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## TABLE OF CONTENTS

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	Page
5.0 ENVIRONMENTAL ANALYSIS OF PROPOSED ACTION.....	1
5.0.1 Water Use .....	2
5.0.2 Water Quality.....	2
5.0.3 Geomorphology.....	3
5.0.4 Aquatic Resources .....	5
5.0.4.1 Rationale, Benefits, and Impacts of Proposed Action on Aquatic Organisms and their Habitats.....	5
5.0.4.2 Benefits and Impacts of the Proposed Action.....	7
5.0.5 Terrestrial Resources .....	22
5.0.6 Riparian Resources .....	24
5.0.7 Aesthetic Resources .....	28
5.0.8 Cultural Resources.....	29
5.0.9 Recreation Resources.....	31
5.0.10 Land Management/Socioeconomics .....	34

### List of Tables

Table 5.0-1. Proposed Action Benefits and Impacts Summary Table.

## 5.0 ENVIRONMENTAL ANALYSIS OF PROPOSED ACTION

This section provides a general description of the Upper San Joaquin River Basin and provides an overview of the Proposed Action and associated environmental effects by resource area. The subsequent section provides a general description of the Big Creek Basin, followed by environmental resource area discussions concerning: Water Use, Water Quality, Geomorphology, Aquatic Resources, Terrestrial Resources, Riparian Resources, Aesthetic Resources, Cultural Resources, Recreation Resources, and Land Management/Socioeconomics. The resource area sections discuss the environmental setting and affected environment, and provide an analysis of resource impacts from implementation of new environmental measures in the Proposed Action. A cumulative effects analysis of the Proposed Action is also provided.

The Proposed Action addresses existing potential resource issues and balances developmental and environmental values by focusing on Project-related factors which limit environmental and cultural resources, and the improvements which can be achieved with a reasonable cost of lost hydroelectric generation. Environmental measures provided in the Proposed Action include:

- Higher Minimum Instream Flow (MIF) releases and the establishment of Channel Riparian Maintenance Flows (CRMF) to improve aquatic habitat (fish, macroinvertebrates and amphibians), water quality, sediment transport and riparian habitat.
- Improved vegetation, integrated pest management and road maintenance practices that will protect sensitive plant and wildlife resources.
- Establishment of environmental resource management and monitoring plans, license articles, training and compliance programs; and scheduled consultation to identify, monitor and coordinate the implementation and effectiveness of resource measures during the term of the license.
- Establishment of a Recreation Management Plan which includes commitments to enhance and maintain recreational opportunities in the vicinity of the four Big Creek ALP Projects (SCE 2007b; Volume 4, SD-G (Books 19 and 24)).
- Maintenance of Project roads; implementation of road use/traffic control measures; and continuation of fire and hazardous materials management measures to protect Project facilities, the public and environmental and cultural resources.
- Implementation of a Historic Properties Management Plan (HPMP) to manage historic properties and other important cultural resources in the vicinity of the four Big Creek ALP Projects (SCE 2005; Volume 4, SD-I (Book 27)).
- Modifications to Project boundaries to more accurately reflect lands necessary for the safe and efficient operation and maintenance of the Projects.

The following provides a summary of existing issues by resource area under existing Project operations (No Action Alternative), the Proposed Action, and the effect and/or benefit of the Proposed Action on environmental resources.

### **5.0.1 WATER USE**

The development and operations of the four Big Creek ALP Projects have resulted in modifications to the timing and magnitude of flows in Project bypass and flow augmented stream reaches, particularly in non-spill periods. Under the Proposed Action, new or higher MIF releases will be provided downstream of Project impoundments and diversions, and CRMF releases would be provided in selected Project stream reaches to enhance aquatic, riparian, and water quality resources. The amount of water released from higher MIFs and CRMFs (particularly during wet water years when most CRMF releases will occur) is small relative to the total amount of water in storage; and the CRMF and recreation enhancement releases are timed to occur during the period of spring run-off when natural inflows into the reservoirs are occurring. Therefore, only very minimal changes are expected in the total storage in the reservoirs or the timing of reservoir filling. Due to physical and contractual constraints, even with the increased MIFs and the establishment of CRMFs and recreation releases, the timing and magnitude of flows leaving the Big Creek System (BCS) (downstream of Big Creek No. 4 (FERC Project No. 2017)) under the Proposed Action will result in only a small change in the volume of water routed through the seven Big Creek Projects for generation. Water use associated with the four Big Creek ALP Projects, with the exception of hydroelectric generation, will not be adversely impacted by environmental measures under the Proposed Action. The four Big Creek ALP Projects have only minimal consumptive water use and therefore, the environmental measures under the Proposed Action will not have an impact on the availability of water for consumptive purposes.

Under the Proposed Action, four back-country diversions (North and South Slide Creek diversions, Tombstone Diversion, and Crater Creek Diversion) associated with the Big Creek Nos. 2A, 8 and Eastwood Project (FERC Project No. 67), and two domestic water diversions (Snowslide Creek and Pitman Creek domestic diversions) associated with the Big Creek Nos. 1 and 2 Project (FERC Project No. 2175) will be decommissioned. Only the Crater Creek Diversion is currently operational and the five other small diversions have not been operational for at least 20 years. Since three of the small diversions have not been operational for some time, and due to the small volume of water diverted at the Crater Creek Diversion, little effect is expected in terms of water used and stored by the Project.

### **5.0.2 WATER QUALITY**

Potential Project-related water quality issues identified under current Project operations include temperatures, dissolved oxygen (DO) levels, and turbidity in some Project stream reaches. Under the Proposed Action, new environmental measures will be implemented to enhance water quality resources. These measures include higher MIF releases and CRMF releases downstream of Project impoundments and diversions, a

Water Temperature Monitoring Plan, and Sediment Management Prescriptions (SMP) (SCE 2007b; SCE 2007a; Volume 4, SD-G (Books 19 and 24) and SD-H (Book 20)). Higher MIF releases from project impoundments and diversions will provide larger volumes of water to increase aquatic habitat, reduce summer water temperatures to levels that benefit trout and comply with Basin Plan objectives, and bring DO concentrations into compliance with Basin Plan objectives. Water temperature monitoring will be conducted in selected bypass reaches to verify that higher MIF releases reduce summer water temperatures. Project operations conducted to manage sediment accumulation behind Project diversions, which have the potential to affect water quality in downstream reaches, are addressed by CRMFs and SMPs, which include physical removal of sediment or sediment pass-through during the spring run-off period of certain water year types.

Under existing operations, water quality issues associated with mean and/or maximum daily water temperatures exceeding the evaluation criteria for trout were identified at: 1) three bypass reaches associated with Mammoth Pool (FERC Project No. 2085); 2) one bypass reach associated with Big Creek Nos. 1 and 2 (FERC Project No. 2175); 3) two bypass reaches associated with Big Creek Nos. 2A, 8 and Eastwood (FERC Project No. 67); and 4) one bypass reach associated with Big Creek No. 3 (FERC Project No. 120). The higher MIFs under the Proposed Action will reduce water temperatures in these reaches to levels that benefit trout and comply with Basin Plan objectives.

Dissolved Oxygen concentrations outside of Basin Plan objectives under the current operations were measured at five bypass reaches (South Fork San Joaquin River, Pitman Creek, Stevenson Creek, Mono Creek and Bear Creek) associated with Big Creek Nos. 2A, 8 and Eastwood (FERC Project No. 67). The higher MIF releases in the Proposed Action will bring DO concentrations into compliance with Basin Plan objectives.

Under existing conditions, turbidity outside of Basin Plan objectives was measured below Hooper Creek Diversion associated with Big Creek Nos. 2A, 8 and Eastwood (FERC Project No. 67). Implementation of the SMP will address the turbidity below the Hooper Creek Diversion by physically removing sediment or allowing sediment pass-through during the high flow spring run-off period.

### **5.0.3 GEOMORPHOLOGY**

Operation of the four Big Creek ALP Projects has resulted in the modification of stream geomorphology primarily through changes in the flow, sediment transport and supply, and large woody debris (LWD) transport. These changes affect gravel recruitment, dominant bed particle size, and the extent of fine sediment storage. Current Project operations have reduced the magnitude and/or frequency of sediment transporting flows which may result in the accumulation of fine sediment in pools and embeddedness of spawning gravels in bypass reaches. Operations of dams and diversions have interrupted downstream recruitment of sediment, including gravels, and recruitment of LWD. Under the Proposed Action, new environmental measures to enhance

geomorphic resources include providing CRMF releases in selected Project bypass reaches, conducting LWD reintroduction below one Project diversion, and implementing SMPs at many Project impoundments and diversions. CRMF releases will enhance geomorphic processes by increasing the frequency and magnitude of sediment transporting flows. Recruitment of LWD will be enhanced by physically moving and transporting LWD from behind the Bear Creek Diversion to the stream channel below. Implementation of the SMPs will include operations and maintenance measures to reduce the risk of channel sedimentation. SMPs address sediment accumulation in Project impoundments and diversions by prescribing measures for the physical removal of sediment from the diversion; or for sediment pass-through and flushing from impoundments and diversions in conjunction with sediment transporting flows to carry sediments through the downstream channel.

Existing Project operations have reduced the frequency and magnitude of high flows in Mono Creek below the Mono Diversion associated with the Big Creek Project Nos. 2A, 8 and Eastwood Project (FERC Project No. 67), and has resulted in accumulation of fine sediment in pools and spawning gravels within the adjustable stream reaches. Under the Proposed Action, CRMF releases would be provided to enhance geomorphic processes and subsequently enhance aquatic resources in the bypass stream reach. The CRMF releases in wet and above-normal water years will transport and reduce accumulations of fine sediment in bypass reaches.

Under existing operations, LWD is captured in the Bear Creek Diversion associated with the Big Creek Project Nos. 2A, 8 and Eastwood Project (FERC Project No. 67). This LWD is subsequently removed from the stream, resulting in a reduction of LWD recruitment downstream of the diversion. Under the Proposed Action, LWD would be collected from the diversion near the dam, and placed below the dam in the downstream channel. Increased recruitment of LWD downstream of the diversion will enhance geomorphic processes in the bypass reach and subsequently benefit aquatic resources.

Under existing operations, sediment management activities may potentially release fine sediments and result in channel sedimentation in bypass reaches below moderate sized impoundments and small diversions associated with all four Big Creek ALP Projects. Under the Proposed Action, SMPs will be implemented to either physically remove accumulated sediment from behind moderate sized dams and small diversions, or allow sediment pass-through from these facilities. Physical removal of the sediment includes dewatering of the forebay or diversion pool while maintaining MIF requirements; excavation of sediment; and removal and disposal to an off-site location above the mean annual flood elevation, where sediment cannot be re-entrained back into the stream channel. SMPs also include best management practices to trap sediments potentially released from diversion structures during maintenance activities in temporary detention basins using silt fences, hay bales, etc., immediately below the diversion. Collected sediments would be removed from the channel. Sediment pass-through activities from the moderate sized impoundments would be conducted approximately once every five years. When feasible, the time frame to conduct the sediment pass-through activities would be coordinated with infrastructure and tunnel inspections. The

sediment pass-through includes prescriptions for a water release of adequate magnitude and duration to transport sediments through the bypass stream reach. Monitoring of fine sediment in pools will be conducted in select reaches following sediment pass-through events to evaluate sediment conditions in the downstream channel. Sediment pass-through activities from small diversions would be conducted during the high flow spring run-off periods of wet years.

