Trevor Quirk, tmq@qlflaw.com
Aletheia Gooden
877 S Victoria Ave., Ste. 111
Ventura, CA 93003
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*Trevor Quirk, Trustees of the Quirk/Gooden Family Trust, Roe 199;*
*Aletheia Gooden, Trustee of the Quirk/Gooden Family Trust, Roe 95*

**SUPERIOR COURT OF THE STATE OF CALIFORNIA**

**FOR THE COUNTY OF LOS ANGELES**

| | |
|---|---|
| SANTA BARBARA CHANNELKEEPER, a California non-profit corporation,<br><br>Petitioner,<br>v.<br><br>STATE WATER RESOURCES CONTROL BOARD, et al.,<br><br>Respondents.<br>_______________<br>CITY OF SAN BUENAVENTURA, et al.,<br><br>Cross-Complainant,<br>v.<br>DUNCAN ABBOTT, an individual, et al.,<br><br>Cross-Defendants. | Case No.: 19STCP01176<br><br>**CROSS-DEFENDANTS TREVOR QUIRK & ALETHEIA GOODEN'S DECLARATION IN SUPPORT OF REQUEST FOR JUDICAL NOTICE**<br><br>Trial Date: 03/16/2022<br>Time: 8:30 AM<br>Place: Dept. SS10 |

I, Trevor M. Quirk, declare that:

1. I am being sued by the City of San Buenaventura as a Cross-Defendant in this matter. The contents of this Declaration are based upon my personal knowledge and belief and I could testify competently to the matters stated herein.
2. Attached as Exhibit 1 is Code of Federal Regulations Code of Federal Regulations § 328.3.
3. Attached as Exhibit 2 is the City of Ventura Legal Report, Agenda Item No. 8E dated November 20, 2018.

4. Attached as Exhibit 3 is the City of Ventura's Response to Public Records Act Request dated February 22, 2022
5. Attached as Exhibit 4 is the United States Department of Commerce letter dated August 29, 2007 and accompanying draft biological opinion.
6. Attached as Exhibit 5 is the definition of material provided in Black's Law Dictionary, Seventh Addition.
7. Attached as Exhibit 6 is the definition of substantial provided in Meriam Webster's Collegiate Dictionary, Tenth Edition. Blacks did not define "substantial."

I declare the foregoing to be true and correct under penalty of perjury under the laws of the State of California.

Executed this March 2, 2022 in Ventura, California.

By: ______________________________
Trevor Quirk
Cross Defendant

EXHIBIT 1

# 33 CFR § 328.3 - Definitions.

## § 328.3 Definitions.

For the purpose of this regulation these terms are defined as follows:

**(a)** ***Jurisdictional waters.*** For purposes of the Clean Water Act, 33 U.S.C. 1251 *et seq.* and its implementing regulations, subject to the exclusions in paragraph (b) of this section, the term “waters of the United States” means:

**(1)** The territorial seas, and waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters which are subject to the ebb and flow of the tide;

**(2)** Tributaries;

**(3)** Lakes and ponds, and impoundments of jurisdictional waters; and

**(4)** Adjacent wetlands.

**(b)** ***Non-jurisdictional waters.*** The following are not “waters of the United States”:

**(1)** Waters or water features that are not identified in paragraph (a)(1), (2), (3), or (4) of this section;

**(2)** Groundwater, including groundwater drained through subsurface drainage systems;

**(3)** Ephemeral features, including ephemeral streams, swales, gullies, rills, and pools;

**(4)** Diffuse stormwater run-off and directional sheet flow over upland;

**(5)** Ditches that are not waters identified in paragraph (a)(1) or (2) of this section, and those portions of ditches constructed in waters identified in paragraph (a)(4) of this section that do not satisfy the conditions of paragraph (c)(1) of this section;

**(6)** Prior converted cropland;

**(7)** Artificially irrigated areas, including fields flooded for agricultural production, that would revert to upland should application of irrigation water to that area cease;

**(8)** Artificial lakes and ponds, including water storage reservoirs and farm, irrigation, stock watering, and log cleaning ponds, constructed or excavated in upland or in non-jurisdictional waters, so long as those artificial lakes and ponds are not impoundments of jurisdictional waters that meet the conditions of paragraph (c)(6) of this section;

**(9)** Water-filled depressions constructed or excavated in upland or in non-jurisdictional waters incidental to mining or construction activity, and pits excavated in upland or in non-jurisdictional waters for the purpose of obtaining fill, sand, or gravel;

**(10)** Stormwater control features constructed or excavated in upland or in non-jurisdictional waters to convey, treat, infiltrate, or store stormwater run-off;

**(11)** Groundwater recharge, water reuse, and wastewater recycling structures, including detention, retention, and infiltration basins and ponds, constructed or excavated in upland or in non-jurisdictional waters; and

**(12)** Waste treatment systems.

**(c)** ***Definitions.*** In this section, the following definitions apply:

**(1)** ***Adjacent wetlands.*** The term *adjacent wetlands* means wetlands that:

**(i)** Abut, meaning to touch at least at one point or side of, a water identified in paragraph (a)(1), (2), or (3) of this section;

**(ii)** Are inundated by flooding from a water identified in paragraph (a)(1), (2), or (3) of this section in a typical year;

**(iii)** Are physically separated from a water identified in paragraph (a)(1), (2), or (3) of this section only by a natural berm, bank, dune, or similar natural feature; or

**(iv)** Are physically separated from a water identified in paragraph (a)(1), (2), or (3) of this section only by an artificial dike, barrier, or similar artificial structure so long as that structure allows for a direct hydrologic surface connection between the wetlands and the water identified in paragraph (a)(1), (2), or (3) of this section in a typical year, such as through a culvert, flood or tide gate, pump, or similar artificial feature. An adjacent wetland is jurisdictional in its entirety when a road or similar artificial structure divides the wetland, as long as the structure allows for a direct hydrologic surface connection through or over that structure in a typical year.

**(2)** ***Ditch.*** The term *ditch* means a constructed or excavated channel used to convey water.

**(3)** ***Ephemeral.*** The term *ephemeral* means surface water flowing or pooling only in direct response to precipitation (*e.g.,* rain or snow fall).

**(4)** ***High tide line.*** The term *high tide line* means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds, such as those accompanying a hurricane or other intense storm.

**(5)** ***Intermittent.*** The term *intermittent* means surface water flowing continuously during certain times of the year and more than in direct response to precipitation (*e.g.,* seasonally when the groundwater table is elevated or when snowpack melts).

**(6)** ***Lakes and ponds, and impoundments of jurisdictional waters.*** The term *lakes and ponds, and impoundments of jurisdictional waters* means standing bodies of open water that contribute surface water flow to a water identified in paragraph (a)(1) of this section in a typical year either directly or through one or more waters identified in paragraph (a)(2), (3), or (4) of this section. A lake, pond, or impoundment of a jurisdictional water does not lose its jurisdictional status if it contributes surface water flow to a downstream jurisdictional water in a typical year through a channelized non-jurisdictional surface water feature, through a culvert, dike, spillway, or similar artificial feature, or through a debris pile, boulder field, or similar natural feature. A lake or pond, or impoundment of a jurisdictional water is also jurisdictional if it is inundated by flooding from a water identified in paragraph (a)(1), (2), or (3) of this section in a typical year.

**(7)** ***Ordinary high water mark.*** The term *ordinary high water mark* means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

**(8)** ***Perennial.*** The term *perennial* means surface water flowing continuously year-round.

**(9)** ***Prior converted cropland.*** The term *prior converted cropland* means any area that, prior to December 23, 1985, was drained or otherwise manipulated for the purpose, or having the effect, of making production of an agricultural product possible. EPA and the Corps will recognize designations of prior converted cropland made by the Secretary of Agriculture. An area is no longer considered *prior converted cropland* for purposes of the Clean Water Act when the area is abandoned and has reverted to wetlands, as defined in paragraph (c)(16) of this section. Abandonment occurs when prior converted cropland is not used for, or in support of, agricultural purposes at least once in the immediately preceding five years. For the purposes of the Clean Water Act, the EPA Administrator shall have the final authority to determine whether prior converted cropland has been abandoned.

**(10)** ***Snowpack.*** The term *snowpack* means layers of snow that accumulate over extended periods of time in certain geographic regions or at high elevation (*e.g.,* in northern climes or mountainous regions).

**(11)** ***Tidal waters*** and *waters subject to the ebb and flow of the tide.* The terms *tidal waters* and *waters subject to the ebb and flow of the tide* mean those waters that rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters and waters subject to the ebb and flow of the tide end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by hydrologic, wind, or other effects.

**(12)** ***Tributary.*** The term *tributary* means a river, stream, or similar naturally occurring surface water channel that contributes surface water flow to a water identified in paragraph (a)(1) of this section in a typical year either directly or through one or more waters identified in paragraph (a)(2), (3), or (4) of this section. A tributary must be perennial or intermittent in a typical year. The alteration or relocation of a tributary does not modify its jurisdictional status as long as it continues to satisfy the flow conditions of this definition. A tributary does not lose its jurisdictional status if it contributes surface water flow to a downstream jurisdictional water in a typical year through a channelized non-jurisdictional surface water feature, through a subterranean river, through a culvert, dam, tunnel, or similar artificial feature, or through a debris pile, boulder field, or similar natural feature. The term *tributary* includes a ditch that either relocates a tributary, is constructed in a tributary, or is constructed in an adjacent wetland as long as the ditch satisfies the flow conditions of this definition.

**(13)** ***Typical year.*** The term *typical year* means when precipitation and other climatic variables are within the normal periodic range (*e.g.,* seasonally, annually) for the geographic area of the applicable aquatic resource based on a rolling thirty-year period.

**(14) *Upland.*** The term *upland* means any land area that under normal circumstances does not satisfy all three wetland factors (*i.e.,* hydrology, hydrophytic vegetation, hydric soils) identified in paragraph (c)(16) of this section, and does not lie below the ordinary high water mark or the high tide line of a jurisdictional water.

**(15) *Waste treatment system.*** The term *waste treatment system* includes all components, including lagoons and treatment ponds (such as settling or cooling ponds), designed to either convey or retain, concentrate, settle, reduce, or remove pollutants, either actively or passively, from wastewater prior to discharge (or eliminating any such discharge).

**(16) *Wetlands.*** The term *wetlands* means areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

[51 FR 41250, Nov. 13, 1986, as amended at 58 FR 45036, Aug. 25, 1993; 80 FR 37104, June 29, 2015; 83 FR 5208, Feb. 6, 2018; 84 FR 56667, Oct. 22, 2019; 85 FR 22338, Apr. 21, 2020]

EXHIBIT 2

# CITY ATTORNEY LEGAL REPORT

**Agenda Item No.:** 8E

**Council Action Date: December 3, 2018**

November 20, 2018

Honorable Mayor and Members of the City Council
City of San Buenaventura, California

Re: Request for Authorization to Extend Outside Counsel Services

Dear Mayor and Members of the Council:

## RECOMMENDATION

Authorize the City Attorney to enter into an extended legal services agreement with the law firm of Best, Best and Krieger, LLP in an amount not to exceed an additional $1,720,000 to continue representation of the City in the litigation matter of *Santa Barbara Channelkeeper v. State Water Resources Control Board and the City of San Buenaventura*, San Francisco County Superior Court Case No. CPF-14-513875, and *Santa Barbara Channelkeeper v. State Water Resources Control Board*, San Francisco Superior Court Case No. CPF-17-515919. Appropriate and authorize the expenditure of funds in 52304-63151-63151-224-52.

## DISCUSSION

On September 19, 2014, Santa Barbara Channelkeeper (Channelkeeper) filed a lawsuit against the State Water Resources Control Board and the City in San Francisco Superior Court seeking a writ of mandate as well as a cause of action for declaratory relief as to the City relating to the City's use of water from the Ventura River. This lawsuit was served on the City on September 23, 2014 and the parties have been litigating this case ever since.

The Ventura River is an important and essential part of the City's water supply, and the City has maintained water rights on the Ventura River for more than a century.

In the litigation, Channelkeeper singled out the City's use of the Ventura River, even though there are many other water users in the Ventura River Watershed. The California Court of Appeal agreed with the City in a ruling earlier this year that it could bring in other users given that Channelkeeper's claims could impact the City's long-held rights to Ventura River water.

The City filed its amended cross-complaint in September of this year, which brings into the litigation all water users in the Ventura River Watershed. The City is bringing in all water users in order to protect its water rights and to ensure that everyone is part of the solution in the event that cutbacks are needed for sensitive species and habitat. Legally, in order to determine water users' respective rights, all users must be parties to the same lawsuit. For this reason, the City named many cross-defendants. This is not a step that was taken lightly and only because it is to protect the City's ability to serve its community.

The City is committed to environmental sustainability and will continue being a good steward of its local water resources. The City believes that all water interests, City residents, other water users, and environmental needs, must cooperate and compromise in using and preserving this precious resource. The City wants to be pro-active and is working with its experts to develop solutions to the competing interests in the Ventura River Watershed.

The most significant costs in this area are the scientists and experts necessary to appropriately evaluate the watershed, and the sensitive species and habitat and develop a judicial solution to this matter. As the scope of the claims have become more clear, the City's attorneys requested a more robust analysis of the Ventura River Basin to show the effects of groundwater pumping on River flows, and the impact of dams and other diversions upon on River flows and habitat.

Based on these developments, the City Attorney is recommending that the City Council authorize the execution of the Fourth Amendment to Legal Services Agreement with Best, Best and Krieger LLP in an amount not to exceed an additional $1,720,000. This request for additional monies includes estimated legal and expert consultant fees. Staff has identified funding within Ventura Water to support this litigation.

Best, Best and Krieger has offices throughout the State of California and is recognized as one of the preeminent municipal and water law firms in the State. The City Attorney and Ventura Water have been discussing with Best, Best and Krieger how to manage this litigation in an economical fashion. Having the litigation filed in San Francisco has added additional cost and expense to the case and providing a strong defense is expensive. Recognizing that the water expert attorneys for Best, Best and Krieger that will be assisting the City are generally Southern California-based and the lawsuit is filed in San Francisco Superior Court, we have worked out an arrangement with Best, Best and Krieger to ensure that to the extent feasible attorneys from their Walnut Creek and other Northern California offices will be assisting in the litigation and making appearances whenever possible. This will avoid paying attorneys from Southern California to travel to Northern California for various court appearances – – particularly procedural ones. The litigation team is headed by the managing partner of the firm's Walnut Creek office, Gene Tanaka, who is a seasoned litigator-- particularly of complicated and complex pieces of litigation. The litigation team will include members from the water practice group particularly in Southern California that have been working on Ventura River issues for Ventura Water for several years.

We recognize that this is going to continue to be a complicated, complex, and expensive litigation matter; however, it is one that is important for the City in order to protect its water rights to ensure an adequate water supply is available for City users, while also addressing the needs of the environment.

## FISCAL IMPACT

We are requesting authorization to extend the legal services agreement with Best, Best and Krieger for these litigation matters. At this time staff is seeking an authorization to increase the existing contract by $1,720,000. There are sufficient appropriations available within the Ventura Water operations fund (52) to cover this increase.

Re: Request for Authorization to Extend Outside Counsel Services

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Respectfully submitted,

Gregory G. Diaz
City Attorney

CC: Alex D. McIntyre, City Manager
Kevin Brown, General Manager, Ventura Water
Pam Townsend, Budget Analyst

EXHIBIT 3

February 22, 2022

Requestor: "Ellie G."
Sent Via Comcate System
Comcate Number 93519

RE: Response to Public Records Act Request of February 8, 2022

Dear Requestor:

I am responding to your Public Records Act request of February 8, 2022 submitted electronically through the City's website, requesting:

- "Updated request for accounting report and or the amount paid to date to Mustang Marketing and Walnut Creek Lawyers. Thank you."

In responding to your request, I am assuming that "Walnut Creek Lawyers" refers to the law firm of Best, Best & Krieger LLP ("BBK") who were retained to defend the City in the lawsuit filed by Santa Barbara Channelkeeper, entitled Santa Barbara Channelkeeper v. State Water Resources Control Board and City of San Buenaventura, Los Angeles County Superior Court, Case No. 19STCP01176. BBK was selected to represent the City in this case because of their expertise in water law, municipal law, and litigation. BBK has attorneys in both northern and southern California; attorneys from their Walnut Creek office were included on the team because Channelkeeper originally filed the lawsuit in San Francisco Superior Court, and those attorneys could make court appearances more cost-effectively than attorneys from southern California. Mustang Marketing was retained by the City Attorney's Office as an expert to assist the City in this litigation.

Comcate Number 93519
February 22, 2022
RE: Response to Public Records Act Request of February 8, 2022

Your request seeks records under the Public Records Act related to attorney and expert billings in this pending litigation. Because your request asks for documents that are exempt from disclosure under the Public Records Act, there are no disclosable documents to produce to you at this time. The records you seek are exempt from disclosure because they pertain to pending litigation, reflect attorney-client privilege and work product, include preliminary drafts and are otherwise not disclosable at this time. (See Gov. Code section 6254(a), (b), and (k) and 6255.)

Although your request does not seek disclosable records, the City is committed to providing the public with disclosable information about this litigation and to explaining the long-term value of the work that is being done. Therefore, we are providing you the following information in response to your request.

Since January, 2020 through February 8, 2022, the City has paid Mustang Marketing $104,770.91 for this litigation. Since 2014 through February 8, 2022, the City has paid the following amounts to BBK for attorneys' fees, expert fees, and other costs for this litigation:

- Attorneys' fees: $3,939,441.80
- Expert fees: $2,638,193.90
- Other costs: $539,028.93 (other costs primarily involve creating a website in the case so parties and the public can access documents, sending notices to property owners who overlie the groundwater basins and serving parties who own property adjacent to the Ventura River or its tributaries).

The determination of the application of the attorney-client and attorney work product privilege as to those requested documents which the City is declining to produce was made by the Office of the City Attorney and the undersigned.

I hope this information is responsive to your request.

Sincerely,

Miles Hogan

Miles Hogan
Assistant City Attorney II

CC: Tracy Oehler, Interim City Clerk
Alex McIntyre, City Manager
Susan Rungren, General Manager, Ventura Water

EXHIBIT 4

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802- 4213

In response refer to:
SWR/2005/05969: SCG

AUG 29 2007

Antal J. Szijj
Army Corps of Engineers
Ventura Regulatory Field Office
2151 Alessandro Drive, Suite 110
Ventura, California 93001

Dear Mr. Szijj:

Enclosed is NOAA's National Marine Fisheries Service's (NMFS) draft biological opinion for the Army Corps of Engineers' (Corps) permitting of the City of Ventura's (City) Foster Park Well Facility Repairs, on the Ventura River, in Ventura County, California (File No. 200501739-JWM). The draft biological opinion addresses effects of the proposed action on the Southern California Distinct Population Segment (DPS) of steelhead (*Oncorhynchus mykiss*) and critical habitat for this species in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U. S. C. 1531 *et seq.*).

The draft biological opinion concludes the well facility repairs and resumed Foster Park well field withdrawals are likely to jeopardize the continued existence of endangered Southern California steelhead DPS, and are likely to destroy or adversely modify designated critical habitat for steelhead. The draft biological opinion includes a preliminary reasonable and prudent alternative that NMFS believes is likely to avoid jeopardy and adverse modification of critical habitat resulting from this project. NMFS would like to meet with the Corps and the City to discuss the basis for the conclusion and refine the reasonable and prudent alternative, or develop new reasonable and prudent alternatives pursuant to the requirements of 50 CFR 402.14(g)(5). Please contact Stan Glowacki at (562) 980-4061 or via email at Stan.Glowacki@noaa.gov if you have any questions concerning the draft biological opinion or if you would like additional information.

Sincerely,

for Rodney R. McInnis
Regional Administrator

cc: Natasha Lohmus, CDFG
Karen Waln, City of Ventura
Don Davis, City of Ventura

Enclosure

**DRAFT BIOLOGICAL OPINION**

| | |
|---|---|
| **AGENCY:** | U.S. Army Corps of Engineers |
| **ACTION:** | Issuance of an Army Corps 404 Permit Authorization for the City of Ventura's Foster Park Well Facility Repairs Project (File No. 200501739-JWM). |
| **CONSULTATION CONDUCTED BY:** | National Marine Fisheries Service, Southwest Region |
| **FILE NUMBER:** | 151422SWR05PR00753 |
| **TRACKING NUMBER** | SWR/2005/05969 |
| **DATE ISSUED:** | ______________________ |

## I. CONSULTATION HISTORY

During the winter of 2005, large storms produced floods that damaged the City of Ventura's (City) Foster Park Well Facility (FPWF) on the lower Ventura River, rendering the facility, including wells and conduits between the wells, unusable for water extraction. The City submitted an application to the Army Corps of Engineers (Corps) to repair the well facility, and the Corps sent a letter dated October 14, 2005, to NOAA's National Marine Fisheries Service (NMFS) requesting concurrence that repairs to the well facility were not likely to adversely affect the Southern California Distinct Population Segment (DPS) of endangered steelhead (*Oncorhynchus mykiss*) or their critical habitat. After reviewing the consultation request, NMFS concluded that the resumption of water extraction from the well facility on steelhead and critical habitat was a part of the effects of the proposed action, but information describing these effects was missing from the consultation request. Consequently, NMFS requested more information in this regard in a letter to the Corps dated November 8, 2005.

The City's consultant, URS Corporation, sent a letter to the Corps and NMFS dated November 28, 2005, containing some additional information about the well facility pumping rates and how repairs would not increase pumping capacity of the well facility, but no information regarding the well facility's effects on surface flows was included in the letter. After reviewing the additional information sent by URS Corporation, NMFS subsequently sent a letter dated January 4, 2006, to the Corps informing them that formal consultation was necessary, based on the need to work during the wet season, divert water, and possibly relocate steelhead, as well as the need to address the indirect effects of resumption of water withdrawals from the well facility. On January 18, 2006, the Corps sent a letter agreeing with NMFS about the need to initiate formal consultation, and included an updated project description. NMFS sent the Corps another letter dated February 22, 2006, informing the Corps that formal consultation could not be initiated because the Corps had not adequately described how the proposed action (i.e., the resumption of well facility operations and pumping) would affect steelhead and designated critical habitat in the Ventura River. The Corps sent a letter and a packet containing additional information dated March 20, 2006, which contained a description of the effects of the individual project elements on steelhead and critical habitat, information on flow records, pumping rates, other facility information, and photographs.

Finding the March 20, 2006, information packet from the Corps to be inadequate for determining the effects of well facility operations on surface flows, steelhead and critical habitat, NMFS sent another letter to the Corps on May 2, 2006, explaining that formal consultation still could not be initiated because the effects of the well facility pumping on surface flows had not been adequately described. The Corps and the City stated through correspondence that information on the effects of the well facility operations on surface flows did not exist, and could not be obtained until well operations resumed. In an effort to determine the effects of well-facility pumping on surface flows from previously collected information, NMFS sent another letter June 8, 2006, requesting two hydrology reports that the Corps and the City had not yet provided. The City provided the reports but no information on the effects of well facility pumping on surface flows could be gleaned from the reports, and the City, and the Corps reiterated their position that that specific information did not exist, but was imminent if a long-term study could be completed after well facility operations resumed. Finally in a meeting on June 14, 2006, between the City, the City's consultant Hopkins Groundwater Consultants Inc., the Corps, and NMFS, all parties agreed that the City and NMFS would assume a 1-to-1 relationship between groundwater pumping and the effects on surface flows in the Ventura River (e.g., a pumping rate of 1 cubic foot per second (cfs) would translate into a 1 cfs reduction in surface flow). The City's consultant sent a letter to NMFS on June 26, 2006 stating that the City would assume a 1-to-1 relationship between well facility pumping and surface flows. With this information, NMFS was able to begin formal consultation.

