EL SUR RANCH

Charles H. Hanson Ph.D.

Fishery Biologist

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- 35 years of fishery experience in California
- SWRCB presentations on fishery issues
- Certified fishery scientist
- Member USFWS Native Delta Fish and NMFS Salmonid Recovery Teams
- Central Valley and Central Coast salmon and steelhead studies

Objectives

Determine whether or not El Sur Ranch well operations result in changes in the lower Big Sur River and lagoon that would adversely impact habitat for juvenile steelhead rearing during the summer and fall

Four Key Questions Addressed

Was there a significant reduction in instream flows within the river as a result of El Sur Ranch well operation that would impact steelhead passage?

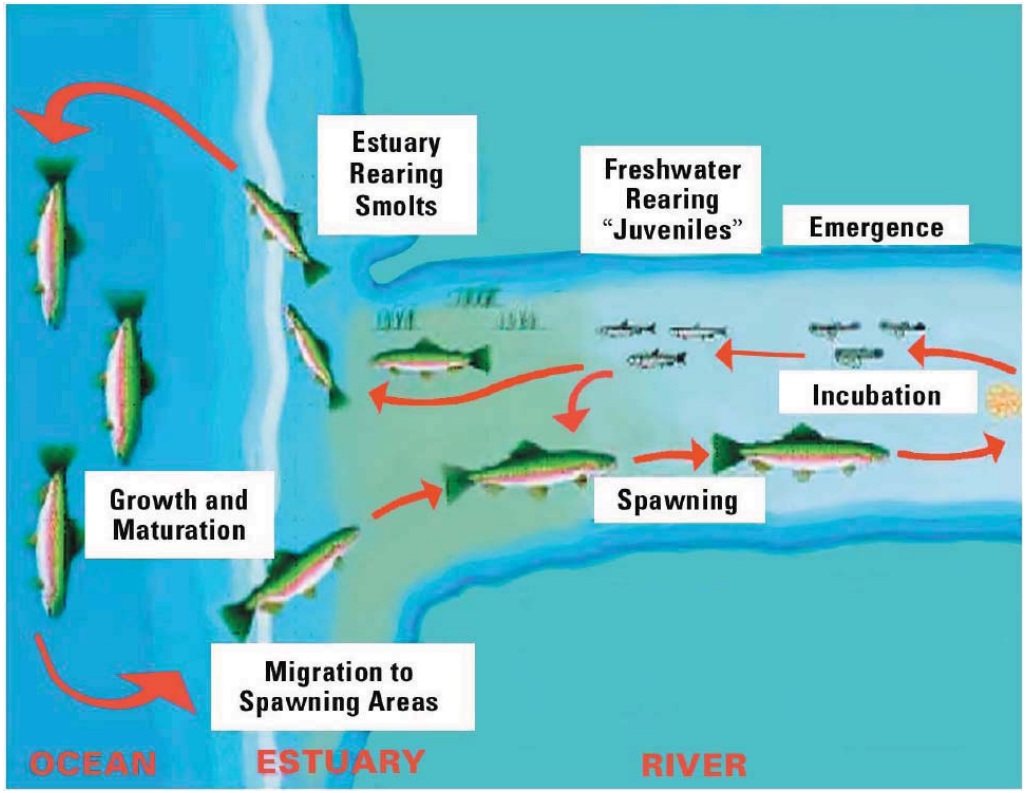
Were dissolved oxygen concentrations, electrical conductivity (salinity), or water temperatures altered to a level that would be stressful or unsuitable for juvenile steelhead rearing as a result of well operations?

Was there water quality stratification within the lagoon associated with well operations that would adversely affect habitat conditions for juvenile steelhead?

Were juvenile steelhead rearing within the lower river and lagoon? What was their abundance, size distribution, and geographic distribution relative to habitat conditions and the location of the El Sur Ranch irrigation wells?

The results of the fishery investigations have been documented in the following technical reports:

- *Assessment of Habitat Quality & Availability within the Lower Big Sur River: April – October 2004*. March 11, 2005 ("2004 Study"). Exhibit ESR—22
- *Evaluation of the Potential Relationship between El Sur Ranch Well Operations & Aquatic Habitat Associated with the Big Sur River During Late Summer and Early Fall 2006*. March 2007("2006 Study"). Exhibit ESR—23
- *Assessment of the Potential Effects of El Sur Ranch Well Operations on Aquatic Habitat within the Big Sur River and Swiss Canyon During Late Summer and Early Fall* – 2007. April 2008 ("2007 Study"). Exhibit ESR—24
- *Juvenile Steelhead Habitat Suitability and Rearing Conditions Within the Big Sur River Lagoon.* May 2011. Exhibit ESR – 25