#### **5.0.4 AQUATIC RESOURCES**

##### **5.0.4.1 Rationale, Benefits, and Impacts of Proposed Action on Aquatic Organisms and their Habitats**

The Proposed Action is composed of measures selected to address identified resource issues and enhance habitats for aquatic organisms. Overall, the Proposed Action is designed to maintain and enhance viable populations and habitats for native and resident aquatic life, focusing largely on fish species, but providing benefits for reptiles and amphibians in certain reaches. The primary goals of the Proposed Action are to enhance conditions for coldwater fish (in this case, trout species) and hardhead. The only reach in the ALP Project area in which hardhead occur is the San Joaquin River between Dam 6 and Redinger Lake. Resource issues identified for aquatic organisms generally consisted of bypass reaches in which there were no MIFs under the No Action Alternative; portions of bypass reaches where, at times, water temperatures were too warm for favorable trout growth or were stressful for trout; reaches in which trout populations were lower in density than in reference streams; and reaches in which enhancement of physical habitat was desirable to increase populations. There currently exist active, productive fisheries in all the major reservoirs associated with the Big Creek ALP Hydroelectric Projects, and few resource issues were identified in any of these.

The objectives for making enhancements give consideration to special status species. This includes hardhead (CDFG species of special concern and US Forest Service sensitive species), a member of the Native Transition Zone Community. Consideration also is given to harvest (game) species, including trout species in bypass reaches and reservoirs, as well as kokanee and bass in reservoirs.

#### Enhancement Actions

##### *Streams without MIFs*

Under the Proposed Action, MIFs are provided to bypass reaches without MIFs under existing conditions. These proposed MIFs, based on instream flow studies, will protect beneficial uses and maintain or enhance physical habitat for aquatic species present (see below). These streams included Rock Creek, Ross Creek, Big Creek between Dam 4 and Powerhouse 2/2A, Balsam Creek below the Balsam Diversion, and Ely Creek below Ely Diversion.

## *Water Temperatures*

The Proposed Action includes increased MIFs from diversions and reservoirs to decrease summer water temperatures to benefit trout and support the COLD (cold water) beneficial use. Water temperature simulation modeling was used to determine appropriate flow releases to reduce summer water temperatures. The focus of these efforts are areas of bypass reaches that, under existing conditions, exceeded target water temperatures for favorable trout growth and, in some cases, reached stressful temperature conditions. The reaches identified for water temperature enhancement are: 1) the downstream portion of the San Joaquin River reach between Mammoth Pool Dam and Mammoth Pool Powerhouse; 2) San Joaquin River from Dam 6 to Redinger Lake; 3) the lower portion of the South Fork San Joaquin River; 4) the lower portion of the Big Creek reach between Dam 4 and powerhouse 2/2A; and 5) the lower portion of the Big Creek reach between Dam 5 and Powerhouse 8.

Temperature monitoring and real-time temperature telemetry are incorporated in an operating plan as part of the Temperature Monitoring and Management Plan (SCE 2007b; Volume 4, SD-G (Books 19 and 24)). This plan will be implemented to ensure that water temperatures are suitable, when under Project control.

## Physical Habitat

Enhancement of physical habitat was a major objective of the Proposed Action. Available habitat would be increased in bypass reaches with lower than desired fish populations, as well as many other bypass reaches with a potential for increasing populations. Measures to enhance physical habitat include increased flow-related habitat based on higher MIFs, seasonal MIFs to reduce potential adverse impacts from stranding of fry and redds, passage flows over shallow areas (such as riffles), and the use of short-term CRMFs to enhance sediment conditions. The Proposed Action provides another enhancement of physical habitat by making MIFs the same for all water year types. This would eliminate the reduction of physical habitat that currently occurs in drier years with lower MIFs. The Proposed Action includes monitoring of fish population trends in selected reaches of concern to the resource agencies. Monitoring will help document the benefits of the Proposed Action to fish.

MIFs to enhance physical habitat are based on the results of instream flow studies using both the Physical Habitat Simulation (PHABSIM) models for larger bypass reaches and the wetted perimeter method for smaller bypass reaches without storage.

MIFs for larger bypass reaches were based on providing enhanced habitats for different life stages and life history activities for the management species present. For rainbow and brown trout, adult rearing habitat, spawning habitat, juvenile rearing habitat, and fry rearing habitat were evaluated using PHABSIM. In general, goals focused on adult rearing and spawning. Emphasis was placed on enhancement of adult rearing habitat during the summer growth season. Enhancement of spawning habitat for rainbow and brown trout focused on the appropriate spawning season. Less emphasis was placed on juvenile and fry habitats, since these generally are less limiting to fish populations

than adult habitats. Proposed Action MIFs in the Dam 6 to Redinger Lake reach of the San Joaquin River represent a balance between flows that benefit trout and those that benefit the Native Transition Community, with an emphasis on hardhead. Proposed Action MIFs during fall through spring are selected to avoid large flow changes that may strand (dry out) brown trout redds. Proposed Action MIFs during the winter months also are selected to improve overwinter survival. During the spring through early summer, monthly changes in MIFs are selected to avoid flow changes that may strand rainbow trout redds. MIFs during this period also are selected to avoid stranding of trout fry and native minnows.

Under the Proposed Action, small stream bypass reach MIFs were set by the application of wetted perimeter analyses to provide habitat for fish and macroinvertebrates. These small streams generally do not have upstream storage and the most limiting flow conditions are generally due to seasonal low flows upstream of the diversion.

The Proposed Action includes MIFs to provide passage over shallow areas of the bypass reaches (representative riffles). In streams in which physical barriers may limit movement into and through the bypass reach, these flows may provide enhancement to passage within sections of the bypass reaches.

The Proposed Action provides MIFs in all stream bypass reaches that address the above physical enhancement goals.

The Proposed Action addresses sediment issues in selected bypass reaches through the use of CRMFs during wet years and Sediment Management Prescriptions (SCE 2007a, Volume 4, SD-H (Book 20)). Improved sediment management will, in general, increase available pool habitat and depth, as well as, decrease embeddedness of spawning gravels in bypass reaches. This should enhance conditions for aquatic life, especially fish and their macroinvertebrate foodbase. The decommissioning of three small, upper-basin creek diversions (Tombstone Creek, North Slide Creek and South Slide Creek diversions) will maintain natural flows to their bypass reaches, while the decommissioning of Crater Creek Diversion will increase instream flows below the diversion and improve sediment transport.

#### **5.0.4.2 Benefits and Impacts of the Proposed Action**

Table 5.0-1 summarizes the benefits and impacts resulting from the Proposed Action by bypass reach and reservoir. Benefits and impacts are evaluated for summer water temperatures, physical habitat by species, life stage, stranding, passage, non-fish species and sediment conditions. Benefits and impacts for reservoir habitat are evaluated for reservoirs in which the Proposed Action may result in changes in operations and conditions.



## Mammoth Pool Project (FERC Project No. 2085)

### *Mammoth Pool Dam to Mammoth Pool Powerhouse*

The principal resource issues under existing conditions are low trout abundance and summer water temperatures in the lower portion of the reach that are, at times, warmer than is suitable for good trout growth, particularly in dry water years with warm air temperatures.

The instream flows under the Proposed Action would be the same for all water year types for the Mammoth Pool Dam to Mammoth Pool Powerhouse bypass reach (Mammoth Reach). This would contribute to increased habitat in all water years, especially drier water years, over existing conditions. These higher MIFs would substantially increase habitat for adult and spawning rainbow and brown trout, and decrease habitat for juvenile and fry of both species. The Proposed Action would slightly decrease the potential for redd and fish stranding resulting from changes in MIFs, but would not affect stranding caused by spills. The Proposed Action would not likely provide a benefit to passage relative to the No Action Alternative, since the existing MIFs provide sufficient depth for upstream movement of adults through typical riffles. Adult sucker habitat would also be increased, while habitat for fry and juvenile sucker would be reduced.

Decreased water temperatures in the lower portion of the bypass reach would be expected to improve conditions for trout growth. Reduced temperatures would also reduce stressful conditions for trout during hot meteorological conditions occurring in drier water years. The temperature monitoring program for this reach would contribute to maintaining target water temperatures, when controllable by the Project, and reduce warming when water temperatures are not controllable, as occurs when Mammoth Pool Reservoir is mixing.

Data suggest that food supply (macroinvertebrates) does not appear to be a factor limiting trout presence or growth in the bypass reach. The effect of uncontrollable spills on sediment movement in spring, during wet and above normal water years, likely results in substantial young-of-the-year trout mortality.

As part of the Proposed Action (Fish Monitoring Plan), fish population trends will be monitored over the course of the new license.

### *Rock Creek*

There are no MIFs under existing conditions. Trout habitat below the diversion is limited; especially spawning habitat. Water temperatures are warmer than suitable for trout growth in the lower portion of this bypass reach in the summer.

The Proposed Action would establish MIFs for the bypass reach of this stream. The only habitats in Rock Creek suitable for fish are plunge pools, which are not responsive to changes in flow, and thus increasing flows is unlikely to result in a substantial improvement in the amount of physical habitat available to support an increase in fish

populations. Decreased water temperatures in dry water years and flow continuity during the summer are likely to benefit trout by providing a longer period of temperatures suitable for trout growth and fewer days with stressful water temperatures. Increased flows also may benefit macroinvertebrates, reptiles and amphibians.

#### *Ross Creek*

Under existing conditions, there are no required MIFs. However, Ross Creek is dry above and below the diversion during much of the summer and fall due to an upstream non-Project diversion. The lack of summer flows limits the value of this stream for fish. However, it is used by reptiles and amphibians.

Under the Proposed Action, the lack of summer flows would continue to limit the value of this stream for fish. However, the provision of MIFs when flow is available may extend the availability of wetted habitats and provide benefits to macroinvertebrates and to western pond turtles, Pacific tree frogs and aquatic garter snakes found in Ross Creek.

#### *Mammoth Pool Reservoir*

No aquatic resource issues were identified under existing conditions.

Since little change is expected to reservoir volumes and operations, little effect is expected to fish habitat, water temperatures, or the potential for entrainment. In drier water years, the increased MIFs would tend to induce mixing of the epilimnion and hypolimnion slightly earlier than under the No Action Alternative. The Proposed Action is not expected to adversely affect fish habitat in the reservoir.

#### Big Creek Nos. 1 and 2 (FERC Project No. 2175)

##### *Huntington Lake*

No aquatic resource issues were identified for Huntington Lake. The Proposed Action would increase MIFs in Big Creek below Huntington Lake which would increase releases from Huntington Lake. However, these releases have minimal effect on operation of the reservoir, or storage, compared to existing conditions. Little change is expected to reservoir habitat, water temperatures, or entrainment. The reservoir fisheries are not expected to be affected by the Proposed Action.

