

## **4.0 ALTERNATIVES, INCLUDING PROPOSED ACTION**

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In developing the HCP, a variety of potential alternatives were identified and evaluated. The Proposed (Preferred) Alternative includes an instream flow schedule for ensuring steelhead passage, spawning and egg incubation, and juvenile rearing. The proposed alternative also includes removal of the Arroyo Grande stream gage to improve steelhead passage. The proposed alternative would establish a Conservation Account to fund habitat enhancement measures within Arroyo Grande Creek including such things as improvements in spawning gravel quality and availability, juvenile rearing habitat, passage improvements, environmental easements, and habitat enhancement to benefit red-legged frog. The proposed alternative also includes a public education/awareness program regarding opportunities to enhance habitat conditions and protect steelhead and red-legged frogs within the Arroyo Grande Creek watershed.

Other alternatives evaluated included the potential for improving steelhead and red-legged frog habitat and protection exclusively through increased instream flows (Alternative 2), and providing improved habitat and steelhead and red-legged frog protection exclusively through non-flow physical habitat enhancement actions (Alternative 3). Construction of a steelhead hatchery at Lopez Dam was evaluated as an alternative. Providing passage for steelhead to access habitat upstream of Lopez Dam (e.g., fish ladder at the dam or trap-and-truck) was considered as an alternative. Consideration was given to a regional 10(A)(1)(B) Habitat Conservation Plan (HCP) developed by a variety of local agencies as part of a more comprehensive HCP for watersheds and protected species within San Luis Obispo County. The No Action Alternative was also considered, continuing operation of Lopez Reservoir and instream flows within Arroyo Grande Creek, with no additional consideration of modifications to habitat conditions within the creek to enhance aquatic habitat and provide protection for either steelhead or red-legged frogs. The following sections briefly describe the alternatives.

### **4.1 ALTERNATIVE 1: PROPOSED (PREFERRED) ACTION**

The proposed (preferred) HCP action includes an instream flow schedule to support steelhead habitat (passage, spawning and egg incubation, juvenile rearing, emigration, and ramping rates) based on inter-annual variability in precipitation and runoff within the watershed and reservoir storage. The instream flow schedule for steelhead would be operated conjunctively with storage and releases from Lopez Reservoir to meet municipal and agricultural water demands (Section 3.2). The Proposed Alternative includes removal of the Arroyo Grande Creek stream gage to facilitate and improve adult and juvenile steelhead migration. Non-flow actions include habitat enhancement for steelhead spawning, egg incubation, and juvenile rearing, improved fish passage at low-flow road crossings, and road-crossings equipped with culverts. Habitat improvements have also been identified to benefit red-legged frogs including the potential to dedicate and manage the District's 37-acre terminal reservoir (Section 3.2) as a wetland habitat. Conservation actions may include securing environmental easements along the stream corridor to benefit steelhead, red-legged frogs, and aquatic resources in Arroyo Grande Creek. Non-flow habitat enhancement would be managed under an adaptive management program funded by a Conservation Account established as part of this HCP. Best Management Practices (BMP's) will be the basis for vegetation control and maintenance performed by the District as part of operations and maintenance within Arroyo Grande Creek. A public education/awareness program will be implemented to inform local landowners and other interested stakeholders about habitat enhancement and protection measures for both steelhead and red-legged frogs and facilitate similar habitat enhancement and protection by other parties.

Since many of the potential passage improvement and habitat sites for steelhead and red-legged frogs occur on private property, the District will need to secure conservation easements and access in order to conduct many, if not all, of these projects. These activities are briefly described below.

#### **4.1.1 Instream Flow Schedule for Steelhead**

Analyses of historical hydrologic conditions within the Arroyo Grande Creek watershed, Lopez Reservoir operations and storage, contractual delivery requirements, and operations for conjunctive water use were performed to develop an instream flow schedule for steelhead as part of this HCP (Section 3.3). Field studies were evaluated to estimate streamflow requirements for adult steelhead passage and habitat conditions for steelhead spawning and juvenile rearing. The resulting instream flow schedule balances water supply and availability, given the variable hydrologic conditions within the area and competing water demands. The instream flow schedule also balances flow releases from Lopez Reservoir for steelhead passage during the winter and spring, and year-round baseflows to support steelhead spawning, egg incubation, and juvenile rearing. The Lopez Reservoir - Arroyo Grande Creek hydrologic model was used to evaluate impacts of the instream flow schedule on reservoir storage, assuming hydrologic conditions within the watershed between 1969 and 2000 represent future hydrologic conditions. The operational criterion used to establish instream flow was to maintain a minimum 9,000 AF within Lopez Reservoir (minimum pool of 4,000 AF, and reserve storage of 5,000 AF) throughout the 1969-2000 hydrologic sequence.

The 9000 AF minimum storage criterion used in these analyses reflects the current minimum storage requirement contained in the Davis-Grunsky contract between the State and District (Section 3.3.3). In addition, since storage within Lopez Reservoir is also required to meet municipal contractual requirements and downstream agricultural needs (Section 3.3.3), prudent water supply operational planning supported the inclusion of a minimum reservoir storage, above minimum pool, as a partial buffer against the likelihood that future hydrologic patterns within the Arroyo Grande Creek watershed could experience more severe or prolonged drought than recent historic hydrologic conditions (1969-2000; Section 3.3.7) used to model HCP alternatives. Based on these considerations, a 9000 AF minimum reservoir stage criterion was established for evaluating the effects of various HCP alternatives on reservoir operations. If results of the hydrologic modeling showed that an HCP alternative reduced reservoir storage below the 9000 AF minimum criterion, the HCP alternative was concluded to be infeasible. The same operational criterion and hydrologic sequence was used in the hydrologic modeling to compare and evaluate each of the alternatives.

The Lopez Dam release schedule for steelhead contained in the Proposed Alternative includes the following components:

- Spawning and egg incubation flows between January 1 – April 30: release 6 cubic feet per second (cfs) if December 31 reservoir storage is greater than 30,000 AF. If reservoir storage is less than 30,000 AF, but greater than 25,000 AF, release 3 cfs or the average inflow over the previous 14 days, whichever is less. If reservoir storage is less than 25,000 AF, the Technical Committee would be consulted to establish instream flow releases. Spawning and egg incubation flows were derived using information on instream habitat conditions observed during habitat typing (Section 3.5), and constraints on water supply availability through iterations of the hydrologic model and results of reservoir storage.

