Redd surveys will be conducted to track the spawning. Snorkel and bank surveys will be conducted to track fish use by rainbow trout/steelhead by counting individuals in different age classes in selected habitats. Fishery data will be tracked to allow long-term evaluation of the Plan.

Habitat Monitoring

Monitoring of the quantity, physical composition, and quality of rainbow trout/steelhead habitat will continue as part of the Long-Term Monitoring Plan. Instream inventories to determine habitat composition (pool, run, riffle) and habitat quality (*e.g.* habitat structure and canopy cover) will be conducted. These studies are used to track available habitat for rainbow trout/steelhead and to identify locations where restoration activities might be useful. Proper functioning condition surveys will be applied to determine if the locations where restoration activities are proposed are likely to remain stable. The relationship between habitat quantity, quality, and flow will be determined in the lower reaches of Hilton Creek to provide the Adaptive Management Committee information for regulating the watering system.

Lagoon Monitoring

In addition to water quality and fisheries surveys in the lagoon, the hydrological characteristics of the lagoon will be tracked. The status of the sand bar will be observed weekly during the migration season to determine if it is open to migration. This information will be necessary for the application of the passage supplementation releases. Water surface elevation in the lagoon will be monitored to determine the hydrologic conditions under which the sand bar opens.

Downstream Water Rights Releases

Additional studies of fish movement during downstream water rights releases will be undertaken to provide a larger body of evidence that rainbow trout/steelhead do not move downstream during these releases. NMFS and the Adaptive Management Committee will work together to develop a study plan for this monitoring (NMFS 2000). In addition,

monitoring will occur to verify that the flow versus stage relationship during the ramp-down of these releases is sufficiently conservative to avoid any impacts on rainbow trout/steelhead.

Enhancement-Specific Monitoring

A number of tributary enhancement projects are proposed in this Plan. These projects include instream and riparian restoration, passage impediment modifications, and habitat creation. Because these projects are diverse, a project-specific monitoring program will be developed to evaluate each project. Criteria will depend upon the location, type of enhancement, and initial conditions.

Target Flows

Monitoring to determine if the target flows are being met at the Highway 154 and Alisal Road Bridges is discussed in Section 3.2.1.

Data Analysis

Additional data collected during the Long-Term Monitoring Program will be used in two ways: (1) to evaluate enhancement measures and (2) to help adaptively manage the proposed measures. Information collected for the second reason will be provided on a regular basis to the Adaptive Management Committee for decision-making purposes. The information previously gathered during the SYRTAC studies and data generated by the Long-Term Monitoring Program will be stored in a database that is currently under development. The database will provide easy access to the data and facilitate data analysis for the purpose of evaluating the enhancement measures.

Considerations for Implementation

The monitoring program is already in progress and modifications will be made to conform to the Long-term Study Plan summarized here. Existing monitoring sites will be continued, where possible, to create a long-term history for these locations. Because most of the lower watershed is on private lands, access for the monitoring studies must be granted by the landowners. The project biologist will expand the monitoring program as needed to provide further information for the Adaptive Management Committee and as opportunities arise to gain access to additional lands.

3.2.7 PUBLIC EDUCATION AND OUTREACH

Objective

To provide the public with an understanding of the importance of improving habitat conditions and steelhead populations in the lower Santa Ynez River, to deter poaching, and to solicit voluntary participation from private landowners and the public in restoration and protection activities.

Biological Need

As a result of the extent of private lands along the river, and the dependency of local ranchers, farmers and urban dwellers on the Santa Ynez River as a water supply, it will not be possible to comprehensively improve aquatic habitat and rainbow trout/steelhead populations

without voluntary involvement and support from the local community. This support is necessary for property access, riparian and aquatic habitat enhancement, and efficient implementation of a successful management plan.

Project Description

A public education and outreach program will be developed to explain the activities related to the protection and enhancement of steelhead populations and their habitat, as well as other sensitive resources in the lower Santa Ynez River system. A number of methods to distribute information will be employed including workshops, newsletters, a website and others. The program will include workshops for the landowners along the mainstem and tributaries. The workshops will discuss the objectives and benefits of the habitat enhancement programs and describe how "fish friendly" conservation management plans can mutually benefit both landowners and fish habitat. The Outreach Program will describe the programs designed to maintain or restore steelhead, and it will solicit volunteer actions from private property owners to improve steelhead habitat in the mainstem of the river and its tributaries downstream of Bradbury Dam. Fishing regulations will be discussed/distributed at the meetings and posted along the stream to deter poaching.

Voluntary Public Participation Programs

The public education and outreach program will stress those actions of the Management Plan that require voluntary participation by individuals. It will be broad-based but will particularly target riparian landowners, keeping them informed of river-related activities to maintain and restore fisheries, and soliciting their voluntary participation in habitat improvement programs. These programs may include riparian planting, spawning gravel augmentation, passage impediment removal, creation of additional habitat features, "fish friendly" land management practices, and other measures to benefit steelhead and other aquatic resources (described further in Section 3.3.1).

This information program will emphasize sections of the river and tributaries under the control or management of the landowners, but will also draw upon the successes from Reclamation property and from other watersheds, as well. The public education and outreach program will provide technical assistance for implementing these measures and will assist the landowners in finding grants to fund these types of enhancements.

Outreach Activities

Public involvement activities will be initiated in order to keep the public informed of the progress of the conservation measures undertaken to protect and restore native fishes, especially steelhead, and their habitat. These activities will include the following outreach activities:

Workshops

Public workshops to exchange information with the public on reasonable conservation measures that mutually benefit landowners and fisheries, and to keep the public informed of the progress of the restoration effort. The first of these meetings was held in June 1998, to solicit input on management alternatives being considered for an overall Plan. A pair of workshops focussed on streambank stabilization and rangeland management practices are planned for spring and fall 2001.

The SYRTAC Project Biologist discusses Hilton Creek enhancements with tour participants.

Press Releases

Issuance of periodic news releases to the Santa Barbara News Press, the Lompoc Record, and the Santa Ynez Valley News to ensure that program successes are relayed to the news media.

Publication of every take violation in local newspapers to deter poaching and habitat destruction.

Toll-Free Information Line

Establishment of a free "800" phone message line with regular updated messages concerning the progress of instream habitat improvements and the effect of those improvements on the various life stages of the steelhead. The public will also have the opportunity to leave messages.

Newsletter

Issuance of annual newsletters summarizing the previous year's enhancement activities on the Santa Ynez River and its tributaries, habitat conditions, fish populations, successes, failures, future milestones, and a schedule of upcoming events. They might also include a "highlight" piece on related topics, such as: voluntary measures undertaken by landowners that have aided in creating additional habitat or improving existing habitat; successful, cooperative fish programs between landowners and public agencies; how cattle and fish can successfully coexist along the river; the cost of the steelhead restoration measures; and sources of funding and technical assistance available to landowners to implement habitat improvement measures.

Web Page

Establishment of a web page with updated messages and photographs, along with information about who to contact with comments, questions, or suggestions.

Field Trips

Seasonal field trips led by project biologists to give interested landowners a real-life perspective on the enhancements that are being made in the river and the benefits they provide to the steelhead. A field trip and workshop on the proper functioning condition of rivers was held in June 2000.

Public Speakers

Establishment of an expert speaker's group to provide informed speakers to local organizations. This group might also include local landowners who have initiated innovative measures to help restore steelhead habitat.

Slide Shows

Annual "Steelhead Restoration" slide shows at local bookstores advertised through fliers posted in local shops and restaurants.

Considerations for Implementation

The public education and outreach program will be developed on an adaptive management basis. The activities that are successful will be continued, and improvements to the public education and outreach program will be continually sought. Funding for implementation (*i.e.*, advertising and public space for meetings, production of newsletters and the web site) will be sought from public agencies and private foundations that are interested in watershed efforts. Two-way communication between the Member Units and the public will be critical for success.

3.3 ACTIONS IN COOPERATION WITH OTHER AGENCIES AND PRIVATE LANDOWNERS

3.3.1 TRIBUTARY ENHANCEMENT MEASURES

Approach

Over the past eight years, SYRTAC has collected detailed data on fish presence and habitat use, and on the quality of habitat conditions in the lower Santa Ynez River and its tributaries (SYRTAC 1997b, 1998a, 2000 and other data). These detailed data, combined with anecdotal observations from long-time residents and other surveys and research (*e.g.*, Harper and Kaufman 1988, ENTRIX 1995, Douglas 1995) provide a good basis on which to identify good rainbow trout/steelhead habitat relative to other areas on the lower Santa Ynez River. Much of SYRTAC's efforts have focused on identifying and prioritizing the tributaries with regard to their ability to support fish populations, enhancement opportunities, and the level of effort required to achieve successful results. The approach used in the Tributaries work group of SYRTAC was to:

- *Identify tributaries that currently support fish populations*

  Each tributary was described with respect to evidence of rainbow trout/steelhead populations. This included observations of migrating adults and juveniles, spawning behavior and redds, presence of young-of-the-year, juvenile and adult fish in various months, and the occurrence of potential predators.

- *Describe the current habitat conditions to determine opportunities for protection and enhancement*

  For each tributary, the habitat conditions were described including factors such as flow, water temperature and quality, riparian canopy, and instream cover. Those areas that appear to have suitable habitat for supporting fish populations were noted.

- *Outline potential actions for selected tributaries and reaches*

  The suite of potential actions appropriate for each tributary were identified. Activities include educating landowners and working with them to establish "fish friendly" conservation land management practices, purchasing conservation easements or leases with willing landowners, enhancing physical stream and riparian habitat, and working with appropriate agencies to remove or modify stream passage impediments.

- *Prioritize potential actions for selected tributaries and reaches.*

  The potential enhancement actions were ranked for each tributary based on the expected biological benefit, technical feasibility, property access, and cost.

The Tributaries Work Group of the SYRTAC prioritized the several south-side tributaries using the above guidelines and a number of variables discussed in detail in Appendix C. Factors used in the prioritization process included stream gradient, property access, enhancement opportunities, amount of habitat to be enhanced, and estimated cost. Below the tributaries assessed by the group are listed in order of priority with number one having the highest priority. In addition, some tributaries were subdivided into reaches based on social and physical features (*e.g.*, property lines, impassable barriers, major sub-tributary junction). When such a division was made, the reach listed first (*i.e.*, "A") was ranked the highest.

#1. Hilton Creek

A) Lower Reach (on Reclamation property)

B) Upper Reach

#2. Quiota Creek

#2. Salsipuedes & El Jaro Creeks

A) El Jaro Creek

B) Lower Salsipuedes Creek (below junction with El Jaro Creek)

C) Upper Salsipuedes Creek

#3. Alisal Creek

A) Lower Reach (below Alisal Dam)

B) Upper Reach

#4. Nojoqui Creek

#5. San Miguelito Creek

Prioritization of actions provides an adaptive management framework for allocating habitat enhancement and restoration resources. Technical Appendix C (Tributaries of the Santa Ynez River below Bradbury Dam) presents a full description of the tributaries and the proposed tributary management actions.

TRIBUTARY HABITAT ENHANCEMENT AND PROTECTION

Objective

To enhance and protect instream habitat and riparian cover on south side tributaries that have perennial streamflow.

Biological Need

Opportunities to enhance habitat conditions in the mainstem Santa Ynez River are limited to a few miles just below Bradbury Dam. The tributaries on the south side of the watershed, however, have good potential as fish habitat because these streams generally have perennial flow through the summer, at least in their upper reaches. Habitat quality can range from good quality in upper reaches (*i.e.*, perennial flow, good canopy cover, suitable water quality) to poor just above the confluence with the mainstem Santa Ynez River (*i.e.*, intermittent or no flow in summer and little canopy cover). Management actions directed at tributary habitat will focus on protecting habitat that is already in good condition and enhancing habitat that is in fair condition. Efforts will not be expended on poor quality habitat where conditions cannot be feasibly improved.

Project Description

Improving aquatic habitat requires a combination of habitat protection and stream enhancement measures. Since all tributaries in the lower basin, except lower Hilton Creek, are on private property, voluntary participation by the landowner is necessary to implement protection and enhancement measures along these streams. Habitat protection measures include assisting landowners in establishing sound land conservation management practices and purchasing conservation easements or leases on private lands. Habitat quality can be improved by increasing instream cover and complexity and by enhancing riparian vegetation.

Habitat Protection

NRCS can assist private landowners in applying conservation practices. The service offers consulting to landowners on conservation management practices and has a variety of voluntary cost-share programs to help offset implementation costs. Many of these practices would equally benefit land management, stream protection and enhancement for fish habitat. Such actions are initiated by the landowner with the NRCS office in Santa Maria. USFWS also administers several grant programs, including the Partners for Fish & Wildlife program, which are designed to benefit landowners while protecting sensitive habitat. Interested landowners would apply directly to USFWS for grant information and assistance.

Assistance in Conservation Management

Safe Harbor

NMFS and USFWS can enter into 'Safe Harbor' agreements with private landowners. The agreements benefit endangered and threatened species while giving the landowners assurances from additional, future restrictions based on the landowner's conservation actions. Interested landowners would apply directly to NMFS (for steelhead) and to USFWS for other listed plants and wildlife.

Landowner Education

In addition to the services offered by federal agencies, literature and public workshops will be offered to promote an understanding of the importance of improving habitat conditions and steelhead populations in the lower Santa Ynez River. These efforts will demonstrate ways in which the protection of fish habitat can be mutually beneficial to the landowner as well as to critical fish habitat. We will also solicit voluntary participation from private landowners and the public in restoration and protection activities.

Conservation Easements/Leases

The Adaptive Management Committee will also seek long-term leases and conservation easements from private landowners. A conservation easement is a legal agreement between a landowner and a non-profit group or government agency. In most agreements, landowners allow certain activities to be performed on their property in exchange for monetary or other benefits. Similarly, a long-term lease allows habitat enhancement activities within the leased area for a fixed time period (*e.g.*, 20 years). Conservation easements/leases can be effective at fostering habitat improvement, both where land use is negatively affecting riparian and aquatic habitat or where frequent access to the stream is required for the maintenance of restoration projects. Ease-ments/leases can foster natural recovery of habitat over time, as well as enhance the success of active intervention through other actions, such as planting riparian vegetation.

Area of privately-owned streamside property in the Salsipuedes-El Jaro Watershed.

Participation by private landowners would be voluntary. The rights to manage a strip of property along streams would be purchased or leased from the property owner by COMB and held as a conservation easement by COMB or an approved land trust organization, such as the Santa Barbara County Land Trust. The owner would retain ownership of the property, but be paid for loss of use. In exchange, the Adaptive Management Committee would be able to implement fish conservation measures within the easement. All easement agreements are voluntary and each one is tailored to the needs of the landowners and/or agencies involved. The Adaptive Management Committee would work with the landowners and NRCS to develop a

series of appropriate management practices, such as livestock management, bank stabilization and soil conservation. Potential benefits that landowners can receive include financial benefits from the sale or lease of easements, estate and property tax reductions for permanent easements that reduce property values, and benefits from conservation projects conducted on the easement. Bank stabilization, gully repairs, and riparian vegetation enhancement will benefit both the landowner and fish habitat.

Structural Modification of Instream Habitat

A variety of measures can be used to enhance aquatic habitat in tributaries. Likely streams include Hilton, Salsipuedes-El Jaro, Quiota, and Alisal creeks. Access to private lands and the results of field surveys, in combination with results of water temperature monitoring, will be used to identify specific sites for habitat protection and improvement.

Create Pools

Physical modifications of the channel through the addition of instream structures would be used to create more over-summering habitat. Habitat complexity has been positively correlated with fish density. Methods for physical enhancement include (1) improving the quality of pools by increasing cover and complexity and (2) increasing the amount of pool habitat by increasing depths in existing pools or scouring new pools.

Enhance Cover with Logs, Root Wads, and Boulders

Structures typically added to pools to enhance cover include logs, root wads, boulders and cobbles. These structures would need to be secured to prevent wash-out. Boulders and cobbles can be placed into pools to create interstitial spaces that provide cover. These rocks should be large enough to minimize transport during high flows.

Riparian Enhancement

Riparian zones perform a number of vital functions that affect the quality of salmonid habitat as well as provide habitat for a variety of terrestrial plants and animals. Propagation of native vegetation can improve habitat by reducing streambank erosion, providing cover and shade, and contributing woody debris and food to the channel. Low ground water levels, scouring streamflows, intensive land use, and livestock grazing are some factors that can reduce riparian vegetation.

Riparian enhancement is relatively inexpensive and easy to perform. Planting or enhancement of riparian vegetation would be useful at sites where the canopy cover is low and the stream channel is not too wide. Young plants should be protected from grazing. Deep-rooted vegetation such as sycamore or cottonwood would be preferable to shallow-rooted vegetation such as willow. The species of vegetation selected for propagation can have a measurable effect on streamflow. The enhancement or expansion of streamside vegetation will likely increase water loss due to transpiration within the stream corridor, although this would be balanced by decreases in evaporation due to improved shading.

