Endangered Species Act
Section 7 Consultation

BIOLOGICAL OPINION

U.S. Bureau of Reclamation operation and maintenance of the
Cachuma Project on the Santa Ynez River in Santa Barbara County, California

Action Agency:
U.S. Bureau of Reclamation

Consultation Conducted By:
National Marine Fisheries Service,
Southwest Region

Date Issued: 9/11/00

F/SW3:EJS

Mr. William H. Luce, Jr.
Bureau of Reclamation
South-Central California Area Office
2666 North Grove Industrial Drive, Suite 106
Fresno, California 93727-1551

Dear Mr. Luce:

Enclosed is the National Marine Fisheries Service's (NMFS) biological opinion for the U.S. Bureau of Reclamation's (BOR) operation and maintenance of Bradbury Dam (the Cachuma Project) on the Santa Ynez River in Santa Barbara County, California. The biological opinion addresses the effects of the proposed project on Southern California steelhead (*Oncorhynchus mykiss*) and its designated critical habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

The biological opinion concludes the BOR's proposed operation and maintenance of Bradbury Dam is not likely to jeopardize the continued existence of the endangered Southern California Evolutionarily Significant Unit (ESU) of steelhead known to be present in the Santa Ynez River, nor is it likely to adversely modify critical habitat. The NMFS believes the action is likely to result in take of steelhead, and therefore, an incidental take statement is attached to this biological opinion. Additionally, the following documents, referred to in the biological opinion, are also enclosed: 1) NMFS's June 23, 1998, letter authorizing emergency fish rescue, and 2) NMFS's July 19, 1999, letter regarding the use of the temporary road crossing. Mr. Darren Brumback is the lead Fishery Biologist for this project. He can be contacted at 562-980-4026 if you would like additional information.

Sincerely,

Rebecca Lent, Ph.D.
Regional Administrator

Enclosures (3)

cc: Jim Lecky, Darren Brumback, NMFS
David Young, BOR

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LIST OF TABLES AND FIGURES

BACKGROUND

The United States Bureau of Reclamation (Reclamation) currently operates and maintains Bradbury Dam and associated water transport and delivery structures on and near the Santa Ynez River for several local water agencies. The Santa Ynez River is about 900 square miles in watershed area, with approximately 417 square miles above the dam. Authorized by the Secretary of Interior in 1948, construction of the dam began in 1950 and was completed in 1953. Associated water transport and delivery structures were completed in 1956. The dam is located approximately 48 miles from the Pacific Ocean and completely blocks steelhead (*Oncorhynchus mykiss*) from migrating to historical spawning and rearing areas upstream. These areas comprised most of the spawning and rearing habitat utilized by steelhead before the dam's construction (U.S. Bureau of Reclamation 1945; U.S. Bureau of Reclamation 1999).

The dam and its associated water transport and delivery structures, collectively known as the Cachuma Project, include the Tecolote Tunnel, which diverts water to the South Coast (Santa Barbara County), and outlet works at the dam which release water to the mainstem of the Santa Ynez River for groundwater recharge and receive water from the Central Coast Water Authority (CCWA) Santa Ynez Extension Pipeline. A permanent water supply line from the reservoir to Hilton Creek, a tributary directly downstream of the dam, has also recently been built, and is considered part of the Cachuma Project for this opinion.

A multi year effort has been underway to determine how best to allocate the water resources controlled by the Cachuma project between public trust resources and consumptive uses. This effort was generated by State Water Right Order 94-5 which required vegetation, fish, and hydrology studies to be conducted in preparation for a hearing before the State Water Resources Control Board (SWRCB) in the year 2000. At this hearing the SWRCB intends to review Reclamation's state water rights permits on the Santa Ynez river to determine if any modifications in permit terms or conditions are necessary to protect public trust values and downstream water rights below Bradbury Dam.

On March 10, 1997, NMFS and Reclamation completed conferencing on a seismic retrofit project currently occurring at Bradbury Dam. As mitigation for 0.05 acre of aquatic habitat lost to this project NMFS and Reclamation agreed to permanently supply water to Hilton Creek via a water line from the reservoir. In addition to supplying water to Hilton Creek, Reclamation has chosen to include the use of this water line as part of the Cachuma Project to supply water to the Santa Ynez River. On April 7, 1999, Reclamation requested formal consultation on the on-going operations and maintenance of the Cachuma Project, including the operation and maintenance of the Hilton Creek Water Supply Line. The request did not provide NMFS enough information to begin consultation. This information was received from Reclamation in mid June, 1999, and formal consultation began on June 14, 1999. During consultation, several issues were identified

as needing further data analysis to determine steelhead protection measures. Reclamation and NMFS mutually agreed to extend consultation, and NMFS received a revised project proposal from Reclamation on June 16, 2000.

DESCRIPTION OF THE PROPOSED ACTION

The federal action involves the proposed operation and maintenance of the Cachuma project to further address fish needs in the mainstem Santa Ynez and several of its tributaries. The action area (Figure 1) includes the mainstem of the Santa Ynez River from Bradbury Dam to the Pacific Ocean, Hilton Creek, Salsipuedes Creek, El Jaro Creek, Quiota Creek, Nojoqui Creek, Alisal Creek and associated riparian areas. The proposed action involves surcharging the reservoir in some years to provide additional water for fish downstream, water rights releases, water releases for anadromous migration support, water releases for summer rearing, the upgrade of road crossings currently blocking or hindering anadromous fish passage in the watershed below the dam, and facility maintenance and monitoring activities, among others. Surcharge will be implemented in a series of interim steps. As noted, some of these water releases will occur through the water supply line at Hilton Creek. The scope of this consultation is 50 years based on the availability and accuracy of data provided and used to predict project effects.

The Cachuma Project is proposed to operate as described briefly below, although some of the proposed modifications to operations will be phased in over several years. Each operation's expected implementation schedule is also described. A more comprehensive description can be found in the Biological Assessment for Cachuma Project Operations and the Lower Santa Ynez River and the Revised Project Description (U.S. Bureau of Reclamation 1999, 2000).

Cachuma Project Facility Overview

Lake Cachuma is a reservoir impounded behind Bradbury Dam, an earth-fill structure 205 feet high (structural height of 275 feet), with a crest length of 2,975 feet set at 766 feet above mean sea level (MSL). The spillway is a broad-crested weir in the south abutment of the dam consisting of four bays, each with a 50-foot wide by 30 foot high radial gate and a one foot high splashboard. The gates open from the bottom and are seated in the weir at 720 feet MSL (U.S. Bureau of Reclamation, 1999). Storage capacity is 190,409 acre feet.

Diversions to the South Coast are conveyed through the 6.4 mile long Tecolote Tunnel, which is connected to the reservoir by an intake tower located near the reservoir's south bank. The intake and tunnel are situated such that when reservoir levels fall near or below 660 feet, pumping from a floating conduit is used to supply water to the tunnel. Outlet works at the dam consist of an inlet structure at 600 feet of elevation in the reservoir; a 1,500 foot long, 7 foot diameter tunnel; a 38 inch diameter pipe running from the tunnel to the outlet works on the downstream toe of the dam on the north side of the stilling basin; two 30-inch hollow-jet valves; and a 10-inch butterfly

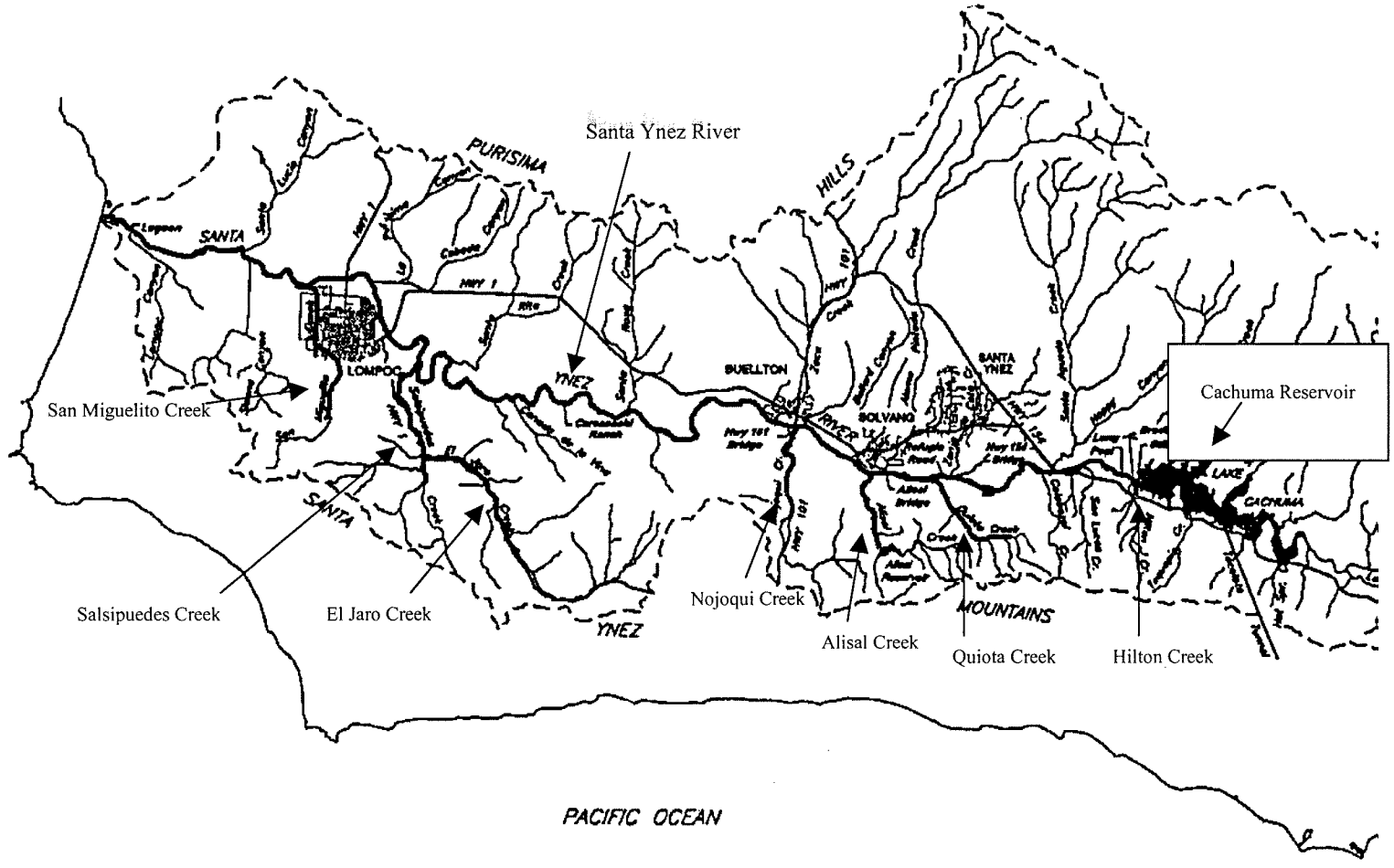

Figure 1. Approximate location of the action area for the Cachuma Project (blue lines). The text of this biological opinion explains the extent of the action area. Inclusion of tributary lengths on this map is not accurate; please refer to text. (Modified from Reclamation 1999).

valve set at 563 feet of elevation. These valves direct water to the stilling basin, which empties into the uppermost point of the mainstem Santa Ynez River below the dam. The Central California Coast Water Authority (CCWA) water line terminates in the outlet works at Bradbury Dam. The configuration of this connection causes CCWA water (from the Sacramento-San Joaquin River system) to mix with water being released to the Santa Ynez River from the reservoir when the CCWA pipeline is delivering water. When the outlet works are not releasing water to the Santa Ynez River, all the CCWA water goes through the outlet works into the reservoir (U.S. Bureau of Reclamation, 1999).

In addition, the Hilton Creek Water Supply Line has recently been constructed at Bradbury Dam. The line consists of a pipeline with an intake in the reservoir and three release points, one on the south side of the stilling basin and two in Hilton Creek. The release point at the stilling basin is separate from the outlet works. The release points in Hilton Creek are located at 1,380 feet and 2,980 feet upstream of the Santa Ynez. Each outlet point was planned for an approximate release capacity of 5 cfs. Recent information indicates that capacity is considerably less than expected. Reclamation expects most of the planned capacity can be achieved and this will begin occurring within two years (Young 2000a). The water supply line is addressed here to evaluate its proposed operation to deliver water to Hilton Creek and the mainstem Santa Ynez (U.S. Bureau of Reclamation 1999). Specifics regarding its construction are on file at NMFS's Southwest Region Headquarters in Long Beach, California.

Proposed Operations, Maintenance, and Conservation

The following is a summary of the proposed action taken from the biological assessment provided by Reclamation (U. S. Bureau of Reclamation 1999) and subsequent modifications proposed by Reclamation during consultation (U. S. Bureau of Reclamation 2000). Readers interested in more specific details should refer to those documents.

Impoundment of Water at Bradbury Dam, Project Yield and Associated Diversions

Reclamation proposes to continue to impound water at the reservoir for use by localities of the Santa Ynez Valley and the South Coast, including the City of Santa Barbara. Water is impounded during the wet season in Southern California (generally November through the end of March). No water is released from the dam unless its capacity is exceeded, flood control or water delivery operations (from the Tecolote Tunnel) are needed, water rights releases are made, or releases to support fish occur. As noted above, the reservoir has a capacity of approximately 190,409 acre feet. Currently (since 1992), about 25,714 acre feet of water is removed from the reservoir each year for municipal, domestic, irrigation supply, incidental recreation and salinity control purposes.

Spill Operations

Reclamation proposes to conduct spill operations by returning water from the reservoir to the Santa Ynez River below Bradbury Dam in years when the dam's capacity is exceeded (spill years). Spill operations, which can include controlled discharge through open gates or over the spillway, or releases from the outlet works, are conducted to keep the reservoir at, but not over, its maximum operating level. Spills have occurred 17 times in wet years since the completion of Bradbury Dam, or in approximately 36% of years. Implementation of spill operations will occur periodically during some wet years.

Downstream Water Rights Releases

Reclamation proposes to release water from the outlet works at the dam during some summer months to replenish groundwater downstream, both between the dam and the Narrows (Lompoc Narrows) and downstream of the Narrows (the Lompoc basin). Releases are proposed to occur during about 65% of years. These releases are governed by State Water Rights Order 89-18 (1989) which amends WR 73-37 (1973), which amended a previous agreement. Under WR 89-18, downstream releases are governed by two water accounts which accrue credits (acre feet of water in the reservoir) which can be used to provide groundwater recharge to the "Above Narrows" and "Below Narrows" areas downstream of the dam. Releases are seldom made in wet years when downstream water basins retain water throughout the summer and fall. During other years, releases are made in late spring, summer, or early fall. In general, releases are made at 130-150 cfs for 12-15 days to deliver water downstream to the Below Narrows Account. Once water reaches the appropriate point downstream to recharge the Below Narrows Account, releases are scaled back to provide just enough water to maintain surface flow throughout the recharge area. The duration of release is then based on the water available in the accounts and/or the amount of water needed to recharge the ground water basin. Releases made only for the Above Narrows Account work in a similar fashion, but the amounts are usually less and the duration is shorter.

Ramping

Ramping down of water rights release flows has been done as a trial operation in the recent past. Reclamation proposes to implement a formalized ramping policy for downstream water rights releases to minimize the potential for fish stranding as shown in Table 1.

Table 1. Reclamation proposed water rights ramping schedule.

Release Rate (cfs)	**Ramping Increment (cfs)**	**Ramping Frequency (no more than once every...)**
>90	25	4 hours
90 - 30	10	4 hours
30 - 10	5	4 hours

10 - 5	2.5	4 hours
5 - 3.5	1.5	4 hours
3.5 - 2.5	1	4 hours

Implementation is proposed to occur the first year water rights releases are needed. This is expected in the summer of 2000.

Reservoir Surcharge

Reclamation is proposing to surcharge the reservoir (increase the reservoir's water level) 3.0 feet above the current maximum level. The 3.0 foot surcharge is proposed to be phased in over the next 5 years. Currently Reclamation can surcharge the reservoir by 0.75 feet. When flash boards are installed on the radial gates Reclamation will surcharge up to 1.8 feet on the first wet season providing enough water to do so. Environmental review of the 1.8 foot surcharge has been completed. Construction of the flash boards is expected to be finished by the end of 2001, and the first 1.8 foot surcharge may occur in 2002. Once environmental review on the 3.0 foot surcharge has been completed, Reclamation proposes to surcharge the reservoir to 3.0 feet, depending upon climate conditions. Reclamation anticipates that this is likely to occur in the Spring of 2005 or the first wet season following that provides enough water for the 3.0 foot surcharge. Several issues must be addressed including sensitive state species and reservoir facilities that will be affected. However, Reclamation is currently not aware of any reason or event that would preclude the approval and implementation of the 3.0 foot surcharge as noted above. Therefore, Reclamation has included the 3.0 foot surcharge as part of the proposed action. If Reclamation is unable to achieve the 3.0 foot surcharge, Reclamation will reinitiate consultation with NMFS (Young 2000b).

Flow-Related Fish Support Measures

Rearing Support
Until the 3.0 foot surcharge is achieved, Reclamation proposes the following flow targets in the mainstem, implemented at the location of the HWY 154 bridge, to support rearing steelhead:

A. In all years when the reservoir spills (when storage is above 120,000 acre feet) and the spill amount exceeds 20,000 acre feet, the target flow will be 5 cfs when no water rights release is underway.
B. In all years when the reservoir does not spill, or the spill amount is less than 20,000 acre feet, and the storage in the reservoir exceeds 120,000 acre feet, the target flow will be 2.5 cfs.
C. In all years when storage in the reservoir is below 120,000 acre feet, but greater than 30,000 acre feet, the target flow will be 1.5 cfs.

Once the 3.0 foot surcharge is approved and implemented an additional amount of water estimated at 9,200 acre feet of water will be stored in the reservoir in approximately 37% of years

based on the hydrology model used by Reclamation and assuming the next 50 years are similar to the 1942-1993 period. This water will be used to provide steelhead rearing support in the mainstem, increase steelhead migration opportunity and provide an adaptive management account. The following flow targets in the mainstem are proposed to support rearing steelhead after the 3.0 foot surcharge is achieved:

A. 10 cfs will be maintained at the HWY 154 bridge in all years when the reservoir spills and the spill amount exceeds 20,000 acre feet.
B. 5 cfs will be maintained in all years when the reservoir does not spill, and storage is above 120,000 acre feet, or when the spill less than 20,000 acre feet.
C. 2.5 cfs will be maintained in all years when reservoir storage is below 120,000 acre feet, but greater than 30,000 acre feet.
D. When the spill amount exceeds 20,000 acre feet and steelhead are present at the Alisal Reach, 1.5 cfs will be provided at the Alisal Bridge.
E. 1.5 cfs will also be provided in the year immediately following a spill year which exceeded 20,000 acre feet if steelhead are present.

Flow releases for steelhead rearing are proposed to be further guided by the following criteria:

A. First priority for flow enhancement will be Hilton Creek.
B. Second priority will be the mainstem between Hilton Creek and HWY 154.
C. Third priority will be the area between Bradbury Dam and the Hilton Creek confluence, including the stilling basin and Long Pool.
D. Fourth priority will be the area downstream from HWY 154 to the Solvang area.

Migration Support
To supplement migration flows, Reclamation proposes to establish a passage account that would provide flow releases during the steelhead migration season (winter and spring) at both the 1.8 and 3.0 foot surcharge level. Passage flow releases will utilize some of the surcharged water to extend the duration of flows, and in many cases increase flows in the Santa Ynez River directly following storms when steelhead are likely migrating. Releases will occur after most storms until the water set aside for migration support is exhausted. Once climate conditions allow the reservoir to be surcharged again, migration supplementation will resume. Flow releases for migration will be operated in the following manner:

A. Water releases are made to augment storms in January through May.
B. Storms are defined as flows of 25 cfs or greater at the Solvang United States Geological Survey (USGS) gauge location.
C. The first storm of the season will not be supplemented as it is considered a recharge storm to saturate the groundwater in the lower watershed for future releases.
D. All storms in the passage period (A - C above) will be supplemented unless (1) flows at Solvang reach 25 cfs within the 7 days following a prior migration flow release (the second storm will not be supplemented), (2) the Adaptive Management Committee (see below) determines that

there is a greater biological benefit not to supplement a particular storm (saving water to supplement later storms), or (3) there is no water left in the Fish Passage Account (see below).
E. A decay function based on the Los Laureles gauge above the reservoir will be used to determine the flow release profile at Cachuma to enhance the storm hydrograph at Solvang. The average storm recession from 150 to 25 cfs at Los Laureles takes 14 days during normal water years.
F. Releases will be made from the reservoir to mimic the average storm recession of the Los Laureles gauge (during normal water years) at the Solvang gauge location.
G. Flow releases will start when the unsupplemented storm hydrograph at Solvang recedes from its peak to 150 cfs.
H. In the event that storm peaks at the Solvang gauge location are less than 150 cfs but greater than 25 cfs, releases will be made to provide a peak of 150 cfs and then follow the decay curve described in E and F above.
I. From 25 cfs to baseflow, releases will be made based on the proposed mainstem ramping rate.
J. Water will be released to supplement fish passage in years following surcharge until there is no water left in the fish passage account.

Flow Accounting
Reclamation proposes that flows for the purposes above be managed either by accounts or by meeting flow targets as described above and below. A fish passage account and adaptive management account will be established. Rearing support releases will be made to meet the mainstem rearing targets regardless of surcharge water availability as described above. Accounts will be allocated water in the following manner:

A. Once the flashboards on the radial gates are installed, and climate conditions allow the reservoir to be surcharged 1.8 feet, 2,500 acre feet will be allocated to the fish passage account. The remaining 3,000 acre feet (5,500 total) will be used to meet the mainstem rearing flow targets.
B. Once the reservoir can be surcharged by 3.0 feet, up to 3,200 acre feet of water will be provided to the fish passage account. Five hundred acre feet of water will be allocated to the adaptive management account. The remaining surcharged water (5,500 acre feet) will be used to meet the mainstem rearing target flows. The total allocation could thus be as high as 9,200 acre feet.
C. When the reservoir spills, each account is deemed to spill and the accounts receive a new allocation based on the amount of surcharge and the rules above. Otherwise, unused water from each account is carried over to the next year.

Adaptive Management
As more data on fish passage supplementation is gathered, an Adaptive Management Committee (AMC) may make modifications to the release protocols described above. The AMC will be made up of one representative from Reclamation, NMFS, the California Department of Fish and Game (CDFG), the Cachuma Conservation Release Board, the Santa Ynez River Water Conservation District Improvement District #1, and the downstream water rights interests. Such

modifications might include changing the trigger flow level, changing the definition of storms, boosting storm peaks that are less than 150 cfs to different levels, and modification of releases in May to focus on smolt outmigrants.

In addition, the adaptive management committee will oversee the use of the 500 acre foot adaptive management account. This water will be used on a case by case basis where appropriate to increase benefit to steelhead. Both passage and rearing opportunities (mainstem and Hilton Creek) might be enhanced by use of this account.