- Steelhead passage and attraction flows between February 1 through April 30: consecutive five (5) day release of 20 cfs each month if reservoir storage is greater than 30,000 AF. If possible, passage flow releases would coincide with increased streamflow from runoff within the watershed. To the extent that naturally occurring streamflow at Lopez Dam (e.g., reservoir spill) meets the 20 cfs passage criteria, no additional releases would be required from Lopez Reservoir to meet requirements of an individual passage event. Releases from Lopez Reservoir may be required to supplement naturally occurring flows, both in magnitude and duration, to achieve the passage criteria. The 20 cfs passage flow for adult steelhead migration was developed based on field surveys conducted within the creek (Section 3.9.1). Results of these surveys showed that passage flows typically ranged from 15-20 cfs at various locations. The Arroyo Grande stream gage and low-flow road crossing within the flood control reach were identified as impediments (the estimated passage flow at the road crossing was 30 cfs). The proposed (preferred) alternative includes removal of the stream gage to facilitate steelhead passage (Section 4.1.2). Passage at the low-flow road crossing would be facilitated by the combined release from Lopez Reservoir for attraction and passage (20 cfs) and the contribution of downstream tributary flow to suitable migration conditions within the flood control reach. In addition, the low-flow road crossing could be modified, if needed, as part of the HCP actions to facilitate passage at lower streamflows (Section 4.1.3).
- Juvenile steelhead rearing flows between May 1 to June 30 and September 1 to December 31: release 3 cfs if April 30 reservoir storage is greater than 30,000 AF. If reservoir storage is less than 30,000 AF, but greater than 25,000 AF, release 3 cfs or a flow equal to average inflow over the previous 14 days, whichever is less. If reservoir storage is less than 25,000 AF, the Technical Committee would be consulted to establish instream flow releases. Summer rearing flows were derived using information on conjunctive water operations for fishery habitat and releases for downstream agricultural demand, in combination with iterations of the hydrologic model to evaluate water supply availability constraints.
- Juvenile steelhead rearing flows between July 1 to August 31: release reservoir inflow or 3 cfs, whichever is greater. Summer flows between July 1 and August 31 were derived based on Lopez Reservoir water right permit conditions and opportunities for conjunction operations to meet fishery and downstream water deliveries.
- Manage reductions in reservoir releases below 100 cfs in accordance with an established ramping rate schedule shown in Table 4-1; and
- Manage increases in reservoir releases, to the extent practical, at a ramping rate not to exceed 10 cfs/hr to protect red-legged frogs.

Ramping rates for managed flows less than 100 cfs were developed from the observed flow recession within the creek prior to construction of Lopez Dam. Daily flow records were compiled for the Arroyo Grande stream gage for 1940-1950 to represent conditions within Arroyo Grande Creek prior to construction of Lopez Dam and major urban development and associated changes in land use practices within the region. Daily streamflow records were examined for January 1 through April 30 each year representing the period of greatest flow

fluctuations within the creek associated with precipitation and storm water runoff. Based on this analysis the following ramping rate schedule (Table 4-1) was developed for this HCP:

**Table 4-1 RAMPING RATE SCHEDULE**

| <b>Initial Reservoir Release Rate (cfs)</b> | <b>Maximum Ramping Rate Change in flow/day</b> |
|---|--|
| 75-100                                      | 20   |
| 50-74                                       | 8  |
| 35-49                                       | 5  |
| 20-34                                       | 3  |
| 19-Oct                                      | 1  |
| 9-May                                       | 1  |
| <5  | 1  |

#### **4.1.2 Passage Improvements at Arroyo Grande Gage**

The stream gage at Arroyo Grande (Figure 3-2), owned and operated by the District, is approximately 7.5 miles downstream of dam. The gage impedes steelhead passage at low and moderate stream flow, although the presence of spawning steelhead upstream from the gage clearly demonstrates that the gage is not impassible to migrating fish under present conditions. Improving passage at the gage for migrating adult steelhead would improve access to suitable spawning and juvenile rearing areas over a wider range of flow conditions than currently possible. Passage improvements would reduce vulnerability of adult steelhead to illegal harvest (poaching) within the pool immediately downstream of the existing gage weir. Modifications to the site to facilitate adult and juvenile downstream migration would reduce stress and mortality during passage over the existing weir and plunge pool.

Based on the physical characteristics of the Arroyo Grande Creek stream gage it was determined that the structure would impede the up- and downstream migration of steelhead under moderately high-flow conditions, and may serve as a complete migration barrier under low-flow conditions. Consideration was given to the design and construction of a fish ladder as part of this HCP that would provide improved steelhead passage at the stream gage over a wider range of flow conditions. Based on a preliminary analysis of the cost and maintenance requirements for a fish ladder at the stream gage site, it was decided that the preferred alternative should include complete removal of the stream gage structure and rehabilitation of the stream channel to facilitate unimpeded up- and downstream migration of steelhead.

Although removal of the stream gage provides the best biological benefit for improving steelhead migration, removal of the stream gage will adversely affect the ability to monitor streamflows within Arroyo Grande Creek. Alternative streamflow measurement techniques would need to be developed to provide information on instream flows within the creek to help support continued measurement of hydrologic conditions occurring within the stream that would supplement streamflow measurements at the release structure from Lopez Dam.

Removal of the Arroyo Grande streamflow gage would require construction and demolition within the stream channel, and would be conducted during low-flow summer months. The incised channel and limited access at the site are elements that need to be factored into the permitting and planning for stream gage removal. Removal of the stream gage, however, represents a significant improvement in habitat conditions and migration opportunities for

steelhead within Arroyo Grande Creek, and will substantially improve migration opportunities as part of the HCP, when compared to existing conditions.