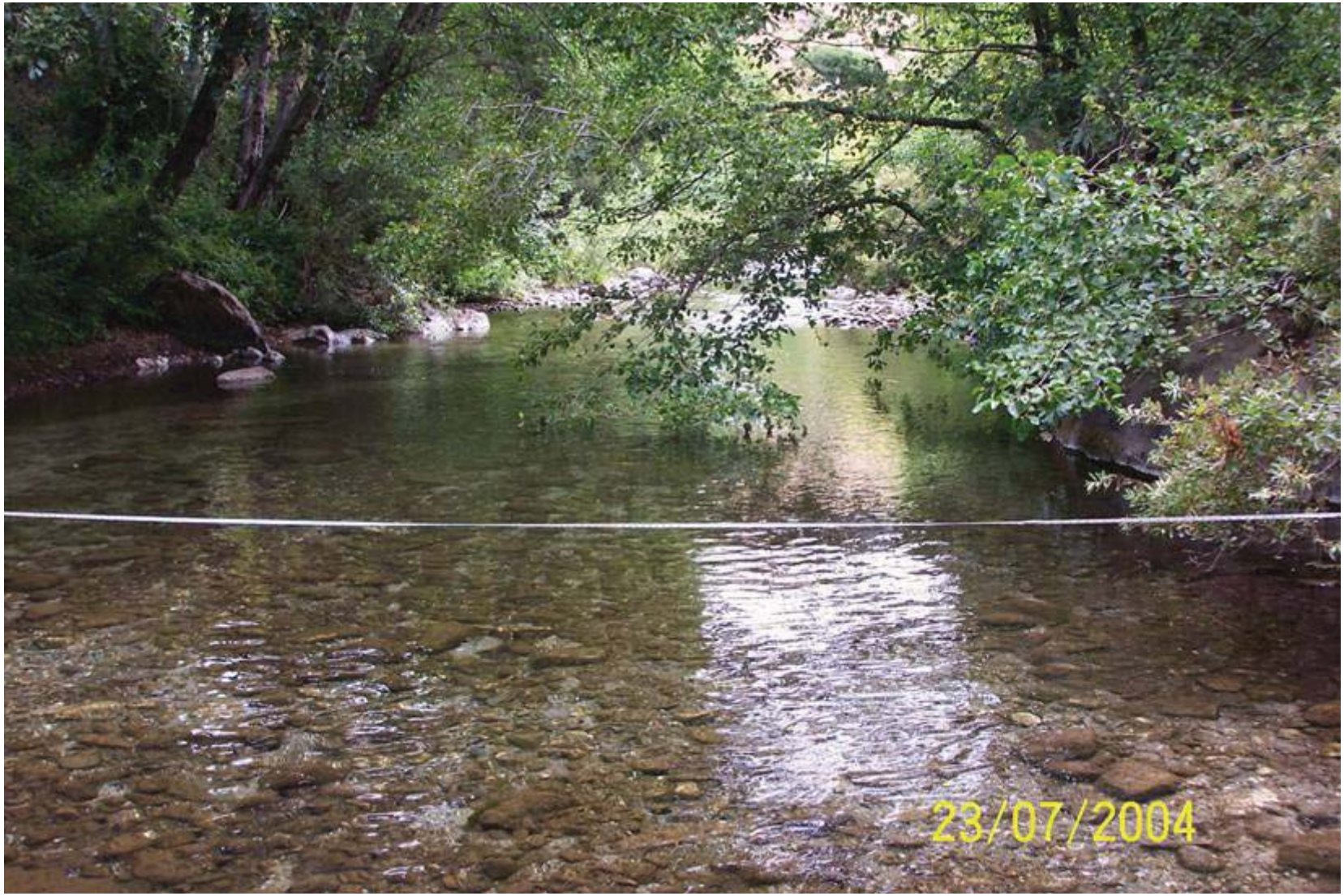
Lifecycle of steelhead

Big Sur River sand bar at the mouth of the lagoon looking downstream.

Near the mouth of the Lagoon in 2004 before lagoon pool blocked.

Habitat 200 ft upstream of lagoon pool. Water depth approximately 6 feet.

Habitat downstream of Water Quality Transect #8 (2004). Water depth approximately 2.5 feet.



Upstream of the Andrew Molera State Park Campground showing shallow water and heavy bank riparian vegetation.

Average Monthly Flow (CFS)			
Month	2004	2006	2007
	Year Type		
	Dry	Wet	Critically Dry
April	50.4	751.2	24.4
May	33.7	158.2	15.8
June	23.4	72.6	11.7
July	14.6	40.5	8.6
August	12.3	26.9	7.6
September	12.2	21.0	7.5
October	34.6	20.9	9.2

Summary of USGS Big Sur River gauging records of average monthly flows during April-October, 2004, 2006, and 2007.