Critical Drought Years
During extremely dry periods when there is less than 30,000 acre feet of storage in the reservoir, it is anticipated by Reclamation that there would only be enough water to refresh the stilling basin and long pool, directly downstream of the dam (about 30 acre feet per month) to provide for steelhead rearing in these areas. Reclamation will reinitiate consultation with NMFS to determine what, if any, actions will be taken for steelhead in the mainstem under these conditions.

Water Release Locations
With the construction of the Hilton Creek Water Supply Line, Reclamation proposes to vary the location of water releases among the stilling basin release point, upper Hilton Creek release point and lower Hilton Creek release point, based on antecedent conditions, the order of priorities given above, and the priorities for Hilton Creek, described below in the "Hilton Creek Water Supply Line" section.

Hilton Creek Water Supply Line

Currently it is estimated that the water supply line will be able to provide water to Hilton Creek in about 63% of years (Santa Ynez River Technical Advisory Committee 1999). This is due to the level at which the intake is located in the reservoir. Reclamation has included the addition of a pump and other equipment that will allow watering of Hilton Creek in about 98% of years (Santa Ynez River Technical Advisory Committee 1999). Installation of the pump and accompanying flexible intake will be completed by 2002.

The planned pump and provision of water in 98% of years will allow Reclamation to satisfy the mitigation agreement between NMFS and Reclamation for the seismic retrofit project. However, specific flow management for water rights releases were not determined as part of the mitigation agreement. Thus, Reclamation is proposing the specific flow targets above, in conjunction with using the pipeline supplying water to Hilton Creek to also supply water to the Santa Ynez as part of the Cachuma Project.

Reclamation proposes to operate the Hilton Creek pipeline according to the priorities for the mainstem given above, and to maintain flows between 1.5 and 5 cfs in Hilton Creek. Specific flows inside (or above) this range in Hilton Creek will depending upon water year type, natural

flow in Hilton Creek, mainstem flow needs and reservoir storage. In most years the upper release point will be used. However, releases may be shifted to the lower release point. The Adaptive Management Committee will manage Hilton Creek Releases within and among years. Factors that will be considered include: presence of spawning and/or rearing steelhead, water quality (temperature and dissolved oxygen), reservoir storage, system maintenance requirements, the relationship between flow and available habitat, water losses (flows may go subsurface near the top of the chute pool area in some years), water temperature at the intake point in the reservoir, and natural flow in the system.

Reclamation has provided NMFS with a list of maintenance activities to be performed on the water supply line (U.S. Bureau of Reclamation 1999b). Several of these activities will require that all or some of the release valves be shut down. Reclamation intends to conduct these maintenance activities only when natural flows in Hilton Creek are above 2 cfs. If this cannot be accomplished, steelhead would be relocated to suitable habitat areas if necessary.

Ramping of Hilton Creek Flows
When supplemental flows are to be reduced in Hilton Creek, the following ramping schedule will be followed:

A. Releases from 10 to 5 cfs will be reduced at no greater than 1 cfs every 4 hours.
B. Releases below 5 cfs will be reduced at no greater than 0.5 cfs every 4 hours.

During the first year of the interim period, managed flow changes will be made during the daylight hours and the creek will be monitored by Reclamation for stranding during ramping events.

State Water Deliveries

The Central California Coast Water Authority (CCWA) delivers water to the reservoir via the Santa Ynez Extension pipeline to provide additional water for local use. CCWA water originates in Central California, but has been both treated and dechloraminated. This water may be mixed with downstream release water due to the way in which the pipeline is connected to outlet works. If water is released to the Santa Ynez River for downstream water rights and/or fish resources at the same time CCWA water is being delivered, no more than half of the total flow released downstream of the dam will be comprised of CCWA water. Reclamation and CCWA have agreed that this water will not enter the stilling basin with a temperature over 18 degrees Celsius. Pipeline water temperatures are monitored every 4 hours and release water and reservoir water temperatures are checked on a daily basis when CCWA is delivering water to the Cachuma Project and the outlet works are releasing water to the Santa Ynez River (U.S. Bureau of Reclamation 1999). When the full state water project entitlement is required (12,545 acre feet per year), CCWA is obligated to deliver water to the reservoir every month, if possible. When a shortfall in deliveries occurs during some months, CCWA attempts to make complete deliveries on a yearly basis. The CCWA pipeline can deliver up to 22 cfs through the outlet works.

Future deliveries and release frequencies of CCWA water to the Santa Ynez River estimated by Reclamation are as follows:

A. Delivery of CCWA water to the reservoir is not made during spill events.

B. Releases of CCWA water to the mainstem would only occur during water rights releases from May to October, with the bulk of releases occurring July - September.

C. CCWA water will not exceed 50% of the total rate of releases to the river.

Emergency Winter Operations

The Cachuma Project was not constructed to provide flood control. However, in the past the reservoir has been used to both delay storm peaks by 2.5 to 3 hours and decrease peak outflow by a few percent. Reclamation proposes to modify this approach to better address flood control needs by including:

A. Pre-storm Reservoir drawdowns of several feet, termed "precautionary releases".

B. Release of storm inflows up to a calculated maximum flow while holding the reservoir below normal operational level, termed "pre-releases".

C. Holding the spillway gates (keeping them closed) to achieve extra reservoir capacity, termed "gateholding".

Peak storm flows can be reduced by up to 40% by combining the above operations procedures. Reclamation intends to ramp down spills at the conclusion of storm events.

Implementation: Immediate, if needed to protect life and property.

Maintenance Activities

The following maintenance activities that may impact steelhead are conducted at the Cachuma Project. These activities will not occur when water is being released from the outlet works at Bradbury Dam.

A. Annual inspection and test of the high pressure guard gate located at the outlet works gate chamber. Gates are operated one at a time from full open to full closed only when the two hollow jet valves and butterfly valve are closed.

B. Annually test the two 30" hollow jet valves and 10" butterfly valve.

C. Annually lubricate fittings on machinery deck and trunnion.

D. Periodically test and calibrate all meters.

E. Inspect trunnion anchor block four times per year.

F. Weekly operational testing of radial gate motors during spill release. Gates are left open until spill conditions occur and are then operated/tested according to spill release.

Low Flow Crossing
Reclamation proposed to sustain a low flow crossing in the mainstem near the confluence of Hilton Creek in both their biological assessment and revised project description. However, during recent consultation discussions Reclamation has indicated they have chosen not to maintain the crossing for the purposes of the Cachuma Project. Equipment may still need to ford the Santa Ynez River at the current crossing location. Reclamation proposes that NMFS July 19, 1999, letter regarding this issue be used as the basis for future equipment crossing, and; if Reclamation needs to improve the crossing they will consult separately with NMFS. This letter and Reclamation's Final Supplemental Environmental Assessment for the Bradbury Dam Modification Seismic Corrective Action Safety of Dams Program to which it refers, provide that 17 pieces of construction equipment may drive across the river bed during no more than 12 crossing events. Steelhead must be monitored via a fisheries biologist on site and construction equipment may not drive through areas containing steelhead.

Hilton Creek Habitat Modification

Reclamation proposes to modify parts of Hilton Creek to improve habitat conditions for steelhead. Specifically, passage impediment and barrier fixes and an artificial rearing channel are planned. Reclamation will modify a rocky cascade/bedrock chute section of Hilton Creek upstream of the proposed rearing channel to increase passage availability for steelhead. Structures are being designed to enable fish passage at flows of 5 cfs or more. The exact location and type of passage improvements are nearly completed. Implementation is expected in 2000.

At the Highway 154 road crossing over Hilton Creek, approximately 4,000 feet upstream of the confluence with the Santa Ynez, passage for steelhead is difficult at both low and high flows. Preliminary designs have been accomplished and are under review by Reclamation, NMFS, U.S. Fish and Wildlife Service, and CDFG. Project design is limited by the need to work within the 120 foot CalTrans easement for the HWY 154 bridge. Implementation is expected in 2002. The rearing channel, referred to as the channel extension in Reclamation documentation, will be approximately 1,500 feet long. Its exact specifications and location have yet to be finalized. Completed construction plans are not available. It is proposed that a flow control structure at the confluence with the current Hilton Creek channel would prevent flood damage to the constructed channel. This flow control structure would allow steelhead adults to migrate upstream past it. The new channel would be able to handle flows of up to 15 cfs. Implementation is expected in 2004.

Fish Rescue

Reclamation proposes to rescue steelhead in Hilton Creek in extremely dry years when water is not available to prevent fish stranding or exposure to harmful habitat conditions. Reclamation estimates this action may be needed in 2% of years. The protocol used (U.S. Bureau of Reclamation 1998b) for a previous fish rescue in Hilton Creek is proposed as the basis for any future rescue actions (U.S. Bureau of Reclamation 1999). The protocol includes trapping, handling, transporting, and release measures to minimize injury to steelhead. It is proposed that fish be relocated after consultation with NMFS and CDFG. In addition, it is proposed that predator removal be conducted in sites to receive relocated steelhead. Predator removal would be accomplished by the use of fyke nets and seines. Implementation of fish rescues will occur as needed with NMFS' prior approval.

Conservation Easements

Reclamation proposes to fund the establishment of conservation easements or lease agreements with private land owners along the mainstem Santa Ynez River and several of its tributaries downstream of Bradbury Dam in areas known to contain steelhead. Easements would allow for conservation measures such as buffer zones, riparian planting, and exclusionary fencing. Reclamation is working to obtain approximately ten miles of conservation easements or lease agreements along El Jaro Creek in the Salsipuedes watershed (a tributary of the Santa Ynez River) in the near future. Conservation easements depend upon the consent of private landowners. Reclamation is confident that ten miles of conservation easements can be obtained on El Jaro Creek (in an area known to contain rearing juvenile steelhead) by 2003 (Reclamation 2000).

Tributary and Mainstem Enhancement

Reclamation has identified eleven passage impediments and barriers on five tributaries downstream of Bradbury Dam. Reclamation will fund the improvement of passage at these sites using the Renewal Funds of the Cachuma Project and the Warren Act Trust Fund. Approximately $300,000 dollars will be available each year. Reclamation intends to accomplish passage improvement at all eleven sites by 2008 at the latest (U. S. Bureau of Reclamation 2000a). Passage improvements may be completed earlier depending upon the availability of grants from outside sources. Specific project descriptions are not available, but the passage impediments and barriers are located as follows:

Passage impediment	Project implementation
1. Cascade/Chute Passage on Hilton Creek	2000
2. HWY 1 on Salsipuedes Creek	2001
3. HWY 154 Culvert on Hilton Creek	2002
4. Six Culverts on Quiota Creek	2003
5. Road Crossing on El Jaro Creek (Tributary of Salsipuedes)	2005

6. Culvert on Nojoqui Creek 2005

Projects would be designed in consultation with NMFS and CDFG.

In addition, Reclamation proposes to institute a program of habitat enhancement in the mainstem and certain tributaries below Bradbury Dam (those known to contain steelhead). Enhancement would include the addition of instream structures to increase pool habitat cover and complexity, increasing the depth of pools, and creating new pools. Enhancement would also include riparian treatments to enhance and restore riparian vegetation where it can enhance shade and cover, and bank stabilization projects. Some information is available on pilot demonstration projects in El Jaro Creek. No other specifics regarding the location, timing, extent, or number and type of these projects is available, although Reclamation has outlined a proposed process for identifying areas where instream enhancement could be conducted by determining reasonable chance of success.

Watershed Monitoring Program

Reclamation is proposing to continue to provide funding to the fisheries monitoring program in the Santa Ynez resulting from the 1993 MOU described above. Many of the activities below would occur every year. Monitoring is intended by Reclamation to characterize fish habitat conditions, fish resources, and steelhead in the Santa Ynez River watershed below Bradbury Dam. In many cases, the specific monitoring proposed is a continuation of the current program. The monitoring program will occur for the life of the project, but it should be noted that specifics may change based on adaptive learning (management). A more complete description can be found in Reclamation's Revised Project Description for the Cachuma Project (U.S. Bureau of Reclamation 2000). The objectives of the monitoring program are to evaluate:

A. Seasonal patterns of water temperature, in both the mainstem and tributaries downstream of Bradbury Dam.
B. Diel variations in water temperature.
C. Diurnal variations in water temperature and dissolved oxygen.
D. Longitudinal gradients in water temperatures downstream of Bradbury Dam.
E. Vertical stratification and evidence of cool water upwelling in selected refuge pools.
F. Water quality suitability for various fish species including steelhead.
G. Reservoir temperature and dissolved oxygen profiles (stratification, depth of anoxic conditions, etc.).
H. Lagoon physical processes including the formation of the sandbar at the mouth.
I. Migrant fish use and timing in the mainstem and tributaries.
J. Steelhead spawning and rearing in the mainstem and tributaries.
K. Steelhead habitat availability in Hilton Creek in relation to water quantity.
L. Target flow provision in the mainstem and Hilton Creek.
M. Specific planned tributary enhancement projects (those noted above).
N. Specific habitat types in the mainstem and tributaries including their distribution, quantity, quality, and persistence over time.

In addition, Reclamation proposes to use a "properly functioning condition" methodology developed by the United States Bureau of Land Management (and suggested by NMFS during consultation) to characterize the status of instream and riparian habitats in the Santa Ynez watershed below Bradbury Dam, guide further habitat analysis efforts, and help determine locations for enhancement projects.

Public Education and Outreach

Reclamation proposes to develop a program of public education and outreach in the Santa Ynez river watershed with the goal of increasing voluntary private conservation of steelhead habitat. Technical assistance will be provided to help interested landowners implement habitat improvement measures, including funding assistance. Public workshops have occurred and more are planned. Educational materials are being prepared and distributed, including news releases to local papers, annual newsletters, a toll-free number providing news on habitat improvements, a web page, project biologist led field trips, etc..

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat Description

The steelhead population in the Santa Ynez River watershed is part of the Southern California steelhead Evolutionarily Significant Unit (ESU) which was listed as an endangered species by NMFS on August 18, 1997 (National Marine Fisheries Service 1997). The final designation of steelhead critical habitat was made on February 16, 2000 (National Marine Fisheries Service 2000). Critical habitat includes all waters and substrates below naturally impassable barriers that have existed for several centuries, and several dams that block steelhead from using historical habitat areas (National Marine Fisheries Service 1999b). This definition includes the action area for this proposed project action.

Life History and Habitat Requirements

Steelhead, an ocean-going form of rainbow trout, are native to Pacific Coast streams from Alaska south to northwestern Mexico (Moyle 1976; National Marine Fisheries Service 1997). Little is known about the specific life history and habitat requirements of steelhead populations south of San Francisco. The following description is based on the best available scientific and commercial information on the life history and habitat requirements of steelhead in all ESUs unless otherwise indicated.

The major 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; National Marine Fisheries Service 1997). Steelhead young usually rear in freshwater for one to three years (but they have been found rearing in freshwater for up to 7 years) before migrating to the ocean, usually in the spring, where they may remain for up to three years. Steelhead grow and reach maturity at age two to four while in the ocean. Adults immigrate to natal streams for spawning during October to March, but some adults do not enter coastal streams until spring. Adults may migrate several miles, 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. Spawning and smolt migration may continue through June (Busby et. al., 1996). Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years. Female steelhead dig a nest in the stream 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 three weeks to two months depending on water temperature. The young fish emerge from the nest about two to six weeks after hatching.

Habitat requirements of steelhead in streams generally depend on the life history stage (Cederholm and Martin 1983; Bjornn and Reiser 1991). Generally, stream flow, water temperature, and water chemistry must be appropriate for adult immigration and juvenile emigration. Low stream flow, 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, food resources, and suitable water quality and quantity, for ontogeny and survival during summer and winter (Bjornn and Reiser 1991). Young-of-the-year and yearling steelhead generally use riffles and runs (e.g., Roper et al. 1994) during much of a given year where these habitats exist. Young-of-the-year and older juveniles may seek cover and cool water in pools during the summer (Nielsen et al. 1994), however.

Migration and life history patterns of Southern California steelhead depend more strongly on rainfall and stream flow than is the case for steelhead populations farther north (Moore, 1980). River entry ranges from September through June, with peaks in January and February. Available data are insufficient to specifically characterize the season timing and interannual variability in steelhead migration within the Santa Ynez River. Based on data from other watersheds it is estimated that steelhead may migrate in the Santa Ynez River and its tributaries as early as November (dependant on climate conditions) with most spawning taking place in February and March (Busby, 1996). Spawning primarily begins in January and continues through early June, with peak spawning in February and March. Average rainfall is substantially lower and more

variable in this ESU than regions to the north. This coupled with diversions of water for public water supplies and agricultural use, results in an increased duration of sand berms across the mouths of streams and rivers and, in some cases, complete dewatering of habitat. Environmental conditions in some habitats are extreme (e.g., elevated water temperatures, droughts, floods, and fires) and presumably impose selective pressures on steelhead populations. Steelhead use of southern California streams and rivers with elevated temperatures suggests that populations within this ESU are able to withstand higher temperatures than those to the north. The relatively warm and productive waters of the Ventura River resulted in more rapid growth of juvenile steelhead than occurred in northerly populations (Moore 1980; McEwan and Jackson 1996). However, relatively little life history information exists for steelhead from this ESU.

Population Dynamics-Status and Distribution

Wild steelhead populations in California have decreased significantly from their historic levels (Swift et al. 1993, National Marine Fisheries Service 1997). Historical estimates for the Southern California ESU indicate a minimum run size of 11,000 adult steelhead prior to 1950, without inclusion of the Santa Ynez River population (National Marine Fisheries Service 1997). The most reliable information on the large size of the historical run in the Santa Ynez during some years comes from CDFG records of the rescue of juvenile steelhead from stranding in drying areas of the mainstem between 1939 and 1947. The number of juvenile fish rescued ranged from 39,500 to 1,036,980 (U.S. Bureau of Reclamation et al. 1995). Estimates of run sizes (returning adults) for the major rivers in the Southern California ESU in 1996 are as follows:

Santa Ynez River.....< 100
Ventura River.....< 200
Santa Clara River.....< 100
Malibu Creek.....< 100
(Busby et. al., 1996)

This dramatic decline and low abundance prompted NMFS to list the Southern California ESU of steelhead as endangered on August 18, 1997 (National Marine Fisheries Service 1997). Low abundance increases risk to this population because demographic and genetic variability in populations of this small size hinder long term survival and recovery. No time series of data are available within this ESU that can be used to estimate the current population trend, however, it is reasonable to assume that the population decline continues based on current habitat conditions.

Extensive habitat loss due to water development, land use practices, and urbanization are largely responsible for the current status of the ESU. In addition, these losses, habitat modifications, and the introduction of non-native species have resulted in increased predator populations in some river systems, which has led to an increase in the level of predation experienced by steelhead. Finally, hatchery practices and rainbow trout planting may have led to genetic introgression, but documentation is lacking to fully assess the situation (Busby et. al., 1996). The run estimates

above are not based on precise survey data and cannot be used to quantitatively assess the effects of specific project actions.

The most current information available regarding steelhead numbers confirms, but cannot specifically quantify, the small size of the ESU and Santa Ynez River steelhead population. Steelhead redd counts, migrant trapping, electrofishing, snorkel surveys and bank observations have been ongoing in the Santa Ynez River and its tributaries below Bradbury Dam starting in 1994 (A smaller survey effort was conducted in 1993). The highest number of redds counted in the Santa Ynez basin below Bradbury Dam was 92 in 1997. A survey with similar coverage in 1998 counted only 8 redds (Engblom 1999). The highest number of adult upstream migrants ever counted in one year is 68 (Engblom 1999). In addition, some of the fish or redds counted may be non-anadromous rainbow trout (see below). The amount of these fish in the action area is unknown.

The only other multi-year set of quantitative data on steelhead numbers in the Southern California ESU comes from fish trapping data on the Santa Clara River gathered from 1994-2000. These data are not comprehensive enough to specifically estimate the size of, or trends in, the Santa Clara River steelhead population. Less than 10 adults were found during the entire sampling period. Smolts returning to the ocean each year ranged in number from 81 to over 800 when the smolt trap was heavily used (National Marine Fisheries Service 1997a, National Marine Fisheries Service 2000). Both the numbers of adults and smolts counted at the diversion probably represent a subset of the total population based on a number of factors including when trapping was done in the fish ladder, when the smolt trap was operated, and the possibility for smolts to pass directly over the diversion sill and avoid the smolt trap.

There is no information available from any other watersheds in the Southern California ESU that could be reasonably interpreted to indicate a larger population size than described above. In addition to the likely continued downward population trend, NMFS believes the restricted spatial distribution of the remaining populations in the ESU is likely to reduce opportunities for recolonization of streams suffering local population declines and/or extinctions (NMFS 1997). The steelhead population in the Santa Ynez River is likely one of the largest remaining in the Southern California ESU. Ensuring the ability of this population to continue to exist into the future while retaining its potential for recovery is critical to the ESU's survival and recovery.

Critical Habitat Status

Steelhead critical habitat in the Southern California ESU has been affected by loss and modification. Information is not available to specifically quantify the condition of critical habitat and its constituent elements (including substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, habitat area, and passage conditions). The following information regarding habitat conditions is based on project reviews, site visits, and field investigations by NMFS: Poorly designed road crossings currently block access to, and fragment habitat; water use partially or completely dewaters streams; flood control

and other modifications (such as gravel mining) to the banks and beds of streams and rivers reduce their quality for steelhead (and in some cases preclude steelhead use); water quality may be impacted from urban and agricultural runoff; and the introduction of non-native species has resulted in increased predator populations in some river systems, which has led to an increase in the level of predation experienced by steelhead. Thus, many of the constituent elements of critical habitat have been temporarily and permanently modified in ways detrimental to the biological needs of steelhead and these modifications hinder the ability of designated critical habitat to provide for the survival and recovery of the Southern California ESU.

Analysis of the Species/Critical Habitat Likely to Be Affected

Proposed operations, maintenance, and conservation measures for the Cachuma Project are expected to occur far into the future (several decades). Steelhead from the Southern California ESU are likely to be adversely affected by the project action through loss, alteration, and reduction of constituent elements of critical habitat including water quantity, cover/shelter, water velocity, food, water quality, and passage conditions. Beneficial effects including increased access to tributary and mainstem habitat areas, and improved rearing conditions in a portion of the mainstem, are also expected to occur. All freshwater life stages of steelhead are present in the action area, with the abundance of a particular life stage dependent upon time of year.

Generally, instream habitat in the action area (Figure 1) includes pool, run, and riffle habitat when water is present, based on observations made by NMFS staff. Cobble, boulder, and sand particle types are common in the mainstem of the Santa Ynez River and the tributaries listed above, with some spawning sized gravels available in certain reaches. Riparian vegetation in the action area is similar to riparian vegetation common to rivers and creeks of this size in Southern California and may also be affected. The mainstem and tributaries contain steelhead spawning, rearing, and migratory habitat of various quality, including vegetative cover, pools, riffles, and runs. Modification of these habitats is likely to adversely affect critical habitat for steelhead.

These adverse effects will occur in combination with other factors presently affecting the steelhead population in the Santa Ynez River watershed below Bradbury Dam and throughout the area used by the Southern California steelhead ESU. Consequently, the status of this species, its life history and habitat requirements, and recent factors affecting populations (i. e., environmental baseline) are described as follows.

ENVIRONMENTAL BASELINE

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area. The environmental baseline is a "snapshot" of a species' health at a specified point in time. It does not include the effects of the proposed action under review in the

consultation.