### **4.1.3 Conservation Account**

The proposed alternative would establish a Conservation Account to fund non-flow habitat enhancement within the Arroyo Grande Creek channel and watershed to benefit steelhead and red-legged frogs. Lopez Dam adversely impacted the quantity and quality of habitat within Arroyo Grande Creek for steelhead spawning and juvenile rearing by blocking access for adult steelhead to upstream spawning and rearing habitat. Lopez Dam has also affected hydrologic conditions within the creek (e.g., flushing flows), and recruitment of gravel suitable for steelhead spawning from the upper watershed. The dam, reservoir operations, flow releases, and channel maintenance activities have also affected habitat for red-legged frogs. To address these impacts of reservoir operations on steelhead and red-legged frog habitat within Arroyo Grande Creek, the proposed project would establish a Conservation Account dedicated to habitat enhancement within the creek, and along channel margins. The Conservation Account would commit \$50,000 per year over the 20-year duration of the HCP for a total contribution of \$1,000,000.

Disbursements from the Conservation Account would be limited to projects benefiting steelhead and/or red-legged frog habitat within Arroyo Grande Creek watershed including staff time and other direct costs associated with managing projects implemented as part of this HCP and the fund itself. A Technical Committee, including representation by the District, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and California Department of Fish and Game, would review proposed habitat enhancement projects each year, and recommend allocation of funds from the Conservation Account. The District would administer and manage contracts for habitat enhancement as part of the HCP. Projects would be evaluated based on anticipated cost, biological benefit for steelhead and/or red-legged frogs, and opportunities for cost sharing and participation by local stakeholders. Management and administration of the Conservation Account funds are discussed in detail in Section 7.

Non-flow habitat enhancement projects could include:

- Improved spawning gravel quality and availability through placing cleaned gravels within spawning areas, mechanical cleaning to reduce fine sediment accumulations within existing gravels, or placement of instream structures such as boulders and large woody debris to stabilize and enhance spawning gravels. Spawning gravel used as part of habitat enhancement would be sized from approximately 0.5 to 3-inch diameter, and would be washed and cleaned prior to placement within the creek. Gravel would be placed at approximately five locations within the creek, depending on access. Gravel would be placed within the creek to form spawning riffles approximately 20 feet wide, having gravel depths of 1 – 1.5 feet. Approximately 50 cubic yards of gravel would be placed at each site each year for a total spawning gravel augmentation of approximately 250 cubic yards per year. Gravel would be monitored as part of the adaptive management process to determine the proper placement and frequency of gravel augmentation within the creek;
- Improve quality and availability of juvenile steelhead rearing habitat through instream structures such as boulders and large woody debris (Figures 4-1 and 4-2) that promote development of additional pool and riffle areas and provide cover for rearing juveniles. Habitat improvement to create a higher frequency of holding pools within Arroyo Grande Creek would be constructed with a combination of timbers and

large woody debris, anchored within the creek to reduce the risk of debris accumulation at downstream road crossings and other structures, in combination with boulder placement. Creation of holding pools would benefit both steelhead and red-legged frog. Holding pools would be accompanied by increased instream cover and gravel deposits. One or two holding pool structures would be constructed each year during the first five years of implementation of the HCP, at an average estimated cost of approximately \$10,000, or more, per pool. Structures would subsequently be monitored to ensure adequate water depths, pool and habitat complexity, and ensure that instream structures did not result in an impediment to either up- or downstream migration of steelhead;

- Improve fish passage facilities within the creek, including modifications to the low-flow road crossing within the flood control section of the creek, modifications to culverts and/or construction of step pools to improve passage at Cecchetti Road; and consideration, if needed, to the replacement of existing culverts at Cecchetti Road with an arched road crossing and natural substrate grade;
- Environmental easements and right-of-way agreements for access to the stream along privately held lands to install and maintain habitat improvement projects, and to protect and improve stream corridor habitat;
- Improve stream corridor riparian vegetation through planting of native trees and under-story vegetation to provide greater stream shading, cover habitat, and stream bank erosion; and
- Improve stream corridor erosion control (e.g., maintenance of vegetated buffer zones, revegetation and plantings, etc.), to reduce point and non-point input of fine sediments that adversely impact steelhead spawning and juvenile rearing habitat.

In addition to habitat enhancement described above which focused on improving instream conditions for steelhead, allocations from the Conservation Account would be used to improve habitat conditions along Arroyo Grande Creek for red-legged frogs. Habitat improvement for red-legged frogs could include:

- The District currently operates a 37-acre terminal reservoir adjacent to the water treatment plant (Section 3.2) that receives water supplies from Lopez Reservoir. To improve water quality at the treatment plant, the District is considering bypassing the terminal reservoir and conveying water directly from Lopez Reservoir to the water treatment facility. Bypassing the terminal reservoir would require approvals from various agencies including the Department of Health Services.

**Figure 4-1**

**Figure 4-2**

- If the District were to receive approvals for the direct diversion of water from Lopez Reservoir to the treatment plant, the terminal reservoir may not be required as part of the water supply facilities to meet service area demand. Under these conditions a commitment would be made as part of the HCP to operate and manage the terminal reservoir as a wetland to benefit red-legged frogs and other wildlife. Management of the Terminal Reservoir as wetland habitat, particularly to benefit red-legged frog, would require development and maintenance of suitable habitat areas for frogs, and consideration of predator (e.g., fish and bullfrog) control and management;
- Existing ponds at the base of the dam could be managed to improve habitat quality for red-legged frogs. These ponds provide excellent habitat except for the occurrence of bullfrogs and predatory fishes. As part of the seismic remediation project, predator control is being done in three of the ponds. Activities under the HCP would augment to existing efforts and provide long-term improvements in habitat conditions for red-legged frogs through habitat improvements and management including, but not limited to, predator management and control;
  - At least two deep, backwater pools could be created along Arroyo Grande Creek. Deep pools in creeks, including those formed by beaver dams, provide red-legged frog breeding habitat and protect early life stages from high winter flows. This may be most beneficial in the reach between Talley Road and the dam access road with abundant overhanging cover, wider riparian borders, shallower banks, and close to known red-legged frog occurrences. If possible, pool habitat may also be created along Tar Springs Creek and other tributaries. Pools should be at least 3 to 4 feet deep and designed so they will not quickly fill with sediment. A biological monitor will be needed to oversee the construction of these pools to minimize the chances of red-legged frog being injured or killed;
  - Riparian and emergent vegetation could be planted along the shoreline of the creek, and in areas adjacent to new ponds. This would enhance red-legged frog cover habitat and improve the reproductive potential for red-legged frogs along the creek. Upland habitat adjacent to the creek could also be improved by widening the riparian borders as much as possible;
  - Arundo, tamarisk, cape ivy, and other nonnative plant species could be monitored and removed if they threaten habitat suitability. These plants can out-compete and ultimately replace native plants resulting in the loss of species diversity and wildlife habitat;
  - The public program could encourage private landowners to develop and implement California Rangeland Water Quality Management Plans. The public education program could inform residents along the creek of the importance of avoiding chemical herbicides and pesticides, and of not removing riparian vegetation;
  - Flow regimes in Arroyo Grande Creek could, to the extent possible, be regulated to mimic natural, seasonal flows. Management actions may include seasonally drawing down water levels in the late summer and fall to suppress nonnative aquatic predators, and basing real-time changes to flow releases on current environmental conditions (e.g., if it is raining, release more water);
  - When increasing managed flows from the reservoir, especially peak flows, flows should be ramped up gradually (as specified in Section 4.1). When possible, ramping rates associated with increasing flow rates should not exceed 10 cfs/hour. At least in some years, water releases during red-legged frog breeding season (February to