##### *Big Creek – Dam 1 (Huntington Lake) to Powerhouse 1 Bypass Reach*

Resource issues under existing conditions include numerous structural passage barriers throughout the reach, owing to its steep, bedrock nature; and low flows from December 15 through April 15. There is currently no required MIF from December 15 to April 15, although SCE releases flow during this period. A guarantee of flow during that period is desirable for incubation of brown trout embryos and overwinter survival. Existing flows in the first two-mile segment of the Big Creek channel are insufficient to maintain sediment transport. Therefore, spawning gravels have a high fine sediment content,

which exceeds the criteria for successful reproduction of trout, and sedimentation may decrease pool habitat.

The Proposed Action for this reach consists of instituting required winter and spring flows (December 15 through April 15) and increasing late spring and summer flows. The proposed MIFs will maintain flow to support aquatic life over winter. Increased spring and summer flows are proposed to provide enhancement for this reach in the spring and summer. During the spring, this would result in habitat enhancement for fish and macroinvertebrates.

In general, area-adjusted densities and biomass of brown trout (adult fish/area and pounds/acre, respectively) were at or above reference levels under current conditions. However, recruitment success may be less than desired. Winter flows and increased spring flows may be beneficial to incubation, but not to spawning, since brown trout is a fall spawning species. Although changes to habitat are expected to be minor, they should be beneficial for trout and macroinvertebrates.

#### *Big Creek – Dam 4 to Powerhouse 2/2A*

##### Powerhouse 2 Forebay (Dam 4)

Powerhouse 2 Forebay is a small waterbody whose temperature and flow is dominated by discharges from Powerhouse 1 and withdrawals to Tunnel 2 (and subsequently, Powerhouse 2). No aquatic resource issues were identified for the forebay. Little change in operations is expected under the Proposed Action.

##### Big Creek – Dam 4 to Powerhouse 2/2A Bypass Reach

The potential fisheries resource issues under existing conditions in Big Creek between Dam 4 and Powerhouse 2/2A include: (i) temperatures exceeding the Central Valley Regional Water Quality Control Board Basin Plan (CVRWQCB) “COLD” objective (i.e., water temperatures unsuitable for trout growth); (ii) potentially insufficient flow (no MIF required under the current license); (iii) potential adult rearing and spawning habitat limitations; (iv) apparent recruitment failure in 2002 (although the presence of all other year classes indicates that recruitment is successful in most years); (v) potential insufficient overwinter habitat for trout due to lack of flow and sediment in pools; and (vi) temporary sedimentation of downstream pools due to potential sediment releases that may occur during periodic de-watering of Dam 4 for tunnel inspections.

The Proposed Action for this reach involves the institution of MIF requirements below Dam 4 to the bypass reach and sediment management prescriptions. The Proposed Action MIFs would substantially enhance trout habitat and water temperatures. The summer MIFs under the Proposed Action would provide increased adult rearing and spawning habitat for trout. This would address the likely cause of recruitment failure identified in 2002. The proposed MIFs would mitigate warm summer water temperature conditions, which would enhance conditions for trout growth. Sediment management prescriptions would result in improved habitat and overwinter conditions.

Macroinvertebrate densities, including EPT densities in this reach are relatively high. The Proposed Action MIFs and sediment prescriptions also are expected to be beneficial for macroinvertebrates, which could benefit trout.

The Proposed Action includes a Fish Monitoring Plan. Under the monitoring plan, the trout populations of this reach of Big Creek would be monitored at years 8, 18, 28 and 38, after the implementation of the proposed enhancement measures, through the remainder of the license period.

#### *Balsam Creek – Diversion to Big Creek*

##### Balsam Creek Diversion

Balsam Diversion forms a very small impoundment on Balsam Creek. No Resource issues were identified for the impoundment. Under the Proposed Action, there would be little, if any, change from existing conditions.

##### Balsam Creek Bypass Reach

Resource issues under existing conditions include no MIFs and the trout population was lower than expected in terms of fish densities and lower biomass. The extremely steep, bedrock stream channel provides limited physical habitat for fish. Natural, structural passage barriers are abundant in this reach and restrict upstream movement of fish.

The Proposed Action MIFs would enhance habitat downstream of Balsam Diversion by providing MIFs where they do not currently exist. Based on the wetted perimeter analysis, flows would be protective of fish and invertebrates during the summer months. Due to numerous structural barriers throughout the reach and the steepness of the habitat present, upstream passage would remain limited, as would the use of the enhanced habitat.

#### *Adit No. 8 Creek – Diversion to Big Creek*

No fisheries issues have been identified on Adit 8 Creek, which is intermittent and has no populations of fish, sensitive amphibians or reptiles.

#### *Ely Creek – Diversion to Big Creek*

##### Ely Creek Diversion

Ely Creek Diversion forms a small impoundment on Ely Creek. Flows are intermittent upstream of the diversion. The Proposed Action would have little effect on the diversion impoundment.

## Ely Creek Bypass Reach

Under existing conditions, there are no MIFs for this reach. Ely Creek may go dry upstream of the diversion and habitat in the bypass reach downstream may be restricted to isolated pools or small accretion flows regardless of whether diversions occur.

The Proposed Action would address resource issues associated with flow-related habitat in this reach. It would provide flows protective of fish and invertebrates, when these flows are available upstream of the diversion. Water temperatures for trout would be enhanced, when flow is available. A decrease in MIFs from 2 to 0.5 cfs on June 1 may potentially result in fry stranding, based on the change in wetted perimeter as identified in Attachment E (CAWG 3, Stranding Report in Volume 4 (Book 5)). However, the overall effect of the Proposed Action MIFs would be to enhance conditions for trout and macroinvertebrates, when flow is available.

## Big Creek Nos. 2A, 8 and Eastwood Project (FERC Project No. 67)

### *Florence Lake*

No resource issues were identified for Florence Lake. The Proposed Action would increase MIFs in the reach below Florence Lake Dam, which would increase releases from Florence Lake. Furthermore, decommissioning the Crater Creek diversion would result in less flow to Florence Lake (and greater flow to the Crater Creek bypass reach). There would be little or no change in operation of the reservoir, or storage, compared to existing conditions. There would be little change in the availability of cool water in the lake or for release downstream. The Proposed Action is expected to have little or no effect on fish populations in the reservoir.

### *South Fork San Joaquin River – Florence Dam to San Joaquin River Confluence*

Under existing conditions, water temperature was a resource issue that had the potential to adversely affect trout in the lower portion of the bypass reach of the South Fork San Joaquin River (SFSJR). During July of a dry year with warm air temperatures, maximum daily water temperatures frequently approached those that might be stressful for trout and daily mean temperatures were occasionally warmer than suitable for trout growth in the 2.5-mile reach upstream of Mono Creek. Daily mean water temperatures were warmer than suitable for trout in the most downstream portion of the reach (the lower five miles in July and the lower 0.3 miles in August).

Trout populations varied in abundance between reaches. Fishing pressure in some areas may reduce populations, as populations were lower in areas with developed recreation facilities (Jackass Meadow Campground and Mono Hot Springs), than in less accessible areas.

The Proposed Action would increase flows to address water temperatures upstream of Mono Creek and upstream of the SFSJR confluence and enhance flow-related habitat, especially in dry years. As part of the Proposed Action, SCE would monitor water

temperatures in the South Fork San Joaquin River as identified in the Temperature Monitoring and Management Plan (SCE 2007b; Volume 4, SD-G (Books 19 and 24)). Objectives of the monitoring plan include: 1) document compliance with water temperature targets for daily mean and maximum water temperatures under the new MIFs; and 2) obtain information about potential Project controllable factors. The monitoring results will be used to prepare a *Long-Term Water Temperature Control Program* that will be added to this Plan. An Interim Water Temperature Control Program (Interim Program) will be implemented during monitoring to document and provide suitable water temperatures for trout.

Habitats for rainbow and brown trout adult rearing and spawning would be enhanced in the reaches of the SFSJR downstream of Florence Dam by increased MIFs in the SFSJR and tributaries. The extent of enhancement would differ by reach within the SFSJR. Juvenile trout rearing habitat, redd stranding and passage would be little affected, while fry habitat would be decreased. Fry also could be adversely affected by increased potential for stranding.

Wet and above normal water year CRMFs would be released from Florence Dam. The four small diversions decommissioned under the Proposed Action which are tributary to this reach may increase aquatic habitat. Additional wet year releases would also be made from Bear Creek and small tributaries. Both wet and above normal water year CRMFs would be released from Mono and Camp 61 creeks. These releases may slightly enhance habitat in the SFSJR. The Proposed Action includes a Fish Monitoring Plan to document trends in fish populations resulting from the Proposed Actions.

### *Bear Creek*

#### Bear Creek Forebay

The Proposed Action would have little effect on Bear Creek Forebay operations and therefore, would have little effect on the fishery. As part of the Proposed Action, LWD accumulating in the Bear Creek Forebay would be placed below the diversion to provide LWD to the downstream reach as habitat elements.

#### Bear Creek Bypass Reach

The Bear Creek bypass reach does not have identified resource issues. The brown trout population is abundant at or above reference stream densities with successful recruitment. However, due to the abundance of brown trout, physical habitat may be approaching limiting values.

The Proposed Action will increase MIFs in the bypass reach, especially in drier water years, and increase physical habitat for all life stages of brown trout. The enhancement of physical habitat may result in enhancement of the brown trout population. Fish monitoring in this reach will provide information on population trends. The diversion will be turned out for 10 days during the spring of wet water years to improve sediment transport through this reach, which should increase available pool habitat, reduce

spawning gravel embeddedness, and benefit macroinvertebrate production. Transport of LWD to the bypass reach would enhance trout habitat by providing additional cover.

The increased MIFs under the Proposed Action also would likely contribute to increased macroinvertebrate production, since the wetted perimeter of the stream would generally increase by 20 to 25 percent over that for existing conditions during the summer months. Enhancements to macroinvertebrates in comparison to existing conditions are most likely to occur during drier water years when MIFs are increased the most. Transport of LWD from the forebay to the bypass reach may also contribute to macroinvertebrate enhancement as a source of carbon and as substrate for macroinvertebrates.

### *Mono Creek*

#### Mono Diversion Forebay

There were no identified aquatic resource issues in Mono Diversion Forebay, under existing conditions. However, habitat issues downstream are related to the accumulation of sand and fine sediment in the Forebay. Sediment released from the forebay potentially adversely affects the bypass reach downstream. Sediment prescriptions that decrease sediment build up in the impoundment would benefit the bypass reach downstream.

#### Mono Creek Bypass Reach

Under existing conditions, trout populations in Mono Creek are low and are a resource issue. Sedimentation of habitat, including loss of pool depth and embeddedness of gravels, likely has adverse effects on trout habitat, recruitment, and over-winter survival. Sediment conditions are the most likely limiting factor in this reach. Under the Proposed Action, the implementation of a sediment prescription for mechanical removal in Mono forebay along with CRMFs will reduce fine sediment accumulations in the bypass reach.