Status of the Listed Species in the Action Area

The action area encompasses the entire area thought to be used by the steelhead population in the Santa Ynez to conduct the freshwater portion of their life cycle. This includes utilization of the entire 48 miles of mainstem below Bradbury Dam as a migration corridor, spawning and rearing in the first ten miles of mainstem below Bradbury Dam, and migration, spawning, and rearing in 5-6 tributaries below the Dam. Steelhead adults, eggs, fry, juveniles, and smolts all occur in the action area affected by the project. Available data are insufficient to specifically characterize the seasonal timing and interannual variability in steelhead migration within the Santa Ynez River. Based on data from other watersheds it is estimated that steelhead may migrate in the Santa Ynez River as early as November (dependant on climate conditions) with most spawning taking place in February and March (Busby 1996). Limited information from the Santa Ynez watershed indicates that the usual time of upstream migration is February to April with spawning activity observed during this same period. In wet years, migration can begin in late January and continue until early May with most spawning between February and April (Engblom 1999d). Rearing (and oversummering of adults) usually occurs from Spring until the next Winter wet season, when smolting may occur. In the Southern California ESU it is hypothesized by NMFS that juveniles may spend more than one summer in freshwater if access to the ocean is not available or food supplies are low, limiting growth.

Data on steelhead presence and numbers in the mainstem and tributaries indicates that the area with the most juveniles and/or migrants and/or redds varies by year, and in all cases numbers are very low. Tables 2 and 3 show numbers of steelhead observed in both the mainstem and the several tributaries still containing steelhead below the dam: Hilton Creek, Salsipuedes Creek, El Jaro Creek (a tributary of Salsipuedes), Nojoqui Creek, and Quiota Creek. In addition, migrating steelhead have been observed via migrant trapping in Alisal Creek and Nojoqui Creek[1]. As shown in the tables, it appears that relatively more spawning takes place in the tributaries. Only four redds have been found in the mainstem in the years surveyed (1994-1999). All were found in 1999 (Engblom 1999a). However, access problems related to private property have prevented surveys from occurring in areas of the mainstem and the amount of spawning that may occur in these areas is unknown (U.S. Bureau of Reclamation 1999).

The number of observed rearing steelhead in tributaries and the mainstem appears to fluctuate on a yearly basis from less than 10 fish to over 1000 (mainstem and Hilton Creek). But in only one case were more than 2,300 young of the year with a few juveniles ever observed in the watershed (Engblom 1999). Fluctuations are not concurrent, i.e., the area with the most juvenile fish varies from year to year. Rearing juveniles have been observed mostly in pools but also in a few runs and riffles (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997,

[1]Fish have been trapped moving downstream in San Miguelito Creek. However, they did not exhibit smolting characteristics during the three years sampled.

Engblom 1999, Engblom 1999a, U.S. Bureau of Reclamation 1999).

Steelhead appear to persist in the mainstem from 0-10 miles downstream of Bradbury Dam over the summers of some of the years observed (in other years steelhead may not have survived, or poor visibility conditions may have prevented observation, etc.). Steelhead have been occasionally observed further downstream. In 1995 and 1996 a few adults were observed approximately 15 miles downstream of the dam. In 1998 a few adults were observed 20 miles downstream of the dam. (U.S. Bureau of Reclamation 1999). Additionally, two adults were observed in the lagoon in 1998, although these appear to be resident fish based on scale samples (Titus 1999).

Table 2. Numbers of steelhead observed in the mainstem from 1995-1999 in HWY 154, Refugio, and Alisal Reaches downstream of Bradbury Dam.

Location	**Date**	**Number of Steelhead Observed: all age classes**
HWY 154, 0-0.5 miles from Bradbury Dam (0.5-3.4 miles is inaccessible due to private property issues)	1995 August September October	173 114 100
	1996 May June August October	7 4 (no Long Pool survey[1]) 26 23
	1997 October	14 (no Long Pool survey[1])
	1998 June	225
	1999 June	55
Refugio Reach, 3.4-7.9 miles from dam	8/23/95 9/20/95 10/31/95	54 5 10
	6/20/96 8/16/96 9/22/96	2 1 2
	1997	0
	1998 June	>1000
	1999	9
Alisal Reach 7.9- 10 miles from dam	8/23/95 9/20/95 10/31/95	46 30 40
	7/16/96 9/19/96 October	4, poor visibility 11 8
	1997 June October	1 0
	1998 June	2
	6/14/99 8/30/99	54 1

Modified from U.S. Bureau of Reclamation, 1999, to reflect number of fish observed in entire reach areas. Data were presented by Reclamation as number of fish per 1000 ft.

[1] Poor visibility prevented survey of the Long Pool.

Table 3. Steelhead migrant trapping, redd surveys, and snorkel/bank observations in the Santa Ynez River Watershed below Bradbury dam 1994-1999.

Activity	Year	Location	Description	#Captured/ Observed
Migrant Trapping	1994	Hilton Creek	Upstream (u/s) Downstream(d/s)	3 adult 0
		Salsipuedes Creek	Upstream Downstream	1 adult 10 juvenile/adult
	1995	Hilton Creek	u/s d/s	52 adult 12 adult
		Alisal Creek	u/s d/s	2 adult 0
		Quiota Creek		0
		Salsipuedes Creek	u/s d/s	2 adult 4 juvenile/adult
	1996	Hilton Creek	u/s d/s	3 adult 0
		Alamo Pintado Creek		0
		Nojoqui Creek		0
		Salsipuedes Creek	u/s d/s	2 adult 4 juvenile/adult
		Mainstem	u/s d/s	1 adult 0
	1997	Hilton Creek	u/s d/s	2 adult
		Alamo Pintado Creek		0
		Nojoqui Creek		0
		Salsipuedes Creek	u/s d/s	34 Adult 10 juvenile/adult
		San Miguelito Creek	u/s d/s	no trap 1 juvenile
		Mainstem	u/s d/s	0 1 adult

Activity	Year	Location	Description	#Captured/ Observed
	1998	Hilton Creek Nojoqui Creek Salsipuedes Creek San Miguelito Creek	u/s d/s u/s d/s u/s d/s	4 adult 0 2 adult 1 adult 1 adult 17 juvenile/adult
	1999	Hilton Salsipuedes Creek San Miguelito Creek	u/s d/s u/s d/s u/s d/s	0 0 40 6 0 1
Redd Surveys	1995	Hilton Creek Quiota Creek Salsipuedes Creek[1] Mainstem		8 2 no survey 0
	1996	Hilton Creek Salsipuedes[1] Creek Mainstem		0 17 0
	1997	Hilton Creek Alamo Pintado Creek Nojoqui Creek Salsipuedes[1] Creek San Miguelito Creek Mainstem		0 0 0 43 49 0

Activity	Year	Location	Description	#Captured/ Observed
	1998	Hilton Creek Alamo Pintado Creek Nojoqui Creek Salispuedes[1] Creek San Miguelito Creek Mainstem		2 0 0 4 2 0
	1999	Mainstem Salsipuedes Creek San Miguelito Creek		4 40 20
Snorkel/Bank observations	1994	Mainstem Salsipuedes Creek		3 104(yoy), 12 juveniles
	1995	Mainstem Hilton Creek Salsipuedes[1] Creek Nojoqui Creek		44-296[2] 224(yoy)25 (adult) 6-15[2] 0
	1996	Mainstem Hilton Creek Salsipuedes[1] Creek Nojoqui Creek		39 no survey 64 0
	1997	Mainstem Hilton Creek Salsipuedes[1] Creek Nojoqui Creek		1 19-25[2] yoy 394 (yoy/juv/adult) 0
	1998	Mainstem Hilton creek Salsipuedes[1] creek Nojoqui Creek Quiota Creek		100-1200[2] 1000 yoy mostly 45[3] juv/adult 1 100 yoy
	1999	Mainstem Salsipuedes[1]		118 98

(Engblom 1999, 1999a).

yoy= young of the year
juv= juvenile

[1] Includes El Jaro Creek, a tributary of Salsipuedes Creek.
[2] Multiple surveys
[3] Estimate, data not compiled

It is also noted by NMFS that the numbers for the mainstem in Tables 2 and 3 do not add up precisely. In NMFS's opinion, this is due to a lack of standardized data recording and reporting techniques among the entities conducting and reporting research on the Santa Ynez. The numbers are fairly close however, especially relative to each other, and clearly reflect the small size of the population.

Scale samples from Santa Ynez River steelhead analyzed by CDFG in 1999 showed evidence of steelhead/rainbow trout with and without growth commonly associated with time in the ocean; which may indicate the presence of both life forms (Titus 1999). The number of resident rainbow trout in the action area is unknown. The exact relationship between resident rainbow trout and steelhead is unknown (NMFS 1997), but it is thought that anadromous and resident forms can interbreed, and that anadromous individuals can have resident offspring and vice versa (NMFS 1997).[2]

The small number of steelhead observed in the Santa Ynez watershed is not encouraging with respect to the population's chance of long term survival in the action area. As noted above, the area with the most juveniles and/or migrants and/or redds varies by year, and in all cases numbers are very low. For example, Salsipuedes Creek appears a fairly consistent producer of juveniles, although in some years Hilton Creek and/or the mainstem contain more juveniles. NMFS concludes that the population is vulnerable not only to environmental variation (natural and human caused) but also to the loss of genetic variation due to low population size (U.S. Department of Energy 1993).

Quantity and Quality of Critical Habitat in the Action Area

Watershed Overview

The Santa Ynez River is one of five major river basins (Santa Ynez, Santa Maria, Ventura, Santa Clara, Malibu Creek) used or potentially used by the Southern California steelhead ESU. The watershed drains an area of approximately 900 square miles. The river itself is about 90 miles in length and flows west to the Pacific Ocean between the Pursima Hills and San Rafael Mountains (4,000 to 6,000 feet) to the north and the Santa Ynez Mountains (2,000 to 4,000 feet) to the South. The climate is typical of Southern California, with hot dry summers and cool wet winters. Droughts lasting several years reoccur, as do wetter periods (U.S. Bureau of Reclamation et al. 1995).

Land use in the Santa Ynez River watershed is mainly private, and within the jurisdiction of Santa Barbara County. There is some United States Forest Service (USFS) land in the upper

[2]In addition, resident rainbow trout from the reservoir may follow spill releases over/through the radial gates and into the lower Santa Ynez, although there is no direct evidence to substantiate this. These fish may be from hatchery stock, as CDFG has planted a variety of strains in the basin above the Dam for many years (U.S. Bureau of Reclamation 1999).

portion of the watershed above Bradbury Dam. Vandenburg Air Force Base has jurisdiction over the river mouth and estuary. There are some Bureau of Land Management lands in the watershed, along with Reclamation lands at the Cachuma Project. Agriculture, including ranching, is a dominant land use in Santa Barbara County and the Santa Ynez watershed. Small cities such as Lompoc, Solvang, and Buellton, are also found along the river below Bradbury Dam. The Santa Ynez Indian Reservation is also located in the watershed (U.S. Bureau of Reclamation et al. 1995).

Above Bradbury dam, the upper portion of the watershed is regulated by Gibraltar and Juncal Dams. Gibraltar Dam was completed in 1920 and regulates 216 square miles of the watershed. Juncal Dam was completed in 1930 and regulates 14 square miles. Gibraltar Dam's reservoir has a capacity of about 8,600 acre feet, while Juncal's has a capacity of about 5,000 acre feet. Diversions from Gibraltar are not operated on a safe yield basis, and could range from 9,000 acre feet to zero depending upon climate conditions. Juncal Dam currently diverts on average 1,750 acre feet of water per year (U.S. Bureau of Reclamation et al. 1995).

The area currently available to steelhead includes the mainstem below Bradbury Dam, approximately 48 miles long, and its tributaries. The river below the dam flows in a moderately constrained valley until it passes through the "Narrows" and emerges onto the Lompoc Plain. The active channel ranges from 40 to 400 feet wide, with a flood plain that is constrained by bedrock in the area termed "the Narrows", and over 1,000 feet wide both upstream at Solvang, and downstream at Lompoc (U. S. Bureau of Reclamation, 1999). Groundwater below Bradbury Dam follows the same pattern. The Santa Ynez Riparian Basin consists of the shallow alluvial material adjacent and hydrologically connected to the surface flows of the Santa Ynez River until the Lompoc Plain is reached. Here, the groundwater basin expands (Lompoc Basin). The Santa Ynez River is the primary water supply for the Santa Ynez Basin and an important component of the Lompoc Basin, which also receives water from precipitation, seepage from other streams, irrigation return flow, and wastewater effluent. Storage in the Santa Ynez River Basin depends upon climate conditions. Demand is greater than the supply in dry conditions. The Lompoc Basin has experienced declines in the level of groundwater available, but specific estimates of available supply appear variable. The Cachuma Project operates under Water Rights Order 89-18 to supply water for recharge to both these basins in certain years and climate conditions (U.S. Bureau of Reclamation et al. 1995).

Reclamation has provided summary maps of habitat conditions in the watershed below Bradbury Dam. NMFS considers these maps to be preliminary because: 1) some of the habitat information has been collected using different sampling strategies sometimes in different but overlapping areas, and sometimes by different agencies during different years. 2) Much of this information cannot or has not been synthesized into a comprehensive quantitatively based whole that provides a clear picture of habitat conditions from a watershed assessment perspective. NMFS does consider the maps useful as an interim general overview and refers those interested to the biological assessment. NMFS has chosen to describe habitat quality in narrative form below.

Habitat Quality - Mainstem

The information available indicates habitat conditions for steelhead in the mainstem and lagoon are typical of conditions found in large rivers in Southern California, and reflect natural climate conditions plus human impacts. Substrates are a mix of cobble, gravels, and fine sediment. Pool habitat is often limited, and the river channel is braided in some areas (U. S. Bureau of Reclamation, 1999). The amount of vegetation in riparian areas varies, and in many cases does not provide shade or cover to the wetted channel during the summer, based on observations by NMFS biologists. Water temperatures are typical of those found in large Southern California rivers. Summer temperatures are often over 25 degrees Celsius during the day for several weeks during most summers (U. S. Bureau of Reclamation, 1999). The majority of the mainstem serves as migration habitat in NMFS's judgment, although as noted above, rearing and some spawning takes place in the first ten miles below the dam. Conditions in this area are often poor for rearing or spawning, as for example cover and pool habitats are sparse (U.S. Bureau of Reclamation 1999, field observations by NMFS biologists during 1998 and 1999).

Habitat Quality - Tributaries

Portions of the tributaries currently utilized by steelhead below the dam often have better habitat conditions than much of the mainstem. The lower reach (1,380 feet) of Hilton Creek (where the lower outlet of the water supply line will be operated and where fish rescues have occurred) is observed by NMFS biologists to be a well-confined channel shaded in many areas by riparian vegetation and by valley walls in incised areas. A rocky cascade and bedrock chute are likely passage impediments (but not a complete blockage) for migrating steelhead. Habitat conditions are considered good for steelhead spawning and rearing both below and above the passage impediment in most cases, although just above the passage impediment there is about 100-200 feet of riffle/run habitat with little, if any, riparian cover (U.S. Bureau of Reclamation 1999). The water supply line's two outlets are both above the passage impediment. Habitat above the impediment to the boundary of Reclamation property (1,593 feet - the location of the upper release point) appears to be in fairly good condition based on the best professional judgement of NMFS staff. According to Reclamation, habitat conditions beyond this point are similar or better (U.S. Bureau of Reclamation 1999).

Salsipuedes Creek and its tributary El Jaro Creek are located upstream of the town of Lompoc near the area known as the Narrows. Habitat conditions vary in this system, with a high silt load found in the lower part of the system in 1996, and a lack of canopy cover in some areas. Good quality habitat for steelhead also exists in both creeks. Salsipuedes Creek has good canopy cover, pool, and riffle areas for spawning and rearing steelhead near its confluence with El Jaro Creek. El Jaro Creek also has good steelhead habitat in this area and may have good habitat further upstream (U.S. Bureau of Reclamation 1999, field observations by NMFS biologists).

Quiota Creek drains to the Santa Ynez River downstream of the town of Santa Ynez and upstream of Solvang. Habitat conditions for steelhead appear good, but access problems prevent

consistent survey efforts. Nojoqui Creek (near Buellton) appears to contain good spawning and rearing habitat for steelhead in upper reaches, but only 1 or 2 steelhead have ever been documented in this creek. Data are currently not available to pinpoint reasons for the lack of use of this creek by steelhead. Habitat surveys have not been done in Alisal Creek, and a dam and small reservoir exist about 2-3 miles upstream of its confluence with the Santa Ynez. San Miguelito Creek joins the Santa Ynez River via a 2 mile long concrete box culvert at the city of Lompoc. The concrete box culvert has several drop structures and is expected to prohibit upstream fish passage. Other passage barriers exist upstream of the box culvert, but fish habitat above the culvert is considered fairly good in Reclamation's opinion. (U.S. Bureau of Reclamation 1999, field observations by NMFS biologists).

Factors Affecting Species Environment Within the Action Area

Steelhead habitat in the action area identified above is, or may be, affected by alteration or modification of stream flow and instream habitat, passage impediments and barriers, agricultural activities, flood control activities, urbanization, poor water quality, and sedimentation, based on the observations of several NMFS fishery biologists, and the record of NMFS section 7 consultations in the watershed. For example, six crossings in Quiota Creek are likely partial (4-5) or complete (1-2) passage barriers. Two problem crossings have been identified in Salsipuedes Creek, and as noted above, the large concrete box culvert in San Miguelito Creek impedes upstream adult passage. The introduction of exotics, including steelhead predators such as large mouth and small mouth bass (*Micropterus salmoides and M. dolomieui*), is also of concern (U.S. Bureau of Reclamation 1999). These species, and bluegill (*Lepomis macrochirus*), are often found in habitats containing steelhead fry and young of the year, and are expected to prey upon them (U.S. Bureau of Reclamation 1999). The amounts and frequencies of many of these activities, and their precise impacts to the small steelhead population and steelhead critical habitat are unknown.

Cachuma Project

Cachuma Project construction, operation and maintenance activities have occurred since the early 1950s, approximately two decades prior to the Endangered Species Act of 1973. The effects of project construction and operation during this time period are reflected, in part, in the current status of the species being considered in this biological opinion. This includes the complete blockage of access to the bulk of steelhead spawning and rearing habitat noted above and the impoundment of sediment that would normally be transported and distributed (at rates dependant upon climate conditions and other factors) throughout the mainstem Santa Ynez River. Operating and maintenance procedures have varied during the past. For example, procedures for water rights releases and winter flood control have varied over the years (U.S. Bureau of Reclamation 1999, U.S. Bureau of Reclamation et al. 1995). Data do not exist to precisely estimate the effects to steelhead and steelhead habitat of changes in operations and maintenance that have occurred since the project's construction. In general, the construction and operation of Bradbury dam has blocked access to spawning and rearing habitat, changed water flow patterns

downstream, resulting in a loss of migration time for steelhead, a potential for fish stranding, and modified rearing conditions in the mainstem in both beneficial and detrimental ways. Thus, the construction, operation, and maintenance of Bradbury Dam is one of the major contributors to the current status of steelhead and their habitat in the Santa Ynez River. Recent operating procedures (since 1995) have provided additional water during summers to increase the amount and quality of rearing habitat in a portion of the mainstem over past operating procedures.

Other Section 7 Actions

NMFS has conducted several section 7 consultations in the action area just prior to and after steelhead were listed in August 1997. The specific actions, and impacts to steelhead are summarized in Table 4.

Table 4. Section 7 consultations in the action area from March 10, 1997 to present.

Type and location	**Impact determination**
Bradbury Dam Seismic Retrofit	Conference Letter - Not Likely to Adversely Affect (NLAA) *Currently under reinitiation
Emergency Flood Response in Alamo Pintado Creek	NLAA
Embankment stabilization (2) in Salsipuedes Creek	NLAA
Bridge replacement St. Route 246, Santa Rosa Creek	NLAA
Embankment replacement/rockslope protection of HWY 154, Alamo Pintado Creek	NLAA
100 feet of rock rip rap in Alamo Pintado Creek	NLAA
60 feet of rock rip rap in Alamo Pintado Creek	NLAA
Pipe and tire dike in Salsipuedes Creek	NLAA
Removal of Hilton Creek Temporary Watering Line	Likely to adversely affect, not likely to jeopardize 11 fish rescued 3 juvenile steelhead killed
Steelhead rescue at Hilton Creek	860 steelhead relocated (3 adults) 5 juveniles killed Approximately 10% received electrical burn injury *Currently under follow-up consultation
Use of temporary road for seismic retrofit project	NLAA

Type and location	Impact determination
Construction of permanent Hilton Creek Water Supply Line	NLAA
Initial test of Hilton Creek Permanent Water Supply Line	NLAA
Opening Ceremony for Hilton Creek Permanent Water Supply Line	NLAA

NMFS has authorized the following take from scientific research permits under Section 10(a)(1)(A) of the ESA in the Southern California ESU as shown in Table 5.

Table 5. Authorized take of Southern California ESU steelhead.

Authorized Take	Observe/Harass		Capture/Release (Mortality in parentheses)		Rescue		Carcass
Permit	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	
1050	25	600	60(1)	500(40)		300	25
1059	50	1500		400(20)			50
1091	50	400	150(1)	110(4)			15
1097	10	400		200(10)			50
1105	50	150					50
1166	20	200		50(3)			20
1180	50	400		100(5)			50
1184	50	200		100(5)	50	500	50
Total	305	3850	210(2)	1460(87)	50	800	310

Several of these take authorizations cover the entire Southern California ESU and could occur on the Santa Ynez River population. Currently only permit number 1091 occurs on the Santa Ynez River steelhead population. The total amount of steelhead take reported under the above permits for 1999 is shown in Table 6.

Table 6. Reported take of Southern California ESU steelhead in 1999.

Authorized Take	**Observe/Harass**		**Capture /Release (Mortality in parentheses)**		**Carcass**
Permit	Adult	Juvenile	Adult	Juvenile	
1050		3	2(0)		
1091	57	160	42(2)		4
1184		several			
Total	57	163+	44(2)		4

NMFS has received 4 applications for new section 10(a)(1)(A) permits for the Southern California ESU requesting observe/harass take of adult and juvenile steelhead, capture/release take with unintentional mortalities, and collection of steelhead carcasses for scientific research purposes. The take applied for is shown in Table 7.

Table 7. Proposed take of Southern California ESU steelhead.

Proposed Take	**Observe/Harass**		**Capture/Release (Mortality in parentheses)**		**Rescue**		**Carcass**
Permit	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	
1110	1,200	12,000	120	1,440(120)	60	1,200	3,600
1164	300	5,000	100(5)	200(10)			40
1207			25	180			25
1208	25	1,050		120			10
Total	1,525	18,050	245(5)	1,940	60	1,200	3,675

Due to the capture/release and observe/harass take allocation of approximately one-third to one-half of the known adult steelhead population in the Southern California ESU, proposed capture and release take for a similar number of adult steelhead, proposed observe/harass for over twice the number of known adult steelhead, and exceedance of observe/harass take and unintentional mortality take in the implementation of permit 1091, NMFS is currently reviewing all authorized and proposed scientific take under section 10(a)(1)(A) in the Southern California ESU.

