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3.0 ENVIRONMENTAL EFFECTS ANALYSIS

The environmental effects analysis in this Supplemental Filing is based on the following information:

- Placer County Water Agency's (PCWA) Pre-Application Document (PAD) (PCWA 2007);
- PCWA's Application for New License (PCWA 2011a);
- PCWA's Response to the Commission's Memo Requesting Additional Information (May 2011) (PCWA 2011b);
- PCWA's Response to the Commission's Memo Requesting Additional Generation Information (June 2011) (PCWA 2011c);
- United States Department of Agriculture-Forest Service (USDA-FS) Preliminary Section 4(e) Conditions (USDA-FS 2011);
- California Department of Fish and Game (CDFG) Section 10(j) Recommendations (CDFG 2011);
- United States Department of the Interior (DOI) Section 10(a) Recommendations (DOI 2011);
- PCWA's Submittal of Alternative Conditions to the USDA-FS (PCWA 2011d); and
- Supplemental Biological and Cultural Resource Studies Completed by PCWA in 2011 (Attachment 2A; Volume 3).

This section is organized as follows:

- 3.1 – Analytical Approach
- 3.2 – Geology and Soils Environmental Effects
- 3.3 – Water Use Environmental Effects
- 3.4 – Water Quality Environmental Effects
- 3.5 – Fish and Aquatic Resources Environmental Effects
- 3.6 – Botanical and Wildlife Resources Environmental Effects
- 3.7 – Geomorphology Environmental Effects
- 3.8 – Riparian Resources Environmental Effects
- 3.9 – Recreation Resources Environmental Effects
- 3.10 – Land Use Environmental Effects
- 3.11 – Aesthetic Resources Environmental Effects
- 3.12 – Cultural Resources Environmental Effects
- 3.13 – Tribal Resources Environmental Effects
- 3.14 – Socioeconomic Conditions Environmental Effects
- 3.15 – Air Quality Environmental Effects

LITERATURE CITED

California Department of Fish and Game (CDFG). 2011. Response to Notice of Ready for Environmental Analysis, Federal Power Act Section 10(j) and 10(a) Recommendations, Middle Fork American River Project (FERC Project No. 2079-069). Filed with FERC August 5, 2011.

Placer County Water Agency (PCWA). 2007. Pre-Application Document (PAD). Filed with FERC December 13, 2007.

_____. 2011a. Application for New License. Filed with FERC February 23, 2011.

_____. 2011b. Middle Fork American River Project (FERC Project No. 2079), Response to the Commission's Memo Requesting Additional Information. Filed with FERC May 13, 2011.

_____. 2011c. Response to the Commission's Request for Additional Generation Information. Filed with FERC June 15, 2011.

_____. 2011d. Placer County Water Agency's Submittal of Alternative Conditions for 16 Preliminary Section 4(e) Conditions Submitted by the United States Forest Service for the Middle Fork American River Project (FERC Project No. 2079-069). Filed with FERC September 6, 2011.

United States Department of Agriculture-Forest Service (USDA-FS). 2011. Preliminary Section 4(e) Terms and Conditions, Middle Fork American River Project, FERC No. 2079. Filed with FERC August 5, 2011.

United States Department of the Interior (DOI). 2011. Middle Fork American River Project, FERC No. 2079-069, Department of the Interior's Response to Commission's June 7, 2011, Notice that Project is Ready for Environmental Analysis. Filed with FERC August 5, 2011.

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3.1 ANALYTICAL APPROACH

The analysis provided in this Supplemental Filing focuses on Alternative 1, which is defined as the Proposed Action included in Placer County Water Agency's (PCWA) Application for New License for the Middle Fork American River Project (MFP or Project) (herein, referred to as the Final License Application [FLA]) (PCWA 2011), with the following modifications:

- Incorporation of updated information associated with construction, operation, and maintenance of four new streamflow gages and associated features (access trails, photovoltaic poles, and cableways) proposed in PCWA's FLA;
- Replacement of the Instream Flow and Reservoir Minimum Pool Measure (IFRM) provided in PCWA's FLA with revised instream flow and reservoir minimum pool conditions provided in the United States Department of Agriculture-Forest Service (USDA-FS) preliminary Section 4(e) conditions (USDA-FS 2011), California Department of Fish and Game (CDFG) Section 10(j) recommendations (CDFG 2011), and United States Department of Interior (DOI) Section 10(a) recommendations (DOI 2011);
- Replacement of the Recreation Plan provided in PCWA's FLA with the Recreation Plan provided in USDA-FS preliminary Section 4(e) conditions and CDFG Section 10(j) recommendations (USDA-FS 2011; CDFG 2011);
- Replacement of the Vegetation and Integrated Pest Management Plan (VIPMP) provided in PCWA's FLA with a revised VIPMP provided in Attachment 1A;
- Replacement of the Transportation System Management Plan (TSMP) provided in PCWA's FLA with a revised TSMP provided in Attachment 1B; and
- Replacement of the Historic Properties Management Plan (HPMP) provided in PCWA's FLA with a revised HPMP provided in Volume 3.

In this analysis, environmental conditions under Alternative 1 are compared to the baseline environmental conditions in the No-Action Alternative. The baseline environmental conditions are those that would exist for each resource area if the MFP were to continue operating under the current Federal Energy Regulatory Commission (FERC) license.

Evaluation of potential environmental effects from implementation of Alternative 1 compared to the No-Action Alternative involved a three step process (Figure 3.1-1). The first step was to identify changes in MFP operations, maintenance activities, Project recreation facilities and features, and Project facilities and features in Alternative 1.

The second step in the evaluation process was to identify the effect of these changes under Alternative 1 on the physical, biological, cultural, and economic environments (resulting conditions). Examples of resulting conditions include modified instream flows and reservoir water surface elevations, changes in habitat/physical environment, loss or disturbance of resources, changes in facility footprint, or increases in Project activities.

The third step was to determine potential effects on individual resources from the resulting conditions. In this analysis, potential short-term and long-term effects on individual resources were identified. Table 3.1-1 identifies these potential effects by resource area. The final effects determination for each resource area considers avoidance, protection, and enhancement measures included in management and monitoring plans and described in construction activities and concept designs (Appendix A).

The following effects determinations are used in the analysis:

- **No Effect** – Changes in the resulting conditions from Alternative 1 will have no effect to a resource. When appropriate, these effects are further defined as:
 - **Protect** – Implementation of measures in Alternative 1 result in additional protection of a resource compared to the No-Action Alternative.
 - **Maintain** – Implementation of Alternative 1 maintains the existing resource condition consistent with the No-Action Alternative.
- **Negligible Effect** – Changes in the resulting conditions from Alternative 1 have a minor effect to a resource that is further reduced through implementation of avoidance and protection (AP) measures or other measures.
- **Adverse Effect** – Changes in the resulting conditions from Alternative 1 have a significant effect to a resource that may be reduced, but not to a negligible level, through implementation of AP measures or other mitigation measures.
- **Beneficial Effect (Enhancement)** – Changes in the resulting conditions from Alternative 1, including implementation of AP measures, improves the resource condition compared to the No-Action Alternative.

The analysis of potential effects to resources from changes in Project operations under Alternative 1 required detailed modeling. The following describes the modeling analytical approach.

Changes in Project operations under Alternative 1 may affect streamflow in the bypass and peaking reaches, water surface elevations in Project reservoirs, current and future consumptive water supply deliveries, and hydroelectric power generation. To analyze these combined effects, PCWA's Middle Fork Project Operations Simulation Model (Model) was used (PCWA 2011, Appendix C1). The Model was developed by PCWA in close coordination with the MFP Model Technical Team Subgroup, which was composed of representatives from the CDFG, the California State Water Resources Control Board (State Water Board), and the USDA-FS. The Model includes a daily time step for analyzing water surface elevations in Project reservoirs, streamflows in the bypass and peaking reaches, and power generation. In addition, the Model includes an hourly time step for the peaking reach to more accurately analyze effects of daily peaking operations.

The Model uses inflow data over a 33-year period from 1975 to 2007, which encompasses the wettest and driest years on record in the Middle Fork American River

Watershed (Watershed). The inflow data were calculated based on historic hydrology records. The Rubicon River Watershed inflow includes flows impaired by the Sacramento Municipal Utility District (SMUD) Upper American River Project (UARP) diversions. The Model accounts for accretion flows along the bypass and peaking reaches allowing for detailed longitudinal comparison of resulting flows. The model run outputs (results) and the historic empirical hydrology were used to compare resource conditions between the No-Action Alternative and the resource agencies preliminary conditions and recommendations.

The hydrology used to represent the No-Action Alternative in almost all the effects analyses was the historical impaired hydrology in the bypass and peaking reaches and reservoirs (1975 to 2007). This is referred to as the No-Action Alternative or the No-Action Alternative – Impaired Hydrology. The No-Action Alternative includes continued operations of the MFP with the existing Project facilities; existing FERC license conditions, operating agreements, and water rights; and current consumptive water demand (42,000 acre-feet [ac-ft]).

Historic MFP operations, however, have changed over time (1975 to 2007) based on changes in consumptive water demand, power demands, facility upgrades, and routine maintenance activities. Therefore, in some locations the historical empirical hydrology does not accurately represent current operations of the MFP under the current license conditions. For example: (1) historic reservoir elevations were the result of much lower water demand than exists currently; and (2) historic diversions in the small streams were reduced due to debris build-up at the intakes or to prevent turbine damage from rocks during high-flow events. Planned screen/intake modifications will alleviate the small diversion issues in the future under the No-Action Alternative allowing unimpeded (full) diversion up to the existing water rights and FERC license conditions.

An additional model run was developed to more accurately reflect current and future operations of the MFP under the No-Action Alternative (existing FERC license conditions) in Hell Hole and French Meadows reservoirs (water surface elevations) and in the bypass reaches downstream of the small diversion dams. This model run is referred to as the No-Action Alternative – Existing License Conditions (ELC). The model run included unimpeded diversion rates at the small diversion and uses modeling parameters in the reservoirs that approximate current operations (e.g., total reservoir carryover target of 142,000 ac-ft on December 31, approximate water balancing between reservoirs, 30-day annual maintenance outage period in October).

The hydrology used to represent the future operations of the MFP under the resource agencies preliminary conditions and recommendations in almost all the effects analyses includes an operations model run of the MFP with modified/new Project facilities; new instream flow and reservoir minimum pool conditions; existing operating agreements and contracts; an additional water right (i.e., Hell Hole Reservoir Seasonal Storage Increase Improvement requires a new non-consumptive water right); and existing consumptive water demand (42,000 ac-ft/year). This model run is referred to as Alternative 1 – Existing Demand.

A second model run of the future operations of the MFP under the resource agencies preliminary conditions and recommendations was also developed that incorporates operations of the MFP with future consumptive water demand under full build-out (120,000 ac-ft/year). This model run is referred to as Alternative 1 – Future Demand. The two model runs are very similar (almost indistinguishable) in terms of instream flows in the different water years in the bypass reaches. The primary difference of consequence between these model runs is water surface elevations in Hell Hole and French Meadows reservoirs in some water years. In the Alternative 1 – Future Demand run, reservoir water levels are lower due to increased water deliveries compared to the Alternative 1 – Existing Demand. In the effects analysis, reservoir elevations at Hell Hole and French Meadows reservoirs under the No-Action Alternative – Existing License Conditions are compared to Alternative 1 – Future Demand.

LITERATURE CITED

California Department of Fish and Game (CDFG). 2011. Response to Notice of Ready for Environmental Analysis, Federal Power Act Section 10(j) and 10(a) Recommendations, Middle Fork American River Project (FERC Project No. 2079-069). Filed with FERC August 5, 2011.

Placer County Water Agency (PCWA). 2011. Application for New License. Filed with FERC February 23, 2011.

United States Department of Agriculture-Forest Service (USDA-FS). 2011. Preliminary Section 4(e) Terms and Conditions, Middle Fork American River Project, FERC No. 2079. Filed with FERC August 5, 2011.

United States Department of the Interior (DOI). 2011. Middle Fork American River Project, FERC No. 2079-069, Department of the Interior's Response to Commission's June 7, 2011, Notice that Project is Ready for Environmental Analysis. Filed with FERC August 5, 2011.

TABLES

Table 3.1-1. Potential Effects on Resources from Implementation of Alternative 1.

Alternative 1	Potential Resulting Condition	Resources Potentially Affected													
		Geology and Soils	Water Use	Water Quality	Fish and Aquatic Resources	Botanical and Wildlife Resources	Riparian Resources	Geomorphology	Recreation Resources	Land Use	Aesthetic Resources	Socioeconomics Conditions	Air Quality	Cultural Resources	Tribal Resources
Project Operations (long-term)	Change in flows in bypass and peaking reaches		X	X	X	X	X	X	X						
	Modified reservoir water surface elevations		X	X	X	X	X	X	X		X			X	
	Modified diversion pools		X	X	X	X	X	X	X						
	Modified habitat/physical environment			X	X	X	X	X	X		X			X	
	Change in generation		X									X	X		
Project Facility Maintenance (long-term)	Modified habitat/physical environment	X		X	X	X	X	X	X		X			X	
	Direct loss or disturbance of resource				X	X	X		X					X	X
	Change in level or location of maintenance	X		X	X	X	X		X	X	X	X			
Project Recreation Facilities and Features Maintenance (routine and heavy maintenance) (short-term or long-term)	Modified habitat/physical environment	X		X		X	X	X	X		X			X	
	Direct loss or disturbance of resource					X	X		X					X	
	Change in facility footprint and/or FERC Project boundary	X				X	X	X	X	X	X				
	Change in designed use								X						
	Increase in Project activities					X			X			X	X		
Project Facilities and Project Recreation Facilities and Features (modified or new) (short-term or long-term)	Modified habitat/physical environment	X		X	X	X	X	X	X		X			X	
	Direct loss or disturbance of resource				X	X	X		X					X	
	Change in facility footprint and/or FERC Project boundary	X		X	X	X	X	X	X	X	X				
	Increase in Project activities			X		X			X			X	X		

FIGURES

Figure 3.1-1. Potential Effects on Resources from Implementation of Alternative 1.

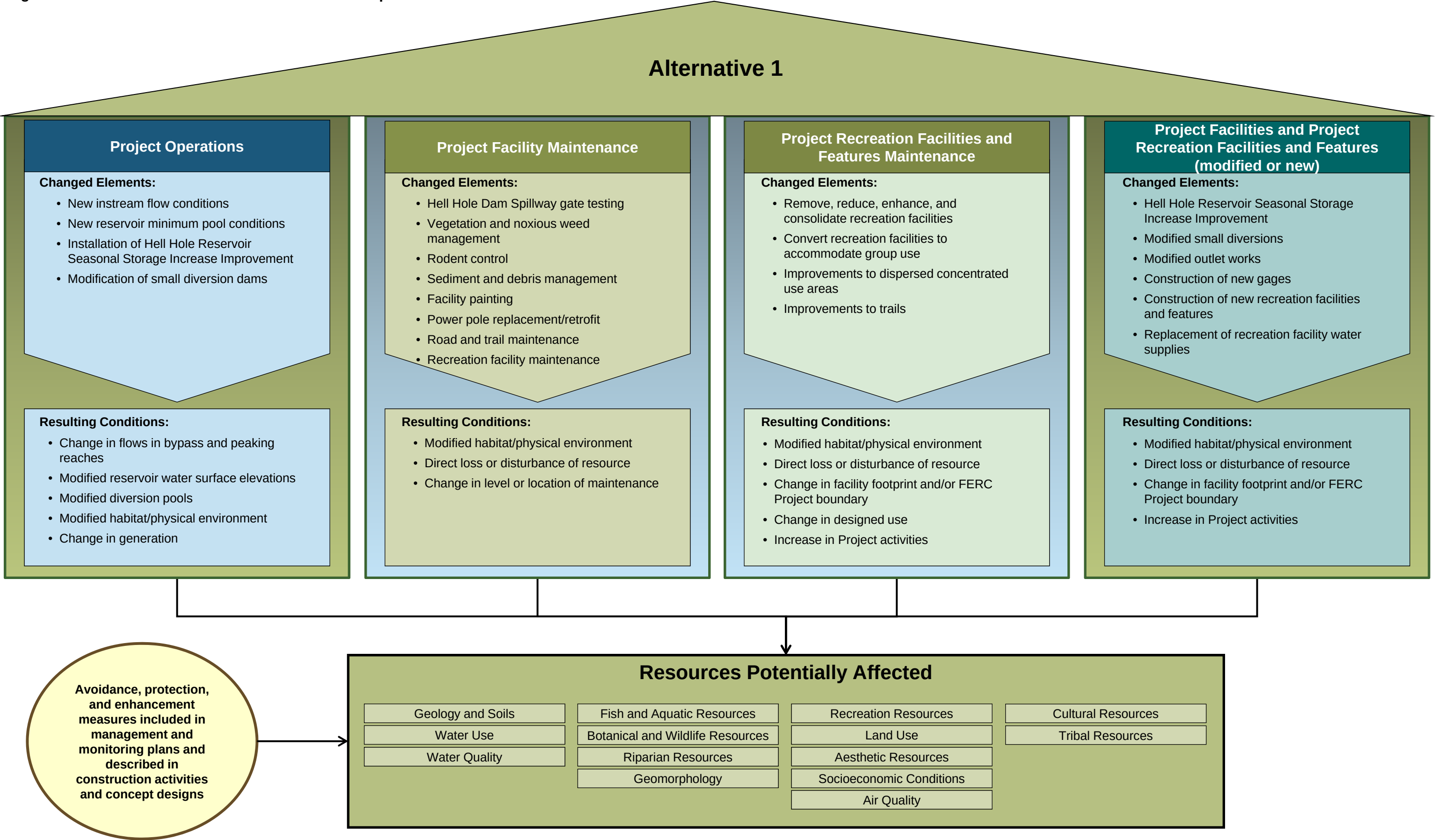


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3.2 GEOLOGY AND SOILS ENVIRONMENTAL EFFECTS

This section describes potential impacts to geology and soils under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facilities Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to geology and soils have been identified based on changes in maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing Project recreation facilities; maintenance activities at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section. Specifically, impacts to geology and soils include the following:

- Potential impacts to local topography from ground disturbance associated with development of augmentation areas and construction activities associated with modification of existing Project facilities and development of new Project facilities and Project recreation facilities and features.
- Potential soil erosion and contamination from implementation of vegetation and noxious weed management (herbicide, surfactant, and fungicide use) and fuels or other toxic material utilized during maintenance activities or construction activities.