Although MIFs during the fall of dry years are lower than the identified passage flows for trout, the actual flows in the reach (based on the USGS record) are usually sufficient to provide passage. Increased MIFs also will result in enhancement of physical habitat for adult trout rearing and spawning. There would be an adverse effect on fry habitat and a minimal effect on other trout life stages, passage, and stranding. Improvements to sediment conditions and increased MIFs also will likely provide beneficial effects to overwinter survival.

The enhancement of the trout population in Mono Creek will be monitored. The Proposed Action includes a Fish Monitoring Plan.

Proposed Action MIFs for Mono Creek would result in an average of about 20 percent increase in summer wetted perimeter. This, plus the reduction in fine sediments due to the proposed CRM flows, would likely result in increased macroinvertebrate production.

### *Tombstone Creek, North Slide Creek, and South Slide Creeks*

These diversions are currently not in operation, and would remain out of operation and would be decommissioned under the Proposed Action. Therefore, any potential impacts to fish or other aquatic species that would have resulted from the repair and operation of these diversions would be avoided. Maintaining all natural flow to the bypass reaches would continue to provide a benefit to aquatic habitat in these streams. Of these streams, only Tombstone Creek currently supports trout (below the diversion). Removal of diversion structures may increase gravel recruitment from these tributaries to the South Fork San Joaquin River, as well as to the Tombstone bypass reach.

### *Hooper Creek*

#### Hooper Creek Impoundment

No resource issues were identified for the impoundment behind Hooper Creek Diversion. The Proposed Action would increase MIFs to the bypass reach and implement a sediment management prescription for mechanical removal. Sediment prescriptions that decrease sediment build up in the impoundment would maintain pool depth (space) for fish.

#### Hooper Creek Bypass Reach

In the Hooper Creek bypass reach, flows for fish passage were identified as a potential resource issue. Under existing conditions, MIFs of 2 cfs are less than the 2.5 cfs needed for passage through a typical riffle on this creek. The Proposed Action would increase MIFs from 2 cfs to 4 cfs during April through June and from 2 cfs to 3 cfs from July through September, thus addressing the passage issue. The proposed MIFs also exceed the flow needed to protect fish and macroinvertebrate habitat, as identified by the wetted perimeter study.

Under the Proposed Action, habitat and temperature conditions would remain favorable with a small increase in wetted perimeter. Enhanced passage flows may provide some benefit to upstream movement for rainbow trout.

Sediment was identified as a resource issue in Hooper Creek. The sediment management prescription would enhance habitat for trout and macroinvertebrates by reducing fine sediment accumulations.

### *South Side Tributaries*

#### Crater Creek

Under existing conditions, Crater Creek above and below the diversion had lower than expected trout densities. There are no MIF requirements. The diversion is constructed so low flows are passed to the diversion channel rather than the natural channel. Flows in the bypass reach below the diversion are due to seepage, accretion, and surface runoff. The operation of the diversion results in periods where flows below the diversion



are less than the flows identified by wetted perimeter analysis as protective of fish and macroinvertebrates in this stream. Natural flows less than this protective flow likely occur in this stream during the summer and fall. Habitat and fish populations in Crater Creek are highly fragmented by numerous falls and areas of bedrock sheet. Extensive upstream fish migration would be unlikely at any flow.

Under the Proposed Action, the Crater Creek Diversion would be removed from service. Removing Crater Diversion from service would provide year-round benefits to trout and invertebrates relative to the No Action Alternative. Peak high flows will remain in the channel, which will ensure that high flows will periodically flush any sediment accumulations, enhancing habitat for aquatic resources within Crater Creek. The level of enhancement may be limited by the availability of flow upstream of the diversion during the drier portion of the year. A late summer and fall habitat bottleneck related to natural flow levels upstream of the diversion will continue to occur. Upstream passage within Crater Creek will continue to be limited, due to numerous structural barriers. Trout would no longer be diverted to Florence Lake from Crater Creek diversion.

#### Chinquapin, Camp 62, and Bolsillo Creeks

Chinquapin, Camp 62, and Bolsillo creeks are steep, boulder/bedrock streams. Multiple age classes of brook trout were observed. The existing MIFs throughout the year approximate the flow indicated by wetted perimeter analysis to be protective of fish and macroinvertebrate habitat, but MIFs are only met when sufficient flow is available. The most severe habitat constraint likely occurs in the summer and fall when the natural base flow upstream of the diversion drops below the protective flow (as identified by the wetted perimeter study) so that actual flows in the bypass reach may drop to less than existing MIFs for several months. During this time, the diversion is turned out (not diverting) and the stream flow is unaffected by the Project. Passage is restricted by frequent structural barriers. Natural summer base flows and fish passage are the factors most likely to constrain fish populations in this bypass reach.

The Proposed Action would provide MIFs that are similar or slightly higher than the existing, no action MIFs for most of the year. In the spring of wet water years, flows in Camp 62 and Bolsillo Creeks would be two to three times the existing MIF, when these flows are available. While these flows will provide benefits, summer and fall habitat would remain the same as under the No Action alternative. Passage conditions and summer water temperatures are expected to remain about the same as under the No Action alternative.

In wet water years, these diversions would be turned out between April 1 and June 30, allowing pass-through of accumulated sediment from behind the diversions, as per the sediment management prescriptions. The high flows will enhance geomorphic and aquatic resources in these creeks, but especially in Bolsillo Creek where there is sediment accumulation under existing conditions.

### *Balsam Forebay*

Since little change is expected in operations, little change would be expected to reservoir habitat, water temperatures, or entrainment. Little change is expected in impacts to fish in the forebay.

### *Diverted Tributaries to Big Creek*

#### Pitman Creek Diversion

In the diversion impoundment, there are no identified resource issues. There would be no change in operations expected under the Proposed Action and therefore, no change in effects on resources.

#### Pitman Creek Bypass Reach

Pitman Creek below the diversion is a steep, bedrock-dominated stream. About half of this reach is plunge pool and step pool habitat with bedrock controls. These provide the vast majority of usable habitat for fish. This type of habitat is not responsive to changes in flow. Most of the remaining habitat is cascade and bedrock sheet, which provides very limited habitat for fish. Upstream migration through this channel is prohibited by numerous, natural, structural barriers. In spite of these constraints, fish populations in the Pitman Creek bypass reach are abundant and healthy under current conditions. Resource issues are considered minor, but flows are below those derived from the wetted perimeter analysis.

The Proposed Action would increase MIFs to meet or exceed the flows recommended by the wetted perimeter and passage analyses. A sediment management prescription would be instituted to avoid future sediment accumulations in the diversion and the bypass reach pools. The Proposed Action MIFs would enhance habitat for both fish and macroinvertebrate below the diversion.

#### Balsam Creek – Balsam Forebay to Balsam Creek Diversion

Flows in Balsam Creek below the Balsam Meadow Forebay are augmented by flows from the forebay. Existing MIFs are greater than the flow identified by the wetted perimeter analysis as protective of fish and macroinvertebrate habitat during the summer months, and slightly less than this flow in the winter months. However, higher than required actual releases made to maintain compliance result in flows that exceeds the protective flow at all times. The only factor that appears to be a resource issue in Balsam Creek between the Forebay and the diversion are the numerous natural structural passage barriers that limit upstream migration at any flow.

The Proposed Action would increase MIF requirements during October through June and provide flows exceeding those recommended by the wetted perimeter analysis. This would increase habitat for rainbow trout, including overwinter habitat. Upstream fish passage would still be an issue, due to numerous waterfalls. Water temperatures

would remain suitable for trout growth, as they are under current conditions. The Proposed Action MIFs are expected to enhance habitat for macroinvertebrates.

#### *North Fork Stevenson Creek*

Current flows in North Fork Stevenson Creek are much higher than that of the original stream. Flows are augmented by Project releases from Tunnel 7 (Huntington-Pitman-Shaver [HPS]) (North Fork Stevenson Creek RM 3.55). These flows are sufficient to provide fish passage through typical riffles at all times, although natural structural barriers will prevent extensive upstream passage in portions of the reach. Resource issues relate to a widening of the channel due to its use as a flow transport reach by SCE prior to the construction and operation of the Eastwood Power Station. This channel may be used to convey high flows in the spring, if the Eastwood Power Station is offline. Trout populations are lower than expected, due to high flow releases in several past years, which adversely affected recruitment. Gravel in this reach is limited in abundance.

The Proposed Action would increase MIFs downstream of the Tunnel 7 outlet over current MIFs. The proposed MIFs would better fill the bottom of the enlarged channel and enhance fish habitat. Adult rearing, juvenile rearing, and spawning habitats would be enhanced for trout. Trout populations are expected to increase in the next few years, as the population is currently recovering from large flow events in the recent past that have adversely affected recruitment. The Proposed Action includes a Fish Monitoring Plan to monitor population trends. Under the Proposed Action, an increase in wetted perimeter of about 15% during the summer may result in increased macroinvertebrate production over existing conditions.

Although water temperature was not identified as a resource issue, as part of the Proposed Action, water temperatures would be monitored at the Tunnel 7 outlet and at the SCE Gage 99 (NFSC RM 1.6) for three years, as identified in the Temperature Monitoring and Management Program to confirm that water temperatures, when controllable by Project operations, are in compliance with the Basin Plan (CVRWQCB 1998; SCE 2007b; Volume 4, SD-G (Books 19 and 24)).

#### *Shaver Lake*

No resource issues were identified for Shaver Lake under existing conditions. Under the Proposed Action, there would be little change in reservoir operations. Therefore, there would be little or no change to fish habitat, water temperatures, or potential for entrainment.

#### *Big Creek Dam 5 to Powerhouse 8 Reach*

##### *Powerhouse 8 Forebay (Dam 5)*

Under existing conditions, the only resource issue is related to the accumulation of sediment in the impoundment and its periodic release during tunnel walks and inspections. Under the Proposed Action, sediment in the forebay would be managed,

primarily by mechanical removal, under a sediment management prescription. Sediment management would maintain habitat conditions in the forebay by maintaining pool depth. No other change in operations or habitat would be expected under the Proposed Action.

#### Big Creek Dam 5 to Powerhouse 8 Bypass Reach

Under existing conditions, the principal resource issues in this reach are warm water temperatures, upstream migration in the fall of dry years, overwinter flows in dry years and periodic sedimentation when the impoundment is drained for tunnel inspections. Despite these resource issues, trout density is similar to that for reference locations. Mean daily water temperatures exceeded 20°C at the bottom of the reach for 11 days in 2001, a dry year with warm air temperatures. MIFs in the fall of dry years are lower than the flow necessary for passage through a typical riffle, which may affect brown trout spawning migration (dry and critically dry years collectively occur about half the time). On average, however, records indicate that passage flows were exceeded at all times under actual operations, due to the release of extra water to maintain compliance with the MIF. Numerous natural passage barriers occur along the bypass reach preventing extensive upstream migration under any flow conditions. Periodic sedimentation may decrease stream depth and smother spawning gravels and redds until flows of sufficient magnitude and duration occur to move this sediment downstream into the San Joaquin River. Overwinter habitat may also be an issue in dry water years due to low flows and the dominance of shallow habitats.