EFFECTS OF THE ACTION

The effects of the project action on steelhead and their critical habitat are those associated with the future operations and maintenance of the Cachuma Project. In general, critical habitat is likely to be adversely affected by changes to river flows, which will affect habitat quantity and quality. Steelhead may be harmed or killed by stranding, delay or prevention of migration, relocation, and degradation of habitat quantity and quality. The duration of many of these effects will be variable and somewhat unpredictable, and is expected to last as long as the project is operated and maintained. There are no other indirect or inter-related and inter-dependent effects of this project action.

Methodology for Effects Analysis

As noted (in the "Status of the Species and Critical Habitat" and "Environmental Baseline" sections) population data in the action area are not sufficient to allow direct quantification of the number of steelhead affected by the project's activities. Where NMFS has no specific data on the demographic responses of listed species, NMFS bases its assessment on the relationship between habitat and species' populations and assumes that an activity that significantly destroys or modifies habitat of listed species would be followed by a significant demographic response. Based on the extensive amount of published literature on the relationship between changes in habitat quantity, quality, and connectivity and the persistence of plant and animal populations, we believe our assumption is consistent with the best scientific and commercial information available. For detailed summaries readers can refer to the work of Fiedler and Jain (1992), Gentry (1986), Gilpin and Soule (1986), MacArthur and Wilson (1967) Nicholson (1954), Odum (1971, 1989), Shafer (1990), and Soule (1986, 1987).

Similarly, to determine a species' needs, NMFS often looks to historical conditions as a guide to conditions associated with self-sustaining and self-regulating populations. Where used, these conditions are not necessarily management goals. Instead, they serve as an important reference point for gauging the effects of projects on the species' ability to survive in the current ecosystem. In such cases, a project often has fewer impacts on a species where it minimizes or avoids changes to, and/or mimics the conditions necessary for the species' long-term survival to protect listed species from adverse effects. This approach has been used in evaluating this project, with the following important caveat: In some cases it is important to recognize that providing or mimicking a more "natural" condition with respect to one or more habitat features may be detrimental or neutral in effect to a listed species if other habitat features are not, or cannot be addressed in a coordinated fashion. For example, a return to what is potentially a more natural flow condition in the summer in the action area would likely increase the amount of time that the river bed below the dam was dry and incapable of supporting steelhead. Because Bradbury Dam precludes steelhead access to the river and tributaries above it, steelhead cannot escape detrimental habitat conditions that would occur in this area of the mainstem; a return to historic pre-dam conditions of flow would be a significant adverse impact. Thus, the analysis

below uses natural or historic conditions only as reference points where appropriate.

The approach used in this assessment is intended to determine if the proposed action is likely to degrade the quantity and quality of habitat necessary to support the population of steelhead in the action area. The assessment approach is intended to determine if the frequency, duration, and magnitude of habitat impacts carried forward into the future are likely to impact the size, number, dynamics, or distribution of the steelhead population in the action area in ways that can be reasonably expected to appreciably reduce the likelihood of both the survival and recovery of the Southern California Steelhead ESU. The ability of the ESU to survive and recover is contingent upon maintaining a sufficient ESU population represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species life cycle, including migration, spawning, and rearing.

A large amount of work has been done to characterize fish and wildlife habitat in the Santa Ynez River below Bradbury Dam and in Hilton Creek. Documents which summarize investigations and the results of data collection include: The 1995 Final Environmental Impact Statement/Environmental Impact Report for Cachuma Project Renewal (U.S. Bureau of Reclamation et al. 1995), the Revised Fish Resources Technical Report for the Final EIS/EIR for Cachuma Project Renewal (U.S. Bureau of Reclamation et al. 1995a), numerous Santa Ynez River Consensus Committee and Technical Advisory Committee (Santa Ynez River Consensus Committee and Technical Advisory Committee) reports and publications (1995-1999) of recent data collection/habitat studies, the draft and final biological assessment for the project (U.S. Bureau of Reclamation 1998, 1999), the Lower Santa Ynez River Fish Management Plan (Santa Ynez River Technical Advisory Committee 1999b), and a California Department of Water Resources Draft Instream Flow Needs Study (1989).

NMFS has analyzed the effects of the Cachuma Project by utilizing information from the above documents, the biological assessment and revised project description (U.S. Bureau of Reclamation 1999, 2000) and the scientific literature. The most current site-specific information has been used where such information exists and reflects the best available data. Many of the activities described above in the Description of the Proposed Action section occur concurrently in the action area. Thus, NMFS has focused where possible on analyzing the project activities in a combined fashion to synthesize effects. Where a lack of information prevents NMFS from being able to analyze the effects of a particular action or actions, NMFS has separated these actions out.

The proposed project is expected to affect the following essential features of steelhead critical habitat: passage conditions, usable area, cover/shelter, water quality (temperature, dissolved oxygen, turbidity and sedimentation), riparian vegetation, and food. Effects to these critical habitat features and the resulting and direct effects to steelhead from the proposed project are described as follows.

Effects to Migrating Steelhead

In order for the Santa Ynez steelhead population to maintain its viability, adults must have adequate opportunity to migrate to the remaining spawning areas in the watershed below the dam, and smolts must have adequate opportunity to reach the ocean. Access to spawning areas in the watershed below the dam requires (among others) sufficient streamflow to enable steelhead adults to swim through shallow areas of the Santa Ynez River on their way to tributary and mainstem spawning areas and on their (if they survive spawning) and their progeny's return to the ocean. In addition to minimum flows needed at shallow areas, flows must be available long enough for steelhead to complete their journey. The project action affects migration opportunity by the impoundment of water at the reservoir during the wet season (usually December-April). Impoundment will reduce the amount and duration of surface flows in the mainstem below the dam during the time adult steelhead and smolts are migrating.

Water Impoundment

Mainstem Santa Ynez
Adult upstream passage conditions have been analyzed by Reclamation and The Santa Ynez River Technical Advisory Committee through the use of cross sections at areas most likely to impede steelhead passage at low flows (Santa Ynez River Technical Advisory Committee 1999; U.S. Bureau of Reclamation et al. 1995). In this case the criteria used for passage availability was 8 feet of contiguous wetted channel at ½ foot of depth at shallow river areas (U.S. Bureau of Reclamation 1999). Different flow at each transect is required to produce this depth and width: 30 cfs at Lompoc (37 miles downstream of Bradbury Dam), 15 cfs at Cargasachi (24 miles downstream of the dam), and 25 cfs at Alisal Bridge (10 miles downstream of the dam). In the opinion of NMFS fishery biologists and hydraulic engineers, these criteria are close to the minimums at which passage is possible, not water depth and width that produce good migration habitat.

The amount of time it takes adult steelhead to migrate in the Santa Ynez River is unknown (U.S. Bureau of Reclamation 1999). A number of factors affect the distance salmonids can or do travel each day of migration in a river or creek, including: stream flows, time of day, turbidity, and temperature. The information available indicates that stream flow is likely the dominant factor (Shapovolov and Taft 1954, Banks 1969). Steelhead will pause migration if flows decrease quickly after storms, and resume when the next storm increases flow. They may also resume migration at low flows if the period without storm flow is prolonged (Shapovolov and Taft 1954). Examination of the available scientific information on the migration of salmonids indicates that when averaged, coho, sockeye, and chum are able to migrate about 20 miles per day (with a range of 8 to 31 miles per day depending upon species and run) (Groot and Margolis 1991). Dettman and Kelly (1986) observed upstream migration rates of from 1 to 10 days (average 4 days), following increases in flow, for the first adult steelhead of a spawning group to travel the lower 18.5 miles of the Carmel River, California. Review of the two flow events that required 9 and 10 days for the first adult steelhead appear to be associated with the two largest

flow events over the 13 years of observation.

Although speculative due to incomplete sampling, trapping data from Hilton Creek provides some indicators of upstream migrant behavior in the Santa Ynez River. The following information is based on a qualitative review relating trapping records of upstream migrating steelhead (>340mm) from Hilton Creek to flow records at the Solvang gauge (Alisal Bridge area). The data from 1995 and 1997 represent years of abundant discharge with multiple flow events and low discharge with a single event, respectively. The 1995 Solvang gauge record indicates that daily average flow following the first storm event in January to the end of May ranged from 95 cfs to 13,330 cfs. Thirty (65%) of the total number of fish trapped occurred on the descending limb of the hydrograph within 10 days of distinct flow events. Nine fish (20%) were trapped on the apparent rising limb of the hydrograph within approximately 3 days of these peaks. The 1997 Solvang gauge record indicates one primary flow event where daily average flow recorded 166 cfs on January 26 and steadily declined to 0 cfs by the end of May. Eight (73%) of the total number of fish trapped occurred within 6 days of the flow peak. However, this event was preceded by an initial rise in the daily average flow from 37 cfs (January 22) to 143 cfs (January 23) resulting in additional migration opportunity relative to the January 26 peak. One fish was trapped the day following this initial increase in daily discharge. Gauge records in the lower Santa Ynez River near Lompoc indicate adequate flow conditions for migrating steelhead occurred prior to the flow events recorded at the Solvang gauge in both 1995 and 1997, thus, providing an opportunity for steelhead to enter the system and migrate through the lower reaches of the Santa Ynez River prior to ascending the remaining distance to spawning areas in the tributaries and mainstem near the dam. It must also be noted that in addition to the uncertainty regarding the time it takes steelhead to migrate in the Santa Ynez River, the river's lagoon at its connection with the Pacific Ocean may become blocked (like many Southern California streams) by a sand berm at times during steelhead migration season, dependent upon climate conditions. According to Reclamation, no information is available regarding the frequency the bar is open or the amount of flows required to breach it (U.S. Bureau of Reclamation 1999).

Reclamation proposes to continue to impound water at Bradbury Dam in the same manner as in the recent past and provide supplemental flows to assist steelhead migration as described in the "Description of the Proposed Action" section above. Therefore, NMFS has addressed the effects of the proposed project on migrating steelhead by analyzing the effects of continued water impoundment and supplemental flows for migration. In general, analysis of the transect passage data confirm information from the 1995 Revised Fish Resources Technical Report (U.S. Bureau of Reclamation et al. 1995), which also used a low flow approach. The data available (Santa Ynez River Technical Advisory Committee 1999), which model flows for natural conditions (without Bradbury Dam) and recent water impoundment operations as if they occurred from 1942-1993, indicate that the proposed water impoundment would decrease the amount of days minimum passage flows were equaled or exceeded at Lompoc by about 24% (2770 total days - 2101 days with impoundment = 669 days, divided by 2770 = 0.242) over the 50 years modeled

when compared with natural (pre-dam) conditions[3]. A similar effect would occur if the proposed impoundment was carried forward into the future; assuming that the next 50 years of climate conditions will be similar to the last 50 years. This reduction would affect steelhead access to all the spawning and rearing areas in the Santa Ynez watershed below Bradbury Dam.

Based on the model, the number of days minimum passage flows are equaled or exceeded at Alisal Bridge is expected to be reduced by about 42% (2839 total days - 1644 days with impoundment = 1195 days, divided by 2839 = 0.421) during the next 50 years if the proposed water impoundment is carried forward. This reduction would affect steelhead access to spawning areas in the mainstem, Hilton, and Quiota Creeks. It is important to note that this use of the model (and its use to determine the occurrence of mainstem rearing flows below) needs further verification in NMFS's judgment. The model represents the best available data and has been used in this analysis to draw generalized conclusions regarding changes in river flows. Where numbers of days, flow amounts, and/or frequencies of actions from the model are reported, they are used to determine relative effects of various operations over a 50 year time horizon and not as a predictor for exact project operations. In addition, the model used does not predict when the natural bar at the mouth of the estuary will be open to allow fish passage. Therefore the numbers reported above could over estimate the actual amount of migration time available under any condition, as the minimum flows noted above may not be enough to breach the bar or maintain passage through it.

Climate conditions and water use will affect the amount of reduction to migration availability in each year, and when the reduction occurs. For example, Table 8 shows the variability in passage availability from 1942-1993 based on the model. Further analysis of this variability indicates that according to Reclamation's model, during wet years (about 33% of all years) steelhead appear to have between 79 to 121 days from January - April when minimum passage flows or greater are available at Alisal Bridge under conditions associated with historical (pre-dam) conditions. The average number of passage days available under these conditions is about 101 days. Under the proposed water impoundment, steelhead will have between 9 and 120 days of minimum or greater passage flows available. The average number of passage days available is about 78. Under both historical conditions and the proposed water impoundment, approximately 95% of the wet years provide 26 or more days of minimum or greater passage flows[4]. Additionally, the bar at the mouth of the estuary is also open often during wet years. Therefore NMFS does not believe that these years present a high degree of concern for migrating steelhead. In dry years (about 36% of all years) the model indicates that in about 90% to 95% of these years 4 or fewer days of minimum passage flows were available with (the proposed impoundment), or without the presence of Bradbury Dam. It is unlikely that much, if any, migration took place

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[3]Natural conditions are not necessarily the goal of resource management; rather an important reference point for gauging the effects of continued operations on listed species.

[4] The year providing only 9 days, 1966, follows two consecutive dry years and one normal year, likely reflecting a large amount of water impoundment associated with a low reservoir level.

Table 8. Summary of passage days generated by Reclamation passage proposal[1].

YEAR	Hydrologic Year Type Classification [3]	Without Cachuma Operations # of Passage Days [4]	Without Cachuma Operations Indicator of > or = 14 days	Baseline # of Passage Days [4]	Baseline Indicator of > or = 14 days	Final Passage Proposal (3.0' Surcharge) [2] # of Passage Days	Final Passage Proposal (3.0' Surcharge) [2] Addtl Days from Baseline	Final Passage Proposal (3.0' Surcharge) [2] Indicator of > or = 14 days
1942	normal	120	yes	55	yes	43	-12	yes
1943	wet	120	yes	120	yes	120	0	yes
1944	wet	91	yes	90	yes	91	1	yes
1945	wet	89	yes	65	yes	67	2	yes
1946	normal	85	yes	33	yes	23	-10	yes
1947	normal	34	yes	0	no	0	0	no
1948	dry	0	no	0	no	0	0	no
1949	dry	1	no	1	no	15	14	yes
1950	dry	1	no	0	no	14	14	yes
1951	dry	0	no	0	no	0	0	no
1952	wet	121	yes	73	yes	55	-18	yes
1953	normal	51	yes	3	no	17	14	yes
1954	normal	53	yes	7	no	26	19	yes
1955	dry	0	no	0	no	1	1	no
1956	normal	78	yes	9	no	12	3	no
1957	dry	3	no	0	no	0	0	no
1958	wet	90	yes	66	yes	70	4	yes
1959	normal	47	yes	2	no	15	13	yes
1960	dry	0	no	1	no	15	14	yes
1961	dry	0	no	0	no	0	0	no
1962	wet	83	yes	32	yes	43	11	yes
1963	dry	3	no	4	no	6	2	no
1964	dry	0	no	0	no	0	0	no
1965	normal	20	yes	4	no	5	1	no
1966	wet	94	yes	9	no	11	2	no
1967	wet	99	yes	99	yes	97	-2	yes
1968	dry	24	yes	1	no	15	14	yes
1969	wet	104	yes	104	yes	104	0	yes
1970	normal	72	yes	11	no	16	5	yes
1971	normal	87	yes	0	no	0	0	no
1972	dry	4	no	0	no	0	0	no
1973	wet	105	yes	85	yes	87	2	yes
1974	normal	114	yes	37	yes	13	-24	no
1975	normal	89	yes	68	yes	74	6	yes
1976	dry	2	no	1	no	16	15	yes
1977	dry	0	no	0	no	0	0	no
1978	wet	111	yes	92	yes	93	1	yes
1979	wet	116	yes	86	yes	91	5	yes
1980	wet	98	yes	93	yes	95	2	yes
1981	normal	64	yes	10	no	22	12	yes
1982	normal	35	yes	6	no	19	13	yes
1983	wet	102	yes	100	yes	100	0	yes
1984	normal	85	yes	60	yes	60	0	yes
1985	dry	0	no	0	no	0	0	no
1986	wet	79	yes	62	yes	64	2	yes
1987	dry	0	no	0	no	16	16	yes
1988	dry	12	no	0	no	15	15	yes
1989	dry	0	no	0	no	0	0	no
1990	dry	0	no	0	no	0	0	no
1991	normal	46	yes	9	no	12	3	no
1992	wet	87	yes	26	yes	31	5	yes
1993	wet	120	yes	120	yes	116	-4	yes

1) Modified from data table provided by Stetson Engineers on 8/24/00.
2) Reclamation passage proposal includes passage supplementation up to 3,200 (2,500 under 1.8' surcharge interim) acre-feet in years following a spill.
3) See Table 1 "Hydrologic Year Type Classification" from the May 11, 2000, memo titled "Analyses Regarding Passage Flow Supplementation Proposal."
4) Passage days are defined as number of days when flows at Solvang were 25 cfs or greater, January through April.

during these years historically, and the bar at the mouth of the estuary was unlikely to be open very often. Normal years comprise 31% of all years. When the model removes the effects of Bradbury dam, passage opportunities (flows at or greater than 25 cfs) ranged from 20 to 120 days, averaging 63.5 days. Under the proposed impoundment of water, passage opportunities ranged from 0 to 68 days, averaging 18.5 days. These years show the most impact when proposed water impoundment operations are compared with historical conditions for steelhead migration and thus are the years of greatest concern.

Therefore, the proposed water impoundment will reduce access to spawning and rearing areas in the mainstem within 10 miles of the dam (Alisal Bridge) including access to Hilton Creek, Quiota Creek, and possibly Alisal Creek by reducing the number of days minimum passage flows are available when these operations are compared with historical (no dam) conditions. Hilton Creek currently provides some of the best spawning and rearing habitat in the watershed below the dam, as evidenced by steelhead use in some years shown in Tables 2 and 3 above. Reduction in the duration of minimum migration flows has likely lowered rates of migration because lower flows occur more often, resulting in reduced water column depth. Reduced water column depth at locations in streams where passage of fish is limited by depth, such as the tail of pools or head of riffles, is expected to lower rates of migration, and alter the timing of migration (Mundie 1991, Washington Department of Fisheries 1992). This reduction in migration opportunity will be carried forward into the future by the proposed water impoundment operations. Lower rates of migration are likely to preclude some fish from successfully spawning. Fish (both adults and smolts) that are delayed are likely to experience increased predation and the extra cost in energy during the delay may reduce the ability of fish to successfully spawn (Mundie 1991, Banks 1969). Fish that spawn later due to migration delay are likely to produce offspring later in the season. Such offspring may have lower survival chances as they may have less time to rear and thus migrate to the ocean as smaller fish.

Quick reductions in flow could harm steelhead migrants by stranding them in small pools if flows become fragmented and on dry river bed if steelhead are unable to escape to areas still containing water. Steelhead separated from water by stranding will not survive longer than ten minutes (Washington Department of Fisheries 1992). Stranded fish in pools unconnected to surface flows can survive for longer periods of time, perhaps several weeks or months. However, fish in such a condition are often exposed to higher rates of predation, higher temperatures, and/or oxygen depletion (Cushman 1985). Returning higher flows may provide respite from these conditions, but the fitness of these fish, and therefore their chance of survival, has likely been reduced by the higher physiological costs of surviving in poor habitat conditions. Juvenile salmonids are more vulnerable to stranding than adults (Washington Department of Fisheries 1992). What little data are available (Engblom 2000a) do not indicate stranding of steelhead (adults or smolts) during migration. On average it takes several days for flows to fall from 50 to 25 cfs downstream of Bradbury Dam under recent climate and proposed operating conditions (U.S. Bureau of Reclamation 2000). It may be possible that steelhead could become stranded in isolated areas of surface flow downstream of the dam during drier years when the reservoir is actively impounding water if quick reductions in flow occur. NMFS cannot accurately estimate

this effect and believes that it is more likely that adult steelhead will avoid becoming trapped in isolated pools when they hold in the lower mainstem during low flow conditions. Juveniles need much less flows to successfully migrate due to smaller body size and their downstream direction of travel. Therefore, the lower rates of migration and migration delay noted above are more likely for adults.

Due to the reduction in migration time availability noted above, and likely adverse effects to steelhead, Reclamation is proposing to supplement migration flows as described above in the "Description of the Proposed Action" section of this opinion. According to Reclamation, the amount of inflow to the reservoir cannot be accurately predicted on a yearly basis. In addition, the reservoir surcharges of 1.8 and 3.0 feet will not be available in all years. Therefore, Reclamation will not always be able to supplement migration flows during the years of greatest concern for steelhead migration (normal years). However, NMFS's analysis indicates that when storms are supplemented, the proposal insures a minimum number of migration days per year during the 14 years the model predicts that surcharged water would be used to supplement storms (Table 9). Storm peaks are extended by mimicking the average storm flow decay rate upstream of the reservoir in normal years; which ensures approximately 14 days of migration availability downstream of Bradbury Dam after storm peaks in the years supplemented. Based on the limited information available, it is NMFS's best professional judgement that 14 days of consecutive migration availability is likely to significantly increase successful migration by steelhead in the Santa Ynez River. The average storm flow decay rate is mimicked at the USGS Solvang gauge location (Alisal). According to Reclamation, the minimum flow necessary to achieve passage at Alisal (25 cfs) will achieve the minimum conditions necessary for passage downstream at Lompoc 92% of the time (U.S. Bureau of Reclamation 2000). As the supplementation will provide a storm flow tail out that starts at 150 cfs, NMFS concludes that the proposal will ensure steelhead passage through all the shallow areas noted above during supplementation.

As above, this information is the best available for predicting approximately how many extra migration days will be provided during the next 50 years[5] (assuming climate conditions are similar). During the interim period before the 3.0 foot surcharge is authorized and implemented, somewhat less additional migration days are provided. The interim period is expected to last for only 5 years, and the reservoir may be surcharged to 1.8 feet only during a few, if any, of these years. Therefore the number of additional migration days achievable during the interim period is not predictable with any useful degree of accuracy.

NMFS's analysis of data tables provided by Reclamation (U. S. Bureau of Reclamation 1999d, Stetson 2000), based on the modeling approach described above, indicates that during normal years proposed water impoundment operations result in 6 of 16 years (38% of years) providing

[5]Reclamation has also analyzed the additional migration day provided using stream gauge data for the years 1958-1998. Because the gauged data includes the effects of the project under historical operating scenarios (different than the proposed operations) NMFS has used the model data for the analysis of proposed migration supplementation.

Table 9. Summary of passage releases and account for long term passage proposal.