Potential impacts to sediment capture at Project diversions; sediment transport in bypass and peaking reaches; and reservoir shoreline and stream bank erosion are discussed in Section 3.7 – Geomorphology Environmental Effects.

A description of potential impacts to geology and soils resulting from implementation of Alternative 1, considering AP measures and enhancement measures, is provided below. There are no unavoidable adverse effects to geology and soils resulting from implementation of Alternative 1 as discussed at the end of this section.

3.2.1 Soil Erosion

Under Alternative 1, implementation of changes in maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features could increase soil erosion. In addition, grading, vegetation removal, and other ground-disturbing activities could increase the susceptibility of soils to water and wind erosion. AP measures incorporated into the Recreation Plan (USDA-FS 2011; CDFG 2011) and Appendix A – Modified or New

Facilities Construction Activities and Concept Designs will be implemented to protect soil resources. These measures include:

Recreation Plan

- Restricting activities to minimize erosion by conducting operations during periods of minimal runoff; and
- Implementation of measures to minimize erosion and sedimentation from disturbed ground on incomplete projects.

Appendix A – Modified or New Facilities Construction Activities and Concept Designs

- Development of an erosion control plan prior to construction activities;
- Establishment of preventative measures to divert surface runoff around bare areas;
- Construction of drainage facilities to control erosion and/or sedimentation during earthwork;
- Implementation of measures to prevent or minimize erosion, including vegetative and/or mechanical measures to improve surface soil stability; and
- Revegetation of unstable or disturbed soil surfaces as soon as possible to minimize erosion potential.

Implementation of the AP measures listed above will protect soil resources and prevent soil erosion over the term of the new license. Therefore, potential soil erosion-related impacts associated with Alternative 1 are considered negligible.

3.2.2 Local Topography

Under Alternative 1, the development and use of new sediment augmentation areas could impact local topography. These new augmentation areas include: Middle Fork Interbay Augmentation Areas (two areas, each approximately 0.11 acre) and Junction Bar Augmentation Area (approximately 1.77 acres) (PCWA 2011). While sediment augmentation will change local topography, this activity will allow for increased natural delivery and transport of sediment and enhance aquatic and riparian habitat downstream of MFP diversions; therefore, impacts are considered negligible.

In addition, grading, vegetation removal, and other ground-disturbing activities associated with maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features could result in minor changes in local topography. While these activities have the potential to change local topography, they also allow for enhanced recreation opportunities and experience in the vicinity of the MFP. In addition, specific modifications are intended to improve Project capabilities and reliability, and protect, enhance or manage biological, recreational, and cultural resources; therefore impacts are considered negligible.

3.2.3 Soil Contamination

Under Alternative 1, the use of herbicides, surfactants, and fungicides as part of routine vegetation and noxious weed management could potentially impact soils as a result of an accidental spill of pesticides, fuels, or other toxic material utilized during vegetation/noxious weed management and other maintenance activities. The revised Vegetation and Integrated Pest Management Plan (VIPMP) (Attachment 1A) includes AP measures to protect soils during vegetation and noxious weed management activities. These measures include:

- Application and handling of pesticides and surfactants consistent with labeling and with applicable laws and regulations governing their use;
- Limiting pesticide use to days when precipitation and wind conditions are within appropriate parameters; and
- Establishing contingency plans in the event of hazardous spills.

Implementation of these AP measures will protect soil resources over the term of the new license. Therefore, potential soil contamination-related impacts associated with routine vegetation and noxious weed management under Alternative 1 are considered negligible.

In addition, implementation of changes in maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features could potentially impact soils as a result of an accidental spill of fuels or other toxic materials used for maintaining and operating heavy equipment. AP measures incorporated in the Recreation Plan and Appendix A – Modified or New Facilities Construction Activities and Concept Designs will be implemented to protect soil resources. These measures include:

- Establishment of contingency plans prior to project activities addressing potential hazardous spills;
- Establishing designated equipment refueling and maintenance areas;
- Required cleaning and inspection of equipment prior to entering the National Forest to ensure it is in proper functioning condition; and
- Required compliance with all applicable local, state, and federal standards associated with handling and disposal of hazardous materials.

Implementation of these AP measures will protect soil resources over the term of the new license. Therefore, potential soil contamination-related impacts associated with implementation of Alternative 1 are considered negligible.

3.2.4 Unavoidable Adverse Effects

There are no unavoidable adverse effects to geology and soils under Alternative 1.

LITERATURE CITED

California Department of Fish and Game (CDFG). 2011. Response to Notice of Ready for Environmental Analysis, Federal Power Act Section 10(j) and 10(a) Recommendations, Middle Fork American River Project (FERC Project No. 2079-069). Filed with FERC August 5, 2011.

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Figure 3.3-3.	Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Reservoirs.
Figure 3.3-4.	Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Powerhouses.

3.3 WATER USE ENVIRONMENTAL EFFECTS

This section describes potential impacts to water use under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facility Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to water use have been identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance at existing Project recreation facilities; maintenance at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section. Specifically, impacts to water use under Alternative 1 are evaluated relative to changes in MFP operations affecting:

- Hydrology in bypass and peaking reaches and reservoirs;
- Beneficial uses and existing water rights;
- Existing operating agreements and contracts;
- Consumptive water deliveries (existing or future) and power generation; and
- Stream and reservoir gaging stations.

A description of potential impacts to water use resulting from implementation of Alternative 1 is provided below. There are no unavoidable adverse effects to water use resulting from implementation of Alternative 1, as discussed at the end of this section.

3.3.1 Hydrology

Alternative 1 results in modifications to Project operations associated with the new instream flow measures, new reservoir minimum pool requirements, Hell Hole Reservoir Seasonal Storage Increase Improvement, and small diversion dam modifications (Section 2.0 – Elements Analyzed). In general, Alternative 1 provides higher instream flows compared to the No-Action Alternative (refer to resource agencies instream flow and reservoir minimum pool conditions [USDA-FS 2011; CDFG 2011; DOI 2011]). Reservoir elevations are similar under both alternatives. Flows through the powerhouses are slightly lower (average annual generation loss of 5.12%) from implementation of the new instream flow conditions (Section 4.0 – Cumulative Effects Analysis and Section 5.0 – Economic Analysis). The potential effects of changes in

MFP operations on hydrology in the bypass and peaking reaches and reservoir storage are described in the following sections.

3.3.1.1 Bypass and Peaking Reaches

Hydrology data under Alternative 1 and the No-Action Alternative are summarized in Tables 3.3-1a–b, including the average, minimum, and maximum flow and 20%, 50%, and 80% exceedance flows by month from 1975–2007 for selected locations in the bypass and peaking reaches. Monthly exceedance plots (20%, 50%, and 80%) for each of these locations are provided in Figures 3.3-1 and 3.3-2. Comparisons of these flow statistics under Alternative 1 and the No-Action Alternative are provided in Tables 3.3-2a–b (Section 3.1 – Analytical Approach). A summary of the effects of Alternative 1 on hydrology (50% exceedance flow) in the bypass and peaking reaches is summarized below.

- Large Bypass Reaches
 - In the Rubicon River, the 50% exceedance flow under Alternative 1 is equal to or higher than the No-Action Alternative throughout the year at all locations. The largest differences in the 50% exceedance flow occur: (1) immediately downstream of Hell Hole Dam during December through June (Alternative 1 50% exceedance flow is 47 to 193% higher) and (2) in the lower reach in May (Alternative 1 50% exceedance flow is 57 to 84% higher) (Table 3.3-2a).
 - In the Middle Fork American River immediately below French Meadows Dam, the 50% exceedance flow under Alternative 1 is higher than under the No-Action Alternative throughout the year (8 to 65% higher) (Table 3.3-2a). At the bottom of the reach (between the confluence of Duncan Creek and Middle Fork Interbay), the 50% exceedance flow under Alternative 1 is higher than the No-Action Alternative, except during December through April. The flows during this time are slightly higher under the No-Action Alternative (2–15% higher; 0.7–25.5 cubic feet per second [cfs]). The primary reason for these differences in December through April is a modeling artifact. Under the No-Action Alternative, inflow into this reach from Duncan Creek is based on impaired historical hydrology where the Duncan Creek diversions were curtailed periodically due to debris problems at the intake (Section 3.1 – Analytical Approach). Under Alternative 1, inflows from Duncan Creek are based on modeling results where the Duncan Creek Diversion diverts up to the allowable limit in the new instream conditions and existing water rights conditions (100% diversion efficiency).
 - In the Middle Fork American River below Middle Fork Interbay, the 50% exceedance flow under Alternative 1 is equal to or higher than the No-Action Alternative throughout the year at all locations (Table 3.3-2a). Differences between the alternatives are most pronounced in April through June when 50% exceedance flows under Alternative 1 are 32 to 88% higher than the No-Action Alternative.

- **Peaking Reach**
 - In the peaking reach, 50% exceedance flows are similar (within approximately 20%) in all months and locations between Alternative 1 and the No-Action Alternative except for October and November (Table 3.3-2a). Under Alternative 1, the 50% exceedance flows at all locations are lower in October (11-12%) and higher in November (59–61%) compared to the No-Action Alternative. These differences are primarily due to differences in maintenance outages (length and timing) and differences in power generation (historical generation versus current power generation demand curve) between the modeled Alternative 1 modeling assumptions and historical hydrology in the No-Action Alternative.
- **Small Bypass Reaches**
 - In the small bypass streams, the 50% exceedance flows under Alternative 1 are similar to No-Action Alternative – Existing License Conditions, with the following exception (Table 3.2-2b). In the spring (March–May), the 50% exceedance flows are higher to substantially higher (up to 267% higher) under Alternative 1 in Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek.

3.3.1.2 Reservoirs

Monthly reservoir storage from 1975–2007 under Alternative 1 and No-Action Alternative are summarized in Table 3.3-3, including the average, minimum, and maximum storage and 20%, 50%, and 80% storage exceedance by month from 1975–2007. Monthly exceedance plots (20%, 50%, and 80%) for each reservoir are provided in Figure 3.3-3. Overall, monthly reservoir storage (50% exceedance) in Hell Hole Reservoir under Alternative 1 – Future Demand is slightly higher (1–4% greater) than under the No-Action Alternative – Existing License Conditions, except in November when storage is slightly lower (3% lower) (Table 3.3-4 and Figure 3.3-3). In French Meadows Reservoir, monthly reservoir storage (50% exceedance) is slightly lower (3–17%) under Alternative 1 compared to the No-Action Alternative – Existing License Condition in all months. In both reservoirs, these relatively small differences are a result of new instream flow conditions, new reservoir minimum pool conditions, and increased consumptive demand (including Water Forum Agreement flows), the Hell Hole Reservoir Seasonal Storage Increase Improvement, and modeling assumptions. Alternative 1 – Future Demand is modeled with a slightly different assumed water balance between the two reservoirs due to changes to the minimum pool conditions under Alternative 1 compared to the No-Action Alternative – Existing License Conditions.

3.3.1.3 Powerhouses

Flow data for French Meadows, Middle Fork, Ralston, and Oxbow powerhouses under Alternative 1 and No-Action Alternative are summarized in Table 3.3-5a, including the average, minimum, and maximum flow and 20%, 50%, and 80% exceedance storage by month from 1975–2007. The percent loss in generation under Alternative 1 by

powerhouse and instream flow component (i.e., pulse flow, spill downramp, and recreation flow), during the period of record (1975–2007) is provided in Table 3.3-5b. In addition, the percent generation loss for each powerhouse by instream flow component and by water year type is provided in Table 3.3-5c. Monthly exceedance plots (20%, 50%, and 80%) for each powerhouse are provided in Figure 3.3-4.

Overall, the 50% exceedance flow through the powerhouses under Alternative 1 are slightly lower compared to the No-Action Alternative due to implementation of the new instream flow conditions. Compared to the No-Action Alternative, the timing of generation is shifted under Alternative 1 at French Meadows, Middle Fork, and Ralston powerhouses. Generation is higher in the early winter (November–December) (50% exceedance) and lower in late winter/early spring (February–March). These differences are primarily due to differences in power generation timing between Alternative 1 and the No-Action Alternative. The No-Action Alternative model run has historical generation built in, whereas Alternative 1 model run utilizes an idealized power demand curve based on 2005 data. At Oxbow Powerhouse, the 50% exceedance flows are similar under Alternative 1 and No-Action Alternative, with the exception of November where Alternative 1 is higher and October where Alternative 1 is lower. These differences are mainly due to differences between Alternative 1 and the No-Action Alternative in maintenance outages (historical length/timing versus modeled Alternative 1 length/timing) and changes in power generation (historical generation versus power generation demand curve).

3.3.2 Beneficial Uses and Existing Water Rights

Alternative 1 includes modifications to Project operations that could affect beneficial uses or existing water rights. These potential effects are described below.

3.3.2.1 Beneficial Uses

The MFP is located in the Central Valley Region – Regional Water Quality Control Board. Existing and potential beneficial uses that apply to surface waters within the Middle Fork American River Watershed are identified in *The Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board – Central Valley Region* (RWQCB 2007). Beneficial uses identified in the Basin Plan that pertain to the MFP include: (1) municipal and domestic supply; (2) agricultural supply; (3) hydropower generation; (4) water contact recreation; (5) non-contact water recreation; (6) cold freshwater habitat; (7) warm freshwater habitat; (8) spawning, reproduction, and/or early development habitat for fisheries; and (9) wildlife habitat.

Alternative 1 protects overall beneficial uses in the vicinity of the MFP. Environmental programs, measures, and facilities included under Alternative 1 were specifically developed to protect municipal, domestic, and agricultural water supply and to enhance water contact recreation; non-contact water recreation; cold freshwater fish habitat; spawning, reproduction and/or early development habitat for fisheries; and wildlife habitat (Figure 2-2). Implementation of Alternative 1 results in reduced power

generation (average annual loss of approximately 5.12%). This loss of generation is the result of higher instream releases designed to enhance aquatic, geomorphology, riparian, wildlife, and recreational resources in the vicinity of the MFP. These enhancements provide greater overall benefits to resources and are protective of beneficial uses.

3.3.2.2 Existing Water Rights

Operations of MFP under Alternative 1 are consistent with existing water rights permits and license issued by the State Water Resources Control Board (State Water Board) for the MFP (PCWA 2011a). The Hell Hole Reservoir Seasonal Storage Increase Improvement requires a new water right from the State Water Board to allow for additional storage for power generation (non-consumptive use) at Hell Hole Reservoir. PCWA will file a request for a new water right with the State Water Board for additional water stored and used for generation associated with the Hell Hole Reservoir Seasonal Storage Increase. The Hell Hole Reservoir Seasonal Storage Increase Improvement will not be constructed until the new water right is issued. Therefore, the Proposed Acton is consistent with existing water rights.