Considerations for Implementation

Implementation will require voluntary participation from private landowners to obtain access to carry out enhancement actions. Assessments will be done to determine the quality and potential of the habitat, feasibility and durability of restoration actions, and the cost and biological benefit of any proposed actions. Priority areas for seeking conservation easements should be identified according to the persistence of flows, suitability of habitat (or potential for enhancement), and presence of downstream passage impediments. The Adaptive Management Committee will provide scientific and engineering expertise and will assist in obtaining funding for easements and enhancement actions.

TRIBUTARY PASSAGE IMPEDIMENT MODIFICATION

Objective

To improve access for migrating steelhead to spawning and rearing habitat in the tributaries, and increase seasonal access by improving passage under low and moderate flow conditions.

Biological Need

Under current conditions, natural and man-made structures may impede steelhead movements in the tributaries of the lower Santa Ynez River, especially under low and moderate streamflow. Since habitat availability may be a primary factor impacting steelhead populations in the river system, it is imperative to improve accessibility to the existing aquatic habitat by removing impassable barriers. These efforts will serve to expand the available habitat for spawning and rearing steelhead; thereby expanding the carrying capacity of the lower river.

Project Description

Barriers and impediments in the tributaries include man-made impediments such as culverts and road crossings, and natural impediments, such as boulder cascades. The tributaries of primary interest are Salsipuedes, El Jaro, Hilton, and Quiota creeks, since they have perennial flow in their upper reaches, and thus can support spawning and rearing. Known passage impediments are identified in Table 3-5. These impediments and tributary habitat quality are described in more detail in Appendix C.

Passage Enhancements

Culverts

Culverts can impede or prevent fish passage at both high and low flows. High flows over culvert surfaces can create fast moving water that prevent fish from moving upstream. Low flows can create water depths that are too shallow for fish to navigate. In general, passage at culverts can be improved by (1) placing boulder weirs downstream of the culvert to raise the water level in the culvert; (2) modifying the culvert to provide some low velocity protection for fish; or (3) reconstructing a box culvert

TABLE 3-5 PASSAGE IMPEDIMENTS ON TRIBUTARIES.

Creek	Location of Impediment	Structure	Type of Impediment	Jurisdiction
Hilton	1,380 feet above Santa Ynez River	Cascade and bedrock chute	High-flow passage impediment	USBR
	Below Highway 154	Concrete culvert	Velocity impediment	CalTrans
Quiota	1.3 - 1.6 miles above Santa Ynez River and beyond	Nine road crossings	Low-flow and high-flow passage impediments	Santa Barbara County Road Department
Nojoqui	3.5 miles upstream of Santa Ynez River	Culvert	May be an impediment	CalTrans
Alisal	2 - 3 miles upstream of the Santa Ynez River	Dam and reservoir	Physical barrier	Private Landowner
Salsipuedes	3.6 miles above Santa Ynez River	Bridge crossing on Highway 1	Low-flow passage impediment	CalTrans
El Jaro	1/3-mile above Salsipuedes confluence	Road crossing	Low-flow passage impediment	Abandoned private road
San Miguelito	Lower 3 miles	Concrete channel	Physical impediment	County Flood Control
	3 miles upstream of Santa Ynez River	Debris basin with 12-foot high concrete wall	Physical barrier	Unknown
	4 miles upstream of Santa Ynez River	Small concrete ford with 4.5-foot drop	Physical impediment	Unknown
	5 miles upstream of Santa Ynez River	Concrete apron 19 feet high with a 9-foot vertical drop	Physical barrier	Unknown

as an arch culvert or bridge. Care must be taken to avoid reducing the flood conveyance capacity of the culvert when correcting passage deficiencies.

Several road crossings on Quiota Creek impede upstream steelhead migration.

Road Crossings

Road crossings can also impede fish passage. Arizona crossings are typically concrete aprons placed across the streambed to permit vehicles passage at low flow, and permit debris and sediment to pass during periods of high flow. Upstream migrants have difficulty swimming across the crossing due to shallow depth or downstream channel incision, which requires fish to jump onto the crossing. Passage at Arizona road crossings can be enhanced by constructing jump pools in the downstream reach, by replacing the crossing with a small bridge, or by notching the road to create a low-flow channel.

Cascades and Drop Structures

Natural and man-made waterfalls, cascades, and drop structures (*e.g.*, a drop below a concrete or steel culvert) can prevent or impede fish migration at low flow levels. Depending on the height of the structure, the depth of the plunge pool below the structure, and the shape and hydraulics of the structure, modifications can be made to "ladder" or otherwise provide fish passage at some flow levels.

Preliminary Engineering Designs

Preliminary engineering designs will be developed for fish passage facilities in consultation with the bioengineering staffs of NMFS and CDFG, and in coordination with USFWS. The preliminary engineering designs for fish passage facilities will be used as a basis for the following: estimating costs for final design and construction; the range of flow conditions for which the passage facilities would provide benefit; identification of permitting requirements and preparation of environmental documentation; and requirements for access to private lands for the construction of fish passage facilities. These preliminary designs will also be used to apply for funding of the enhancement projects.

Salsipuedes & El Jaro Creeks

Access to habitat within Salsipuedes and El Jaro creeks by anadromous steelhead is limited by two passage impediments, associated with bridges or road crossings. These impediments are thought to impede the passage of both adult and juvenile fish primarily during periods of low flow. Highway 1 Bridge #51-95 on lower Salsipuedes Creek has a 3- to 4-foot drop from the concrete apron into a pool downstream of the bridge. Pool depth may not be sufficient to allow fish to negotiate the apron. SYRTAC has created preliminary designs to provide low flow passage over the concrete apron. El Jaro Creek has a road crossing and concrete apron about 1/3-miles upstream of the confluence. It is an old ford on a private, unused road, with a 3-foot drop below it.

The Highway 1 Bridge apron presents a low flow fish passage impediment on lower Salsipuedes Creek.

Hilton Creek

As described earlier under actions for Hilton Creek and in Appendix D, modification of a passage impediment at the cascade and bedrock chute would improve access to approximately 2,800 feet of habitat (approximately 1,600 feet on Reclamation property) up to the Highway 154 Culvert.

The culvert under Highway 154 is a passage barrier. The culvert will be modified to slow down the water velocity and raise the water surface elevation in the culvert. These modifications will allow for fish passage at storm flows. These actions will open the upper reaches of Hilton Creek to rearing and spawning rainbow trout/steelhead.

Quiota Creek

Refugio Road makes several shallow-water crossings of upper Quiota Creek. This road is maintained by the County of Santa Barbara. Steelhead migrating upstream have difficulty swimming across due to the shallow depth or, in some cases, incision of the stream channel just below the crossing which requires the fish to jump onto the crossing. These impediments could be modified by constructing jump pools in the downstream reach and notching the road crossing to create a low flow channel. Replacing the crossing with a small bridge is another, more expensive alternative. The Santa Barbara County Roads Department and SYRTAC are working together to develop more fish-friendly crossings. The County is planning to repair three of these crossings in the next few years and the remaining six crossings will be modified by the Member Units.

Considerations for Implementation

Modification of passage impediments requires coordination with private landowners for access, as well as various local, state, and federal agencies. Alterations to man-made impediments require site assessment, and design modifications that allow passage at various flows while maintaining the utility of the structure. Removal of some natural impediments, such as beaver dams, may require annual inspection and removal effort. Additional impediment removal projects may be identified through landowner outreach efforts. NMFS and CDFG will provide final project design approval.

3.3.2 MAINSTEM HABITAT ENHANCEMENT AND PROTECTION

Objective

To improve summer habitat conditions in the mainstem just below Bradbury Dam using physical habitat enhancements.

Biological Need

Deep pool habitats within the mainstem are important refuge for rainbow trout/steelhead and other native fish during low flow summer conditions. Through upwelling and stratification, such pools can maintain cooler water temperatures than shallower waters. Additional structural elements, such as boulders and large woody debris, in conjunction with water releases from Lake Cachuma, could improve rearing conditions for young steelhead and reduce their vulnerability to predation by warmwater fish species (*e.g.*, largemouth bass) known to inhabit existing pools. Improved riparian vegetation could provide

sufficient shade under low-flow conditions when the stream follows the bank, and add to the overall health of the system.

Project Description

Opportunities exist to improve structural habitat within pools on the lower Santa Ynez River. Water quality in these pools will be maintained via conjunctive use of downstream water rights and rearing target flow releases. In addition to water releases, non-flow related measures may be taken to improve the quality of pool habitat on Reclamation property. To the extent that private landowners are interested in allowing habitat improvements on their property, these improvements may be made elsewhere as well.

Site Selection

Pools with rainbow trout/steelhead include the Stilling Basin, the Long Pool, and several pools between Highway 154 and Alisal Road in Solvang (Refugio and Alisal reaches). Actions will focus on the Long Pool, which is on Reclamation property. Site selection would take into account accessibility, channel hydraulics, geomorphology, streamflow, and availability of structural materials and existing habitat complexity. Sites with a relatively stable streambed, stable banks, and woody riparian vegetation will afford the greatest opportunities, while sites with steep banks, non-cohesive sandy soils, little riparian vegetation, and high stream gradients present greater challenges. Suitable sites for riparian enhancement in the mainstem will be selected based on accessibility and landowner approval.

Instream Structures

Once suitable sites have been identified, a conceptual enhancement plan can be developed. A feasibility analysis would be performed to evaluate factors such as continued site accessibility, structural stability, cost, and longevity prior to developing final engineering plans for the proposed enhancements. Although the improvements will be designed to withstand some flood damage, periodic maintenance will be required to correct problems such as unsuitable scouring or in-filling of pools with excess sediment.

Structures typically added to pools to enhance cover include logs, root wads, boulders and cobbles. These structures would need to be secured to prevent wash-out. Pool depth can also be increased by installing instream structures to increase scour, by direct excavation, and/or by manipulating channel geomorphology. The objective is to promote self-maintaining pools and to create backwater conditions during periods of low flow.

Riparian Enhancement

Propagation of native vegetation can improve habitat by reducing streambank erosion, providing cover and shade, and contributing woody debris and food to the channel. Riparian enhancement is relatively inexpensive and easy to perform. Planting or enhancement of riparian vegetation would be useful at sites where the canopy cover is low and the

stream channel not too wide. Deep-rooted vegetation such as sycamore or cottonwood would be preferable to shallow-rooted vegetation such as willow. The enhancement or expansion of streamside vegetation will likely increase water loss due to transpiration within the stream corridor, although this would be balanced by decreases in evaporation due to improved shading. Riparian enhancement at sites other than the Long Pool will occur as opportunities become available when landowner approval is granted.

Considerations for Implementation

Access to most of these sites will require permission from private landowners, except for pool habitat on Reclamation property (*i.e.*, Long Pool). All potential sites will be assessed to determine the potential benefit of installing structures or riparian enhancement. Structures will likely require maintenance, especially after winter storms. The magnitude of winter flows and the somewhat mobile channel will be a challenge for installing instream structures that will stay in place.

3.3.3 GENETIC PROTECTION OF SOUTHERN STEELHEAD POPULATIONS

Objective

To protect southern rainbow trout/steelhead populations below Bradbury Dam from genetic introgression with the northern derived hatchery stocks currently used to support the put-and-take fishery in and above Lake Cachuma.

Biological Need

The rainbow trout planted to support the put-and-take fishery in Lake Cachuma and below Gibraltar Dam are derived from non-native stocks. These stocks evolved under different environmental conditions than those present in southern California, and thus are likely less adapted to survive the extreme environment. While most of these fish are caught by fishermen, some fish survive and may be washed over the dam in spill years. These fish may then interbreed with native stocks and thereby reduce the fitness of the steelhead population in the Santa Ynez River.

Project Description

Two actions are proposed for replacing the northern-origin rainbow trout currently used for stocking in Lake Cachuma and other upper basin localities with either rainbow trout with a genetic profile more typical of southern California steelhead or sterile trout that cannot breed with the protected population. These actions are fully described in Appendix E and steelhead genetics are discussed in Appendix F.

Southern Steelhead Hatchery

Previous genetic work on rainbow trout/steelhead from the Santa Ynez River basin indicates that the large majority of fish utilizing the basin above Juncal Dam may be residualized southern California steelhead (Nielsen *et al*. 1994).

Establish Broodstock

Adult rainbow trout/steelhead selected for potential use as brood stock would be collected from land locked populations upstream of Gibraltar Dam or Juncal Dam. Selected fish would be individually tagged and a tissue sample collected for genetic analysis prior to their inclusion as part of the population used for brood stock. Gametes for the hatchery operation would only be collected from fish identified as being genetically similar to southern California anadromous rainbow trout/steelhead.

Eggs and sperm must be collected from at least 500 females and 500 males to establish the broodstock. Additional eggs and sperm from wild trout will be collected each year. This periodic infusion of new genetic material will help maintain genetic similarity with wild fish and reduce genetic drift due to artificial selection forces in the hatchery environment. Typically, the adults are captured in tributaries as they are migrating upstream to spawn. They are either spawned immediately or kept in live pens on site for several days until they are ready to spawn. Once all the adults are spawned they are released back into the tributaries. It is anticipated that it will take eight to ten years to establish a suitable broodstock.

Existing Hatchery Facilities

The possibility of developing and maintaining a broodstock in one of the existing hatcheries was explored but determined to be infeasible. The Fillmore Hatchery currently provides fish to stock the Santa Ynez River. However, it is a rearing facility without the capabilities and capacity to develop and maintain broodstock, and its remaining capacity may be used by other programs. The Whitney Hatchery has experience in rearing wild trout (golden trout), but it has an ongoing problem with whirling disease and is located in a substantially different climate than the Santa Ynez River (Owens River).

New Hatchery

Due to the difficulties associated with using an existing hatchery, it is likely that the construction of a new hatchery facility would be required to pursue this action. Ideally, a southern steelhead hatchery would be developed within the ESU to best emulate the environmental conditions of the Santa Ynez Basin. A new facility would require a substantial investment to design and construct. Such a facility would require a water source with appropriate temperature, quality and reliability for spawning and rearing of rainbow trout on a year-round basis. Additional issues will involve the feasibility of permitting the construction of such a facility and the resulting water discharge of its operation.

Hatchery Operations

Hatchery fish would need to be raised to a size of between three to five fish per pound in order to meet the needs of the stocking program. To reach this size, it currently takes the domestic stocks seven to eight months of rearing. It may take as long as two years for a wild stock to

reach this size at the hatchery. All hatchery fish released would be marked with PIT tags and fin clips.

Stock Sterile Trout

A second action that might be implemented to avoid the genetic introgression of native steelhead and rainbow trout with exotic strains would be to replace the rainbow trout currently planted in the lake and mainstem below Gibraltar Dam with sterile rainbow trout or sterile brown trout-rainbow trout hybrids. A second option in developing a sterile trout for planting would be to use a process which produces triploid fish, which have an extra set of chromosomes that makes these fish sterile.

Monitoring

Several monitoring programs should be conducted to determine the success of the program. These include:

- genetic monitoring of the fish used for stocking in order to maintain a genetic profile similar to southern California steelhead/rainbow trout;
- creel surveys to determine if the fish are returning to the creel; and/or
- genetic monitoring of the fish within Lake Cachuma to determine whether there is a beneficial genetic shift.

Considerations for Implementation

The current practice of stocking northern rainbow trout strains into Lake Cachuma and the mainstem below Gibraltar Dam has the potential to adversely affect the protected steelhead population below Bradbury Dam (no stocking occurs below Bradbury Dam). However, this practice supports a unique and valuable fishery that cannot be found elsewhere in Santa Barbara County (the lower river is closed to rainbow trout/ steelhead angling). This fishery should be continued and enhanced. The SYRTAC recommends that CDFG pursue stocking practices that will not jeopardize the genetics of the protected steelhead population. Two options have been investigated, each of which presents substantial biological and technical challenges. Based on feasibility of the development of a new hatchery and the potential problems associated with any hatchery, the SYRTAC recommends that the development of a southern steelhead hatchery stock be shelved. The SYRTAC further recommends that the Adaptive Management Committee and CDFG stay abreast of current research on the development of sterile trout strains for use in put-and-take fisheries, and as this research becomes applicable, use it to replace the current stocking practice in Lake Cachuma and the upper mainstem below Gibraltar Dam.

3.3.4 ACCESS FOR ADULT STEELHEAD TO THE UPPER BASIN

The Plan developed from a SWRCB request to propose management alternatives in the lower Santa Ynez River (i.e. downstream of Bradbury Dam). Because the majority of the historical spawning and rearing habitat was originally upstream of the dam, the Consensus Committee allowed the SYRTAC to study alternatives for providing steelhead access to waters above the dam (i.e. passage over/around Bradbury Dam).

Objective

To investigate opportunities to provide adult steelhead access to areas of the upper basin that once provided the majority of habitat in the Santa Ynez River without jeopardizing the valuable recreational fishery in Lake Cachuma and the mainstem Santa Ynez River below Gibraltar Dam.

Biological Need

The area above Bradbury Dam historically provided much of the good steelhead spawning and rearing habitat in the basin. Due to the current passage barriers, steelhead do not have access to this area of the basin. Opportunities to enhance habitat on the mainstem below Bradbury Dam are limited by the high rate of percolation into groundwater basins and rapid warming of water released below the dam.

The upper Santa Ynez River watershed within Los Padres National Forest.