Year	Spill?	Years from Surcharge	Release from Passage Account	End-of-Year Passage Account
1942	spill		0	3,200
1943	spill		0	3,200
1944	spill		0	3,200
1945	spill		0	3,200
1946	spill		0	3,200
1947		1	0	3,200
1948		2	0	3,200
1949		3	1,750	1,450
1950		4	1,450	0
1951		5	0	0
1952	spill		0	3,200
1953		1	1,550	1,650
1954		2	1,650	0
1955		3	0	0
1956		4	0	0
1957		5	0	0
1958	spill		0	3,200
1959		1	1,450	1,750
1960		2	1,750	0
1961		3	0	0
1962		4	0	0
1963		5	0	0
1964		6	0	0
1965		7	0	0
1966		8	0	0
1967	spill		0	3,200
1968		1	1,825	1,375
1969	spill		0	3,200
1970		1	1,070	2,130
1971		2	0	2,130
1972		3	0	2,130
1973	spill		0	3,200
1974	spill		0	3,200
1975	spill		902	3,200
1976		1	1,970	1,230
1977		2	0	1,230
1978	spill		0	3,200
1979	spill		0	3,200
1980	spill		0	3,200
1981		1	1,230	1,970
1982		2	1,760	210
1983	spill		0	3,200
1984	spill		0	3,200
1985		1	0	3,200
1986	spill		0	3,200
1987		1	1,950	1,250
1988		2	1,250	0
1989		3	0	0
1990		4	0	0
1991		5	0	0
1992		6	0	0
1993	spill		0	3,200

14 or more days of passage. The proposed supplementation of migration flows will increase the number of years providing 14 or more days of passage to 10 out of 16 years, or 63% of years. Three of the normal years would decline in number of passage days if supplementation is provided, likely due to the effect of impoundment operations. In one of these years the decline reduces the total number of migration days to 13. Three other normal years would not receive supplementation and the total number of passage days for each of these ranges from 0 to 5. While these years are a concern for steelhead passage, the proposed supplementation roughly doubles the amount of normal years when 14 consecutive days of migration opportunity are available under the proposed water impoundment.

During dry years the proposed water impoundment operations result in zero years with 14 or more passage days. The supplementation proposal will provide approximately 14 passage days in 7 out of 19 dry years, or in 37% of these years. Conditions may be poor for steelhead rearing during some of these years, depending in part upon previous and subsequent year conditions. Therefore, additional migration opportunity in dry years may have detrimental effects to the steelhead population in the Santa Ynez watershed. Adults could be encouraged to migrate and spawn in the Santa Ynez River watershed when conditions are not favorable for their offspring's survival. Based on Reclamation's intent to adaptively manage these releases to avoid the driest years and review of stream gauge records in the Santa Ynez River, NMFS believes this effect can be minimized (and releases for migration further shifted to years of higher concern) as dry climate conditions should become quickly apparent during steelhead migration season. The best available information does not allow NMFS to predict the exact number of years or days additional migration will be provided, nor the number of fish that may benefit (or possibly harmed if a large amount of releases are made during the driest years). The proposed increase in migration availability will occur for the life of the project.

Tributaries - Hilton Creek

Migrating steelhead (adults and juveniles) in Hilton Creek may be affected by the project action if flows in Hilton Creek are altered during the wetter months when migration and spawning occurs. As noted, changes to flows could delay, prevent, and/or strand steelhead. Based on review of the proposed use of the water supply line in Hilton Creek, NMFS does not believe migration of adults or juveniles will be adversely affected by the operation of the water supply line, provided the ramping procedures outlined in the Description of the Proposed Action are followed. The narrow confined Hilton Creek channel makes stranding unlikely.

Tributaries - Passage improvements

Reclamation is proposing to fix a total of eleven road crossings in tributaries in the watershed below Bradbury Dam to improve or restore steelhead passage. The tributaries included in this effort are Hilton, Quiota, Salsipuedes, El Jaro (tributary to Salsipuedes), and Nojoqui Creeks. The total length of these streams is about 209,616 feet, or 40 miles. The length of stream newly accessible to steelhead once passage impediments and barriers are fixed will be 63,564 feet, or about 12 miles (U.S. Bureau of Reclamation 2000a). Unfortunately, about 4.5 miles of proposed

newly accessible habitat is currently in poor condition according to Reclamation (U.S. Bureau of Reclamation 2000). The remaining habitat that will become accessible (7.5 miles) is all in good condition (U. S. Bureau of Reclamation 2000a) and located in Hilton and Quiota Creeks. Reclamation will also improve access to approximately half of the habitat available in the 4 tributaries (about 20 miles) by fixing passage impediments. Habitat with improved access is all in fair or good condition according to Reclamation (U.S. Bureau of Reclamation 2000a). Reclamation has proposed a schedule to accomplish tributary passage restoration and improvement by 2005 (U.S. Bureau of Reclamation 2000, 2000a). Road crossings may be fixed earlier if matching grant money can be obtained. Steelhead will benefit by the availability of additional spawning and rearing habitat in many cases. These actions are likely to substantially increase the amount of spawning and rearing habitat available below Bradbury Dam and/or improve steelhead access to habitat. Thus, these actions will improve the Santa Ynez River steelhead population's opportunity to survive and recover.

Emergency Winter Operations

Emergency winter operations and gate testing during spill release may also affect available migration habitat. The purpose of these operations is to provide extra storage in the reservoir for incoming storm flows, temporarily hold back storm flows entering the reservoir, release storm flows from the reservoir at a faster rate than the natural rule curve, or test radial gate motors. Reclamation estimates these emergency flood control procedures will vary in length from a few hours to 2-3 days and will occur in approximately 11% of years, although the effects will be of temporary duration in each year that they occur. Water released by flood control operations will be equaled and likely exceeded by flood flows occurring within 48 hours. Thus, it is possible that these operations may further delay steelhead migrating in the Santa Ynez River if they result in enough flow to prevent steelhead from migrating during the water releases. However, because these operations will only occur in 11% of years, and the magnitude of releases will vary, NMFS does not believe these operations will substantially affect the ability of steelhead to migrate in the Santa Ynez River during the next 50 years.

Effects to Spawning Steelhead

To spawn and incubate eggs successfully, steelhead require cool clean water flowing through gravels of appropriate size, and cover for spawning adults, among other factors. In order for the Santa Ynez population to persist into the future, adequate access to good quality spawning habitat needs to be available.

Santa Ynez River

Adults spawning in the mainstem could face the same effects noted above for migrating steelhead, including reductions in spawning habitat and stranding. Effects will vary based on climatic conditions and reservoir levels. Little information on spawning habitat quantity and quality has been collected in some areas of the mainstem, due mostly to access problems related to private property. The most recent information available (U.S. Bureau of Reclamation 1999)

appears to indicate that the proposed project provides more wetted area than historic conditions (pre-dam) in riffles in the first ten miles downstream of the dam during dry years, and similar, but slightly less area than historical conditions during normal and wet years, as shown in Table 10. However, the amount of spawnable gravels contained in these riffle areas is unknown and data do not currently exist to further refine this information, although four redds were found in 1998 in the areas where surveys have occurred. Therefore, specific amounts of spawning habitat in the mainstem affected by the proposed project cannot be adequately quantified in relation to recent operations and historical conditions at this time.

Due to the reduction of historical flows expected by the proposed project (noted above in the discussion of migrating steelhead) during the winter and spring (January-May) it is reasonable to conclude that the proposed project would provide less flows than were historically available during some years to potential spawning areas in the mainstem for the life of the project if these operations were continued into the future. Some steelhead attempting to spawn would likely be prevented from doing so, thus contributing to constraining the population at its current small size or further reducing its total offspring in each year this effect occurred. Reclamation's proposed supplemental flows will offset this effect somewhat by providing additional flows in the mainstem for migration and maintaining the rearing target flows during the migrating and spawning period (January - May). As noted, information is not available to allow NMFS to estimate the likely magnitude of spawning reduction. Data from the Revised Fish Resources Technical Report (U.S. Bureau of Reclamation et. al.1995a) appears to confirm NMFS's generalized conclusion above.

Table 10. Flow and Available Spawning Habitat[6] Under Historic and Long Term Proposed Operations for January 1 through April 30th.

Location/Scenario	Dry Years[7]		Normal Years[7]		Wet Years[7]	
	Flow (cfs)	Habitat area (acres)	Flow (cfs)	Habitat area (acres)	Flow (cfs)	Habitat area (acres)
Dam to HWY 154						
Historic	1.6	4.1	20.1	6.2	164.1	8.0[8]
Proposed Project	3.4	4.8	5.3	5.6	33.2	6.5
HWY154 - Refugio Rd.						
Historic	0.3	0.4	18.9	4.0	167.1	5.2[8]
Proposed Project	3.1	3.3	5.0	3.4	58.2	4.6
Refugio Rd. - Alisal bridge						
Historic	0.0	0.0	15.9	8.5	174.9	12.0[8]
1999 Proposed Project	1.4	5.7	4.2	7.1	76.5	10.7

(From U.S. Bureau of Reclamation 2000, Updated by Reclamation during consultation)

Emergency Winter Operations

Emergency winter operations and gate testing during spill release may affect available spawning habitat in the mainstem. Reclamation estimates these emergency flood control procedures will vary in length from a few hours to 2-3 days and will occur in approximately 11% of years, although the effects will be of temporary duration in each year that they occur. Water released by flood control operations will be equaled and likely exceeded by flood flows occurring within 48 hours. It is possible that these operations may disrupt spawning behavior and/or redds. However, because these operations will only occur in 11% of years, and the magnitude of releases will vary, NMFS does not believe these operations will substantially affect the ability of

[6]The areas indicated in Table 10 above may or may not contain spawnable gravels and other appropriate spawning conditions. Data do not currently exist to further refine this information. Furthermore, the exceedance percentages do not allow for accurate cross comparison of years.

[7]Dry years are represented by an 80% exceedance for all years in the model (for example, under Historic conditions from the Dam to HWY 154, 80% of the time flows are greater than 1.6 cfs); Normal years are represented by a 50% exceedance and Wet years by a 20% excedance.

[8]Habitat estimated by Reclamation; flows exceed the predictive reliability of habitat-flow relationship.

steelhead to spawn in the Santa Ynez River during the next 50 years.

Spawning Steelhead in Hilton Creek

Migrating and spawning steelhead may be affected by the project action if flows in Hilton Creek are altered during the wetter months when migration and spawning occurs. Impeding passage of migrant salmonids is a problem associated with regulation of discharge (Mundie 1991). Reduced water column depth at locations in stream where passage of fish may be limited by depth, such as the tail of pools or head of riffles, may lower rates of migration, alter the timing of migration, and/or strand individual fish. Varying and quickly reducing releases could harm steelhead migrants by stranding them in wetted areas. Juvenile salmonids are more vulnerable to stranding than adults (Washington Department of Fisheries 1992). Based on review of the Hilton Creek channel by NMFS biologists in the field, NMFS believes that stranding of spawning adults and dewatering of redds in Hilton Creek is unlikely to occur as a result of the proposed operation of the permanent water supply line and associated ramp downs due to the confined nature of the channel and as long as reduction in releases follow the proposed ramping schedule.

Tributaries - Passage improvements

The length of stream newly accessible to steelhead once passage impediments and barriers are fixed will be about 12 miles as noted above. About 4.5 miles of proposed newly accessible habitat is currently in poor condition according to Reclamation (U.S. Bureau of Reclamation 2000). The remaining habitat that will become accessible (7.5 miles) is all in good condition (U. S. Bureau of Reclamation 2000a) and located in Hilton and Quiota Creeks. Reclamation will also improve access to approximately half of the habitat available in the 4 tributaries (about 20 miles) by fixing passage impediments and barriers. Habitat with improved access is all in fair or good condition according to Reclamation (U.S. Bureau of Reclamation 2000a).

The newly accessible habitat (and habitat with improved access) contains several miles of spawning habitat for steelhead (U. S. Bureau of Reclamation 1999). The exact amount of spawning habitat cannot be precisely quantified based on available data. Adult fish from the Santa Ynez Steelhead population will have additional opportunities to spawn once renewed and improved access is achieved in the tributaries. This is likely to help the population to expand its numbers by utilizing an increased amount of spawning area.

Effects to Rearing Steelhead

Rearing steelhead need habitat area, cover to allow escape from predators, surface flows, water quality conditions, and food that allow them to survive and grow properly to reach smolt age in healthy condition. The proposed operations of the Cachuma Project will have adverse and beneficial effects on steelhead rearing in the mainstem. NMFS details these effects below and relates their occurrence to steelhead location in the action area.

Water Rights Releases

In the summers of dry and some normal years, water rights releases often increase the amount of surface water in the mainstem between Bradbury Dam and Lompoc for several weeks. These releases usually start in July when flows in the mainstem are intermittent to non-existent and may last through August (U.S. Bureau of Reclamation 1999). Releases start at about 150 cfs and are ramped down as described in the Description of the Proposed Action section. Water rights releases are not made unless continuous surface flows do not exist between Bradbury Dam and the City of Lompoc. In general, water rights releases are expected to occur in 65% of years (U.S. Bureau of Reclamation 1999c). Benefits to steelhead that are likely to occur during releases (additional habitat space, and/or more cover from predators for example) are lost when releases cease. Steelhead may also be exposed to stranding during the ramp down of releases.

Habitat area and Stranding

Water rights releases will alter available habitat area and composition. Data to directly quantify changes to available habitat area resulting from water rights releases and their cessation do not currently exist. However, recent cross section data are available in the first ten miles downstream of Bradbury dam for flows from 1.5 to 50 cfs. These data indicate that the top width of wetted channel habitats surveyed at the HWY 154 reach (Bradbury dam to the HWY 154 bridge, 3.1 miles) can change as much as 12-29 feet when flows range from 50 to 1.5 cfs (16% to 40% of wetted area, depending upon habitat unit). At the Alisal reach about 10 miles downstream, top width of wetted channel habitats surveyed changed 10-26 feet (29% to 45% of wetted area, depending upon habitat unit) at the same flow measurements (Santa Ynez Technical Advisory Committee, 1999a). Water rights releases are initially made at about 150 cfs and would thus be expected to produce larger changes in the wetted widths of habitats until releases are ramped down and ended and fish rearing releases instituted. Data from the Revised Fish Resources Technical Report also indicates that water rights releases will increase available juvenile rearing habitat. The initial discharge rate of 150 cfs appears to almost maximize juvenile habitat space between Refugio Road and Bradbury Dam at the flows modeled in 1995 (U.S. Bureau of Reclamation et. al. 1995a).

The composition of instream habitat will be altered by the ramping down and cessation of water rights releases because reducing discharge eliminates or decreases swift water habitat and cover, and increases the abundance of slow water habitat (Kraft 1972). Loss of habitat will occur when surface discharge is eliminated to the extent that swift water habitats such as riffles and runs are lost (Kraft 1972), or when surface discharge is reduced to the extent that water column depth is lost (Thomas R. Payne & Associates 1992). NMFS notes that in the Alisal Reach deep pools and riffles experienced similar loss in percentage of wetted area (Santa Ynez Technical Advisory Committee, 1999a). The opposite changes will occur when discharge is increased at the beginning of water rights releases.

Thus available rearing habitat in water rights release years, including the area and depth of riffles, runs, and pools, will be temporarily increased while water rights releases occur. In some years

water rights releases may be made 2-3 times and/or fluctuate up and down during the release (U.S. Bureau of Reclamation 1999, Stetson Engineers 1999). These effects would occur in the mainstem Santa Ynez downstream to the furthest area receiving surface flows from water rights releases (approximately 30 miles). Steelhead rearing in the first ten miles of mainstem downstream of Bradbury Dam will be unable to effectively utilize the additional habitat space because the increases occur only for a short time. Riffle, run, and pool habitats are used by juvenile steelhead during their life history phase in freshwater (Everest et al. 1984; Roper et al. 1994), and reduced discharge has been associated with reduced quantity of cover (for shelter from predators and harsh environmental conditions), reduced abundance of fish, and changes in competitive interactions among fish (Kraft 1972, Mundie 1991). The amount of surface flow in streams has been found to be inversely related to the amount of trout fry found in the stomach of an avian predator (Mundie 1991). Reduced average velocities may decrease the availability of positions in streams used by fish to maximize energy intake while at the same time minimizing the cost of obtaining food and the chance of being eaten (Jenkins 1969; Fausch 1984; Gilliam and Fraser 1987). Thus, additional steelhead that survive and/or additional growth in steelhead due to additional habitat area are likely lost when the additional area is removed. Water rights releases also disrupt thermal refuges for steelhead (see below under *"Water Quality - Temperature"*).

The reduction of flows after water rights releases are ended could also harm individual steelhead by concentrating or stranding them in residual wetted areas where they are likely to be exposed to dewatering and desiccation, increased water temperature, decreased dissolved oxygen concentration, and predation (Cushman 1985; Washington Department of Fisheries 1992). The SYRTAC has studied fish movement during Water Rights releases using trapping (1994) and snorkel surveys (1994, 1996) and concludes that steelhead are not likely to move downstream to areas that would become dry after water right releases are ended (Engblom 2000). Nevertheless, steelhead may already be present in such areas within ten miles of Bradbury Dam (see below in the "Rearing Support" section).

Exact behavioral mechanisms in salmonid juveniles for responding to changes in flow rates are not well understood (Washington Department of Fisheries 1992). Juvenile steelhead are more vulnerable to stranding than adults, and fry are particularly vulnerable in cobble substrates (which, NMFS has observed, is a major component of habitat in the Santa Ynez River where steelhead occur). Fry have been found in laboratory experiments to retreat to spaces among cobbles when dewatering occurs, instead of moving to areas still maintaining water (Washington Department of Fisheries 1992). This is a potential concern in habitats that contain steelhead during water rights release ramp downs. NMFS notes that the complete dewatering of a reach of Hilton Creek in early 1998 resulted in steelhead stranding and death. Three juvenile steelhead died despite rescue efforts and a slow ramp down of flows (0.5 cfs per half hour) (NMFS 1997b). The dead steelhead were found in spaces under cobble (U.S. Bureau of Reclamation 1998a).

The proposed ramping schedule provided by Reclamation is intended to stimulate steelhead to move from drying habitats to remaining areas of surface water. Water rights releases are reduced

from 150 to 30 cfs or lower by a several step process. The ramp down rate proposed is much slower (likely ten times slower) than the rate recommended in the literature to avoid fish stranding (Payne, 1999). Surveys conducted during previous ramp downs (at somewhat faster rates) have not found stranded fish (Engblom 1999c). Therefore NMFS concludes that stranding of steelhead during ramp downs of water right releases is unlikely.

Water Quality - Temperature

The alterations in water flow caused by water rights releases affect water temperature in the mainstem. Water releases from the dam are made with water at a temperature of approximately 17 to 18 degrees Celsius (U.S. Bureau of Reclamation 1999). In general, when water rights releases occur, water temperatures are lowered for approximately 3 miles downstream of the dam (U.S. Bureau of Reclamation 1999-no access is available due to private property issues from 0.5-3.5 miles downstream of the dam)[9]. Given the supply of additional water from water rights releases, overall water temperatures (runs, riffles, glides, and pools) might be expected to be lower throughout the area affected by releases. In general summer water temperatures often naturally exceed 25 degrees Celsius in the mainstem Santa Ynez River for several hours each day for several weeks with or without water rights releases (U.S. Bureau of Reclamation 1999).

Available information indicates that water rights releases in 1996 and 1997 appeared to disrupt thermal stratification in most, if not all, pools where data were recorded (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997). This disruption mixes cool water at the bottom of pools with warmer surface water and increases the overall temperature of water in pools (U.S. Bureau of Reclamation 1999). Thermal stratification can be caused by several factors, including influxes of cold water from intergravel flow, tributary flow, groundwater seepage and/or structural factors. As rivers and streams are dynamic systems, the location and form of thermally stratified pools is expected to vary over time as changes to stream bed and banks occur due to natural conditions and human management (Nielsen et al. 1994). The data available indicate that many pools sampled in 1996 and 1997 lost thermal stratification at flows of about 40-70 cfs (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997).

Nearer the dam in the Long Pool area, water rights releases disrupt thermal stratification in pools and lower water temperatures. For example, prior to 1996 water rights releases minimum and maximum average daily water temperatures at the surface of the Long Pool (within 1 mile of the dam) ranged from 21.0 to 25.0 degrees Celsius on a daily basis. After the water rights release, these temperatures ranged from 15.8 to 17.8 degrees Celsius. At the bottom of the pool, minimum and maximum average daily temperatures ranged from18.0 to 18.6 degrees Celsius prior to water rights release, and 15.8 to 17.0 degrees Celsius after release. Conversely, further downstream (9.5 miles) water rights releases disrupt thermal stratification but do not lower water

[9]Reclamation is basing this conclusion on temperature monitoring near the dam, 3.5 miles downstream, and at several points farther downstream which appear to show that temperatures increase in the Santa Ynez the farther they are measured from the dam in the first ten miles downstream.

temperatures. In this area of the mainstem, temperatures ranged from 21.0 to 27.0 degrees Celsius at the surface, and 19.4 to 22.5 at the bottom prior to release on a daily basis. After the water rights release, these temperatures ranged from 17 to 27.3 at the surface and 17.0 to 27.1 degrees Celsius at the bottom of the pool sampled (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997) on a daily basis, indicating that bottom temperature matched surface temperature and stratification had ceased.

Temperature thresholds for steelhead indicate that physiological stress and reduced growth rates generally occur at temperatures over 20 degrees Celsius (U.S. Bureau of Reclamation 1999). Moyle and Marchetti (1992) reviewed several investigations of the upper incipient lethal temperature for rainbow trout and found that in most cases 25 degrees Celsius was indicated as lethal, with a range in reported values from 21 to 25.6 degrees Celsius. These data appear to be mostly from northern populations.

NMFS believes that data from Pacific Northwest steelhead populations may not always be applicable to steelhead in Southern California. Data available in southern California (Mathews and Berg 1997) and the visual observations of steelhead in the Santa Ynez river watershed feeding, persisting, and appearing to increase in size in habitats with temperatures that periodically exceed 25 degrees Celsius (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997), indicate that these fish are able to survive in relatively high temperatures. Notwithstanding probable higher temperature tolerances, thermally stratified pools are thought to provide important refuge from high temperatures for steelhead in Southern California (Nielsen et al. 1994; Mathews and Berg 1997). Water rights releases are expected to reduce or eliminate temperature stratification in pools downstream of the dam, providing lower temperatures likely improving steelhead survival within 3.5 miles of the dam but removing thermal refuges and likely increasing temperature stress on, and reducing the survival of, steelhead in the mainstem 3.5 to 10 miles downstream of the dam. This effect will occur for the duration of water rights releases and is expected to occur in 65% of years for the life of the project. The additional water releases for fish may slightly reduce the magnitude and duration of water rights release in some years, although data are not available to precisely estimate the effect on the steelhead or their habitat.

Water Quality - Dissolved Oxygen

The data available indicate that in general, water rights releases increase the amount of dissolved oxygen found in mainstem pools monitored during the summer months. At these flows, dissolved oxygen concentrations measured in the mainstem Santa Ynez where steelhead are known to occur ranged from 7.4 to 12 parts per million (ppm) per day in the Alisal and Refugio reaches 3.5 to 10 miles downstream of Bradbury Dam (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997). Conversely, in July prior to 1996 water rights releases, dissolved oxygen was 0.2 ppm at about maximum pool depth at one site but ranged from 4.4 ppm to 9.4 ppm at about maximum pool depth at a second site, at little to no surface flows (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997).

In the spring, fall and winter, cooler temperatures and increase in flows appear to raise dissolved oxygen levels to 7-8 ppm in most cases. Even at low flows (1 cfs or less) dissolved oxygen levels at one site sampled in the Alisal reach at the end of October in 1995 were at least 4.8 ppm, and ranged from 4.8-9.33 ppm (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997). However, in mid October of 1993 (a spill year) dissolved oxygen levels measured at sites between 0.25 and 3.0 miles downstream of Bradbury dam ranged from 1.8 ppm to 13.8 ppm with the lowest levels occurring in the morning. By November 9 of 1993 dissolved oxygen remained at 3.0 ppm or above (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997).