April) should be timed to minimize scouring and stranding mortality (Kupferberg 1996).

- At least two new ponds adjacent to Arroyo Grande Creek to maximize habitat quality and availability for various red-legged frog lifestages, with:
  - A) Pond water depth at least three feet in at least one part of each pool or pond with pond water lasting until mid-August;
  - B) No more than 50 percent of the pond perimeter supporting woody plant species (e.g., willows);
  - C) At least 10 percent of the pond shoreline maintained as open habitat free of emergent vegetation;
  - D) Predatory species, including bullfrogs and crayfish, collected at the managed ponds will be permanently removed.

An expert in wetland ecology should oversee the creation of the new ponds. Although ponds can provide the highest-quality red-legged frog breeding habitat, they may be detrimental to frog populations if precautions are not taken to suppress predation. Ponds that attract red-legged frogs may also attract nonnative predators such as bullfrogs, crayfishes, and predatory fishes. If ponds dry too early in the season, red-legged frog eggs or tadpoles may desiccate. If water persists over the winter, nonnative predators may thrive.

Man-made ponds mimicking the natural seasonal water cycle are most beneficial. Red-legged frogs evolved in California's Mediterranean climate with wet winters and springs, and dry summers and falls, but most nonnative predators have not. Ponds should contain water for tadpole development at least until mid-August. Then, for predator control, ponds could be drained in late September or early October before the winter rains and remain dry for at least three days. The need for draining ponds each fall depends on whether nonnative predators are found during pond monitoring that year. Draining will reduce survival of red-legged frog predators requiring year-round water. Bullfrog eggs are laid in early summer and the majority of tadpoles do not transform until the following year. Draining will destroy bullfrog tadpoles, but adults will return once ponds refill (S. Sweet, pers. comm.). Large adult bullfrogs are major predators on red-legged frogs, and could be captured and dispatched when the ponds are being drained (S. Sweet pers. comm.). Bullfrogs are typically associated with large, deep ponds and small ponds a few meters across with considerable shallow, marshy areas would favor red-legged frogs.

New ponds should be less than 500 feet from Arroyo Grande Creek, so the creek is accessible for sheltering and dispersal. Intervening habitat could be well vegetated, preferably with riparian species, and contain no barrier to movement. Ponds should be as far as possible from predator source-areas. Resident bullfrogs quickly invade new habitats as far as 1,000 feet away. It would take longer to build up damaging numbers of bullfrogs within an area if the ponds were separated by 2 miles or more. Because raccoons are serious red-legged frog predators in many places, ponds should also be well away from urban areas and campgrounds, where there is usually a good supply of garbage or food.

The ideal pond has two main components: deep water for escape cover and shallow tadpole and juvenile rearing habitat. Deep-water escape areas should be more than three feet deep. Tadpole and juvenile rearing areas should be unshaded and shallow enough to warm quickly in the winter sun. Emergent vegetation should be established, and ponds should be planted with a combination of cattails, bulrush, spikerush, and willows. Clogging of deep habitats with vegetation would still support escape.

While grazing is consistent with pond management for red-legged frogs, special precautions could be taken for ponds sited in grazed areas. To prevent excessive trampling, the deepest portion of the pond could be fenced to keep cattle out without compromising the water source for livestock. Grazing can be an important tool in keeping shallow tadpole-rearing areas free of excessive vegetation that shades water and keeps it from heating up.

#### **4.1.4 Best Management Practices (BMP) for Stream Maintenance and Vegetation Control**

The proposed alternative includes implementation of Best Management Practices (BMPs) for stream corridor maintenance, sediment removal from the flood control channel, and vegetation control. Modification to vegetation control and maintenance would include provisions for mowing, application of aquatic herbicides, burning, and application of non-aquatic herbicides. Maintenance activities would also include consideration of retaining large woody debris within the creek channel to provide steelhead and red-legged frog cover habitat, if it does not impede flood control. Vegetation control and maintenance would be modified to minimize adverse impacts to red-legged frog and/or steelhead habitat, and to improve habitat quality and availability when possible.

#### **4.1.5 Public Education/Awareness**

A public education/awareness program would be implemented as part of the proposed alternative using funds allocated from the Conservation Fund. The public education/awareness program would highlight habitat enhancement developed as part of the HCP, and provide information to local landowners and other stakeholders about improving instream habitat and environmental conditions for steelhead and red-legged frogs along Arroyo Grande Creek. Information would be presented on life history and identification for steelhead and red-legged frogs. A major purpose of the program would be to develop support among local landowners to provide access to the stream corridor to facilitate non-flow habitat enhancement environmental easements and activities to enhance habitat.

Public education programs would include materials for use in the science curriculum within local elementary, intermediate, and high schools. Public awareness programs would also include periodic tours of the creek to demonstrate habitat enhancement and solicit volunteer help from local sportsmen's organizations and interested stakeholder groups.

The District would prepare slides and make speakers available for presentations to local groups describing the HCP, benefits of habitat enhancement, methods for enhancing steelhead and red-legged frog habitat, and opportunities for stakeholder involvement. A short orientation will be prepared describing the HCP, identification of steelhead and red-legged frog habitat, and measures to minimize and avoid adverse effects for routine training and orientation of the District staff involved in Lopez Reservoir operations and Arroyo Grande Creek maintenance.