The actions evaluated are intended to provide steelhead access to the historical spawning and rearing habitat in the upper basin. In order for the progeny of steelhead transported into the upper basin to complete their life history cycle, however, it will also be necessary to provide smolts downstream passage around Bradbury Dam so that they can reach the ocean. Trap-and-truck operations for downstream transport of smolts produced in the upper basin are discussed separately.

Project Description

Four alternatives were considered to provide passage around Bradbury Dam: (1) fish ladder from the mainstem to Lake Cachuma, (2) fish ladder from Hilton Creek to Lake Cachuma, (3) a bio-engineered fish passage channel that would pass fish around or into Lake Cachuma, and (4) trap-and-truck operations to move returning adult steelhead from below Bradbury Dam into the Upper Basin. Each of these actions is described in Appendix E.

The options of a fish ladder from the mainstem Santa Ynez River or a bio-engineered fish channel are currently technically infeasible and require further study. The fish ladder from the mainstem was considered infeasible because of the elevation gain between the mainstem and the top of Bradbury Dam. The bio-engineered fish channel was infeasible because of the topography of the region. These alternatives may be further evaluated for achieving technical feasibility. The fish ladder from Hilton Creek and trap-and-truck operations are described below.

Ladder from Hilton Creek

During winter flows, rainbow trout/steelhead swim up Hilton Creek to spawn. Under this action, Hilton Creek would be used to gain some elevation, and a fish ladder would be constructed from the upper end of Hilton Creek near the property boundary to Lake Cachuma. The ladder would be 86 feet high and approximately 349-459 feet in length. The type of ladder proposed for this action is an Alaska Steep-pass ladder, which is a style of Denil fishway. Implementation of a fish ladder would require an appropriate outlet structure to provide continuous water flow from the lake into the ladder at varying water surface elevations within the lake.

Trap-and-Truck Transport of Adult Steelhead

Trap-and-truck would trap adult upstream migrant steelhead below Bradbury Dam and release them into suitable spawning habitat in the upper basin. An advantage of a trap-and-truck operation over a fish ladder is that it has the potential to allow steelhead access to habitat throughout the upper basin, depending on the selected release site. However, such distribution could make successful downstream migration more difficult.

Trapping Methods

Trapping of adult steelhead would be conducted using the same methods as the current SYRTAC studies of the lower basin. The trap would likely be located in the mainstem on Reclamation property below Bradbury Dam and on Hilton Creek. A fyke trap would be placed across the stream to collect fish migrating upstream. Monitoring of traps and transport of steelhead would occur daily throughout the operation period. Trapping can be conducted only at relatively low flows to avoid the risk of losing equipment. More permanent trapping stations able to withstand higher flows could be designed and constructed.

Captured adults would be transported in an aerated tanker truck to the upper basin. Access to this area will be difficult. The existing roads would require improvements so that they are passable by a medium-sized tanker truck during winter months. The fish would be released above Gibraltar Dam or Juncal Dam in Los Padres National Forest, and/or in suitable tributary habitat above Gibraltar Dam.

Downstream Transport for Smolts

In order for the progeny of steelhead transported into the upper basin to complete their life history pattern, it will be necessary to provide them

access to the ocean. This would likely be accomplished with a trap-and-truck operation of outmigrating smolts from upper basin tributaries to below Bradbury Dam (discussed in the following action and Appendix E).

Considerations for Implementation

Challenges of Fish Ladders

The fish ladder from Hilton Creek has some serious technical and biological challenges. A ladder this long may be difficult for adults to successfully negotiate. Furthermore, the ladder would require substantial, expensive modifications to the dam to allow it to work at different lake elevations. A fish ladder alone would not allow steelhead to complete their life cycle because it would likely be ineffective at providing downstream passage for outmigrating smolts and for any adults that may be returning to the ocean. Outmigrating smolts would have to navigate through Lake Cachuma in order to find the entrance to the fish ladder. Lake Cachuma is a large reservoir (3,000+ acres) which has negligible flow throughout most of the year. As a result, it is unlikely that smolts would be able to negotiate through the reservoir to find the relatively small outlet into the fish ladder. Also, the numerous warmwater predatory fishes in Lake Cachuma would prey on the smolts during their migration.

Impacts on Lake Cachuma Fishery

Another important concern is the potential affect on the recreational fishery in Lake Cachuma. CDFG currently manages the lake as a fishery for bass, catfish and stocked rainbow trout. Lake Cachuma is the largest lake in the area available to local fishermen. The presence of steelhead would essentially prohibit fishing in the lake and in the mainstem and tributaries between Bradbury and Gibraltar dams, thus significantly impacting the opportunity for recreational fishing within the county. Therefore, allowing steelhead above the dam would raise institutional conflicts with the Santa Barbara County Fish and Game Commission and CDFG. These concerns could be mitigated if NMFS designated steelhead above Lake Cachuma as an experimental population and therefore not subject to ESA protections.

Agency Positions on Trap and Truck

Trap-and-truck operations raise concerns for state and federal agencies when a listed species is involved. CDFG policy does not favor trap-and-truck measures. NMFS would prefer to see if conservation measures in the lower basin are successful at enhancing steelhead production before engaging in trap-and-truck measures.

Challenges of Trap and Truck

Transporting fish into the upper basin would be very difficult given the poor road conditions in winter. These operations could also potentially affect other protected species in the upper basin, principally California red-legged frog (federally listed as threatened) and the southwestern arroyo toad (federally listed as endangered). Both species move around and are present on roadways in the winter. Increased vehicular traffic

during this time of year could result in increased mortality to these species. If a trap-and-truck operation were put into place, consultation with USFWS would be required to develop appropriate mitigation measures and to obtain an incidental take permit.

Effects of Trap and Truck on Steelhead below Bradbury Dam

In the short term, trapping and trucking adult steelhead could have negative impacts on the population below Bradbury Dam. It would move the production of any fish transported from the lower basin to the upper basin. Given their relatively low numbers, this would likely have a significant effect on the population. In addition, adult steelhead moved over the dam would not be able to return to the ocean (steelhead do not necessarily die after spawning), thus reducing their potential lifetime production. However, other enhancement measures are currently being pursued to increase the population of steelhead in the lower basin. The success of these additional measures could result in a "surplus" of adult steelhead returning to the lower basin to spawn (*i.e.*, more adults and/or resulting offspring than the habitat can support). As these populations increase, the biological impacts of moving adults to the upper basin will be reduced and, therefore, its feasibility will increase.

Recommendations on Fish Ladders

Currently, the SYRTAC recommends that a fish ladder over Bradbury Dam be studied further because of the lack of certainty that the ladder would be successful, the difficulty of getting juvenile fish back downstream of the dam, and the presence of the valuable fishery of Lake Cachuma and the mainstem below Gibraltar Dam, which is the single most important freshwater fishing opportunity in Santa Barbara County. The SYRTAC recommends that the proposed habitat rehabilitation and enhancement efforts below Bradbury Dam be carried out and monitored to see how the population responds.

Recommendations on Trap-and-Truck

Trap-and-truck operations for upstream migrants still face several technical and institutional challenges to implementation, including: access to suitable release sites in the upper basin over poor roads in winter; permission for establishing trapping sites on tributaries in the lower basin (not an issue if trapping conducted at Hilton Creek on Reclamation property); measures to minimize take of red-legged frogs and arroyo toads which inhabit the upper Santa Ynez watershed during transport; providing downstream access for outmigrating smolts to the ocean; short-term loss of steelhead production in the lower basin due to transport of adults into the upper basin for spawning; and CDFG and NMFS resistance to trap-and truck operations. In the face of these challenges, the SYRTAC recommends that the proposed habitat rehabilitation and enhancement efforts below Bradbury Dam be carried out and monitored to see how the population responds. If a surplus number of spawning fishes are consistently observed, then the concept of trapping and trucking adults into the upper basin should be revisited.

3.3.5 DOWNSTREAM PASSAGE FOR OUTMIGRATING JUVENILES FROM THE UPPER BASIN

Objective

To provide passage from the upper basin to the lower Santa Ynez River for juvenile steelhead outmigrating to the ocean.

Biological Need

The construction of Bradbury, Gibraltar, and Juncal dams severed the steelhead population's connection between the ocean and the historic spawning and rearing habitat in the upper Santa Ynez watershed. Above the dams, steelhead became landlocked except for any fish that may be washed downstream over the spillways. These landlocked steelhead, however, can potentially give rise to juveniles that would attempt to migrate out if provided access. Providing downstream passage of outmigrating juveniles should therefore increase returns of adult steelhead to the Santa Ynez River.

Project Description

A trap-and-truck operation would be used to provide downstream transportation for juveniles produced in the upper basin, around the dams. Additional details are provided in Appendix E.

Trapping Sites

Downstream migrants would be trapped in tributaries above Gibraltar Dam. Likely trapping sites would be where flow rates and debris loads are manageable. Tributaries that appear to support good juvenile production and thus are potential trapping targets include Blue Canyon, Indian Creek, Mono Creek, and Devil's Canyon (Figure 2-1).

Trapping Facilities

During high streamflow, traps can be difficult to operate successfully because of the large amount of water to be "trapped," high velocities, and large amounts of floating debris and sediment. Even during low-flow years when trapping has the greatest potential to be effective, runoff events will occur which are capable of damaging trapping facilities not removed from the channel. A "fish gulper" could be used to collect juveniles under low or moderate flow conditions. The fish gulper facility would require a reasonably stable channel reach that could be completely screened. The collection mechanism involves placing a screen diagonally across the stream channel, which will funnel fish down into the narrow apex. The "fish gulper" is a pipe at the apex of the funnel. Water velocity increases as the water is funneled down, so the fish are sucked into the gulper and carried through a pipe to a holding tank. The water is then bypassed or pumped back to the river.

Transportation

Juveniles captured in the trap would be transported downstream via a tanker truck to be released in the river just downstream of Bradbury Dam.

Considerations for Implementation

Trapping and transport of fish from the Los Padres National Forest will require coordination with the U.S. Forest Service (USFS), NMFS, CDFG,

and USFWS. Trapping fish during high flows, when they are most likely to move, will be technically challenging. Another challenge will be negotiating the wet roads in the tanker truck. USFS frequently closes roads near streams in the spring to protect the arroyo toad and California red-legged frog.

Conservation actions in the area downstream of Bradbury Dam should be implemented and their success evaluated as a first priority. If those actions do not produce a sufficient number of smolts, then downstream transport of juvenile fish from the upper basin should be revisited as should the fish laddering concept.

3.4 LONG-TERM EVALUATION OF THE PLAN

Long-Term Goal

A number of actions have been proposed in this section of the Plan. The long-term goal of the Fish Management Plan is the protection and recovery of southern steelhead in the lower Santa Ynez River. This Plan outlines a strategy which is expected to provide the habitat requirements needed to support growth of the steelhead population in the river. In focussing on the steelhead, the Plan should also help support the habitat requirements of many other riparian and aquatic species located in the lower watershed.

Slow Recovery Process

The SYRTAC acknowledges that the recovery of an endangered species is a slow process that will likely take decades. Many factors critical to the recovery of this anadromous species are beyond the control of Reclamation, the Member Units and the resource agencies responsible for their protection. For instance, impacts to steelhead during the oceanic lifestage will affect the number of adult steelhead returning to the Santa Ynez River. The hydrologic variability in the Santa Ynez River system also increases the variability in the steelhead population: population declines often occur during drought conditions while substantial population growth can occur during a single wet year. In addition, the SYRTAC acknowledges that the majority of the historical spawning and rearing habitat continues to be unavailable (upstream of Bradbury Dam). Thus, restoration of the Santa Ynez River steelhead population to historical levels may not be possible. Implementation of this Plan will begin the restoration process, the adaptive management program will help to keep the restoration process on track, but time will be required for the steelhead population to be improved.

Adaptive Management

The adaptive management structure was built into the Plan to provide a framework for future decisions based on an evaluation of the Plan's actions. This framework will not only manage day-to-day activities but is also structured to build on successes and change as the needs of the steelhead population and opportunities within the basin shift. The Adaptive Management Committee is tasked with exploring new opportunities, modifying the existing programs as necessary and presenting their recommendations to NMFS and the Consensus Committee (see Section 5.7) for approval.

Evaluating the Plan

Implementation Evaluation

There are two levels of evaluation criteria for the actions proposed in the Plan. The first level is to determine that the action has been successfully implemented. In Section 5 (Plan Implementation) there is a brief summary of each action and a discussion of how implementation will be evaluated. For example, stream flow monitoring will determine if implementation of the conjunctive use of rearing and water rights

releases is meeting the established target flows at the Highway 154 and Alisal Road Bridges.

Long-Term Evaluation

The second level of evaluation criteria are a wider interpretation of Plan implementation. As was stated above, the overall goal of this plan is the protection and recovery of southern steelhead in the lower Santa Ynez River. This will be evaluated through long-term study of trends in fish use and in the quantity of available habitat. Habitat quantity and quality surveys (including water quality) will be conducted. An increase in the available habitat or quantity of available habitat will be considered a success of the Plan. By providing steelhead with more high quality habitat, a long-term trend of increasing fish use is also anticipated. Such trend analysis will factor in critical environmental factors such as rainfall and streamflow. However, it is anticipated that it may be decades before such a trend can clearly be seen.

Long-Term Data Set

A long-term data set is required to track the restoration of the steelhead use in the lower river. The Santa Ynez River system is highly variable. Successful analysis of trend data from such a system requires (1) information on environmental variables (*e.g.*, hydrology) so that they can be corrected for and (2) a long-term data set so that different types of climatic conditions (*e.g.*, extended drought or wet cycles) can be observed. In addition, the longer term data set will average out short term events that can drastically shift the availability of habitat and steelhead use. Combine these needs with the slow restoration anticipated for steelhead and the importance of long-term monitoring to evaluate the overall Plan is obvious. The long-term data set required for long-term evaluation will be gathered as part of the monitoring program. This program is summarized in Section 3.2.6 and discussed in more detail in Appendix I. Previously collected SYRTAC data (1993-2000) will help provide some baseline information for comparison.

Short Term Evaluation

In addition to evaluating the long-term goal, the monitoring data collected will also be used on a short term basis by the Adaptive Management Committee. The committee will use these data to evaluate particular restoration actions. For instance, redd, snorkel and bank observations for fish use will be conducted prior to and post construction of instream enhancement actions. These data will be used to evaluate the restoration action. Based on this evaluation, the Adaptive Management Committee will make future recommendations about such projects. In another example, fish passage releases will be made based on the experimental plan discussed above. The migrant trapping program and redd, snorkel and bank surveys for fish use will be used to determine if the passage releases are providing additional days that fish are using to migrate upstream. Based on these results, the Adaptive Management Committee will likely recommend changes in the protocol for these

releases. Short-term studies specifically targeted to evaluate individual projects will also be used. For example, observations will be made downstream, upstream, and at fish passage structure sites to determine if the structure is functioning as designed and to determine fish use of the structure.

4.0 EVALUATION OF POTENTIAL IMPACTS AND BENEFITS

The recommendations proposed in the Plan will provide a number of benefits to rainbow trout/ steelhead in the Santa Ynez River watershed below Bradbury Dam. Benefits include improving and maintaining habitat in lower Hilton Creek and up to 10.5 miles of mainstem habitat immediately below Bradbury Dam, improving passage opportunities for adult steelhead in approximately 1/3 of years, improving access to over 150,000 linear feet of tributary habitat, and protecting and enhancing additional mainstem and tributary habitat. The other aquatic inhabitants of the lower watershed will also benefit from the habitat improvement measures. Impacts to fish and wildlife are primarily temporary and related to construction of some enhancement measures, monitoring, and fish rescue. The Plan will adversely impact the Cachuma Project water supply by increasing shortages in drought years.

4.1 EFFECTS ON RAINBOW TROUT/STEELHEAD

Mainstem Rearing Target Flows & Conjunctive Use

Storm events and Fish Passage Account releases will augment flow in the mainstem during much of the winter and spring seasons. Water rights releases will provide instream flow downstream of Bradbury Dam during most summers. Mainstem rearing target-flow releases will maintain habitat to Highway 154 in all but the driest years and seasons. In some years, flow will persist and be maintained as far as Alisal Bridge.

Increased Summer Rearing Habitat

Conjunctive use of reservoir releases and water rights releases will provide a substantial benefit to rainbow trout/steelhead. SYRTAC studies have documented that the lack of summer rearing habitat is the primary limiting factor in the lower Santa Ynez River system (SYRTAC 1997). Conjunctive use will support 2.9 miles of good habitat between Bradbury Dam and the Highway 154 Bridge, 5 miles of fair to poor habitat in the Refugio Reach, and 2.6 miles of poor habitat from the Refugio Bridge to Alisal Bridge. Analyses of the potential spawning and rearing habitat area provided under historical conditions (*i.e.*, no storage by Bradbury Dam), current Project operations, and the proposed operations were conducted (see Appendix B for more

Flow enhancement will provide water in the Santa Ynez River in most years.

detail). These analyses show that the proposed operations (both long-term and interim target flow levels) will provide substantially more rearing habitat in the summer and fall seasons compared to the other two scenarios.