Dissolved oxygen levels will vary dependent upon climate conditions and the specific timing and magnitude of water rights releases. Based on the data available, NMFS cannot estimate specific flow and dissolved oxygen relationships. However, the data available indicate that water rights releases provide dissolved oxygen at levels near or equal/greater to levels at which salmonids are known to function normally (6-8 ppm) (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997). Therefore, dissolved oxygen levels are not a cause for concern during water rights releases.

Water Quality - Sediments and Turbidity

Sediments and other materials (algae) become suspended in the water column during water rights releases (Engblom 2000) but no data are available to estimate amounts or duration of turbidity or the amounts of sediments that may settle out of the water column in steelhead habitats. Turbidity may cause harm, injury, or mortality to juvenile and adult steelhead in the action area and downstream of the action area. High turbidity concentrations 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 bury less mobile organisms (Ellis 1936; Cordone and Kelley 1961) that serve as a food source for many fish species, degrade instream habitat conditions (Cordone and Kelley 1961; Eaglin and Hubert 1993), cause reductions in fish abundance (Alexander and Hansen 1986; Berkman and Rabeni 1987), and reduce growth in salmonids (Crouse et al. 1981). Observations by SYRTAC (Engblom 2000) indicate that water rights releases produce a short term (3 days) debris load which is transported downstream through the steelhead habitat area 0 - 10 miles downstream of the dam. Thus, it is likely that some sedimentation from water rights releases will adversely affect steelhead habitat and steelhead. NMFS cannot specifically estimate the amount of sediment left behind by water rights releases, but notes that winter storms in the following wet season should substantially reduce this effect. The turbidity effects noted above are also likely. These effects to steelhead habitat are expected to be of temporary duration. However, steelhead may be injured by turbidity and sedimentation as noted above. These effects will likely occur with each year of water rights release, roughly 65% of years over the life of the project.

Riparian and Aquatic Vegetation

Operations of the Cachuma Project were thought to probably continue a slow increase in riparian vegetation due to water rights releases (U.S. Bureau of Reclamation, 1995). The functional

values of riparian corridors and the benefits they provide to aquatic systems in general, and stream fish populations in particular, are well documented (Hall and Lantz 1969; Karr and Schlosser 1978; Lowrance et al. 1985; Wesche et al. 1987; Gregory et al. 1991; Platts 1991; Welsch 1991; Castelle et al. 1994; Lowrance et al. 1995; Wang et al. 1997). The amount of riparian vegetation increase that occurs due to water rights releases cannot be estimated.

Algae growth is common in the mainstem Santa Ynez and portions of the tributaries during the summer (U.S. Bureau of Reclamation 1999). While algae reduces dissolved oxygen instream through photosynthesis and decomposition of dead algae, it also may provide some shade in certain habitat areas and a food source for aquatic macro invertebrates which are eaten by steelhead. The data available indicate that high flows from water rights releases (130-150 cfs) remove most of the algae growth that has occurred during the summer (U.S. Bureau of Reclamation 1999). Lower summer flows (no water rights releases) resulting from wet winters such as those occurring in 1998 appear to NMFS to result in less algae growth when compared to years without flood control spills. However, data are scant and NMFS is not confident that the amount of algae likely to be present at particular flows can be reliably estimated. In the years surveyed, algae growth begins to decline in October (U.S. Bureau of Reclamation, 1999).

Thus, any adverse or beneficial effects to steelhead are somewhat speculative and depend upon a number of unknown factors. Water rights releases will likely increase riparian vegetation which may provide more cover and indirectly more food supply to steelhead. When water rights releases occur they also remove most of the algae growth that occurs during summers. This likely decreases shade, increases dissolved oxygen, and may decrease aquatic macro invertebrate production (see below).

Aquatic Macro Invertebrates

The benthic (bottom dwelling) aquatic insect assemblage of most waterways 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 year. Some species of 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. Riffles are generally accepted as the most productive habitat in streams. Any activity that affects instream habitat could be reasonably expected to affect these food resources.

Available research suggests that aquatic invertebrates may be severely impacted by rapid flow fluctuations and/or dewatering. Rapid fluctuations and/or dewatering can strand these organisms (resulting in harm and/or death), and can cause increased drift downstream which may increase food supply for fish in some areas and leave others with less supply. Flows may also disrupt algae growth upon which certain species of herbivorous aquatic insects graze. (Cushman 1985; Washington Department of Fisheries 1992).

No data are available to quantitatively estimate effects to aquatic macro invertebrates from flow fluctuations and dewatering in the Santa Ynez River. Rapid flow fluctuations appear unlikely

based on how water rights releases will be delivered and ramped. However, it is likely that water rights releases may temporarily increase aquatic macro invertebrate production, depending upon the ability of specific species to colonize new habitats in a short period of time. Most, if not all, of any increased production will likely end when water rights releases end. Water rights releases may also displace macro invertebrate populations (but this is speculation as no data from the Santa Ynez River are available). As noted, water rights releases remove most of the algae growth that occurs in the Santa Ynez mainstem as a result of very low summer flows. The exact relationship among increased wetted area, decreased algae, and macro invertebrate production in the Santa Ynez River is unknown. In theory, both beneficial and adverse effects to steelhead could occur as noted above. The results of such effects are speculative.

Steelhead Rearing Support Flows

Santa Ynez River

During nearly all years, it is proposed that target flows be established to provide and supplement flows for steelhead in the mainstem of the Santa Ynez. Water is to be released based on Reclamation's proposed flow targets given in the Description of the Proposed Action section when water rights releases are not being made; and when natural flows do not meet the flow targets. Reclamation expects to meet flow targets based on climate conditions, water rights releases and rearing support releases as shown in Table 10. NMFS has used this table from Reclamation's 1999 Biological Assessment because the flows provided by the revised proposal for juvenile rearing are judged by NMFS to be essentially unchanged from the flows provided by the 1999 proposal.

Habitat area and stranding. Proposed rearing support releases (and water rights releases as noted above) for the revised project will provide for increased surface flows during years when such flows would normally not be available during the summer and fall of dry, normal, and wet years based on climate conditions and water use downstream of Bradbury Dam (Table 11). This indicates that, in general, Reclamation's revised project will provide additional water releases over natural conditions and past operations.

Table 11. Percent exceedance of different minimum flows for proposed project, past operating conditions, and historical conditions (based on data provided in U.S. Bureau of Reclamation 1998, 1999).

Proposed Project	% exceedance 3.5 miles from Bradbury Dam - HWY 154 bridge	% exceedance 10 miles from Bradbury Dam -Alisal bridge
Reclamation flow target (cfs)		
10 cfs	40%	34%
5cfs	78%	54%
2.5 cfs	98%	65%
(U.S. Bureau of Reclamation 1999)		
Operating conditions in the recent past (with the 2,000 acre foot fish account)	% exceedance HWY 154	% exceedance Alisal
Reclamation flow target (cfs)		
10 cfs	34%	32%
5 cfs	40%	41%
2.5 cfs	80%	50%
(U.S. Bureau of Reclamation 1998)		
Historical (without Bradbury Dam)	% exceedance HWY 154	% exceedance Alisal
Reclamation flow target (cfs)		
10 cfs	32%	30%
5 cfs	40%	35%
2.5 cfs	45%	38%
(U.S. Bureau of Reclamation 1999)		

As shown in Table 11, the flow targets will provide more flow to the Santa Ynez River in summer and fall than past operations or natural conditions provided below Bradbury Dam. This will increase available habitat in the first ten miles downstream of Bradbury Dam over historical

and past operating conditions. It is likely to increase available habitat beyond ten miles during some years, but data are not available to NMFS to assess the effect beyond ten miles from the dam. Data from the study noted above indicates that the top width of wetted channel habitats can vary by as much as 5 to15 feet (7% to 30% of wetted area depending upon habitat) when flows change from 2.5 to 10 cfs in the first 3.1 miles downstream of Bradbury Dam. At the Alisal reach about 10 miles downstream of the dam, the top width of wetted channel habitats surveyed varies by 12 feet (17 to 27% of wetted area depending upon habitat unit) (Santa Ynez River Technical Advisory Committee 1999a). As noted above for water rights releases, increasing flows will alter the composition of habitat by increasing swift water habitats (riffles and glides for example) and cover, although pool habitat again shows similar changes as runs and glides at Alisal. The amount of habitat provided will vary based on the flow target applied, with 10 cfs providing the most habitat and 2.5 cfs providing the least.

Steelhead rearing in the first ten miles downstream of Bradbury Dam may be, or likely were, subject to intermittent surface flows and stranding under historical, past operations, and the revised project proposal. NMFS cannot accurately predict if continuous surface flows will be maintained by Reclamation's proposed flow targets in the entire ten miles downstream of Bradbury Dam where steelhead commonly rear. The small amount of flow provided in some years, the variability of climate conditions, and water use downstream of the dam may result in loss of habitat during some years if surface flows become fragmented. Based on the flow targets proposed and the flow model used by Reclamation, it appears that continuous surface flow will not be provided in some years to the entire ten miles downstream of Bradbury Dam where steelhead commonly occur. Flows are expected to reach 0 cfs in the Alisal reach in 19 out of 51 years (Reclamation 2000), or 37% of years (Stetson 2000a). (This is based Reclamation's modeling of the proposed flows during the years 1942-1993 and assumes climate conditions in the next 50 years will be similar to the last 50 years). The available steelhead presence data indicates steelhead are found in the Alisal Reach in 4 out of the 5 years surveyed, or 80% of years. The years when nearly all of the observed steelhead were present were spill years or the year directly after a spill year. Reclamation's data analysis indicates that proposed long term operations are likely to provide continuous surface flows in the Alisal reach during all of these years for the next 50 years. Therefore NMFS believes it unlikely that more than a few, if any, steelhead in the Alisal Reach could become stranded in isolated pools or beached by the proposed project in more than 37% of years. NMFS cannot estimate the specific number of years this is likely to occur nor the specific number of steelhead effected, but expects it to be a very small number, based on the information noted above.

Rearing support releases for the long term operation of the proposed project will maintain some habitat area with low flows for rearing steelhead downstream of Bradbury Dam during the dry season in many years for the life of the project. However, flow targets during the proposed interim period (before the 3.0 foot surcharge is achieved) are lower and NMFS expects an increase in the amount of years steelhead are present at Alisal and not receiving water. Reaches farthest from the dam known to contain steelhead will not be supplied water in many years. Data are not available to accurately predict the effect of these potential steelhead strandings and

beachings on the small steelhead population in the Santa Ynez during the interim period. NMFS believes the following factors important: 1) The data available indicate that in some years the amount of juveniles rearing in the mainstem comprise as much as 50% of the observed[10] juvenile population of steelhead in the Santa Ynez River below Bradbury Dam; 2) The number of steelhead in the Alisal Reach can comprise as much as 46% of the known mainstem rearing population (the range is from 0-46%, average is 20%- these data are rough estimates only, survey procedures and locations varied); 3) Steelhead are currently unable to access several miles of spawning and rearing habitat below the dam in tributary streams due to improperly designed stream crossings; 4) In the opinion of NMFS biologists who have visited the action area, habitat for rearing in some of the tributaries below the dam is in better condition than rearing habitat in the mainstem; Thus, while the total number of steelhead in the Santa Ynez River below Bradbury Dam remains low, and impediments and barriers prevent access to some of the remaining habitat, the potential for lack of flow in the Alisal Reach during Reclamation's proposed interim period in many years remains a concern. NMFS notes that in some years steelhead do not appear to survive in the Alisal Reach. The data available do not allow for accurate correlation of fish survival and flow in both Alisal and Refugio Reach. NMFS believes that steelhead receiving surface flows, (or enough subsurface flows to maintain pool area) have a better chance of survival than steelhead in shrinking pools or dry streambed.

Water quality - temperature. About half of the pools sampled in summer 1998 at Alisal and Refugio reaches appear to have remained somewhat thermally stratified at flows of about 10-15 cfs (Scott Engblom 1999a). Thus, proposed fish rearing support releases may have much less of an effect on pool stratification than water rights releases in the area 3 to 10 miles downstream of the dam. Data are lacking to fully evaluate this however. Closer to the dam, fish rearing support releases are expected to lower water temperatures, based on available data (Santa Ynez River Technical Advisory Committee, 1997). The exact effects on temperature and stratification will depend on climate conditions, specific magnitude and timing of water releases, and the structural and hydrologic factors creating pool stratification. Based on the data available, NMFS cannot estimate exact flows at which stratification will be maintained or lost. Steelhead may be adversely affected by increased temperatures as noted above in the discussion of water rights releases if pools lose thermal stratification and temperatures increase. These effects on water temperature and steelhead are expected to be variable and somewhat unpredictable, likely much less than the effects of water rights releases due to lower flow amounts, and expected to last as long as the project is operated.

Water quality - dissolved oxygen. The provision of water for fish rearing support will increase the amount of time low flows are provided to pools during the summers, and will likely increase dissolved oxygen concentrations several miles downstream of the dam throughout the life of the project. However, in approximately 35% of years, flows are predicted to range from 0 to 2.5 cfs ten miles downstream of the dam during part of the summer under the proposed fish rearing

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[10]Note the lack of access to much of the area within 3.5 miles of the dam discussed earlier. Thus, the % of the mainstem juvenile population in Alisal Reach may be over estimated.

support releases. This area, and areas several miles upstream, are likely to experience low dissolved oxygen levels in some wetted stream habitats, especially those that do not receive surface flows. For example, in 1995 dissolved oxygen in a pool habitat (where steelhead are often present) ranged from 0.011 ppm (depth) to 2.33 ppm (surface) in the morning and 1.32 ppm (depth) to 17 ppm (surface) in the evening when measured on August 23 (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997).

The low levels of dissolved oxygen associated with fragmented or lack of surface flows during summers are expected to be equal or below the 3 ppm threshold thought to be lethal to rainbow trout under many conditions (Matthews and Berg 1997). In general, salmonids are known to function normally at dissolved oxygen concentrations of 6-8 ppm. Indications of stress are commonly seen at 5-6 ppm and negative effects occur at concentrations below 4 ppm (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997). However, steelhead in the Santa Ynez River and elsewhere in Southern California have been noted to survive in or near very low dissolved oxygen concentrations (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997; Mathews and Berg 1997). The frequency, duration, and magnitude of tolerance for low dissolved oxygen concentrations in the southern California ESU steelhead is unknown. Steelhead rearing support releases will improve dissolved oxygen concentrations in those areas where surface flows are provided. But, as noted, there is a higher degree of probability that surface flows will not be present in areas likely to contain steelhead during the proposed interim period (prior to approval and implementation of the 3.0 foot surcharge) than during proposed long term operations. The improvement in dissolved oxygen conditions near the Dam and potential for poor dissolved oxygen conditions farther from the Dam are expected to continue for the life of the project.

Water quality - sediments and turbidity. Fish rearing support releases are not expected to affect turbidity and sediment levels in the Santa Ynez River mainstem. These releases will either occur after winter storms, which will have flushed sediments out, and/or after water rights releases that push sediments and debris downstream as noted above.

Riparian vegetation. The proposed fish rearing support releases would likely add and/or sustain additional riparian vegetation, but no data are available for NMFS to accurately estimate the effects of water releases on riparian vegetation. Additional riparian vegetation is likely to benefit steelhead by providing shade, cover, increased inputs of nutrients and increase in the production of certain types of macro invertebrates.

Aquatic macro invertebrates. In NMFS's opinion, fish rearing support releases are likely to increase aquatic macro invertebrate production in the areas of the mainstem affected by these releases. These releases will provide relatively little increase in habitat area when compared with the initial level of water rights releases. However, fish rearing support releases will occur for a much longer duration, providing stable low flow areas (where non fragmented low flows are maintained) for macro invertebrate production. Additional macro invertebrate production will increase steelhead food supply. This is expected to continue for the life of the project.

Hilton Creek
Reclamation proposes to deliver water to Hilton Creek based on the considerations outlined in the "Description of Proposed Action" section. The water supply line will be able to provide an increase in water quantity in Hilton Creek in 98% of years based on the addition of a planned pump in 2002. In general water will be released to maintain flows between 1.5 and 5 cfs in Hilton Creek, depending upon water year type, natural flows in Hilton Creek, and reservoir storage.

Habitat area. The proposed project is expected to increase wetted habitat area in Hilton Creek in nearly all years after 2002 (the planned pump, see above). As much as 2,980 feet of creek bed will become wetted during some years when natural surface flows would not be available. Flows in this area may range from 1.5 to 5 cfs during 98% of years. This beneficial effect to steelhead habitat and steelhead is part of the mitigation for the seismic retrofit project noted above, and while noted here, is not part of the effects analysis for this project. The effects to steelhead habitat and steelhead caused by specific flow management in Hilton Creek and the Santa Ynez River through the Hilton Creek pipeline are analyzed in this biological opinion as noted above and below. For example, higher or lower flow releases may affect migration, spawning, and rearing habitat.

Switching water releases between the pipeline's release points may also affect steelhead habitat and steelhead. A shift in water release from the upper release point (if it occurs) will result in reduction and loss of habitat area in the reach directly downstream of the upper release point. Approximately 1,600 feet of Hilton creek bed could be affected, depending upon climate conditions and water use decisions at Hilton Creek. Habitat area could reach zero in some years in the 1,600 feet between the upper and lower release points. The percentage of years that releases will be shifted to the lower release point is unknown. Currently, steelhead migrants are impeded, if not prevented from reaching the area between the upper and lower release points due to the passage impediment. Steelhead will not directly experience loss of habitat area here until the passage fix proposed by Reclamation (U.S. Bureau of Reclamation 1999), is implemented and steelhead begin to migrate, spawn and rear between the water supply line release points. Reclamation has indicated that if steelhead are present between the upper and lower release point, enough water to maintain good habitat will be provided in this area (David Young 2000a).

During these releases, loss of habitat will occur if surface discharge is reduced. The composition of instream habitat could be altered by the project action because reducing discharge reportedly eliminates or decreases swift water habitat and cover, and increases the abundance of slow water habitat (Kraft 1972). Because Hilton Creek is a confined channel in most areas, these habitat changes are not expected to be pronounced. In general, significant changes to habitat availability do not occur until flows drop below 2 cfs (Engblom 2000a). Therefore NMFS remains concerned that the revised project proposal will provide flows in Hilton Creek below 2 cfs at some times. The available data do not allow NMFS to accurately predict the frequency of flow reductions in Hilton Creek or the frequency that flows less than 2 cfs will be provided.

Flow ramping. As stated previously in "Water Rights Releases, *Habitat area and Stranding*", completely dewatering a portion of Hilton Creek in early 1998 resulted in steelhead stranding and death. The dead steelhead were found in spaces under cobble (U.S. Bureau of Reclamation 1998a). Relatively rapid or instantaneous fluctuations releases (particularly decreases) may cause harm, injury, and mortality to steelhead by confining them to areas that are predisposed to dewatering and desiccation, increased water temperature, decreased dissolved oxygen concentration, and predation (Cushman 1985). However, Reclamation's proposed ramping schedule for Hilton Creek is likely to avoid steelhead stranding as long as surface flows are maintained in areas containing steelhead. This is due to the slow reduction of flows proposed, and the relatively confined nature of the Hilton Creek Channel. As noted, flows would not be reduced faster than 1 cfs every 4 hours, which is slower than that ramping rate suggested by the literature (Washington Department of Fisheries 1992).

Water quality - temperature. During operation of the temporary watering system (located at the site of the permanent lower release point) water temperature and dissolved oxygen were suitable for steelhead in the watered area of Hilton Creek (U.S. Bureau of Reclamation 1999). There is some concern that water released at the upper release point could experience warming as it travels through the open reach lacking canopy cover and topographic shading down to the area currently often occupied by steelhead (U.S. Bureau of Reclamation 1999). The available data are not sufficient to estimate the likely temperature change in areas likely to be occupied by steelhead. Both surface flow exposure to the sun and gravel infiltration of flows will influence the temperature of water reaching the lower reach (U.S. Bureau of Reclamation 1999). As noted above, steelhead are likely to experience stress at water temperatures near and above 25 degrees Celsius. However, Hilton Creek has naturally exceeded 25 degrees Celsius in the past, and steelhead young of the year have been observed to be generally healthy and actively feeding at these high temperatures (Santa Ynez Technical Advisory Committee 1997). The use of the upper release point may have the potential to increase the frequency and duration of temperature stress experienced by steelhead in Hilton Creek. The data available are not sufficient to estimate the amount of time this may occur.

Water quality - dissolved oxygen. Dissolved oxygen levels are expected to be increased in Hilton Creek by the project action during 98% of years once the planned pump is installed. The amount of increase will depend upon release flows and climate conditions. Dissolved oxygen levels may be reduced by the proposed action if water release to Hilton Creek is reduced and/or surface flows become fragmented. For example, isolated pools may experience infiltration of groundwater that is oxygen depleted (Matthews and Berg 1997). As noted above, dissolved oxygen has generally decreased where it was measured in pool habitats in the mainstem Santa Ynez during summers as flows were decreased and became fragmented. NMFS believes it reasonable to conclude that dissolved oxygen levels in Hilton Creek pools would become stressful to steelhead in Hilton Creek if flows to these pools decreased and became fragmented. Based on the operating procedures for the permanent water supply line, NMFS believes this reduction in dissolved oxygen levels is unlikely to occur.

Water quality - turbidity and sedimentation. Use of the Hilton Creek Permanent Water Supply Line may increase turbidity and sedimentation if surface flows are increased rapidly and/or provided to dry areas of Hilton Creek. An initial test of the pipeline on January 27, 1999, resulted in unanticipated turbidity and sedimentation in pools containing steelhead in Hilton Creek (NMFS 1999). Some of this sedimentation resulted from the improper construction and placement of the concrete apron and rock and erosion matting below the lower Hilton Creek release valve. This has been corrected. (Young 1999). Some of the turbidity and sedimentation resulted from the addition of surface flows which mobilized sediment in isolated pools and previously dry areas of the creek bed (NMFS 1999). NMFS does not expect that surface flows will be provided to Hilton Creek in the future in a manner that results in turbidity or sedimentation. Therefore, the effects to steelhead outlined above for water rights releases are unlikely to occur.

Riparian vegetation. NMFS believes the provision of extra surface flows to Hilton Creek in 98% of years is likely to encourage the growth of additional vegetation along Hilton Creek, but NMFS cannot estimate the extent of any new growth that may occur. New growth would likely be beneficial to steelhead.

Aquatic macro invertebrates. NMFS believes that in general the provision of water to Hilton Creek in 98% of years will benefit aquatic macro invertebrate populations by providing a greater amount of flows during most years. When it occurs as proposed, reduction and cessation of flows in the area between the upper and lower release point in Hilton Creek will likely decrease the amount of aquatic insects available to steelhead in the reaches below. As noted above, no data are available to quantitatively estimate effects to aquatic macro invertebrates from flow fluctuations in the action area, including the amount and duration flows may be eliminated between the two Hilton Creek release points. However, the effect of macro invertebrate loss (steelhead food) on steelhead caused by cessation of flows between the upper and lower release point is likely to be temporary. Rapid recolonization by macro invertebrates of the disturbed area is expected once flows return to this area. Reported rates of recolonization range from about one month (Thomas 1985) to 45 days (Harvey 1986).