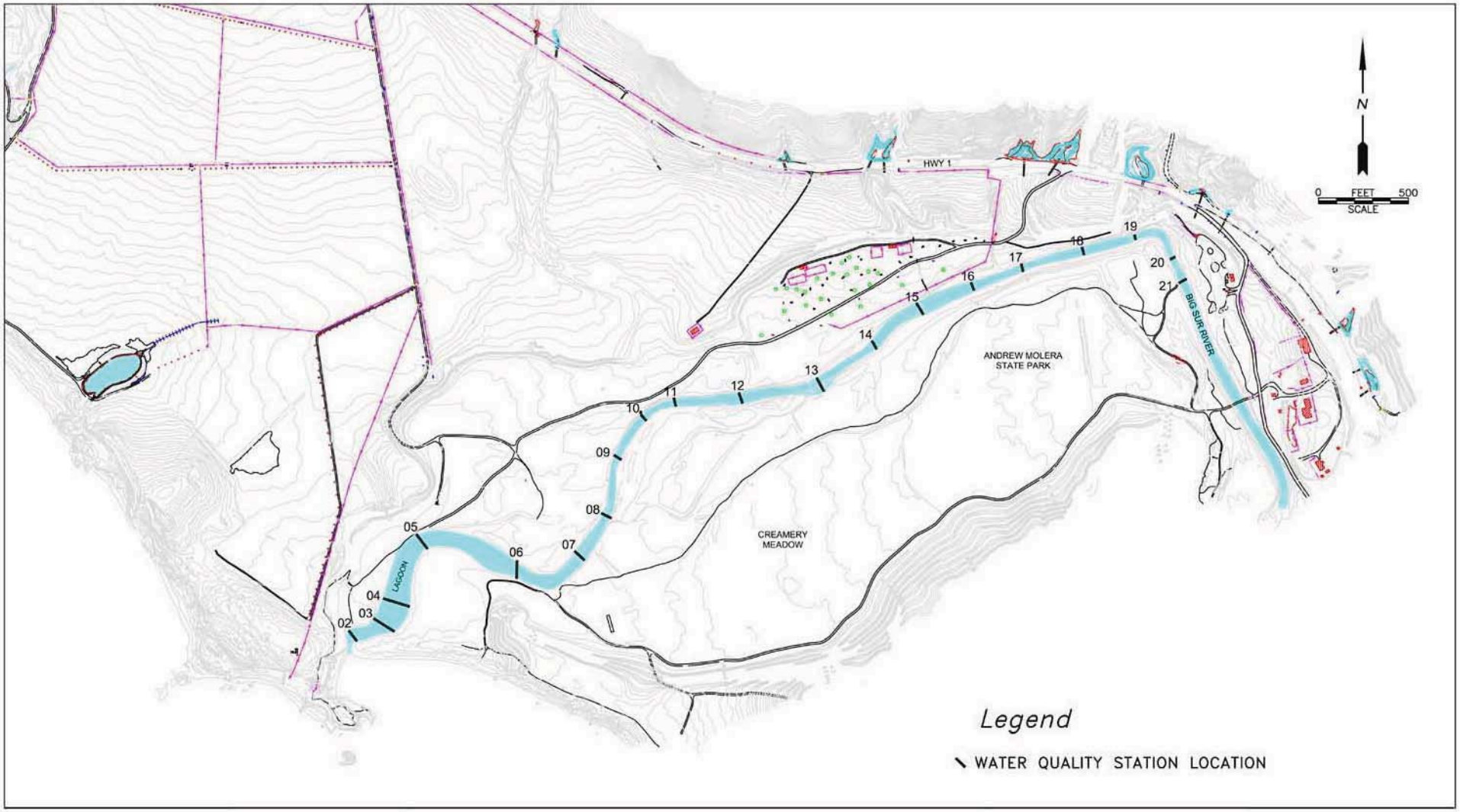
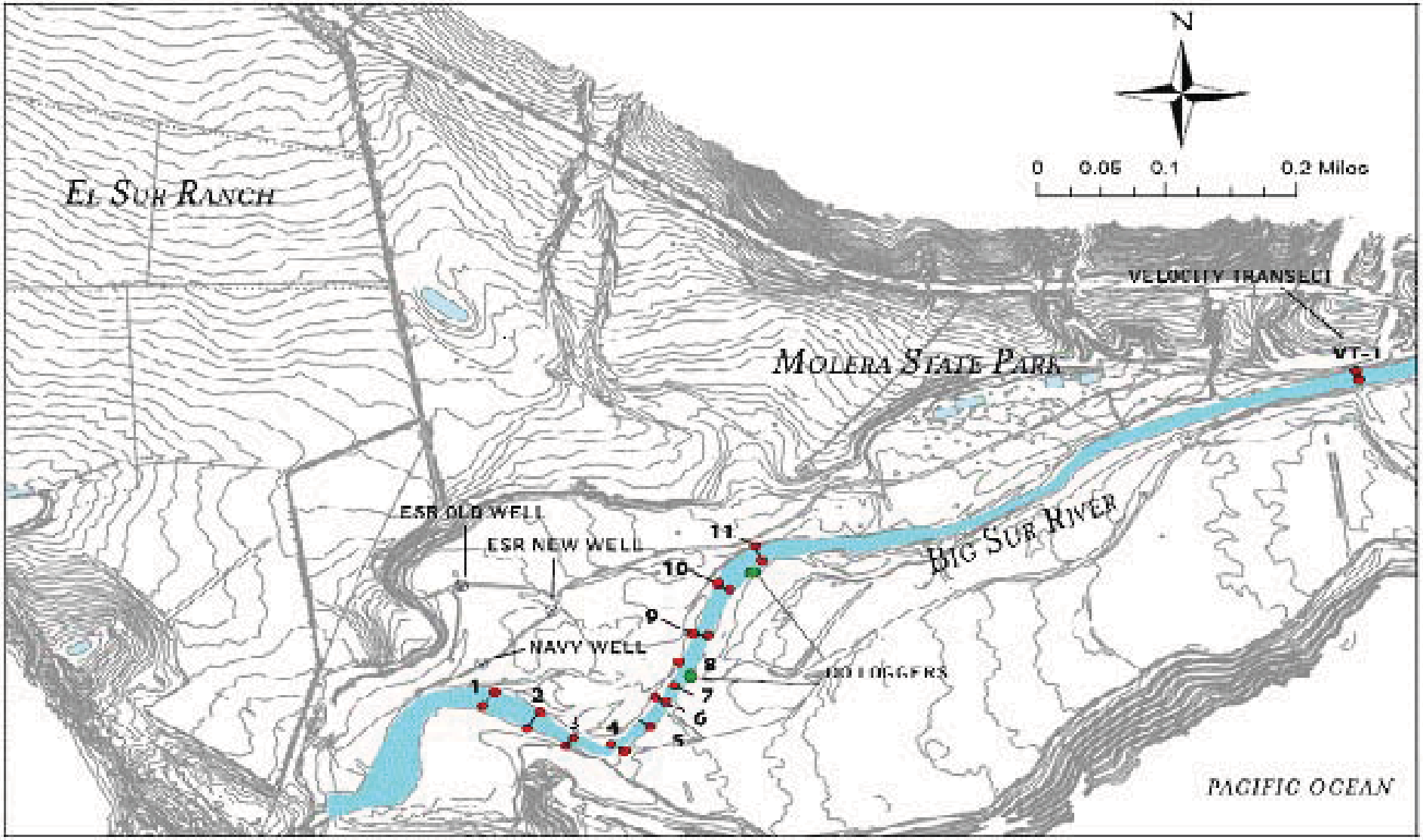