These studies also show that historical conditions would provide more spawning and rearing habitat in the early part of the year. However, the benefits of providing additional habitat early in the year, under historical scenarios, are likely lost in the latter portion of the year as rearing habitat is reduced by decreased flows and increased water temperatures. During the first part of the year, temperatures are relatively cool and, therefore, the metabolism of rainbow trout/steelhead is slower. These fish tend to reside in pools during the winter months and feeding is reduced, therefore habitat needs are less. In the April through June period, juvenile fish may be smolting and moving downstream to the ocean when flows permit. Young-of-the-year fish, where present (they are emerging from the gravels during this time), are small and require less space. As the fish grow, they require more space and this can lead to a habitat bottleneck in the late summer or early fall as the amount of space required by each fish increases, while the amount of space available decreases. The greater availability of rearing habitat in the late summer and early fall under the proposed conjunctive operations will likely provide a substantial benefit to the rainbow trout/steelhead population relative to current and historic conditions in this portion of the river.

Surcharge

Hydrological analyses of the effect of surcharging the reservoir by 3 feet indicate that the magnitude and duration of flows causing the reservoir to spill at 750 feet will generally also lead to spill events at 753 feet. Therefore, the number and intensity of spill events will not be reduced substantially, and no negative impacts on rainbow trout/steelhead migration are expected.

Water Rights Releases

Water rights releases will benefit rearing rainbow trout/steelhead by providing additional habitat space during parts of the spring, summer, and fall of many years as part of the conjunctive use program (see above). In addition, water rights releases provide large amounts of cooler water which can have the beneficial affect of reducing the temperature in habitat near the dam (for approximately 3 miles). These releases carry a debris load near the leading edge which could temporarily have a negative impact. However the releases have the beneficial affect of clearing out substantial amounts of algae which, if left in the river, reduce water quality for rainbow trout/steelhead by decreasing night-time dissolved oxygen temperatures. Finally, it has been noted that these releases can negatively affect water quality for rainbow trout/steelhead in the Refugio and Alisal Reaches by causing stratified pool habitat, when present, to mix. While releases may overturn once stratified pools, those

thermal refuges created by subsurface upwelling are likely to return after releases have ended.

Ramping

Changes in flow may result in fish stranding. To reduce the potential for fish to become stranded during changes in releases, a ramping schedule has been developed that limits the amount of change in flow that can be made in a given time period. This ramping schedule will be in effect for all operations and is expected to benefit rainbow trout/steelhead in the Highway 154 and Refugio Reaches.

Riparian Vegetation

The increase in summer instream flow would likely increase growth of willows and other riparian plant species, thus enhancing aquatic habitat by providing additional cover and shading and by reducing evaporation. Increased riparian growth may remove some water from the stream through increased evapotranspiration, but not at levels that would likely affect fish. Increased vegetation also may require periodic maintenance.

Fish Passage Supplementation

The creation of the Fish Passage Account in Lake Cachuma is expected to benefit the rainbow trout/steelhead population in the Santa Ynez River system. Typically in wet years, the combination of reservoir spill and natural runoff is sufficient in the lower watershed to provide an adequate number of passage opportunities for migrating steelhead. Passage supplementation will occur in years following these wet years and will provide additional upstream migration opportunities for adult steelhead, as well as benefit downstream migrants (both adults and juveniles). Thus, releases from the Fish Passage Account should have a substantial, positive benefit on the rainbow trout/steelhead population in the Santa Ynez River. The account will be adaptively managed and changes may be made to increase biological benefit based on the results of the monitoring program.

Additional Migration Days

Analyses based on the Santa Ynez River Hydrologic Model (1949-1993) were undertaken to estimate the total passage days, flows that provide fish access to the Highway 154 Reach and Hilton and Quiota Creeks, in the months of January through April. The analysis includes the passage days resulting from both supplementation releases and naturally occurring flows. For the 14 years in which passage supplementation would have occurred, the proposed operations result in a 166% increase in the number of passage days provided over current operations. However, the number of passage days at Solvang provided by the proposed operations still represents a 35% reduction compared to non-operation of Lake Cachuma (*i.e.*, passing through all inflow). The interim Fish Passage Account allocation also provides more (145%) opportunities for migrating fish than current operations although fewer additional days are provided compared to the long-term passage account. A more

detailed evaluation of the benefits of the passage account is presented in Appendix B.

Adaptive Management Account

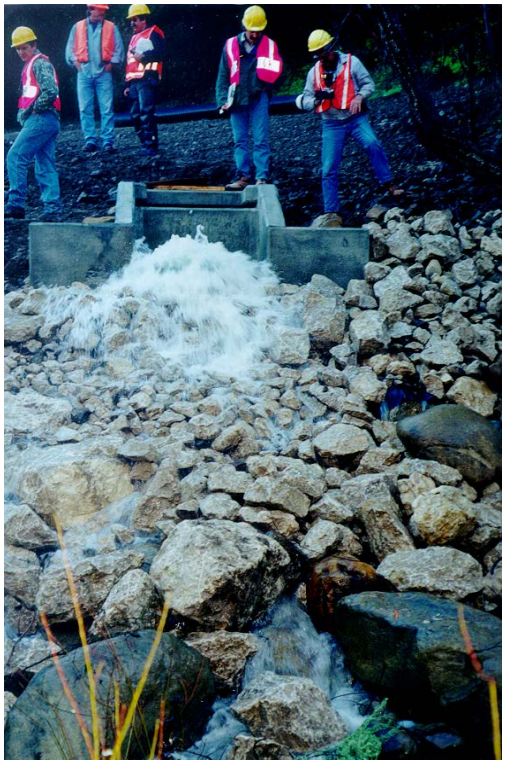
The provision for an Adaptive Management Account will benefit the rainbow trout/steelhead population in the Santa Ynez River by allowing managers the flexibility to maximize beneficial effects of the actions in this Plan. The Adaptive Management Committee will release water from the account in a way that will benefit rainbow trout/steelhead and other sensitive resources. The account is available to be released to provide additional passage or supplement rearing flow and, therefore, a more extensive description of the potential impacts and benefits of these releases are discussed in those sections.

Hilton Creek

Conservation measures in Hilton Creek will benefit rainbow trout/steelhead in several ways (Table 4-1). Enhancement measures for Hilton Creek include a supplemental watering system, creation of additional habitat in a channel extension (if feasible), and structures to improve passage for migrating fish at the cascade/chute impediment and the Highway 154 Culvert.

Supplemental Watering System

The supplemental water delivery system will maintain flows in Hilton Creek between 2-5 cfs. Further study of the conditions within Hilton Creek will be needed to develop specific release scenarios for this system therefore, as discussed in the Plan, releases from the supplemental facility will be adaptively managed within the capability of the system. The existing infrastructure of the supplemental watering system is being repaired to increase the capacity of the system (currently below the anticipated 10 cfs level) and additional portions of the infrastructure (*i.e.* the flexible intake and pump) will be added in the next few years.



Testing of the upper Hilton Creek release point of the Supplemental Watering Facility.

Within these constraints, the supplemental watering system will be managed in combination with natural runoff to provide year-round instream flows. This will directly benefit rainbow trout/steelhead by improving the availability and quality of juvenile rearing habitat, particularly during late spring, summer, and fall. The amount of summer habitat expected to be provided by the supplemental watering system alone is 1,380 feet up to the lower release point and 2,980 feet up to the upper release point. The upper release point will be used most commonly to maximize the increase in perennial habitat.

TABLE 4 - 1 AMOUNT OF HABITAT AND RAINBOW TROUT/STEELHEAD LIFE STAGES AFFECTED BY HILTON CREEK ENHANCEMENT PROJECT

Project Element	Steelhead Lifestage Affected	Nature of Effect	Amount of Habitat Affected
Supplemental Watering System	Fry, rearing juveniles, and over-summering adults	Maintain streamflow to support habitat through spring, summer, and fall.	1,380 feet to lower release 2,980 feet to upper release
Fish Passage Facilities	Migrating and spawning adults	Enhance access to spawning and rearing habitat above chute pool	2,800 feet between chute pool and Highway 154 Culvert and 3+ miles above the culvert
Channel Extension	Fry, rearing juveniles, possibly spawning adults	Create additional stream habitat for summer rearing and possibly spawning by extending lower channel	1,215 feet

Releases to Hilton Creek and Stilling Basin

Depending on how the Adaptive Management Committee chooses to distribute the water to released through the supplemental watering facility among the three system releases points, there are different effects. If only the Hilton Creek release point(s) are used, there will be no additional flow into the Stilling Basin (and the upper part of the Long Pool, should the channel extension be constructed). This affect will likely only occur in years with low target flow levels. Habitat quality for young rainbow trout/ steelhead is better in Hilton Creek than the Stilling Basin because there are no predatory warmwater fish. Therefore having the Hilton Creek release points as first priority will produce a net increase in high quality habitat for rainbow trout/ steelhead.

Passage Facilities

Construction of fish passage facilities at the cascade and bedrock chute will benefit rainbow trout/steelhead by improving access to an additional 2,400 feet of upstream spawning and/or rearing habitat, a portion of which will be maintained by the supplemental water facility. Fish passage facilities at the Highway 154 Culvert will provide access to approximately 3 miles of habitat in the upper reaches of Hilton Creek. Increased habitat availability is an environmental benefit of the proposed actions.

Channel Extension

Construction of the Hilton Creek channel extension is expected to benefit rainbow trout/steelhead by increasing the availability of suitable habitat. The channel extension will create about 1,500 feet of habitat. When streamflows are less than 15 cfs, the flow control structure at the head of the channel will direct flows into the channel extension instead of the current channel, which extends about 100-200 feet from the proposed head of the channel extension down to the Santa Ynez River.

Some limited depletion of the water released will occur due to evapotranspiration and percolation losses. Thermal gains may be an issue through the channel extension if the selected alignment does not provide good canopy cover. To minimize warming, the proposed project will be near existing trees and shrubs, where possible, and will plant additional riparian vegetation to shade the channel extension. Construction will be conducted in a dry channel and, therefore, will not impact rainbow trout/steelhead residing in the creek or river.

Fish Rescue Plan

While the supplemental water supply system will provide flow to Hilton Creek in most years, it may be impossible to provide streamflow in critically dry years when lake levels fall to near 660 feet. In addition, fish may be at risk of stranding should the Hilton Creek supplemental watering facility fail due to mechanical or human error. Under these conditions, fish rescue and predator control operations will be undertaken, if needed, to prevent mortality of rainbow trout/steelhead in the creek. Although some fish may die in the course of capture and transfer, the anticipated level of incidental mortality is lower than the mortality expected if fish were not rescued.

Predator removal operations may be conducted at relocation sites if surveys indicate that introduced warmwater predators are a potential problem for the size class(es) of rainbow trout/steelhead to be released at that site. The benefits of predator removal, however, will likely be temporary. In addition, predator removal activities may stress steelhead inhabiting the site where predator removal is taking place. Areas where steelhead are rearing/oversummering will be avoided during the predator removal process. Minimization measures to reduce impacts on steelhead inhabiting the habitat where predator removal activities will occur and specific reporting requirements have been established in the Cachuma Project Biological Opinion (NMFS 2000, and described in Appendix D). These measures include following the NMFS electrofishing guidelines should this method be employed. CDFG and NMFS favor habitat enhancement actions over predator removal for long-term management. CDFG and NMFS will be consulted before any fish rescue actions occur. The fish rescue program will benefit the rainbow trout/ steelhead population by increasing the number of fish that survive through the summer.

Fish rescue operations may also be conducted in other stream reaches not on Reclamation property that are drying and/or have stressful temperatures. The decision to conduct fish rescues in these areas will be made on a case-by-case basis based on the landowner's permission and in consultation with the resource agencies.

Conservation Easements: Habitat Protection and Enhancement

Rainbow trout/steelhead have been observed in a number of tributaries, including Salsipuedes, El Jaro, Quiota, and Alisal creeks. Habitat conditions within these tributaries, however, could be enhanced and improved for spawning and/or rearing. In addition, while some of this habitat is in fair or good condition, there is the potential for further enhancement. Sediment deposition, adjacent land-use practices, minimal riparian shading, and lack of suitable spawning gravels have been identified as areas where habitat protection and improvement may prove beneficial.

The tributaries are largely in areas under private ownership. SYRTAC is seeking partnerships with landowners to protect areas that have good habitat and to enhance areas that have fair to good habitat. Currently, discussions are underway with landowners in the El Jaro watershed regarding establishment of conservation easements or long-term leases along approximately ten miles of stream. Development of any habitat improvement projects will incorporate best management practices within these tributary areas. These practices are designed to minimize and avoid potential adverse impacts to rainbow trout/steelhead habitat (*e.g.*, sediment deposition during construction). The long-term impacts to rainbow trout/steelhead of these restoration and enhancement actions would be positive. Short-term potential impacts due to construction activities will be mitigated or avoided on a case-by-case basis.

Tributary Passage Impediment Modification

This proposed action will enhance passage at several fish passage impediments on tributaries, including several road crossings of Refugio Road on Quiota Creek, a bridge crossing on Salsipuedes Creek, and a cascade and chute and a highway culvert on Hilton Creek (described earlier). Modification of these impediments will benefit steelhead by improving upstream and downstream migration and access to spawning and/or rearing habitat. Modifying passage impediments on Hilton, Quiota, Nojoqui, Salsipuedes and El Jaro Creeks will improve access to approximately 95,000 linear feet of stream habitat and provide access to approximately 64,000 linear feet of habitat. Providing or improving access to existing habitat will increase the amount of spawning and rearing habitat in the lower Santa Ynez River system

Pool Habitat Management

Pools within the lower Santa Ynez River provide important habitat for rainbow trout/steelhead. Pool habitat is especially important as a refuge for rainbow trout/steelhead during summer and fall periods of low instream flow and elevated temperatures. Opportunities exist to improve structural habitat within pools on Reclamation property, mainly the Stilling Basin and Long Pool. Additional structural elements, such as boulders and large woody debris, can be added to pools to improve rearing conditions for young rainbow trout/steelhead and reduce their vulnerability to predation by warmwater fish species (*e.g.*, largemouth

bass) known to inhabit existing pools. Although the effectiveness of pool habitat management on the availability and quality of habitat, and the associated improvements in growth and survival of rainbow trout/ steelhead cannot be quantified, evaluation of the available information indicates that these actions will benefit rainbow trout/steelhead. This type of enhancement will also be implemented on a case-by-case basis on property not owned by Reclamation if willing landowners can be located.

Construction Related Impacts

A number of the proposed actions require construction activities. These proposed actions represent projects on both the mainstem and tributaries and involve both instream and riparian enhancements and/or modifications. While each proposed project is designed to positively benefit the steelhead population in the Santa Ynez River, the construction phase of project implementation has the potential to, temporarily, cause negative impacts to steelhead and their habitat. A number of actions will be taken to minimize these construction-related impacts. Construction of the impediment modifications and other enhancement projects will occur during summer and fall when there is either no flow or when surface flows are at a minimum. Short-term, potential impacts to steelhead may occur should they be rearing at or near the construction site. Consultation with NMFS (NMFS 2000) has produced a number of best management practices for the implementation of the tributary enhancement measures (see Appendix C). These practices will be applied to all construction projects that have the potential to negatively impact steelhead. In addition, construction plans will be reviewed and approved by NMFS, USFWS, and CDFG prior to implementation. Specific reporting requirements for construction project monitoring have been established (see Appendix I).

Construction of the Supplemental Watering System Pipeline. Photo courtesy of Barry Longwell.

Long-Term Monitoring

The majority of the monitoring proposed in the Plan is passive in that it will not directly impact rainbow trout/steelhead. Water quality monitoring in the tributaries, mainstem, Lake and lagoon, monitoring the lagoon water surface elevation and sandbar status, redd surveys and target flow compliance monitoring should have minimal or no impact on endangered steelhead as these actions will result in little or no impact within the stream channel. Habitat inventories and snorkel surveys may temporarily affect rainbow trout/steelhead by causing minor, localized disturbances to fish and their habitat; however these impacts will only occur during the sampling event and affected fish will be able to avoid the sampling team. Migrant trapping in the mainstem and tributaries has

the greatest potential to negatively impact rainbow trout/steelhead because these fish will be briefly trapped and handled as part of the monitoring process. Reclamation has consulted with NMFS to identify measures to reduce the impact of the monitoring program on fish (NMFS 2000, see Appendix I).

The data provided by the monitoring program will benefit rainbow trout/steelhead by generating the information necessary to assess the success of the Plan and adaptively manage the implementation of the Plan. Thus, the minor impacts that may occur during the monitoring program will be outweighed by the additional benefits to these fish that will result from successful implementation of the Plan's actions and the development of the recovery plan for the ESU.

Public Education and Outreach Program

Informing and educating the residents of the Santa Ynez River Valley and, in particular, the landowners along the lower Santa Ynez River and its tributaries, is an essential element of the Plan. Increasing public awareness of measures that can and will be implemented on the lower Santa Ynez River and tributaries to protect rainbow trout/steelhead and improve habitat conditions, will result in both direct and indirect benefits. Education of local landowners regarding land-use practices and simple management techniques may result in improved habitat conditions within a number of areas of the watershed which are currently under private ownership. Increased education of local landowners may also improve access to privately held areas where additional habitat improvement efforts can be designed and implemented as part of this Plan. As most of the watershed is privately held, even a small improvement in increasing landowner buy-in and participation could provide a substantial benefit to the rainbow trout/steelhead population. Increased public awareness of the actions being implemented to improve habitat conditions for rainbow trout/steelhead may also contribute to additional public support and increased funding for habitat improvement projects.