## II. DESCRIPTION OF THE PROPOSED ACTION

The Corps proposes to issue a section 404 permit to the City for performing repairs and maintenance activities to the FPWF on the lower Ventura River (Figure 1). The objectives of the City's repairs are to restore the withdrawal capacity of the FPWF to pre-damage levels. The average pre-damage rate of water withdrawal from the FPWF over the past 20 years has been about 6.9 cubic feet per second (cfs), but typically has varied from as high as 19 cfs to as low as 0 cfs based on the time of year, the amount of water in the river, and the condition of the well field.

The well field consists of 3 production wells (known as the Nye wells and numbered 2, 7, and 8) a number of test wells (numbered 1-10), a subsurface diversion collector pipe which withdraws water from about 4 feet under the substrate, and conduit pipes for transference of raw water from the wells and subsurface collector to the water treatment plant in the city of Ventura (Figure 1). Currently the FPWF is inoperable and no well withdrawals are occurring. Well facility repairs would be undertaken in spring or summer 2007 and would take approximately 3-4 weeks. The individual project elements to accomplish repairs are summarized below.

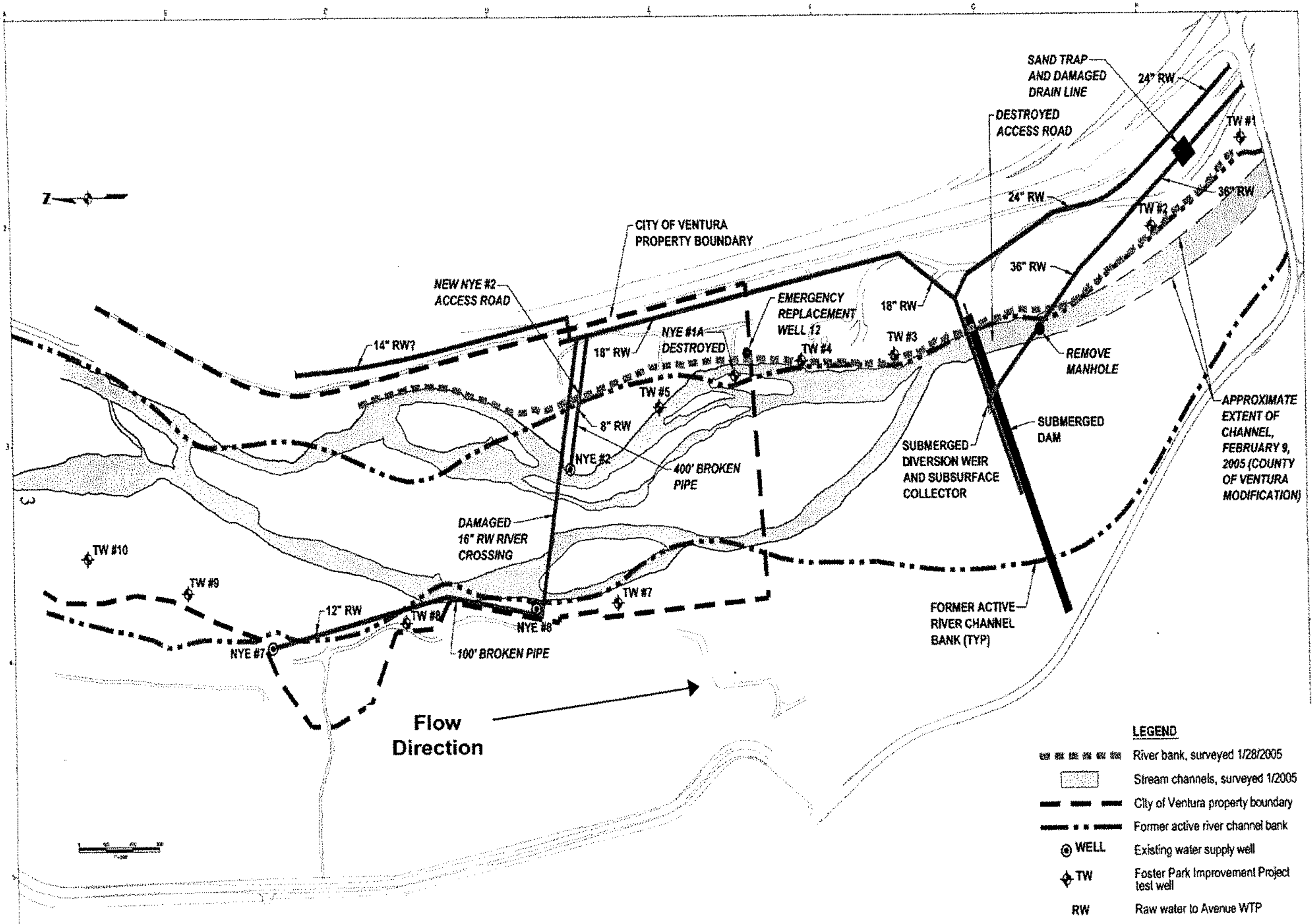


Figure 1: City of Ventura's Foster Park Well Field showing production wells, monitoring (test) wells, subsurface diversion and related components

## A. Sand Trap Flush Line Repair

The end of a 12-inch sand trap flush line, which is used for catching sand from the well field connection conduits, is buried and needs to be exposed so it will function properly. Personnel with shovels and a backhoe will expose the drain line penetrating the riverbank near the bottom of the slope and native rock will be placed around the area at the end of the flush line. A large piece of concrete near the work area will be removed during the repair. This project component will occur on a dry stream bank and will take approximately two days to complete.

## B. Reconnection of Pipeline between Nye Wells No. 7 and No. 8

The connection pipeline between wells number 7 and number 8, which carries water from well number 7 to well 8, was washed out and will be rebuilt. The City will abandon the existing pipe alignment and replace it with a new pipe located farther away from the riverbank. A trench about ten feet deep by four feet wide will be excavated and a new 12-inch high density polyethylene (HDPE) plastic pipe approximately 1000 feet in length will be installed between Nye Wells 7 & 8. The pipe trench will be bedded and covered with imported sand and then backfilled with cement with an accelerant for quick curing. This project component will occur outside of the river channel and outside of the Corps jurisdiction.

## C. Protection of Nye Well No. 8

About 40 cubic yards of 3-5-ton granite boulders will be placed around the Nye Well number 8 wellhead, and on the adjacent bank to protect the structure from scour. The riprap will extend around well no. 8 and along approximately 100 feet of bank, and the width of the riprap will be about 10 feet. The rock will be placed with equipment stationed outside of the river channel on the west bank and no excavation will be necessary. The area where the work will occur is outside of the active channel and is currently dry. The work will take about one week to complete.

## D. Removal of Well Debris from the River Channel

With use of a backhoe, sections of broken pipeline, well head and casing for the defunct well 1A, as well as granite boulder riprap that were protecting Well 1A will be removed from the riverbed. Well 1A will be permanently removed from the FPWF system. A rubber-tire backhoe will access the channel when it is dry and can be accessed without crossing active flow. The backhoe will be driven to each location and remove the debris to locations outside of the riverbanks in approximately three days.

## E. Intake Structure Access Route

To allow for routine checking and maintenance of the sub-surface diversion collector, minor regrading of the access road to the intake structure will be performed to allow for City work truck access.  Grading will consist of a backhoe performing minor leveling and removal of boulders that could damage trucks.

**F.   Nye Well No. 2 Repair**

This project component involves the installation of a 400-foot long, 8-inch diameter plastic pipe from well No. 2 across the river to the east bank, where the new pipeline will reconnect well No. 2 to the City's main raw-water pipeline.  A backhoe will dig a trench of about 2-4 feet deep and about a foot wide and the pipeline connection will be restored.  The trench will be refilled and the river channel contours restored to preconstruction condition.  The work will take place in the dry riverbed and will take about 3 days to complete.

**G.   Repair of Monitoring Wells No. 5 and No. 10**

Two in-channel monitoring-test wells, which monitor the status of the aquifer beneath the river, will be repaired.  Under dry conditions, City personnel will access the wells and straighten the well casings.  Then the top portions of the wells will be replaced with new well heads.  This project component will take about 2 days to complete.

**H.   Removal of Gravity Line Manhole Covers**

Two manhole covers attached to the 36-inch main water line were damaged by storms and will be removed.  After excavating the river substrates around the manhole covers, personnel with jackhammers and hand tools will demolish the concrete manholes.  A backhoe will then be used to remove the destroyed manhole materials from the channel.  Concrete will be used to cap the opening over the pipeline after the manhole removal is complete.  BMPs to contain the fresh concrete within the work area will be implemented.  An accelerator will be mixed with the concrete to reduce the concrete cure time to two hours. No diversion of surface water is needed because the removal operation will be accomplished when the work areas are dry.  The work will take approximately two days to complete.

**I.   River Crossing Pipeline Rehabilitation and Repair**

The main concrete pipeline which runs under the river and brings the majority of water from FPWF to the City's water treatment plant was damaged by floods and will be repaired by slipping a smaller plastic pipe inside the concrete pipe.  The first phase of the repairs will be carried out by slip-lining a 14" HDPE plastic pipe through the damaged 16-inch concrete pipeline under the river for a distance of approximately 870 feet to the point near the west side of the river where the concrete pipe changes size from 16 inches to 12 inches.  After this is accomplished the 30-foot long section of 12-inch concrete pipe which ties into the larger concrete pipe near the west bank of the river will be replaced with a new section of 16-inch concrete pipe.

To facilitate replacement of the damaged 30-foot section of 12-inch concrete pipe, a water diversion will be constructed by creating a diversion berm using riverine sediments about 5 feet high with heavy equipment, and then diverting the river flows into a new channel which will be eastward by about 30 feet, and approximately 450-feet long. To reduce sedimentation downstream, the diversion berm will be lined with plastic sheeting which will be anchored with sandbags. After the water diversion is in place and the river has been diverted into the new river channel, a trench about 20 feet wide and 10 feet deep will be excavated in the river channel and the 30-foot long damaged section of 12-inch concrete pipe will be removed. Dewatering of the trench will be necessary and will be performed with the aid of screened pipes and pumps. A new section of 16-inch concrete pipe will be joined with the other concrete pipe section, and the HDPE plastic pipe will be slip-lined into the new concrete pipe. The new concrete pipe and 14-inch plastic pipe (liner) will be connected to a smaller trench which will be excavated on the west bank. The river channel and trenches will be backfilled and returned to the pre-project condition after pipeline repairs are complete.

Prior to water diversion and river excavation, a biologist will survey the diversion area for steelhead by visual observation on the banks and in the river, and will set block nets to keep fish from entering the diversion area during the dewatering process. If steelhead are found within the water diversion area during dewatering, the biological monitor will relocate steelhead using dip nets to the nearest suitable habitat. During water diversion and instream work, BMPs will be implemented to control downstream sedimentation occurring from excavations, and channel disturbance. To reduce disturbance to the river channel the diversion berm and channel containing the diverted flows will be left in place and allowed to erode naturally during winter flows. All foreign materials from construction and water diversion (*i.e.*, concrete debris, plastic sheeting, sandbags) will be removed from the river channel when construction and repair work is complete. The work will take approximately 2 weeks to complete.

### J. Action Area

The action area begins north of Foster Park on the Ventura River, 100 feet upstream of Nye well no. 7, and continues down to but does not include the Ventura River Estuary, where water withdrawals from the FPWF would affect surface water discharge levels. The length of the action area is approximately 6 miles.

## III. STATUS OF THE SPECIES AND CRITICAL HABITAT

This Biological Opinion considers the potential effects of the proposed action on the DPS of endangered Southern California steelhead and their critical habitat. The status of Southern California steelhead, their life history and habitat requirements, the status of their critical habitat, and recent factors affecting steelhead populations and their critical habitat are described as follows.

### A. Status of Southern California Steelhead

1. Listing Status

Steelhead, an ocean-going form of rainbow trout (*Oncorhynchus mykiss*), are native to Pacific Coast streams from Alaska south to northwestern Mexico (Moyle 1976; August 18, 1997, 62 FR 43937). Wild steelhead populations in California have decreased considerably from their historic levels (Swift *et al*. 1993; August 18, 1997, 62 FR 43937). This decline prompted listing of the Southern California Evolutionarily Significant Unit (ESU) of steelhead as endangered on August 18, 1997 (62 FR 43937), which includes all naturally spawned populations of steelhead and their progeny residing below long-term impassible barriers. The endangered status was reaffirmed on January 5, 2006 (71 FR 834). Critical habitat for Southern California steelhead was recently designated on September 2, 2005 (70 FR 52488).

The Southern California steelhead DPS extends from the Santa Maria River in Santa Barbara County to the Mexican border (inclusive). Estimates of historical (pre-1960s) and recent (1990s) abundance show a considerable drop in numbers of spawning adults for major rivers in the Southern California steelhead DPS. A recent updated status report states that the chief causes for the decline of steelhead populations in the Southern California DPS are urbanization, de-watering, channelization of creeks, human-made barriers to migration, and the introduction of exotic fishes and riparian plants (Good *et al*. 2005). Historical data on steelhead numbers for this region are sparse. The historic and recent steelhead abundance estimates, and percent decline are summarized in Table 1 below. The run size estimates illustrate the severity of the decline for the major rivers in the Southern California steelhead DPS ( Busby et al. 1996).

Table 1. Historical and current estimates of adult steelhead in the Southern California DPS. Data from Busby *et al.* 1996.

| | **Pre-1950** | **1990s** | **% Decline** |
|---|---|---|---|
| Santa Ynez River | 20,000-30,000 Adults | < 100 | 99.6 |
| | **Pre-1960** | **1990s** | **% Decline** |
| Ventura River | 4,000-5,000 adults | < 100 | 96 |
| Santa Clara River | 7,000-9,000 adults | < 100 | 99 |
| Malibu Creek | 1,000 adults | < 100 | 90 |

Even though population estimates of steelhead have decreased substantially from historic estimates, fish surveys by NOAA Southwest Fisheries Science Center (SWFSC), direct observations by NMFS biologists, and anecdotal information from major rivers and creeks throughout the DPS suggest that steelhead populations, although small, continue to persist (Good *et al*. 2005, Titus *et al*. 2001). Efforts to document the species' current pattern of occurrence indicate that steelhead are still wide spread across the northern portions of the DPS, although the steelhead components (i.e., anadromy) of *O. mykiss* populations appear to have been lost in about one third of the basins, mostly in the southern portion of the DPS (Boughton et al. 2006). On a positive note, there have been recent observations of steelhead recolonizing vacant watersheds during years with abundant rainfall, notably San Mateo Creek and Topanga Creek

(Good *et al*. 2005). Nevertheless, the updated status review still lists this DPS as endangered (Good *et al*. 2005). During the recent updated status review, NMFS put together a biological review team (BRT) to assess the viability of the Southern California DPS. The viability analyses suggest that many populations in large watersheds, including the Ventura River Watershed, should continue to survive in the near future if climate conditions remain relatively stable (Boughton et al. 2006). The biggest threat to the viability of the southern populations of steelhead in coastal basins appears to be climate related, as the BRT found a high degree of correlation between the risk of extinction and environmental stochasticity for the coastal basins (Boughton et al. 2006). Recent conservation efforts, migration barrier removal projects, increased public awareness, and continuing protection may play a future role in the viability of steelhead populations within the DPS.

2. Life History and Habitat Requirements

The major freshwater life history stages of steelhead involve freshwater rearing and emigration of juveniles, upstream migration of adults, spawning, and incubation of embryos (Shapovalov and Taft 1954, Moyle 1976, Cederholm and Martin 1983, Barnhart 1991, Meehan and Bjornn 1991, Busby *et al*. 1996). Steelhead juveniles rear in freshwater for 1-3 years before migrating to the ocean, usually in the spring, where they may remain for up to 4 years. Steelhead grow and reach maturity at age 2 to 4 while in the ocean. In Southern California, adults immigrate to natal streams for spawning during December to March, but some adults may not enter coastal streams until spring, depending on flow conditions. Adults may migrate several miles to hundreds of miles in some watersheds to reach their spawning grounds. Although spawning may occur during December to June, the specific timing of spawning may vary a month or more among streams within a region. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration two or more years. Female steelhead dig a nest in the streambed and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel; the embryos incubate within the gravel pocket. Hatching time varies from about 3 weeks to 2 months depending on water temperature. The young fish emerge from the nest about 2 to 6 weeks after hatching.

Habitat requirements of steelhead in streams generally depend on the life history stage (Cederholm and Martin 1983, Bjornn and Reiser 1991). Habitat for southern California steelhead consists of water, substrate, and adjacent riparian zone of estuarine and riverine reaches of coastal river basins, and major rivers. Generally, streamflow volume, water temperature, and water chemistry must be appropriate for adult immigration and juvenile emigration (specific habitat requirement data can be found in Bjornn and Reiser 1991). Low streamflow, high water temperature, physical barriers, low dissolved oxygen, and high turbidity can delay or halt upstream migration of adults and timing of spawning, and downstream migration of juveniles and subsequent entry into estuary, lagoon, or ocean. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning, but water temperature and turbidity are also important. Dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. Fine sediment, sand, and smaller particles can fill interstitial spaces between substrate particles, thereby reducing water-flow through and dissolved oxygen levels within a nest. Juvenile steelhead require living space (different combinations of water depth and velocity), shelter from predators and harsh environmental conditions, adequate food resources, and suitable water quality and quantity, for ontogeny and survival during summer and winter. Young-of-the-year and yearling steelhead generally use riffles and runs during much of a given year where these habitats exist (Roper *et al*. 1994). However, young-of-the-year and older juveniles may seek cover and cool water in pools during periods of elevated water temperature (Matthews and Berg 1997) or low flows (Kraft 1972, cf. Spina 2006)

**B. Status of Critical Habitat**

Critical habitat for the Southern California steelhead DPS was designated on September 2, 2005, and consists of the stream channels listed in 70 FR 52488, which include the Ventura River and the south fork of Matilija Creek up to the base of the Matilija Dam. Critical habitat has a lateral extent defined as the width of the channel delineated by the ordinary high-water line as defined by the Corps in 33 CFR 329.11, or by its bankfull elevation, which is the discharge level on the streambank that has a recurrence interval of approximately 2 years (September 2, 2005, 70 FR 52522). Estuarine areas of streams are also included in the designation. Primary constituent elements (PCE) within these streams essential for the conservation of the DPS are those sites and habitat components that support one or more steelhead life stages. These include freshwater spawning sites and rearing sites with water quantity and quality sufficient to form and maintain physical habitat conditions that support juvenile growth and mobility. PCEs also include natural cover, such as shade, submerged and overhanging large wood, logjams, beaver dams, aquatic vegetation, large rocks, boulders, side channels and undercut banks (September 2, 2005, 70 FR 52521). Additional PCEs of critical habitat consist of freshwater migration corridors free of obstruction and excessive predation that have sufficient water quantity and quality, and physical cover within migration corridors that supports steelhead mobility and survival, as well as estuarine areas that also share these attributes. Also listed as PCEs are juvenile and adult steelhead food forage, including aquatic invertebrates and fishes that support steelhead growth and maturation (September 2, 2005, 70 FR 52522).

Streams designated as critical habitat in the Southern California DPS have the above PCE attributes to varying degrees, depending on the stream location and the impacts associated with the watershed. NMFS' most recent Status Review Update for West Coast Steelhead (Good *et al*. 2005) identified habitat destruction and degradation as serious ongoing risk factors for this DPS. Urban development, flood control, water development, and other anthropogenic factors have adversely affected the proper functioning and condition of some spawning, rearing, and migratory habitats in streams designated as critical habitat. Urbanization has resulted in some permanent impacts to steelhead critical habitat due to stream channelization, increased bank erosion, riparian damage, migration barriers, and pollution (Good *et al*. 2005). Many streams within the DPS have dams and reservoirs that mute flushing stream flows, withhold or reduce water levels suitable for fish passage and rearing, physically block upstream fish passage, and retain valuable sediments for spawning and rearing. In addition, some stream reaches within the DPS' designated critical habitat may be vulnerable to further perturbation resulting from poor land use and management decisions.

As part of the process to gather and analyze information to finalize this most recent designation of critical habitat several Critical Habitat Analytical Review Teams (CHARTs) were formed. The CHARTs compiled all available information regarding the distribution and habitat use of steelhead within the Southern California DPS, as well as habitat condition. The CHARTs also performed conservation assessments for all occupied watersheds, including riverine reaches and estuarine areas within each DPS. To assess the conservation value of the hydrologic sub-areas (HSA) in the DPS, the CHART used their best professional judgment, considered a variety of data sources and employed a generally uniform scoring system based on the quality, quantity, and distribution of physical or biological features associated with spawning, rearing, and migration in each HSA. From this analysis each occupied HSA was given a value of "high," "medium," or "low." Within the freshwater and estuarine range of the Southern California DPS, the CHART identified 32 HSAs that were occupied by steelhead (NMFS 2005). Of the 32 occupied HSAs that were evaluated, 21 were rated as having high conservation value (including the Ventura River), 6 were rated as having medium conservation value, and 5 were rated as having low conservation value. Overall, although essential features of aquatic habitats in many streams are impaired and could continue to be so in the future, there are substantial areas of suitable habitat within designated critical habitat areas in a condition suitable to have allowed steelhead to persist thus far. Maintenance and recovery of these areas as well as improvement in other areas of critical habitat will facilitate the future recovery of Southern California steelhead populations within the DPS (NMFS 2005). Additional information regarding the existing condition of designated critical habitat within the action area is presented below in the Environmental Baseline

## IV. ENVIRONMENTAL BASELINE

### A. Hydrology in the Action Area

Foster Park is approximately 6 miles upstream from the mouth of the Ventura River. The Ventura River within the FPWF lies at the boundary between the upper Ventura River Basin and the Lower Ventura River Basin. The boundary is designated by a submerged dam that was constructed below the river alluvium between 1906 and 1908. The submerged dam is approximately 975 feet long and extends from the confluence of Coyote Creek almost completely across the river channel. There is a gap of approximately 300 feet between the submerged dam and the bedrock boundary on the east side of the alluvial basin, and water within the aquifer "leaks" downstream of the subsurface dam at all times (Fugro 2002). The purpose of the submerged dam is to bring subsurface water flow to the surface in the Foster Park area so it would be available for agricultural and domestic use. Flows in the Ventura River throughout the action area are naturally perennial, due to the geology of the bedrock formations beneath the river facilitating groundwater from the aquifer to rise (Moore 1980), and partially because of the subsurface dam. About a mile below the FPWF, the Ojai Valley Sanitary District water treatment plant (OVWTP) discharges about 3 cfs of tertiary treated water at all times. Additionally, the bedrock formations near the OVWTP contribute several more cfs of rising groundwater to this portion of the action area, which contributes to the flows in the lower part of the action area (Fugro 2002, Hopkins 2007).

The dominant source of recharge to the Ventura River aquifer in the portion of the action area, from which the FPWF wells draw water, is direct infiltration of surface flows. Other sources of recharge include direct infiltration of precipitation and underflow through alluvial sediments within the river and flows from major tributaries (Fugro 2002). These tributaries include Coyote Creek, which joins the Ventura River within Foster Park, and San Antonio Creek, which is about two miles upstream of the FPWF. Although Coyote Creek is usually dry after spring since it is dammed at Lake Casitas, San Antonio Creek has perennial flows which supplement Ventura River flows in the FPWF area and downstream throughout the action area. Groundwater levels in the Ventura River aquifer within the action area fluctuate seasonally, rising during winter rainfall inputs and declining during the summer due to decreased flows and upstream water extractions. The water levels in the aquifer can change from year to year, with net increases or decreases in water elevation occurring as a function of yearly rainfall amounts, and the balance between recharge rates, groundwater extraction and other groundwater losses.