#### **4.1.6 Priorities and Schedule of Implementation**

The priorities and schedule of implementation of flow and non-flow conservation actions include:

- Implementation of the flow schedule 30 days after final approval of the HCP, to remain in effect throughout the HCP;
- Design and permitting for removal of the Arroyo Grande stream gage completed within two years of approval of the HCP. Removal of the stream gage would occur during the low-flow summer period in year three;

- Financial contribution (\$50,000) to the conservation account within eighteen months after approval of the final HCP. Subsequent contributions of \$50,000 would be made to the conservation account once per year;
- Financial contribution (\$50,000) to the monitoring account within eighteen months after approval of the final HCP. Subsequent contributions of \$50,000 would be made to the monitoring account once per year. Funding provided to the monitoring account would support field data collection and analyses designed to evaluate performance of the HCP actions, provide input to adaptive management decisions, monitor incidental take, and provide information in support of the design, construction, and operation of various actions implemented as part of the HCP to improve and enhance habitat conditions for steelhead and/or red-legged frogs;
- Non-flow habitat enhancement and conservation adaptively managed throughout the period of the HCP, based on performance monitoring. Priorities for the first five years of the HCP include:
  - A) Construction of fish passage improvements at the low-flow road crossing within the flood control section, and the culverts and road crossing at Cecchetti Road;
  - B) Solicit and where acceptable to willing landowners secure five environmental easements for access to private lands adjacent to the creek between Highway 101 and Biddle Park (Figure 4-3) to construct instream habitat improvement (Figures 4-1 and 4-2) and place/clean spawning gravels;
  - C) Spawning gravel placement within upstream reaches, with approximately 250 cubic yards per year dispersed among five sites between Biddle Park and Highway 101;
  - D) Construct two ponds for red-legged frog habitat;
  - E) In the first year after approval of the HCP, written protocols (Best Management Practices BMPs) for stream maintenance/vegetation control by the District along Arroyo Grande Creek will be developed using funds allocated from the Conservation Account and provided to CDFG, USFWS, and NOAA Fisheries for review and approval. Following approval of the BMPs the District would develop right-of-way easements for conducting work on private property within one year. No easements are required for implementing BMPs immediately after approval within the flood control channel. Best management practices for stream maintenance/ vegetation control will be implemented for District operations immediately after approval of the protocols and securing right-of-way easements;

**Figure 4-3**

- F) A public education/awareness program will be developed as funding becomes available within the Conservation Account after approval of the HCP. CDFG, USFWS, and NOAA Fisheries will be provided a draft copy of written material for the public awareness/education program, for review and comment;
- G) Solicit, and where acceptable to willing landowners, secure environmental easements to private lands along the creek channel to allow riparian planting and improve stream corridor erosion control during the decade of the HCP.

Following the initial phase of the HCP, conservation actions to be funded as financial resources become available within the Conservation Account will focus on:

- Solicit, and where acceptable to willing landowners secure additional environmental easements and right-of-way agreements with private property owners;
- Construction of additional instream habitat improvements;
- Continuation of spawning gravel replacement;
- Develop additional fishery habitat features within Lopez Reservoir, if water levels are low, to provide fishery habitat over a range of reservoir storage volumes to mitigate for increased reservoir elevation fluctuations attributable to implementation of the HCP;
- Contingent upon the necessary approvals and funding for a direct water diversion from Lopez Reservoir to the water treatment plant that allows the District to bypass the terminal reservoir, and upon funding for maintenance of the reservoir through the HCP Conservation Account, the District shall protect and maintain the 37-acre terminal reservoir as a managed wetland for the benefit of red-legged frogs and other wildlife. Management of the terminal reservoir as a wetland may require vegetation control and/or riparian planting, cover habitat, water level control, and other actions. Within two years of obtaining all necessary approvals and initiating direct diversion from Lopez Reservoir to the water treatment plant the District, as part of this HCP, would develop a proposed wetland management plan for the terminal reservoir for review and comment by the Technical Committee;
- Additional riparian planting and erosion control; and
- Maintenance of existing instream habitat improvement projects and fish passage facilities.

#### **4.2 ALTERNATIVE 2: INSTREAM FLOW**

An alternative was developed that exclusively used releases from Lopez Reservoir to provide greater instream flows in all water-year-types for spawning, egg incubation, and juvenile rearing, and provide increased passage opportunities for adult and juvenile steelhead migration between January and April. Benefits to red-legged frog habitat, if they occur, would be incidental to the flow schedule for steelhead. Increased minimum flows and periodic increased flows to benefit steelhead passage (e.g., 20 cfs) between January and April are not expected to adversely affect red-legged frog reproduction and would increase availability of slackwater habitat along the creek. Increased flows and associated habitat may, however, also increase survival of bullfrogs and predatory fish abundance within the creek.

The instream flow schedule would be managed independently of inflow or storage within Lopez Reservoir. Fishery releases would be managed conjunctively with reservoir releases to meet agricultural and municipal water demands. The alternative was not constrained by requirements to meet minimum storage within Lopez Reservoir, other than the 4,000 AF minimum pool dictated as a condition of the Davis-Grunsky contract between the State and District. The hydrologic operations model was used to evaluate the feasibility of operating Lopez Reservoir in accordance with the instream flow alternative using results of historic hydrologic patterns. Results of the feasibility analysis of the instream flow alternative, and the effects of the alternative on reservoir storage and operations, are documented in Section 5.2.

The instream flow schedule for steelhead contained in the alternative includes:

- Continuous instream flow release (baseflow) of 7 cfs from Lopez Reservoir year-round, to support instream habitat for steelhead spawning, egg incubation, and juvenile rearing;
- Increased frequency and duration of passage opportunities for adult and juvenile steelhead by releases from Lopez Reservoir of 20 cfs or greater during seven consecutive days in January, February, March, and April. If possible, passage flow releases would coincide with increased streamflow from runoff within the watershed. To the extent that naturally occurring streamflow meets the 20 cfs passage criteria, no additional releases would be required from Lopez Reservoir to meet requirements of an individual passage event. Releases from Lopez Reservoir would be required to supplement naturally occurring flows, both in magnitude and duration, to achieve the passage criteria;
- A 500 AF Fish Reserve Account would be maintained in Lopez Reservoir and used upon demand each year to supplement fisheries benefits; and
- Managed flow ramping rate (year-round; Table 4-2) would follow the ramping schedule described below:
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**Table 4-2 RAMPING RATE SCHEDULE**

| <b>Initial Reservoir Release Rate (cfs)</b> | <b>Maximum Ramping Rate Change in Flow/Day</b> |
|---|--|
| 75-100                                      | 20   |
| 50-74                                       | 8  |
| 35-49                                       | 5  |
| 20-34                                       | 3  |
| 10-19                                       | 1  |
| 5-9   | 1  |
| <5  | 1  |

The instream flow alternative would provide habitat benefits to steelhead through increased minimum streamflows in the absence of any additional non-flow conservation actions.