3.3.3 Existing Operating Agreements and Contracts

Operating agreements/contracts affecting Project operations (i.e., water supply contracts and the Water Forum Agreement) identified in PCWA's Application for New License (PCWA 2011a) will remain unchanged under Alternative 1. The one exception, unrelated to Alternative 1, is that the existing power purchase contract for the MFP expires on April 30, 2013. PCWA is currently negotiating a new power purchase contract, which will be in place prior to the expiration of the current Pacific Gas & Electric (PG&E) contract. This power purchase contract will be consistent with the new Federal Energy Regulatory Commission (FERC or Commission) license conditions, water rights, and existing operating agreements/contracts and will not result in additional limitations or constraints in Project operations. Therefore, the Proposed Acton does not conflict with any existing operating agreements or contracts.

3.3.4 Consumptive Water Deliveries and Power Generation

Changes in operations resulting from implementation of Alternative 1 have the potential to affect consumptive water deliveries and power generation. The potential effects of each of these are discussed below.

3.3.4.1 Consumptive Water Deliveries

PCWA provides water for consumptive use from the MFP (PCWA 2011b). Current water demand from the MFP is approximately 42,000 acre-feet (ac-ft). However, during the term of the next license, PCWA expects to utilize its full allocation of 120,000 ac-ft of water available annually from the MFP to meet increasing consumptive water demands. Under Alternative 1, operations of the MFP allow delivery of consumptive water (timing and magnitude) consistent with existing and future demand. Therefore, Alternative 1 protects PCWA's current and future consumptive water supply.

3.3.4.2 Power Generation

Under Alternative 1, the Project will produce an annual average of approximately 985,877 megawatt-hours (MWh) of electricity. This represents a 5.12% reduction (53,201 MWh) in Project generation compared to the No-Action Alternative. This loss of generation is the result of higher instream releases designed to enhance environmental resources.

3.3.5 Stream and Reservoir Gaging Stations

Alternative 1 includes 14¹ new flow gages to measure instream flow conditions and/or collect real-time flow data for public dissemination in specified bypass and peaking reaches. These gages will be constructed as part of the modifications of existing Project facilities and construction of new Project facilities. The locations and gages are described in Section 2.0 – Elements Analyzed, Table 2-3, and Appendix A; and the Streamflow and Reservoir Elevation Gaging Plan (PCWA 2011c). These new gages under Alternative 1 increase instream flow monitoring capabilities.

3.3.6 Conclusions – Water Use

Changes in MFP operations under Alternative 1 maintain current and future water use, as follows:

- Maintains MFP hydrology;
- Protects existing beneficial uses and existing water rights;
- Consistent with current operating agreements and contracts;
- Protects PCWA's current and future consumptive water supply;
- Reduces power generation only slightly to provide environmental benefits; and
- Increases instream flow monitoring capabilities.

3.3.7 Unavoidable Adverse Effects

There are no unavoidable adverse effects to water use under Alternative 1.

LITERATURE CITED

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¹ Includes 2 existing gages added to the Middle Fork Project to collect real-time flow data for public dissemination.

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TABLES

Table 3.3-1a. Hydrology Data Summary for Selected Locations in the Large Bypass and Peaking Reaches.

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Large Bypass Streams													
Rubicon River - Below Hell Hole Reservoir (540.832)													
Alternative 1 - Existing Demand	20%	79.0	27.0	27.0	27.0	27.0	57.0	62.0	200.0	200.0	32.0	32.0	32.0
	50%	64.9	22.0	22.0	22.0	22.0	37.0	44.0	44.0	33.0	22.0	22.0	32.0
	80%	38.3	16.0	16.0	16.0	16.0	22.0	37.0	37.0	22.0	22.0	22.0	22.0
	Average	60.8	23.8	43.9	66.3	29.8	47.4	51.0	156.1	125.5	51.1	25.9	30.6
	Max	107.6	107.6	3,624.2	23,316.7	1,196.3	5,438.5	472.3	4,900.1	1,995.0	1,236.2	32.0	197.7
	Min	16.0	16.0	16.0	16.0	16.0	16.0	32.0	24.0	16.0	16.0	16.0	16.0
No-Action Alternative - Impaired Hydrology	20%	30.6	23.0	22.0	17.0	20.0	21.0	21.0	25.0	25.0	23.0	23.0	23.0
	50%	22.0	22.0	15.0	13.0	14.0	15.0	15.0	21.0	22.0	22.0	22.0	22.0
	80%	10.0	14.0	12.0	12.0	12.0	12.0	13.0	14.0	20.0	18.0	11.0	11.0
	Average	23.8	19.6	25.9	65.0	20.9	30.5	20.7	105.0	107.4	43.3	18.6	21.1
	Max	69.0	55.0	4,350.0	17,100.0	1,190.0	6,650.0	557.0	8,720.0	1,950.0	1,350.0	31.0	66.0
	Min	4.3	6.5	5.6	5.9	6.1	5.9	7.7	7.7	0.3	6.5	6.5	5.9
Rubicon River - Below South Fork Rubicon River (834.836)													
Alternative 1 - Existing Demand	20%	100.7	51.9	78.1	147.6	197.0	257.0	253.1	326.2	260.4	82.1	68.7	59.6
	50%	85.2	43.2	50.1	72.5	97.9	154.4	153.7	135.9	91.8	56.7	50.3	52.0
	80%	62.1	35.9	41.3	46.3	56.8	90.3	93.2	77.3	52.7	40.4	39.2	39.2
	Average	83.2	63.5	138.1	211.5	194.5	210.5	192.2	273.2	190.8	87.5	53.0	52.9
	Max	577.8	3,327.5	9,353.1	35,322.5	11,194.5	9,416.4	2,666.3	8,296.4	2,295.1	1,508.8	85.2	219.1
	Min	29.1	25.9	25.5	27.3	27.0	31.8	48.3	41.6	31.3	26.3	24.2	24.2
No-Action Alternative - Impaired Hydrology	20%	52.0	45.0	71.5	147.2	187.8	225.4	203.5	186.9	85.7	55.4	47.2	47.2
	50%	43.7	38.5	41.0	57.5	83.9	120.8	107.0	73.8	58.3	43.2	37.7	39.0
	80%	28.6	31.8	30.7	31.0	42.0	68.1	55.9	46.2	39.1	33.1	28.7	26.9
	Average	43.5	57.7	118.3	206.6	181.8	185.9	150.7	208.8	159.0	68.1	37.1	38.8
	Max	570.8	3,354.5	9,413.1	27,559.9	11,308.5	10,627.9	2,662.3	12,194.1	2,349.8	1,512.7	63.2	188.2
	Min	9.2	10.8	13.0	15.4	15.1	15.2	13.3	14.8	12.2	8.8	8.3	8.3
Rubicon River - Above Ralston Afterbay (842.815+815ACC)													
Alternative 1 - Existing Demand	20%	123.9	100.0	213.9	541.8	771.6	953.8	888.8	875.6	360.1	138.2	100.4	84.4
	50%	101.9	72.0	110.0	204.5	300.6	475.7	452.3	306.7	162.5	93.0	73.0	66.8
	80%	84.6	54.1	72.9	80.4	129.5	233.4	208.9	139.5	77.6	54.1	47.0	47.1
	Average	105.0	117.0	356.6	538.0	667.9	683.1	630.7	559.9	291.9	127.3	74.1	69.7
	Max	993.6	5,073.1	26,067.5	47,438.6	35,186.2	13,301.2	7,974.5	9,561.8	2,710.5	1,732.5	154.2	310.0
	Min	34.3	29.5	32.0	36.9	34.9	47.6	57.0	57.6	36.1	27.2	24.7	24.8
No-Action Alternative - Impaired Hydrology	20%	78.0	93.2	220.1	567.4	777.1	934.1	822.2	716.4	234.1	111.3	78.3	72.2
	50%	65.5	67.1	97.4	193.6	290.0	447.0	392.5	195.0	122.5	75.0	56.0	54.3
	80%	42.0	49.7	58.9	64.9	115.0	204.8	160.0	104.1	65.0	47.0	39.2	37.0
	Average	65.6	115.3	345.3	543.6	669.8	666.0	588.3	489.1	260.5	107.5	58.2	55.6
	Max	1,060.0	5,400.1	26,427.4	40,451.5	35,600.2	14,812.7	8,270.5	13,459.0	3,230.1	1,790.1	131.2	289.0
	Min	11.0	14.0	20.0	25.0	23.0	31.0	22.0	28.3	17.0	9.9	8.9	9.0

Table 3.3-1a. Hydrology Data Summary for Selected Locations in the Large Bypass and Peaking Reaches (continued).

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Large Bypass Streams (continued)													
Middle Fork American River - Below French Meadows Reservoir (530.802)													
Alternative 1 - Existing Demand	20%	16.3	15.0	15.0	15.0	15.0	17.0	22.0	190.0	19.0	15.0	15.0	15.0
	50%	15.0	12.0	12.0	12.0	12.0	13.0	15.0	15.0	14.0	12.0	12.0	13.0
	80%	12.0	9.0	9.0	9.0	9.0	12.0	15.0	15.0	13.0	11.0	11.0	11.0
	Average	14.6	12.3	13.4	18.4	15.4	23.0	17.9	96.2	57.2	20.1	12.6	12.8
	Max	23.7	15.0	359.1	4,585.8	1,249.3	4,429.7	22.0	1,072.5	1,113.1	809.6	15.0	25.4
	Min	9.0	9.0	9.0	9.0	9.0	9.0	12.0	12.0	9.0	9.0	9.0	9.0
No-Action Alternative - Impaired Hydrology	20%	9.9	10.0	11.0	13.0	14.0	15.6	14.0	17.0	12.0	10.0	10.0	9.9
	50%	9.1	9.5	9.8	10.0	10.0	12.0	11.0	9.9	9.7	9.5	9.2	9.3
	80%	7.7	7.7	8.2	8.7	8.6	9.5	9.3	8.5	7.7	7.6	7.7	7.7
	Average	9.1	9.4	11.2	20.2	19.5	23.8	17.7	61.6	36.3	15.1	8.6	9.8
	Max	75.0	71.0	164.0	3,280.0	993.0	2,380.0	531.0	3,430.0	690.0	521.0	11.0	152.0
	Min	2.7	2.8	2.8	4.1	4.4	4.1	3.9	2.7	3.1	2.8	2.7	2.6
Middle Fork American River - Above Middle Fork Interbay (806.810+810ACC)													
Alternative 1 - Existing Demand	20%	28.0	46.0	93.3	181.3	213.8	282.6	265.2	440.5	105.3	48.3	30.0	26.6
	50%	25.0	26.3	41.0	78.0	113.0	165.0	160.6	126.0	56.4	30.9	23.3	21.7
	80%	24.0	20.6	25.9	30.5	49.2	94.7	93.7	60.2	32.6	19.2	16.3	15.4
	Average	26.4	44.2	93.7	142.5	168.5	211.7	191.3	251.9	108.8	43.5	24.0	22.1
	Max	404.0	754.0	2,459.0	6,875.3	4,394.0	5,879.7	946.0	1,461.8	1,320.1	863.6	62.2	97.0
	Min	12.4	12.0	15.2	16.9	17.5	22.0	28.7	28.5	16.9	13.0	11.2	11.6
No-Action Alternative - Impaired Hydrology	20%	25.5	45.6	108.8	222.8	260.5	331.2	297.4	342.4	101.7	47.4	27.5	23.0
	50%	19.6	24.1	41.7	91.1	133.5	190.5	172.0	104.0	52.0	29.7	20.7	19.3
	80%	15.1	18.6	24.3	28.2	51.6	105.9	93.3	53.7	30.4	19.2	14.9	13.6
	Average	23.1	49.2	110.3	175.3	208.9	246.7	215.5	216.8	98.3	40.2	21.7	20.1
	Max	604.6	1,071.1	2,985.4	7,801.0	5,238.7	3,231.7	1,169.0	3,604.5	953.9	575.7	53.8	117.7
	Min	7.6	8.6	13.1	10.0	15.5	18.8	18.5	18.7	12.3	7.5	6.1	5.8
Middle Fork American River - Below Middle Fork Interbay (810.812)													
Alternative 1 - Existing Demand	20%	27.2	25.0	25.0	25.0	25.0	159.5	65.0	373.2	78.7	34.0	34.0	34.0
	50%	25.0	24.0	24.0	25.0	25.0	25.0	40.0	40.0	45.0	24.0	24.0	24.0
	80%	24.0	12.0	12.0	12.0	24.0	24.0	27.0	27.0	24.0	18.0	18.0	18.0
	Average	25.6	22.4	48.1	84.1	82.1	114.5	94.9	196.6	90.4	36.3	25.1	25.1
	Max	179.0	438.5	2,816.9	7,795.3	4,773.2	5,895.7	1,077.0	1,706.1	1,336.1	859.6	58.2	70.6
	Min	12.0	12.0	12.0	12.0	12.0	12.0	18.0	18.0	12.0	12.0	12.0	12.0
No-Action Alternative - Impaired Hydrology	20%	24.0	24.0	25.0	26.8	34.9	124.7	136.4	94.8	64.1	24.0	24.0	24.0
	50%	20.0	23.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	23.0	20.0
	80%	15.0	18.0	19.0	19.0	23.0	23.0	23.0	23.0	21.0	20.0	15.0	15.0
	Average	20.4	24.5	62.5	92.8	127.8	118.0	98.0	124.8	76.1	30.7	20.4	20.1
	Max	180.2	601.6	2,885.9	7,616.1	4,993.0	3,261.7	1,373.1	3,931.4	881.1	615.2	48.0	119.0
	Min	4.8	6.3	8.5	6.9	11.0	11.0	11.0	7.6	7.8	5.7	5.5	5.5

Table 3.3-1a. Hydrology Data Summary for Selected Locations in the Large Bypass and Peaking Reaches (continued).

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Large Bypass Streams (continued)													
Middle Fork American River - Above Ralston Afterbay (813.845)													
Alternative 1 - Existing Demand	20%	47.1	59.5	106.0	199.6	223.2	287.9	189.4	492.2	130.0	63.3	47.6	45.8
	50%	35.1	38.6	48.3	75.3	110.2	131.5	115.7	109.0	66.3	43.7	35.8	36.7
	80%	25.9	28.8	32.4	37.0	52.4	81.6	62.2	51.1	31.7	27.3	23.7	22.2
	Average	40.6	63.0	122.8	192.8	201.2	228.8	180.8	266.5	123.2	56.7	37.5	36.7
	Max	451.9	1,704.9	4,167.3	9,164.5	6,336.3	5,973.4	1,407.6	2,061.7	1,437.6	879.1	101.8	155.5
	Min	13.9	13.3	15.1	16.9	20.9	25.8	24.1	25.1	13.7	12.0	12.0	12.0
No-Action Alternative - Impaired Hydrology	20%	51.1	61.8	88.4	142.9	203.0	281.5	237.2	177.3	104.8	47.1	38.6	35.5
	50%	35.3	38.1	45.3	51.7	89.8	106.3	87.8	74.2	47.0	37.0	31.3	29.5
	80%	22.7	28.4	36.3	36.7	42.4	68.1	42.3	43.7	33.9	27.0	19.9	18.9
	Average	40.1	59.3	131.2	171.5	242.2	218.1	190.6	185.1	104.8	46.1	30.5	29.2
	Max	375.8	1,764.6	6,253.2	10,952.8	10,409.8	3,521.2	2,656.6	4,144.6	924.9	644.4	72.5	131.5
	Min	8.7	8.7	12.1	13.2	17.7	22.7	12.5	14.5	13.0	6.7	6.2	6.4
Peaking Reach													
Middle Fork American River - Below Ralston Afterbay (855.857)													
Alternative 1 - Existing Demand	20%	200.0	1,121.6	1,288.8	2,146.1	2,334.6	2,899.0	2,521.3	2,785.8	1,564.9	1,095.7	1,041.7	873.2
	50%	165.0	923.7	642.1	708.4	1,087.2	1,634.8	1,415.9	1,407.3	855.3	840.8	776.4	489.6
	80%	140.0	449.1	250.0	233.6	342.8	633.0	523.3	340.9	464.1	518.6	470.9	311.7
	Average	235.4	927.1	1,205.9	1,570.7	1,805.2	1,981.3	1,754.4	1,685.9	1,125.7	870.6	756.4	570.5
	Max	2,179.1	11,819.1	44,719.1	68,681.6	57,794.3	27,595.8	15,998.1	14,743.2	5,014.8	3,821.8	1,270.6	1,642.1
	Min	90.0	90.0	103.9	140.0	100.1	117.3	127.2	128.3	162.3	165.7	129.4	110.7
No-Action Alternative - Impaired Hydrology	20%	742.0	843.2	1,220.0	1,966.0	2,378.0	2,780.0	2,282.0	2,160.0	1,390.0	1,000.0	983.6	830.2
	50%	187.0	572.0	613.0	777.0	1,200.0	1,560.0	1,350.0	1,190.0	798.0	741.0	746.0	600.0
	80%	94.0	187.8	209.0	287.0	450.4	635.4	466.6	324.0	430.6	480.8	487.8	244.4
	Average	389.4	676.9	1,137.9	1,532.3	1,852.7	1,900.6	1,620.7	1,481.1	1,021.3	758.0	711.6	572.2
	Max	2,910.0	15,500.0	35,700.0	64,500.0	46,400.0	23,200.0	19,500.0	23,500.0	4,430.0	3,640.0	1,230.0	1,260.0
	Min	41.0	51.0	54.0	75.0	79.0	79.0	69.0	76.0	50.0	64.0	65.0	65.0
Middle Fork American River - Above Otter Creek (860.863)													
Alternative 1 - Existing Demand	20%	207.0	1,130.6	1,302.5	2,172.4	2,364.3	2,942.3	2,566.1	2,837.0	1,597.7	1,108.4	1,048.0	879.5
	50%	171.7	931.8	653.1	721.8	1,105.2	1,660.6	1,450.9	1,445.5	865.5	850.1	781.9	495.6
	80%	145.3	456.3	259.0	242.1	353.3	648.3	545.8	358.1	472.5	525.9	476.5	317.2
	Average	242.3	938.9	1,226.2	1,596.6	1,835.4	2,014.6	1,788.8	1,723.8	1,147.6	880.6	762.9	576.8
	Max	2,267.6	12,091.4	45,462.1	69,634.0	58,735.1	27,951.7	16,288.6	14,982.0	5,088.0	3,883.2	1,286.3	1,659.5
	Min	95.0	95.2	109.5	145.5	106.5	124.1	135.4	136.7	168.0	170.5	134.2	115.5

Table 3.3-1a. Hydrology Data Summary for Selected Locations in the Large Bypass and Peaking Reaches (continued).