The thickness of the groundwater aquifer varies through the action area, but in the Foster Park area upstream of the submerged dam and in the vicinity of the FPWF, the aquifer is between 45 and 60 feet thick. The saturated thickness of the aquifer in this area ranges from 35 feet to 45 feet thick. Because of the relatively shallow aquifer and the porous substrate, the FPWF has been characterized as having a quick aquifer response to surface flows and thus a rapid recharge rate (Fugro 2002). Previous studies have shown that rapid recharge can occur after the aquifer has been drawn down during droughts, as illustrated by a rapid rise of the groundwater levels which occurred immediately after drought-breaking wet seasons in 1952 and more recently in 1992 (City of Ventura 2003). The fast response illustrates a high degree of hydraulic connectivity between the groundwater and surface hydrology (City of Ventura 2003). Although no definitive studies have been completed that show the drawdown effects of the FPWF on surface flows (the City was in the middle of such a study when the well field was damaged), well field withdrawals are believed to have fast-occurring drawdown effects on surface flows in the Ventura River in the area of the FPWF because of the high degree of hydraulic connectivity between the surface hydrology and the aquifer (Fugro 2002). This characteristic led to the assumption of a 1-to-1 relationship between well field withdrawals and surface flows in the Foster Park area assumed by the City's hydrological consultant to facilitate the effects analysis in this biological opinion (Hopkins 2006). Once surface and subsurface flows have passed the subsurface dam the water downstream of the subsurface dam is not available for well field withdrawals because of the barrier formed by the subsurface dam between the sections of the aquifer (Hopkins 2007).

## B. Status of Critical Habitat in the Action Area

The Ventura River in the action area has been characterized by the CHART as being occupied by steelhead and having high conservation value. The action area provides spawning and rearing habitat for steelhead, and provides a migratory corridor for steelhead to upstream reaches where the bulk of the spawning and rearing habitat in the Ventura River watershed is located (NMFS 2005). Within the action area, the Ventura River is characterized by a river channel that varies in width from about 100 to 400 feet. A well-developed floodplain is present in most areas along the river, except where levees or riprap bank protection have separated the floodplain from the river channel. Point bars, and gravel bars, many of which have been colonized by riparian vegetation, occur within the main channel and can remain in place for years. The river substrate in the action area consists of a full range of grain sizes, including clays, silts, sands, gravels, cobbles and boulders, however the majority of the substrate is large, being gravels and cobbles (Corps 2004).

The aquatic habitat in the action area consists of an array of shallow riffles, runs, glides, and pools. The wetted channel ranges from about 15 feet to over 100 feet wide, depending on flows. Pools can range from a few feet deep to over 6 feet deep and from a few feet long to several hundred feet long. Pools are suitable for summer rearing of juvenile steelhead and contain PCEs (i.e., boulders, undercut banks, overhanging vegetation) for juvenile steelhead rearing and survival. There are approximately 5 miles of juvenile rearing and oversummering habitat in the action area. Oversummering habitat is important in the Ventura River Watershed and for the DPS as a whole because it is the most geographically restricted type of habitat in the Southern California DPS (Boughton and Goslin 2006). Based on USGS gauge data (gauge no. 11118500), there are surface flows in the action area during winter and spring periods in most years that range from several hundred cfs to about 12 cfs, depending on rainfall. Based on Moore (1980) and observations of NMFS biologists, this range of flows is sufficient for steelhead spawning, rearing, and migration in and through the action area. However, during droughts and before substantial winter rainfall has occurred, flows in the action area can be very low in winter, ranging between 1 to 5 cfs. During the summer and fall, flows in the action area can range from less than 1 cfs during extreme dry conditions to about 12 to15 cfs during years with wet winters. Low flow conditions during summer and fall still sustain productive oversummering habitat for steelhead, and survival for oversummering wild steelhead is high (about 80%) in the Lower Ventura River just upstream of the FPWF when flows are around 15 cfs, based on studies by Moore (1980). Summertime survival of wild steelhead is substantially lower (19%) during drought conditions when flows are between 2 to 4 cfs (Moore 1980). Inputs from tributaries such as San Antonio Creek, the rising groundwater table of the upper Ventura River Basin, and the treated wastewater from the OVWTP contribute to sustained perennial flows in the steelhead rearing habitat during the dry season. However, parts of the action area can go dry naturally during drought periods. During late-spring and summer thick algal mats can cover most of the channel bottom in shallower parts of the action area (Leydecker 2006, Stan Glowacki, NMFS, June 2006, pers. obs.). Water is normally clear during summer base-flow conditions in the action area.

The riparian zone is well-established throughout much of the action area, with extensive areas of mature riparian vegetation consisting of sycamores, alders, cottonwoods and willow species present in the Foster Park area and downstream all the way to the estuary. Riparian vegetation is found in mid-channel areas as well as the banks. The riparian zone provides some shade and cover along the river, but due to the width of the river a riparian canopy is not present. Riparian recruitment is an ongoing process and large areas of mature riparian vegetation have developed in the Foster Park area since being scoured during floods in 1998 and 2001. There is also ongoing recruitment of riparian species along the banks in the lower reaches of the action area. Some exotic vegetation (*i.e.*, *Arundo donax*) is present in the action area, but this is mostly in areas near the mouth and estuary, and the Ventura County Watershed Protection District is currently formulating a plan to remove Arundo from the watershed.

In the future the removal of Matilija Dam will affect the aquatic habitat conditions (including critical habitat) in the action area. The effects of the dam removal on steelhead and critical habitat are discussed below in section D.

## C. Status of Steelhead in the Action Area

Steelhead populations in the Ventura River system have not been thoroughly studied. Prior to the completion of Matilija Dam in 1947, CDFG personnel estimated that a minimum of 4,000 to 5,000 steelhead spawned in the Ventura River system in normal water years (Moore 1980). NOAA Fisheries' estimated run size of <200 adults (Busby et al. 1996) was one of the last recent estimates of steelhead population numbers in the Ventura River. However, in light of the continued pressures exerted upon the population and the paucity of recent sightings in the drainage, NOAA Fisheries believes the Ventura River adult steelhead population is likely less than 100 individuals at the current time (Busby et al. 1996). This estimate is similar to the more conservative predictions offered by other researchers (Moore 1980; Nehlsen et al. 1991; Titus et al. 2001).

Although population numbers have declined significantly, observations of small numbers of adult steelhead in the Ventura River have continued through the present, including documented steelhead sightings in 1974, 1975, 1978, 1979, 1991, 1993, and 2001 (Titus et al. 2001). Until recently, all adult spawning of steelhead in the Ventura River has been confined to reaches downstream of the Robles diversion, and there have been reports of steelhead spawning in the Foster Park area historically (ENTRIX 1997, Capelli 2006).

Juvenile steelhead were sampled throughout the lower Ventura River in the spring of 1995 downstream of the Robles Diversion Dam and in the action area (Capelli 1997). Many of the juvenile steelhead sampled appeared to be smolting, which suggest the fish were steelhead and not resident rainbow trout. More recently, in July 2006, juvenile *O. mykiss* were observed and photographed during a snorkel survey within the action area beneath the Foster Park Bridge (Stan Glowacki, NMFS, personal observation, July 2006). During a subsequent study in August 2006 by Thomas R Payne and Associates to evaluate steelhead abundance in the lower Ventura River,

juvenile *O. mykiss* were observed during snorkel and electrofishing surveys in the area downstream of Foster Park (Allen 2006).

Within the action area other fish species besides *O. mykiss* are common (S. Glowacki, NMFS, 2006, pers. obs.). Large numbers (thousands) and multiple age classes of arroyo chubb, threespined stickleback, and common carp have been observed throughout the action area (Larson 2006, S. Glowacki, NMFS, 2006, pers. obs.), including reaches below the OVWTP. These fish species may compete with *O. mykiss* for forage and space but the extent of their effect on steelhead rearing, growth and survival in the action area is unknown at this time.

Recently, the NMFS Technical Recovery Team (TRT) identified the Ventura River steelhead population as one of the "core" populations essential for the successful recovery of the Southern California endangered steelhead DPS, in part, due to the watershed's large size, spawning and rearing habitat quality, and relatively reliable winter river discharge (Boughton *et al*. 2006). Additionally, the steelhead population in the Ventura River has been evaluated by the TRT as having a high potential for being independently viable, and the Ventura River steelhead population was ranked number 3 for overall viability, based on watershed habitat conditions, reliable flows, amounts of habitat present, and environmental stochasticity.

## D. Factors Affecting the Species and Critical Habitat within the Action Area

The CHART identified several management activities and anthropogenic modifications in the Ventura River watershed within the action area that have impacted steelhead and lead to the impairment of critical habitat in the action area. These are summarized below.

### 1. Dams and Diversions

The main modifications to the river are several dams built on the Ventura River and its main tributaries, including Matilija Dam on the south fork of Matilija Creek, Casitas Dam on Coyote Creek, and Robles Diversion Dam on the mainstem of the Ventura River. All the dams are upstream of the action area. The building and operation of these dams has blocked access to historic steelhead spawning and rearing habitat in the headwaters, and has affected the timing and magnitude of flows in the Ventura River, which has impacted steelhead migration, spawning, and rearing throughout the Ventura River system.

The historic operation of the Casitas Dam and Robles Diversion has appreciably affected natural flows within the lower river, and the dam was a complete barrier to upstream steelhead migration after it was completed in 1959. The historic 20 cfs downstream bypass flow from the Robles Diversion was observably insufficient for successful upstream migration of adults, and for adequately maintaining available spawning and rearing habitat in the lower river. Recently, the Robles Diversion Fish Passage Facility, completed in 2005, was constructed to allow steelhead to access historical steelhead spawning and rearing areas in the upper Ventura River and in the forks of Matilija Creek. Additionally, since completion of the Robles Diversion Fish Passage Facility, a new plan to release more water for the benefit of adult and juvenile steelhead is now being implemented. Now, after major storms during the "steelhead migration season" (January 1 through July 1), at least 50 cfs is released for a 10-day period to facilitate adult steelhead migration from the ocean. Outside of the "steelhead migration season" (July 1 through December 31), 20 cfs is released downstream of the Robles diversion when available. These flows are not designed to augment steelhead passage or aquatic habitat during this time of the year, but are designed to fulfill water rights functions (NMFS 2003). Some of the water released may make it to the action area after going subsurface near the Santa Ana Road Bridge and then rising to the surface near the confluence of San Antonio Creek, but these releases and resulting conditions in the action area between July 1 and December 31 (the juvenile steelhead rearing period) are not expected to be a great deal different compared to conditions prior to the completion of the fish passage facility. Typically, surface flows released downstream of the Robles Diversion will cease sometime in August during average and dry water years, based on USGS gauge data (USGS gauge No. 11116550).

Matilija Dam was built in 1947 and blocks about 50% of the available steelhead spawning and rearing habitat in the Ventura River Watershed (Corps 2004). The lake behind the dam has since almost completely filled with sediments, and, as a result, has lost most of its storage capacity. Thus, the dam does not substantially affect surface flows in the Ventura River, including the action area. However, because the dam blocks such a significant portion of the historical steelhead spawning and rearing habitat, is deteriorating, and has no real capacity for water storage, the Corps has proposed removing the dam as part of the Matilija Dam Ecosystem Restoration Project, and it is likely that the dam will be removed in the next 20 years (Corps 2004b).

Removal of the dam is expected to result in large amounts of both fine and coarse sediment moving through the action area, during high flow events (*i.e.*, 5-year flood or above) for about 20 years after the dam is removed (Corps 2004). Hydraulic and sediment modeling results within the action area after dam removal were variable, but average changes in thalweg elevation through the action area ranged from an increase of 1.2 feet to 3.6 feet (Corps 2004). Although the channel is expected to aggrade in the action area after the removal of Matilija Dam, the channel substrate size ratios, as well as the thalweg and channel morphology in the action area are not expected to change substantially from the present condition (Corps 2004). The movement of coarse and fine sediments through the action area is a concern for NMFS because these sediments are expected to affect all life stages of steelhead. Channel morphology could change in terms of the pool, riffle sequence (Pizzuto 2002), and portions of the action area could be rendered unsuitable for spawning and rearing for months or even years (NMFS 2007). A reduction in the availability of spawning and rearing habitat in the action area could reduce the occurrence of adult steelhead spawning and juvenile steelhead rearing in the action area. The effects of increased sediment supply to the river, however, are expected to be temporary, lasting until new sediment equilibrium within the watershed is reached (Corps 2004). While the dam removal may create temporary instream conditions in the action area that are not entirely congruous with the habitat requirements of steelhead, after the dam is gone the Ventura River population of endangered steelhead is expected to have access to historical spawning and rearing habitats. This is expected to increase the potential viability of the endangered steelhead population in the river through the elimination of habitat fragmentation and restoration of bi-directional gene flow (i.e., movement of steelhead to and from the reaches upstream of the former dam). Ultimately, this is expected to decrease the risk of species extinction in the watershed, and the Ventura River steelhead population is expected to increase. Based on these conclusions, NMFS released a no jeopardy/no adverse modification opinion for the Matilija dam removal project on March 27, 2007. A population increase could result in increased steelhead usage of the action area for spawning and rearing.

2. Water Withdrawals

Water withdrawals from surface diversions and subsurface pumping have affected the timing and magnitude of the Ventura River flows in the action area, which has resulted in reduced surface flows. This has altered the natural hydrologic processes responsible for recharging the aquifer underlying the lower Ventura River Basin and the lower part of the action area, and has decreased the quantity and quality of critical habitat for steelhead, predominantly in the dry season. The City of Ventura, via the FPWF, has extracted an average of approximately 6,350 acre feet (AF) of surface flow and groundwater annually between 1980 and 2000. Additionally, several other smaller water districts and individual water extractors drew an average of approximately 3,200 AF per year out of the alluvial aquifer between the Robles Diversion and Foster Park during approximately the same time period (NMFS 2003). The surface diversion part of the FPWF was destroyed in 1998 and was never rebuilt, but the City continues to extract water all year from the FPWF. Currently the City is only operating its subsurface diversion, which takes about 3 to 6 cfs. The production wells in the FPWF are not currently operating due to the 2005 storm damage, but operation of the wells is expected to resume after repairs are completed. Because the City withdraws water from the FPWF at all times of the year, the FPWF can impact critical habitat and steelhead in the action area at any time of year. However, negative impacts to steelhead and critical habitat from the FPWF are most likely to occur when the river flows are low, which is more likely to occur in the summer and fall, based on past hydrologic flow data. However, because flows in the action area can be low at any time of year, FPWF withdrawals have the potential to negatively impact the spawning and migration of steelhead in the action area as well as summer rearing of juveniles.

Late summer surface flows in the action area are typically low based on USGS gauge data (USGS gauge No.11118500), and are dependent on the status of the aquifer, the amount of winter rainfall, seasonal droughts, and the amounts of water diverted from the river upstream. Consequently, the quantity of surface flow in the action area is particularly vulnerable to subsurface water extraction when flows are at seasonally low levels and rearing fish and aquatic organisms are confined to diminished areas of perennial habitat. Given FPWF withdrawals in summer and fall, the diversion of water from the Ventura River has decreased the functional value of the action area as an oversummering area for juvenile steelhead. Given the functional value of mainstem habitats in the ecology of steelhead (Bramblett *et al*. 2002, Spina *et al* 2005), and the finding that oversummering habitat is the most restricted habitat type in the Southern California DPS, the reduction in quantity and quality of oversummering rearing sites from water diversion is considered unfavorable for steelhead conservation.

While there is water extraction typically occurring in the action area and upstream of the action area, there is also some water released into the lower Ventura River by the OVWTP about 0.75 miles downstream of the FPWF. The treatment facility constantly discharges about 3 cfs of tertiary treated wastewater constantly into the river. While this helps to keep the lower reaches flowing, the value of the releases for creating and maintaining habitat for juvenile steelhead is currently unknown.

As part of the Matilija Dam project, the City plans on installing 2 new water wells which will operate during times of elevated turbidity expected from increased fine sediment loads after the dam is removed. The mitigation wells will have a combined capacity of only 3 cfs. Use of the 2 proposed wells is likely to be during, and for several days after, high flow events in the winter and spring, but only if river flows are above 15 cfs (Corps 2006). Due to these factors, the new wells are expected to result in a reduction of no more than 3 cfs in the action area. The 3 cfs reduction is not expected to result in adverse effects to steelhead and critical habitat but this is based on the assumption that 12 cfs is sufficient to allow for growth and survival of steelhead in the action area, and the reduction of surface flow will not appreciably reduce essential features of critical habitat in the action area for steelhead at any time of year.

3. Water Quality

Water quality in the action area has been found to have certain problems depending on the location within the action area, the parameter measured, and the time of year. Water temperatures in the action area are generally good, ranging from about 12° C in the winter to between 20° to 24° in the summer. These temperatures are within the limits of tolerance for southern steelhead (Bjorrn and Rieser 1991, Spina 2006), and comparable to other parts of the watershed. In some years water temperatures in the action area were found to be cooler than sites upstream in the Matilija Creek areas (Leydecker 2006). Nutrient concentrations (nitrogen and phosphorous) in the lower river, however, have been found to be elevated in the action area, especially during the dry season, with the highest levels found downstream of the OVWTP discharge outfall, 0.75 miles downstream of Foster Park. This has led to eutrophication and excessive blooms of algae and other aquatic macrophytes like watercress in the action area during the dry season (Leydecker 2006). The excessive amounts of algae during summer months in the action area, particularly downstream of the OVWTP have been implicated in aberrant water quality parameter measurements. Turbidity and pH levels have been found to be unnaturally high in the lower part of the action area downstream of the OVWTP during the dry season, and excessive algal and aquatic macrophyte blooms have been identified as the likely cause (Leydecker 2006). While dissolved oxygen measurements recorded during the daytime have been within steelhead tolerances (above 5mg/L) in the Foster Park area and in areas downstream between 2001 and 2006, a better measure of biologically stressful oxygen conditions is the percent dissolved oxygen (% DO) saturation (Leydecker 2006), which was measured at excessively high levels in the action area during the dry season between 2001 and 2006. Excessive % DO saturation during the day implicates excessive biological oxygen demand at night via aquatic plant photosynthesis. While dissolved oxygen levels are elevated during the day they can be very low (< 4 mg/L) at night and likely exceed the lethal limits for steelhead, especially in the lower parts of the action area (Bjorrn and Rieser 1991, Leydecker 2006). This suggests that critical habitat in the action area is impaired by water quality conditions during the summer and fall rearing period, and habitat conditions, at least in parts of the action area, may not be conducive to juvenile steelhead growth and survival during the summer and fall. Because higher flows during the wet season flush out algae and channel vegetation, and dilute excessive nutrients, these water quality problems are not expected to be a factor for steelhead and critical habitat during the wet season.

4. Encroachment and Impacts to Riparian Vegetation

Although there are many areas along the lower Ventura River within the action area which exhibit healthy riparian areas and active floodplains, a substantial portion of the action area has been affected by flood plain encroachment on at least one side of the river, and the construction of large levees and areas of streambank armoring. Along the Ventura River downstream of the FPWF an approximately 5 mile-long levee is located on the east bank of Highway 33 to protect the highway and residential and commercial structures from naturally occurring flood flows. Another earthen levee in the Foster Park reach is also located adjacent to the river on the east bank to protect the highway and developments. Although the Matilija Dam removal project includes the raising of some existing levees along the Ventura River, the action area levees will not be raised since the action area reach is not due to significantly aggrade with sediment from the dam site (Corps 2004). The action area levees have interfered to some degree with the natural meandering of the Ventura River channel and as the natural riverine processes have adjusted to these static hardened banks, geomorphic processes in the action area have become disrupted, which has affected riparian recruitment adjacent to the levees and hardened banks by decreasing lateral channel migration and precipitating unnatural streambed scouring (Schmetterling et al. 2001). Following floods of winter 2005, emergency repairs to roads and banks adjacent to Foster Park altered the river morphology and the riparian zone in the area of the FPWF, as the main channel was artificially moved several times. Additionally, floods during winter 2005 scoured out most of the instream riparian vegetation throughout the entire action area and decreased the amount of shade over the river. The increase in solar insolation from reduced riparian vegetation in the action area has contributed to instream algal and aquatic vegetation growth throughout the action area since 2005 (Leydecker 2006).

## V. EFFECTS OF THE PROPOSED ACTION

### A. Methodology for Determining Effects

To identify the potential effects of well field repair activities, NMFS reviewed the activities outlined in the project description and the description of potential effects to steelhead and critical habitat supplied by the Corps. Then, NMFS considered the proposed action along with the type, amount and extent of direct effects and indirect effects to steelhead individuals and critical habitat that could be expected to result from the proposed action. The ecological literature was also reviewed concerning the effects of habitat changes on steelhead and aquatic habitat. A general knowledge of physical and biological processes, population dynamics, and the life history and habitat requirements of steelhead supplemented the literature review, particularly where there was little or no information concerning effects of an impact on steelhead or the aquatic environment.

To identify the effects of resumed well field pumping on steelhead and critical habitat several principal assessments were performed. First, it was assumed that there was a one-to-one correlation between well facility pumping and surface flows (Hopkins 2006). For instance, a withdrawal rate of 1 cfs from the wells is equal to a 1 cfs reduction in river discharge. This assumption was based on the shallow aquifer and the high degree of hydraulic connectivity within the river in the FPWF area, and because studies on the actual effects of well field withdrawals on surface flows have not been completed by the City's hydrogeologist consultant (Hopkins 2006). Second, rainfall records for the Foster Park area were collected from the Ventura County Watershed Protection District's web site for the period of 1982 through 2002 to determine rainfall patterns for the action area. Years were stratified into wet, average, and dry water-year type by calculating the upper 25% and lower 25% of rainfall per year through the period. Calculations resulted in average water years having between 12 and 22 inches of rainfall, wet years having greater than 22 inches of rainfall, and dry years having less than 12 inches of rainfall during the water-year. Third, the records of average daily discharge from the USGS Foster Park Ventura River stream gauge (gauge no. 11118500) located immediately downstream of the FPWF were collected for the period of 1984 through 2002, along with the City's records of daily water production from the FPWF facilities for the same period. The USGS Foster Park gauge flow data from1984 through 2002 period was certified by USGS (Gromer 2006) and determined to be reliable for comparison with available well field production. The FPWF daily withdrawal amounts were added to the average daily flow discharge values for the Foster Park gauge to calculate river discharge without well field withdrawals for the period of 1984 through 2002. The calculated river discharge without well-field withdrawals was graphed alongside gauged river discharge with well-field withdrawals by year to compare discharge just downstream of the well field under the two conditions for individual years for the period of 1984 through 2002.

To see the range of effects of the well field withdrawals and the range of river discharges under different hydrologic conditions, the discharge data under the two withdrawal scenarios (with and without pumping) was stratified by water year type (*i.e.*, wet, average, and dry rainfall years), and maximum and minimum discharge rates with and without pumping were graphed to determine the expected range of effects on river discharge under different hydrologic conditions. The times in which different lifestages of steelhead are expected to be in the action area were also added to the graphs to understand which steelhead lifestages would be exposed to the hydrologic conditions in the river with and without pumping. The expected effects of the proposed action identified from the data analysis and information review were then integrated with information from the ecological literature concerning the effects of habitat changes on steelhead and aquatic habitat.

This biological opinion does not rely on the regulatory definition of "destruction and adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat. Therefore, destruction or adverse modification involves determining whether, with implementation of the proposed Federal action, critical habitat would remain functional (or retain the current ability for the primary constituent elements to be functionally established) to serve the intended conservation role for the species.

In the analysis below NMFS first discusses the effects of the proposed action on steelhead habitat, including critical habitat. Following this analysis NMFS discusses how the habitat changes affect steelhead adults and juveniles in the Ventura River.

## B. Effects on Critical Habitat from Construction and Repair Activities

### 1. Alteration of Aquatic Habitat

Most of the construction and repair activities (Activities A through H) will not affect aquatic habitat since they are expected to take place in dry areas of the riverbed and banks during the summer. However, during the implementation of project component I (excavation and replacement of 30 feet of 16-inch concrete water line, slip-lining of the 14-inch waterline; excavation of a new sending pit, *etc*.), aquatic habitat will be disturbed and dewatered due to a 450-foot long water diversion that is needed to facilitate the trench excavation in the riverbed and pipeline section replacement. The water diversion will be implemented by creating a berm several feet high and about 450-feet long in the dry portion of the river channel immediately adjacent to the active flowing channel using native material and heavy equipment. The berm will be lined with anchored plastic sheeting and river flows will be redirected into the dry portion of the river channel delineated by the berm, which will keep flows out of the excavation area and will prevent work in flowing water and decrease sediment releases.