The flow schedule identified in Alternative 2 would be implemented 30 days after approval of the final HCP, to remain in effect throughout the HCP.

### **4.3 ALTERNATIVE 3: NON-FLOW PHYSICAL ACTIONS**

An alternative was developed that would provide habitat benefits for steelhead and red-legged frog exclusively through non-flow physical actions, using a Conservation Account to fund non-flow habitat enhancement or provide the local cost-share, with additional funds from

state, federal, or private grants, to implement a wider range of improvement actions. The Conservation Account would be funded at \$200,000 per year over the 20-year duration of the plan, for a total local contribution of \$4,000,000. Allocation of funds would be limited to non-flow habitat enhancement to benefit steelhead and/or red-legged frogs within Arroyo Grande Creek and watershed. Proposals for habitat enhancement would be solicited from state, federal, and local parties, including the District. A Technical Committee, with representatives from National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Game, and the District, would recommend allocation of funds from the Conservation Account. The District would be responsible for administration and contract management.

A wide range of non-flow habitat enhancement measures would be evaluated under this alternative. Selection of projects for funding would be based primarily on the costs and biological benefits for steelhead and/or red-legged frogs.

Non-flow habitat enhancement evaluated as part of this alternative include modifications to the Arroyo Grande Creek channel between Lopez Reservoir and Rodriguez Bridge, improvements in spawning gravel quality and availability, improvements in juvenile rearing habitat, and improvements in fish passage at various locations within the creek. Potential non-flow habitat enhancements are briefly discussed below.

#### **4.3.1 Channel Modification in Upper Reach**

Habitat within Arroyo Grande Creek immediately downstream of Lopez Dam was modified by borrow pits and changes in channel alignment during construction of Lopez Dam. The borrow pits are large, relatively deep pools (lacustrine habitat) with low water velocities and do not provide high-quality habitat for steelhead spawning or juvenile rearing. The borrow pits do provide habitat for predatory fish (e.g., largemouth bass), birds and bullfrogs (which prey on red-legged frogs).

Modifications to Arroyo Grande Creek within the upper reach at the abandoned trout hatchery also reduced habitat quality and availability for steelhead and/or red-legged frogs. Further downstream, at the DWR mitigation site, percolation of streamflow dewatered a portion of Arroyo Grande Creek at reservoir release rates less than approximately 5 cfs (Section 3.5).

The Lopez Dam Remedial Project includes the addition of two new pools for red-legged frogs as well as stream gravel enhancements for steelhead, both to occur on District property downstream of the dam.

Physical modifications within the upper reach of Arroyo Grande Creek can improve habitat quality and availability for steelhead and red-legged frogs. Physical modifications could include a separate stream channel to provide habitat suitable for steelhead spawning and juvenile rearing between the dam outlet and the DWR mitigation site. The stream channel could be equipped with flow control structures to allow some of the streamflow to stay within the channel, and some of the flow to pass into the borrow pits and remnants of the existing channel. Controlled releases from the stream to the borrow pits would continue to support wetlands and wildlife habitat within the pools and provide local ground-water recharge. The separate channel would parallel the existing Arroyo Grande Creek channel for 1,000-1,500 feet. Creating pool habitat along this section could also create potential breeding habitat for red-legged frogs. Creation of the channel would require environmental easements and right-of-way agreements along privately held lands, and would represent a major construction project. Development of a separate stream channel to provide habitat benefits to steelhead and red-legged frogs, would require detailed geologic, geomorphic, and hydraulic analyses to be compatible with baseflow

and peak flood flow events. Channel maintenance affected by sediment deposition and erosion and periodic inundation of the floodplain areas would need to be considered to insure long-term habitat benefits.

An alternative to a bypass channel would be an impassable barrier to upstream steelhead migration near the DWR mitigation site or Biddle Park. The passage barrier would prohibit steelhead access to the borrow pits, where there is poor spawning and juvenile rearing habitat. The passage barrier would restrict adults to downstream spawning areas where additional habitat enhancement to increase availability and quality of spawning and juvenile rearing habitat would be constructed. The steelhead passage barrier would eliminate access to approximately 6,500 feet of creek channel and borrow pit areas. Passage barriers to restrict steelhead access to existing habitat is counter to NOAA Fisheries policy guidance.

Channel modifications may be developed for the DWR mitigation site to reduce the frequency of stream dewatering at lower flows. These modifications may include changes to the width of the creek in the low-flow section and modifications to change local gravel permeability (e.g., installation of a clay layer beneath the existing gravel substrate). Surface flows within the area and localized percolation rates are also influenced by local ground-water pumping to meet irrigation demands. Non-flow alternatives to reduce ground-water pumping in the area may include a separate water supply pipeline from Lopez Reservoir to meet irrigation demand within the area downstream to approximately Biddle Park.

#### **4.3.2 Spawning Gravel Enhancement**

The quality and availability of spawning gravel within Arroyo Grande Creek would be improved and enhanced by placing cleaned gravels within spawning areas, mechanical cleaning to reduce fine sediment accumulations within existing gravels, or placement of instream structures such as boulders and large woody debris to stabilize and enhance spawning gravel areas. Habitat surveys within the creek showed that spawning gravel availability was low (Section 3.5). In many areas, spawning gravel has been impaired by deposition and accumulation of fine sediments. Additional non-flow actions to benefit spawning gravel quality include expansion of vegetated riparian buffer zones and actions to reduce erosion.

#### **4.3.3 Juvenile Rearing Habitat Enhancement**

Non-flow habitat actions to improve the quality and availability of juvenile steelhead rearing habitat include instream structures such as boulders and large woody debris to promote development of additional pool and riffle areas and provide additional cover for rearing juveniles.