The Proposed Action MIFs would decrease water temperatures in the lower portion of the reach, resulting in temperatures suitable for trout throughout the summer in all water year types. As part of the Proposed Action, water temperatures would be monitored in Big Creek downstream of Dam 5 and upstream of Powerhouse 8 for three years, as identified in the Temperature Monitoring and Management Program to confirm that water temperatures, when controllable by Project operations, are in compliance with the Basin Plan (CVRWQCB 1998; SCE 2007b; Volume 4, SD-G (Books 19 and 24)).

Proposed Action flows would substantially increase overwinter habitat in drier water years for rainbow and brown trout. MIFs would be increased and the same in all water year types, increasing the benefit of habitat enhancement in drier years. Passage conditions would improve in December through March of drier years, although numerous structural barriers would continue to restrict upstream movements. The MIFs would enhance habitat throughout the year. Adult and juvenile rearing habitats, as well as spawning habitats would be enhanced for both rainbow and brown trout. Trends in trout populations in this reach of Big Creek will be monitored as part of the proposed Action to evaluate enhancement. The Proposed Action includes a Fish Monitoring Plan.

Proposed Action MIFs would result in increased flow and a summer increase of wetted perimeter of about 15 percent, likely increasing macroinvertebrate production. Implementation of the sediment management actions, by reducing sedimentation of substrates, also would contribute to increased production of macroinvertebrates.

### *Stevenson Creek – Shaver Dam to San Joaquin River*

The availability of spawning habitat and passage flows were identified as potential resource issues for rainbow trout in Stevenson Creek under existing conditions. Spawning habitat in Stevenson Creek is likely reduced because suitable spawning gravels are uncommon, but current MIFs also contribute to the low availability of spawning habitat. Current MIFs are less than required for passage through a typical riffle, which may reduce access to areas of suitable spawning habitat, but natural structural passage barriers along this stream would prevent migrations longer than 1,000 to 2,000 ft, on average, at any flow. Recruitment appears to be lower than expected.

The Proposed Action for this reach would increase MIFs throughout the year. The Proposed Action MIFs enhance passage and spawning habitat for rainbow trout. The Proposed Action MIFs enhance passage flows during November through April, when pre-spawning movement of rainbow trout is likely to occur. Habitat for adult and juvenile rearing, as well as spawning, would be enhanced. These enhancements will likely result in improved recruitment. Potential enhancement of trout populations in this reach will be monitored. The Proposed Action includes a Fish Monitoring Plan. Proposed MIFs would decrease water temperatures, but water temperatures are already suitable for trout under existing conditions.

Proposed Action increased MIFs would increase the wetted perimeter of the stream by about 10% and would likely result in additional macroinvertebrate production.

### Big Creek No. 3 (FERC Project No. 120)

#### *Powerhouse 3 Forebay (Dam 6)*

No aquatic resource issues were identified in the Powerhouse 3 Forebay. Implementation of a sediment management prescription would reduce sediment build up in the impoundment, thereby maintaining pool depth (space) for fish habitat.

#### San Joaquin River –Dam 6 to Powerhouse No. 3 (Redinger Lake)

The resource issues under existing conditions in the San Joaquin River between Dam 6 and Powerhouse No. 3 include water temperatures in the lower portion of the bypass reach during the summer that are too warm to be suitable for trout, lower than expected trout abundance, and absence of adult hardhead residing in the lower portion of the reach.

Summer water temperatures in the lower portion of this reach are too warm to meet the COLD objective of the CVRWQCB Basin Plan, which is based upon water temperatures generally suitable for trout (daily mean temperature of 20°C or less). However, temperatures that meet the COLD objective of the Basin Plan may be too cool to be suitable for hardhead in the summer. Temperatures in lower portions of this reach under existing conditions are in the preference range for hardhead and Sacramento pikeminnow, but are too warm for trout (CAWG 5, Water Temperature Monitoring

Report, SCE 2004; Volume 4, SD-D (Books 12 and 23)). A resource issue raised by the resource agencies is the need for increased adult hardhead and Sacramento pikeminnow habitats. This is based on the observation that there is an absence of adult hardhead after the spawning season in the reach.

The Proposed Action would increase MIFs below Dam 6 to the bypass reach (Stevenson Reach) and MIFs would be the same for all water year types. The MIFs under the Proposed Action would increase by 6.7 to more than 26 times for individual months. The Proposed Action MIFs are intended to produce compliance with the Basin Plan requirement to protect COLD fish habitat, when and where temperatures in the bypass reach are practically controllable by the Project. The current Basin Plan (CVRWQCB 1998) does not recognize the conflict between temperature preferences of cold water game fish and sensitive, native transition zone species, such as hardhead. The reduction of summer water temperatures from those present under existing conditions may be considered an adverse impact to hardhead. The Temperature Monitoring and Management Plan would implement the use of telemetry to monitor summer water temperatures and would release additional flow, if needed, to meet temperature targets when water temperature is a Project controllable factor. Under the temperature monitoring and fish population monitoring plans, the lower portion of the reach would be studied to evaluate whether a change in temperature classification is justified to manage water temperatures and habitat conditions for hardhead in preference to trout in this particular reach.

The Proposed Action would increase flow-related habitat for both trout and native transition zone species. MIFs would increase rainbow and brown trout adult and juvenile rearing habitats. They would greatly increase available spawning habitats for both rainbow and brown trout. The changes in flow from October to December would result in a minor increase in potential for redd loss due to stranding for brown trout, while current MIFs during this period are stable. The increased flows would permit fish passage throughout the reach. The Proposed Action MIFs would increase habitat for native transition zone species. Habitat would increase for both juvenile and adult hardhead. Increased adult hardhead habitat may result in increased use by adult hardhead during the summer months. Under the Proposed Action, decreased water temperatures may facilitate increases in trout populations for which increased physical habitat should be beneficial.

Fish monitoring would take place under the Fish Monitoring Plan to assess trends in fish populations. This would be supplemented by additional sampling during the first five years focused on hardhead, Sacramento pikeminnow, and Sacramento sucker under the temperature monitoring plan.

Sediment prescriptions would be implemented in this reach. Sediment pass-through at Dam 6 would move sediments downstream and would take place at five-year intervals. Following sediment pass-through a flow of at least 3,000 cfs will be provided for at least a 24-hour. This would benefit aquatic habitat by reducing the potential for long-term sediment accumulation in the impoundment and release sediments (including spawning gravels) to the downstream channel under conditions that provide adequate transport.

Under the Proposed Action, higher MIFs from Dam 6 and Stevenson Creek would likely result in some enhancement of macroinvertebrate populations.

### **5.0.5 TERRESTRIAL RESOURCES**

Operation and maintenance of the four Big Creek ALP Projects may potentially affect special-status plants and wildlife, and game species, and may cause the spread of noxious weeds in the vicinity of the Projects. Maintenance of the Projects includes vegetation management activities at Project facilities and along Project roads and trails, which may affect special plant and wildlife species that are known to occur in the vicinity, and may result in the spread or introduction of new noxious weed populations. Game species affected by Project operations include the mule deer herd and black bear in the vicinity of the Project. Under the Proposed Action, environmental measures will be implemented to enhance or maintain terrestrial resources. These measures include: implementation of the three resource management plans (Vegetation and Integrated Pest Management Plan, Valley Elderberry Longhorn Beetle Management Plan, and Bald Eagle Management Plan), four license articles (Special-status Species License Article, Special-status Bat Species License Article, Mule Deer License Article, and Bear/Human Interaction License Article) (SCE 2007b; Volume 4, SD-G (Books 19 and 24)), and a number of environmental training programs (Environmental Training Program, Endangered Species Alert Program, Northern Hydro Special-status Species Awareness Program, Noxious Weed Training Program, and Environmental Compliance Program). These environmental measures will maintain or enhance the protection of special-status terrestrial resources and their habitats in the vicinity of the four Big Creek Projects.

Special-status plant species in the vicinity of all four Big Creek ALP Projects could be affected by vegetation management activities (vegetation trimming by hand and with equipment, and herbicide use) conducted at Project facilities and along roads and trails. To enhance protection of these special-status plant species the environmental measures and programs outlined in the Vegetation and Integrated Pest Management Plan will be implemented (SCE 2007b; Volume 4, SD-G (Books 19 and 24)). These measures include: establishment of buffer areas around special-status plant populations, monitoring of the effectiveness of avoidance protection measures, conducting special-status plant species surveys every 10 years, and implementation of employee training programs (i.e., Environmental Training Program, Endangered Species Alert Program, Northern Hydro Special-status Species Awareness Program, Noxious Weed Training Program, and Environmental Compliance Program). Implementation of the Special-status Species license Article requires that a Biological Assessment/Biological Evaluation (BA/BE) be completed prior to construction of new Project features (SCE 2007b; Volume 4, SD-G (Books 19 and 24)). Implementation of these measures and programs will maintain and enhance protection of special-status plant species in the vicinity of the four Big Creek ALP Projects.

Several special-status wildlife species are known or could potentially occur in the vicinity of the four Big Creek ALP Projects. These include: valley elderberry longhorn beetle (VELB), special-status amphibians and reptiles, raptors (including, but not limited to,

bald eagle and osprey), riparian-nesting songbirds, special-status bats, and mesocarnivores. To enhance protection of these species, SCE will implement measures and programs outlined in the Vegetation and Integrated Pest Management Plan, VELB Management Plan, Bald Eagle Management Plan, Special-status Species License Article, and Special-status Bat Species License Article (SCE 2007b; Volume 4, SD-G (Books 19 and 24)). These measures and programs include: implementation of employee training programs (i.e., Environmental Training Program, Endangered Species Alert Program, Northern Hydro Special-status Species Awareness Program, Avian Protection Program, Noxious Weed Training Program, and Environmental Compliance Program). The VELB Management Plan includes measures to avoid or minimize disturbance of VELB and their habitat to protect VELB during implementation of vegetation management of road maintenance (SCE 2007b; Volume 4, SD-G (Books 19 and 24)).

The Bald Eagle Management Plan includes measures for monitoring nesting and wintering eagles in the Project vicinity, establishes buffer areas around active nests, and includes the Avian Protection Policy (Special Order) which prescribes measures for protection of raptors when conducting maintenance activities on Project powerline structures (SCE 2007b; Volume 4, SD-G (Books 19 and 24)).

Implementation of the Special-status Species License Article requires that a BA/BE be completed prior to construction of new project features. The Special-status Bat Species License Article includes measures to protect special-status bats during implementation of non-routine maintenance activities (SCE 2007b; Volume 4, SD-G (Books 19 and 24)).

Implementation of the Special-status Species License Article requires that a BA/BE be completed prior to construction of new Project features. Implementation of these measures and programs will maintain and enhance protection of special-status wildlife species in the vicinity of the Big Creek ALP Projects (SCE 2007b; Volume 4, SD-G (Books 19 and 24)).