Prior to water diversion, block nets will be set upstream and downstream of the diversion area, and sediment control devices and silt fencing will be installed along the berm and around the work area to reduce sedimentation that could occur during water diversion, and from in-channel trenching and construction. To divert water into the dry river channel adjacent to the berm, the top end of the berm will be placed across the flowing channel and the flowing water will be diverted into the dry part of the river immediately adjacent to the flowing channel, which will be partitioned with the berm. After the work area is dewatered, trenches will be dug to facilitate the replacement and repairs to the water lines. During the trenching operations, dewatering of the trenched areas will be necessary and dewatering pumps and equipment will be implemented to prevent the trench from filling with groundwater. The collected groundwater is required to be sediment free by the Regional Water Quality Control Board, before being discharged back into the river downstream of the work area.

The water diversion, block nets and sediment controls will cause a loss of service of the 450-foot section of riverine habitat, since the river flows will be moved into a new part of the river channel approximately 30 feet to the east, and the habitat in the work area will become unavailable to steelhead. During the diversion process, when water is diverted from one part of the river channel to the part delineated by the berm, block nets will temporarily restrict the migration of steelhead through the entire river in this part of the action area. While the PCEs of critical habitat, including depth, cover, and migration opportunities are important to steelhead survival and conservation (NMFS 2005), the loss of service and blockage of migration from the water diversion will be temporary, lasting approximately 1 day while the river is diverted into the bermed portion of the river channel. The block nets will be removed once water is flowing and clear within the newly wetted portion of the river channel and steelhead will have access to and passage through the new diversion channel. The effects to steelhead from the diversion of flows from the wetted portion of the river to the bermed portion are not expected to be adverse since aquatic habitat of similar quantity and quality will be available for steelhead in the new diversion channel. Furthermore, steelhead migration will be affected only temporarily, as fish will be able to migrate through this portion of the action area in the new diversion channel once it is in place and water is flowing in the channel. In addition, the water discharged back into the river from the dewatering of the trenching operation is not expected to degrade aquatic habitat because the discharged water is expected to be clean, as conditioned in the Regional Water Board permit. After construction is completed the riverbed in the construction area will be regraded to pre-existing conditions and all foreign objects and materials from construction and water diversion (*i.e*., concrete debris, plastic sheeting, and sandbags) will be removed from the river channel. The diversion berm will be left in place and allowed to erode naturally during winter flows in order to reduce disturbance by heavy equipment to the river channel. No effects to PCEs of critical habitat are expected from leaving the river channel in the portion delineated by the berm. The river will be located immediately adjacent to where it was before and is expected to have the same PCEs that occurred in the previous location. In addition, the berm will erode naturally during the first bank-full flow event, and no permanent changes to channel morphology are expected to occur.

<u>2. Loss of Riparian Vegetation</u>

Streamside and instream vegetation provides numerous functions and values to stream fish (Hall and Lantz 1969; Karr and Schlosser 1978, Lowrance *et al.* 1985, Gregory *et al.* 1991, Platts 1991, Welsch 1991, Castelle *et al.* 1994, Wang *et al.* 1997), and actions which affect riparian vegetation are a concern of NMFS. The majority of project components will cause minimal loss of riparian vegetation since there is little vegetation within the areas impacted by the proposed action. Some loss of riparian vegetation is expected during the execution of trenching operations within the riverbed, however, and the riparian vegetation immediately within the footprint of the trenching operations will likely be removed during the excavation work. However, the amount of riparian vegetation that will be removed during trenching is small, and the majority of the vegetation that will be removed is newly recruited willows which are small in size. Removal of this vegetation is expected to only slightly reduce the amount of shade cast over this portion of the river, and it is not expected to affect water temperature. In addition, this type of riparian vegetation (*i.e*., willow species) recolonizes rapidly, and large mature riparian vegetation that currently provides shade and cover for steelhead will not be affected by the proposed action. Overall, only a very small amount of vegetation is expected to be affected by the proposed action compared to existing riparian vegetation, and this is not expected to diminish the functional value of the riparian vegetation and riparian zone within the action area.

<u>3. Alteration of Water Quality</u>

Although most work will occur in dry channel areas, and only a small portion of the project area will be dewatered during the time of construction, heavy equipment and people working within the stream channel and on the banks will likely cause the release of fine sediments. Fine sediments would be mobilized mostly after repairs and construction are complete, after the water diversion is removed, and during the onset of winter rains when stream flow increases and water flows over disturbed areas and erodes the diversion berm, causing increased turbidity and sedimentation within the action area. This could affect water quality, and this is a concern to NMFS because water quality is an important feature of steelhead habitat. High turbidity can cause fish mortality, reduce fish feeding efficiency, and decrease food availability (Berg and Northcote 1985; McLeay *et al*. 1987; Gregory and Northcote 1993; Velagic 1995). Substantial sedimentation rates could also bury less mobile organisms that serve as a food source for many fish species (Ellis 1936; Cordone and Kelley 1961), degrade instream habitat conditions (Cordone and Kelley 1961; Eaglin and Hubert 1993), and cause reductions in fish abundance and growth (Alexander and Hansen 1986, Crouse *et al*. 1991). The magnitude and degree of the potential water quality alteration is unknown because the specific sedimentation and turbidity rates cannot be predicted. The actual sedimentation and turbidity rates would depend in part on the amount of substrate disturbed, and the severity of rain events that could happen during construction or after construction is complete.

NMFS reasons that some sedimentation and turbidity will occur during water diversion operations, but most turbidity increases will occur with the resumption of rainfall since most of the channel work is occurring in dry portions of the channel. While turbidity levels and suspended sediment concentrations will increase as a result of the proposed action, the effects are expected to be temporary (1 to 2 days), and sediment concentrations and turbidity are not expected to be appreciably higher than levels which will be occurring in the river during a major winter storm (*i.e*., 2-year flood/bankfull discharge), which is the size of flow expected to be necessary to inundate dry disturbed portions of the construction areas, mobilize sediments, and erode the diversion berm (Leopold *et al*. 1964, Leopold 1994). Turbidity and suspended sediment concentrations that occur in the Ventura River during the first major rainstorms are very high as sediments from the entire river channel are washed downstream (Corps 2004). The area/size of the construction site and diversion berm that will erode and release sediments are small compared to the entire river channel, and sediments released from the construction sites are expected to be washed out to the ocean and not settle within the river channel (Leopold *et al*. 1964, Leopold 1994). Additionally, turbidity increases due to disturbance in the construction area are expected to last as long as the first major storm, expected to be 1 to 2 days, and are not expected to diminish the functional value of critical habitat in the action area.

### C. Effects to Steelhead from Construction and Repair Activities

During implementation of project component I, direct impacts to steelhead are expected to occur during the time block nets are set up across the river to keep steelhead from entering the river areas affected by water diversion, when the wetted areas are dewatered and juvenile steelhead could become trapped between the block nets within the dewatered area, and when steelhead are captured and relocated. Since the project is expected to take place in the late spring/early summer, direct impacts to adult steelhead are not expected since adult steelhead are not expected to be in the Ventura River at this time. However, impacts to juvenile steelhead would be expected because this is the lifestage that would likely be in the river at the time of project action.

One of the main effects to juvenile steelhead during repair activities will be a temporary delay in migration through the Ventura River channel near Nye Well No. 8, as migrating steelhead will be temporarily impaired from moving through the project area by block nets set across the river channel. However, this delay in migration is only expected to last one working day while the river is diverted into the new diversion channel within the river. After water has been diverted into the new diversion channel and block nets are removed, juvenile steelhead will be able to migrate freely upstream and downstream through the Ventura River channel adjacent to the project area. Additionally, no adverse effects to juvenile steelhead are expected to occur from the loss of habitat within the dewatered area since juvenile steelhead will be able to use the habitat in the new channel for rearing, and large pools immediately downstream of the project area. Another main effect to juvenile steelhead rearing within the diversion area would be stranding and desiccation if fish become trapped by block nets within the area to be dewatered. Stranding and desiccation of a large number juvenile steelhead is not expected to occur, however, since prior to, during, and following water diversion the biological monitor will survey the dewatering area via visual observation thoroughly for juvenile steelhead, and will be capture (with dip nets) and relocate steelhead found within the diversion area. There is a chance that a small number of steelhead may be missed by the biological monitors during capture and relocation efforts since steelhead can hide under rocks and vegetation. The number of steelhead killed from stranding is expected to be low however (0 to 2) since few steelhead have been observed in this part of the river (Allen 2006, Stan Glowacki, NMFS, 2006, pers. obs.), and the biological monitor will check the whole dewatered area thoroughly before, during, and after dewatering to minimize the number of steelhead missed during relocation efforts. Juvenile steelhead may be harassed or harmed during capture and relocation, but it is not expected that they will be killed because mortality of steelhead from capture, handling and relocation under these conditions is typically low (<5%), fish will be caught with soft nets, and will be moved by bucket to suitable pool habitat a short distance downstream (< 100 yards). Few (n = 10) juvenile steelhead are expected to be captured and relocated because of the size of the diversion area, and because few steelhead have been observed in the area where dewatering will take place during recent stream surveys (Stan Glowacki, NMFS, 2006, pers. obs.) NMFS expects that one captured steelhead would be killed as a result of capture and relocation.

### D. Effects to Critical Habitat from Resumed Well Field Pumping

Resumed well field pumping is expected to affect the following essential features of steelhead critical habitat: water quantity, space, water velocity, cover/shelter, passage conditions, food, and water quality. Effects to these critical habitat features are described as follows.

1. Loss, Alteration and Reduction of Water Quantity

The quantity of surface discharge, and thus critical habitat, within the lower Ventura River will be affected by the resumption of well field operations to varying degrees, depending on the time of year, the amount of rainfall during the wet season, and the rate of well field withdrawals. In some wet years, well-field withdrawals would begin to substantially affect discharge, and thus summer rearing habitat, around July, when recorded minimum flows with well pumping are shown to drop to low levels during summer and/or fall (Figure 2). Past surface discharge rates fell to low levels during 50% of the wet years analyzed (i.e., 1986, 1992, and 1993 in Figures 3 and 4). In the future, given similar hydrologic conditions and similar pumping rates, FPWF operations would be expected to reduce surface flows in at least the upper part of the action area to at or below 2 cfs in about half of all wet years, mostly during the summer and fall rearing period, but also during the winter until substantial rainfall had occurred and surface flows increased. NMFS' observations indicate that droughts or extended rain free periods can cause dry-season type flows during the winter. The rate of pumping during wet years analyzed was quite variable, between 1 cfs and 20 cfs, but most of the time it was between 9 to 12 cfs. These well pumping rates reduced surface discharge by more than 50%, from about 15 cfs to less than 5 cfs in during the summer or fall in 1992, 1993, and 2001 (Figures 3 through 5) when juvenile rearing is expected. These flow reductions would considerably diminish the quantity of rearing habitat within the action area in the Foster Park area and for at least one mile downstream of the FPWF, even during wet years. About one mile downstream of the FPWF, rising groundwater/aquifer flows and discharge from the OVWTP would increase discharge by more than 3 cfs (Hopkins 2007), but it is unknown if this would mitigate for well field withdrawals and increase the potential for successful juvenile steelhead rearing in the lower portion of the action area. Based on studies done by Moore (1980), FPWF operations during wet years have the potential to reduce the width of riffle habitat by more than 30% and widths of pools by more than 50%. It appears that the extent of oversummering habitat would be reduced to the greatest degree by FPWF operations during wet years (Figure 2, 3, 4, 5)

During average hydrologic conditions, the maximum and minimum discharge rates in the lower Ventura River were again reduced by well field withdrawals (Figure 6). The range of well field withdrawals during average rainfall years was again from about 2 cfs to 20 cfs, but mostly between 8 and 10 cfs. Given historical maximum and minimum flows, and withdrawal rates during average rainfall years, the reduction of surface flows from well field withdrawals to extremely low levels (< 2 cfs) would happen at an earlier time of year, compared to wet hydrologic conditions (Figures 6 through 10). Flow records during average rainfall years show that flows dropped to levels at or near zero due to FPWF withdrawals during the summer and fall rearing period in almost all average rainfall years (Figures 7 through 10). In 6 out of 9 average rainfall years analyzed, surface discharge, which would have been at or near 10 cfs and would have provided rearing habitat in the action area, was eliminated by well field withdrawals during a substantial portion of the dry season (*i.e*., 1991, 1994, 1996, 1997, and 1999 in Figures 8 through 10). In only 3 out of the 9 years analyzed (*i.e*., 1984, 1985 and 1988) were surface flows in the action area near zero "naturally", without the effects of FPWF operations. Additionally, surface discharge records of average years revealed that reduction in surface flows from FPWF operations during the wet season could negatively affect steelhead spawning and migration through the action area during some average years (Figure 6). Surface discharge was reduced to very low levels or eliminated during a portion of the wet season in 1991, 1996, and 2000 (Figures 8 through 10). Consequently, NMFS expects that resumed FPWF operations would diminish and at times eliminate the functional value of the action area as a freshwater rearing site for juvenile steelhead during years with average rainfall, and during some average rainfall years may affect spawning and smolt out-migration. Surface discharge reductions would be most severe within the Foster Park area and for about one mile downstream of the FPWF until rising aquifer flows and releases from the OVWTP would increase surface flows (Hopkins 2007). However, NMFS does not know at this time whether the additional water from these sources creates and maintains suitable habitat for juvenile steelhead. The frequency of years with less rainfall, when discharge would drop to levels that are not suitable for maintaining steelhead habitat, is expected to increase with climate change (Hayhoe et al. 2004). Thus, critical reductions in surface discharge from well field withdrawals, and related adverse effects to rearing habitat, and in some years spawning and migratory habitat, are expected to increase in the future.

During dry hydrologic conditions, the maximum and minimum discharge rates in the Foster Park area will again be reduced by well field withdrawals (Figure 11). The rate of well field withdrawals recorded during dry years was less than during wet and average hydrologic conditions, being mostly around 7 to 9 cfs. This was likely caused by less water being available for withdrawals due to the depleted state of the aquifer. Nevertheless, the effects of well-field withdrawals on surface flows during the 4 dry years that occurred between 1984 and 2002 were still substantial, and the maximum and minimum discharges with and without well field withdrawals were considerably lower than wet and average hydrologic conditions. Sometimes annual droughts and rain-free periods led to winter-discharge conditions that were very low, even in the absence of FPWF withdrawals (i.e., 1987, 1988, and 1990 in Figures 12 and 13). Surface flows without FPWF pumping during the winters of 1987, 1988, and 1990 appear to be, during some periods, non-existent or so low that spawning and smolt out-migration may not have occurred even without well field withdrawals because surface flows were probably not sufficient to breach the Ventura River Estuary, which can close during dry years (Stan Glowacki, NMFS, 2007, pers. obs). Additionally, flows appear so low even in the absence of well field withdrawals that suitable rearing habitat was likely not present in the action area for a large portion of the dry season (Figure 12 and 13), as was observed by Moore (1980) during drought conditions. In only one of the four dry years analyzed (2002) did it appear that, in the absence of FPWF operations, there was enough surface flow to create aquatic habitat suitable for steelhead spawning, migration and rearing. During 2002, FPWF withdrawals reduced the available flow from about 15 cfs to 5 cfs in the winter and spring of 2002, and eventually surface flows were eliminated by well field withdrawals by August.

Out of the 19 years in which flow records were analyzed, it was found that 4 (20%) were dry, with rainfall in the action area being less than 12 inches. In the future, climate change could decrease rainfall and exacerbate dry conditions in the action area, and the frequency of years with lower than average rainfall may increase (Hayhoe et al. 2004). Recent studies and computer modeling of precipitation for Southern California over the next hundred years show a slight to modest decreases in annual precipitation ranging from 5% to 15% occurring by the year 2100 (Hayhoe *et al.* 2004). This predicted decrease in the amount of rainfall is expected to result in a greater frequency of dry rainfall years, and an increased frequency and duration of dry hydrologic conditions in the Ventura River Watershed, including the action area. The increased frequency of dry conditions in the action area resulting from climate change would be exacerbated by well field withdrawals.

Consequently, resumed well field operations are expected to substantially reduce, and at times eliminate surface flows in the action area, and could completely dewater the upper portion of the action area in the vicinity of the FPWF during most years (Figures 2 through 13). The lower portion of the action area may not be completely dewatered from FPWF operations because of rising groundwater from the aquifer, and discharge from the OVWTP. Because well-field withdrawals appear to have the most effect on surface discharge during the summer and fall periods and the winters of drought years, resumed well-field pumping is generally expected to diminish and at times eliminate the functional value of the action area as a freshwater rearing site for juvenile steelhead during all but the wettest years, and, at a lesser, frequency affect adult spawning and migratory habitat. Of the 19 years analyzed, only 5 years (1984, 1985, 1987, 1989, 1990), or about 20% of the years analyzed appear to have had a "natural" minimum discharge (*i.e*., discharge without FPWF withdrawals) that may not have been sufficient to maintain suitable steelhead habitat in the action area for a portion of the year. Conversely, in about 80% of the years analyzed, including all years with average and below average rainfall, the Ventura River in at least a portion of the action area went dry with FPWF withdrawals and thus was not suitable steelhead habitat for a substantial portion of the year.

2. Loss, Reduction, and Alteration of Space, Cover/Shelter, Water Velocity, and Fish Passage

A reduction in value of the rearing habitat will occur in the action area from the reduction and loss of surface discharge due to resumed FPWF operations. Well field withdrawals will result in reduced area, depth, and volume of pools, runs and riffles (Kraft 1972, Moore 1980, Spina et.al 2006), which are essential habitat types for rearing steelhead juveniles. The loss of instream habitat, which will consist of the loss of space and cover/shelter for steelhead, is expected when well field withdrawals reduce surface discharge to the extent that aquatic habitats such as pools, riffles and runs disappear or become so shallow that they are unusable to steelhead (Kraft 1972, Moore 1980, Spina et al. 2006). Moore (1980) found immediately upstream of the action area that reductions in discharge from 15 to 2 cfs decreased riffle depths by more that 50% and pool depths by more than 40%. Depth of aquatic habitat provides cover and shelter and is an essential PCE of rearing habitat for steelhead. Reduction in depth of summer rearing habitats result in reductions in growth and survival for juvenile steelhead (Moore 1980, Harvey et al. 2005, Harvey et al. 2006). The loss of instream habitat due to well field withdrawals is expected to occur over a substantial area since the action area is several miles long. A reduction or loss of steelhead oversummering habitat in the action area has implications for the entire Ventura River steelhead population, and may affect the viability of the population. Boughton and Goslin (2006) determined that steelhead oversummering habitat is the most geographically restricted habitat for the endangered Southern California DPS, and concluded that the availability of this type of habitat could be a limiting factor for steelhead population viability in the Southern California DPS.

Resumed well field withdrawals are also expected to change the characteristics of instream habitat, and the proportions of pools runs and riffles in the action area, because reducing discharge decreases or eliminates swift water habitats (riffles) reduces water velocities, and increases the amounts of slow water habitat (Kraft 1972, Moore 1980). The decreased discharge from resumed well-field withdrawals is expected to decrease the velocities within pool habitats in the action area as well. Decreased water velocities has been shown to negatively affect steelhead presence, growth, and survival (Harvey et al. 2005, Harvey et al. 2006). Reducing flows from well field withdrawals would also change the characteristics of migratory habitat by reducing depth and cover of the habitat used by migrating adult and juvenile steelhead.

3. Alteration of Water Quality

The reduction in discharge volume resulting from well-field withdrawals is expected to affect water quality within the action area. The specific effects on water quality will depend on the water quality parameter (*i.e*., temperature, dissolved oxygen. Reducing discharge and thus depth, is expected to increase water temperatures in the action area because of increased surface area to depth ratio and increased insolation of the river. Water temperature is an important aspect of water quality, which is a PCE of critical habitat for steelhead (NMFS 2005). Increased water temperatures are generally expected to negatively affect the quality of rearing habitat in the action area. Although juvenile steelhead in the southern part of their range can survive relatively high water temperatures (Spina 2006), steelhead generally prefer cooler water temperatures if available (Nielsen et al. 1994, Matthews and Berg 1997), and exhibit better survival and growth in lower water temperatures (Warren 1971). In addition to the potential for increasing water temperature in the action area, resumed well-field withdrawals will decrease the water velocity of instream habitat (Kraft 1972, Cushman 1985), which can affect water quality. Decreased flow velocities can reduce water quality by causing stagnant conditions, especially in pools, which will result in low oxygen levels (Warren 1971). Dissolved oxygen is an important aspect of water quality for steelhead, and steelhead are particularly susceptible to low dissolved oxygen levels below 4 mg/L (Warren 1971, Bjornn and Reiser 1991).

4. Reduction and Loss of Food for Steelhead

The benthic (bottom-dwelling) aquatic insect assemblage of most watercourses typically comprises numerous species. Aquatic insects provide a source of food for stream fish populations, and may represent a substantial portion of food items consumed by steelhead juveniles at various times of a year, including those occupying rearing habitats. Aquatic insect forage is an important part of freshwater rearing sites, which are a PCE of critical habitat for steelhead (NMFS 2005). In terms of diversity, some species of aquatic insects are found in swift-water habitats such as riffle and runs, whereas other species are found in slow-water habitats such as glides and pools (Merritt and Cummings 1996), but riffles are generally accepted as the principal food-producing habitat in streams.

Benthic aquatic insects within the riverine areas would be most affected by well-field withdrawals in the Foster Park area and upstream of the OVWTP. Abundance of aquatic insect fauna would be reduced as flows decrease, and insects would be eliminated during extreme dry conditions as water in the shallowest habitats (riffles) goes subsurface (Moore 1980), and individual organisms are stranded (Cushman 1985). The amount of habitat (*i.e*., wetted perimeter) available to aquatic insects, and thus aquatic insect production will be less as a result of the resumed well-field withdrawals, with the most acute effects on aquatic insect production in riffles during the summer and fall of dry and average rainfall years. Additionally, the composition of aquatic insect species may be altered during the dry season by the project action as a result of loss or reduction of swift-water habitats and increased proportion of slow-water habitats (Cushman 1985). Additionally, the negative effect of resumed well-field withdrawals on abundance of benthic macroinvertebrates could occur annually depending on the water year type. Reduction in invertebrate densities resulting from reduced stream discharge would reduce drift forage for steelhead which reduces juvenile steelhead growth, and affects survival (Harvey et al. 2006). Although dewatered areas would lose their capacity to produce invertebrate forage, recolonization of dewatered areas by macroinvertebrates would occur quickly in one to two months when flows increase during the wet season (Cushman 1985, Harvey 1986), and this would be expected to occur on a yearly basis.

## D. Effects of Resumed Well Field Pumping on Steelhead

Based on the projected effects of resumed well-field withdrawals on steelhead critical habitat, and information from the ecological literature, resumed well-field operations are expected to cause adverse effects to steelhead in the action area. From the analysis of past discharge and the effects of well-field withdrawals on the timing, magnitude, duration and frequency of flows in the lower Ventura River, the adverse effects of resumed well-field operations are expected to occur mainly to rearing juvenile steelhead, since the bulk of the effect is expected to be the loss of summer rearing habitat for juvenile steelhead. However, adverse effects could also occur to spawning steelhead, eggs and fry if flows are reduced to critical levels during adult steelhead migration and spawning (Figures 2, 6, and 11). Additionally, steelhead migration through the action area could be affected by well field withdrawals.

The loss of flows and habitat in the mainstem of the Ventura River is not expected to favor growth and survival of steelhead. Juvenile steelhead are known to rear in mainstem habitat when dry-season flows are present (Spina *et al*. 2005) and the literature regarding the ecology of juvenile steelhead provides evidence that mainstem habitats have functional value for juvenile anadromous salmonids, and may be essential for their survival (Leider *et al*. 1986, Loch *et al*. 1988, Murphy *et al*. 1997, Bramblett *et al*. 2002). Summer rearing of juvenile steelhead occurs in the lower Ventura River in the area of Foster Park area and downstream (Moore 1980, Capelli 1997). Juvenile steelhead were observed in the mainstem of the Ventura River in the action area as recently as summer 2006 during different stream surveys (Allen 2006, S. Glowacki, NMFS, 2006, pers. obs.). Given that juvenile steelhead are known to rear in the Ventura River within the action area, resumed well-field withdrawals are expected to reduce and at times eliminate summer rearing habitat for juvenile steelhead.