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Peaking Reach (continued)													
Middle Fork American River - Above Otter Creek (860.863)													
No-Action Alternative - Impaired Hydrology	20%	749.5	850.7	1,231.5	1,996.9	2,406.1	2,823.7	2,326.6	2,202.5	1,418.6	1,015.5	990.4	837.6
	50%	194.0	581.0	622.5	790.6	1,215.1	1,589.7	1,380.3	1,218.5	811.7	747.4	752.9	605.6
	80%	100.2	196.0	217.5	295.2	460.9	653.3	490.3	342.8	439.6	486.5	493.5	249.6
	Average	396.4	688.5	1,158.1	1,557.5	1,882.8	1,933.6	1,655.2	1,518.8	1,043.0	767.8	718.1	578.4
	Max	2,996.6	15,794.0	36,242.7	65,335.7	47,434.6	23,560.3	19,822.3	23,741.4	4,503.3	3,697.9	1,245.0	1,270.5
	Min	46.9	56.1	59.6	81.5	84.7	85.9	77.4	84.3	59.7	69.3	70.4	70.6
Middle Fork American River - Above North Fork American River Confluence (866.868)													
Alternative 1 - Existing Demand	20%	217.3	1144.5	1332.8	2207.1	2403.2	3001.1	2628.9	2900.9	1645.3	1126.9	1057.3	888.9
	50%	181.2	940.8	664.9	739.7	1130.6	1698.1	1497.2	1495.3	883.7	864.7	790.3	504.3
	80%	153.2	467.2	270.3	253.4	368.3	670.5	577.2	377.6	484.5	535.1	484.7	325.3
	Average	252.3	955.3	1254.5	1632.0	1877.0	2061.2	1838.0	1779.0	1179.6	895.0	772.5	585.9
	Max	2392.3	12496.1	46560.8	71058.2	60109.9	28490.8	16723.3	15341.9	5195.9	3976.1	1309.4	1685.0
	Min	102.4	102.8	117.8	153.6	115.9	133.9	147.6	149.1	176.6	177.9	141.5	122.8
No-Action Alternative - Impaired Hydrology	20%	758.8	862.5	1247.1	2030.0	2446.8	2879.7	2375.7	2256.6	1464.4	1033.2	999.8	847.5
	50%	202.8	593.3	636.4	811.7	1239.2	1627.3	1430.9	1273.1	836.3	758.8	761.8	614.5
	80%	108.9	208.9	228.8	307.8	475.3	675.1	524.7	370.1	452.2	495.0	502.6	257.5
	Average	406.4	704.9	1186.3	1592.9	1924.4	1980.1	1704.4	1574.0	1075.1	782.2	727.7	587.5
	Max	3121.3	16198.7	37036.2	66484.9	48809.5	24099.4	20257.0	24101.3	4613.1	3785.0	1267.3	1285.4
	Min	55.5	63.7	67.8	89.8	93.2	95.6	90.1	96.7	74.1	77.2	78.4	78.8

Table 3.3-1b. Hydrology Data Summary for Selected Locations in the Small Bypass Reaches.

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Duncan Creek - Top of Reach (804.805)													
Alternative 1 - Existing Demand	20%	2.3	10.0	10.0	10.0	10.0	18.0	26.0	69.6	14.0	7.4	2.0	1.3
	50%	1.0	3.1	6.2	10.0	10.0	13.0	19.0	19.0	11.0	2.6	1.0	0.8
	80%	0.6	1.3	3.7	4.9	5.0	10.0	16.0	16.0	5.0	1.2	0.5	0.5
	Average	1.8	5.4	13.6	14.6	14.9	17.5	21.2	48.0	11.5	5.5	1.6	1.2
	Max	10.0	484.0	1,530.0	2,400.0	1,830.0	1,180.0	251.0	547.0	90.0	26.0	24.0	26.0
	Min	0.1	0.3	0.7	0.8	1.4	3.4	5.5	3.6	1.2	0.1	0.1	0.2
No-Action Alternative - Impaired Hydrology	20%	2.2	7.5	14.0	16.0	16.0	18.0	17.0	20.0	12.0	6.3	1.9	1.3
	50%	1.0	2.6	7.2	11.0	12.0	14.0	13.0	11.0	8.7	2.6	1.0	0.8
	80%	0.6	1.3	3.4	4.6	6.0	11.0	9.3	8.4	4.4	1.2	0.5	0.5
	Average	2.1	8.2	19.7	24.9	25.2	20.0	16.4	29.3	14.6	4.2	1.4	1.1
	Max	196.0	674.0	1,730.0	2,560.0	2,020.0	1,070.0	651.0	834.0	252.0	105.0	9.2	12.0
	Min	0.1	0.3	0.7	0.8	0.9	3.0	4.1	3.4	1.2	0.1	0.1	0.1
No-Action Alternative - Existing License Conditions	20%	2.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	7.4	2.0	1.3
	50%	1.0	3.1	7.9	10.0	10.0	10.0	10.0	10.0	10.0	2.6	1.0	0.8
	80%	0.6	1.3	3.7	4.9	5.4	10.0	10.0	10.0	5.0	1.2	0.5	0.5
	Average	1.8	5.4	13.0	13.6	14.1	11.2	9.7	12.1	8.0	4.0	1.5	1.2
	Max	10.0	484.0	1,530.0	2,400.0	1,830.0	780.0	251.0	547.0	26.0	10.0	10.0	10.0
	Min	0.1	0.3	0.7	0.8	1.4	3.4	5.0	3.6	1.2	0.1	0.1	0.2
Duncan Creek - Bottom of Reach (805.806)													
Alternative 1 - Existing Demand	20%	7.5	19.8	42.2	80.6	94.8	127.8	123.5	155.6	38.3	20.0	8.2	6.0
	50%	4.7	7.8	17.4	34.2	50.4	75.2	75.5	56.7	24.3	9.6	5.1	4.2
	80%	2.9	4.7	8.0	10.2	20.4	42.8	44.6	29.2	11.8	4.9	3.0	2.4
	Average	6.3	17.3	43.5	63.7	76.9	94.3	89.5	96.3	29.5	13.5	6.0	4.8
	Max	180.1	598.4	1,941.0	2,785.2	2,975.1	1,301.1	428.9	885.7	233.6	76.7	34.4	51.1
	Min	0.6	0.9	2.6	3.7	3.7	7.7	10.8	8.0	4.1	1.4	0.4	0.6
No-Action Alternative - Impaired Hydrology	20%	7.2	18.4	44.7	88.9	103.6	127.1	115.6	121.4	37.2	17.9	8.0	6.0
	50%	4.6	7.5	17.0	38.1	53.5	75.9	68.0	41.1	21.8	9.6	5.1	4.2
	80%	2.9	4.7	8.0	10.2	20.7	42.9	38.3	22.0	10.9	4.8	3.0	2.4
	Average	6.6	20.0	49.6	74.0	87.2	96.8	84.7	77.6	32.5	12.2	5.8	4.7
	Max	307.1	788.4	2,141.0	3,185.2	3,165.1	1,191.1	717.4	1,086.7	272.3	117.6	19.2	37.1
	Min	0.6	0.9	2.6	3.6	3.7	7.3	8.1	8.0	4.1	1.4	0.4	0.5
No-Action Alternative - Existing License Conditions	20%	7.5	19.8	42.3	80.9	94.8	120.3	108.3	93.8	33.8	19.2	8.2	6.0
	50%	4.7	7.8	17.7	35.2	50.8	71.7	64.7	38.7	22.0	9.6	5.1	4.2
	80%	2.9	4.7	8.0	10.2	20.7	41.8	36.5	22.2	11.0	4.9	3.0	2.4
	Average	6.3	17.3	42.9	62.7	76.1	88.0	78.0	60.4	25.9	12.0	5.9	4.8
	Max	180.1	598.4	1,941.0	2,785.2	2,975.1	901.1	412.9	885.7	153.6	60.7	21.1	35.3
	Min	0.6	0.9	2.6	3.7	3.7	7.7	8.3	8.0	4.1	1.4	0.4	0.6

Table 3.3-1b. Hydrology Data Summary for Selected Locations in the Small Bypass Reaches (continued).

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
North Fork Long Canyon Creek - Top of Reach (819.825)													
Alternative 1 - Existing Demand	20%	0.5	3.0	3.0	3.0	3.0	8.0	12.0	12.0	6.0	1.4	0.5	0.4
	50%	0.3	0.8	3.0	3.0	3.0	7.0	11.0	10.3	2.3	0.7	0.3	0.3
	80%	0.2	0.4	1.0	1.4	3.0	3.0	8.7	4.1	0.9	0.4	0.2	0.1
	Average	0.4	1.5	5.4	6.3	5.4	7.0	10.6	10.5	3.1	1.1	0.4	0.3
	Max	9.0	84.1	665.5	692.3	472.3	142.8	116.8	112.7	7.0	13.4	2.1	5.2
	Min	0.0	0.1	0.0	0.3	0.3	0.7	0.6	0.9	0.2	0.1	0.0	0.0
No-Action Alternative - Impaired Hydrology	20%	0.5	2.2	5.9	8.5	8.7	10.5	5.6	5.5	3.9	1.4	0.5	0.4
	50%	0.3	0.8	2.4	3.1	3.5	3.5	3.1	3.2	2.1	0.7	0.3	0.3
	80%	0.2	0.4	1.0	1.4	2.0	2.6	2.0	2.0	0.9	0.4	0.2	0.1
	Average	0.5	3.1	8.8	10.6	10.7	9.1	8.7	8.0	3.1	1.1	0.4	0.3
	Max	29.9	184.1	765.5	692.3	572.3	242.8	216.8	212.7	30.8	13.4	2.0	5.2
	Min	0.0	0.1	0.0	0.3	0.3	0.7	0.6	0.9	0.2	0.1	0.0	0.0
No-Action Alternative - Existing License Conditions	20%	0.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	1.4	0.5	0.4
	50%	0.3	0.8	3.0	3.0	3.0	3.0	3.0	3.0	2.3	0.7	0.3	0.3
	80%	0.2	0.4	1.0	1.4	3.0	3.0	3.0	3.0	0.9	0.4	0.2	0.1
	Average	0.4	1.5	4.1	5.0	4.8	3.3	3.2	3.0	2.0	1.0	0.4	0.3
	Max	9.3	84.1	665.5	592.3	472.3	142.8	116.8	112.7	3.0	3.0	2.1	3.0
	Min	0.0	0.1	0.0	0.3	0.3	0.7	0.6	0.9	0.2	0.1	0.0	0.0
South Fork Long Canyon Creek - Top of Reach (822.825)													
Alternative 1 - Existing Demand	20%	0.9	4.9	6.0	6.0	6.0	10.0	15.0	15.0	8.0	2.4	1.0	0.7
	50%	0.6	1.4	3.5	6.0	6.0	10.0	13.0	13.0	5.1	1.2	0.6	0.5
	80%	0.3	0.7	1.7	2.3	3.5	6.0	13.0	9.1	1.9	0.7	0.3	0.2
	Average	0.7	2.5	9.4	11.0	9.3	9.8	13.9	17.6	4.9	2.2	0.7	0.5
	Max	6.5	123.2	1,144.2	1,215.6	805.0	226.4	180.7	179.0	8.0	24.3	6.0	9.1
	Min	0.1	0.1	0.4	0.5	0.6	1.3	1.0	1.5	0.3	0.1	0.0	0.0
No-Action Alternative - Impaired Hydrology	20%	0.9	5.0	8.7	11.2	13.2	13.2	6.7	6.7	5.9	2.4	1.0	0.7
	50%	0.6	1.4	4.9	5.3	6.1	6.3	5.9	5.9	5.0	1.2	0.6	0.5
	80%	0.3	0.7	1.7	2.3	4.1	5.0	5.0	5.0	1.9	0.7	0.3	0.2
	Average	0.9	5.0	14.7	17.2	18.6	15.2	14.9	13.6	5.3	1.9	0.7	0.5
	Max	52.5	323.2	1,344.2	1,215.6	1,005.0	426.4	380.7	373.5	54.1	23.6	5.0	9.1
	Min	0.1	0.1	0.4	0.5	0.6	1.3	1.0	1.5	0.3	0.1	0.0	0.0
No-Action Alternative - Existing License Conditions	20%	0.9	4.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0	2.4	1.0	0.7
	50%	0.6	1.4	4.4	6.0	6.0	6.0	6.0	6.0	5.1	1.2	0.6	0.5
	80%	0.3	0.7	1.7	2.3	3.7	6.0	6.0	6.0	1.9	0.7	0.3	0.2
	Average	0.8	2.5	6.9	8.6	8.5	6.2	6.0	5.8	4.2	1.8	0.7	0.5
	Max	16.4	123.2	1,144.2	1,015.6	805.0	226.4	180.7	173.5	6.0	6.0	6.0	6.0
	Min	0.1	0.1	0.4	0.5	0.6	1.3	1.0	1.5	0.3	0.1	0.0	0.0

Table 3.3-1b. Hydrology Data Summary for Selected Locations in the Small Bypass Reaches (continued).