#### **4.3.4 Passage Facilities**

A number of passage impediments have been identified within Arroyo Grande Creek, affecting migration of steelhead. These passage impediments include the low-flow road crossing within the flood control section, culverts associated with the road crossing at Cecchetti Road and the Arroyo Grande Creek stream gage. Passage improvements at the Arroyo Grande Creek stream gage, implemented as part of this alternative, would include construction and operation of a fish ladder or similar passage facility. Improvements to fish passage at Cecchetti Road may include step pools downstream of existing culverts, modification to culverts to improve passage, or replacement of existing road crossings with an arched bridge and natural substrate grade.

Modifications to the low-flow road crossing can be made to improve steelhead passage at lower streamflows than under existing conditions.

#### **4.3.5 Priorities and Implementation Schedule**

The priorities and implementation schedule for non-flow conservation actions as part of Alternative 3 would include:

- A feasibility study in the two years after final approval of the HCP evaluating engineering design, construction requirements, environmental easements and right-of-way agreements, environmental constraints, potential adverse environmental impacts, and requirements for environmental documentation/permitting for channel modifications within the upper reach of Arroyo Grande Creek. The feasibility study would include cost estimates for final design, permitting, and construction of channel modifications. Depending on the feasibility analysis, the cost, and the time required to complete design, permitting, and construction, channel modifications may take 3-5 years to complete;
- Spawning gravel and juvenile rearing habitat enhancement projects would be similar to those described for Alternative 1. These non-flow enhancement projects would require environmental easements and right-of-way agreements for access to Arroyo Grande Creek, and would be preferentially located in areas upstream of the Highway 101 Bridge. If a modified stream channel is constructed, non-flow habitat improvement projects would occur within the modified channel upstream of Rodriguez Bridge. The non-flow habitat improvement would include a minimum of 5 sites (depending upon environmental easements and access) where habitat enhancement projects similar to those shown in Figures 4-1 and 4-2 would be installed, in addition to spawning gravel placement in the creek;
- Passage improvement projects under this alternative would not be initiated until year five of the HCP. Selection of passage improvement projects would be based, in large part, on the cost of channel modifications within the upper reach and the non-flow habitat improvement projects implemented within the first five years. Remaining funds within the conservation account would be allocated for expenditure over years 5-20 of the HCP for:
  - A) Repair and maintenance of the modified channel, spawning gravel enhancement, and juvenile rearing habitat enhancement;
  - B) Construction of a fish passage facility at the Arroyo Grande stream gage; and
  - C) Improvements to fish passage at the low-flow road crossing within the flood control reach and road-crossing culverts at Cecchetti Road.

#### **4.4 ALTERNATIVE 4: STEELHEAD HATCHERY**

In the past, a trout hatchery had been operated at Lopez Dam, where releases from Lopez Reservoir pass through a series of raceways used for rearing. The trout hatchery was removed as part of the Lopez Dam seismic remediation project. As an alternative for supporting steelhead within Arroyo Grande Creek, a steelhead hatchery could be re-established at the dam. The steelhead hatchery would use broodstock from the South-Central California Coast Steelhead Evolutionarily Significant Unit (ESU) to rebuild the steelhead population within Arroyo Grande Creek. The hatchery would operate as a supplementation to enhance recovery of wild (in-river) spawning steelhead within the creek, in accordance with genetic principles designed to maintain

genetic integrity and life history diversity of steelhead within the ESU. Juvenile steelhead produced within the hatchery could be released into Arroyo Grande Creek as fry or fingerlings, using the creek as rearing areas, or could be reared in the hatchery to yearling smolt stage and released into the creek for emigration to the ocean. Water for the hatchery would be provided from Lopez Reservoir. The hatchery would be managed to support runs of returning adult steelhead of approximately 200-500 fish. The capital, operating, and maintenance costs for the steelhead hatchery would be provided as part of this HCP.

Design of the hatchery would be initiated within 18 months following approval of the final HCP, and provided to CDFG, USFWS, and NOAA Fisheries for review and approval prior to initiating construction. An operations plan for the hatchery would be provided to resource agencies for review, covering brood stock selection, genetic testing, disease control, and juvenile out-planting strategies for hatchery operations. The total cost for the hatchery, including design, construction, operations, and maintenance will not exceed four million dollars over the 20-year duration of the HCP.

Following final approval of the engineering design and operating plan for the steelhead hatchery, environmental documentation, permitting, and solicitation of construction bids would occur. Construction of the hatchery would require approximately 1-2 years. Based on planning, design, and construction it is estimated that the hatchery would be operational within 5-7 years of approval of the final HCP. The steelhead hatchery would remain in service throughout the remainder of the HCP period.

#### **4.5 ALTERNATIVE 5: PASSAGE UPSTREAM OF LOPEZ DAM**

Lopez Dam is an impassable barrier to upstream migration of adult steelhead, which eliminated access to upstream spawning and juvenile rearing habitat. As an alternative, opportunities were evaluated for re-establishing steelhead passage and access to these upstream habitats. Options include a fish ladder at Lopez Dam or a trapping facility and trucking operation to release steelhead upstream of the reservoir. The total cost for upstream passage facilities, including capital, operating, and maintenance costs would be expected to exceed \$4,000,000 over the period of the HCP.

##### **4.5.1 Fish Ladder**

Construction of a fish ladder is an alternative for steelhead passage at Lopez Dam. The fish ladder would need to accommodate a vertical rise of approximately 166 feet from the existing stream surface to the crest of the dam and operate over a wide range of flows within Arroyo Grande Creek during the winter and spring steelhead passage period. The fish ladder would be designed in consultation with CDFG and NOAA Fisheries to meet passage design criteria. The fish ladder at Lopez Dam would be substantially higher than any existing ladder facility in California. As a result of the height and subsequent length of the passage facility, a number of resting pools would be required to accommodate upstream passage.

Assuming a 10 percent slope for the fish ladder, the facility would be approximately 1,700 feet or more in length. Because of the size and length of the fish ladder, and the range of flows to be accommodated, detailed engineering and seismic analyses would be required to ensure the facility is compatible with seismic stability requirements, integrity, and operations of Lopez Dam. The fish ladder operates to provide for steelhead passage only during the January-April period. The frequency of operation and the resulting passage flows through the fish ladder would be determined based upon reservoir storage elevation.