The reduction, alteration or elimination of rearing habitat during well-field withdrawals is expected to result in harm, injury or death of steelhead due to increased predation, stress, stranding and desiccation as instream conditions become unsuitable for rearing, ontogeny and survival of juvenile steelhead. Juvenile steelhead would be forced to leave riverine areas that became too shallow to support steelhead rearing (Kraft 1972, Campbell and Scott 1984), and they could become more susceptible to predation by birds as they migrate through or rear in extremely shallow areas, given the elevated risk of predation to fish from wading and diving predators (Power et al. 1989, Harvey and Stewart 1991). Furthermore, well-field withdrawals could impair the ability of steelhead to migrate to other areas outside of the action area for refuge as discharge volume and depth are reduced to critical levels. Steelhead migration between pools and runs and riffles could become impossible, and rearing habitat could become unusable as depth decreases to the point where it would not support growth or survival. Steelhead would also experience stress and could die if they became stranded in habitats that became dewatered or if dissolved oxygen was reduced to low or lethal levels in habitats that became too warm or stagnant (Leydecker 2006). Juvenile steelhead growth rates would also be reduced by decreased invertebrate drift forage caused by decreased flow velocities and decreased riffle areas where forage is produced (Moore 1980, Harvey et al. 2006). Decreased growth rates of juvenile steelhead would also occur from increased competition when fish become concentrated in reduced areas of habitat, and when yearling steelhead are forced to move from preferred riffle habitats into pool habitats and compete with larger steelhead (Harvey and Nakamoto 1997, Harvey et al. 2005, Spina et al. 2006). Juvenile steelhead would also have to compete with other species of fish observed in the action area (i.e., Arroyo chubb) as habitat area becomes reduced by well field withdrawals. Generally, as flows decrease to low levels, steelhead abundance, growth, and survival in the action area is expected to decrease (Moore 1980, Harvey et al. 2006, Spina et al. 2006).

The numbers of juvenile steelhead affected by resumed well field withdrawals and resulting reduction in aquatic habitat will depend on steelhead population dynamics in the lower Ventura River. Recent snorkel surveys by NMFS and CDFG biologists revealed low numbers of steelhead in the action area in June and July 2006 (S. Glowacki, NMFS, 2006, pers.obs.). Steelhead abundance surveys performed in the action area in summer 2006 by Thomas R. Payne and Associates (TRPA) estimated less than 5 juvenile *O. mykiss* per mile inhabiting the lower part of the Ventura River between the ocean and San Antonio Creek (Allen 2006, Appendix B). However, the potential exists for much greater numbers of steelhead to use the action area for rearing habitat, based on the amount of habitat available, and on studies by Moore (1980), who estimated hundreds of wild *O. mykiss* inhabiting the 1.3 miles of rearing habitat immediately upstream of the action area during his study between 1976 and 1978. Additionally, with the removal of Matilija Dam the population of steelhead in the Ventura River is expected to increase, and thus the potential for greater numbers of steelhead to use the action area for rearing is likely in the future. Although the steelhead rearing population in the action area may represent only a small portion of the entire juvenile steelhead population in the Ventura River (Appendix B), all juvenile steelhead in the Ventura River watershed will have to use the action area at some point in their life cycle, either for rearing or as a migration corridor on their return to the ocean. Consequently, the resumption of well field pumping has the potential to affect all juvenile steelhead in the watershed, and this has implications for the survival, abundance, productivity, and spatial structure of the Ventura River steelhead population, and consequently the current and future viability of the Ventura River steelhead population, and the Southern California DPS.

Adult steelhead are known to have spawned in the Foster Park area historically, and need to migrate through the action area to reach upstream spawning habitat (Entrix 1997). Given resumed well field withdrawals, adult steelhead may be affected during winter conditions when steelhead spawning and migration will occur. The availability of spawning habitat in the action area could be reduced, and areas where adult steelhead have built redds could be impacted by reductions in flows a result of well field withdrawals under some minimal flow conditions (i.e., 1991, 1992, and 1996 in Figures 3, 8, and 9). Additionally, the quality of spawning habitat could be reduced during low-water winter conditions, and conditions for eggs and alevins within redds would be exacerbated by well field withdrawals under low flow scenarios.  The adverse effects to spawning of adult steelhead are only expected to occur only if winter storms are large enough to breach the estuary and trigger adult steelhead to enter the river (Shapovalov and Taft 1954), and spawn in the action area, after which flows in the action area became extremely low.  This does not appear to have happened often (3 out of 19 years examined) or consistently throughout the winter period based on the flow record.  Thus, very few adult steelhead in the Ventura River would be expected to be affected by pumping during wet season conditions, and probably only in years with low winter flow conditions.  Nonetheless, well field withdrawals could still affect steelhead spawning and hatching of fry in the action area in the future.

## VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion.  Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.  NMFS maintains a general familiarity with projects in this watershed and is unaware at this time of any actions or activities that would be reasonably certain to occur that would not require section 7 consultation.

## VII. INTEGRATION AND SYNTHESIS OF EFFECTS

This section combines the impacts of the environmental baseline with the effects of the proposed action and cumulative effects (*i.e.*, future actions that are reasonably certain to occur within the next 20 years).  The purpose of this assessment is to develop an understanding of how the combined effects might affect steelhead and critical habitat for this species.

NMFS reasons that the larger river systems were the historical foundation for the Southern California steelhead DPS, based on their large steelhead populations.  The Ventura River watershed is one such system because the drainage is one of the largest steelhead-bearing watersheds within the Southern California steelhead DPS, and up to the late-1940s, the Ventura River watershed was estimated to support an annual run of 4,000 to 5,000 adult steelhead (Moore 1980).  However, the abundance of steelhead in the Ventura River, like other drainages throughout the DPS, has been dramatically reduced due to a variety of anthropogenic alterations to the watershed.  Presently, the number of steelhead in the Ventura River watershed is small. Likewise, the number of steelhead comprising the DPS is small.  The viability of small populations is especially tenuous, and such populations are susceptible to prompt decreases in abundance as a result of natural or anthropogenic disturbances, and possess a greater risk of extinction relative to large populations (Pimm *et al*. 1988, Berger 1990, Primack 2004).  Given the consequences of past actions and the viability of steelhead populations, NMFS reasons that activities which reduce the quality and quantity of habitats will reduce the abundance, productivity, reproduction and survival of individuals, which may reduce the viability of the overall population.  Based on the importance of the Ventura River to the conservation of southern California steelhead, activities that harm steelhead or destroy habitat, including critical habitat, within a large watershed such as the Ventura River have implications for the entire Southern California DPS.

## A. Summary of Effects of Past and Present Activities

Evidence indicates that past and present anthropogenic activities have reduced the quality and quantity of spawning, migratory, and rearing habitat within the action area, and within the rest of the Ventura River watershed. Additionally, anthropogenic activities are believed to have contributed to declines in steelhead abundance within the action area, and within the entire Ventura River watershed. Because dams (*i.e*., Matilija Dam, Robles Diversion dam) have blocked most of the upstream passage of steelhead to historical spawning and rearing habitat, and water diversions have severely reduced amounts of surface discharge in the mainstem, abundance of this species in the mainstem of the Ventura River and upstream tributaries, including those upstream of man-made dams and diversions, has decreased. Additionally, the City of Ventura's FPWF, surface diversion, and subsurface diversion were collectively extracting about 6,350 AF of water per year from the lower Ventura River before the FPWF was damaged and became inoperable in 2005. Recently, there have been improvements for steelhead in the watershed, specifically the construction of a fish passage facility and a new 50 cfs flow release regime after storms intended to facilitate adult steelhead passage past the Robles diversion. Additionally, the removal of the Matilija Dam, which is expected to occur within 20 years, is expected to restore steelhead migration and connectivity to the upper portion of the watershed, and may increase the size and viability of the Ventura River steelhead population (NMFS 2007). The TRT designated the Ventura River steelhead population as being a "core" population important for recovery of the Southern California endangered DPS, and, based on the amounts of high quality habitat in the Ventura River watershed, the TRT listed the Ventura River steelhead population as currently having a high potential for independent viability (Boughton et al. 2006). Recent steelhead surveys have also found *O. mykiss* throughout the Ventura River, and fairly high densities of *O. mykiss* in the upper Ventura River and Matilija Creek (Allen 2006, Appendix B). Thus, although the risk of extinction for the Ventura River steelhead population still exists, the risk may be buffered by these factors, even though the effects of past and present activities are expected to extend into the future.

## B. Summary of Effects of the Proposed Action

With regard to steelhead critical habitat, the proposed repair of the FPWF and the resulting resumption of well-field withdrawals from the lower Ventura River are expected to diminish the quantity and quality of the freshwater rearing habitat and PCEs in the action area for juvenile steelhead on a yearly basis. Additionally, the proposed action is expected to diminish the quantity and quality of spawning and migratory habitat in the action area, especially under dry hydrologic conditions. With regard to the species, the proposed action is expected to reduce the potential for juvenile steelhead rearing in the lower Ventura River in all but the wettest of hydrologic conditions, and could affect survival and growth of rearing juvenile steelhead on almost a yearly basis, with the exception of very wet winters. The out-migration of juvenile steelhead smolts within the entire watershed could be impacted as well, since all smolts will have to pass through the action area to reach the ocean, and well field withdrawals will diminish the quantity and quality of migratory habitat in the action area during dry rainfall years and in some average rainfall years. Additionally, effects to adult steelhead spawning and migrating could occur under dry hydrologic conditions as well, but these effects are not expected to occur every year. Even though current steelhead abundance estimates in the action area are small, the action area has the potential for use by significant numbers of rearing steelhead, and the proposed action has the potential to decrease the growth and survival of all rearing steelhead in the action area on a yearly basis. In addition, the proposed action has the potential to negatively affect rearing, migration, and spawning of the entire steelhead population because of its placement in the watershed, as all adult and juvenile steelhead in the Ventura River are expected to use the action area one or more times in their life cycle. As a result, the proposed action is expected to reduce the viability of the Ventura River steelhead population, and the steelhead habitat in the action area will suffer a permanent reduction in terms of water quantity and aquatic habitat quality, and thus will be adversely modified.

## C. Combined Effects

The steelhead population in the Ventura River drainage is susceptible to any activity that destroys or alters rearing, spawning, or migratory habitat within the watershed, including any reasonably anticipated future actions. This biological opinion provides considerable evidence that the quantity and quality of aquatic habitat in the watershed has been reduced, with effects expected to continue into the future. Current factors affecting steelhead and critical habitat in the action area, including dams, water withdrawals, poor water quality and riparian impacts, increase the potential for a continuation of adverse effects on the steelhead population. Additional demands on water resources from population growth, or agriculture may occur in the future and reduce the quantity of surface water in the river or tributaries. The effects of the removal of the Matilija Dam are expected to alter the channel bed and thalweg while sediments are routed through the watershed, but this is not expected to result in changes in flow regime or depths within the lower Ventura River, and may lead to enhancement of the thalweg (Corps 2004). In addition, the removal of Matilija Dam is expected to result in renewed access to high quality spawning and rearing areas in the upper watershed, and may increase the steelhead population abundance and viability.

Adding the effects of the proposed action to the combined effects of past and ongoing activities, and reasonably certain future actions and drier conditions due to climate change, is expected to increase the amount of habitat loss and destruction in the Ventura River, and hamper the recovery of the Ventura River steelhead population. The cumulative effects of past and present activities, and the proposed action, are expected to continue to diminish the functional value of steelhead critical habitat within the action area. For instance, summer rearing habitat for juvenile steelhead is expected to be altered or eliminated in the action area through the effects of the proposed action alone. Adding to the current levels of exploitation of surface-water and ground-water resources will result in conditions that are unlikely to support rearing habitat and rearing success for juvenile steelhead in the action area and, under dry conditions, spawning and migration of adult steelhead. Consequently, the conservation value of a large portion of critical habitat in the lower Ventura River would be diminished by resumed well-field withdrawals.

Given that oversummering habitat is the most geographically limited type of habitat in the southern California DPS of endangered steelhead, and considering the importance of Ventura River critical habitat to the overall critical habitat designation, as well as the importance of the Ventura River steelhead population to the recovery of the southern California DPS, the conservation value of critical habitat in the DPS is expected to be diminished, and the likelihood of survival and recovery of the southern California DPS of steelhead is expected to be reduced as well.

## VIII. CONCLUSION

After reviewing the best available scientific and commercial information, the status of the Southern California steelhead DPS, the environmental baseline, expected effects of the proposed action, cumulative effects, and the combined effects of past and present activities, the proposed action, and actions that are reasonably certain to occur, NMFS concludes the proposed action is likely to jeopardize the continued existence of the Southern California DPS, and is likely to destroy or adversely modify critical habitat for this species.

## IX. REASONABLE AND PRUDENT ALTERNATIVE

Regulations (50 CFR §402.02) implementing section 7 of the ESA define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technically feasible; and (4) would, NMFS believes, avoid the likelihood of jeopardizing the continued existence of a listed species or avoid the destruction or adverse modification of critical habitat. NMFS believes the following reasonable and prudent alternative (with two elements) is necessary and appropriate to avoid the likelihood of jeopardizing the continued existence of the southern California DPS, and destroying or adversely modifying critical habitat within the Southern California steelhead DPS.

1. Implement a plan to alter well-field operations such that the quantity of water withdrawn by the FPWF does not result in surface discharge at the Foster Park USGS gauge no. 111185000 falling below 11 to12 cfs . This flow rate is based on past studies which indicate that flows of 12 cfs and above will allow for natural rates of growth and high rates of survival of steelhead within the action area (Moore 1980), and essential features of critical habitat and PCEs within the action area will be preserved.

The reasonable and prudent alternative can be implemented in a manner consistent with the intended purpose of the action because it does not preclude the City from resuming well-field withdrawals. The reasonable and prudent alternative is technically feasible because no technical modifications to the well field are required. Furthermore, the reasonable and prudent alternative is economically feasible because the FPWF provides only a portion of the City's water supply, and the City will still be able to obtain water from the FPWF for much of the year during most years.  Generally, the elements of the reasonable and prudent alternative will (1) allow juvenile steelhead to rear in the mainstem of the lower Ventura River watershed during the summer and fall; (2) allow adult and juvenile steelhead to migrate freely through the action area during the wet season and dry season, and ensure adult and juvenile steelhead will not be stranded due to dewatering of habitat in the action area; (3) allow for adult steelhead to successfully spawn within the action area.  Accordingly, NMFS believes the elements of the reasonable and prudent alternative would avoid jeopardy and destruction or adverse modification of critical habitat. Because this biological opinion has determined the proposed action is likely to jeopardize the species, and destroy or adversely modify critical habitat for this species, the Corps is required to notify NMFS of its final decision on the implementation of the reasonable and prudent alternative.

## X. INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct.  Harm is further defined by NMFS to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering.  Incidental take is defined as take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity.  Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and must be undertaken by the Corps for the exemption in section 7(o)(2) to apply.  The Corps has a continuing duty to regulate the activity covered by this incidental take statement.  If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of this incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse.  In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement (50 CFR §402.14(i)(3)).

To fulfill the monitoring requirements described above, the Corps and the applicant shall:

1. Develop and execute a mutually agreeable (to NMFS and the Corps) plan to monitor well field operations and resulting changes in surface discharge with a monitoring system that measures both well field withdrawals and simultaneously the resulting changes in surface discharge and aquatic habitat at multiple points within the action area.

2. Develop and execute a mutually agreeable (to NMFS and the Corps) plan to monitor steelhead, and specific steelhead habitat parameters and essential features of critical habitat (PCEs) in select areas within the action area under differing flow conditions.

## A. Amount or Extent of Take

NMFS anticipates the proposed action that will occur in the Ventura River near Foster Park, Ventura County, California, may result in the incidental take of steelhead. At this time NMFS cannot yet describe the amount and extent of anticipated take because this would depend on the implementation of the reasonable and prudent alternative, which is currently in draft form.

## IX. REINITIATION OF CONSULTATION

This concludes formal consultation on the actions outlined in the project proposal. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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# Appendix A

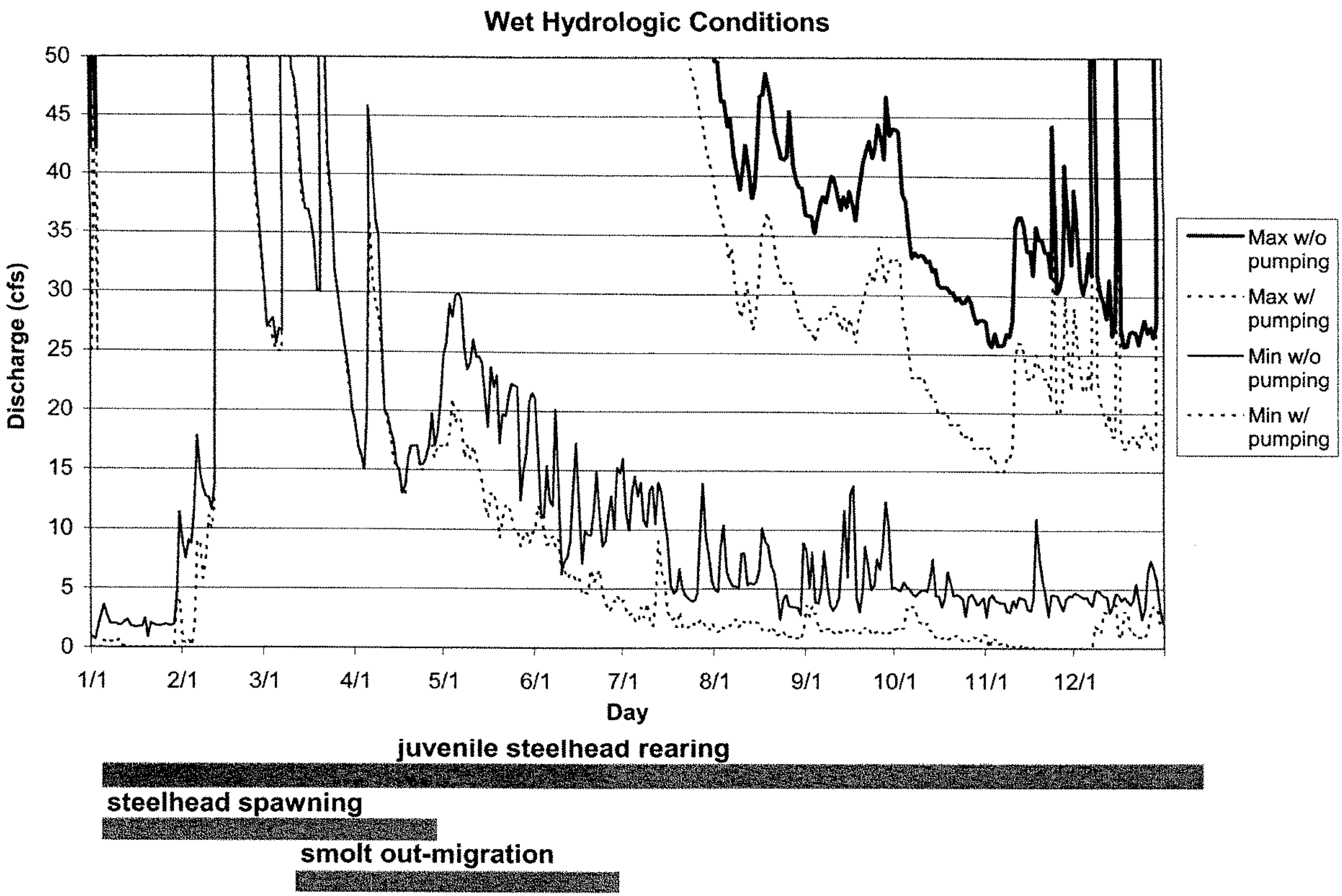
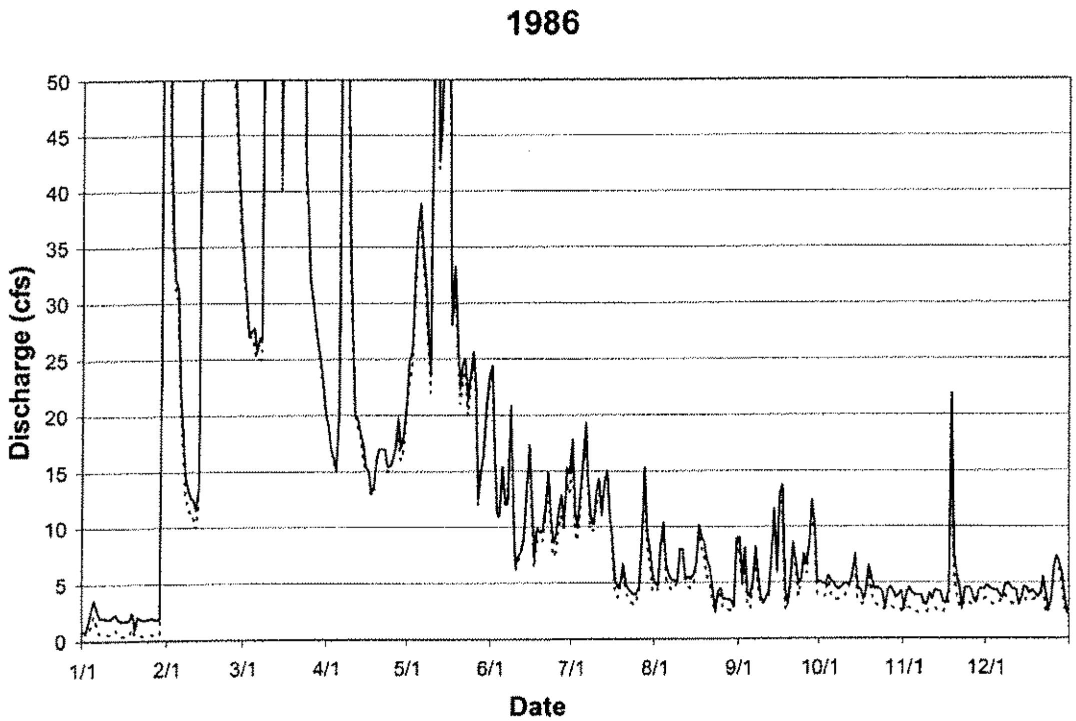



Figure 2: Maximum and minimum surface discharge in the lower Ventura River near Foster Park with and without well field withdrawals during **above average rainfall** years for the period of 1984 through 2001. Times when specific steelhead life stages are expected to be present are shown below graph for reference. Data from USGS and City of Ventura.