Tributaries - Passage Improvements

As noted in the "Effects on migrating steelhead" section, Reclamation will fix 11 passage impediments and barriers in the watershed below Bradbury Dam to restore or improve passage for migrating steelhead. Steelhead will have access to several more miles of rearing habitat once the passage impediments and barriers are fixed. As noted above access will be improved to about half of the tributary habitat available, and access will be restored to one quarter of the total tributary habitat that could be used by steelhead. Much of this is rearing habitat in fair to good condition, according to Reclamation (U.S. Bureau of Reclamation 1999) and observations made in the field by NMFS fishery biologists. Additional rearing habitat will provide areas for the additional juvenile steelhead expected from increased steelhead spawning (from passage improvements and migration flow supplementation) to grow to smolt age. Thus, the passage

improvements are expected to significantly improve population numbers and distribution.

Implementation of these projects (including the chute pool and HWY 154 on Hilton Creek) is expected during summers when steelhead juveniles may be rearing in areas directly affected by at least some of these projects. NMFS has a high degree of familiarity with these types of projects and expects that temporary turbidity and sedimentation are likely to result which are likely to adversely affect steelhead (as noted above) if they are present. The amount of turbidity and sedimentation will depend upon the specifics of each project. These adverse effects are not likely to substantially affect the survival of the Santa Ynez steelhead population if they are avoided and/or minimized during project construction.

El Jaro Creek Demonstration Projects

Reclamation is proposing to fund three habitat enhancement/remediation demonstration projects in El Jaro Creek, a tributary of Salsipuedes Creek. The projects are: 1) the replacement of a plugged road culvert to prevent catastrophic road crossing failure and resulting sediment delivery to the creek, 2) stabilization of an eroding hillside downstream of the culvert to avoid stream bank failure, and 3) stabilization of an actively eroding stream bank via installation of a hard rock toe. The ultimate effect of these projects is likely beneficial to steelhead and steelhead critical habitat, but due to the small amount of habitat affected by these demonstration projects, there is likely to be no easily measurable beneficial effect to the steelhead population in the Santa Ynez.

The purpose of the demonstration projects is to educate and inform landowners regarding beneficial actions that could be taken to protect and restore steelhead habitat. Such actions, if implemented by landowners on a larger scale than the demonstrations would likely have measurable, significant, beneficial effects to steelhead. Adverse effects from the three projects described above include temporary sedimentation and turbidity, and in the case of the third project, the possibility of contact between rearing steelhead and construction equipment should steelhead be present at the site of pool creation. Based on the available information NMFS can not accurately predict the rate and duration of sedimentation and turbidity but expects these effects to be temporary in nature. NMFS also believes that with proper measures, contact between steelhead and construction equipment can be avoided.

CCWA Water Releases

CCWA will supply water to the reservoir as described above in the "Description of the Proposed Action" section. As the water is treated and then the treatment chemicals are removed, effects are expected to be minimal, except for possible interference with steelhead imprinting. Steelhead and other salmonids are known to imprint on their natal streams during smoltification (Hasler and Scholz 1983). In the Santa Ynez River, smolts may migrate downstream from January through June. Therefore the possible mixing of CCWA water with Santa Ynez River water during dry years in May and June is a concern and potential adverse effect. However, water rights releases are made in dry years when there is no continuity between the mainstem and the

ocean before, during, or after water rights releases (until the next winter season's storms). It is unclear if juveniles rearing in mainstem pools would be encouraged to smolt and attempt to move downstream when water rights releases occur during dry years. The limited data available do not indicate that steelhead move in the mainstem during water rights releases (Engblom 2000). Based on the data available, NMFS cannot estimate the amount of incorrect imprinting that might occur. However, for the reasons given above, the risk of incorrect imprinting is expected to be remote.

Temporary Road Crossing

The continued use of the Santa Ynez River bed for vehicle crossing is likely to result in turbidity and sedimentation, and the possibility of direct contact between steelhead and construction equipment. Turbidity and sedimentation are expected to be temporary. NMFS cannot estimate the number of fish that may be affected in part because Reclamation has provided no estimate of the frequency the crossing may be used nor the number and type of equipment to be driven across the river bed at that location.

Fish Rescue

Fish rescue and relocation in Hilton Creek, while in general a beneficial action, may adversely affect some steelhead in the action area. The stress caused through capture, handling, and release can easily injure steelhead. Mortalities may also result. These effects may also occur if steelhead are inadvertently captured during proposed predator removal. NMFS notes that electrical burning (from electroshocking equipment) and several mortalities resulted during a recent steelhead rescue effort in the Santa Ynez. Sixty of about 860 juveniles were electrically burned (7%) and five juveniles (less than 1%) were killed (U.S. Bureau of Reclamation 1998). Reclamation estimates that fish rescues in Hilton Creek will be needed in approximately 2% of years due to climate conditions and the resulting ability to supply water to Hilton Creek. (U.S. Bureau of Reclamation 1999). Thus, NMFS expects the adverse effects of fish rescues on the steelhead population in the Santa Ynez River to be relatively insignificant. Rescues are expected to be ultimately beneficial to the population, as steelhead will be relocated to habitats likely to contain water for the rest of the summer.

Hilton Creek Habitat Modification

The proposed construction of a 1,500 foot long rearing channel extension for Hilton Creek also may result in sediment and turbidity impacts. These effects depend upon project magnitude and timing. If not carefully designed, the channel extension may disrupt steelhead migration into Hilton Creek. Maintenance needs are also unknown. Therefore NMFS will require more detail regarding this project through a tiering consultation or reinitiation of this consultation. The extension may provide benefits to steelhead rearing in Hilton Creek. However, as noted below, instream habitat manipulations have not always been successful. It is likely to take several years to fully evaluate the amount of benefits provided in this case.

Tributary and Mainstem Enhancement

The information NMFS needs (number of projects, timing, location, specific construction plans etc..) to assess possible tributary and mainstem enhancement projects other than the passage fixes and demonstration projects described above, is not available. Adverse effects such as sedimentation and turbidity could occur during enhancement projects, but would likely be temporary. Take may occur if steelhead need to be relocated to avoid interactions with project construction. Ultimately, NMFS expects most such projects will provide benefits to steelhead and steelhead habitat. However, NMFS notes that habitat manipulations in streams have sometimes brought mixed results (Mundie 1991). For example, in some cases artificially created habitat has not persisted for more than a few years. Until Reclamation develops a plan for enhancement in those areas under their jurisdiction, NMFS cannot predict the specific amount and extent of such projects nor their specific impacts. The specific extent of projects in areas outside of Reclamation's jurisdiction (but funded, at least in part, by Reclamation) also can not be predicted, in part because implementation will rely on willing landowners. However, based on the funding proposed by Reclamation to implement such projects, and the project schedule for the 11 passage fixes, NMFS does not believe that more than 4 enhancement projects are likely to occur each year, making their temporary adverse effects minimal and likely only temporarily affecting a portion of the steelhead population.

Monitoring Program

Most of the proposed monitoring program is already occurring. Take of steelhead associated with this program has been authorized by NMFS under ESA scientific research permit No. 1091 (which expires in 2003) and accounted for in the "Environmental Baseline" section of this opinion. Reclamation proposes to assume responsibility for the take authorized in research permit 1091 upon issuance of this opinion. The permit holder has agreed to turn in this research permit to NMFS. Therefore, Reclamation's proposed monitoring program will not result in a "doubling" of steelhead take through monitoring. However, the proposed additional migrant trap set in the mainstem is likely to trap steelhead that are headed to or returning from Hilton Creek where they are again likely to be migrant trapped (or have already been trapped). NMFS is concerned that trapping these fish twice could reduce the survival chances of each fish through additional stress related injuries.

Public Education and Outreach

NMFS does not believe that these programs will result in any measurable adverse effects to steelhead. Possible increases in poaching could occur based on more knowledge of steelhead presence in the Santa Ynez, but such increases are speculative. NMFS does expect benefits to occur based on education and outreach. For example, outreach programs may result in more conservation easements. However, quantifying the beneficial effects of such programs for ESA analysis purposes is not possible, as the amount of benefits provided cannot be predicted in terms of amount and quality of habitat likely to be produced.

SUMMARY AND SYNTHESIS OF EFFECTS

When determining the effects of proposed actions on listed species and critical habitat, NMFS relies on the best scientific and commercial data available to analyze effects as specifically as possible. Where information is lacking to specifically assess project effects, NMFS must err on the side of conservation to protect listed species (USFWS and NOAA final rule on "Interagency Cooperation - ESA of 1973, as amended" - 51 FR 19926 at 19952, June 3, 1986; H.R. Conf. Report 96-697 - 96th Congress, First Session, Dec. 11, 1979). As noted, the specific magnitude and frequency of adverse effects to steelhead and steelhead critical habitat resulting from several aspects of this proposed project are not easily determined. Therefore, NMFS has taken a conservative approach in the analysis of project effects on the species and its critical habitat.

As noted above, NMFS often relies on natural conditions as a guide to the conditions under which a species best survives and which are therefore associated with self-sustaining and self-regulating populations. However, in some cases it is important to recognize that providing or mimicking a more "natural" condition with respect to one or more habitat features may be detrimental or neutral in effect to a listed species if other habitat features are not, or cannot be addressed in a coordinated fashion.

To complete their freshwater life cycle in the Santa Ynez River watershed, steelhead must first migrate as adults up river and tributary to spawning habitat. Enough eggs and alevins must survive to become juvenile fish, many of which in turn must survive over at least one summer to become smolts during the next winter's rains. Enough smolts must survive migration and reach the ocean to ensure sufficient numbers of returning adults to repeat the cycle. In general, egg to smolt survival in salmonids ranges from 1 to 7%. Survival in the ocean has been estimated at 0.7 to 9.8% (Bradford 1995). These numbers have been reported here to emphasize NMFS's concern with the small size of the Santa Ynez steelhead population, and the importance of survival at each life stage. Such a small population may also be characterized by a lack of genetic diversity which negatively impacts the species' fitness, including its adaptability, reducing the chances of the population's survival in the face of environmental changes (Meffe and Caroll 1997). For a population to survive it must produce sufficient numbers of individuals at all life stages and/or age classes to maintain itself into the future regardless of expected environmental and human impacts. Habitat must provide all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter.

Impacts of the Proposed Action that Affect the Survival of Steelhead Freshwater Life History Stages

1. Reclamation will provide supplemental flows to assist steelhead with migration and these flows will be applied to storms in approximately 24% of years. Supplemental flows will roughly double the amount of normal years when 14 or more consecutive days of migration are available, significantly assisting steelhead migration during the years migration is most impacted by water

impoundment. These additional flows likely provide sufficient time after storms for steelhead to migrate from the Pacific Ocean to spawning areas near the dam, including tributaries, substantially improving baseline conditions. Therefore NMFS believes that the supplemental migration flows proposed likely appreciably increase steelhead survival in the Santa Ynez River watershed below Bradbury Dam over recent operating conditions, improving the Santa Ynez steelhead population's long term viability. However, migration opportunity below the dam will continue to be reduced over the life of the project when compared with natural conditions associated with the larger historical steelhead population in the Santa Ynez River.

2. Supplemental flows for migration may increase spawning habitat availability in the mainstem over recent operating conditions. Because data on the specific location, extent, and quality of spawning habitat in the mainstem are not currently available, NMFS cannot firmly conclude that spawning habitat will be increased or decreased by the proposed action. Spawning habitat in several other tributaries may be affected by enhancement actions but a lack of specific project information prevents NMFS from assessing the overall effects of these actions. Increase to spawning habitat in Hilton Creek that may occur is part of mitigation for the seismic retrofit project and is not considered an effect of this project.

3. Water rights releases, which were also part of recent operations, will continue to provide beneficial effects (except for temporary sedimentation and turbidity) near the dam, and detrimental effects in the area 3.5 to ten miles downstream from the dam in 65% of years. These releases create additional habitat area, water velocity and cover/shelter, better dissolved oxygen conditions, and better temperature conditions near Bradbury Dam. Temperature stratification in many pools downstream of the dam is likely to be lost however, resulting in the potential for increased temperature stress to steelhead between 3.5 and ten miles downstream of the dam. The benefits and temperature problem of releases are significantly reduced and/or negated when water rights releases are ramped down and/or fluctuated. Under these conditions, steelhead, especially those located from 3.5 -10 miles downstream of the dam, are likely subjected to the following adverse effects: reduction in cover/shelter, reduction in food supply, increased predation, and lower dissolved oxygen conditions. These adverse effects likely negate the beneficial effects from increased flows. In addition, temporary turbidity is created during the first three days of release and sedimentation may occur. These effects are expected to continue under the proposed project for its duration, although they may occur in somewhat fewer years and/or for shorter duration due to the provision of water for fish which may reduce the need for water rights releases in some years. In NMFS's judgment, water rights releases are of beneficial value to steelhead near the dam, but detrimental to steelhead located 3.5 to 10 miles downstream of the dam.

4. Maintaining the proposed flow targets for steelhead will provide increased low flow summer rearing habitat when compared with recent or historical conditions. This will provide the benefits identified above, including increased food, cover/shelter, dissolved oxygen, and lower temperatures near the dam. However, at some low flows, areas of the river known to contain steelhead are likely to return to fragmented flow, or complete lack of flow based on the proposed

project. A lack of flow in the areas is likely to continue to reduce the survival chances of steelhead farthest from the dam (3.5 to 10 miles) if steelhead are present. As noted, this adverse effect is most likely to occur during the interim prior to approval and implementation of the 3.0 foot surcharge. Proposed long term flow targets will increase the survival chances of steelhead in the mainstem improving the Santa Ynez's populations viability. These effects are expected to continue in the mainstem for the duration of the project.

5. Steelhead passage impediment and barrier fixes scheduled to occur as part of the Cachuma Project will provide restored and/or improved access to 32 miles of habitat in the tributaries below Bradbury Dam. NMFS considers these actions to provide significant improvement in the survival chances of the steelhead population in the Santa Ynez when all are completely implemented. NMFS notes that the tributaries known to contain steelhead downstream of the dam have a total length of 40 miles. Eighty percent of this habitat will be made available for steelhead. Reclamation's supplemental flows for migration are also likely to improve steelhead access to these areas when compared with conditions in the recent past.

6. The adverse effects to steelhead and steelhead critical habitat caused by implementing the 11 passage impediment and barrier fixes, the three demonstration projects, and the temporary road crossing in the watershed below the dam are expected to be temporary; lasting less than a few months at most. The potential for contact between steelhead and construction equipment is unknown, but can be minimized by appropriate avoidance measures. Other potential enhancement projects described above are also likely to have only temporary effects. Based on the small number of projects anticipated due to the funding provided by Reclamation, NMFS does not believe that the levels of temporary turbidity and sedimentation, nor relocation of steelhead, are likely to rise to a level that might affect a substantial portion of the population.

Impacts on ESU Survival and Potential for Recovery

1. The Santa Ynez River steelhead population and the entire Southern California ESU population are very small. The steelhead population in the Santa Ynez River is comprised of very few adult fish. Redd counts, migrant trapping, and observations are all consistent with a very low population size, probably less than 200 adult fish. As noted previously, the information available on population numbers and distribution does not allow accurate quantification of the expected project effects on steelhead. The Southern California ESU was listed as endangered by NMFS due to its greatly reduced range and population size. The limited available information regarding fish abundance is insufficient to determine if the current ESU population is continuing to decline, has stabilized, or is increasing. In the absence of any significant actions to protect or recover the species, it is reasonable and conservative to assume that the population continues to decline. Less data are available on steelhead numbers in other rivers and streams in the ESU. As noted above, the entire Southern California ESU is thought to contain fewer than 500-600 adult fish, but the ESU's population cannot be reliably estimated due to a lack of consistent fish management data in Southern California such as redd counts and catch estimates. The existing data indicate that the Santa Ynez River population may be one of the largest remaining in the

ESU with a number estimated at less than 200 adult fish. The Santa Ynez River steelhead population is therefore an essential component of the Southern California ESU population as a whole.

2. NMFS' analysis indicates that proposed operations will: 1) Significantly increase the opportunity for steelhead to migrate to spawning areas in the Santa Ynez River below Bradbury Dam over recent conditions during 27% of years; 2) Increase the ability of steelhead to successfully rear within 3.5 miles of the dam; 3) Significantly increase habitat availability in tributaries downstream of the dam when all proposed passage fixes are fully implemented; 4) Continue to adversely affect steelhead rearing in some portions of the mainstem where steelhead are commonly found (3.5 - 10 miles downstream of the dam, most significantly during the proposed interim period); 5) Temporarily adversely affect steelhead in tributaries below the dam when passage fixes are implemented (turbidity, sedimentation, relocation); and 6) Result in additional migrant trapping stress (and possible mortalities) of Hilton Creek fish. NMFS cannot specifically predict the long term survival chances of this population based on the data available and the proposed project. However, in NMFS's best professional judgement, the improvements over recent conditions for migration, habitat access in the tributaries (once fully implemented), and rearing habitat in the mainstem near the dam are likely to outweigh the adverse effects noted above in #s 4, 5, and 6 because such adverse effects are temporary and/or occur to only a portion of the population or small portion of critical habitat. Improved migration and habitat access will likely benefit the entire population. Thus, it is likely that this population's chance of persisting into the foreseeable future will be appreciably improved when the project is fully implemented. NMFS remains concerned about steelhead farthest from the dam during the interim due to the current population's small size and restricted access to habitat.

The Cachuma Project is one of the major factors affecting steelhead in the Santa Ynez River. Proposed Cachuma Project operations and maintenance, if carried forward many years into the future, will provide the small Santa Ynez River steelhead population with improved critical habitat conditions in the form of increased migration opportunity and better access to spawning and rearing areas in the watershed below Bradbury Dam, allowing the population to increase in size. Therefore the proposed project is likely to appreciably increase the likelihood of survival and recovery of the ESU by increasing its numbers and distribution. Monitoring will be needed to confirm this expected population trend.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Endangered Species Act. NMFS maintains general familiarity with actions affecting steelhead in the Santa Ynez River,

and is unaware of any such actions that are reasonably certain to occur within the proposed action area that would not require section 7 consultation (i.e. private actions). High property values in the Santa Ynez Valley have precluded much conversion of rangelands to vineyards (which could affect water demands) and this trend is expected to continue (United States Bureau of Reclamation, 1999). Consequently, we believe no cumulative effects are likely to occur in the near future.

CONCLUSION

Therefore, after reviewing the best scientific and commercial data available, the current status of steelhead, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is NMFS' biological opinion that the proposed project action is not likely to jeopardize the continued existence of the Southern California steelhead ESU, and is not likely to destroy or adversely modify steelhead critical habitat.

INCIDENTAL TAKE STATEMENT

Take is defined as harass, harm, pursue, hunt, shoot, kill, trap, capture or collect, or attempt to engage in any such conduct of listed species of fish or wildlife without a special exemption under the Endangered Species Act. NMFS defines the term "harm" as an act which kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering. "Incidental take" is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or an applicant. Under the terms of section 7(b)(4) and section 7(o)(2) of the Endangered Species Act, taking that is incidental to and not intended as part of the agency action is not considered a "prohibited taking", provided that such taking is in compliance with the terms and conditions of this incidental take statement.

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

AMOUNT OR EXTENT OF TAKE

The NMFS anticipates that incidental take of Southern California ESU steelhead is likely to occur as a result of the ongoing operations of the Cachuma Project as proposed. Adequate data are not available to allow NMFS to determine the specific number of steelhead that may be taken in many instances as a result. Therefore, as in the analysis in this biological opinion, NMFS anticipates take in the form of harm due to the habitat modifications proposed by the project:

1) Harm to steelhead present in pools 3.5 to ten miles downstream of Bradbury Dam is likely to occur when water rights releases (made in 65% of years) disrupt thermal stratification in these pools, removing temperature refuges for steelhead.

2) Harm to steelhead is likely to occur in during the first three days of water rights releases (made in 65% of years) when sediments and organic debris are transported downstream.

3) Harm to steelhead is likely to occur when water rights releases are ceased (65% of years) and habitat space in the mainstem for steelhead shrinks.

4) Harm to steelhead is likely to occur in 37% of years under long term operations if water releases for fish do not reach areas occupied by steelhead during the dry part of each year.

5) Harm to steelhead is likely to occur if adults and/or juveniles are delayed or prevented from migrating in the mainstem due to water impoundment by the Cachuma Project when compared with historical (no dam) conditions. This may occur in 40% or more of years.

In each case, take is anticipated based on the specific operating procedures described by Reclamation in the revised project description (U.S. Bureau of Reclamation 2000). Operation of the project in a different manner than described in the revised project description may increase the level of harm to steelhead through additional adverse habitat conditions. Therefore such changes in project operation would require reinitiation of consultation.

In addition, NMFS anticipates take of steelhead through capture and collection as follows:

1) Rescue/relocation of steelhead in Hilton Creek to avoid severe drought conditions in 2% of the next 50 years, or in 1 year. Thus, in the next 50 years one relocation of all steelhead found in Hilton Creek at that time is anticipated.

2) Relocation of steelhead directly affected by implementation of the 11 passage barrier fixes, and three demonstration projects. NMFS anticipates (given the current low numbers of juvenile steelhead observed in this population) that as many as 800 juvenile steelhead may need to be relocated to accomplish all of these projects combined.

3) The number of steelhead that may need relocation as a result of future enhancement projects conducted and/or funded by Reclamation cannot be specifically anticipated in this opinion. Therefore these projects will be tiered to this opinion as described below (see Project Tiering).

NMFS anticipates that less than 1% of steelhead captured and collected will be killed during capture, transport to relocation sites, and release. Five percent may be harmed by electrical burning if electrofishing is authorized. NMFS notes that electrical injury greatly decreases a fish's chance of survival (Dalby et. al. 1996, Nielsen 1998). The steelhead numbers above are based on the data available for the total number of steelhead rearing in the Santa Ynez watershed and NMFS best professional judgement as to the number likely affected.

4) Take (observe, harass, capture, collect, and mortalities) associated with Reclamation's monitoring plan is anticipated as follows based on the small steelhead population in the Santa Ynez River below Bradbury Dam:

A. Observe/harass 50 adult and 400 juvenile steelhead per year (snorkel surveys, bank observations, redd counts)
B. Capture/release 150 adult and 110 juvenile per year with 1 adult unintentional mortality and 4 juvenile unintentional mortalities (migrant trapping).
C. Collection of 15 steelhead carcasses per year.

In addition, no more than 70 total adult and juvenile steelhead will be captured twice (both in the in the additional migrant traps each year and at the Hilton Creek traps. This is based on six years of steelhead migrant trapping Hilton Creek; where no more than 64 steelhead were ever trapped. Capture of adult and juvenile steelhead in the new migrant traps is anticipated the first year they are installed.

A large population response is not expected during the first five years of project operations as access to tributary habitats will still be limited and supplemental flows for migration will not be fully instituted. As the population expands, take from monitoring will have to be revisited through reinitiation of consultation.