Genetic Protection

Protecting the unique southern steelhead genotype below Bradbury Dam will provide direct benefit to the steelhead population. This could be done by replacing the current northern derived stocks of rainbow trout supporting the put-and-take fishery above Bradbury Dam with either a southern steelhead hatchery stock or sterile trout. Southern steelhead have unique evolutionary adaptations that allow them to persist and even flourish in the more extreme climates of southern California, at the extreme edge of the species range. Genes introduced through cross-breeding with more northern strains, such as those used in the put-and-take fishery stocks, will decrease the ability of steelhead to survive in these harsher conditions and thus may reduce the viability of the population in the long run. The proposed action would reduce or

eliminate this intermixing and thereby provide a long-term benefit to the population. Because the northern fish currently stocked would be replaced with an equal number of southern steelhead hatchery stock or sterile trout, this action would not impact the recreational fishery in Lake Cachuma and the mainstem below Gibraltar Dam.

Access for Adult Steelhead above Bradbury Dam

Providing adult steelhead to historic habitat above Bradbury Dam could benefit the population in the basin, but has several difficulties associated with it that must be overcome. The benefits would derive from providing these fish access to areas of good spawning and rearing habitat that are not currently available to them. Another benefit would arise from reintroducing the anadromous life history strategy into resident rainbow trout populations that have been isolated from the ocean for over 45 years. This would likely result in an increased frequency with which juvenile fish in the upper basin exhibit anadromous tendencies. Problems with this action that preclude its implementation at this time include handling an endangered species, getting the progeny of these fish back down to the ocean where they could complete an anadromous life cycle, accessing suitable habitat in the upper basin on an inadequate road system, and potential impacts to other endangered species.

Downstream Transport of Upper Basin Juvenile Trout

Trapping juvenile rainbow trout migrating downstream in the upper basin and trucking them to the upper end of the estuary may benefit the steelhead population in the lower Santa Ynez River. It has been documented that some fraction of resident rainbow trout in coastal systems exhibit anadromous tendencies, that is they go out to sea to grow to adulthood. It is unknown what proportion of the juvenile fish in the upper basin might have this tendency, but by trapping migrant juveniles, the probability that these fish may have this tendency will be increased. To the extent that these juvenile fish do smolt and go to the ocean, the number of returning steelhead adults in the lower river could be increased, thereby increasing steelhead production in the system. To the extent that the juvenile fish do not go to the ocean, they may remain in the system and compete with and possibly displace the progeny of anadromous steelhead. This would negatively impact the anadromous population. By placing these fish near the estuary, this potential for competition is reduced; although, the importance of the estuary as a rearing habitat for juvenile steelhead/rainbow trout in the lower basin should not be overlooked. The need for this action is uncertain at this time, as juvenile production in the lower basin has been good during the current wet cycle, when compared to average baseline conditions (Engblom, pers. comm.). There are several other problems that preclude this action at this time. These include accessing suitable habitat in the upper basin on an inadequate road system, and potential impacts to other endangered species.

4.2 EFFECTS ON OTHER FISH

In addition to rainbow trout/steelhead, nine other native and fifteen introduced fish species inhabit the Santa Ynez River basin. The primary goal of the Fish Management Plan is to develop actions to restore the rainbow trout/steelhead fishery and provide collateral benefits to other native fishes and aquatic species. The Plan actions do not attempt to benefit the introduced species although, where possible, negative impacts were avoided. Of the ten native fish species in the basin, six species are found only in the lagoon and four are found in the mainstem and its tributaries.

4.2.1 NATIVE FISH

Tidewater Goby and Other Lagoon Species

The tidewater goby, Pacific herring, topsmelt, shiner perch, staghorn sculpin, and starry flounder are native to the Santa Ynez River basin and are confined to the lagoon. The majority of the proposed actions will not affect habitat in the lagoon and therefore will not positively or negatively impact these species.


Santa Ynez River Lagoon.

Supplementation of storm events to provide additional passage opportunities for migrating rainbow trout/steelhead will occur when there is a live stream from Bradbury Dam to the ocean, and therefore have the potential to affect lagoon species. The passage flow supplementation will result in more freshwater being transported by the mainstem river into the lagoon and out to the ocean, however, it is anticipated that the additional freshwater input should be minor compared with the instream flow derived naturally from the lower Santa Ynez River watershed. Thus, the effects on the lagoon should not adversely impact these native lagoon species.

Lagoon water quality, water surface elevation, and sandbar status monitoring are not expected to substantially impact these lagoon species. The later two types of monitoring will not involve entry into the lagoon. Water quality monitoring is frequently done by boat which avoids any negative impacts on these species. When the lagoon is shallow, the water quality monitoring sampling may occur by wading to the sampling sites. In these cases, care is taken to minimize the impact on goby habitat.

Trapping in the lagoon has the potential to negatively impact the tidewater goby and measures to minimize these impacts have been established in a biological opinion from USFWS.

Threespine Stickleback, Prickly Sculpin and Pacific Lamprey

Threespine stickleback, prickly sculpin and Pacific lamprey are all native to the Santa Ynez River. These species reside in the area affected by the proposed management actions and are expected to benefit from some of these actions. Conjunctive use of mainstem rearing target flow releases downstream water rights releases will maintain fish habitat in Hilton Creek and the mainstem near Bradbury Dam. The late summer and early fall is typically the most stressful period for fish in the Santa Ynez River because of warmer water temperatures and shrinking habitat. The water releases at this time will benefit these fishes by providing increased habitat during this critical period. In addition, perennial flows in the reaches just below Bradbury Dam will likely increase riparian growth and thereby further enhance available habitat for these native fish.

Conjunctive Use (Target Flows)

Passage Flow Supplementation

It is anticipated that passage flow supplementation will benefit the Pacific lamprey population in the Santa Ynez River. Lamprey, like steelhead, are dependent on winter storms providing sufficient streamflow to open the mouth of the lagoon to the ocean, and to provide adequate streamflow to allow for migration. The passage flow releases will occur at the same time that lamprey are migrating (ENTRIX 1995) and therefore will benefit lamprey by increasing the number of passage opportunities for this species. Stickleback and sculpin will not be impacted by passage supplementation as these releases will mimic natural storm events and be well within the range of natural variability within the Santa Ynez River system.

Downstream Water Rights

Lamprey's freshwater phase is often spent burrowed tail first into the channel substrate and they rarely migrate into the water column. Therefore they are not likely to be transported downstream to less suitable habitat by water rights releases. These releases also transport algae which is a food source for young lamprey. However, these releases do not remove all of the algae and therefore this action is expected to result in a minor impact, if any.

Stickleback inhabit aquatic vegetation or other structure within pools and sculpin are found on the bottom of the channel and not in the water column. Because these preferred locations provide some shelter from the higher flow rates during water rights releases, these species should not be adversely impacted by the increase in flow.

Monitoring

The majority of the monitoring-related actions will not substantially impact these three native species because any in-channel disturbances will be temporary and can be easily avoided by the fish. Migrant trapping has the potential to impact these species should they be trapped, however

the traps are checked regularly and the fish handled carefully to minimize effects on the fish.

Habitat Enhancement & Protection

Non-flow related enhancement measures will have some temporary impacts and other long-term benefits on these three species. Impacts and benefits will vary with the location of these populations and the particular enhancements proposed for each location. Sculpin are found in the lower 800 feet of Hilton Creek, and both sculpin and stickleback are located in the Salsipuedes-El Jaro system and the mainstem. Lamprey have only been found in the mainstem although they may inhabit the tributaries. Populations of these three species will be temporarily, negatively impacted where construction must occur in a perennial area that they inhabit. Measures taken to protect steelhead (*e.g.*, fish exclusion, sediment traps), which will be determined in consultation with NMFS, should also provide adequate protection for these other native species.

Sculpin will benefit from the perennial habitat provided by the supplemental watering system in Hilton Creek and by the additional perennial habitat created by the channel extension. Sculpin will not be impacted by construction of the cascade/chute passage structure because construction will occur in a dewatered channel and no sculpin are located in the section to be dewatered. Mainstem pool habitat enhancement, conservation easements, and habitat enhancements on those easements will provide a long-term benefit to the lamprey, sculpin, and stickleback populations in these areas by providing additional cover, habitat structure, and habitat protection.

Fish Rescue

The possible stress associated with fish rescue procedures might have an adverse impact on native fishes. Sculpin inhabiting lower Hilton Creek are likely to be stressed by the rescue operations in this reach. In addition, should predator removal activities occur in the mainstem pool habitats that will receive the rescued fish, sculpin, stickleback, and lamprey populations in these habitats will also be subjected to additional stress from capture and subsequent handling. Care will be taken in handling these native fish during both the fish rescue and predator removal operations. Native fish found in the mainstem pools will be returned to these habitats once the predator removal effort is complete. These fish will receive a short-term benefit from the predator removal effort, until the predators recolonize the mainstem habitat.

4.2.2 INTRODUCED FISH

Fifteen introduced species inhabit the Santa Ynez River, its tributaries, and Lake Cachuma. Fish with similar life histories have been grouped for the discussion of potential impacts.

Arroyo Chub

Flow-Related Enhancement

The arroyo chub, while not native to the Santa Ynez River basin, is a species of special concern and a fish native to southern California. The arroyo chub will benefit from the proposed actions. Arroyo chub prefer pool habitat which will increase in area and quality under the proposed operations. However, like rainbow trout/steelhead juveniles, they are exposed to predation from the other introduced species in the mainstem and the Salsipuedes/El Jaro Creek system. Conjunctive use of downstream water rights releases and target flow releases are expected to benefit the chub, like other native fishes, by increasing available habitat and enhancing the quality of existing habitat in the mainstem below Bradbury Dam. Fish passage releases should not adversely impact the chub as they are designed to mimic natural storm events which are well within the range of the natural variation of southern California storms. Downstream water rights releases have the potential to adversely impact mainstem arroyo chub by transporting these fish to more downstream habitat where water quantity and quality conditions are less favorable.

Habitat Enhancement & Protection

Chub populations will benefit from mainstem pool enhancement, the purchase of conservation easements, and habitat enhancement actions on those easements as these actions will protect and improve the quality (*e.g.*, instream structure, decreased sediment load) of chub habitat. Construction activities related to the installation of these enhancements and passage modifications in the mainstem and the Salsipuedes/El Jaro Creek system will likely result in temporary, negative impacts on arroyo chub. Actions will be taken to protect steelhead (in consultation with NMFS) and other fishery resources (in discussion with CDFG). These steps will likely include installing sediment traps, temporary removal of fish, and construction during the low flow time period and should result in minimizing the construction-related impacts on chub. The passage structures will not provide long-term benefits to the arroyo chub because the structures will be designed for the swimming capabilities of steelhead and therefore chub will not likely be able to use the structures to gain access to upstream habitat.

Fish Rescue

Possible stress associated with fish rescue procedures may have an adverse impact on arroyo chub; but impacts will be minimized whenever possible, and chub are not found in Hilton Creek where fish rescues are most likely to occur. Predator removal in mainstem pools that may occur in conjunction with fish rescue events will both benefit and impact chub. Short term impacts will occur during predator removal which may

involve electrofishing and therefore expose the chub to potential harm. Electrofishing will follow the best management practices that will be outlined by NMFS. The chub will receive a subsequent benefit as they are returned to mainstem pool habitat with fewer predators.

Monitoring

Of the actions outlined in the monitoring program, only the migrant trapping has the potential to negatively impact these fish should they be affected by the trap. Care will be taken to reduce impacts of trapping on all fish species.

Fathead Minnow and Mosquito Fish

Enhancement Measures

Fathead minnow and mosquito fish should be beneficially impacted by the proposed actions. Target flow releases and conjunctive use will maintain fish habitat for extended periods during late summer and early fall, thus increasing habitat availability for these species. The perennial flows will likely increase riparian growth, thereby enhancing available habitat although this may also result in the need for vegetation control projects in the mainstem which will likely result in localized, temporary impacts to habitat. Passage flow releases will not affect these species because the releases are similar to naturally occurring events. Habitat protection and enhancements in the mainstem, and the Salsipuedes/El Jaro Creek system for the fathead minnow, will also benefit these species by increasing riparian growth, reducing sediment deposition, and increasing instream structure. Construction activities associated with enhancement projects will temporarily impact these fish because construction will occur in the stream channel. Minimization measures will be developed to reduce impacts on steelhead and other fish during the design phase of individual projects.

Fish Rescue & Monitoring

The stress associated with the predator removal activities that accompany fish rescue activities (or the rescue activity itself should one take place in Salsipuedes or El Jaro Creek) will have an adverse impact on individuals located in the mainstem habitat receiving the rescued fish. Of the actions proposed in the monitoring program, only the migrant trapping procedures might have an adverse impact on fathead minnows and mosquito fish should they be caught in the traps. Other in-channel monitoring should not result in the harassment of these or other fish.

Bass, Sunfish, and Crappie

Conjunctive Use (Target Flows)

The members of the family Centrarchidae introduced into the Santa Ynez River watershed (largemouth bass, smallmouth bass, bluegill, green sunfish, redear sunfish, black crappie and white crappie) are predatory fish, most of which are found in both the Santa Ynez River and in Lake Cachuma. Fish inhabiting the mainstem below Bradbury Dam will be both positively and negatively impacted by the Plan. Conjunctive use of mainstem rearing target flow releases and downstream water rights will positively benefit centrarchids by increasing the available habitat in the late summer and early fall. All of these fish prefer pools with good

structure and, generally, good water quality, both of which will be improved by Plan actions. In the reach above Highway 154, mainstem target flow releases may negatively affect centrarchids because the water released will be 18°C or less. Since these fish are warmwater species, the cooler water temperatures could potentially slow their growth rate. In the mainstem areas downstream of Highway 154, this impact is expected to be minor because of the rapid heating of water as it moves downstream. The additional riparian growth provided by the target flow releases will yield additional instream structures which are utilized as shelter by centrarchids.

Passage & Water Rights Releases

Centrarchids may be negatively affected by the higher velocity flows that result from both passage flow supplementation and downstream water rights releases. These fish have trouble holding their position in the water column against higher velocity flows. Passage and water rights releases have the ability to transport these fish downstream to potentially less suitable summer habitat. Such transport has been observed by the SYRTAC project biologist during water rights releases. Passage flow supplementation is less likely to have an impact than the water rights releases because Fish Passage Account releases will follow naturally occurring storms. Presumably, centrarchids will have either moved to suitable habitat where they can maintain their position triggered by flows gradually increasing at the leading edge of the natural storm front, or have already been moved downstream by the storm event.

Habitat Enhancement & Protection

Mainstem pool habitat enhancement will yield a temporary-construction related impact on centrarchids in these habitats but will yield a long-term benefit by providing additional structure in these pools. Enhancement activities on Hilton and Quiota Creeks will have no impact on these species as they are not found in these tributaries. Green sunfish and largemouth bass are located in the Salsipuedes/El Jaro Creek watershed and therefore the installation of passage modifications and habitat enhancements will negatively impact these species. These impacts will be construction-related, will be temporary, and will be minimized by steps taken to protect native species. Long-term benefits will accrue to these inhabitants as a result of habitat protection and enhancement (*e.g.*, bank stabilization, riparian planting). The long-term benefits should outweigh any temporary impacts.

Fish Rescue

Rainbow trout/steelhead rescue operations may involve predator removal in pools prior to the release of the rescued fish into the new habitat. Centrarchids inhabiting these pools are the target of this operation and thus will be negatively impacted. Because these fish are located throughout the mainstem and also in Lake Cachuma, and therefore will be able to recolonize these habitats, predator removal

activities will not have substantial negative impacts on the mainstem population.

Monitoring

The majority of the monitoring program will not impact these fish as in-channel activities will only yield temporary disturbances that can be avoided by the fish. Migrant trapping activities have the potential to impact these fish on Salsipuedes Creek and at the mainstem trapping site (Refugio Reach) should these fish get washed into the traps.

Inhabitants of Lake Cachuma

Surcharging the reservoir to 3.0 feet in wet years is not expected to impact bass, sunfish, and crappie inhabiting Lake Cachuma. Based on a study of the effect of a 1.8 foot surcharge on spawning and fry rearing in the Lake, done for the Cachuma contract renewal (ENTRIX 1995), the impacts of the 1.8 foot surcharge are almost identical to current operations. A 1.2 foot increase beyond the level already determined to have little impact on these fish should not negatively impact spawning. Bass, sunfish, and crappie create their nests over a range of water depths (see Section 2.3.1). Once the nests are built, surcharging the reservoir will only submerge these nests to a slightly deeper level. This will not substantially impact the success of the nests. Surcharging the reservoir will not lead to a decrease in spawning habitat and will allow for access to spawning habitat in the Lake's tributaries.