Several noxious weeds are known to occur in the vicinity of the four Big Creek ALP Projects. Ongoing maintenance activities (e.g., vegetation and road maintenance) at Project facilities, roads, trails, and recreation facilities could result in the spread of these populations or the introduction of new populations to the watershed. SCE will implement measures as described in the Vegetation and Integrated Pest Management Plan to reduce the spread or introduction of noxious weeds in the vicinity of the four Big Creek ALP Projects. These measures include: cleaning of SCE vehicles entering the watershed from another watershed, cleaning of vehicles traveling through noxious weed populations within the watershed, treatment of new and established noxious weed populations, monitoring of noxious weed treatment areas, and development of a Noxious Weed Training Program. Additionally, SCE will not plant invasive ornamental plant species and will remove invasive ornamental plants that are present around Project facilities. Implementation of these measures will reduce the spread and introduction of noxious weeds and invasive ornamentals in the vicinity of the four Big Creek ALP Projects.



Mule deer and black bear are two game species that are known to occur in the vicinity of the four Big Creek ALP Projects. The San Joaquin mule deer herd crosses Mammoth Pool Reservoir (FERC Project No. 2085) as they migrate from their winter habitat to their breeding grounds. Operations of Mammoth Pool Reservoir could potentially disturb migrating mule deer. Under the Proposed Action, SCE will implement the Mule Deer License Article that includes measures to maintain or enhance habitat for mule deer (SCE 2007b; Volume 4, SD-G (Books 19 and 24)). This includes, maintaining existing facilities at Mammoth Pool Reservoir to protect mule deer migration, placement of sand on the Mammoth Pool Dam road, implementation of road closures, and monitoring the presence of debris buildup in Mammoth Pool Reservoir.

Black bear are known to occur in the Project vicinity and food and trash storage at these facilities could result in bear/human interactions. Under the Proposed Action, SCE will implement the Bear/Human Interaction License Article (SCE 2007b; Volume 4, SD-G (Books 19 and 24)). This includes measures to install and maintain bear-proof dumpsters at the Big Creek No. 1 administrative offices (Big Creek Nos. 1 and 2 Project, FERC Project No. 2175), at company housing, and other Project facilities where food waste may be disposed or stored. Additionally, SCE will implement a program to educate SCE personnel about proper food storage and garbage disposal to reduce bear/human interactions. Implementation of these measures will reduce bear/human interactions.

#### **5.0.6 RIPARIAN RESOURCES**

Existing Project operations and maintenance have the potential to affect riparian resources primarily through changes in flow regime, including timing in Project bypass and augmented stream reaches. Riparian resource issues were identified in the South Fork San Joaquin River near Jackass Meadows, Mono Creek below the Mono Diversion, and Crater Creek near Hellhole Meadow. These three reaches, as described below, are associated with the Big Creek Nos. 2A, 8 and Eastwood Project (FERC Project No. 67). Riparian issues include diversity of age class structure, community composition, coverage of non-riparian species on bars, upland species present in meadows and riparian corridors, high willow decadence, decreased floodplain connectivity, encroachment, stress and changes in flow.

Under the Proposed Action, the implementation of new environmental measures will modify the existing flow regime and enhance riparian and geomorphic resources in selected bypass reaches. The new environmental measures include: (1) scheduled CRMF releases in wet and above normal water years in Mono Creek and the South Fork San Joaquin River; and (2) established time periods when small diversions on Bolsillo Creek, Chinquapin Creek, Camp 62 Creek, and Bear Creek may not be operated. Implementation of these measures would return some of the natural flow to the streams during spring run-off and will enhance or maintain riparian resources and improve sediment conditions and physical habitat for aquatic species. The Proposed Action also includes trend monitoring, as proposed in the Riparian Monitoring Plan to monitor the affect of the flow modifications on riparian resources.

The Proposed Action also includes decommissioning four small diversions located on North Slide Creek, South Slide Creek, Tombstone Creek, and Crater Creek. The diversions on North Slide, South Slide, and Tombstone creeks have been out-of-service for approximately 20 years. Therefore, the flow conditions under the existing operations represent free-flowing conditions, and the Proposed Actions are expected to result in little change to riparian resources. Crater Creek Diversion is currently operational and its decommissioning will return natural flow conditions to the creek and associated meadows.

The new measures under the Proposed Action will enhance and maintain riparian and meadow resources and will provide additional benefit for aquatic species, reptiles and amphibians, and terrestrial and avian species dependent on the riparian habitat. The implementation of the CRMF release measures will also protect, maintain, and may benefit riparian resources downstream of Project facilities, due to the increase of the amount of water available to the rooting zone, particularly during the drier months.

The following describes the stream reaches, by Project, with riparian resource issues and the benefit of implementing new environmental measures under the Proposed Action.

#### Big Creek Nos. 2A, 8 and Eastwood Project (FERC Project No. 67)

##### *South Fork San Joaquin River*

Riparian resource issues along the South Fork San Joaquin River primarily occur in the Jackass Meadow Complex, and the adjustable reaches. Within the riparian corridor and Jackass Meadow Complex, riparian resource issues include: age class structure (regeneration), community composition, encroachment of upland species, stress (high willow decadence; grazing and recreation pressures), and changes in the frequency of high flows that inundated the bars and meadow. Under existing conditions, the bars and meadow were inundated during most, but not all, wet water years and rarely during drier water year types. The high flows were associated with spill events, and the flows often receded very quickly. Under the Proposed Action, CRMF releases will be provided during the spring in wet and above normal water years, increasing the frequency, magnitude, and duration of flows that will inundate the bars and meadow. The flows also will likely have a slower recession rate compared to existing operations, resulting in higher moisture conditions on the meadows for a longer period of time. The Proposed Action will likely enhance the riparian habitat along the San Joaquin River, particularly in the Jackass Meadow area by: (1) depositing fresh alluvium on the bar and meadow surfaces, which is important for successful establishment of riparian species; (2) providing higher moisture conditions to support wetland species within the meadow; and (3) potentially discouraging continued encroachment of upland species on the bars. However, the success of these enhancement flow objectives may be reduced if other land use activities contributing to the current state of the meadow (i.e., pack animal grazing and recreation) are allowed to continue in these sensitive areas. The Proposed Action also includes the Riparian Monitoring Plan to monitor trends in the condition of the riparian community along South Fork San Joaquin River (Jackass Meadow area).

### *Mono Creek, Diversion to South Fork San Joaquin River*

Riparian resource issues identified along Mono Creek included coverage of non-riparian species on bars, riparian encroachment, age class structure (regeneration), and changes in the frequency and timing of high flows. Within the adjustable stream reaches, the frequency of inundation of the bars and floodplain has decreased. Under the Proposed Action, the magnitude and frequency of high flows will be increased by providing CRMF releases in all wet and above normal water years and increasing the extent of floodplain inundation and the frequency of floodplain connectivity. The higher flows will: (1) scour young vegetation that has recently established and may establish within the channel during the drier water years; (2) cause localized bank erosion, scouring mature vegetation established within the channel margins; (3) deposit fresh alluvium on the bar surfaces, which is important for successful establishment of riparian species; (4) provide higher moisture conditions to support wetland species on bars and floodplains; and (5) discourage continued encroachment of upland species on the bars. The Proposed Action also includes a Riparian Monitoring Plan to monitor the trends in condition of the riparian community along Mono Creek.

### *Crater Creek, Diversion to South Fork San Joaquin River*

Riparian resource issues along Crater Creek primarily occur in the adjustable reach, which includes Hellhole Meadow. These issues include: upland species present in the meadow and riparian corridor, high willow decadence, decreased floodplain connectivity, and changes in the natural hydrologic regime. Under existing operations, the diversion is believed to take nearly all of the flow for considerable portions of the year. Under the Proposed Action, the diversion will be decommissioned, thereby providing natural flows in the channel and on the floodplain, including Hellhole Meadow. Natural flow will remain in the channel in all water year types, and more water will be provided to downstream resources, which will enhance the riparian resources, as well as other resources dependent on the riparian habitat, along Crater Creek and in Hellhole Meadow, unless grazing use increases within the meadow. The natural flows will: (1) increase the frequency and duration of meadow inundation; (2) provide higher moisture conditions to support wetland species within the meadow; (3) deposit fresh alluvium on the bar and meadow surfaces, for successful establishment of riparian species; and (4) discourage continued encroachment of upland species on the bars. By decommissioning the diversion, 3.0 miles of bypass reach will be returned to a free-flowing stream.

### *Camp 62, Chinquapin, and Bolsillo Creeks, Diversions to South Fork San Joaquin River*

Under existing operations, diversions changed the natural hydrologic regime within these streams. Flows during spring run-off were diverted during a portion of some, but not all, wet water years and all drier water year types on Bolsillo, Camp 62, and Chinquapin creeks. Under the Proposed Action, the Bolsillo, Camp 62, and Chinquapin diversions will be left open between April 1 and June 30 during wet water years. The Proposed Action will restore some natural variability in the timing, magnitude, and

duration of high spring run-off flows during wet water years within these creeks, which will protect, and be beneficial to the riparian resources.

*Bear Creek, Diversion to South Fork San Joaquin River*

Under existing operations, diversion operations change the timing of spring run-off flows and decrease the frequency of high flow events. Under existing operations, high flows occur during spill events, and seven spills that exceeded the 1.5-year flow occurred in a 19-year period (1983 to 2002 (no data is available for 1983)). The spills mostly occur, during the spring run-off period. Under the Proposed Action, water will not be diverted for ten consecutive days between May 15 and June 30 of wet water years. This is within the spring run-off period. The Proposed Action will increase the flow magnitude and duration during the time period of natural spring run-off, which coincides with riparian regeneration. The proposed changes in flows will protect, and be beneficial to the riparian resources.

*Tombstone Creek Diversion, North Slide Creek Diversion, and South Slide Creek Diversion (Diversion to South Fork San Joaquin River)*

Under the Proposed Action, these three diversions will be decommissioned returning the bypass reaches to free-flowing streams. As the diversions have been out-of-service for many years, the existing resource conditions are expected to remain the same. The Proposed Action is expected to result in little change to riparian resources. If grazing by pack animals and heavy recreation continues in the meadows and within the stream channel of Tombstone Creek, regeneration (age class structure) may continue to be limited as the shrubs are often eaten and/or trampled by animals and people.

*North Fork Stevenson Creek, Tunnel Outlet to Shaver Lake*

Along North Fork Stevenson Creek, riparian resource issues include riparian community structure and coverage (high stem densities), coverage of upland species within the riparian zone, and changes in the hydrologic regime. Historically, this stream segment was used to convey water from Huntington Lake into Shaver Lake prior to the construction of the Eastwood Power Project in 1987. The historic operations enlarged sections of the stream from a small headwater stream into a stream with adjustable segments (approximately 0.9 mile in total) that now support extensive riparian habitat. Current operations (since construction of the Eastwood Power Station pump-back facility) release subsequent lower flows down this creek. Under existing operations, the riparian vegetation is re-establishing closer to the present stream channel, while upland species are establishing along the outer margins of the riparian zone within the historically enlarged channel. However, under the Proposed Action, SCE may still need to occasionally release high flows from Tunnel 7. Therefore, no changes from existing operations, other than higher MIF are proposed.