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long Canyon Creek - Top of Reach (825.828)													
Alternative 1 - Existing Demand	20%	2.3	10.9	24.4	42.4	49.5	62.6	76.5	87.4	18.0	6.3	2.5	1.8
	50%	1.5	3.6	12.7	17.7	19.9	34.3	42.5	34.1	10.3	3.2	1.6	1.2
	80%	0.8	1.8	4.5	6.1	10.5	19.0	26.2	18.7	4.9	1.8	0.8	0.6
	Average	2.1	9.9	35.7	49.5	47.3	53.4	58.2	52.4	13.1	4.9	1.7	1.3
	Max	64.5	549.0	3,231.0	3,193.2	2,340.0	831.6	700.0	681.1	83.0	62.0	7.3	24.0
	Min	0.2	0.5	1.1	1.2	1.6	3.3	2.7	4.0	0.8	0.3	0.1	0.1
No-Action Alternative - Impaired Hydrology	20%	2.3	11.9	31.5	59.3	64.0	78.0	70.0	61.1	15.0	6.3	2.5	1.8
	50%	1.5	3.5	12.4	20.0	23.0	30.0	29.0	19.6	9.3	3.2	1.6	1.2
	80%	0.8	1.8	4.4	6.1	10.0	16.0	14.5	11.0	4.5	1.8	0.8	0.6
	Average	2.3	14.0	44.3	59.9	61.9	60.9	57.3	45.9	13.5	4.6	1.7	1.3
	Max	138.0	849.0	3,531.0	3,193.2	2,640.0	1,120.0	1,000.0	981.1	142.0	62.0	6.9	24.0
	Min	0.2	0.5	1.1	1.2	1.6	3.3	2.7	3.6	0.8	0.3	0.1	0.1
No-Action Alternative - Existing License Conditions	20%	2.3	10.9	24.4	41.2	49.7	56.0	58.8	51.3	14.7	6.3	2.5	1.8
	50%	1.5	3.6	12.9	18.7	20.0	28.5	27.0	19.3	9.0	3.2	1.6	1.2
	80%	0.8	1.8	4.5	6.1	10.6	15.9	14.6	10.9	4.7	1.8	0.8	0.6
	Average	2.1	9.9	31.9	45.7	46.0	46.1	42.9	33.1	11.3	4.5	1.7	1.3
	Max	64.5	549.0	3,231.0	2,893.2	2,340.0	831.6	700.0	681.1	77.0	34.0	7.3	18.7
	Min	0.2	0.5	1.1	1.2	1.6	3.3	2.7	4.0	0.8	0.3	0.1	0.1
Long Canyon Creek - Bottom of Reach (830.842)													
Alternative 1 - Existing Demand	20%	10.3	24.1	65.4	153.2	199.9	249.1	243.3	203.7	58.3	22.4	11.7	8.5
	50%	7.0	11.2	27.3	58.7	78.9	121.2	118.4	71.6	30.1	12.4	6.9	5.3
	80%	3.0	6.9	11.8	15.1	33.2	64.4	58.1	34.4	12.2	5.5	2.6	2.1
	Average	8.2	24.0	92.7	131.1	173.3	178.4	171.2	123.7	41.8	16.2	7.6	5.8
	Max	187.6	951.4	7,247.0	5,002.2	8,672.1	2,471.6	2,057.5	1,738.7	331.9	207.6	26.3	54.1
	Min	0.3	1.3	2.8	3.1	3.6	8.0	4.7	8.8	2.3	0.3	0.1	0.2
No-Action Alternative - Impaired Hydrology	20%	10.3	24.5	71.8	166.9	221.0	262.1	231.9	183.0	57.4	21.6	11.7	8.5
	50%	7.0	11.2	27.6	62.5	81.0	118.6	105.6	58.5	28.4	12.4	6.9	5.3
	80%	3.0	6.9	11.7	15.1	33.3	60.8	44.7	28.8	12.2	5.5	2.6	2.1
	Average	8.4	28.1	101.3	141.6	188.0	185.9	170.3	117.3	42.3	15.9	7.6	5.8
	Max	261.0	1,251.4	7,547.0	5,002.2	8,972.1	2,771.6	2,357.5	2,038.7	386.8	207.6	25.3	54.1
	Min	0.3	1.3	2.8	3.1	3.6	8.0	4.7	6.9	2.3	0.3	0.1	0.2
No-Action Alternative - Existing License Conditions	20%	10.3	24.1	65.7	147.7	200.3	238.5	224.6	167.5	55.6	21.6	11.7	8.5
	50%	7.0	11.2	27.4	59.1	79.4	114.4	102.9	56.6	28.7	12.4	6.9	5.3
	80%	3.0	6.9	11.8	15.1	34.1	60.6	45.4	29.0	12.2	5.5	2.6	2.1
	Average	8.2	24.0	88.9	127.3	172.0	171.1	155.8	104.4	40.1	15.7	7.6	5.8
	Max	187.6	951.4	7,247.0	4,702.2	8,672.1	2,471.6	2,057.5	1,738.7	325.9	185.6	26.3	48.8
	Min	0.3	1.3	2.8	3.1	3.6	8.0	4.7	7.9	2.3	0.3	0.1	0.2

Table 3.3-2a. Hydrology Statistics for Alternative 1 as a Percentage of the No-Action Alternative for Selected Locations in the Large Bypass and Peaking Reaches.

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Large Bypass Streams													
Rubicon River - Below Hell Hole Reservoir (540.832)													
No-Action Alternative - Impaired Hydrology	20%	258%	117%	123%	159%	135%	271%	295%	800%	800%	139%	139%	139%
	50%	295%	100%	147%	169%	157%	247%	293%	210%	150%	100%	100%	145%
	80%	383%	114%	133%	133%	133%	183%	285%	264%	110%	122%	200%	200%
	Average	255%	122%	170%	102%	142%	155%	247%	149%	117%	118%	139%	145%
	Max	156%	196%	83%	136%	101%	82%	85%	56%	102%	92%	103%	300%
	Min	372%	246%	286%	271%	262%	271%	416%	312%	4706%	246%	246%	271%
Rubicon River - Below South Fork Rubicon River (834.836)													
No-Action Alternative - Impaired Hydrology	20%	194%	115%	109%	100%	105%	114%	124%	175%	304%	148%	145%	126%
	50%	195%	112%	122%	126%	117%	128%	144%	184%	158%	131%	133%	133%
	80%	217%	113%	135%	149%	135%	133%	167%	167%	135%	122%	136%	146%
	Average	191%	110%	117%	102%	107%	113%	128%	131%	120%	129%	143%	136%
	Max	101%	99%	99%	128%	99%	89%	100%	68%	98%	100%	135%	116%
	Min	316%	239%	196%	177%	179%	210%	364%	281%	257%	298%	291%	292%
Rubicon River - Above Ralston Afterbay (842.815+815ACC)													
No-Action Alternative - Impaired Hydrology	20%	159%	107%	97%	95%	99%	102%	108%	122%	154%	124%	128%	117%
	50%	156%	107%	113%	106%	104%	106%	115%	157%	133%	124%	130%	123%
	80%	201%	109%	124%	124%	113%	114%	131%	134%	119%	115%	120%	127%
	Average	160%	101%	103%	99%	100%	103%	107%	114%	112%	118%	127%	125%
	Max	94%	94%	99%	117%	99%	90%	96%	71%	84%	97%	118%	107%
	Min	312%	211%	160%	148%	152%	154%	259%	204%	212%	275%	278%	274%
Middle Fork American River - Below French Meadows Reservoir (530.802)													
No-Action Alternative - Impaired Hydrology	20%	164%	150%	136%	115%	107%	109%	157%	1118%	158%	150%	150%	152%
	50%	165%	126%	122%	120%	120%	108%	136%	152%	144%	126%	130%	140%
	80%	156%	117%	110%	103%	105%	126%	161%	176%	169%	145%	143%	143%
	Average	159%	131%	120%	91%	79%	97%	101%	156%	158%	133%	147%	130%
	Max	32%	21%	219%	140%	126%	186%	4%	31%	161%	155%	136%	17%
	Min	333%	321%	321%	220%	205%	220%	308%	444%	290%	321%	333%	346%
Middle Fork American River - Above Middle Fork Interbay (806.810+810ACC)													
No-Action Alternative - Impaired Hydrology	20%	110%	101%	86%	81%	82%	85%	89%	129%	104%	102%	109%	116%
	50%	128%	109%	98%	86%	85%	87%	93%	121%	108%	104%	113%	112%
	80%	159%	111%	107%	108%	95%	89%	100%	112%	107%	100%	109%	113%
	Average	114%	90%	85%	81%	81%	86%	89%	116%	111%	108%	111%	110%
	Max	67%	70%	82%	88%	84%	182%	81%	41%	138%	150%	116%	82%
	Min	164%	140%	116%	169%	113%	117%	155%	152%	138%	172%	182%	201%

Table 3.3-2a. Hydrology Statistics for Alternative 1 as a Percentage of the No-Action Alternative for Selected Locations in the Large Bypass and Peaking Reaches (continued).

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Large Bypass Streams (continued)													
Middle Fork American River - Below Middle Fork Interbay (810.812)													
No-Action Alternative - Impaired Hydrology	20%	113%	104%	100%	93%	72%	128%	48%	394%	123%	142%	142%	142%
	50%	125%	104%	100%	104%	104%	104%	167%	167%	188%	100%	104%	120%
	80%	160%	67%	63%	63%	104%	104%	117%	117%	114%	90%	120%	120%
	Average	125%	91%	77%	91%	64%	97%	97%	158%	119%	118%	123%	125%
	Max	99%	73%	98%	102%	96%	181%	78%	43%	152%	140%	121%	59%
	Min	250%	190%	141%	175%	109%	109%	164%	237%	154%	211%	218%	218%
Middle Fork American River - Above Ralston Afterbay (813.845)													
No-Action Alternative - Impaired Hydrology	20%	92%	96%	120%	140%	110%	102%	80%	278%	124%	134%	124%	129%
	50%	100%	101%	107%	146%	123%	124%	132%	147%	141%	118%	114%	124%
	80%	114%	101%	89%	101%	124%	120%	147%	117%	94%	101%	119%	118%
	Average	101%	106%	94%	112%	83%	105%	95%	144%	118%	123%	123%	125%
	Max	120%	97%	67%	84%	61%	170%	53%	50%	155%	136%	140%	118%
	Min	160%	153%	125%	128%	118%	114%	193%	173%	105%	179%	192%	188%
Peaking Reach													
Middle Fork American River - Below Ralston Afterbay (855.857)													
No-Action Alternative - Impaired Hydrology	20%	27%	133%	106%	109%	98%	104%	110%	129%	113%	110%	106%	105%
	50%	88%	161%	105%	91%	91%	105%	105%	118%	107%	113%	104%	82%
	80%	149%	239%	120%	81%	76%	100%	112%	105%	108%	108%	97%	128%
	Average	60%	137%	106%	103%	97%	104%	108%	114%	110%	115%	106%	100%
	Max	75%	76%	125%	106%	125%	119%	82%	63%	113%	105%	103%	130%
	Min	220%	176%	192%	187%	127%	148%	184%	169%	325%	259%	199%	170%
Middle Fork American River - Above Otter Creek (860.863)													
No-Action Alternative - Impaired Hydrology	20%	28%	133%	106%	109%	98%	104%	110%	129%	113%	109%	106%	105%
	50%	88%	160%	105%	91%	91%	104%	105%	119%	107%	114%	104%	82%
	80%	145%	233%	119%	82%	77%	99%	111%	104%	107%	108%	97%	127%
	Average	61%	136%	106%	103%	97%	104%	108%	113%	110%	115%	106%	100%
	Max	76%	77%	125%	107%	124%	119%	82%	63%	113%	105%	103%	131%
	Min	203%	170%	184%	178%	126%	144%	175%	162%	281%	246%	191%	164%
Middle Fork American River - Above North Fork American River Confluence (866.868)													
No-Action Alternative - Impaired Hydrology	20%	29%	133%	107%	109%	98%	104%	111%	129%	112%	109%	106%	105%
	50%	89%	159%	104%	91%	91%	104%	105%	117%	106%	114%	104%	82%
	80%	141%	224%	118%	82%	78%	99%	110%	102%	107%	108%	96%	126%
	Average	62%	136%	106%	102%	98%	104%	108%	113%	110%	114%	106%	100%
	Max	77%	77%	126%	107%	123%	118%	83%	64%	113%	105%	103%	131%
	Min	185%	161%	174%	171%	124%	140%	164%	154%	238%	230%	180%	156%

Table3.3-2b. Hydrology Statistics for Alternative 1 as a Percentage of the No-Action Alternative for Selected Locations in the Small Bypass Reaches.

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Duncan Creek - Top of Reach (804.805)													
No-Action Alternative - Impaired Hydrology	20%	105%	133%	71%	63%	63%	100%	153%	348%	117%	117%	105%	100%
	50%	102%	119%	86% ¹	91%	83%	93%	146%	173%	126%	100%	102%	103%
	80%	101%	100%	109%	107%	83%	91%	172%	190%	113%	100%	102%	103%
	Average	86%	66%	69%	59%	59%	88%	129%	164%	79%	133%	116%	107%
	Max	5%	72%	88%	94%	91%	110%	39%	66%	36%	25%	261%	217%
	Min	100%	100%	107%	100%	163%	113%	134%	106%	100%	100%	100%	170%
No-Action Alternative - Existing License Conditions	20%	100%	100%	100%	100%	100%	180%	260%	696%	140%	100%	100%	100%
	50%	100%	100%	78% ¹	100%	100%	130%	190%	190%	110%	100%	100%	100%
	80%	100%	100%	100%	100%	93%	100%	160%	160%	100%	100%	100%	100%
	Average	100%	100%	105%	108%	106%	156%	218%	398%	145%	139%	105%	102%
	Max	100%	100%	100%	100%	100%	151%	100%	100%	346%	260%	240%	260%
	Min	100%	100%	100%	100%	100%	100%	110%	100%	100%	100%	100%	100%
Duncan Creek - Bottom of Reach (805.806)													
No-Action Alternative - Impaired Hydrology	20%	103%	108%	94%	91%	92%	101%	107%	128%	103%	112%	102%	100%
	50%	101%	104%	102%	90%	94%	99%	111%	138%	111%	101%	100%	100%
	80%	100%	101%	101%	100%	99%	100%	117%	133%	109%	100%	100%	101%
	Average	96%	86%	88%	86%	88%	97%	106%	124%	91%	111%	104%	102%
	Max	59%	76%	91%	87%	94%	109%	60%	82%	86%	65%	179%	138%
	Min	100%	100%	100%	103%	100%	105%	134%	100%	100%	100%	108%	116%
No-Action Alternative - Existing License Conditions	20%	100%	100%	100%	100%	100%	106%	114%	166%	113%	104%	100%	100%
	50%	100%	99%	98%	97%	99%	105%	117%	146%	111%	100%	100%	100%
	80%	100%	100%	100%	100%	99%	102%	122%	131%	107%	100%	100%	100%
	Average	100%	100%	101%	102%	101%	107%	115%	160%	114%	113%	101%	101%
	Max	100%	100%	100%	100%	100%	144%	104%	100%	152%	126%	163%	145%
	Min	100%	100%	100%	100%	100%	100%	130%	100%	100%	100%	100%	100%
North Fork Long Canyon Creek - Top of Reach (819.825)													
No-Action Alternative - Impaired Hydrology	20%	100%	138%	51%	35%	34%	76%	214%	217%	154%	100%	100%	100%
	50%	100%	100%	125%	97%	87%	200%	355%	319%	105%	100%	100%	100%
	80%	100%	100%	100%	100%	150%	115%	435%	200%	100%	100%	100%	100%
	Average	84%	47%	62%	60%	50%	77%	121%	131%	98%	100%	100%	101%
	Max	30%	46%	87%	100%	83%	59%	54%	53%	23%	100%	105%	100%
	Min	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No-Action Alternative - Existing License Conditions	20%	100%	100%	100%	100%	100%	267%	400%	400%	200%	100%	100%	100%
	50%	100%	100%	100%	100%	100%	233%	367%	343%	100%	100%	100%	100%
	80%	100%	100%	100%	100%	100%	100%	290%	136%	100%	100%	100%	100%
	Average	99%	100%	133%	128%	111%	212%	334%	348%	151%	110%	100%	101%
	Max	97%	100%	100%	117%	100%	100%	100%	100%	233%	448%	100%	173%
	Min	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 3.3-2b. Hydrology Statistics for Alternative 1 as a Percentage of the No-Action Alternative for Selected Locations in the Small Bypass Reaches (continued).