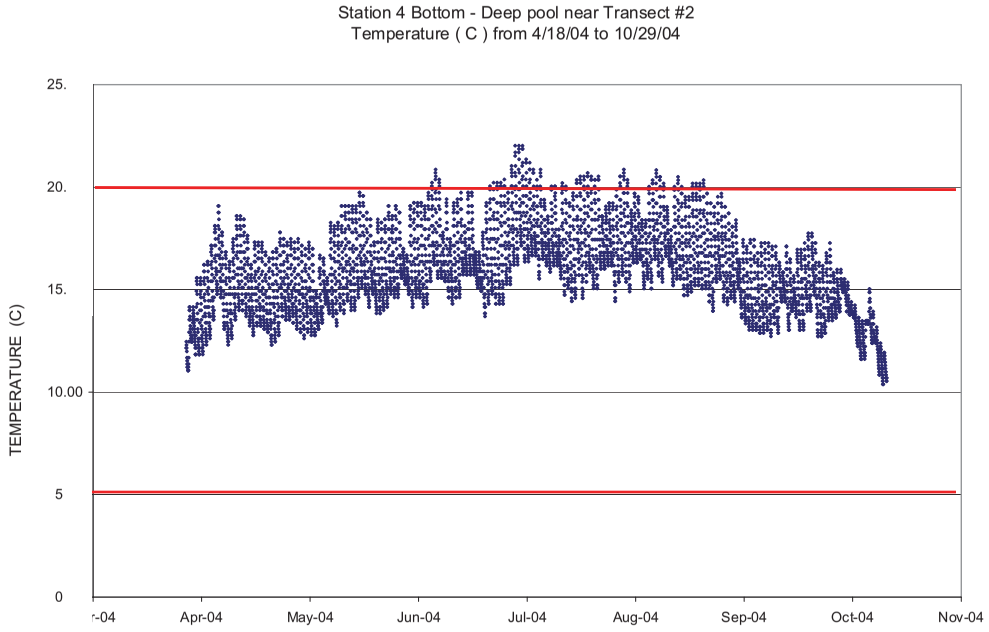
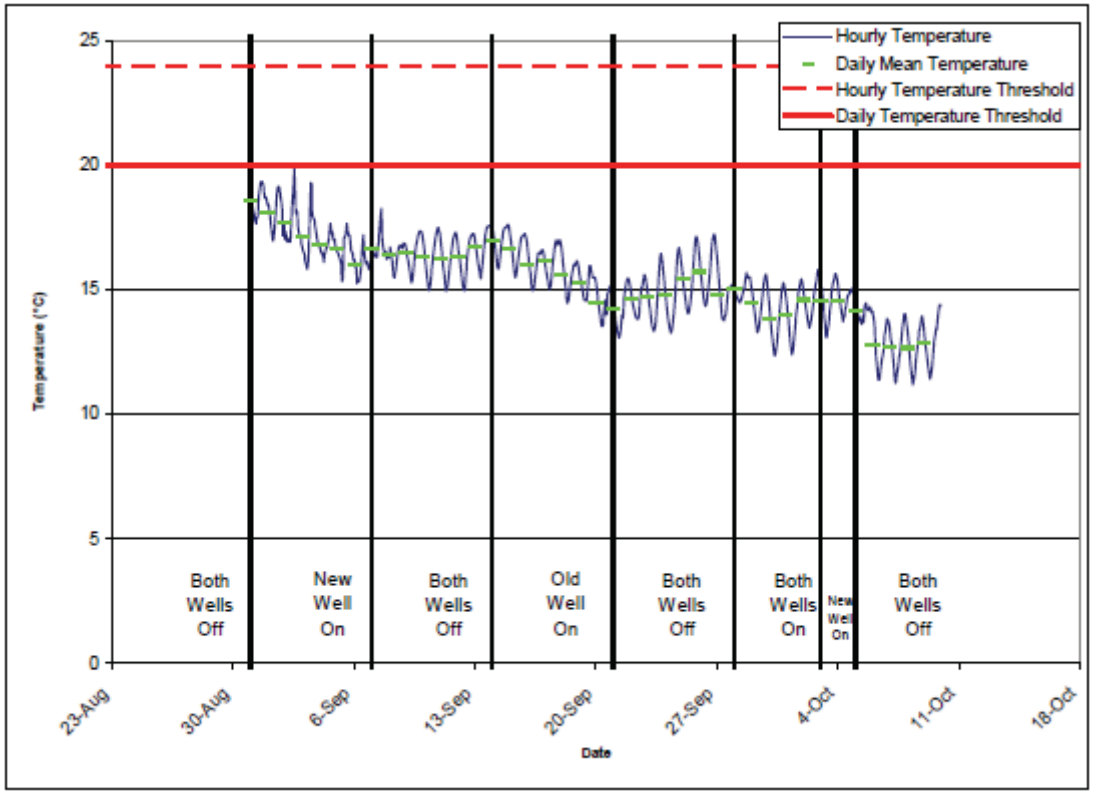