PROJECT TIERING

Reclamation is committing funding to a tributary and mainstem enhancement program as part of the Cachuma Project. Except for the tributary passage impediment fixes and demonstration projects described and analyzed in this opinion, projects that are likely to result from the enhancement program remain relatively undefined. Therefore NMFS cannot anticipate take for these projects. As noted in the analysis of effects section above, NMFS expects the adverse effects from these projects to be low and temporary based on the small number of projects that could occur each year and types of projects proposed. In order for these projects to proceed, NMFS will need a complete description for each particular project. NMFS will work with

Reclamation to avoid, minimize and analyze the adverse effects of each project, and depending upon the effects of the particular project will concur with a "not likely to adversely affect" determination or issue a biological opinion, both of which will be tiered to this biological opinion.

REASONABLE AND PRUDENT MEASURES

The proposed project is likely to result in adverse effects in some situations, as noted above. The NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize and monitor incidental take of steelhead.

1. In addition to meeting the interim and long term flow targets described in the Description of the Proposed Action section, Reclamation shall maintain full residual pool depth in Alisal and Refugio reaches downstream of Bradbury Dam during spill years and the first year after spill years until the first 3.0 foot surcharge is achieved and the 11 passage impediment and barrier fixes are completed.

2. Reclamation shall maintain flows in Hilton Creek at levels currently considered to provide optimal habitat space until better data are available.

3. Reclamation shall develop and implement a plan to further refine supplemental releases for steelhead migration in the Santa Ynez River.

4. Reclamation shall reinitiate consultation if the tributary passage impediment and barrier fixes described in the revised project description (U.S. Bureau of Reclamation 2000) are not completed by 2005.

5. Reclamation shall avoid mixing CCWA water in the Santa Ynez River downstream of Bradbury Dam when steelhead smolts could become imprinted with it.

6. Reclamation shall monitor fish movement during water rights releases.

7. Reclamation shall monitor stage and wetted width during mainstem and Hilton Creek ramp downs.

8. Reclamation shall avoid and minimize turbidity, sedimentation, loss of riparian vegetation, and steelhead relocation during implementation of tributary passage fixes, the El Jaro Creek demonstration projects, and future Reclamation enhancement measures. Reclamation shall obtain NMFS's approval of final project designs.

9. Reclamation shall avoid and minimize steelhead harm and death during relocation and predator removal.

10. Reclamation shall obtain NMFS approval of the adaptive management committee's decisions that affect listed steelhead prior to their implementation.

11. Reclamation shall provide NMFS with monitoring data and reports evaluating the effects of the proposed project on steelhead.

12. Reclamation shall relocate steelhead in danger of becoming stranded should releases fail due to mechanical or human error.

13. Reclamation shall implement the steelhead protection measures specified in the July 19, 1999, letter from NMFS (including the measures specified in Reclamation's Final Supplemental Environmental Assessment for the Bradbury Dam Modification Seismic Corrective Action Safety of Dams Program) concerning vehicle use of the temporary road crossing and limit the amount of crossing events and vehicles using the crossing.

14. Reclamation shall reinitiate consultation if work to upgrade the Hilton Creek pipeline's capacity may adversely affect steelhead.

15. Reclamation shall develop and implement a plan to further verify the use of the model to analyze migration supplementation and mainstem target flows.

TERMS AND CONDITIONS

In order to be exempt from the take prohibitions of the ESA, Reclamation must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring conditions. These terms and conditions are non-discretionary.

The following term and condition implements reasonable and prudent measure No. 1.

> 1) Until the first year that the 3.0 acre foot surcharge is achieved and the 11 passage barrier fixes are completed, Reclamation shall maintain pools in the Alisal and Refugio reaches in spill years and the first year after spill years, if steelhead are present. This shall be accomplished by maintaining residual pool depth. This may be accomplished by surface or subsurface flow and is in addition to meeting the flow targets in the interim and long term. Residual pool depth is the difference between the elevation of the deepest point in the pool and the elevation of the lowest point of the crest (outlet depth) that forms the pools' hydraulic control.
>
> This term and condition provides a much better chance that steelhead farthest from the

dam will be provided some habitat during the interim when access to habitat in the tributaries below Bradbury Dam remains restricted and supplementation for improved migration opportunity is not fully implemented. This will increase their chance of survival and help maintain the very small Santa Ynez River population until the full benefits of proposed enhancements are available.

The following terms and conditions implement reasonable and prudent measure No. 2.

1) Flow in Hilton Creek will be maintained at levels no lower than 2 cfs once the pump is installed and Reclamation has the ability to provide water in 98% of years unless: 1) the adaptive management committee decides otherwise and NMFS approves (see below), and/or 2) transect data indicate that habitat space does not decrease significantly at flows below 2 cfs.

2) Reclamation shall implement the Hilton Creek Habitat Monitoring study plan described on page 3-60 of the Revised Project Proposal (U.S. Bureau of Reclamation 2000) and report the results to NMFS in each year the study is conducted.

The following term and condition implements reasonable and prudent measure No. 3.

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

The following term and condition implements reasonable and prudent measure No. 4.

1) Reclamation will reinitiate consultation with NMFS if information is available indicating that the planned tributary passage impediment and barrier fixes will not be completed by 2005. Reclamation shall provide the following information, at minimum: 1) Explanation of the delay in completing this aspect of the proposed action; and 2) Steps Reclamation will take to complete this aspect of the proposed action and a new anticipated date of completion.

The following term and condition implements reasonable and prudent measure No. 5.

1) CCWA water will not be mixed into the waters of the Santa Ynez River during the months of December through June unless flow is discontinuous in the mainstem.

The following term and condition implements reasonable and prudent measure No. 6.

1) During the next three years of water rights releases Reclamation shall monitor steelhead downstream of Bradbury Dam to better confirm that they are not encouraged to move downstream by water rights releases. This shall be accomplished as follows:

A. A study design will be developed and forwarded to NMFS for approval that will include snorkel surveys of fish numbers and species in areas known to contain steelhead before and after the highest levels of water rights releases, snorkel surveys of fish numbers and species in areas downstream of Alisal reach before and after the highest water rights releases, and snorkel surveys of these areas after water rights releases are ended.

B. Upon NMFS approval of the monitoring plan it will be implemented during the next three water rights release years and each year's results will be reported to NMFS.

The following terms and conditions implement reasonable and prudent measure No. 7.

1) Reclamation shall implement the WR 89-18 Monitoring as described in the Revised Project Description for the Cachuma Project (U.S. Bureau of Reclamation 2000).

2) Reclamation shall report the results to NMFS in the year the data is collected.

The following terms and conditions implement reasonable and prudent measure No. 8.

1) Reclamation shall obtain NMFS's approval of final project designs for the tributary passage fixes, the El Jaro Creek demonstration projects, and future Reclamation enhancement measures.

2) Reclamation, or it's designated agent (here after referred to as Reclamation), shall isolate work spaces from flowing water for the purpose of avoiding heavy equipment in flowing water, sedimentation, turbidity, and direct effects to steelhead. Prior to work, sandbag cofferdams, straw bales, culverts, or visqueen (here after referred to as diversion) shall be installed to divert streamflow away or around the workspace. The diversion shall remain in place during the work, then removed immediately after work is completed.

3) As a result of isolating the workspace from flowing water, Reclamation shall ensure and maintain a corridor for unimpeded passage of steelhead during work activities.

4) When practical, Reclamation shall use existing ingress or egress points, or perform work from the top of creek banks, for the purpose of avoiding work and heavy equipment in flowing water and disturbing instream habitat.

5) Reclamation shall photograph the work space during and immediately before and after work activities are completed for the purpose of developing a reference library of instream and riparian habitat conditions.

6) Excavation of a channel for the purpose of isolating the work space from flowing water is prohibited.

7) Reclamation shall minimize disturbance of riparian and upland vegetation. Using only native plant species, Reclamation shall replace vegetation affected by the work and ensure a revegetation success ratio of no less than 2:1.

8) Reclamation shall revegetate soil exposed as a result of work activities using seed casting, hydroseeding, or live planting methods, no later than 30 days after the work has been completed. Only native plant species shall be used for revegetation.

9) Reclamation shall inspect the revegetated area during spring and fall for two years for the purposes of qualitatively assessing growth of the plantings or seedlings and the presence of exposed soil. Reclamation shall note the presence of native and non-native vegetation and extent (percent area) of exposed soil, and photograph the revegetated area during each inspection.

10) Reclamation shall prepare and implement a NMFS approved plan for restoring instream habitat and streambed within the areas affected by work activities to pre-work conditions and characteristics unless the intent of the work was to positively affect these areas by improving habitat conditions such as by fixing passage impediments and barriers or placing cover in pools. For example, if an access route cut into a stream bank for heavy equipment cannot be avoided by the use of existing ingress, then the bank must be returned to its pre-work condition when work is completed.

11) Reclamation shall retain or designate a fisheries biologist with expertise in areas of resident or anadromous salmonid biology and ecology, fish/habitat relationships, biological monitoring, and handling, collecting, and relocating salmonid species. On a daily basis Reclamation's fisheries biologist shall monitor work activities, instream habitat, and performance of sediment control/detention devices for the purpose of identifying and reconciling any condition that could adversely affect steelhead or their habitat. The fisheries biologist shall be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat. Reclamation's biologist shall ensure a corridor for unimpeded passage of steelhead during the work.

12) Reclamation's fisheries biologist shall continuously monitor the placement and removal of any diversion needed to isolate work spaces from flowing water for the purpose of removing any steelhead that would be adversely affected. The fisheries

biologist shall capture steelhead stranded in residual wetted areas as a result of streamflow diversion and workspace dewatering, and relocate the steelhead to a suitable location immediately upstream or downstream of the work area. The fisheries biologist shall note the number of steelhead observed in the affected area, the number of steelhead relocated, and the date and time of collection and relocation. One or more of the following NMFS approved methods shall be used to capture steelhead: dip net, seine, throw net, minnow trap, hand. Electrofishing is prohibited from use unless prior separate written consent is obtained from NMFS.

13) Reclamation's fisheries biologist shall contact NMFS fisheries biologist Darren Brumback (562-980-4026) immediately if one or more steelhead are found dead or injured. If Darren Brumback is unavailable Reclamation shall immediately contact NMFS Protected Resources Division at 562-980-4020. If no one at Protected Resources is available, Reclamation shall immediately contact NMFS's Office of Law Enforcement at 562-980-4050. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required. Reclamation will need to supply the following information initially: The location of the carcass or injured specimen, and apparent or known cause of injury or death, and any information available regarding when the injury or death likely occurred.

14) Erosion control and sediment detention devices shall be incorporated into Reclamation's work activities and implemented immediately before commencing work. These devices shall be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment (sand and smaller particles) and sediment water/slurry input to flowing water, and of detaining sediment laden water on site. The devices shall be placed at all locations where the likelihood of sediment input exists.

15) Placement of any soil/sediment berm for isolating any workspace from flowing water is prohibited.

16) When dewatering any area, either a pump shall remove water to an upland disposal site, or a filtering system shall be used to collect and then return clear water to the creek for the purpose of avoiding input of sediment/water slurry to flowing water. The pump intake shall be fitted with a device to exclude all life stages of steelhead.

17) Reclamation shall provide a written monitoring report to NMFS within 30 working days following completion of any work activity. The report shall include the number of steelhead killed or injured during the work activity and biological monitoring; the number and size of steelhead removed; and photographs taken before, during, and after work activity.

18) Reclamation shall provide a written report to NMFS describing the results of the revegetation task within 30 working days following completion of revegetation. The

report shall include a description of the locations planted or seeded, the area (m^2) revegetated, a plant palette, planting or seeding methods, proposed methods to monitor and maintain the revegetated area, performance or success criteria, and pre- and post-planting color photographs of the revegetated area.

19) Reclamation shall provide a written report to NMFS describing the results of the vegetation monitoring within 30 working days following completion of each fall inspection. The report shall include the color photographs taken of the work area during each inspection and before and after implementation of the work activities, and estimated percent of exposed soil remaining within each area affected by the work.

The following terms and conditions implement reasonable and prudent measure No. 9.

1) During future fish rescues Reclamation shall implement the methods described in the Hilton Creek Fish Rescue Plan (U.S. Bureau of Reclamation 1998b), the recommendations of the August 9, 1998 Hilton Creek Fish Rescue Assessment Report (United States Bureau of Reclamation 1998c), and the reporting requirements of NMFS's June 23, 1998 letter (NMFS 1998) authorizing emergency fish rescue. Modifications to these methods and recommendations may be made with NMFS's approval and shall be documented in writing.

2) During future fish rescues Reclamation shall implement NMFS's forthcoming electrofishing policy if electrofishing is necessary. This term and condition will become effective upon delivery by NMFS to Reclamation of the NMFS electrofishing policy.

3) If predator removal operations are conducted in areas to receive relocated steelhead, the following measures will be taken:

A. Site inspections shall be performed prior to removal activities for the purpose of identifying the presence of endangered steelhead within the relocation area. Instream areas found to harbor steelhead shall be avoided during predator removal activities. Removal timing and techniques, and point of egress and ingress shall be modified to either avoid or minimize take of steelhead.

B. A fisheries biologist with training and expertise in steelhead biology shall supervise pre-action, removal, and post-removal surveys. The biologist shall be empowered to halt those activities that may adversely affect steelhead, and recommend and implement avoidance measures.

C. The fishery biologist shall conduct a brief training session for all project personnel who are not fishery biologists familiar with steelhead before the action is implemented. The training session shall include a description of the steelhead and its habitat, general provisions and protections provided by the ESA, and the

terms and conditions of this incidental take statement that will be implemented to minimize injury and mortality of steelhead.

D. Reclamation's fisheries biologist shall contact NMFS fisheries biologist Darren Brumback (562-980-4026) immediately if one or more steelhead are found dead or injured. If Darren Brumback is unavailable Reclamation shall immediately contact NMFS Protected Resources Division at 562-980-4020. If no one at Protected Resources is available, Reclamation shall immediately contact NMFS's Office of Law Enforcement at 562-980-4050. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required. Reclamation will need to supply the following information initially: The location of the carcass or injured specimen, the apparent or known cause of injury or death, and any information available regarding when the injury or death likely occurred.

E. Any steelhead captured, collected, or trapped shall be revived, if necessary, and immediately released without delay to either the capture location or a more suitable instream location. No steelhead body length or mass data shall be measured.

F. Reclamation shall provide a written report to the NMFS within 4 weeks following completion of the proposed action. One report shall be submitted to the NMFS for each year that the project action is implemented. The report shall include the number of steelhead observed, handled (captured, collected, trapped), killed and injured during the proposed action; the estimated size of individual steelhead observed, handled, injured, or killed; a map delineating the location(s) where steelhead were observed or handled; a description of any problem encountered during the project or when implementing terms and conditions; and, any effect of the proposed action on steelhead that was not previously considered.

The following term and condition implements reasonable and prudent measure No. 10.

1) All decisions made by the Adaptive Management Committee (AMC) which could reasonably be expected to affect steelhead must be approved by NMFS before they are implemented. NMFS will require 30 working days to review such AMC decisions and any supporting data available. However, until the ability to surcharge the reservoir 3.0 feet is achieved, NMFS will waive the 30 day requirement, but not the approval requirement, in order to allow short term fine tuning of fish support operations. The first point of NMFS contact for the AMC will be Darren Brumback at the number given above. For example, shifting water from different release points or different areas of the mainstem and Hilton Creek known to contain steelhead may require NMFS approval. Known effects to water supplies for fish later in the year from such shifts must be fully

described.

The following term and condition implements reasonable and prudent measure No. 11.

1) Monitoring of the Cachuma Project shall occur as described above and as described in the revised project description (Reclamation 2000) under the direction of a qualified biologist. Reclamation shall provide NMFS with yearly reports (unless otherwise noted) that include the data taken each year and preliminary data analysis. Especially important for monitoring the effects of the Cachuma Project will be monitoring of: steelhead movement during migration supplementation, successful access, spawning, and rearing of steelhead in previously inaccessible and/or access restricted tributary habitat, and mainstem flow targets and the condition of steelhead in the mainstem.

2) Monitoring involving take of endangered steelhead such as migrant trapping, snorkel and bank observations, tagging, and tissue sampling, shall be conducted as described in the revised project description and the following take minimization and avoidance measures shall apply (see A-G below). Current information on effects associated with migrant trapping have caused NMFS to revise migrant trapping procedures to avoid and minimize adverse effects (see H below). NMFS is currently reviewing migrant trapping and other procedures in the Southern California ESU. Should new procedures be needed, migrant trapping (and other) procedures in this opinion will be updated accordingly.

A. All ESA-listed fish handled out-of-water for the purpose of recording biological information must be anesthetized. Anesthetized fish must be allowed to recover (e.g. in a recovery bucket) before being released. Fish that are simply counted must remain in water but do not need to be anesthetized.

B. ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during sampling and processing procedures. Adequate circulation and replenishment of water in holding units is required. The transfer of ESA-listed fish must be conducted using a sanctuary net that holds water during transfer to prevent the added stress of an out-of-water transfer.

C. ESA-listed juvenile fish must not be handled if the water temperature exceeds 21 degrees Celsius (70 degrees Fahrenheit) at the capture site. Under these conditions, ESA-listed fish may only be identified and counted. If any adult ESA-listed fish are captured incidental to sampling for juveniles, they must be released without further handling, and such take must be reported.

D. Visual observation protocols (such as snorkeling and stream side surveys) must be used instead of intrusive sampling methods whenever possible. This is especially appropriate to ascertain whether steelhead are merely present.

E. If there is any indication that the survival of ESA-listed fish will be affected by increasing water flows or other conditions, the traps must be removed from use until hazardous conditions have elapsed.

F. Due caution must be exercised during spawning ground surveys to avoid disturbing, disrupting, or harassing ESA listed adult steelhead when they are spawning. Whenever possible, walking in the stream must be avoided, especially in areas where steelhead are likely to spawn.

G. Tissues of ESA listed steelhead are the responsibility of Reclamation and remain so as long as they are useful for monitoring the effects of the Cachuma Project. The transfer of tissues from Reclamation on other entities requires written approval from NMFS.

H. Traps and live boxes must examined every 4-6 hours, at minimum to minimize delay and harm to steelhead. Reclamation shall redesign the migrant traps to provide additional habitat space for adult steelhead waiting to be released, prevent access by predators and prevent tampering by non-authorized persons. Trap design and staffing procedures are subject to NMFS approval.

3) Reclamation will develop a plan to monitor changes that may occur to the bed and banks of the Santa Ynez River that could affect the ability of steelhead to migrate. This plan will be developed within 1 year of the issuance of this opinion and implemented upon receiving NMFS's approval.

4) Until a gauge is installed at Highway 154, Reclamation will monitor the achievement of flow targets at HWY 154 on a weekly basis by having professional staff familiar with instream flow monitoring use a flow meter and standard methodology (transect of cells) to check flows at HWY 154. This shall only be done when flows decrease to the levels of flow targets. A marking device visible from outside of the wetted channel may be used once initial achievement of flow targets is measured with a current meter. If a gauge relationship is developed, weekly monitoring for at least one rearing season will be used to confirm the reliability of the model. If flow targets are not being met, water release shall be increased until the target is met.

5) If conditions occur during the interim period that require pool surface areas to be maintained in the Alisal and Refugio reaches, Reclamation shall monitor these pools on a weekly basis and adjust flows as necessary to maintain residual pool depth.

6) NMFS shall receive quarterly reports detailing water releases for fish and the achievement of flow targets (and pool surface areas) during the interim period (until the 3.0 surcharge is achieved) and for the first three years of long term operations. In later years, these reports may occur on a yearly basis.

7) Reclamation shall provide plans for changes in monitoring locations and methodologies and obtain approval from NMFS prior to implementation.

8) Reclamation shall identify to NMFS the personnel designated to conduct the monitoring activities described in this opinion prior to each monitoring season and confirm their experience through resumes or other evidence of their accomplishments.

The following terms and conditions implement reasonable and prudent measure No. 12.

1) If water releases to the mainstem and/or Hilton Creek fail, NMFS will be contacted immediately and Reclamation shall relocate any steelhead that may become stranded to appropriate habitats.

2) Reclamation will utilize the methods described in the Hilton Creek Fish Rescue plan (U.S. Bureau of Reclamation 1998b), the recommendations of the August 9, 1998 Hilton Creek Fish Rescue Assessment Report (United States Bureau of Reclamation 1998c), and the reporting requirements of NMFS's June 23, 1998 letter (NMFS 1998) authorizing emergency fish rescue. Modifications to these methods and recommendations may be made with NMFS's approval. If electrofishing is necessary, Reclamation shall also implement NMFS's forthcoming electrofishing policy.

3) Maintenance or other activities that will result in dewatering or quick flow reductions that must occur in emergency situations to prevent loss of life or property shall be subject to the emergency procedures under 50 CFR 402.05.

The following term and condition implements reasonable and prudent measure No. 13.

1) Reclamation shall implement the steelhead protection measures for use of the temporary road crossing as described in the Final Supplemental Environmental Assessment for the Bradbury Dam Modification Seismic Corrective Action Safety of Dams program as modified by NMFS's July 19, 1999, letter regarding the temporary road crossing and:

2) No more than one crossing event (across and return) of six or fewer vehicles may occur each year.

The following term and condition implements reasonable and prudent measure No. 14.

1) If upgrading the Hilton Creek water supply line to increase capacity requires shutting down the supply of water to steelhead in Hilton Creek and/or the Santa Ynez, Reclamation shall reinitiate consultation on the Cachuma Project.

The following term and condition implements reasonable and prudent measure No. 15.

1) Reclamation shall work with NMFS to design and implement a strategy to further verify the analysis of migration supplementation and mainstem rearing targets within six months of the issuance of this opinion. Once approved by NMFS, the strategy shall be implemented and results provided to NMFS in a timely manner.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

NMFS recommends Reclamation pursue the following:

1) Water rights releases produce a number of adverse effects to steelhead attempting to rear in the mainstem, most notably to steelhead 3.5 to 10 miles downstream of Bradbury Dam. NMFS recommends Reclamation investigate and implement alternative means of providing water to downstream users from the Cachuma Project that would avoid and/or minimize adverse effects to listed steelhead in consultation with NMFS.

2) The major portion of steelhead historical spawning and rearing areas are currently blocked by Bradbury Dam. Access to these areas would be of huge benefit to the Santa Ynez steelhead population. NMFS recommends Reclamation design and implement a study to determine effective passage for steelhead at Bradbury Dam, including upstream passage, a downstream smolt trapping facility, and proper screening of the Tecolote Tunnel and other water intakes in consultation with NMFS.

3) There is a growing body of scientific evidence that dominant river flows, i.e., flood flows, play an important role in river geomorphology and the production and maintenance of salmon and steelhead habitat (Mundie 1991). NMFS believes that further knowledge in this area could be helpful in understanding what effects, if any, winter operations may have on the ecological characteristics of the Santa Ynez River downstream of Bradbury Dam. Any potential impacts are purely speculative at this point. NMFS recommends Reclamation design and implement a study to determine if there any impacts on the ecological characteristics of the Santa Ynez River due to flood flow reduction in consultation with NMFS.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the project proposal (U.S. Bureau of Reclamation 1999, 2000). In addition to the reinitiation events noted above, as provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal 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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