#### **4.5.2 Trap and Truck**

The trap and truck operation would include construction of an adult steelhead capture facility within Arroyo Grande Creek. The adult capture facility would include a weir, fyke net, and live car adult steelhead holding area. Adult steelhead collection would occur near the DWR mitigation site or other suitable location where access to the creek and adult collection facility is possible for a transport truck. Adult steelhead collected in the trap would be transported upstream for release at the boat ramp within Lopez Reservoir. The adult steelhead trap and truck operation would operate each year between January and April.

Two options exist within the trap and truck strategy for the downstream migration of juvenile and/or adult steelhead. The first option is to allow the downstream migrants to pass through Lopez Reservoir and over the existing spillway or through the Dam outlet structure. Passage over the spillway would occur only in high flow years. The alternative would be to construct a second trapping location within the dominant tributary upstream of Lopez Reservoir. The trapping facility would include a weir, fyke net, and live car holding area for juveniles and adult steelhead collected during downstream migration. The downstream migrant trap would operate from February through May. Juvenile and adult steelhead collected at the downstream migrant trap would be transported to the downstream access location (e.g., immediately downstream of the adult trapping facility near the DWR mitigation site or other suitable location).

#### **4.5.3 Priorities and Schedule for Implementation**

Priorities and schedule for implementation of Alternative 5 would include:

- An engineering feasibility study would be conducted in the two years after final approval of the HCP to evaluate the potential for a fish ladder at Lopez Dam. The feasibility study would consider design and construction of a fish ladder, structural support, flow requirements, preliminary construction costs, and an analysis of effects on seismic stability and operations of the existing dam and reservoir. The feasibility study would be performed in consultation with fish passage engineers from CDFG, USFWS, and NOAA Fisheries. The feasibility assessment would also consider constraints and potential success of the fish ladder in providing upstream and downstream steelhead passage;
- Based on the initial feasibility study, a decision would be made in year three regarding further engineering design and analysis of the fish passage option at Lopez Dam. If the feasibility study shows fish passage would be successful at the dam, a more detailed engineering design and analysis would be initiated. Prior to soliciting construction bids, the final engineering design for the fish passage facility would be provided to CDFG, USFWS, and NOAA Fisheries for review and approval. Construction of the fish passage facility would occur during the low-flow summer period and would require 1-2 years to complete. Initial operation of a fish ladder would be expected 5-7 years after HCP final approval, depending on reservoir storage and hydrology;
- The design of trap and truck operations including the trapping facility for upstream migrant steelhead, a decision regarding trapping of downstream migrant steelhead, and operating protocols and procedures for the trap and truck operation would be developed in the two years following approval of the HCP. Trapping facilities would be installed during the third year of the HCP and would operate throughout the HCP.

The trap and truck operation would be discontinued in the event that a fish ladder or passage facility is constructed at Lopez Dam.

#### **4.6 ALTERNATIVE 6: PARTICIPATE IN REGIONAL 10(A)(1)(B) PERMIT**

As part of the proposed (preferred) alternative, the District developed an HCP including only steelhead and red-legged frogs within Arroyo Grande Creek downstream of Lopez Dam. An alternative would involve District participation within a comprehensive regional HCP, including a variety of watersheds within the County, and potentially throughout the South-Central California Coast ESU. Such a planning effort would consider fish passage barriers, instream flow schedules, modifications to enhance aquatic and terrestrial habitat, and modifications to routine maintenance activities to protect fish and wildlife species and their habitat. Since such a planning effort would be a large, complex, multi-faceted, multi-species effort, concern has been expressed regarding the schedule for completing a regional HCP and implementing comprehensive protective measures. There is also uncertainty about the success of developing such a comprehensive HCP and the necessary coordination and cooperation required among a diverse group of stakeholders and participants.

Based upon concerns about the long-term planning required to develop a comprehensive regional HCP, and the uncertainty associated with its implementation, participation in a regional 10(a)(1)(B) permit process was not identified as the preferred alternative. The elements within the proposed alternative, however, are compatible with, and complementary to, a more comprehensive regional HCP effort to promote steelhead and red-legged frog recovery along the Central Coast, should such a regional effort be implemented in the future.

Discussions would be initiated with parties and stakeholders involved in preparation of a regional HCP within one year following final approval of this HCP. Depending on the geographic scope, species, and complexity of covered activities in a regional HCP, the time required to complete a draft and final regional HCP is uncertain. Based on the anticipated complexity of such a planning process and document it is assumed that preparation, review, and final approval of a regional HCP may take five or more years to complete.

#### **4.7 ALTERNATIVE 7: NO ACTION ALTERNATIVE**

The No Action Alternative would involve continued operations of Lopez Reservoir and instream flow releases to Arroyo Grande Creek as in the past. During below average and dry years, streamflow at Arroyo Grande is reduced by reservoir operation and diversion in winter and spring, but augmented by releases from reservoir storage in summer. Figure 3-17 shows that, during dry years, streamflow at Arroyo Grande would diminish to near zero between June and August if Lopez Dam had not been constructed. With the Lopez Project in place, flow augmentation by releases from reservoir storage allows summer flow to be maintained at a higher and more stable rate than if the dam was not present. On average, total flow augmentation is about 500 acre-feet in a below average year and about 800 acre-feet in a dry year.

The No Action Alternative would result in continued passage impediment at the Arroyo Grande stream gage and incidental take of steelhead and red-legged frogs from flow fluctuations, lack of minimum baseflow, and loss of habitat quality and availability. The No Action Alternative would not provide financial support as a local cost share for modifying current operations to reduce fishery losses or opportunities for instream and red-legged frog habitat enhancement. The No Action Alternative would continue to result in losses and incidental take

of steelhead and/or red-legged frogs. Under the No Action Alternative red-legged frogs may benefit by keeping the creek less perennial, which should decrease the predator population in some areas. However, there would be no opportunity for non-flow habitat enhancements.

Since the No Action Alternative would not require changes in of Lopez Reservoir operations or releases to Arroyo Grande Creek or any further financial requirements for non-flow habitat enhancement, the No Action Alternative would be implemented immediately upon final approval of this HCP.