### *Stevenson Creek, Shaver Lake Dam to San Joaquin River*

Along Stevenson Creek, potential riparian resource issues were identified within the adjustable reaches immediately below Shaver Dam, including stress associated with Non-Project erosion control measures and flow capacity constrictions of the culvert at Highway 168, and to a lesser degree, age class structure, and upland species encroachment. Ponding in the upstream reach occurs when high flow releases are made from the Shaver Lake Dam Howell Bunger (HB) valve. The erosion control measures and culvert flow capacity constrictions that cause ponding within the upstream reach, will continue to impact the riparian resources under existing operations. As high flows are not proposed to change, the Proposed Action is likely to have little impact on the condition of the riparian resources.

### Big Creek Nos. 1 and 2 Project (FERC Project No. 2175)

#### *Big Creek, Huntington Lake to Dam 4*

The lack of high flows and inundation of the areas adjacent to Big Creek immediately downstream of Huntington Lake have led to the establishment of woody riparian vegetation within the channel. For more than 60 years, operational constraints have required that Huntington Lake not spill and threaten the dam and downstream infrastructure, including the domestic water supply diversion and the bridge serving the community of Big Creek. As a result, flow magnitudes have been significantly reduced, with the 1.5-year flow occurring twice in the past 56 years. This reduction in flow magnitude has led to the establishment and extensive encroachment of riparian vegetation within the historic stream channel. The threat of higher flows to downstream infrastructure continues to be a safety and operational constraint, and precludes the release of high flows downstream of Huntington Dam. Mechanical removal of this encroached vegetation would not be effective and the vegetation would quickly return. Consequently, CRMF or other enhancement measures have not been recommended. As high flows are not proposed to change, the Proposed Action is likely to have little impact on the condition of the riparian resources.

## **5.0.7 AESTHETIC RESOURCES**

Project features (lakes and forebays) and facilities (powerhouses, penstocks, flowlines, and transmission lines) that are visible to the public and that are located on federal lands may be considered potential impacts to visual quality due to their inconsistency with the USDA-FS designated Visual Quality Objectives (VQO). Project reservoir shorelines at Mammoth Pool Reservoir, Huntington Lake, and Florence Lake that are visible during periods of low water surface elevations were found to be inconsistent with designated VQO's. Under the Proposed Action, SCE would make a good-faith effort to maintain reservoir water surface elevations relatively constant during the recreation season when visitation is at its peak.

Five Project facilities were found to be inconsistent with designated VQOs. These five facilities include: (1) the Mammoth Pool Powerhouse Penstock, associated with the Mammoth Pool Project (FERC Project No. 2085); (2) the Big Creek No. 1 Penstocks, associated with the Big Creek Nos. 1 and 2 Project (FERC Project No. 2175); (3) the Big Creek No. 1 Switchyard, associated with the Big Creek Nos. 1 and 2 Project (FERC Project No. 2175); (4) the Mono-Bear Siphon, associated with the Big Creek Nos. 2A, 8 and Eastwood Project (FERC Project No 67); and (5) the Big Creek No. 3 Penstocks, associated with the, Big Creek No. 3 Project (FERC Project No. 120). Under the Proposed Action, when SCE repaints these penstock facilities and flow line conduit, it will use a color selected in consultation with the USDA-FS to better blend with the surrounding landscape, as long as that color retains the historic character of these contributing elements of the Big Creek Hydroelectric System Historic District (BCHSHD). Under the Proposed Action, SCE will implement silvicultural practices to increase the size, vigor, and canopy closure of vegetation along a segment of Huntington Lake Road to screen the Big Creek No. 1 Switchyard from distant public view.

### **5.0.8 CULTURAL RESOURCES**

The relicensing of the four Big Creek ALP Projects has resulted in the identification of a number of issues related to cultural resource management associated with the Projects. Under the Proposed Action, environmental measures proposed in the Historic Properties Management Plan (HPMP) describe how these issues will be resolved and result in a benefit to cultural resources (SCE 2005; Volume 4, SD-I (Book 27)).

Cultural resources associated with the projects include:

- Prehistoric and historic archaeological sites;
- A proposed Chawanakee Flats archaeological district;
- Historic buildings and structures associated with the Big Creek Hydroelectric System Historic District;
- Other buildings and structures that are more than 50 years old (e.g., Kaiser Pass cabin, Kaiser Pass road, non-contributing elements within the BCHSHD);
- Native American trail segments;
- Native American Mammoth Pool Cultural Use Area (a proposed Traditional Cultural Property);
- Remains of a World War II B-25 bomber;
- A Huntington Lake Recreation Historic District.

The historical significance of cultural resources is evaluated with regard to the eligibility of individual resources for listing in the National Register of Historic Places (NRHP). Resources already listed in or eligible for NRHP listing are managed per the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR 800 by the lead federal agency responsible for the proposed action; in this case, the FERC. Resources that do not meet the NRHP significance criteria may not require management by the FERC. However, under the Proposed Action, certain measures will be employed to protect even resources that are not NRHP eligible.

A primary issue is that operation and maintenance activities of the Proposed Action that affect cultural resources be identified and managed consistent with NHPA. Cultural resources may be affected due to activities associated with: (1) annual filling and drawdown of reservoir pools; (2) maintenance of Project access roads; (3) use, development, renovation and maintenance of recreation facilities; (4) maintenance of Project powerlines and SCE facilities; and (5) vandalism. In addition to recognizing these issues, Native Americans and other stakeholders have expressed concern that:

- Certain species of plants of traditional value to them could be affected by SCE's use of herbicides or by roads and vegetation maintenance activities;
- Trained Native Americans monitor archaeological activities associated with the proposed action;
- Native Americans be allowed access to SCE lands for the purpose of collecting plants of traditional value;
- Public education and interpretation regarding cultural resources and local Native American culture be provided.

Stakeholders have identified these additional issues:

- Provide a means for stakeholders to remain engaged in the process of managing cultural resources after FERC issues the new Project licenses;
- Periodic revision of the HPMP, as necessary;
- Periodic training for SCE employees in the preservation of cultural resources and appreciation of Native American cultures in the Big Creek area;
- Preparation of a plan to address the management of unanticipated discoveries of archaeological and human remains;
- Nomination of the BCHSHD to the National Register;
- Evaluation of the historical significance of any unevaluated cultural resources in the Area of Potential Effect;

- Preparation of a Maintenance and Repair Plan for historic buildings and structures associated with the BCHSHD;
- Identification of needed archaeological data recovery at certain sites affected by SCE operation and maintenance activities;
- Monitoring of certain archaeological sites to assess the effects of vandalism and to determine what preservation methods should be applied to those sites;
- Protection and management of cultural resources that are not determined historically significant according to NRHP criteria.

A draft HPMP has been prepared in cooperation with stakeholders of the Big Creek Collaborative that identifies the relevant issues, explicates the nexus between the Projects and each resource issue, and provides an explicit management program to address and resolve the issues identified above, consistent with the NHPA.

The HPMP provides for a Big Creek Heritage Advisory Committee that will meet periodically to assess the success of the management prescriptions in the HPMP, and to assess whether there is a need to revise the HPMP. The Committee will also assess SCE's progress towards resolving the issues identified by stakeholders.

The HPMP also defines SCE's management responsibilities toward cultural resources that are not NRHP eligible. Although the FERC may not require that SCE manage cultural resources that are not NRHP eligible, SCE has agreed to do so to a limited extent. SCE has stipulated in the HPMP what management will be provided for each resource and has established Standard Operating Procedures for operation and maintenance activities subject to the HPMP.

### **5.0.9 RECREATION RESOURCES**

Potential recreation resource issues associated with operation and maintenance of the four Big Creek ALP Projects include the operation, maintenance and rehabilitation of existing recreational facilities, compliance with current and future Americans with Disabilities Act (ADA) facility design standards, water surface elevations (WSE) within Project reservoirs, flows for whitewater boating in bypassed river reaches, and user conflicts on Project reservoirs. These issues affect the availability and quality of experience of recreation activities throughout the four Big Creek ALP Projects. New measures associated with the Proposed Action protect and enhance recreation at the four Projects by maintaining and rehabilitating recreation facilities, developing new recreation facilities, and expanding recreation opportunities. The implementation of these measures would be consistent with the recreation needs projected over the term of the new license in the four Big Creek ALP Project areas. There will be only minor adverse impacts to recreation associated with temporary campground and access road closures during specific rehabilitation and construction projects, with the implementation of these measures.



## Common Recreation Resource Issues at the Four Big Creek ALP Projects

The majority of Project-related recreation use is supported by developed recreation facilities such as campgrounds, picnic areas, and restrooms. If facilities are not adequately maintained, are in a state of deterioration, or do not provide for those recreationists in need of accessible facilities, a decrease in recreational use and opportunities, and diminishment of the recreation experience will result. Under the Proposed Action, developed recreation facilities associated with the four Big Creek ALP Projects will be rehabilitated and upgraded to meet ADA guidelines during the term of the new FERC license. The implementation of the rehabilitation measures will enhance and protect developed recreation facilities in the vicinity of the Projects.

A need to expand interpretive opportunities in the vicinity of the four Big Creek ALP Projects was identified through consultation with the USDA-FS and stakeholders in the Big Creek Collaborative. Under the Proposed Project, 13 interpretive display exhibits (kiosks) will be designed and installed at various locations to enhance the recreational interpretive experience in the vicinity of the four Big Creek ALP Projects.

Reservoir WSE levels too low to support the function of boat ramps, the lack of WSE information for trip planning purposes, and a fishery that does not support successful angling could result in the loss of opportunity and use, and result in a diminished recreational experience for reservoir recreationalists. Under the Proposed Action, implementation of environmental measures to protect and enhance reservoir recreation opportunities include: (1) a commitment by SCE to make a good faith effort to maintain reservoir WSEs at levels adequate to support recreation; (2) providing reservoir water surface elevation information to the public and annually notifying local organizations of monthly reservoir storage targets; and (3) contributing to fish stocking by equally matching recent levels of CDFG stocking of Project-related reservoirs.

Enhanced streamflow information may result in an increase in potential stream corridor recreational use (e.g., whitewater boating and angling) and an augmented recreational experience. Under the Proposed Action, environmental measures will be implemented to enhance and protect river corridor recreation. These measures include: (1) providing streamflow information and a forecast of the water year type to the public; (2) installing staff gages in select Project bypass reaches and Project reservoirs from which streamflow or reservoir elevation can be determined; and (3) annually meeting with American Whitewater or regional whitewater boating representatives, upon their request, to discuss anticipated water run-off conditions. To protect and enhance angling opportunities on bypassed stream reaches below project reservoirs, SCE will equally match recent CDFG stocking of Project bypassed stream reaches.

Kaiser Pass Road (5S80) and Florence Lake Road (7S01) provide snowmobiling opportunities during the winter recreation season. Disruption of the snowmobile trail due to the need to plow the road for emergency access to Project facilities could result in the loss of recreational use and diminishment of the experience. To protect winter recreation use and opportunities, if SCE needs to obtain vehicular access in the winter, it will plow one lane only on the Eastwood Visitors Center to Badger Flat segment of

road 5S80 and the other lane will be maintained and reserved for winter sports use, maintaining a uniform travel surface.