Flow-related enhancements have the potential to affect Lake Cachuma resources because they, like water supply deliveries, reduce the lake surface elevation. Decreasing lake surface elevation has the potential to de-water nests prior to fry emergence, however, because of the small shifts in reservoir surface elevation expected as a result of the flow-related enhancements, this should be a negligible impact. None of the proposed releases (target flows or Fish Passage Account) will dramatically change the reservoir surface elevation in a short period of time. For the steelhead spawning period of January through May, analysis shows that the largest projected release for passage supplementation would be 1,800 AF over at least two-14 day periods. The surface area of Lake Cachuma is approximately 3,000 acres at a reservoir surface elevation of 750 feet. Because of the large surface area of the Lake, the 1,800 AF release will amount to a decrease in reservoir surface elevation of slightly more than 0.5 feet. Such a small change in surface elevation will have the potential to de-water only the most shallow of nests. Bass, sunfish, and crappie generally do not create nests in water shallower than 0.5 feet and therefore few, if any nests should be impacted by these operations.

Catfish

Channel catfish and black bullhead will be both positively and negatively impacted by the Plan. Conjunctive use of downstream water rights and mainstem target flow releases will maintain habitat in the mainstem for

catfish. These releases may have a slight, negative impact for those fish residing near the dam because they prefer warm water. These effects will not persist downstream of the Highway 154 Bridge. Passage flow and water rights releases have the potential to move catfish to downstream habitats that are less suitable for oversummering. Mainstem pool habitat enhancement will improve habitat for catfish although temporary impacts will occur during the construction phase of this project. Catfish spawn in 8-12 foot deep water and therefore nests should not be impacted by changing lake levels. Construction-related impacts will be minimized through steps taken to protect steelhead and other fishery resources as identified during the project design phase and with NMFS and CDFG input. The tributary enhancement measures will not impact the channel catfish because it is not located there. Black bullhead are located in Salsipuedes Creek and therefore may be impacted during construction of habitat enhancements and passage modifications. Fish rescue activities also may impact these species as they will be removed from mainstem habitat should predator removal activities commence.

Threadfin Shad

Threadfin shad are only present in Lake Cachuma. Surcharging the reservoir will not impact the shad, nor will any of the proposed release operations, because shad prefer open surface waters. Water fluctuations should not affect shad because spawning occurs on floating or partially submerged vegetation or other structures.

Goldfish and Carp

The activities proposed in the Plan will benefit goldfish and carp by providing habitat maintenance flows in the mainstem. Passage flow supplementation and water rights, may negatively impact these fish by transporting them to less desirable habitats downstream. Releases and surcharging are not expected to impact individuals of these species who inhabit the lake. Mainstem pool habitat enhancement will provide a long-term benefit for these species as both goldfish and carp prefer pool habitat with structure. Short term impacts associated with construction of the instream structures may occur.

4.3 EFFECTS ON OTHER PROTECTED SPECIES

In addition to rainbow trout/steelhead, sensitive species occurring in the Santa Ynez River downstream of the Lake Cachuma include California red-legged frog, California tiger salamander, arroyo southwestern toad, southwestern pond turtle, two-striped garter snake, least Bell's vireo and southwestern willow flycatcher. Although we do not anticipate any significant adverse impacts to these species, the SYRTAC representatives from the USFWS and the CDFG are closely involved in the management activities and will provide required advice and consultation with respect to potential effects to sensitive and listed species.

California Red-Legged Frog

Conjunctive Use (Target Flows)

The California red-legged frog needs water throughout much of the year. The Plan includes measures to extend summer flows in Hilton Creek through releases at the Hilton Creek supplemental water supply facility in most years (through pool maintenance releases from Bradbury Dam in critical drought years). These releases will have a beneficial effect on red-legged frogs and other non-listed aquatic species by providing additional habitat and improving existing habitat through water quality improvements and additional riparian growth. Several predators of the red-legged frog, including introduced fish, bullfrogs, and native garter snakes, inhabit the mainstem. Therefore, it is not anticipated that perennial flow in the Highway 154 Reach will provide significant benefits to the red-legged frog population. Sustaining flows in lower Hilton Creek will create good red-legged frog habitat. The sustained flows and the dense riparian corridor that will develop as a result of these releases will, however, also benefit both bullfrogs and garter snakes, predators of the red-legged frogs.

California Red Legged Frog. Photo by Tom Taylor

Passage Flows & Monitoring

Passage flow releases should not impact the frog because (1) releases from the Fish Passage Account will be well within the range of natural storm flows and (2) they will only affect the mainstem and red-legged frogs are not currently found there (Woodward-Clyde 1995). The majority of the actions proposed in the monitoring plan also should not adversely impact red-legged frogs. However, migrant trapping in the tributaries, where red-legged frogs are found (*e.g.*, Salsipuedes Creek), and potentially in the mainstem, should red-legged frogs colonize the area, has the potential to adversely effect this species. SYRTAC has worked with USFWS to develop protocols to minimize the impact of trapping on this sensitive species (USFWS 2000).

Habitat Protection & Enhancement

Establishment of conservation easements and implementation of habitat enhancement projects is planned for the tributaries. California red-legged frogs have been reported in Salsipuedes and Nojoqui Creeks. The proposed actions are likely to benefit frogs, which occur primarily in areas with pools and dense cover in the riparian corridor. Conservation easements will protect streams from disturbance of riparian vegetation. Depending on the site, enhancement actions will decrease sediment inputs that can fill pools, add instream structures that increase cover and foster deepening of pools, and protect and plant riparian vegetation. It is not known whether frogs are present at the passage impediments where proposed improvements would be made. Surveys will be conducted prior to construction to determine whether frogs are present, and appropriate measures will be taken to minimize short-term impacts from construction. In the long-term, red-legged frogs will not be adversely affected by modification or removal of an impediment.

Hilton Creek Enhancement & Fish Rescue

The California red-legged frog has not been reported in the immediate vicinity of Hilton Creek and therefore is not expected to be directly affected by construction of passage facilities and the channel extension. Construction will occur in late summer and/or fall such that eggs and tadpoles will not be present. Pre-construction surveys will be conducted to provide protection to adult frogs. If individuals of this species are located in the project area, they will be removed and exclusion fences erected and maintained during the construction period. Fish rescue activities in Hilton Creek, and possibly in selected mainstem areas, are not expected to affect red-legged frogs because the frogs do not occur in either the areas where rescue operations will take place or in the likely relocation site (mainstem below Stilling Basin and in the Long Pool).

Upper Basin Actions

Trap-and-truck operations proposed to provide steelhead access to the upper basin could potentially affect red-legged frogs. This species is mobile and can be present on roadways in the upper basin in the winter. Increasing vehicular traffic during this time of year could result in increase mortality to this threatened species.

California Tiger Salamander

The California tiger salamander is located in isolated ponds and the adjacent upland areas (up to 1.2 miles away). None of the ponds identified as potential or existing tiger salamander habitat in Santa Barbara County are near the Santa Ynez River mainstem, the south side tributaries discussed in this Plan, or Lake Cachuma nor are they likely to colonize these areas as a result of actions proposed in the Plan. Therefore the actions in the Plan will not negatively impact this species. The public education and outreach action proposed here, however, may have a positive benefit for the tiger salamander by making the public more aware of endangered species issues and by providing assistance to landowners to implement conservation measures on their property.

Southwestern Arroyo Toad

The arroyo southwestern toad is not found in the area where actions are recommended and therefore will not be impacted by the actions proposed in this Plan. The arroyo toad is found in the Santa Ynez River watershed above Gibraltar Reservoir.

Trap-and-truck operations proposed to provide steelhead access to the upper basin could potentially affect the southwestern arroyo toad. This species is mobile and can be present on roadways in the upper basin in the winter. Increasing vehicular traffic during this time of year could result in increase mortality to this endangered species.

Southwestern Pond Turtle

Flow-Related Enhancement

The southwestern pond turtle needs water from spring to fall, and possibly throughout the year. Currently, dependable water supplies are limited to a few isolated pools. The Plan includes measures to extend summer flows through releases at the Hilton Creek supplemental water supply facility in most years, and through pool maintenance releases from Bradbury Dam in critically dry years. These releases will have a beneficial effect on western pond turtles and other non-listed aquatic species by providing additional habitat and improving existing habitat through water quality improvements. However, an increase in bullfrogs might negatively effect the turtle population through predation on hatchlings. Adverse impacts to hatchlings could also occur if substantial spring streamflow washed them downstream. Passage flow releases will be well within the range of naturally occurring storm events and will mimic historical conditions. Because flow releases will be no more than 150 cfs, such releases should not move turtles. Surcharging the reservoir by 3 feet is not expected to impact the species' breeding or nesting habitat (Engblom, pers. comm.). The monitoring program is not expected to impact this species and should any be noted in monitoring areas, care will be taken to avoid any adverse impacts.

Habitat Protection & Enhancement

Conservation easements/leases will benefit turtles by protecting instream and riparian habitat. Construction projects (such as impediment modifications) and riparian enhancement could adversely affect turtles by destruction of nest sites during construction projects. Actions will be taken in consultation with USFWS and CDFG to minimize short-term impacts. In the long-term, the proposed actions would make these habitats more suitable for western pond turtles, leading to an overall beneficial impact. Fish rescue activities are not expected to have a negative affect on western pond turtles.

Two-Striped Garter Snake

Flow-Related Enhancement

Suitable habitat for two-striped garter snakes is generally limited around Lake Cachuma, but tributaries in general and backwater areas may provide additional habitat for the species. The Plan includes measures to extend summer flows in Hilton Creek and portions of the mainstem. These releases will have a beneficial effect on two-striped garter snakes

and other non-listed aquatic species by providing additional habitat and improving existing habitats through water quality improvements.

Habitat Protection Enhancement

The construction of the Hilton Creek channel extension, the removal of passage impediments on tributaries, and other improvements, could have short-term, adverse effects on garter snakes. Surveys will be conducted prior to construction to determine whether snakes are present, and appropriate measures will be taken to minimize construction related impacts. In the long-term, the proposed actions would likely result in additional habitat for two-striped garter snakes, leading to an overall beneficial impact. Fish rescue activities are not expected to have a negative affect on the species. Establishment of conservation easements is likely to benefit snake habitat, since conservation easements will protect riparian vegetation and reduce disturbance and erosion of streambanks.

Southwestern Willow Flycatcher

Passage Flow Supplementation

The southwestern willow flycatcher needs dependable water during its summer nesting period. This species occurs at locations between Buellton and Lompoc. The passage flow supplementation will likely increase flows slightly in this reach on the descending limb of supplemented storms. These flows, however, are well within the range of natural variation within this watershed and therefore will not adversely impact this sensitive resource.

Conjunctive Use

Conjunctive use of downstream water rights and mainstem target flow releases will likely have a positive benefit on the habitat of this species. Providing year-round flow to the Highway 154 Bridge, and additional flow to Alisal Road in some years, will increase the riparian vegetation that is the preferred habitat of willow flycatchers. Colonization can potentially occur from the exiting nesting populations near Buellton and Lompoc. Flycatchers require a source of water or saturated soil. Downstream water rights releases will provide a source of water during the breeding season in many years. These releases are not likely to adversely impact nests because flycatchers build their nests 3.2 to 15 feet above the ground (USFWS 1995) and water rights releases provide shallow flow constrained to the low-flow channel. While some of the new vegetation growth may need to be removed periodically, conjunctive releases to meet the mainstem rearing target flows are expected to result in a net increase in available flycatcher habitat. Finally, conservation easements and riparian enhancement activities may also benefit the flycatcher should they colonize this restored or protected habitat.

Least Bell's Vireo

A population of least Bell's vireo may occur on the Santa Ynez River near Salsipuedes Creek. Passage flow releases will affect the stream in this region however since the magnitude of these releases is much smaller than many naturally occurring storm events. Conjunctive use operations

will provide flow maintenance from Bradbury Dam to Highway 154 in most years and to Alisal Road in many years. These releases may positively benefit vireos by creating additional riparian habitat for these birds. Downstream water rights releases for the Below Narrows Account will provide surface flow from the dam to Lompoc. Since vireo's construct their nests at a height of 3 to 8 feet and 30 to 650 feet from the water's edge (Olson and Gray 1989), and water rights releases are confined to the low flow channel, these releases will not be large enough to adversely affect nests. Establishment of conservation easements and implementation habitat enhancement projects in Salsipuedes Creek are likely to benefit vireos by protecting and enhancing potential nesting habitat.

Species and Habitat Around Lake Cachuma

Wildlife

Sensitive species in the vicinity of Lake Cachuma include the bald eagle and American peregrine falcon. In addition, the California red-legged frog and likely also the two striped garter snake are located in the tributaries to the Lake (Woodward-Clyde 1995). It is proposed that Lake Cachuma be surcharged by 3 feet in years when spill occurs. This will temporarily raise lake levels and increase inundation of the surrounding land. Such inundation should have a negligible affect, if any, on the bald eagle or falcon by potentially affecting some of their perching trees. Most of the trees adjacent to the water are expected to withstand the temporary inundation of the additional surcharge. In addition, the surcharge and flow-related enhancements are not likely to impact the fish species (primarily catfish) that are their prey (see discussion above).

Bald Eagle

Surcharging the reservoir by 3 feet would raise the full-water surface elevation in Lake Cachuma to 753 feet, and would result in the temporary flooding of approximately 95 acres along the lake (Woodward-Clyde 1995). This area includes approximately 14 acres of riparian habitat, 36 acres of oak woodland, 4.2 acres of chaparral and less than .5 acre of wetland. According to the Santa Ynez River simulation model, the water level would be at 753 feet, during 8.8% of the period of record and would be above 750 feet for 16.8% of the time (76 year period of record). The majority of these habitats would not be lost, they would simply be inundated for a period of time before the reservoir returned to an elevation below 750 feet. Because oak trees are considered a sensitive resource in Santa Barbara County, mitigation for any temporarily inundated oak trees (typically a 10 to 1 replacement) may be required.

Plant Communities

4.4 EFFECTS ON WATER SUPPLY

Water Supply

Effects on Water Supply

The Plan will adversely impact the water supply of the Cachuma Project Member Units by creating greater water supply shortages during dry periods. Reclamation has proposed to address this impact by continuing to draft the Project at the current amount of 25,714 AFY. The Member Units expect and accept more frequent shortages from the Project and greater shortages during dry periods. The results of modeling indicate that the Plan will produce greater shortages during the critically dry period of approximately 2,300 AF (a 19% increase) in the worst year of the critical period and a greater cumulative shortage of approximately 4,150 AF (a 19% increase) during the last three years of the critical period. Smaller shortages would happen during dry periods less severe than the worst historical dry period.

It is important to note that the shortages described above are additional shortages. During dry periods, the Cachuma Project and other local surface water supplies would be expecting, prior to implementation of this plan, substantial shortages under baseline conditions in many years. Cachuma Project Member Units plan to meet expected shortages under current operations with SWP water and local groundwater. Under the proposed Plan, the total shortages expected from the Project during the worst year of the critical dry period have increased to an estimated 14,500 AF. Member Units will offset some of the additional shortages by ordering SWP water, which has an additional marginal cost. This assumes, however, that shortages in the SWP do not coincide with critical year shortages in the Cachuma Project. In critical drought years, Cachuma Project Member Units will experience water shortages and additional measures (*e.g.*, water rationing, extensive conservation measures) will be required.

Downstream Water Rights

Under the Plan, the mainstem rearing target flows take the place of the Fish Reserve Account and are designed to maintain and restore rainbow trout/steelhead. Through use of the proposed increased surcharge (3 feet), the Plan establishes the target flows downstream and provides adaptive and fish passage water. These releases will have an ancillary effect of providing additional recharge to upper reaches of the Santa Ynez River groundwater basin, which should have the effect of decreasing dewatered storage in the upper portion of the Above Narrows area near Bradbury Dam. For the purpose of the ANA and BNA, mainstem target flow releases, Fish Passage Account, and Adaptive Management Account releases used for rearing habitat are not treated as natural flow in the Santa Ynez River.

State Water Deliveries

NMFS is concerned that the non-Santa Ynez River basin water provided by the SWP not affect local imprinting of steelhead smolts. Imprinting of steelhead smolts that allows them to return to their natal waters is not

well understood. Therefore as a precaution, CCWA will not mix SWP water with river water downstream of the dam from December through June unless there is discontinuous flow in the mainstem Santa Ynez River (NMFS 2000). Deliveries of SWP water are made to Lake Cachuma through the outlet works that are also used (at different times) to release water for the downstream water rights accounts and for passage flow supplementation. The mixing restriction will not affect the ability to make downstream water rights releases as these releases are only made when the flow in the river is discontinuous. When flow is continuous, no recharge releases would be called for.

The passage flow supplementation releases have the potential to temporarily interrupt deliveries of SWP water as these releases will occur during the December through June period and when there is a continuous channel from the dam to the ocean (to allow for migration). Under the passage flow scenario described in Section 3.2.2 above, releases would be made for approximately 14 to 15 days for each storm that is supplemented. In years when supplementation would have occurred, typically 1 to 2 storms would be supplemented resulting in approximately 15 to 30 days in which CCWA deliveries could not be made. Analyses with the Santa Ynez River hydrologic model show that, for the 16 years supplementation would have occurred, the average number of days CCWA water would be undeliverable would be 21 and the maximum number of days would be 36. In either case, there is still sufficient time to deliver the entire CCWA entitlement to Lake Cachuma. Therefore, passage flow releases will only temporarily delay CCWA deliveries, they will not affect the ability to fully deliver CCWA water.