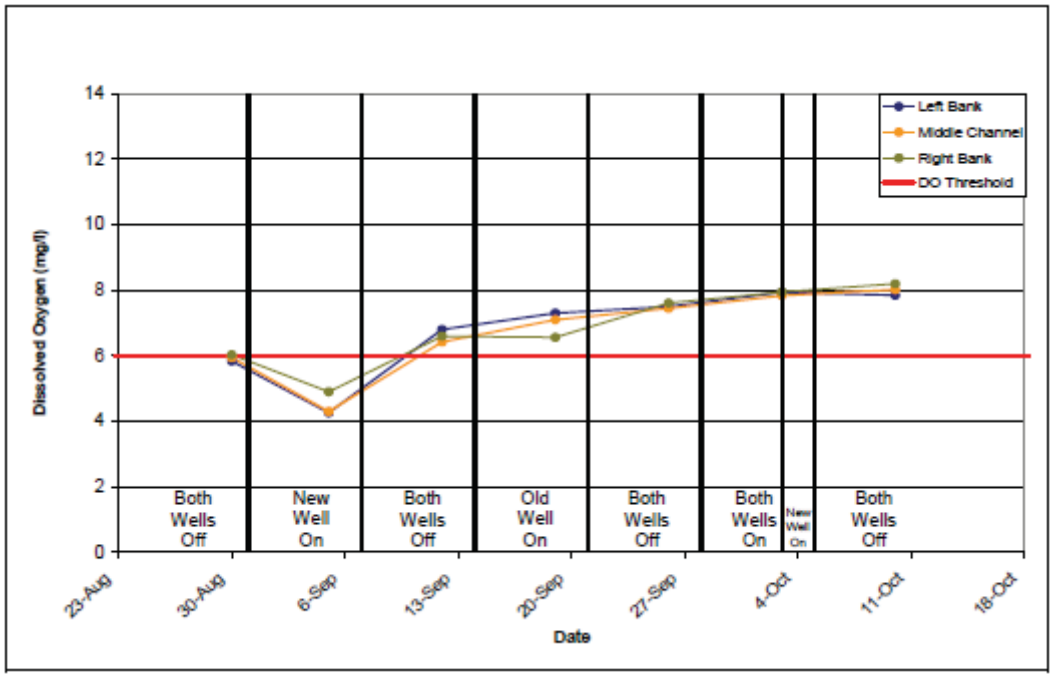
FIGURE 8. Location of periodic water quality surveys within the lower Big Sur River and lagoon.