### Recreation Resource Issues at Individual Big Creek ALP Projects

#### *Mammoth Pool (FERC Project No. 2085)*

The potential to provide additional whitewater boating opportunities through the provision of pre-spill flow releases on the Tied-for-First whitewater boating run downstream of Mammoth Pool Dam was identified through studies and consultation with stakeholders. Under the Proposed Action, pre-spill flow releases of sufficient magnitude and timing to support whitewater boating on the Tied-for-First whitewater boating run in wet and above normal water years will be provided. Implementation of this measure will enhance whitewater recreation by providing additional boating opportunities.

Recreational trails are often oriented toward dispersed recreational use, and not clearly associated with Project facilities or impacts. However, these trails sometimes connect or overlap with certain Project features, such as access roads. Routine recreational trail maintenance activities are required to ensure the functionality of these trails, minimize the need for trail reconstruction activities, and prevent the loss of use and diminishment of the recreational experience by trail users. Under the Proposed Action SCE will maintain a section of the San Joaquin River Trail that is co-aligned with the Mammoth Pool Transmission Line Project Road. SCE will also maintain the two Project road crossings of the trail with a surface material that accommodates multiple use of the San Joaquin River Trail. The implementation of this measure will enhance recreational use of the trail.

#### *Big Creek Nos. 1 and 2 (FERC Project No. 2175)*

The area around Dam 3 at Huntington Lake is a popular location for dispersed day-use recreation activities (angling, picnicking, hiking, and general relaxing); however, the lack of infrastructure (parking, tables, and toilets) has resulted in a need for a more developed facility at this location. Consultation with the USDA-FS and stakeholders has identified a need for handicapped accessible fishing at Huntington Lake. Under the Proposed Action, SCE will develop a day-use facility at the Dam 3 location, and develop a handicapped accessible fishing platform with expanded parking at Huntington Lake. The Dam 3 day-use facility will include a parking area with two designated handicapped parking spots, trail from the parking area, toilet and picnic tables. The handicapped accessible fishing location and expanded parking will be selected, designed and developed in consultation with the USDA-FS to provide accessible fishing opportunities at the lake.

Low WSE during the recreation season at Huntington Lake could result in the loss of water surface area available for use by sailboats, water skiers and anglers. No increased loss of surface area under the Proposed Action should occur. This is identified in the HydroBasin model results, which indicate that there will be a slight shift

in the timing when the reservoir will be filled (Attachment A, HydroBasin Technical Manual in Volume 4 (Book 5)), and when drawdown will begin. However, the shift does not affect the peak recreation season, nor does it reduce lake WSE below the functional range of the boat ramps. However, under the Proposed Action, SCE will: (1) provide daily reservoir elevation information to the public; (2) install a staff gage and post the annual water plan for Huntington Lake at the Forest Service boat ramp; (3) provide notification to local stakeholders if SCE must reduce the reservoir elevation for emergency purposes; and (4) provide an annual report of Huntington Lake water surface elevations.

#### *Big Creek Nos. 2A, 8, and Eastwood (FERC Project No. 67)*

A decrease in recreational opportunities or in the recreation experience will result if developed recreation facilities are not adequately maintained or are in a state of deterioration. Under the Proposed Action, SCE will provide the operational maintenance of Camp Edison facilities on Shaver Lake; Day-Use Area recreational facilities located at Shaver Lake, and the day-use area at Balsam Forebay, while the Sierra National Forest continues to own and operate other developed recreation facilities in the Basin.

A need for a handicapped loading facility at the boat ramp near Florence Lake and for handicapped accessible fishing along the South Fork San Joaquin River near Jackass Meadows was identified through consultation with the Sierra National Forest and the stakeholders as part of the Big Creek ALP. Under the Proposed Action, SCE will develop these handicapped accessible facilities in the vicinity of Florence Lake. The handicapped accessible facilities will be located, designed and developed in consultation with the USDA-FS and will provide an overall enhancement of handicapped accessible facilities in the vicinity of Florence Lake.

There is an interest in increasing the existing whitewater boating recreation opportunities in the Florence Run along the bypassed reach of the South Fork San Joaquin River below Florence Lake. Under the Proposed Action, CRMF releases will be made in the South Fork San Joaquin River below Florence Lake in wet and above normal water years. To the extent it is within SCE's control and consistent with the requirements of the CRMF schedule at Florence Dam, SCE will attempt to provide flows sufficient in timing and magnitude for whitewater boating opportunities during the descending portion of the CRMF release.

#### **5.0.10 LAND MANAGEMENT/SOCIOECONOMICS**

Potential land management and socioeconomic resource issues associated with the operation and maintenance of the four Big Creek ALP Projects include consistency with land management plans, socioeconomic contributions to the local economy, incorporation of all lands needed for the safe and efficient operation of the Projects into the FERC Project boundary, and transportation system management of Project roads.

The four Big Creek ALP Project facilities represent an established land use in the Project vicinities and do not conflict with any other developed or planned use. SCE's hydroelectric facilities present no land use compatibility issues or policy conflicts with county plans in Fresno or Madera counties. The Proposed Action does not propose any changes in the planned land use in the Project vicinities. The mitigation and enhancement measures in the Proposed Action were developed to protect and enhance environmental resources in accordance with the goals and guidelines contained in the Forest Service Land Resource Management Plan and the Sierra Nevada Forest Plan Amendments, and conforms to the guidelines and goals contained in these plans.

Six small diversions (Crater Creek Diversion, Tombstone Creek Diversion, and North and South Slide Creek diversions, Snowslide Creek Domestic Diversion and Pitman Creek Domestic Diversion) will be decommissioned under the Proposed Action. Four of these small diversions are associated with the Big Creek Nos. 2A, 8 and Eastwood Project (FERC Project No. 67). The Crater Creek and Tombstone Creek diversions are located within the John Muir Wilderness Area and the North and South Slide Creek diversions are located adjacent to the wilderness. The Tombstone Creek, North Slide Creek and South Slide Creek diversions have been out of service for the past 20 years. The Crater Creek Diversion is currently in service. The decommissioning of these diversions will benefit wilderness resources by removing non-conforming land uses from the wilderness. The decommissioning provides a benefit to wilderness recreation by enhancing the wilderness recreation experience through the removal of developed facilities that are located in or immediately adjacent to the wilderness area. Aquatic, riparian and geomorphic resources are benefited by restoring natural flow to Crater Creek.

Under the Proposed Action, socioeconomic contributions resulting from the operation and maintenance of the four Big Creek ALP Projects include federal land use fees, state and local property tax payments, SCE employees that are residents in the local communities, and enhanced recreation use on Project reservoirs and nearby campgrounds. Under the Proposed Action, additional socioeconomic contributions to the local economy include staffing by SCE of additional employees and expenses associated with the rehabilitation of developed recreation facilities. SCE employs area residents for operation and maintenance of all the Projects of the Big Creek System. Under the Proposed Action, SCE employment needs for the operation and maintenance will increase by approximately 20 people, thus resulting in an increased economic contribution to the local economy. Rehabilitation of the developed recreation facilities in the vicinity of the Projects will contribute to the local economy by providing continued recreation derived revenue to the SNF and local businesses, as well as some seasonal employment to local residents, and through the lodging and food expenditures of construction crews working in the vicinity.

The Proposed Action includes proposed boundary modifications to encompass all those and only those lands that are needed for the safe and efficient operation of the hydroelectric Projects. The purpose of FERC Project boundary modifications may include protection of environmental resources. Incorporating lands into a Project boundary allows the FERC to condition a license to protect, mitigate, and enhance

environmental resources, while ensuring that protective measures would not be compromised by conflicting management objectives of other landowners.

Project roads must be maintained to provide access for the safe and efficient operation and maintenance of the four Big Creek ALP Projects. However, road maintenance activities may potentially affect environmental resources (e.g., special-status species plants and wildlife, cultural resources, plants of Native American concern, and water quality) or cause the spread of noxious weed populations or the introduction of new weed populations to the watershed. Under the Proposed Action, Project roads will be maintained in accordance with the environmental measures described in the Transportation System Management Plan (TSMP) and the HPMP (SCE 2007b; SCE 2005; Volume 4, SD-G (Books 19 and 24) and SD-I (Book 27)). The TSMP and HPMP outline the responsibilities and procedures for the maintenance of Project roads; address transportation system management issues, and describe measures that SCE will implement to minimize or eliminate potential impacts to the environment that may occur as the result of road maintenance or improvement activities. Implementation of the measures in the TSMP and HPMP will maintain and enhance protection of environmental resources in the vicinity of the Big Creek ALP Projects.

## TABLE



**Table 5.0-1. Proposed Action Benefits and Impacts Summary Table.**

	Stream Bypass Reaches																								Reservoirs and Impoundments																								
	Flow-related habitat - rainbow trout or golden X rainbow trout						Flow-related habitat - brown trout						Flow-related habitat - brook trout				Fish	Flow -related hardhead				Flow - related Sacramento sucker			Flow - related Sacramento Pikeminnow			Non-Fish Species			Stream Temperature																		
	Adult Rearing	Spawning	Fry Rearing	Juvenile Rearing	Passage	Stranding - redds	Stranding - fry	Adult Rearing	Spawning	Fry Rearing	Juvenile Rearing	Passage	Stranding - redds	Stranding - fry	Fish Rearing	Passage	Stranding - redds	Stranding - fry	Overwinter Habitat	Adult Rearing	Juvenile Rearing	Passage	Stranding - fry	Adult Rearing	Juvenile Rearing	Stranding - fry	Adult Rearing	Juvenile Rearing	Stranding - fry	Macroinvertebrates	Amphibians	Reptiles	Sediment Condition	Fish Monitoring	Tissue Monitoring	Trout Stream Temperature - Growth (Daily Mean 20°C)	Trout Stream Temperature - Stress (Daily Max 22°C)	Hardhead Stream Temperature	Temperature Monitoring	Real-time Telemetry	Water Temperature	Early Depletion of Cool Water Pool	Physical Habitat	Entrainment	Reservoir Fisheries	Temperature Monitoring			
Big Creek - Dam 5 to Powerhouse 8	B	B	N	B	N	N	N	B	B	N	B	B	N	N	-	-	-	-	B	-	-	-	-	-	-	-	-	-	-	-	B			B	B		B	B		B	B		B						
Stevenson Creek	B	B	N	B	B	N	N	-	-	-	-	-	-	-	-	-	-	-	B	-	-	-	-	-	-	-	-	-	-	-	B			B	B		N	N		-	-		-						
<b>Big Creek No. 3 (FERC Project No. 120)</b>																																																	
Big Creek Powerhouse 3 Forebay (Dam 6)																																		B										N			N	N	
San Joaquin River - Dam 6 to Redinger Lake (Stevenson Reach)	B	B	N	B	B	N	N	B	B	N	B	B	A	N	-	-	-	-	N	B	B	B	N	B	N	N	B	N	N	B			B	B		B	B		B	B	A	B	B						

Key: B = Beneficial Impact; A = Adverse Impact; N = No (or Little) Change (within 10%)

<sup>1</sup>This is an artificial stream created by leakage from tunnel. This leakage must be repaired for safety reasons. This water course will be dewatered as a result.

<sup>2</sup>Diversion will be decommissioned under the Proposed Action

Gray indicates that the impact category does not apply.

- indicates this species was not collected during sampling in this reach.