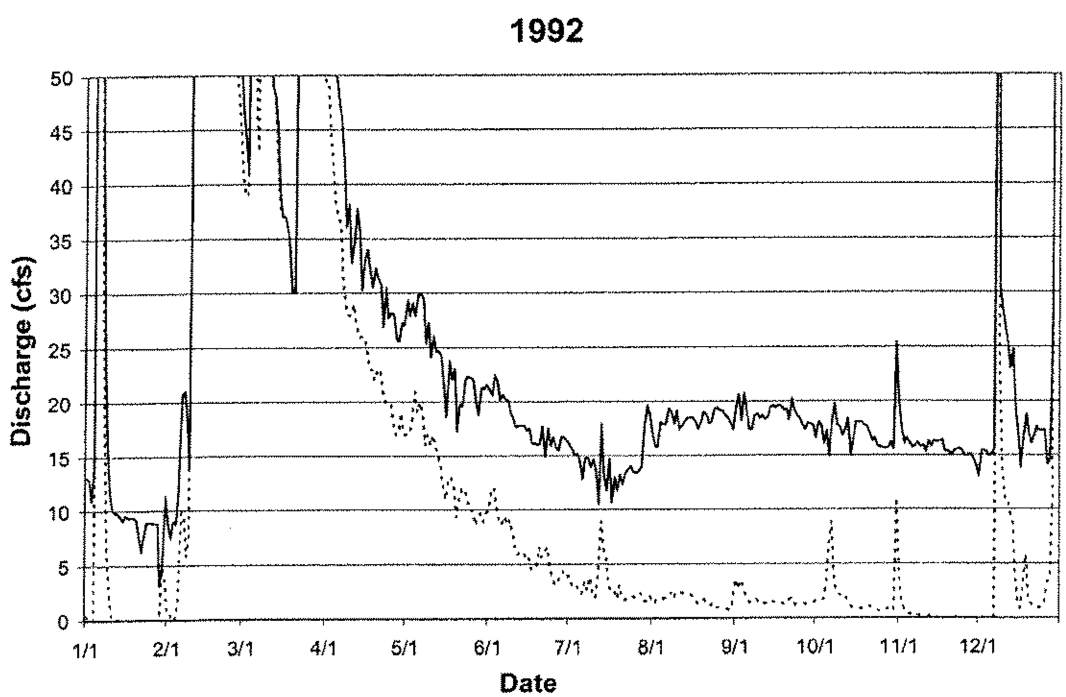
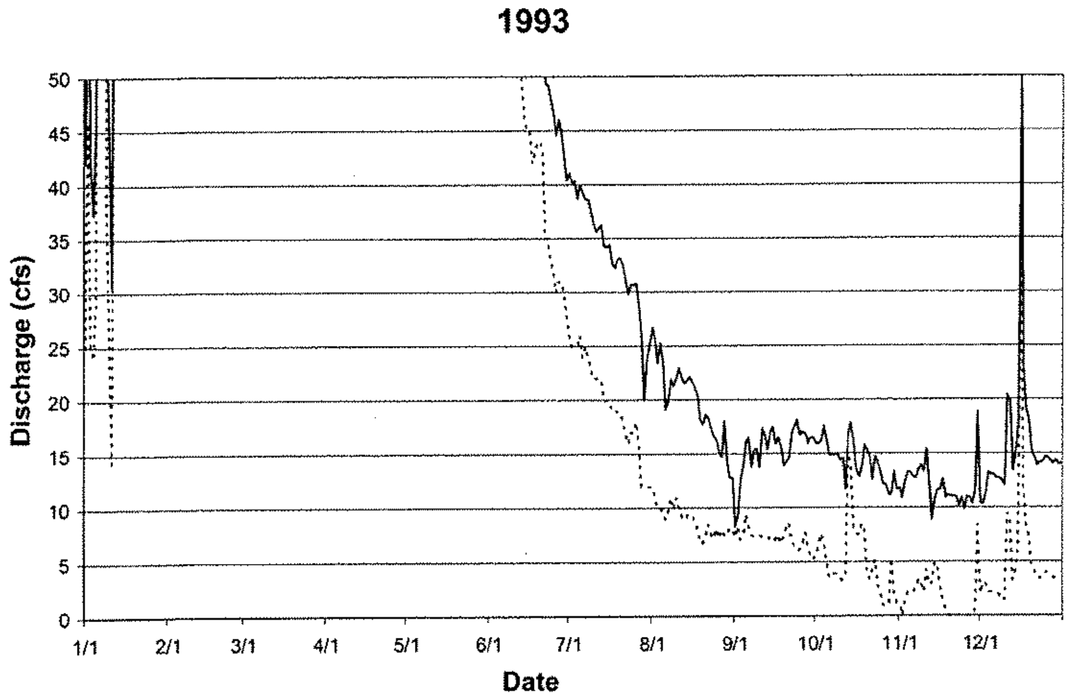




Figure 3: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **wet** rainfall years 1986 and 1992. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.



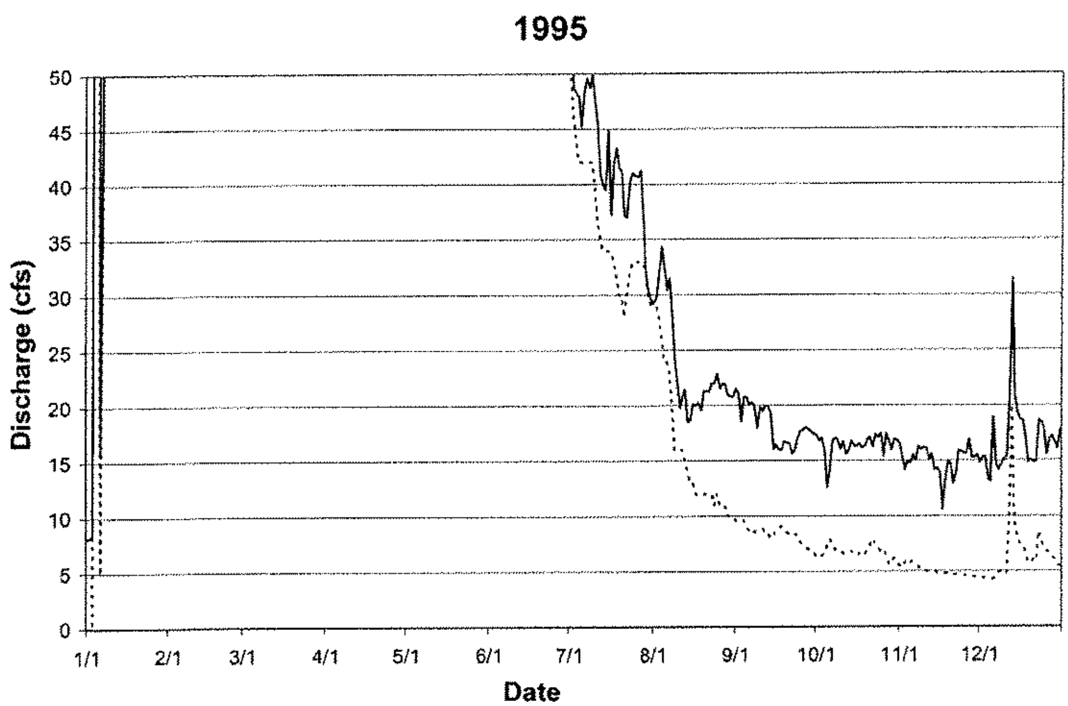
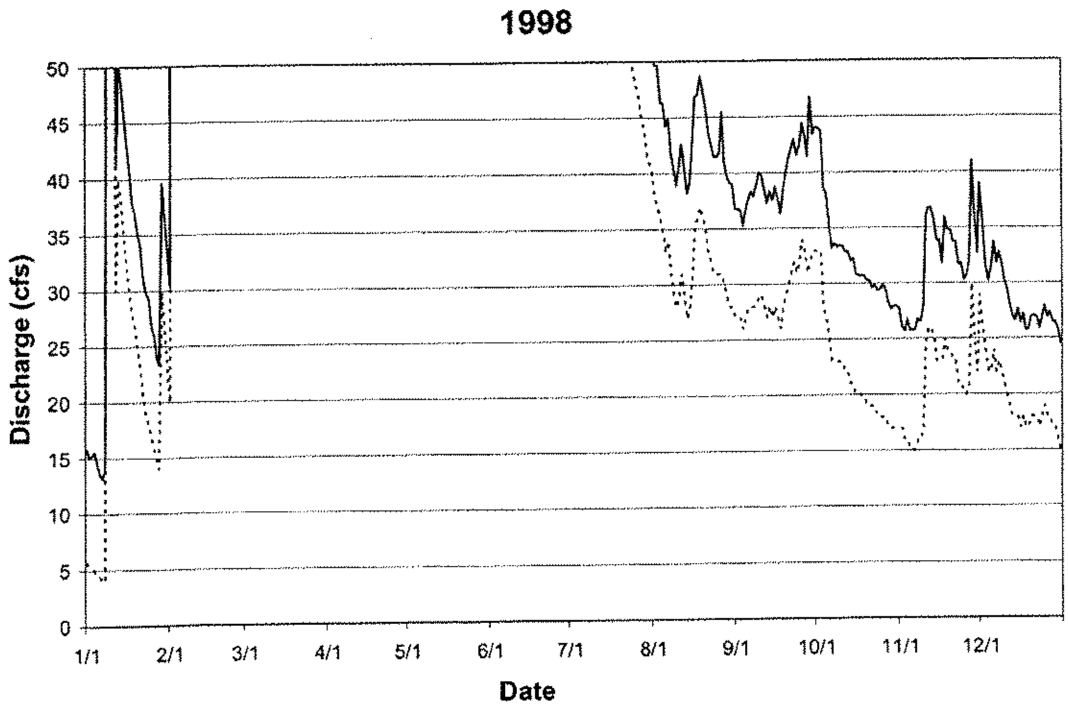




Figure 4: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **wet** rainfall years 1993 and 1995. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.



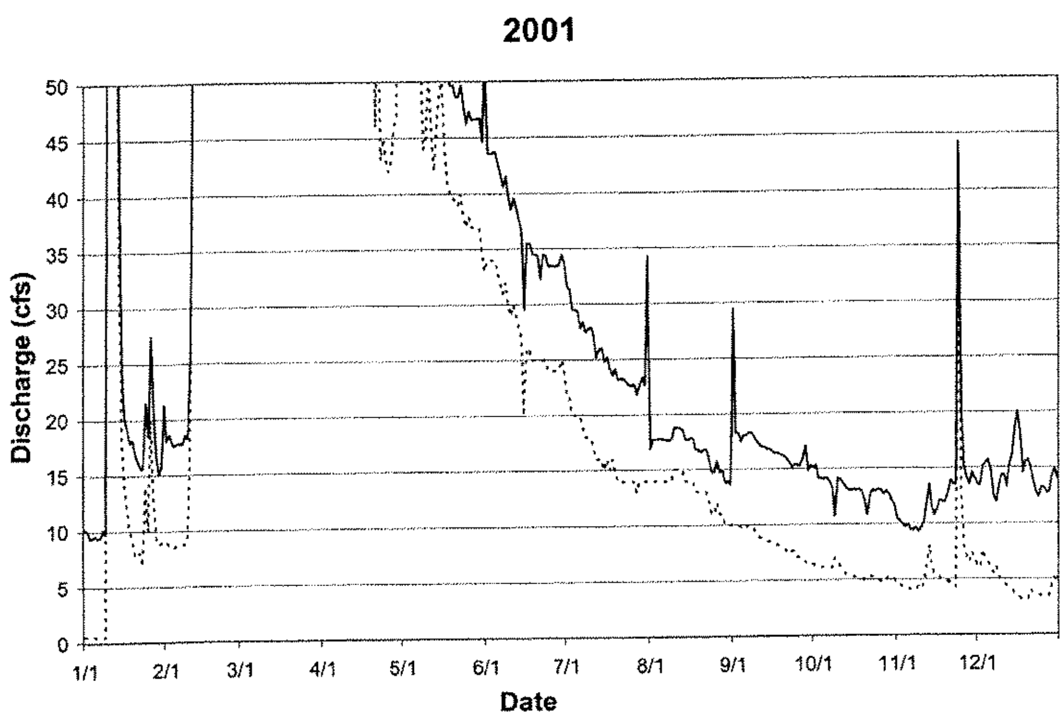




Figure 5: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **wet** rainfall years 1998 and 2001. Lines represent discharge with (solid line) and without (stippled line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.

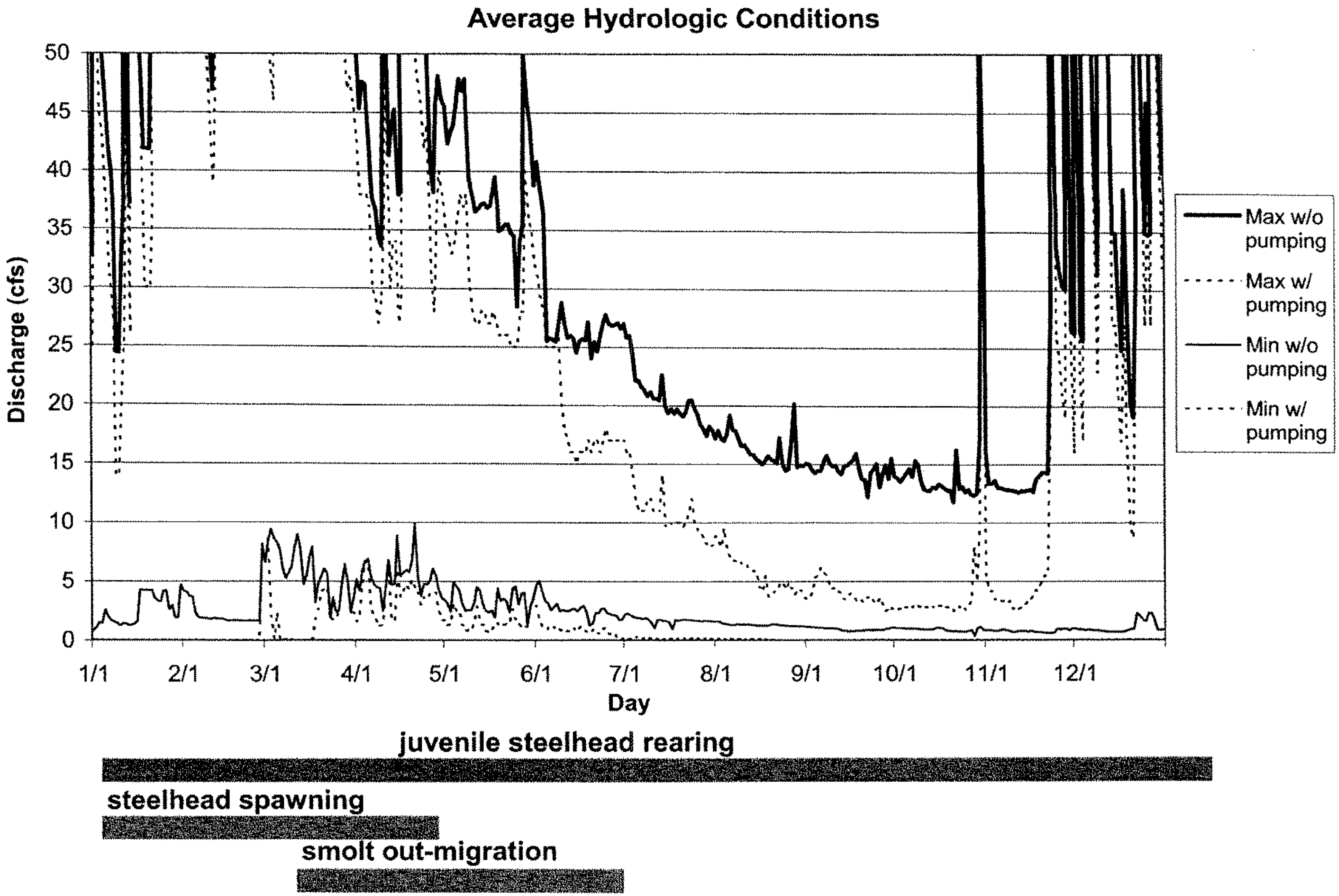
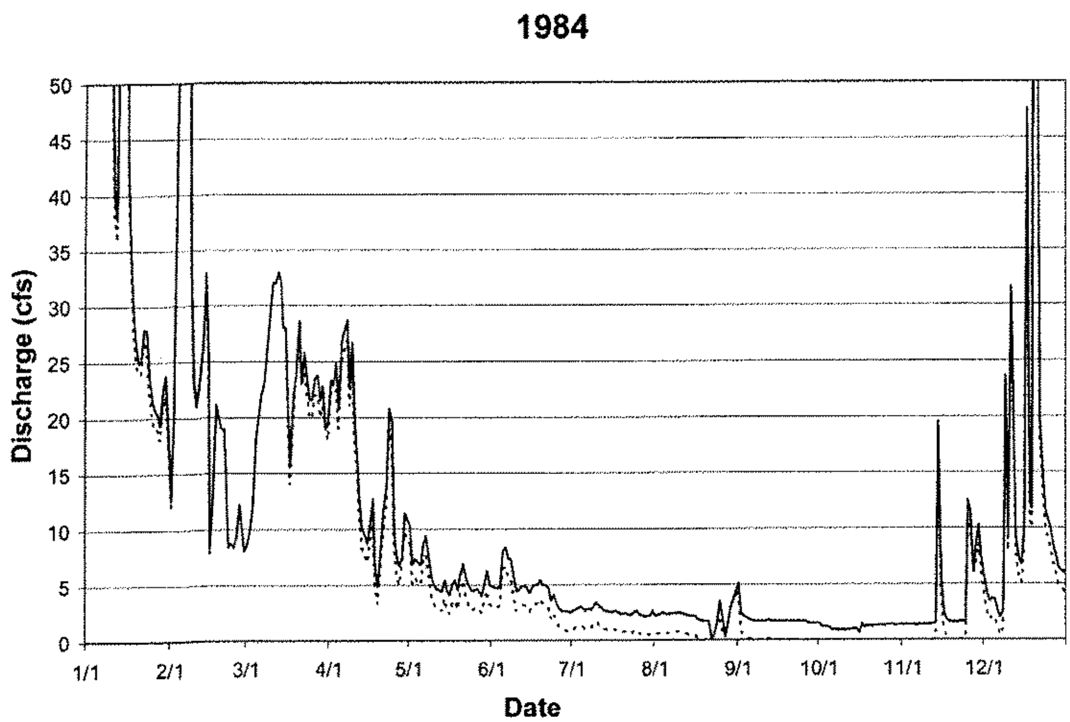



Figure 6: Maximum and minimum surface discharge in the lower Ventura River near Foster Park with and without well field withdrawals during **average rainfall** years for the period of 1984 through 2001. Times when specific steelhead life stages are expected to be present are shown below graph for reference. Data from USGS and City of Ventura.



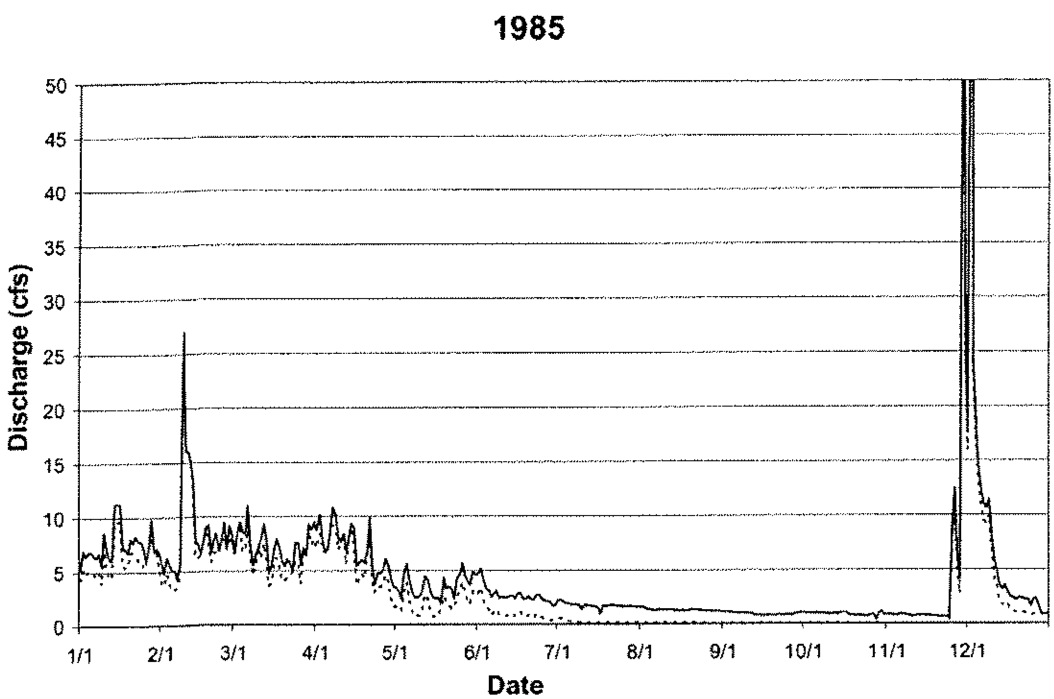
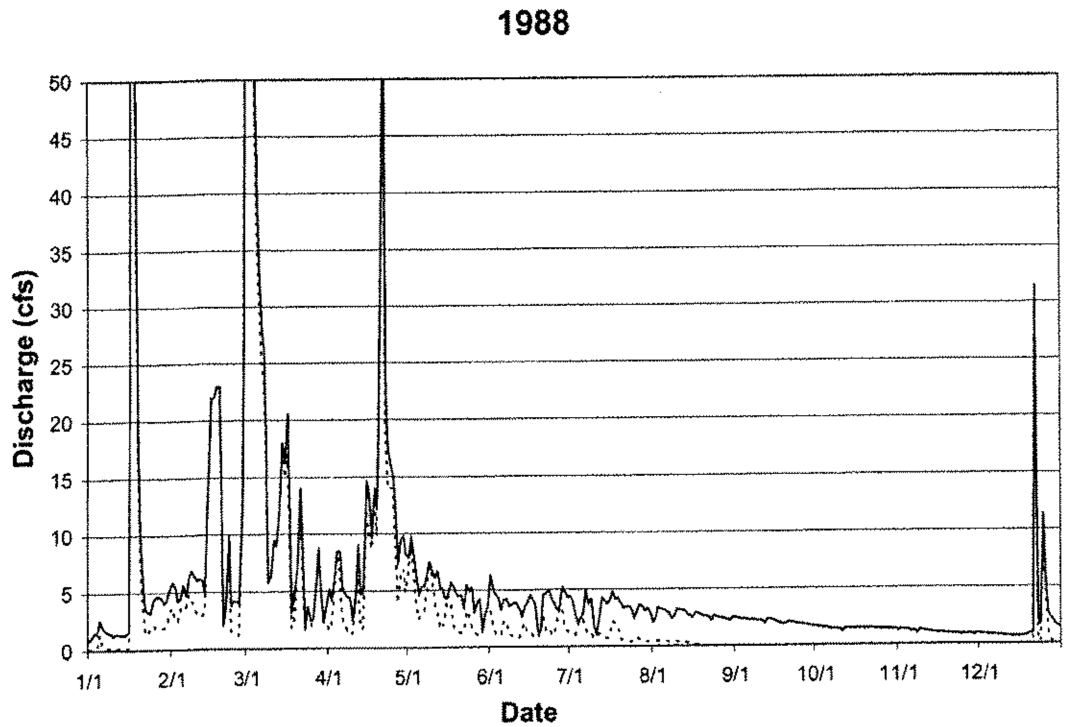




Figure 7: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **average** rainfall years 1984 and 1985. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.