Site and Hydrology Node Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
South Fork Long Canyon Creek - Top of Reach (822.825)													
No-Action Alternative - Impaired Hydrology	20%	100%	98%	69%	54%	45%	76%	224%	224%	136%	100%	100%	100%
	50%	100%	100%	74% ¹	114%	98%	159%	220%	220%	102%	100%	100%	100%
	80%	100%	100%	100%	100%	86%	120%	260%	182%	100%	100%	100%	100%
	Average	82%	50%	64%	64%	50%	65%	93%	129%	93%	116%	100%	100%
	Max	12%	38%	85%	100%	80%	53%	47%	48%	15%	103%	120%	100%
	Min	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
No-Action Alternative - Existing License Conditions	20%	100%	100%	100%	100%	100%	167%	250%	250%	133%	100%	100%	100%
	50%	100%	100%	80% ¹	100%	100%	167%	217%	217%	100%	100%	100%	100%
	80%	100%	100%	100%	100%	94%	100%	217%	152%	100%	100%	100%	100%
	Average	98%	100%	135%	128%	109%	159%	233%	304%	118%	120%	100%	101%
	Max	40%	100%	100%	120%	100%	100%	100%	103%	133%	405%	100%	152%
	Min	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Long Canyon Creek - Top of Reach (825.828)													
No-Action Alternative - Impaired Hydrology	20%	100%	91%	77%	72%	77%	80%	109%	143%	120%	100%	100%	100%
	50%	100%	103%	103%	89%	86%	114%	147%	174%	111%	101%	100%	100%
	80%	100%	100%	102%	100%	105%	119%	180%	170%	108%	100%	100%	100%
	Average	89%	71%	81%	83%	76%	88%	102%	114%	97%	106%	100%	100%
	Max	47%	65%	92%	100%	89%	74%	70%	69%	58%	100%	106%	100%
	Min	100%	100%	100%	100%	100%	100%	100%	112%	100%	100%	100%	100%
No-Action Alternative - Existing License Conditions	20%	100%	100%	100%	103%	100%	112%	130%	170%	122%	100%	100%	100%
	50%	100%	100%	98%	95%	100%	120%	157%	177%	114%	100%	100%	100%
	80%	100%	100%	100%	100%	99%	119%	180%	172%	103%	100%	100%	100%
	Average	99%	100%	112%	108%	103%	116%	136%	158%	116%	110%	100%	101%
	Max	100%	100%	100%	110%	100%	100%	100%	100%	108%	183%	100%	129%
	Min	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Long Canyon Creek - Bottom of Reach (830.842)													
No-Action Alternative - Impaired Hydrology	20%	100%	99%	91%	92%	90%	95%	105%	111%	101%	104%	100%	100%
	50%	100%	100%	99%	94%	97%	102%	112%	122%	106%	100%	100%	100%
	80%	100%	100%	101%	100%	100%	106%	130%	120%	100%	100%	100%	100%
	Average	97%	85%	92%	93%	92%	96%	101%	105%	99%	102%	100%	100%
	Max	72%	76%	96%	100%	97%	89%	87%	85%	86%	100%	104%	100%
	Min	100%	100%	100%	100%	100%	100%	100%	128%	100%	100%	100%	100%
No-Action Alternative - Existing License Conditions	20%	100%	100%	100%	104%	100%	104%	108%	122%	105%	103%	100%	100%
	50%	100%	100%	100%	99%	99%	106%	115%	127%	105%	100%	100%	100%
	80%	100%	100%	100%	100%	97%	106%	128%	119%	100%	100%	100%	100%
	Average	100%	100%	104%	103%	101%	104%	110%	118%	104%	103%	100%	100%
	Max	100%	100%	100%	106%	100%	100%	100%	100%	102%	112%	100%	111%
	Min	100%	100%	100%	100%	100%	100%	100%	112%	100%	100%	100%	100%

¹This difference is due to a change in water year type designation in two years between the No-Action Alternative and Alternative 1. The No-Action Alternative established flows based on two water-year type designations with winter flows based on the April forecast. The Alternative 1 established flows based on five water-year type designations with winter flows based on an end of year forecast (typically in October). Although flows in the Alternative 1 are higher in all water year types, in two years (1988 and 1993), the water year type designation that establishes winter flows changed between the Alternative 1 and No-Action Alternative due to difference in the forecast months. This resulted in higher December flows under the No-Action Alternative.

Table 3.3-3. Hydrology Data Summary for MFP Reservoirs.

Reservoir Analysis	Exceedances and Summary Statistics	Storage (AF) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
French Meadows Reservoir (530)													
Alternative 1 - Future Demand	20%	79,608.0	64,651.0	51,932.2	54,846.0	66,795.0	84,883.0	96,451.8	119,939.6	130,969.6	124,253.0	105,459.8	88,710.0
	50%	73,837.0	58,884.0	47,699.0	45,796.0	47,699.0	57,596.0	74,974.0	100,429.0	120,256.0	113,507.0	95,469.0	82,736.0
	80%	61,500.0	52,142.0	43,324.6	42,610.6	43,948.0	49,555.0	61,311.0	82,736.0	94,306.0	85,810.0	73,158.2	64,073.0
	Average	70,219.5	57,716.2	49,478.1	53,018.3	56,455.7	64,972.3	78,247.4	99,671.3	113,272.7	106,972.3	90,967.2	77,874.9
	Max	93,843.0	91,658.0	111,476.0	111,476.0	111,476.0	111,476.0	121,182.0	134,852.0	134,852.0	134,852.0	127,367.0	106,736.0
	Min	21,809.0	16,690.0	15,872.0	25,936.0	29,726.0	35,622.0	47,199.0	46,042.0	58,515.0	47,532.0	40,400.0	27,833.0
No-Action Alternative - Impaired Hydrology	20%	86,165.2	73,505.6	71,860.0	79,740.8	92,408.0	95,001.8	101,457.6	124,000.0	133,600.0	130,488.4	114,885.2	100,061.4
	50%	75,255.0	62,585.0	57,400.0	59,300.0	61,100.0	67,200.0	83,500.0	103,800.0	124,050.0	119,335.0	105,361.0	89,750.0
	80%	46,140.0	42,579.0	43,293.0	48,888.0	49,572.0	50,404.0	62,559.2	85,060.0	97,651.0	90,940.0	71,940.0	58,420.0
	Average	69,993.6	61,132.1	59,661.6	64,444.6	66,636.4	70,688.7	81,193.9	101,735.7	115,689.5	110,282.0	95,845.9	81,621.1
	Max	100,035.0	99,404.0	112,870.0	122,900.0	116,180.0	121,200.0	127,900.0	136,100.0	137,113.0	136,405.0	131,441.0	112,248.0
	Min	28,500.0	29,200.0	29,800.0	30,400.0	30,900.0	34,000.0	40,323.0	46,520.0	53,654.0	51,784.0	33,900.0	33,100.0
No-Action Alternative - Existing License Conditions	20%	85,324.0	71,790.0	59,905.0	62,885.0	75,223.6	86,831.8	101,027.0	127,095.0	134,150.0	125,682.6	108,468.0	93,265.0
	50%	78,756.0	65,378.5	54,079.0	54,882.0	56,413.0	65,136.0	81,705.0	109,216.0	126,959.0	116,465.0	99,237.0	86,753.5
	80%	66,991.0	57,049.0	48,202.0	47,366.0	48,538.0	56,812.4	68,971.0	88,261.0	107,477.0	97,556.4	82,519.0	71,160.8
	Average	76,234.1	64,423.9	56,684.7	59,911.2	62,913.0	70,901.0	84,323.0	107,259.6	119,160.9	111,145.4	95,614.7	82,885.1
	Max	94,074.0	96,991.0	111,476.0	111,476.0	111,476.0	111,476.0	125,061.0	134,852.0	134,852.0	134,852.0	129,010.0	110,092.0
	Min	41,872.0	41,249.0	40,170.0	37,529.0	37,976.0	38,576.0	50,668.0	55,061.0	62,637.0	54,792.0	48,286.0	44,414.0
Hell Hole Reservoir (540)													
Alternative 1 - Future Demand	20%	132,094.4	127,052.4	111,242.6	115,605.8	126,686.0	161,073.2	171,101.6	200,588.2	207,991.2	193,331.0	165,103.0	137,319.2
	50%	125,038.0	113,854.5	100,088.0	101,035.0	104,095.0	117,142.0	138,729.5	169,405.0	193,873.5	172,991.0	147,561.0	125,903.0
	80%	90,986.4	87,617.0	82,789.8	87,498.0	95,018.0	101,431.0	116,056.0	141,732.8	154,100.6	133,591.4	113,929.2	96,008.6
	Average	113,203.4	107,900.5	101,264.1	107,789.1	111,486.4	124,084.9	141,174.6	167,543.0	180,619.6	163,809.0	139,556.4	116,983.2
	Max	163,687.0	202,734.0	207,590.0	207,590.0	207,590.0	207,590.0	215,178.0	215,178.0	215,178.0	215,178.0	202,240.0	174,009.0
	Min	5,183.0	5,183.0	6,432.0	29,075.0	31,708.0	42,891.0	44,912.0	52,918.0	59,432.0	38,137.0	14,584.0	5,183.0
No-Action Alternative - Impaired Hydrology	20%	138,476.4	135,232.2	129,125.2	128,076.8	140,056.8	165,629.0	172,161.6	198,400.0	205,072.0	196,961.2	173,054.6	148,231.4
	50%	123,100.0	114,100.0	105,700.0	101,787.0	102,050.0	107,512.0	123,050.0	155,300.0	187,151.0	176,057.0	146,100.0	124,520.0
	80%	101,600.0	85,500.0	77,733.6	77,400.0	78,620.0	81,081.8	99,093.4	124,165.8	144,781.6	136,023.2	125,028.0	102,980.0
	Average	117,588.8	110,612.1	105,430.6	108,953.8	110,845.3	117,324.7	132,576.4	158,490.3	174,011.7	164,780.4	144,001.1	123,256.1
	Max	167,400.0	182,702.0	211,050.0	213,100.0	208,845.0	210,700.0	208,845.0	211,100.0	209,348.0	209,000.0	202,018.0	181,825.0
	Min	35,000.0	34,001.0	40,100.0	40,200.0	41,700.0	51,100.0	71,900.0	87,836.0	83,000.0	74,400.0	50,600.0	37,509.0
No-Action Alternative - Existing License Conditions	20%	126,686.0	129,495.0	108,972.0	117,478.0	119,665.0	158,281.8	174,598.8	197,697.0	206,089.0	188,255.4	161,095.0	133,338.0
	50%	119,834.0	116,808.0	98,518.0	98,283.0	102,501.0	112,987.0	134,884.5	166,309.0	192,007.0	173,556.0	146,177.0	125,254.0
	80%	109,461.0	104,535.0	90,332.8	88,790.4	89,213.0	100,561.0	114,841.2	143,542.0	152,007.6	136,484.8	121,596.0	109,950.0
	Average	119,110.1	117,761.7	106,213.5	111,375.2	115,013.7	126,332.0	142,582.0	168,082.0	181,686.4	167,068.4	144,288.7	123,558.8
	Max	156,743.0	194,539.0	207,590.0	207,590.0	207,590.0	207,590.0	207,590.0	207,590.0	207,590.0	207,590.0	199,287.0	170,185.0
	Min	96,490.0	81,997.0	81,047.0	82,878.0	82,510.0	84,798.0	91,108.0	98,440.0	111,013.0	108,160.0	103,496.0	89,515.0

Table 3.3-4. Hydrology Statistics for Alternative 1 as a Percentage of the No-Action Alternative for MFP Reservoirs.

Reservoir Analysis	Exceedances and Summary	Storage (AF) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
French Meadows Reservoir (530)													
No-Action Alternative - Impaired Hydrology	20%	92%	88%	72%	69%	72%	89%	95%	97%	98%	95%	92%	89%
	50%	98%	94%	83%	77%	78%	86%	90%	97%	97%	95%	91%	92%
	80%	133%	122%	100%	87%	89%	98%	98%	97%	97%	94%	102%	110%
	Average	100%	94%	83%	82%	85%	92%	96%	98%	98%	97%	95%	95%
	Max	94%	92%	99%	91%	96%	92%	95%	99%	98%	99%	97%	95%
	Min	77%	57%	53%	85%	96%	105%	117%	99%	109%	92%	119%	84%
No-Action Alternative - Existing License Conditions	20%	93%	90%	87%	87%	89%	98%	95%	94%	98%	99%	97%	95%
	50%	94%	90%	88%	83%	85%	88%	92%	92%	95%	97%	96%	95%
	80%	92%	91%	90%	90%	91%	87%	89%	94%	88%	88%	89%	90%
	Average	92%	90%	87%	88%	90%	92%	93%	93%	95%	96%	95%	94%
	Max	100%	95%	100%	100%	100%	100%	97%	100%	100%	100%	99%	97%
	Min	52%	40%	40%	69%	78%	92%	93%	84%	93%	87%	84%	63%
Hell Hole Reservoir (540)													
No-Action Alternative - Impaired Hydrology	20%	95%	94%	86%	90%	90%	97%	99%	101%	101%	98%	95%	93%
	50%	102%	100%	95%	99%	102%	109%	113%	109%	104%	98%	101%	101%
	80%	90%	102%	107%	113%	121%	125%	117%	114%	106%	98%	91%	93%
	Average	96%	98%	96%	99%	101%	106%	106%	106%	104%	99%	97%	95%
	Max	98%	111%	98%	97%	99%	99%	103%	102%	103%	103%	100%	96%
	Min	15%	15%	16%	72%	76%	84%	62%	60%	72%	51%	29%	14%
No-Action Alternative - Existing License Conditions	20%	104%	98%	102%	98%	106%	102%	98%	101%	101%	103%	102%	103%
	50%	104%	97%	102%	103%	102%	104%	103%	102%	101%	100%	101%	101%
	80%	83%	84%	92%	99%	107%	101%	101%	99%	101%	98%	94%	87%
	Average	95%	92%	95%	97%	97%	98%	99%	100%	99%	98%	97%	95%
	Max	104%	104%	100%	100%	100%	100%	104%	104%	104%	104%	101%	102%
	Min	5%	6%	8%	35%	38%	51%	49%	54%	54%	35%	14%	6%

Table 3.3-5a. Middle Fork Project Hydrology Data Summary for MFP Powerhouses.

Powerhouse Analysis	Exceedances and Summary Statistics	Flow (cfs) 1975 - 2007											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
French Meadows Powerhouse (530.540)													
Alternative 1 - Existing Demand	20%	321.5	368.3	388.1	306.5	240.6	318.4	304.9	399.2	400.0	364.9	320.9	236.0
	50%	183.5	254.4	159.0	67.6	0.0	0.0	35.2	1.5	102.5	249.7	247.7	128.5
	80%	38.5	86.8	6.7	0.0	0.0	0.0	0.0	0.0	0.0	163.8	163.0	58.2
	Average	184.2	230.1	185.6	130.6	86.9	123.2	128.8	139.5	158.8	255.7	240.4	145.3
	Max	400.0	400.0	400.0	400.0	400.0	400.0	390.9	400.0	400.0	400.0	400.0	382.8
	Min	0.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0	16.5
No-Action Alternative - Impaired Hydrology	20%	329.7	299.4	243.8	245.3	328.3	342.3	326.4	328.9	326.4	321.5	322.3	318.1
	50%	220.9	25.3	0.0	0.0	83.7	111.9	0.0	0.0	197.2	229.2	234.7	209.0
	80%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	149.8	174.0	0.0
	Average	190.5	128.1	98.0	92.4	139.7	152.9	123.4	126.4	179.9	222.2	229.8	195.2
	Max	404.3	390.4	377.0	397.7	394.3	398.4	400.8	391.2	389.3	388.3	363.2	364.9
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Fork Powerhouse (823.810)													
Alternative 1 - Existing Demand	20%	0.0	900.1	717.8	678.9	705.8	920.0	763.4	920.0	920.9	902.1	845.0	693.2
	50%	0.0	710.0	274.4	113.7	33.9	0.0	101.3	403.6	544.2	635.8	638.3	331.1
	80%	0.0	305.3	50.9	13.6	0.0	0.0	0.0	0.0	227.5	377.8	376.1	227.5
	Average	62.6	611.1	360.0	288.1	276.5	348.7	325.7	423.8	559.2	625.5	612.4	417.6
	Max	920.0	910.0	940.0	940.0	940.0	940.0	940.0	940.0	940.0	920.0	920.0	910.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	119.5	84.3	0.0
No-Action Alternative - Impaired Hydrology	20%	573.4	586.4	671.0	516.5	779.3	825.0	830.4	897.6	892.8	811.6	827.6	675.9
	50%	52.7	391.4	265.9	221.8	335.5	340.0	260.6	406.2	553.3	563.7	609.5	451.6
	80%	0.0	26.4	6.0	0.0	8.8	0.0	0.0	0.0	232.7	344.3	380.0	125.2
	Average	259.0	358.1	343.2	289.3	389.9	409.3	378.6	446.7	540.9	547.1	577.2	439.8
	Max	989.8	933.0	978.4	964.6	963.4	985.7	954.7	982.5	980.8	949.8	947.8	952.8
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ralston Powerhouse (810.815)													
Alternative 1 - Existing Demand	20%	0.0	913.5	813.1	842.5	923.4	924.0	924.0	924.0	924.0	909.9	842.8	688.3
	50%	0.0	753.0	311.0	174.3	165.1	212.8	258.9	495.4	570.5	647.9	632.9	326.0
	80%	0.0	315.1	67.5	45.7	34.8	71.0	61.8	33.4	243.5	384.7	372.4	224.8
	Average	63.4	632.9	405.5	346.5	362.9	446.0	422.1	479.1	577.5	632.7	611.4	414.6
	Max	924.0	924.0	924.0	924.0	924.0	924.0	924.0	924.0	924.0	924.0	924.0	923.6
	Min	0.0	4.3	0.0	0.0	0.0	0.0	10.7	0.0	4.0	120.7	84.4	0.0
No-Action Alternative - Impaired Hydrology	20%	590.9	602.3	738.8	642.6	889.7	908.2	909.8	910.4	909.0	816.8	817.8	673.4
	50%	55.3	437.0	322.9	284.5	441.2	572.2	451.1	577.5	582.8	590.8	607.0	479.6
	80%	0.0	44.2	24.5	23.7	40.8	71.9	61.3	47.7	254.1	372.9	408.1	129.6
	Average	267.1	389.5	382.9	356.1	447.0	501.3	464.0	517.8	561.7	560.2	582.7	448.2
	Max	971.0	917.3	931.0	924.7	930.2	929.9	929.7	930.1	930.2	1,118.3	929.9	925.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oxbow Powerhouse (845.847)													
Alternative 1 - Existing Demand	20%	0.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	997.0	801.7
	50%	0.0	873.7	509.7	463.7	764.0	1,000.0	1,000.0	1,000.0	775.1	777.1	737.5	447.3
	80%	0.0	391.7	203.1	183.9	211.5	369.6	311.0	212.9	374.9	465.1	439.9	280.1
	Average	67.8	726.7	568.7	562.3	644.6	731.2	725.4	662.4	713.5	741.5	705.0	511.5
	Max	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
	Min	0.0	0.0	75.0	89.6	75.0	83.0	89.3	92.2	147.1	156.9	118.1	0.0
No-Action Alternative - Impaired Hydrology	20%	730.0	760.0	932.8	986.0	1,050.0	1,060.0	1,060.0	1,060.0	1,050.0	933.0	933.0	805.0
	50%	286.0	481.0	452.0	594.0	790.0	905.0	834.0	858.0	723.0	696.0	715.0	534.0
	80%	0.0	81.4	120.2	165.0	301.0	414.0	284.4	188.0	344.6	414.0	414.0	188.0
	Average	345.2	472.7	507.2	569.1	684.7	762.1	701.8	695.0	672.0	641.0	654.0	519.1
	Max	1,100.0	1,080.0	1,080.0	1,110.0	1,110.0	1,210.0	1,230.0	1,110.0	1,110.0	1,080.0	1,070.0	1,080.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3.3-5b. Percent Generation Loss by Powerhouse and Instream Flow Component (1975–2007).