N
0 0.05 0.1 0.2 Miles
EL SUR RANCH
MOLERA STATE PARK
VELOCITY TRANSECT
VT-1
ESR OLD WELL
ESR NEW WELL
NAVY WELL
BIG SUR RIVER
1
2
3
4
5
6
7
8
9
10
11
PACIFIC OCEAN

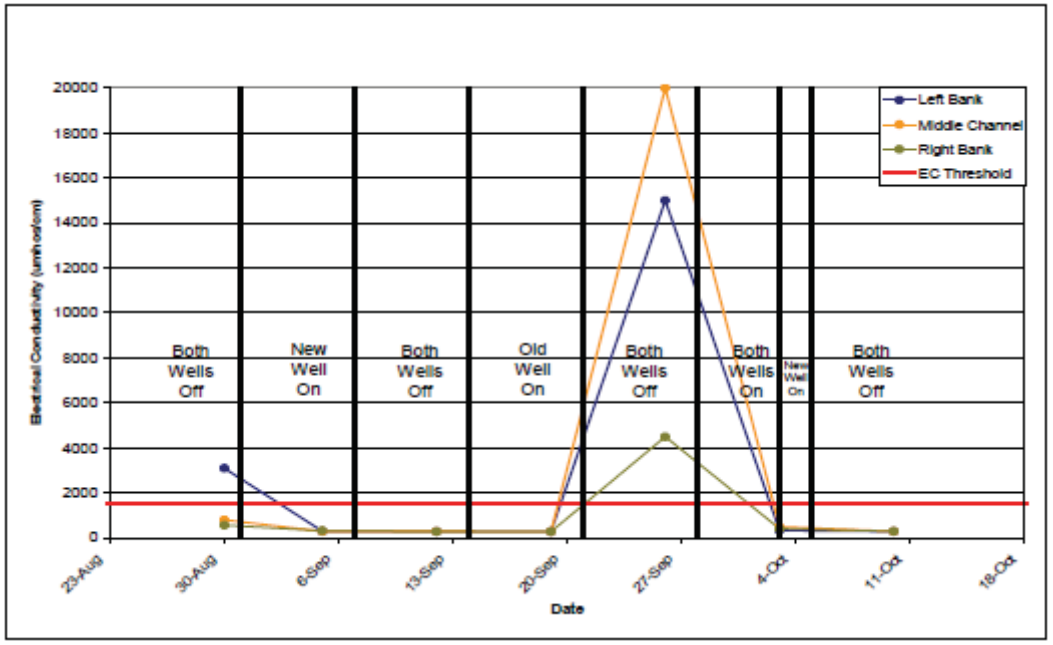

Station 4 Bottom - Deep pool near Transect #2
Temperature (C) from 4/18/04 to 10/29/04
TEMPERATURE (C)
25.
20.
15.
10.00
5
0
r-04
Apr-04
May-04
Jun-04
Jul-04
Aug-04
Sep-04
Oct-04
Nov-04



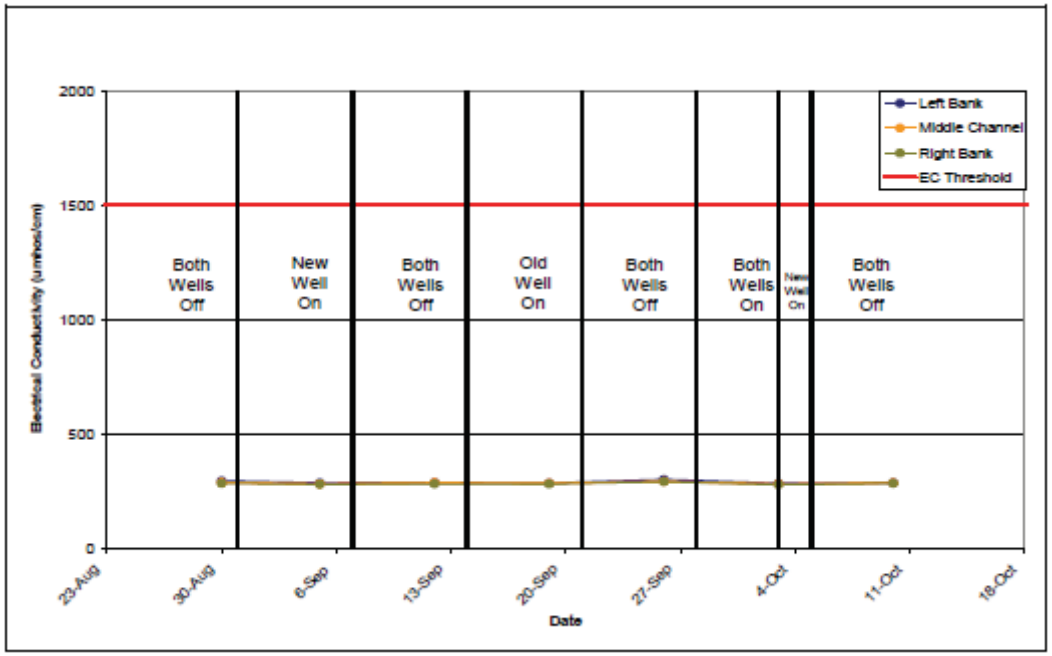
Hourly and average daily water temperatures recorded during 2007 in the lower Big Sur River at PT 11, left bank.



Dissolved oxygen concentrations measured during periodic water quality surveys in the Big Sur River during 2007 at Passage Transect #5.



Electrical conductivity measured in the Big Sur River during 2007 at Passage Transect #1.



Electrical conductivity measured in the Big Sur River during 2007 at Passage Transect #3.

Results

Water temperatures, electrical conductivity, and dissolved oxygen in the river and lagoon, were suitable for juvenile steelhead rearing, with the exception of the Creamery Meadow reach under extremely low-flow conditions, where localized groundwater upwelling affected dissolved oxygen and temperature within the river.

Results of statistical analysis of water temperature data (26,000 measurements) under critically dry hydrologic conditions (2007) detected a small (0.3 C) increase in temperatures at two locations when the wells were on. The incremental increase is within the natural daily variation and would not adversely affect natural seasonal patterns or environmental cues within the river.

Streamflows were sufficient to maintain connectivity (no channel dewatering) among habitat units except when a sand bar deposit along the beach naturally blocked the lagoon and temporarily precluded access to the ocean.

Water quality and habitat conditions within the lagoon remained good throughout all three years of investigation. There was no indication of vertical stratification in water quality that would adversely affect habitat suitability for juvenile steelhead rearing.