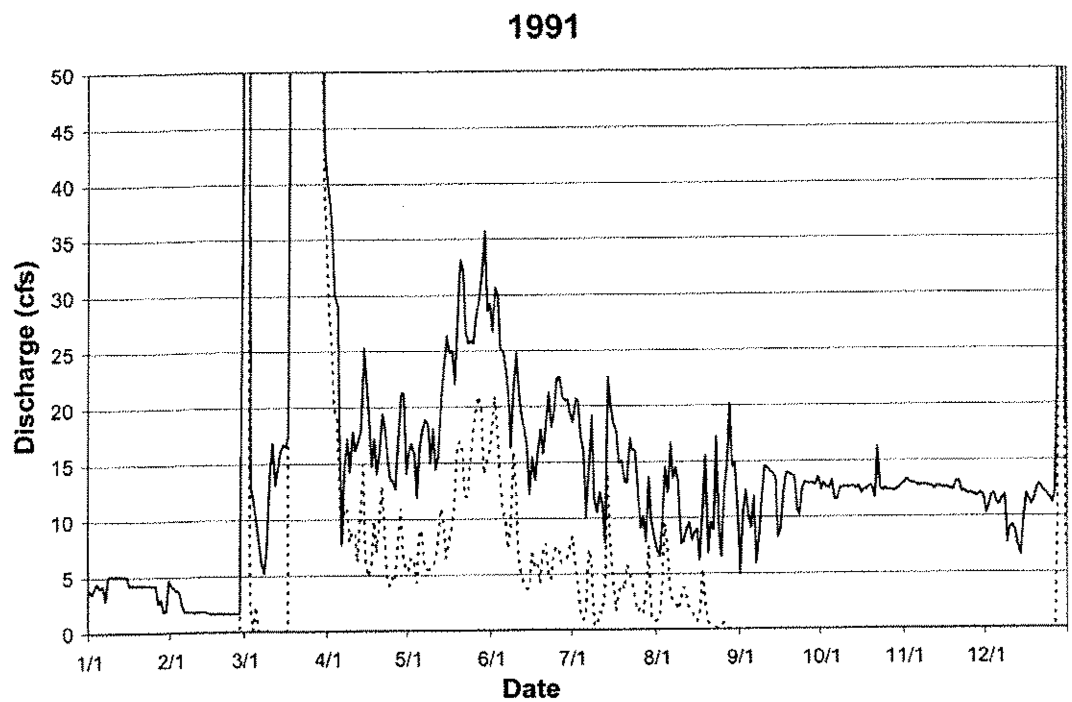
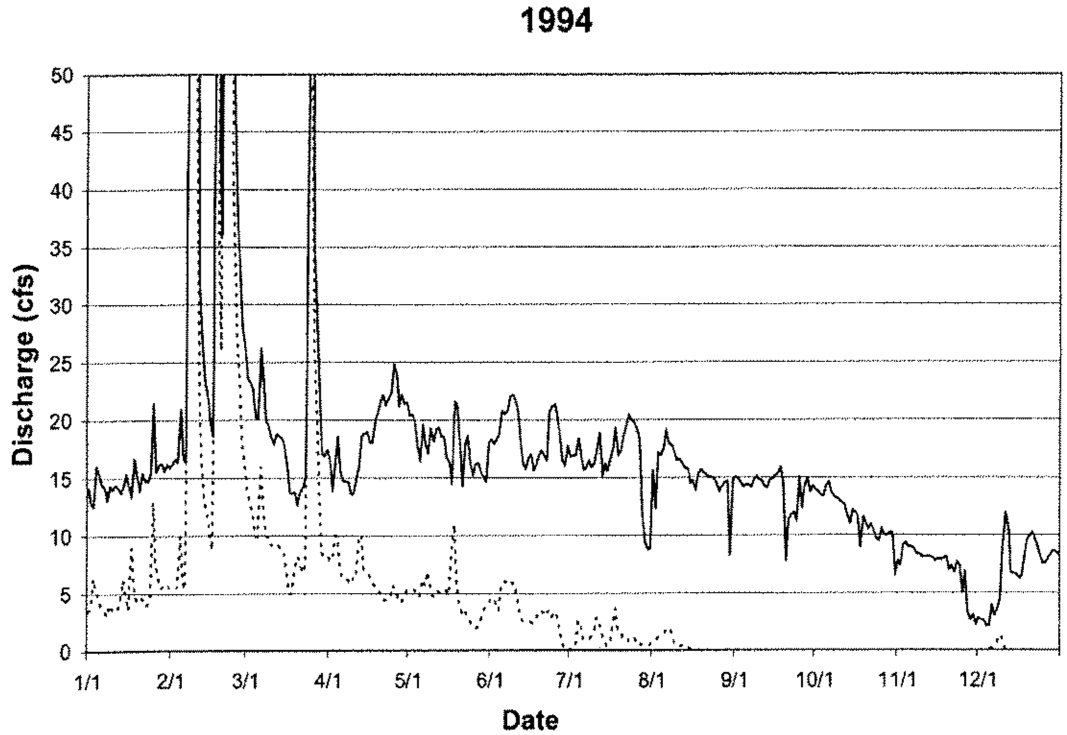




Figure 8: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **average** rainfall years 1988 and 1991. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.



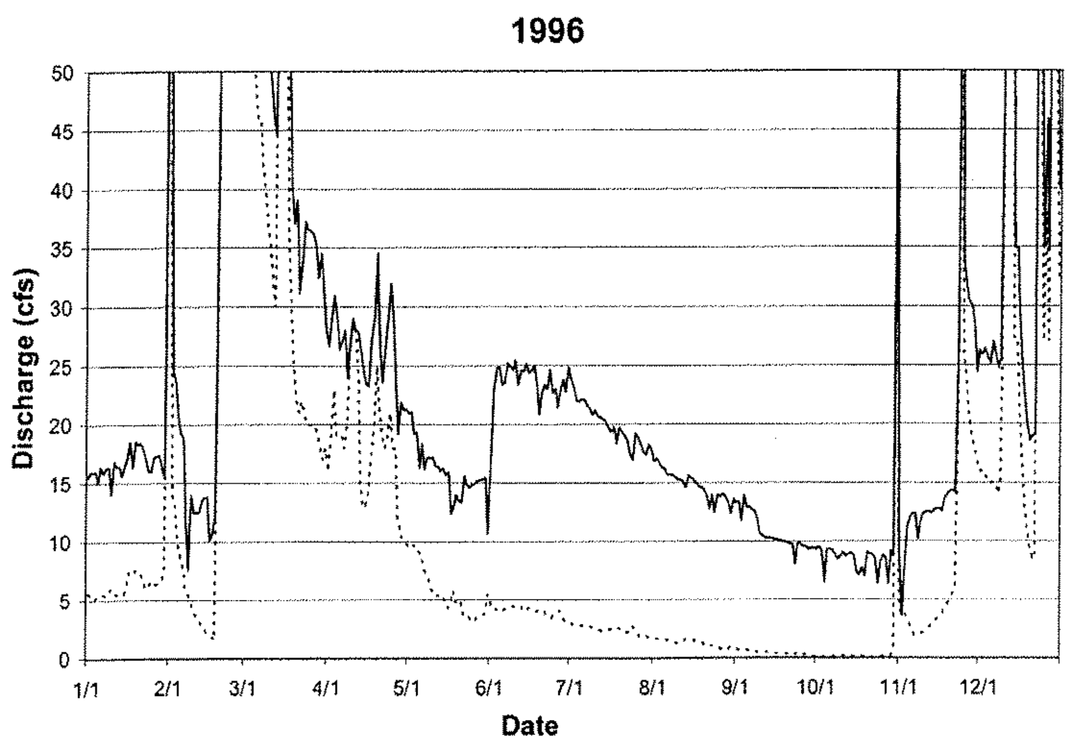




Figure 9: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **average** rainfall years 1994 and 1996. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.

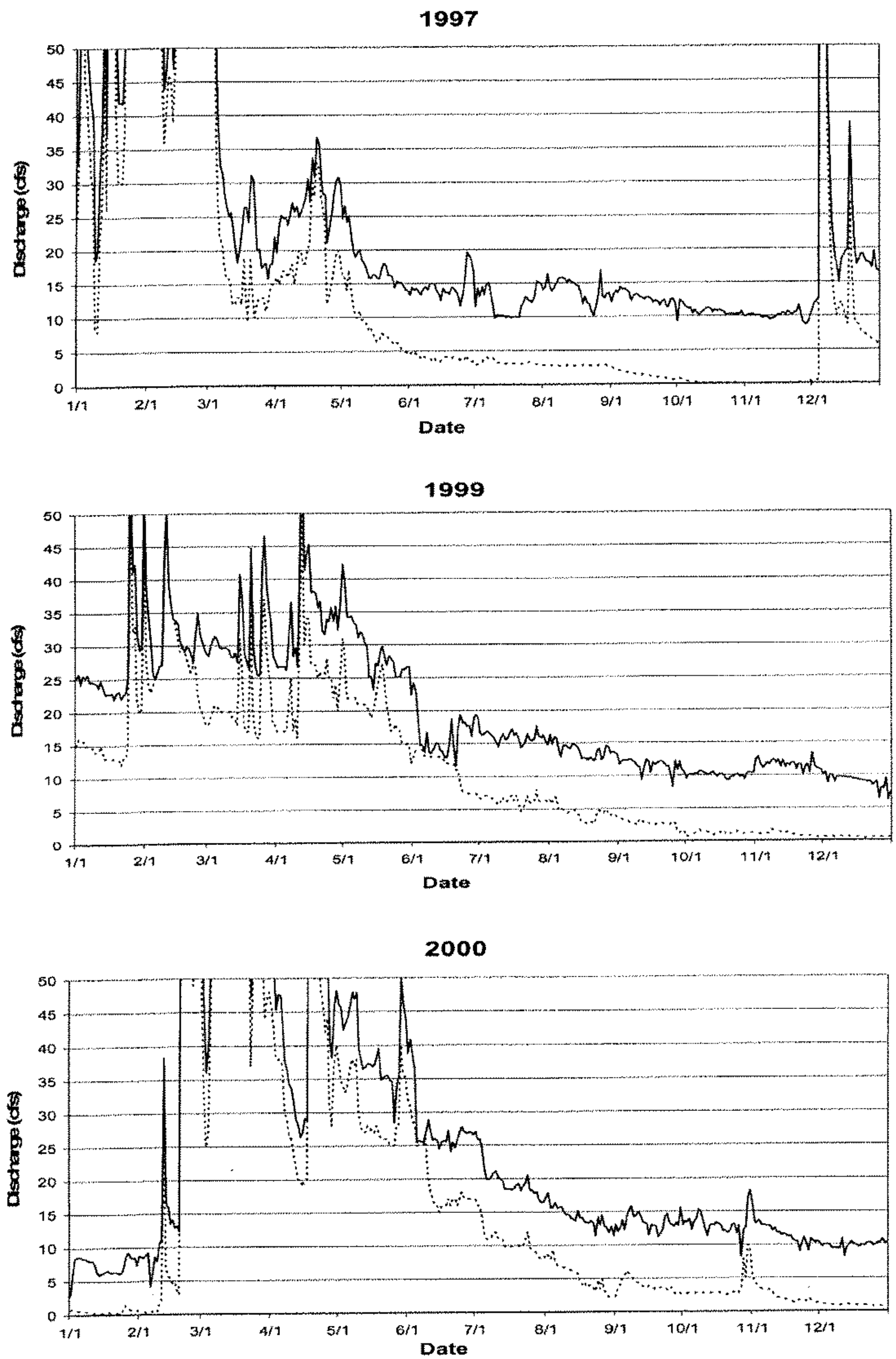



Figure 10: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **average** rainfall years 1997, 1999, and 2000. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.

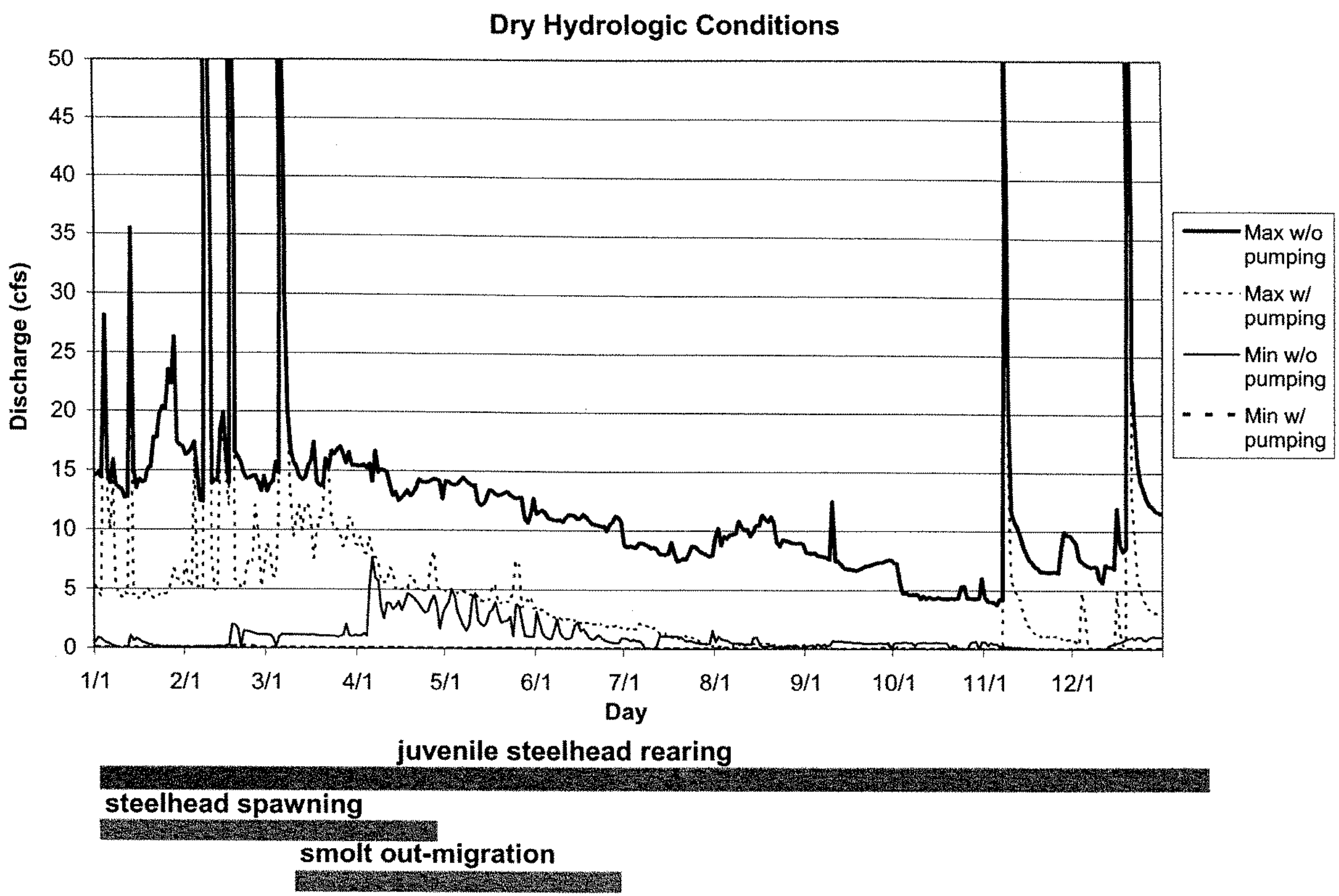
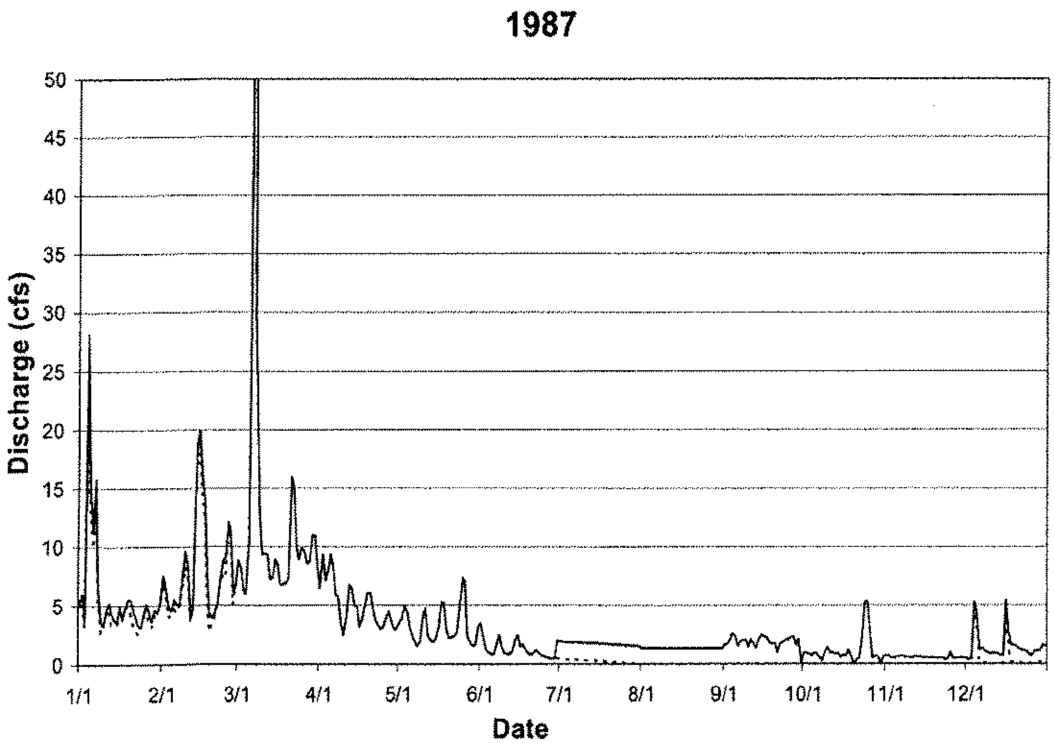



Figure 11: Maximum and minimum surface discharge in the lower Ventura River near Foster Park with and without well field withdrawals during **below average rainfall** years for the period of 1984 through 2001. Times when specific steelhead life stages are expected to be present are shown below graph for reference. Data from USGS and City of Ventura.



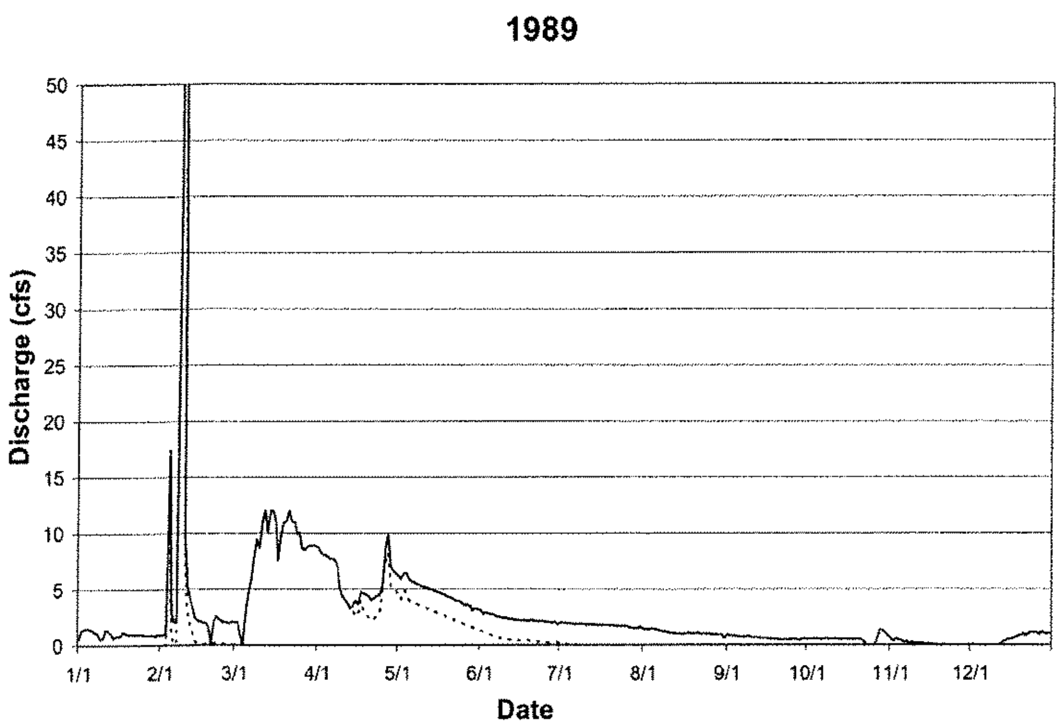
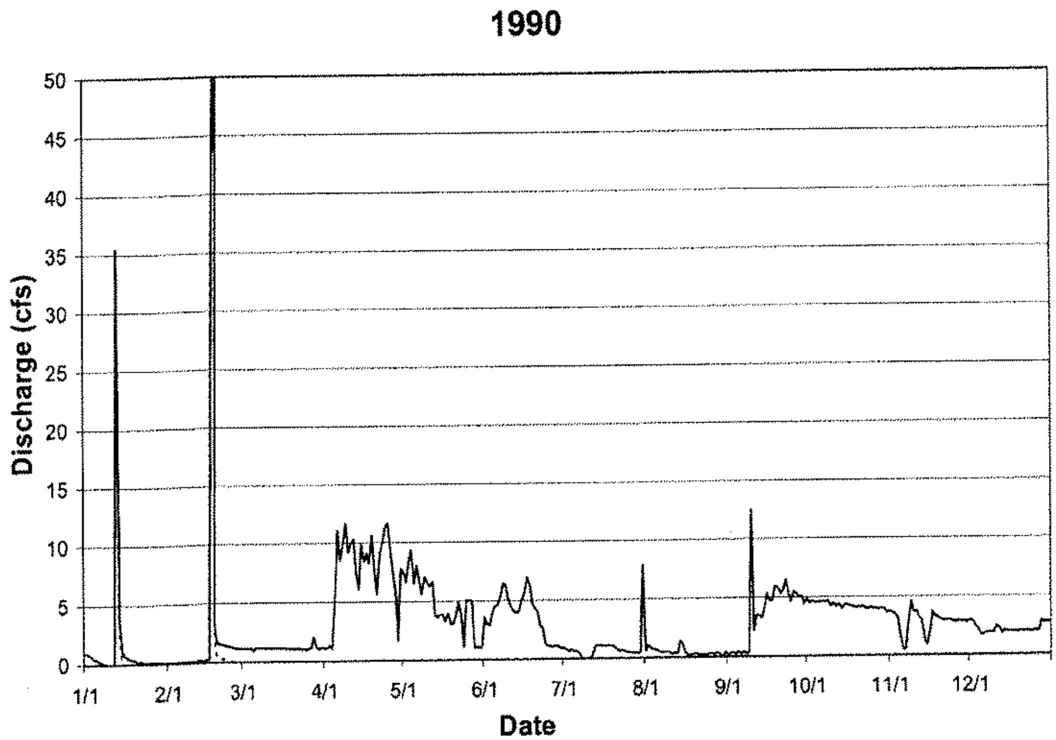




Figure 12: Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **dry** rainfall years 1987 and 1989. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.