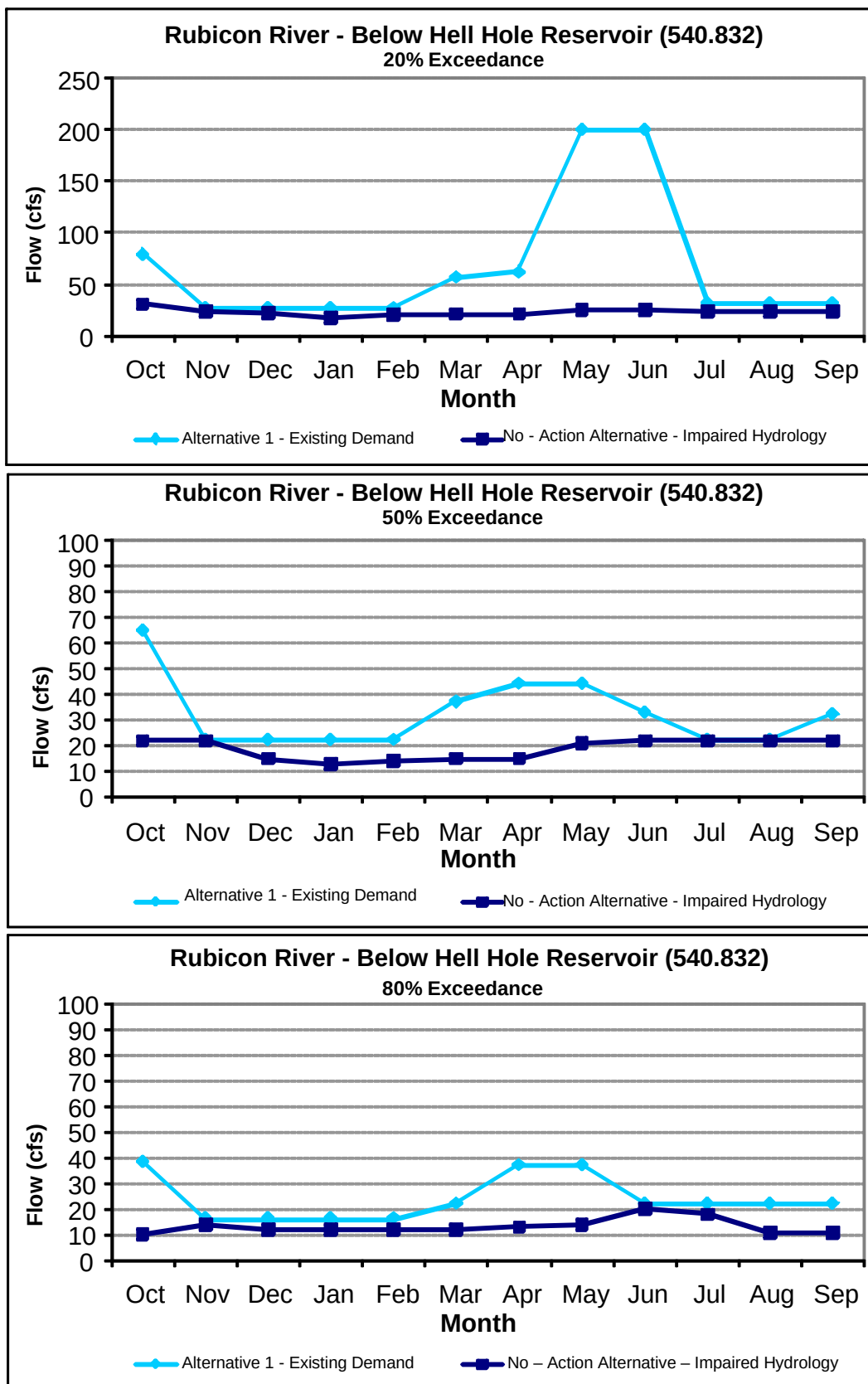
Instream Flow Component	Average Percent Change in Generation by Flow Component					Total Percent Change
	Powerhouse					
	French Meadows	Middle Fork	Ralston	Oxbow	Hell Hole	
Minimum Instream Flows	-3.43%	-4.96%	-4.70%	-0.44%	69.06%	-4.39%
Pulse Flows	-3.00%	-2.41%	-2.21%	-0.88%	-0.53%	-2.32%
Spill Downramp	-0.07%	-0.09%	-0.07%	-0.04%	-0.04%	-0.08%
Recreation	1.55%	1.53%	1.94%	1.29%	-0.26%	1.67%
Total All Components	-4.96%	-5.94%	-5.04%	-0.08%	68.24%	-5.12%

Table 3.3-5c. Percent Generation Loss by Powerhouse, Instream Flow Component, and Water Year Type (1975–2007).

Water Year Type	Powerhouse					Total Percent Change
	French Meadows	Middle Fork	Ralston	Oxbow	Hell Hole	
Minimum Instream Flows						
Wet	-1.97%	-2.98%	-2.76%	-0.84%	74.85%	-2.60%
Above Normal	-3.30%	-5.84%	-5.42%	-0.96%	70.33%	-5.15%
Below Normal	-3.64%	-6.17%	-5.65%	-0.56%	62.68%	-5.35%
Dry	-7.15%	-7.59%	-7.50%	1.31%	52.89%	-6.85%
Critical	-11.99%	-12.03%	-10.08%	1.56%	110.01%	-10.09%
Total All Years	-3.43%	-4.96%	-4.70%	-0.44%	69.06%	-4.39%
Pulse Flows						
Wet	-2.97%	-1.84%	-1.50%	-0.62%	-0.32%	-1.76%
Above Normal	-5.06%	-3.99%	-3.78%	-1.42%	-1.05%	-3.89%
Below Normal	-3.80%	-3.26%	-3.18%	-0.95%	-0.78%	-3.17%
Dry	-0.52%	-1.04%	-0.93%	-0.62%	-0.11%	-0.94%
Critical	0.71%	-1.08%	-0.97%	-0.66%	-0.34%	-0.89%
Total All Years	-3.00%	-2.41%	-2.21%	-0.88%	-0.53%	-2.32%
Spill Downramp						
Wet	-0.06%	-0.13%	-0.11%	-0.08%	-0.14%	-0.12%
Above Normal	-0.03%	-0.05%	-0.04%	-0.03%	-0.01%	-0.05%
Below Normal	-0.19%	-0.10%	-0.09%	-0.03%	0.03%	-0.10%
Dry	-0.05%	0.01%	0.01%	0.01%	0.00%	0.01%
Critical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total All Years	-0.07%	-0.09%	-0.07%	-0.04%	-0.04%	-0.08%
Recreation						
Wet	-1.03%	-0.03%	0.03%	0.77%	3.76%	-0.04%
Above Normal	2.89%	1.28%	2.21%	1.89%	-3.00%	1.75%
Below Normal	4.70%	3.14%	3.25%	1.45%	-3.58%	3.20%
Dry	6.53%	4.49%	4.87%	1.74%	2.27%	4.67%
Critical	0.18%	5.61%	6.31%	2.31%	-5.26%	5.29%
Total All Years	1.55%	1.53%	1.94%	1.29%	-0.26%	1.67%
Total All Instream Flow Components						
Wet	-6.03%	-4.98%	-4.34%	-0.75%	78.15%	-4.52%
Above Normal	-5.51%	-8.59%	-7.03%	-0.52%	66.26%	-7.33%
Below Normal	-2.93%	-6.39%	-5.68%	-0.09%	58.34%	-5.42%
Dry	-1.19%	-4.13%	-3.55%	2.43%	55.04%	-3.13%
Critical	-11.10%	-7.50%	-4.74%	3.21%	104.41%	-5.69%
Total All Years	-4.96%	-5.94%	-5.04%	-0.08%	68.24%	-5.12%

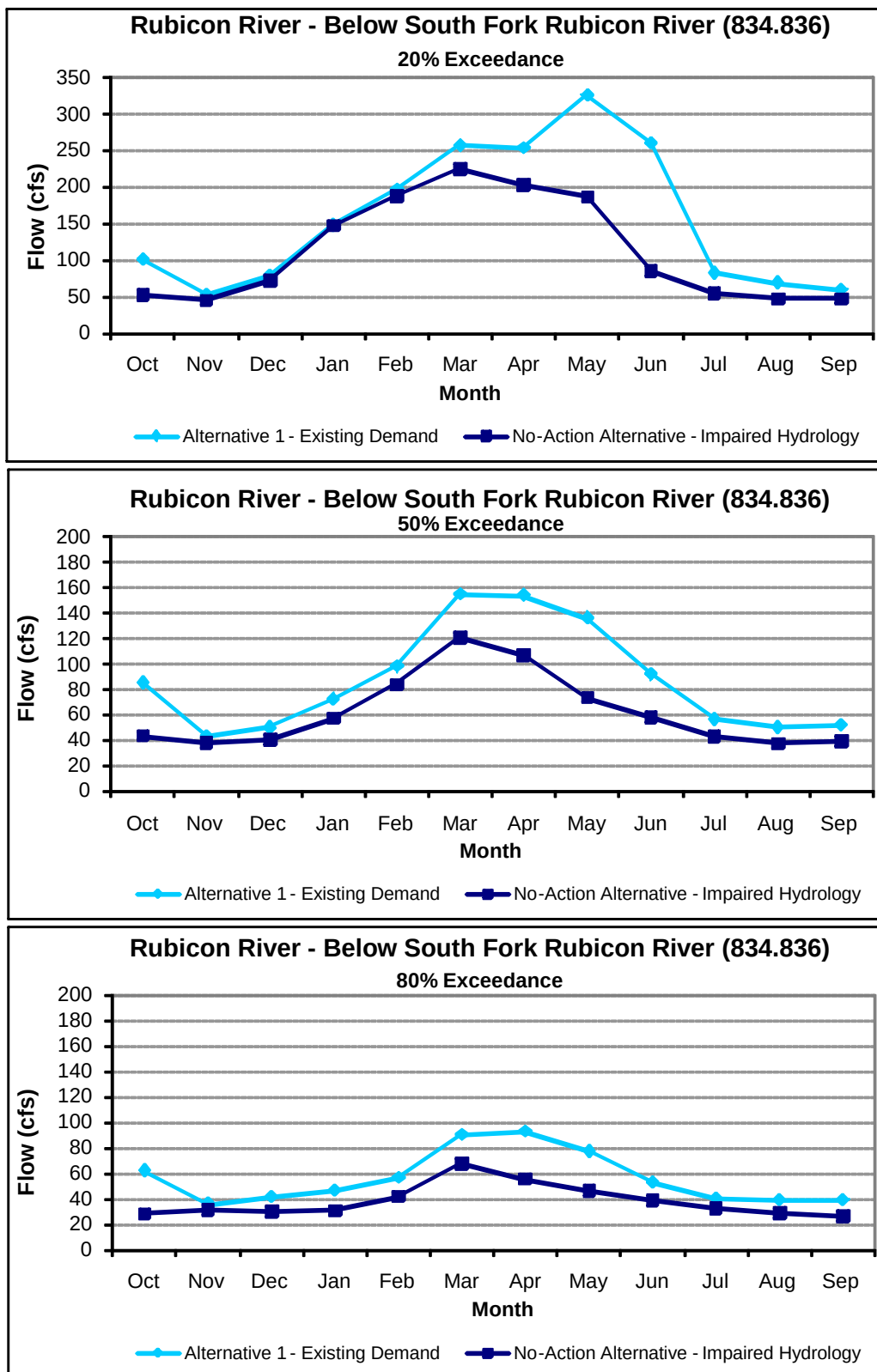
FIGURES

Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches.



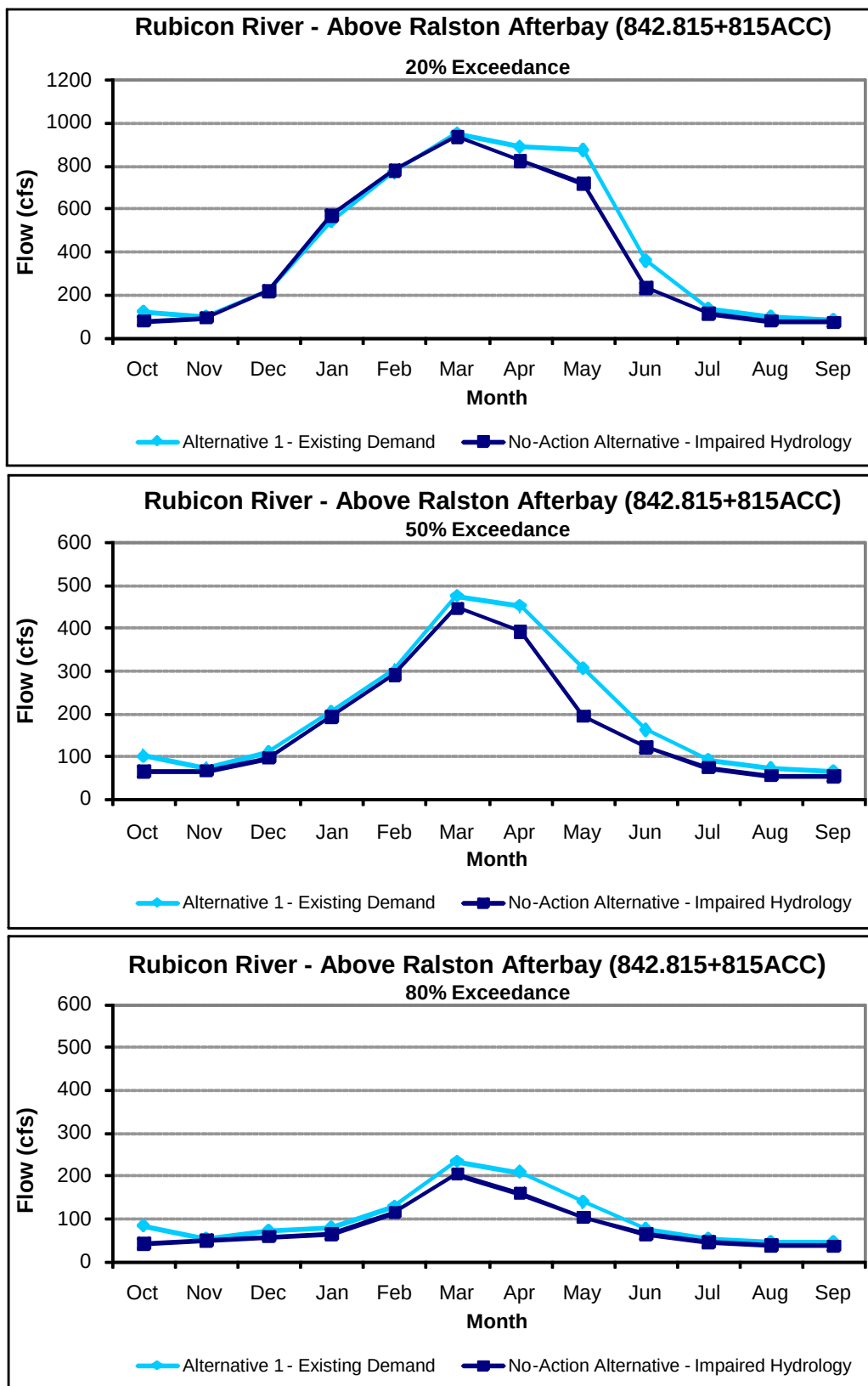
Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).