Flood Control Operations

The river channel capacities vary greatly along the Santa Ynez River below Bradbury Dam. In general, with the exception of the 1969 floods, river channel capacities have been adequate to pass historic flood flows without damage to urban areas. However, flooding of agricultural lands west of the Lompoc Regional Wastewater Treatment Plant is of particular concern. Riparian growth in the channel has been enhanced by the effluent from the plant, which has created a flood hazard by reducing the conveyance capacity and water velocities, and increasing sediment deposition.

The Santa Barbara Flood Control District has expressed concern about the effects of conjunctive releases from Bradbury Dam on riparian vegetation and consequently channel capacity for flood conveyance. The Plan will not increase the flood hazard below Lompoc, which is the area of greatest concern, as no change in flow is anticipated this far downstream. The presence of perennial flow would, however, potentially stimulate riparian growth in reaches closer to Bradbury Dam.

4.5 LAND USE

The potential impacts of the Plan on land uses in the Santa Ynez River basin, other than water supply, were assessed. Land uses considered included agriculture, transportation, and recreation.

Agriculture & Ranching

Agricultural uses will potentially be affected by actions in the Plan, both by flow-related measures on the mainstem and by conservation easements (*e.g.*, restrictions to some landowner activities).

In the mainstem just below Bradbury Dam, maintenance of instream flows through conjunctive water releases will increase watering opportunities for cattle, but will also negatively affect crossing by cattle, horses, and ranchers at low streamflow. In summer, maintaining flow in the mainstem can facilitate the production of algae which can create a hazard for stream crossing. In addition, passage flow supple-mentation may have a small impact by delaying the ability to cross cattle by no more than 14 days. Efforts will be made to work with landowners to minimize adverse impacts to ranching operations.

Landowners who choose to establish conservation easements or leases will benefit from monetary compensation in exchange for voluntarily yielding certain management rights. The terms of the easements will be negotiated with the landowner and therefore there should be no unacceptable adverse impacts to the operations of the property. These actions can benefit the landowner as well as the stream habitat by protecting a natural resource on the property. For example, bank stabilization will prevent loss of arable land to erosion.

The proposed 3-foot surcharge is expected to have no impact on agricultural practices. The majority of the land surrounding Lake Cachuma is publicly owned and consists of open space. A small amount of grazing land along the lakeshore will be temporarily inundated during surcharge.

Transportation

Road crossings and bridges block or impede fish passage on some tributaries, including some moderate to low flow impediments on Salsipuedes, El Jaro, and Quiota creeks. These structures can be modified with minimal or no impact to function (*e.g.*, by notching the Arizona road crossings and creating a fishway). The fish passage modifications will be designed in conjunction with CalTrans and the Santa Barbara County Roads Department to have a minimal effect on flood conveyance capacity.

Recreation

Surcharge of the reservoir up to 1.8 feet in the spring would have no significant adverse effects on the resources and uses of the Lake

Cachuma, according to the Cachuma Contract Renewal EIS/EIR (Woodward-Clyde 1995). No long-term impact is expected as a result of the proposed 3 foot surcharge either; however short-term effects are expected. At a full water surface elevation of 753 feet, approximately 5 acres along the shoreline of the park (or approximately 1.3% of the entire area of the park) would be inundated. Inundation of the majority of this area would have no impact on the operation of the park because raising the shoreline slightly does not affect the ability to use the shoreline for recreational purposes. However, at 753 feet MSL, there is the potential to partially inundate or otherwise affect the function or use of some of the County Park facilities. Most of these structures can withstand temporary inundation with little or no impact to the structure (*e.g.*, flooding a boat ramp) but they may temporarily impact use of these structures. Modification or movement of affected structures will be considered in the near future or in the renewal process for the park's lease agreement with Reclamation (lease expires in 2003).

Conservation easements on agricultural/ranch lands will protect fish habitat and benefit landowners. Photo by Tom Taylor

5.0 PLAN IMPLEMENTATION

The Fish Management Plan will be implemented in a phased approach. Those measures that are under the direct jurisdiction of Reclamation and/or the Member Units and that do not require the construction or modification of facilities will be implemented immediately. Other actions have been scheduled for short-term, near-term and long-term implementation.

Funding for these actions is available from Reclamation, the Member Units, the Cachuma Project Renewal Fund, and the Warren Act Trust Fund. Additional funding will be sought from state, federal and private sources.

5.1 INTRODUCTION

The proposed actions will be implemented in a phased approach. Those measures under the jurisdiction of Reclamation and/or the Member Units that do not require the construction or modification of facilities will be implemented immediately. A schedule for accomplishing the measures requiring the construction of facilities on Reclamation property has been established. Management actions that require the active involvement of other agencies or require the permission or participation of private landowners will be established in consultation with the landowners and agencies.

Funding for the proposed conservation measures is available from Reclamation, the Member Units, the Cachuma Project Contract Renewal Fund, the Warren Act Trust Fund, and Santa Barbara County. Additional funding will be sought from state and federal sources and private foundations.

This section is organized into subsections that progress from proposed actions which can be implemented immediately, to those that are in the planning stage and will be implemented within the next three to five years. Selected projects, research topics, and analysis of the long-term monitoring data have a longer implementation window. Sections are followed by discussions of the funding mechanisms for the action and the administration of this implementation program.

5.2 ACTIONS FOR IMMEDIATE IMPLEMENTATION

Adaptive Management Committee

Action. The Adaptive Management Committee will be created to administer the implementation of actions discussed in the Plan (see Section 5.7).

Schedule. The Adaptive Management Committee will be created as soon as the final Plan is approved by Reclamation and the Cachuma Member Units.

Evaluation. The actions of the Adaptive Management Committee will be overseen by NMFS and the Consensus Committee. NMFS must approve the actions taken by the Adaptive Management Committee and require 30 working days to review the action(s) and supporting data (NMFS 2000). The 30 day requirement, however, will be waived until the ability to surcharge Lake Cachuma to 3 feet is achieved, but not the approval requirement.

Reservoir Surcharge

Action. In years when the reservoir spills, the reservoir will be surcharged 0.75 feet to store additional water that will be released from the reservoir to meet target flow levels.

Schedule. Reclamation will surcharge the reservoir to a level of 0.75 feet if water is available beginning in 2000. Surcharging will be carried out at the proposed 1.8- or 3-foot levels in subsequent years.

Evaluation. The structure for the 0.75 surcharge already exists and the reservoir will continue to be surcharged to this level in spill years.

Interim Mainstem Rearing Target Flows and Conjunctive Use

Action. Until the water from the proposed 3-foot reservoir surcharge is available, interim target flows will be employed. Interim target flows have been established at the Highway 154 Bridge. In years when the reservoir spills at least 20,000 AF, a target flow of 5 cfs will be established at Highway 154. In years when the lake spills less than 20,000 AF and/or storage is more than 120,000 AF, 2.5 cfs will be the flow target. In addition, the residual pool depth will be maintained in refuge pools in the Refugio and Alisal reaches during spill years (spill >20,000 AF) and the year immediately following a spill year when steelhead are present in the pool habitat. When lake storage recedes below 120,000 AF, the target flow is 1.5 cfs. Releases to refresh the Long Pool and Stilling Basin may be made when storage is less than 30,000 AF (releases not to exceed 30 AF per month). In years when water rights releases are made, the water will be used conjunctively to meet the target flow levels.

Schedule. The interim mainstem rearing target-flow releases will begin during the fall of 2000.

Evaluation. Flow levels at the Highway 154 Bridge will be measured weekly to determine if the target flows described in Section 3 above are being met. A staff gage will be installed and a flow versus water surface elevation relationship developed. Releases will be adjusted accordingly based on the weekly result. If the residual pool depth in the Refugio and Alisal Reaches must be maintained, then a staff gage installed in representative pools will be monitored weekly to determine that the depth of the pool is remaining at the residual depth. Target flows are expected to water the lower 1380 to 2,980 feet of Hilton Creek and the 2.9 miles of the Highway 154 Reach in the mainstem year round (except for drought years).

Hilton Creek Supplemental Watering System

Action. Reclamation has completed a supplemental water supply that began providing water directly to Hilton Creek and to the Stilling Basin in the spring of 2000. The supplemental water system has three delivery points, two in Hilton Creek that can be used to maximize habitat availability and minimize thermal loading from solar radiation, and one to the Stilling Basin to provide improved water quality conditions when necessary. A second phase of the supplemental watering system is the installation of a pump to allow delivery of water to Hilton Creek at lower lake elevations. With a pump, water deliveries can be made down to lake elevations of 665 feet. The estimated cost for designing and installing a pump and flexible intake system is approximately $360,000. The estimated annual cost of maintenance is $16,000, and operation of the pump system is $19,000.

Schedule. The supplemental water system began operating in the spring of 2000. The Member Units have received $230,000 from Proposition 12 funds and $147,000 from the National Fish and Wildlife Foundation (NFWF) to fund the design and construction of the pump and flexible intake system. Installation of the pumping facilities is planned for 2002.

Evaluation. This system will provide the water to meet the mainstem rearing target flows when downstream water rights releases are not underway. Therefore, this system will provide water to the lower 1380 to 2,980 feet of Hilton Creek, the 2.9 miles of the Highway 154 Reach, and provide 1.5 cfs at the Alisal Road Bridge (10.5 miles downstream of the dam) in large spill years and the year following. Water will be released such that Hilton Creek and the mainstem below Bradbury Dam will have perennial flow except in very dry years (2% of the time). In addition, to evaluate the capacity of the Hilton Creek Supplemental Watering System, tests will be conducted to determine the maximum operating capacity of the modified system. Finally, habitat versus flow relationships will be

developed for lower Hilton Creek to determine how much rearing space is available at different flow regimes. This information will be used by the Adaptive Management Committee and NMFS to regulate Hilton Creek flow.

Long-Term Monitoring Plan

Action. Monitoring of the lower Santa Ynez River and its tributaries to provide additional information for the adaptive management of the Plan's actions and information on the status of the habitat and fish in the lower Santa Ynez River system.

Schedule. The monitoring program is already in place and will be continued. Monitoring activities will be funded from the Trust and Renewal Fund.

Evaluation. The Adaptive Management Committee will oversee the implementation of the monitoring program. Data will routinely be supplied to the Adaptive Management Committee for decision-making purposes and will be entered into the database for annual and long-term trend analysis. Data collected will include information on the status of the fishery, quantity and quality of habitat, status of the lagoon, and other variables. Trend analysis will occur on a annual basis and the results reported to the Consensus Committee.

Public Education and Outreach

Action. Reclamation, the Member Units, and the SYRWCD will develop a public education and outreach program to explain the activities related to protection of rainbow trout/steelhead and to solicit volunteer action from private property owners to improve rainbow trout/steelhead habitat. These agencies will facilitate habitat enhancement actions on private property by providing information on potential habitat enhancement actions through the public education and outreach program, by providing technical assistance in designing and implementing the actions, and by providing assistance for acquiring public funds such as the NRCS habitat programs, or by providing funding for approved activities.

Schedule. The Member Units are proceeding with public workshops to inform the public and solicit public input. Three public meetings have been held to discuss conservation measures. A grant from the SWRCB's Non-Point Source Pollution Program will fund two workshops scheduled for 2001.

Evaluation. The Member Units will evaluate the many methods used each year for public education and outreach to determine which were the most successful based on public response, attendance, and workshop evaluation forms. Successful outreach methods will be continued and others discontinued. The types of workshops and resources needed will also be evaluated and used the following year to meet current needs of the public and the program.

5.3 ACTIONS FOR SHORT-TERM IMPLEMENTATION (1-2 YEARS)

Reservoir Surcharge Modification

Action. The spillway gates at Bradbury Dam will be modified to allow the reservoir to be surcharged more than the existing 0.75-foot level. Once the higher flashboards are installed, the reservoir will be surcharged to the 1.8 foot level as soon as climatic conditions allow.

Schedule. Modification of the Bradbury Dam flashboards is anticipated in 2001 to allow the 1.8-foot surcharge to be implemented (environmental review complete) and accommodate the 3-foot surcharge once environmental review is completed. Surcharging will be carried out to 1.8 feet in subsequent years when there is sufficient runoff to cause the reservoir to spill. The reservoir will be surcharged in each year there is sufficient runoff until the proposed 3-foot surcharge can be implemented. Funds from Proposition 12 ($225,000) have been approved for the surcharge modification project.

Evaluation. Because of the short duration of this interim phase, it is anticipated that the 1.8 foot surcharge will be implemented only once or twice (and possibly not at all) depending on water storage in Lake Cachuma, water demand, and the types of water years that occur during this interim period. Success is determined by a reservoir with the capability to surcharge to the 1.8 foot level.

Interim Fish Passage Account

Action. Reclamation will establish the Fish Passage Account in Lake Cachuma and will allocate 2,500 AF to this account in years when the reservoir surcharges to 1.8 feet (prior to the implementation of the proposed 3-foot surcharge). The water will be released from the Fish Passage Account in the years following the surcharge year to supplement naturally occurring storm events in the lower watershed.

Schedule. The interim passage flow releases will begin in the year following the implementation of the 1.8-foot surcharge (*i.e.*, the reservoir is surcharged to 1.8 feet) and will continue until the proposed 3-foot surcharge water is available.

Evaluation. The Fish Passage Account will be provided when (and if) the reservoir surcharged to the 1.8 foot level. If the water becomes available for the interim allocation to the Account, fish passage supplementation will likely be evaluated at the Solvang gage. The gage will monitor the flows at this location. Success will be determined by achieving the targeted decay curve and therefore providing approximately 14 days of additional passage for upstream migrants on the descending limb of storm hydrographs.

Conservation Easements/Leases

Action. Reclamation and the Member Units will pursue the establishment of conservation easements and long-term leases on private lands. The first priority for the establishment of conservation easements will be tributary habitats. The Member Units are in discussions with landowners on El Jaro Creek. As part of the program, Reclamation and the Member Units will consider, in consultation with NMFS and CDFG, appropriate actions on the easements to promote the restoration of habitat values that benefit rainbow trout/steelhead.

Schedule. Actions on private lands will be implemented within the constraints and schedules established by landowners, permitting processes and funding availability. The easements on El Jaro Creek and its tributaries are currently under discussion. The Member Units expect to have obtained property appraisals on El Jaro Creek property by 2001 and will engage in contract negotiations thereafter. These actions will be funded from the Trust and Renewal Funds, the Warren Act Trust Fund, and from additional funding that can be secured from public and private sources. Funding is available ($234,000) from Proposition 12 to acquire conservation easements.

Evaluation. This action will be evaluated by the purchase or lease of identified El Jaro Creek properties or other valuable stream habitat. In addition, once the easement/leases exist, the habitat will be evaluated and suitable enhancement measures will be conducted if needed. Evaluation of these enhancement measures will be based fish use and the increase in the quantity of instream and riparian habitat.

Tributary Enhancement Measures

Action. A number of tributary enhancement measures have been proposed including providing passage over a number of impediments (Hilton, Quiota, Nojoqui, Salsipuedes and El Jaro creeks) and creating a channel extension in the lower reach of Hilton Creek. These enhancement measures will provide or improve access to existing tributary habitat or create new habitat for spawning and rearing steelhead.

Schedule. The enhancement actions have been prioritized by SYRTAC and will be implemented accordingly. Implementation of the tributary enhancement measures has already begun; the Hilton Creek fish passage project is designed and scheduled for construction next summer. It is anticipated that all of the tributary enhancement measures will be implemented by 2005. If not, then Reclamation will need to re-consult with NMFS and provide them with (1) an explanation for the delay in project completion, (2) the steps taken to complete the project(s), and (3) a new estimated date of completion. Funding for these actions will come from the Trust and Renewal Funds, the Warren Act Trust Fund, and from public and private funding sources. Reclamation and the Member Units

will coordinate with the County, CalTrans, and private landowners to implement the recommended tributary enhancements.

Evaluation. These projects, primarily impediment and barrier modifications, will be evaluated to determine that they meet their design criteria to provide fish passage. The passage structures will be studied to determine if fish can navigate through the structure at the flows for which the structure was designed. The tributary fish passage enhancements discussed here will improve access to approximately 95,000 linear feet of stream habitat located above partial impediments (based on main-tributary blue line stream above the impediment) in Hilton, Quiota, Nojoqui, Salsipuedes and El Jaro Creeks. In addition, these projects will provide access to an additional 64,000 linear feet of habitat that is above passage barriers.

Instream habitat enhancement projects will occur at locations where observations suggest they are needed and can be successful. The stream habitat on any easements/leases will be evaluated (current discussions are looking at easements on approximately 10 miles of habitat) and restoration actions will be implemented as needed on these properties in cooperation with the landowners. The channel extension on Hilton Creek, if determined to be feasible, will also be constructed to create about 1,200 feet of appropriate fish habitat. These habitat restoration/creation efforts will be evaluated by determining the quantity of habitat modified and the stability of the habitats. Further monitoring to provide information regarding what types of projects provide the greatest benefit to rainbow trout/steelhead will focus on fish use the modified habitats.