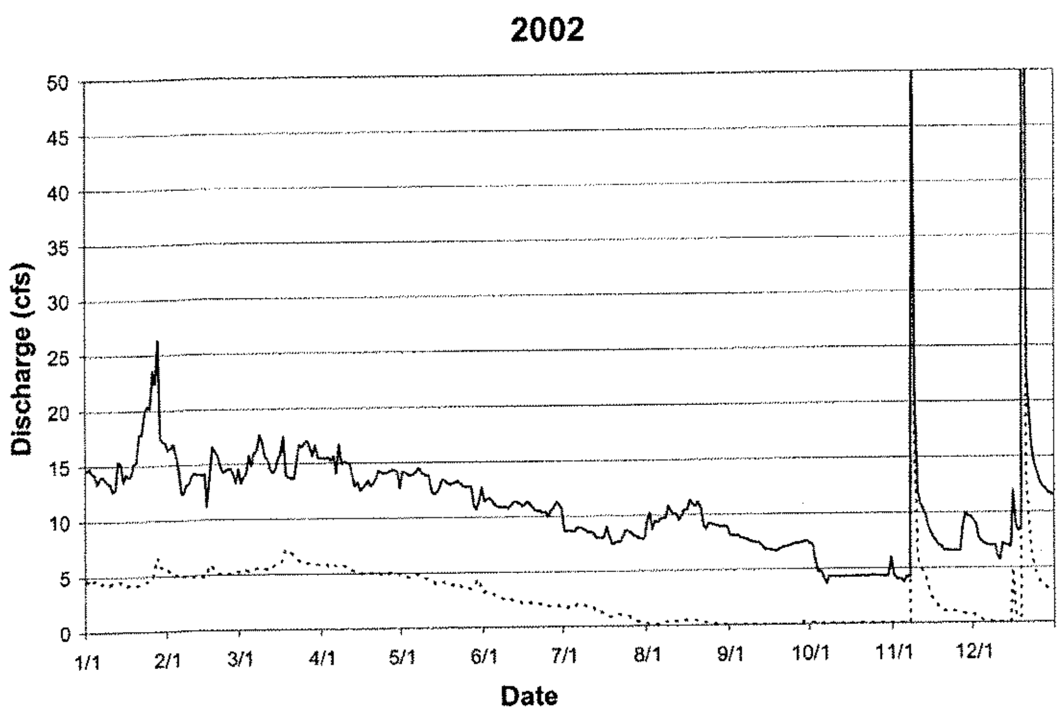
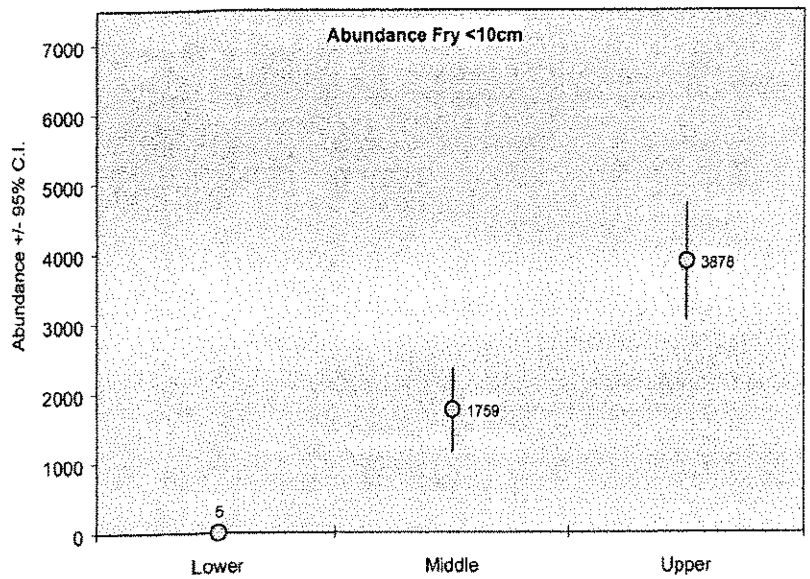
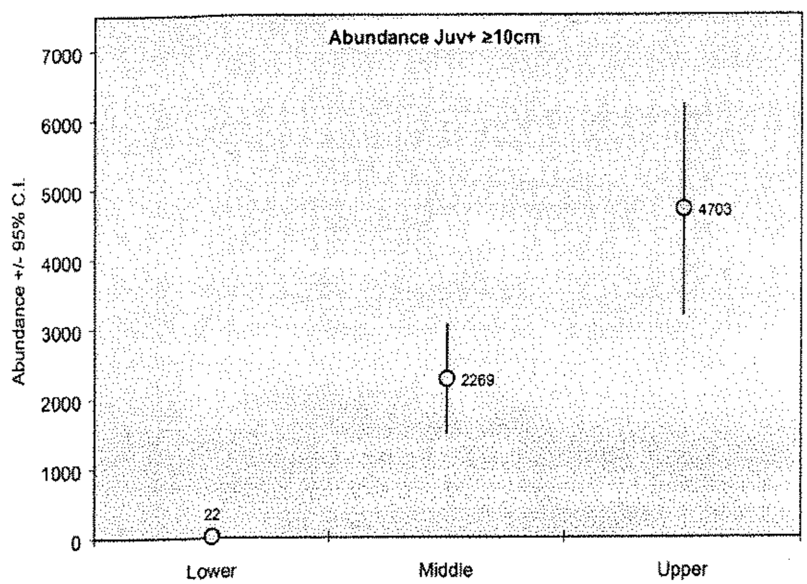




Figure 13. Effects of Foster Park well-field withdrawals on surface flows in the Ventura River for **dry** rainfall years 1990 and 2002. Lines represent discharge with (stippled line) and without (solid line) well-field withdrawals by the City of Ventura. Data from USGS Foster Park stream gauge and City of Ventura water extraction records.

## Appendix B

**Results of seelhead (*Oncorhynchus mykiss*) abundance surveys performed in Matilija Creek and Ventura River, summer 2006. Provided by M. Allen, Thomas R. Payne & Associates, Arcata, California**




**Lower** = Ventura River from lagoon up to Robles Diversion Dam
**Middle** = Ventura River from Robles Diversion Dam up to Matilija Dam and Lower NF Matilija Creek up to Wheeler Gorge CG
**Upper** = Matilija Creek above Matilija Dam and Upper NF Matilija Creek (both to first impassable barriers) - NOT incl Murietta or Old Man Creeks

EXHIBIT 5

**er of the Rolls.** The president of the Court
ıppeal in England. • Formerly, the Master
ıe Rolls was an assistant judge to a court of
ıcery, responsible for keeping the rolls and
ıcery records. In recent times, the most
ous Master of the Rolls was Lord Denning
ɔ lived from 1899 to 1999).

Since 1875, the Master of the Rolls has been president
f the Court of Appeal. Until 1958 he had the general
esponsibility for the public records (a responsibility then
ransferred to the Lord Chancellor) and is still responsi-
le for the records of the Chancery of England. He
dmits persons as solicitors of the Supreme Court."
)avid M. Walker, *The Oxford Companion to Law* 816
1980).

**er of the Supreme Court.** An official of
Queen's Bench and Chancery Divisions of
Supreme Court who fills the several posi-
s of master in the common-law courts, the
en's Coroner and Attorney, the Master of
Crown Office, record and writ clerks, and
ciates.

**er plan.** *Land-use planning.* A municipal
for housing, industry, and recreation facil-
, including their projected environmental
ıct. See PLANNED-UNIT DEVELOPMENT.

**er policy.** See INSURANCE POLICY.

**er-servant rule.** See RESPONDEAT SUPERI-

**r's report.** A master's formal report to a
, usu. containing a recommended decision
case as well as findings of fact and conclu-
of law.

**selling.** *Hist.* The practice of selling the
s of a dead seaman at the mast.

**ıed order.** See ORDER (4).

**ıing principle.** *Tax.* A method for han-
expense deductions, by which the depreci-
in a given year is matched by the associ-
tax benefit.

**1.** A spouse. **2.** A second-in-command offi-
ı a merchant vessel. **3.** A petty officer who
s a warrant officer. **4.** A friend or compan-

***familias*** (may-tər-fə-**mil**-ee-əs), *n.* [Latin]
*n law.* **1.** The wife of a *paterfamilias*, or
ıistress of a family. **2.** A respectable wom-
a household, either married or single.

**materia** (mə-**teer**-ee-ə), *n.* [Latin] **1.** *Roman law.* Materials, esp. for building, as distinguished from the form given to something by the exercise of labor or skill. **2.** Matter; substance.

**material,** *adj.* **1.** Of or relating to matter; physical <material goods>. **2.** Having some logical connection with the consequential facts <material evidence>. **3.** Of such a nature that knowledge of the item would affect a person's decision-making process; significant; essential <material alteration of the document>. — **materiality,** *n.* Cf. RELEVANT.

**material allegation.** See ALLEGATION.

**material alteration.** See ALTERATION.

**material breach.** See BREACH OF CONTRACT.

**material change in circumstances.** *Family law.* An involuntary occurrence that, if it had been known at the time of the divorce decree, would have resulted in the court's issuing a different decree, as when an involuntary job loss creates a need to modify the decree to provide for reduced child-support payments.

**material evidence.** See EVIDENCE.

**material fact.** See FACT.

**material information.** *Securities.* Information that would be important to a reasonable investor in making an investment decision. • In the context of an "efficient" market, materiality translates into information that alters the price of a firm's stock. Securities Exchange Act of 1934 § 10(b), 15 USCA § 78j(b); 17 CFR § 240.10b–5.

**materialman.** A person who supplies materials used in constructing or repairing a structure or vehicle.

**materialman's lien.** See *mechanic's lien* under LIEN.

**material misrepresentation.** See MISREPRESENTATION.

**material representation.** See REPRESENTATION.

**material terms.** Contractual provisions dealing with significant issues such as subject matter,

EXHIBIT 6

QUIOUS implies fawning or sycophantic compliance and exaggerated deference of manner ⟨waiters who are *obsequious* in the presence of celebrities⟩.

**sub·set** \ˈsəb-ˌset\ *n* (1902) **:** a set each of whose elements is an element of an inclusive set

**sub·shrub** \-ˌshrəb, *esp Southern* -ˌsrəb\ *n* (1851) **:** a perennial plant having woody stems except for the terminal part of the new growth which is killed back annually; *also* **:** a low shrub

**sub·side** \səb-ˈsīd\ *vi* **sub·sid·ed; sub·sid·ing** [L *subsidere,* fr. *sub-* + *sidere* to sit down, sink; akin to L *sedēre* to sit — more at SIT] (1607) **1 :** to sink or fall to the bottom **:** SETTLE **2 :** to tend downward **:** DESCEND; *esp* **:** to flatten out so as to form a depression **3 :** to let oneself settle down **:** SINK ⟨*subsided* into a chair⟩ **4 :** to become quiet or less ⟨as the fever ~s⟩ ⟨my anger *subsided*⟩ ***syn*** see ABATE — **sub·si·dence** \səb-ˈsī-dᵊn(t)s, ˈsəb-sə-dən(t)s\ *n*

**sub·sid·i·ar·i·ty** \ˌsəb-si-dē-ˈer-ə-tē, səb-ˌsi-\ *n* (1936) **1 :** the quality or state of being subsidiary **2 :** a principle in social organization: functions which subordinate or local organizations perform effectively belong more properly to them than to a dominant central organization

[1]**sub·sid·i·ary** \səb-ˈsi-dē-ˌer-ē, -ˈsi-də-rē\ *adj* [L *subsidiarius,* fr. *subsidium* reserve troops] (1543) **1 a :** furnishing aid or support **:** AUXILIARY ⟨~ details⟩ **b :** of secondary importance ⟨a ~ stream⟩ **2 :** of, relating to, or constituting a subsidy ⟨a ~ payment to an ally⟩ — **sub·sid·i·ari·ly** \-ˌsi-dē-ˈer-ə-lē\ *adv*

[2]**subsidiary** *n, pl* **-ar·ies** (1603) **:** one that is subsidiary; *esp* **:** a company wholly controlled by another

**sub·si·dise** *Brit var of* SUBSIDIZE

**sub·si·dize** \ˈsəb-sə-ˌdīz, -zə-\ *vt* **-dized; -diz·ing** (1795) **:** to furnish with a subsidy: as **a :** to purchase the assistance of by payment of a subsidy **b :** to aid or promote (as a private enterprise) with public money ⟨~ soybean farmers⟩ ⟨~ public transportation⟩ — **sub·si·di·za·tion** \ˌsəb-sə-də-ˈzā-shən, -zə-\ *n* — **sub·si·diz·er** *n*

**sub·si·dy** \ˈsəb-sə-dē, -zə-\ *n, pl* **-dies** [ME, fr. L *subsidium* reserve troops, support, assistance, fr. *sub-* near + *sedēre* to sit — more at SUB-, SIT] (14c) **:** a grant or gift of money: as **a :** a sum of money formerly granted by the British Parliament to the crown and raised by special taxation **b :** money granted by one state to another **c :** a grant by a government to a private person or company to assist an enterprise deemed advantageous to the public

**sub·sist** \səb-ˈsist\ *vb* [LL *subsistere* to exist, fr. L, to come to a halt, remain, fr. *sub-* + *sistere* to come to a stand; akin to L *stare* to stand — more at STAND] *vi* (1549) **1 a :** to have existence **:** BE **b :** PERSIST, CONTINUE **2 :** to have or acquire the necessities of life (as food and clothing); *esp* **:** to nourish oneself ⟨~*ing* on roots, berries and grubs⟩ **3 a :** to hold true **b :** to be logically conceivable as the subject of true statements ~ *vt* **:** to support with provisions

**sub·sis·tence** \səb-ˈsis-tən(t)s\ *n* [ME, fr. LL *subsistentia,* fr. *subsistent-, subsistens,* prp. of *subsistere*] (15c) **1 a (1) :** real being **:** EXISTENCE **(2) :** the condition of remaining in existence **:** CONTINUATION, PERSISTENCE **b :** an essential characteristic quality of something that exists **c :** the character possessed by whatever is logically conceivable **2 :** means of subsisting: as **a :** the minimum (as of food and shelter) necessary to support life **b :** a source or means of obtaining the necessities of life — **sub·sis·tent** \-tənt\ *adj*

**subsistence farming** *n* (1939) **1 :** farming or a system of farming that provides all or almost all the goods required by the farm family usu. without any significant surplus for sale **2 :** farming or a system of farming that produces a minimum and often inadequate return to the farmer — called also *subsistence agriculture* — **subsistence farmer** *n*

**sub·so·cial** \ˌsəb-ˈsō-shəl\ *adj* (ca. 1909) **:** incompletely social; *esp* **:** tending to associate gregariously but lacking fixed or complex social organization ⟨~ insects⟩

[1]**sub·soil** \ˈsəb-ˌsȯil\ *n* (1799) **:** the stratum of weathered material that underlies the surface soil

[2]**subsoil** *vt* (1840) **:** to turn, break, or stir the subsoil of — **sub·soil·er** *n*

**sub·so·lar point** \ˌsəb-ˈsō-lər-\ *n* (ca. 1908) **:** the point on the surface of the earth or a planet at which the sun is at the zenith

**sub·son·ic** \ˌsəb-ˈsä-nik\ *adj* [ISV] (1937) **1 :** of, relating to, or being a speed less than that of sound in air **2 :** moving, capable of moving, or utilizing air currents moving at a subsonic speed **3 :** INFRASONIC 1 — **sub·son·i·cal·ly** \-ni-k(ə-)lē\ *adv*

**sub·space** \ˈsəb-ˌspās\ *n* (1927) **:** a subset of a space; *esp* **:** one that has the essential properties (as those of a vector space or topological space) of the including space

**sub spe·cie ae·ter·ni·ta·tis** \su̇b-ˈspe-kē-ˌā-ˌī-ˌter-nə-ˈtä-təs\ *adv* [NL, lit., under the aspect of eternity] (1895) **:** in its essential or universal form or nature

**sub·spe·cies** \ˈsəb-ˌspē-shēz, -sēz\ *n* [NL] (1699) **:** a subdivision of a species: as **a :** a category in biological classification that ranks immediately below a species and designates a population of a particular geographical region genetically distinguishable from other such populations of the same species and capable of interbreeding successfully with them where its range overlaps theirs **b :** a named subdivision (as a race or variety) of a taxonomic species **c :** SUBGROUP 1 ⟨~ of economy fares —Michael DiPaola⟩ — **sub·spe·cif·ic** \ˌsəb-spi-ˈsi-fik\ *adj*

**sub·stage** \ˈsəb-ˌstāj\ *n* (1888) **:** an attachment to a microscope by means of which accessories (as mirrors, diaphragms, or condensers) are held in place beneath the stage of the instrument

**sub·stance** \ˈsəb-stən(t)s\ *n* [ME, fr. MF, fr. L *substantia,* fr. *substant-, substans,* prp. of *substare* to stand under, fr. *sub-* + *stare* to stand — more at STAND] (14c) **1 a :** essential nature **:** ESSENCE **b :** a fundamental or characteristic part or quality **c** *Christian Science* **:** GOD 1b **2 a :** ultimate reality that underlies all outward manifestations and change **b :** practical importance **:** MEANING, USEFULNESS ⟨the . . . bill—which will be without ~ in the sense that it will authorize nothing more than a set of ideas —Richard Reeves⟩ **3 a :** physical material from which something is made or which has discrete existence **b :** matter of particular or definite chemical constitution **c :** something (as drugs or alcoholic beverages) deemed harmful and usu. subject to legal restriction ⟨possession of a controlled ~⟩ ⟨has a ~ problem⟩ **4 :** material possessions **:** PROPERTY ⟨a family of ~⟩ — **sub·stance·less** \-ləs\ *adj* — **in substance :** in respect to essentials **:** FUNDAMENTALLY

**substance abuse** *n* (1982) **:** excessive use of a drug (as alcohol, narcotics, or cocaine) **:** use of a drug without medical justification — **substance abuser** *n*

**substance P** *n* (1934) **:** a neuropeptide that consists of 11 amino-acid residues, that is widely distributed in the brain, spinal cord, and peripheral nervous system, and that acts across nerve synapses to produce prolonged postsynaptic excitation

**sub·stan·dard** \ˌsəb-ˈstan-dərd\ *adj* (1897) **:** deviating from or falling short of a standard or norm: as **a :** of a quality lower than that prescribed by law **b :** conforming to a pattern of linguistic usage existing within a speech community but not that of the prestige group in that community **c :** constituting a greater than normal risk to an insurer

**sub·stan·tial** \səb-ˈstan(t)-shəl\ *adj* (14c) **1 a :** consisting of or relating to substance **b :** not imaginary or illusory **:** REAL, TRUE **c :** IMPORTANT, ESSENTIAL **2 :** ample to satisfy and nourish **:** FULL ⟨a ~ meal⟩ **3 a :** possessed of means **:** WELL-TO-DO **b :** considerable in quantity **:** significantly great ⟨earned a ~ wage⟩ **4 :** firmly constructed **:** STURDY **5 :** being largely but not wholly that which is specified ⟨a ~ lie⟩ — **substantial** *n* — **sub·stan·ti·al·i·ty** \-ˌstan(t)-shē-ˈa-lə-tē\ *n* — **sub·stan·tial·ly** \-ˈstan(t)-sh(ə-)lē\ *adv* — **sub·stan·tial·ness** \-ˈstan(t)-shəl-nəs\ *n*

**sub·stan·tia ni·gra** \səb-ˌstan(t)-shē-ə-ˈnī-grə, -ˈni-\ *n, pl* **sub·stan·ti·ae ni·grae** \-chē-ˌē-ˈnī-(ˌ)grē, -ˈni-\ [NL, lit., black substance] (1882) **:** a layer of deeply pigmented gray matter situated in the midbrain and containing the cell bodies of a tract of dopamine-producing nerve cells whose secretion tends to be deficient in Parkinson's disease

**sub·stan·ti·ate** \səb-ˈstan(t)-shē-ˌāt\ *vt* **-at·ed; -at·ing** (1657) **1 :** to give substance or form to **:** EMBODY **2 :** to establish by proof or competent evidence **:** VERIFY ⟨~ a charge⟩ ***syn*** see CONFIRM — **sub·stan·ti·a·tion** \-ˌstan(t)-shē-ˈā-shən\ *n* — **sub·stan·ti·a·tive** \-ˈstan(t)-shē-ˌā-tiv\ *adj*

**sub·stan·ti·val** \ˌsəb-stən-ˈtī-vəl\ *adj* (ca. 1832) **:** of, relating to, or serving as a substantive — **sub·stan·ti·val·ly** \-və-lē\ *adv*

[1]**sub·stan·tive** \ˈsəb-stən-tiv\ *n* [ME *substantif,* fr. MF, fr. *substantif,* adj., having or expressing substance, fr. LL *substantivus*] (14c) **:** NOUN; *broadly* **:** a word or word group functioning syntactically as a noun — **sub·stan·tiv·ize** \-ti-ˌvīz\ *vt*

[2]**sub·stan·tive** \ˈsəb-stən-tiv; *2c & 3 also* səb-ˈstan-tiv\ *adj* [ME, fr. LL *substantivus* having substance, fr. L *substantia*] (14c) **1 :** being a totally independent entity **2 a :** real rather than apparent **:** FIRM; *also* **:** PERMANENT, ENDURING **b :** belonging to the substance of a thing **:** ESSENTIAL **c :** expressing existence ⟨the ~ verb is the verb *to be*⟩ **d :** requiring or involving no mordant ⟨a ~ dyeing process⟩ **3 a :** having the nature or function of a grammatical substantive ⟨a ~ phrase⟩ **b :** relating to or having the character of a noun or pronominal term in logic **4 :** considerable in amount or numbers **:** SUBSTANTIAL **5 :** creating and defining rights and duties ⟨~ law⟩ — compare PROCEDURAL **6 :** having substance **:** involving matters of major or practical importance to all concerned ⟨~ discussions among world leaders⟩ — **sub·stan·tive·ly** *adv* — **sub·stan·tive·ness** *n*

**substantive due process** *n* (1954) **:** DUE PROCESS 2

**substantive right** *n* (1939) **:** a right (as of life, liberty, property, or reputation) held to exist for its own sake and to constitute part of the normal legal order of society

**sub·sta·tion** \ˈsəb-ˌstā-shən\ *n* (1881) **:** a subordinate or subsidiary station: as **a :** a branch post office **b :** a subsidiary station in which electric current is transformed **c :** a police station serving a particular area

**sub·stit·u·ent** \səb-ˈsti-chə-wənt, -ˈstich-wənt\ *n* [L *substituent-, substituens,* prp. of *substituere*] (ca. 1896) **:** an atom or group that replaces another atom or group in a molecule — **substituent** *adj*

**sub·sti·tut·able** \ˈsəb-stə-ˌtü-tə-bəl, -ˈtyü-\ *adj* (1805) **:** capable of being substituted — **sub·sti·tut·abil·i·ty** \ˌsəb-stə-ˌtü-tə-ˈbi-lə-tē, -ˌtyü-\ *n*

[1]**sub·sti·tute** \ˈsəb-stə-ˌtüt, -ˌtyüt\ *n* [ME, fr. L *substitutus,* pp. of *substituere* to put in place of, fr. *sub-* + *statuere* to set up, place — more at STATUTE] (15c) **:** a person or thing that takes the place or function of another — **substitute** *adj*

[2]**substitute** *vb* **-tut·ed; -tut·ing** *vt* (1588) **1 a :** to put or use in the place of another **b :** to introduce (an atom or group) as a substituent; *also* **:** to alter (as a compound) by introduction of a substituent ⟨a *substituted* benzene ring⟩ **2 :** to take the place of **:** REPLACE ~ *vi* **:** to serve as a substitute

**sub·sti·tu·tion** \ˌsəb-stə-ˈtü-shən, -ˈtyü-\ *n* [ME *substitucion,* fr. MF *substitution,* fr. LL *substitution-, substitutio,* fr. *substituere*] (14c) **1 a :** the act, process, or result of substituting one thing for another **b :** replacement of one mathematical entity by another of equal value **2 :** one that is substituted for another — **sub·sti·tu·tion·al** \-shnəl, -shə-nᵊl\ *adj* — **sub·sti·tu·tion·al·ly** *adv* — **sub·sti·tu·tion·ary** \-shə-ˌner-ē\ *adj*

**substitution cipher** *n* (1936) **:** a cipher in which the letters of the plaintext are systematically replaced by substitute letters — compare TRANSPOSITION CIPHER

**sub·sti·tu·tive** \ˈsəb-stə-ˌtü-tiv, -ˌtyü-\ *adj* (1668) **:** serving or suitable as a substitute — **sub·sti·tu·tive·ly** *adv*

**sub·strate** \ˈsəb-ˌstrāt\ *n* [ML *substratum*] (1807) **1 :** SUBSTRATUM **2 :** the base on which an organism lives ⟨the soil is the ~ of most seed plants⟩ **3 :** a substance acted upon (as by an enzyme)

**sub·stra·tum** \ˈsəb-ˌstrā-təm, -ˌstra-, ˌsəb-ˈ\ *n, pl* **-stra·ta** \-tə\ [ML, fr. L, neut. of *substratus,* pp. of *substernere* to spread under, fr. *sub-* + *sternere* to spread — more at STREW] (1631) **:** an underlying support **:** FOUNDATION: as **a :** substance that is a permanent subject of qualities or phenomena **b :** the material of which something is made and from which it derives its special qualities **c :** a layer beneath the surface soil; *specif* **:** SUBSOIL **d :** SUBSTRATE 2

**sub·struc·ture** \ˈsəb-ˌstrək-chər\ *n* (1726) **:** an underlying or supporting part of a structure — **sub·struc·tur·al** \-chə-rəl, -shrəl\ *adj*

**sub·sume** \səb-ˈsüm\ *vt* **sub·sumed; sub·sum·ing** [NL *subsumere,* fr. L *sub-* + *sumere* to take up — more at CONSUME] (1825) **:** to include or place within something larger or more comprehensive **:** encompass as a subordinate or component element ⟨red, green, and yellow are *subsumed* under the term "color"⟩ — **sub·sum·able** \-ˈsü-mə-bəl\ *adj*

**sub·sump·tion** \səb-ˈsəm(p)-shən\ *n* [NL *subsumption-, subsumptio,* fr. *subsumere*] (1651) **:** the act or process of subsuming