Naturally occurring critically dry year flows (2007) in combination with local water demand during high use periods (e.g., Labor Day weekend) had a major impact on conditions for juvenile steelhead passage. Well operations under these critically low-flow conditions contribute to a small incremental reduction in flow and passage in the lowermost reach of the river.

Taking into account the natural variation in flows within the river, the effect of well operations on water depth could not be detected statistically during the critically low flows in 2007.

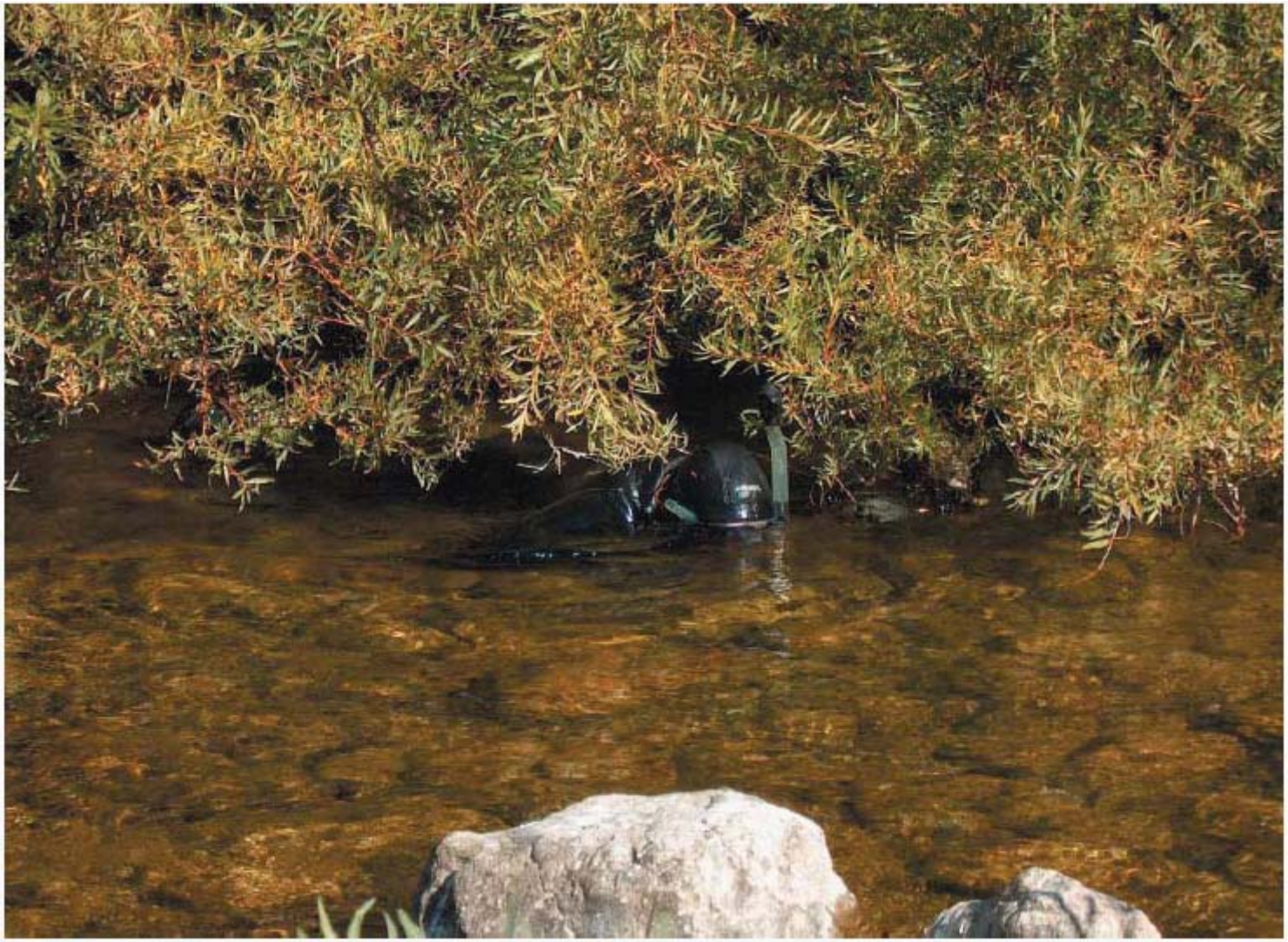
Based on the small change in water surface elevation (0.03-0.04 feet) estimated by SGI it was concluded that a change of this magnitude would not result in a detectable adverse impact on habitat for juvenile steelhead within the lower river and lagoon.

Instream flows for adult steelhead passage (0.7 foot depth) were estimated at 28-30 cfs.

Instream flows providing juvenile passage (0.3 foot depth) were estimated at 8-10 cfs.