Mainstem Habitat Enhancement

Action. Reclamation will develop and implement a habitat enhancement plan for their property located downstream from Bradbury Dam. Habitat enhancements are likely to include pool habitat enhancement, placement of cover objects and riparian enhancement.

Schedule. Reclamation is currently reviewing enhancement options and will develop a plan in 2001. If implementation is determined to be biologically beneficial and the project feasible, implementation will be scheduled.

Evaluation. The Long Pool habitat will be evaluated to determine if enhancement actions are warranted. Should these or other habitat restoration/creation efforts be implemented, they will be evaluated by determining the quantity of habitat modified and the stability of the habitats (over time and during high flow events). Further monitoring to provide information regarding what types of projects provide the greatest benefit to rainbow trout/steelhead will focus on fish use of the modified habitats.

5.4 ACTIONS FOR NEAR-TERM IMPLEMENTATION (3-5 YEARS)

Reservoir Surcharge (3 feet)

Action. Reclamation will surcharge the reservoir to 3 feet upon completion of the flashboard modification and environmental compliance for this surcharge level.

Schedule. Long-term operations (full target flow levels, 3,200 AF Fish Passage Account, and 500 AF Adaptive Management Account) will be implemented as soon as the water is available from the 3-foot surcharge. Completion of the environmental review and compliance, and construction of the flashboards required for the 3-foot surcharge is anticipated by 2004. Depending on climatic conditions, the first opportunity to surcharge the reservoir to the 3-foot level will be in winter 2005.

Evaluation. This project will be evaluated on the basis of when the reservoir has the capability to surcharge to 3 feet (*i.e.*, construction and environmental review are complete). The Santa Ynez River Hydrologic Model estimates that Lake Cachuma will surcharge to 3 feet in 24% of years once 3-foot surcharge capability is completed.

Long-Term Mainstem Target Flows and Conjunctive Use

Action. Long-term target flows will be established at the Highway 154 and Alisal Road Bridges. In years when Lake Cachuma spills at least 20,000 AF, a target flow of 10 cfs will be set for Highway 154, and a 1.5 cfs target will be set at Alisal. When the lake spills less than 20,000 AF, or when the lake does not spill but storage exceeds 120,000 AF, the target level will be 5 cfs at the Highway 154 Bridge. A 2.5 cfs target will be established in years when lake storage recedes below 120,000 AF at Highway 154. When storage is less than 30,000 AF, 30 AF per month will be reserved for fish enhancement releases to refresh the Stilling Basin and Long Pool. In addition, in the year immediately following a 20,000 AF spill year, a 1.5-cfs target will be maintained at the Alisal Road Bridge when steelhead are present.

Schedule. The long-term rearing target flows will begin in the year when the reservoir surcharges to 3 feet and will continue from that point on following the criteria outlined in the Plan above.

Evaluation. Target flows will be monitored using gaging stations over the long-term to determine if the flow targets discussed in Section 3 above are being met. Releases will be adjusted accordingly based on the results of this monitoring. Target flow releases will be made primarily through the Hilton Creek supplemental watering system to meet the target flows as necessary (water rights releases are made through the outlet works). Conjunctive use will provide water to the lower 1380 to 2,980 feet of

Hilton Creek, the 2.9 miles of the Highway 154 Reach, and provide 1.5 cfs at the Alisal Road Bridge (10.5 miles downstream of the dam) in large spill years and the year following.

Long-Term Fish Passage Account

Action. Reclamation will allocate additional water to the Fish Passage Account to further increase opportunities for fish passage enhancement. An additional 700 AF, for a total account allocation of 3,200 AF, will be allocated to the Fish Passage Account in years when the reservoir surcharges to 3 feet.

Schedule. The long-term allocation to the Fish Passage Account will begin when the reservoir has surcharged to the proposed 3-foot level. Releases based on the long-term passage criteria will begin in the year following the 3-foot surcharge year.

Evaluation. Fish passage supplementation will likely be evaluated at the Solvang gage by monitoring flows at this location. This project will be evaluated by determining whether the targeted decay curve is achieved and therefore provides approximately 14 days of additional passage on the descending limb of storm hydrographs. The experimental fish passage supplementation regime may be modified as information on the application of the passage releases is analyzed. New evaluation criteria may be required based on these changes.

Adaptive Management Account

Action. Reclamation will establish an Adaptive Management Account in Lake Cachuma. The Account will be allocated 500 AF of water in years when the reservoir surcharges to 3 feet. The water will be used by the Adaptive Management Committee to provide additional passage or rearing flow supplementation for the benefit of the downstream fishery.

Schedule. Water will be allocated to the Adaptive Management Account in years when the reservoir surcharges to the 3-foot level. It is anticipated that the first opportunity to implement the Adaptive Management Account will be in the winter of 2005.

Evaluation. This account is reserved for providing additional biological benefit as needed for either rearing or passage. The use of this account will be evaluated by (1) tracking the biological benefit of the releases (*e.g.*, provided 10 additional days of passage flows; provided a month of higher flows during spawning period in Hilton Creek), and (2) tracking how much, if any, water was unused because the account was reset (by spill) before it could be released. This information will be used by the Adaptive Management Committee to refine releases so that they maximize biological benefit and use the water efficiently.

Fish Rescue

Action. Rainbow trout/steelhead will be collected and moved to perennial habitat if it becomes apparent that habitat conditions in Hilton

Creek, or other sites, are degrading to the point where fish could be lost. To enhance survival following transfer to a new site, predatory fish may be removed prior to transferring young rainbow trout/steelhead. Consultation with NMFS and CDFG will occur before any fish rescue operation.

Schedule. Rescue activities will be conducted on a case-by-case basis as the need arises in consultation with NMFS and other state and federal resource agencies (and private landowners, if appropriate). Predator control activities may be conducted on a case-by-case basis at relocation sites to minimize predation in the short term. The reservoir spilled in the spring of 2000, therefore it is not anticipated that a fish rescue will be needed in the near future.

Evaluation. The fish rescue operation will be evaluated by monitoring fish use in and around the relocation habitat to estimate the survival of the relocated fish. Additional components of the rescue operation include determining the number and age class of rainbow trout/steelhead relocated and if any mortalities of rescued and relocated fish occur. Non-native predatory fish may be removed from relocation sites to increase the chance of survival of the relocated rainbow trout/steelhead. The benefit of such an action on the survival of relocated fish will also be assessed.

5.5 ACTIONS FOR LONG-TERM IMPLEMENTATION (5+ YEARS)

Investigate Passage Around Bradbury Dam

Action. Opportunities and institutional changes to provide rainbow trout/steelhead access to the historical spawning and rearing habitat upstream of Bradbury Dam will continue to be investigated.

Schedule. The opportunity to provide passage around Bradbury Dam will continue to be explored as new information, technologies, and opportunities become available in the Santa Ynez River watershed. Impacts to Lake Cachuma fisheries, upstream landowners, and recreational fishing within and above Lake Cachuma will also be addressed. Should a method prove feasible, then implementation will be evaluated by Reclamation, the Member Units, CDFG, NMFS, USFWS, CalTrout, Santa Barbara Fish and Game Commission, and others and the best course of action determined.

Evaluation. The Adaptive Management Committee will continue to study passage opportunities around Bradbury Dam and will provide periodic verbal reports on any new information to the Consensus Committee.

Adaptive Management Committee

Action. The Adaptive Management Committee will continue to manage Plan actions (*e.g.*, rearing and passage releases), evaluate additional opportunities (*e.g.*, new restoration locations, conservation easements), refine implementation of the actions (*e.g.*, more efficient use of water resources), explore opportunities for steelhead access above Bradbury Dam, oversee implementation of the long-term monitoring program, implement new actions as opportunities become available, and analyze the long-term data set to evaluate the Plan.

Schedule. The Adaptive Management Committee will be established when the Plan is finalized. The Committee is primarily responsible for implementation of the Plan and will continue to function indefinitely.

Evaluation. The actions of the Adaptive Management Committee will be overseen by NMFS and the Consensus Committee (see Section 5.7). NMFS must approve the actions taken by the Adaptive Management Committee that could reasonably be expected to affect steelhead (NMFS 2000). NMFS requires 30 working days to review the action(s) and supporting data. The Consensus Committee will analyze and determine the feasibility of fishery resource management alternatives recommended by the Adaptive Management Committee at semi-annual meetings.

Long-Term Plan Evaluation

Action. Determine the long-term trends in fishery use, habitat quality, habitat quantity, water quality and other variables to evaluate the Plan and determine if there has been an improvement in rainbow trout/steelhead use in the lower Santa Ynez River. The Adaptive

Management Committee will evaluate the trends in the steelhead use annually and, if necessary, recommend alternatives and revisions to the recommend actions outlined in the Plan.

Schedule. Data has been collected since 1993 and will continue to be collected into the future to provide the long-term data set needed to analyze fishery and habitat trends. This data has been, and will continue to be, analyzed yearly to (1) refine the data collection and analysis process and to (2) determine preliminary trends in the data. This action will continue indefinitely.

Evaluation. Data will be evaluated to determine long-term trends in the (1) fishery use, (2) habitat quantity, and (3) habitat quality (including water quality). The data will be analyzed for evidence of long-term trends, with the aim of determining if the management actions are providing the expected positive trend in fish use of the lower river. Because of the natural variability in the system (*e.g.*, hydrologic variability), factors outside of our control (*e.g.*, ocean conditions), and the nature of the challenges inherent in restoring an endangered species (*e.g.*, low population numbers), it is not anticipated that restoration will occur for decades. However, it is anticipated that the long-term data set (started in 1993) will show positive trends in a somewhat shorter timeframe when the data can be corrected for at least some environmental factors. Based on the annual trend analyses for the lower watershed and also site specific data the Adaptive Management Committee will modify the actions in the Plan as needed.

5.6 FUNDING

Trust Fund and Renewal Fund

Reclamation and the Member Units are proposing to fund the conservation actions from the Cachuma Project Contract Renewal Fund and the Warren Act Trust Fund. These funds are presently administered by COMB and are overseen by the Trust and Renewal Fund Committee and the Advisory Committee. These funds were established in 1996 during the contract renewal process to provide money for enhancement and watershed improvements, and come from an assessment on water taken from the Project ($10 per AF) and on use of the reservoir for delivery of State Water ($43 per AF), providing $257,000-$500,000 per year. The Santa Barbara County Water Agency is also required under a contract with the Member Units to provide $100,000 annually for projects that may include conservation-type activities related to the Cachuma Project. Allocation of these funds for specific projects requires consensus by the County and Member Units, subject to public input. In the future, approximately $300,000 per year will continue to be dedicated to rainbow trout/steelhead restoration.

Public and Private Sources

In addition to these funds, Reclamation and the local water agencies are seeking funds from other sources, such as the State's Watershed Restoration and Protection Council, the CDFG's Fishery Restoration Grants Program, the California Coastal Salmon Recovery Program, the National Fish and Wildlife Foundation, and the SWRCB's Non-Point Source Pollution Program to supplement funds available from local sources. The Member Units have been successful in obtaining outside funding for enhancement projects.

Funding in the amount of $147,000 has been approved from the National Fish and Wildlife Foundation and $230,000 from the California Parks Bond (Proposition 12) to fund the construction of the pump system for the Hilton Creek watering facility. The Member Units have also received a $50,300 grant from the CDFG's Fishery Restoration Grants Program to complete the fish passage structure at the cascade and chute on Hilton Creek. In addition, funding has been received from the Pacific Coastal Salmonid Initiative ($25,000) and the CalTrans Environmental Enhancement and Mitigation Fund ($20,885) for the modification to the concrete apron at the Highway 1 Bridge crossing over Salsipudes Creek. Funding has also been received from the SWRCB's Non-Point Source Pollution program to construct 3 habitat improvement projects on El Jaro Creek. In addition, the Santa Barbara County Roads Department has received funding to modify three of the Refugio Road crossings on Quiota Creek and CalTrans has expressed interest in funding the modification to the Highway 154 Culvert on Hilton Creek. The Member Units are continuing to actively seek funding for the remaining proposed enhancement measures.

5.7 PROGRAM ADMINISTRATION

Coordination and administration of Plan activities will be managed by the Consensus and Adaptive Management Committees.

Consensus Committee

The responsibilities of the Consensus Committee include directing the work and activities of the Adaptive Management Committee (see below) and to provide advice on policy surrounding fisheries issues beyond those described in the Cachuma Project Biological Opinion (NMFS 2000). The Consensus Committee is made up of a representative from each of the agencies/organizations that are party to the MOU. The Consensus Committee will meet at least semi-annually. This committee will analyze and determine the feasibility of fishery resource management alternatives recommended by the Adaptive Management Committee in an attempt to attain consensus, address potential impacts to water supply, and evaluate cost, potential benefits, and the need to minimize conflicts. Reclamation will be the chair of the Consensus Committee and will provide a representative to preside over meetings. This committee will conduct open meetings and notices and agendas will be provided to all those who request notice. In addition, Reclamation shall provide the Committee and NMFS with an accounting of all water held in and released from Cachuma Reservoir for fishery purposes.

Adaptive Management Committee

The Adaptive Management Committee will be made up of one representative from each of the following agencies/organizations: Reclamation, NMFS, CDFG, CCRB, SYRWCD, and ID#1. The Adaptive Management Committee will administer implementation of the Plan's actions (*e.g.*, distribution of water between Hilton Creek release points; passage flow supplementation), oversee the development of programs required under the Biological Opinion (NMFS 2000), explore opportunities for access above Bradbury Dam, oversee implementation of the long-term monitoring plan, evaluate additional restoration opportunities and make recommendations to the Consensus Committee, analyze the long-term data set to evaluate the Plan, and provide technical support as needed to the Consensus Committee. All of the decisions that could reasonably be expected to affect steelhead must be approved by NMFS prior to implementation (NMFS has required a 30 working day period to review existing data and render a decision[1]) (NMFS 2000). The Adaptive Management Committee will be required to report to NMFS quarterly the (1) water released for fishery purposes (records maintained by Reclamation) and (2) flow target monitoring (and pool surface areas if

[1] Before the ability to surcharge the reservoir to 3 feet is achieved, NMFS will not require the 30 day review period. NMFS does still required their approval of these decisions. Mr. Darren Brumback is the first point of contact for NMFS approval.

appropriate). After the first 3 years of long-term operations, reports may occur annually.

Additional Information Requirements

The Cachuma Project Biological Opinion (NMFS 2000) requires development of additional information and actions on particular projects recommended in this Plan. The Adaptive Management Committee will oversee the development of this information and work with NMFS to achieve a successful resolution. Once the strategy/plan is developed and approved by NMFS, the Adaptive Management Committee will oversee implementation of the action.

These actions discussed in the terms and conditions of the Biological Opinion are repeated here verbatim (NMFS 2000):

- *Term and Condition #3 Due: March 11, 2001*
  "Design a strategy within six months of the issuance of this opinion to further refine the supplemental flow releases for steelhead migration. Such a strategy shall include shifting migration supplementation releases away from dry years when releases may not be helpful to the steelhead population in the Santa Ynez and review of storm flow decay curves (mean, median, etc.,) and other methodologies for providing increased migration availability. Once this strategy is approved by NMFS, it shall be implemented. Such a strategy should include an adaptive management component."

- *Term and Condition #6 Due: Prior to the next water rights release*
  "A study design will be developed and forwarded to NMFS for approval that will include snorkel surveys of fish numbers and species in areas known to contain steelhead before and after the highest levels of water rights releases, snorkel surveys of fish numbers and species in areas downstream of Alisal reach before and after the highest water rights releases, and snorkel surveys of these areas after water rights releases are ended."

- *Term and Condition #11, Item #3 Due: September 11, 2001*
  "Develop a plan to monitor changes that may occur to the bed and banks of the Santa Ynez River that could affect the ability of steelhead to migrate. This plan will be developed within 1 year of the issuance of this opinion and implemented upon receiving NMFS's approval."

- *Term and Condition #12, Item #1 Due: March 11, 2001*
  "Work with NMFS to design and implement a strategy to further verify the analysis of migration supplementation and mainstem rearing targets within six months of the issuance of this opinion. Once approved by NMFS, the strategy shall be implemented and results provided to NMFS in a timely manner."

Project Biologist

The Project Biologist (currently the SYRTAC Project Biologist), with assistance from the Adaptive Management Committee, will be responsible for implementation of the Long-Term Monitoring Program. The Project Biologist will be responsible for developing sampling programs, data collection, and analysis of the information generated by the program. The Biologist will provide the Adaptive Management Committee with the information necessary for them to carry out their responsibilities including management of Hilton Creek and passage releases and data to evaluate the actions implemented.

In addition to the monitoring program, a number of reporting requirements were established in the Biological Opinion (NMFS 2000). A complete list of the required reports is included in Appendix I. The Project Biologist will be responsible for compiling this information and providing it to NMFS as needed.

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6.1 PERSONAL COMMUNICATION

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