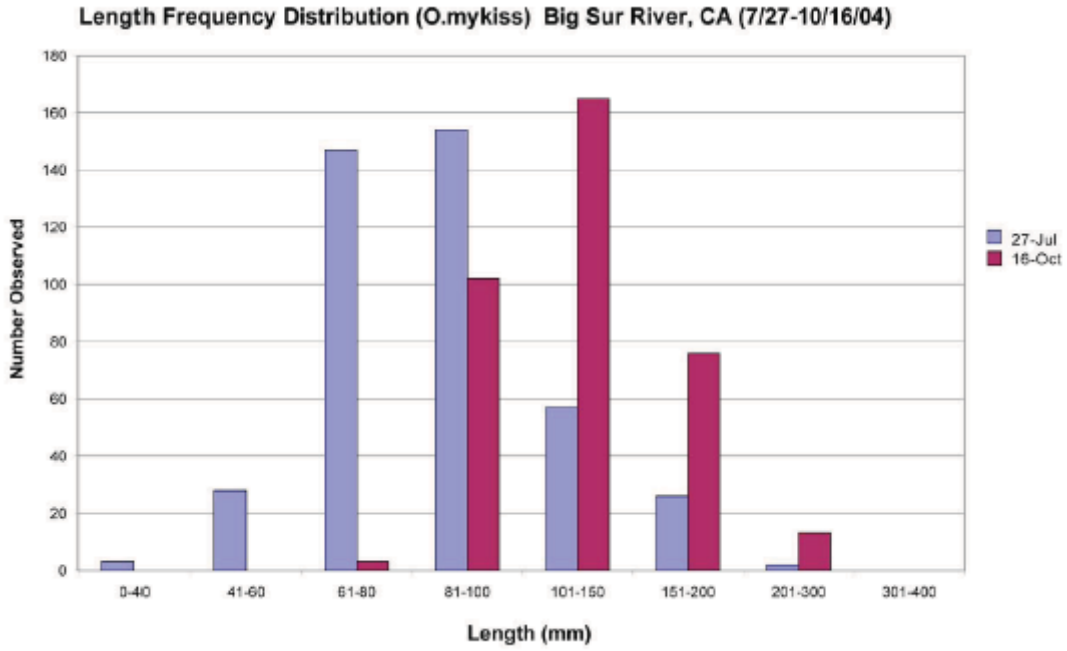
Summer baseflows observed during 2004, 2006 and 2007 provided physical habitat within the lower river and lagoon to support juvenile steelhead/rainbow trout rearing.

Sub-reach locations for snorkel surveys.



Photograph of divers performing steelhead snorkel surveys within the lower Big Sur River and lagoon.

The majority of Juvenile steelhead reared in the lagoon. Juveniles were in good health and condition, summer survival and growth rates were good, and steelhead showed evidence of smolting typical of juveniles preparing to emigrate from the river into coastal waters.



Length frequency distribution of juvenile steelhead/rainbow trout observed in the lower river and lagoon during the July and October snorkel surveys.

Figure 21. Side-by-side comparison of juvenile steelhead growth rates in coastal streams. (1See Table 3; 2Bond et al. (2008), DFG-T-17; 3Atkinson 2010, DFG-T-18; 4Sogard et al. (submitted), DFG-T-12).

River System	Period	Growth Rate (mm/day)
Scott Creek Estuary[2]	*April-July*	0.69
Navarro[1]	*September-October*	0.61
Navarro estuary[1]	*July-September*	0.53
Lower Big Sur	*July-October*	0.48
San Gregorio Lagoon[3]	*July-October*	0.44
Mattole[1]	*September-October*	0.40
Navarro[1]	*June-November*	0.33
Mattole[1]	*July-October*	0.24
Eel experiment[1]	*June-August*	0.23
Soquel Creek (estimated)[4]	*Summer/Fall*	0.14
Navarro[1]	*July-August*	0.13
Scott Creek (estimated)[4]	*Summer/Fall*	0.11
Navarro tributaries[1]	*July-September*	0.09
Scott Creek[4]	*Summer/Fall*	0.05
Soquel Creek[4]	*Summer/Fall*	0.03-0.05
Mattole[1]	*August-September*	-0.02

Table 2. The top five sources of threats in the component watersheds of the Big Sur Coast BPG (see CAP Workbooks for individual watersheds for details). Only three medium-severity threat sources were identified for the relatively undeveloped Bixby Creek watershed.

Threat Sources	Component Watershed (north to south)						
	San Jose Creek	Garrapata Creek	Bixby Creek	Little Sur River*	Big Sur River	Willow Creek	Salmon Creek
Other Passage Barriers							
Roads							
Non-Point Pollution							
Natural Barriers							
Groundwater Extraction							
Recreational Facilities							
Wildfires							
Dams and Surface Water Diversions							
Logging							
Non-Native Species							

Key: Threat cell colors represent threat rating from CAP Workbook:
Red = Very High threat
Yellow = High threat
Light green = Medium threat
Dark green = Low threat

*Wildfires were not identified during the CAP Workbook analyses as one of the top five threats in these watersheds, but recent fires in coastal watersheds in 2008 could result in significant impacts to steelhead habitats.

Prepared for NOAA-NMFS, South-Central California Coast Steelhead Recovery Planning Area, Conservation Action Planning (CAP) Workbooks Threats Assessment (2008), Exh. ESR-34

Conclusions of Fishery Analysis

- Habitat conditions for steelhead are in good condition
- Habitat in the lower river and lagoon supports steelhead rearing and passage
- Steelhead were in good condition, had good summer survival and growth rates, and reached a size sufficient to emigrate at age 1
- No adverse effects on steelhead habitat of El Sur Ranch well operations were detected at moderate summer flows (2004 and 2006)
- de minimis incremental effects were detected when river flow is critically low