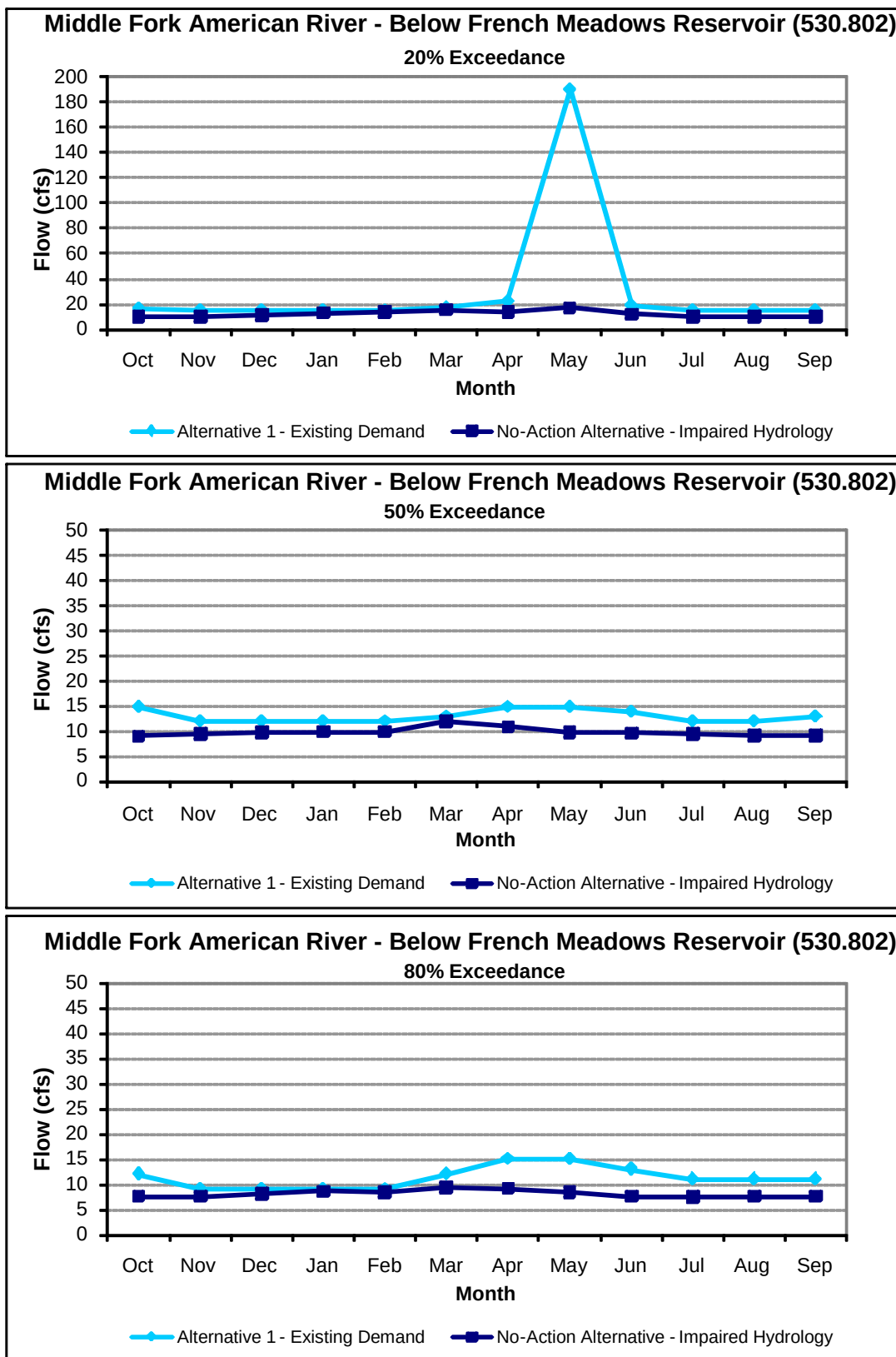
Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).

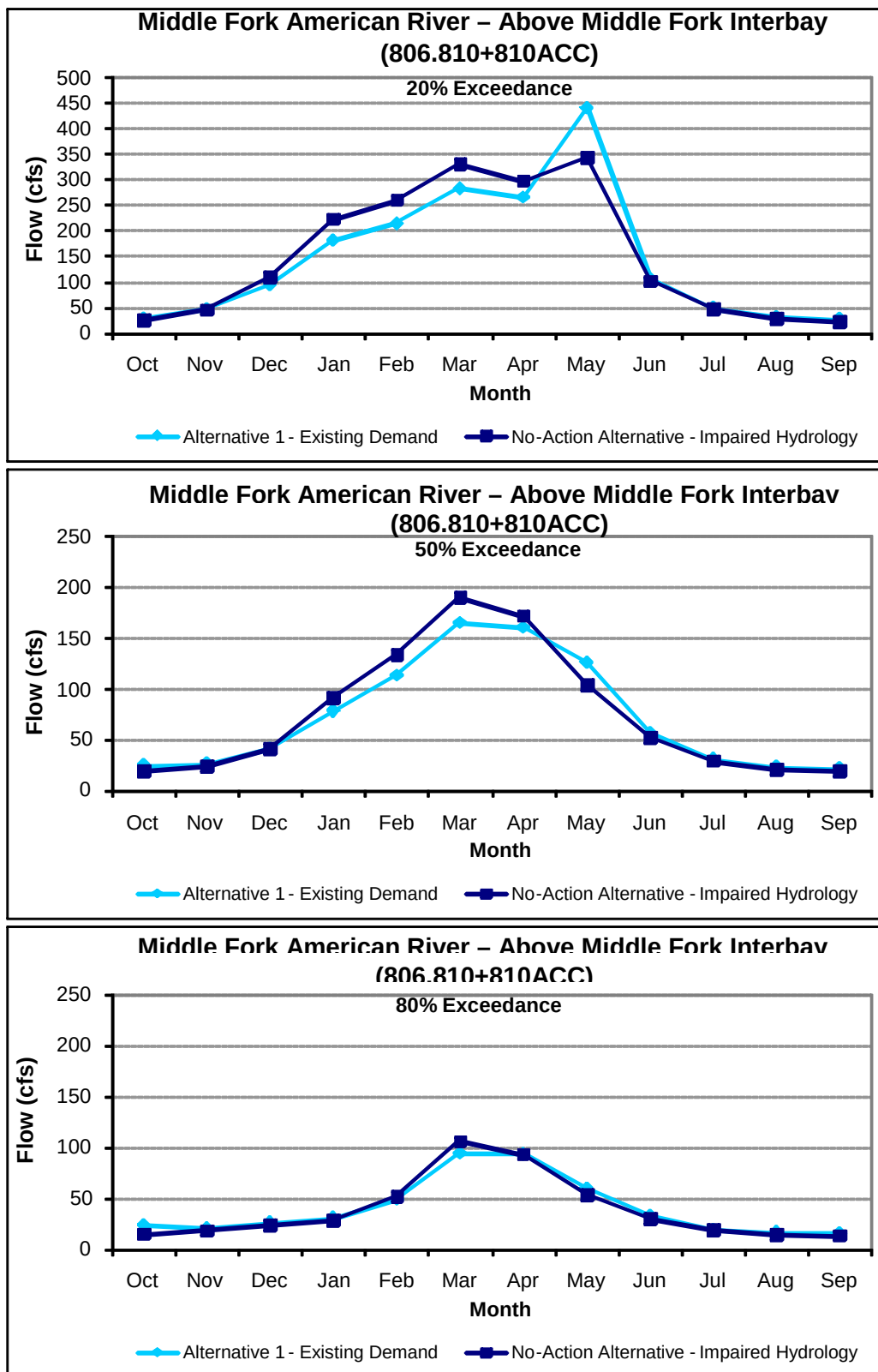
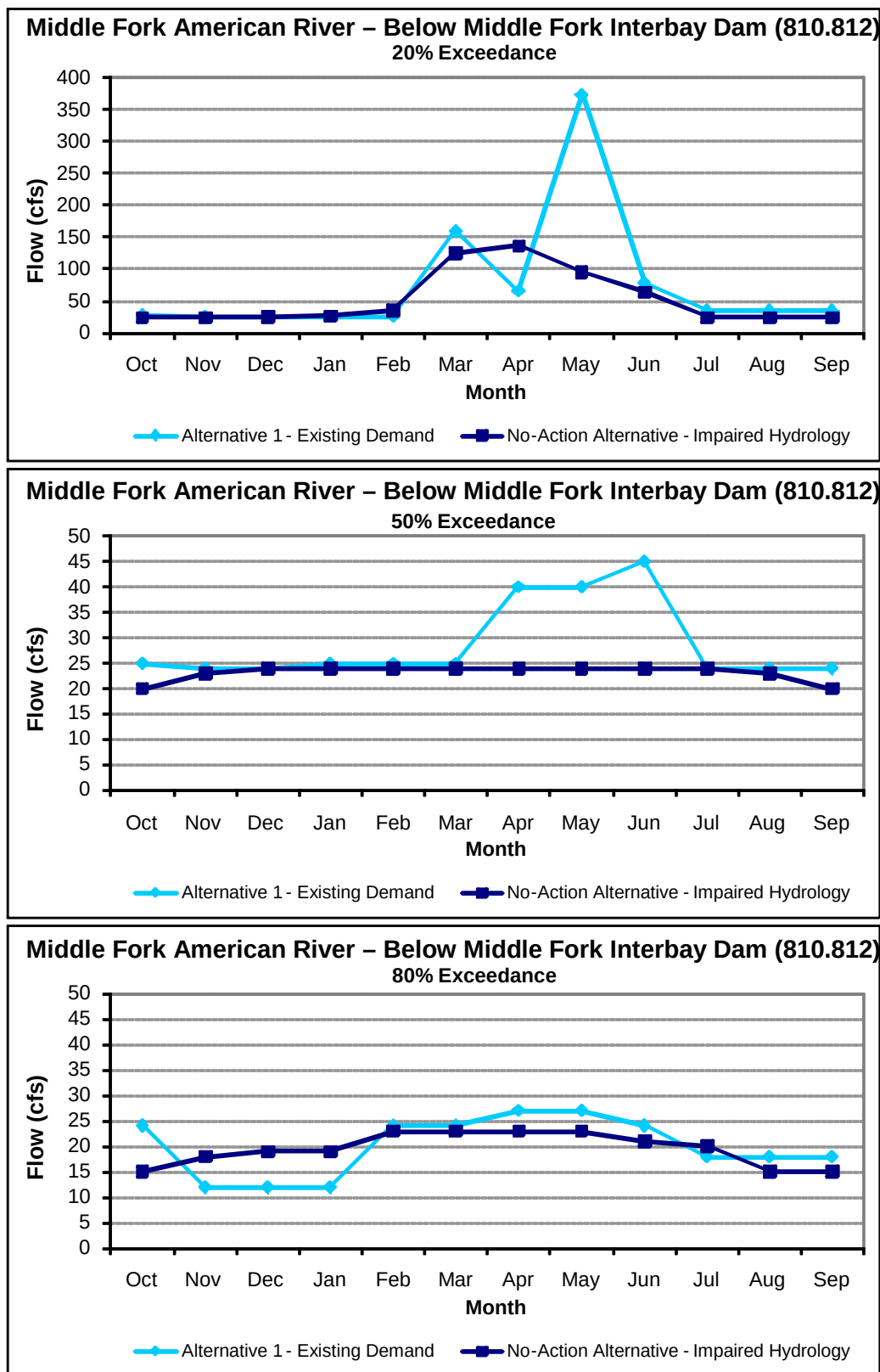
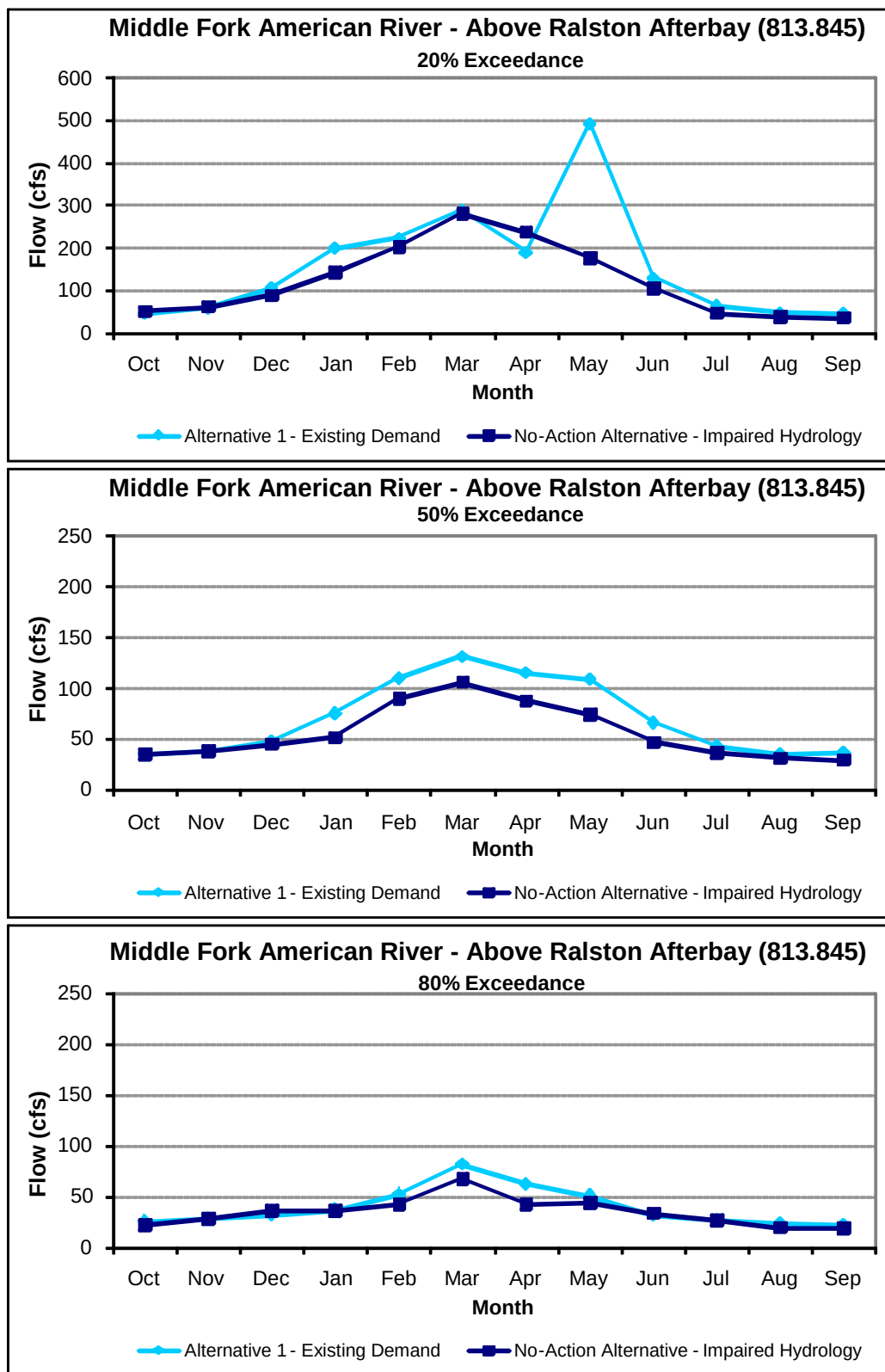


Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).

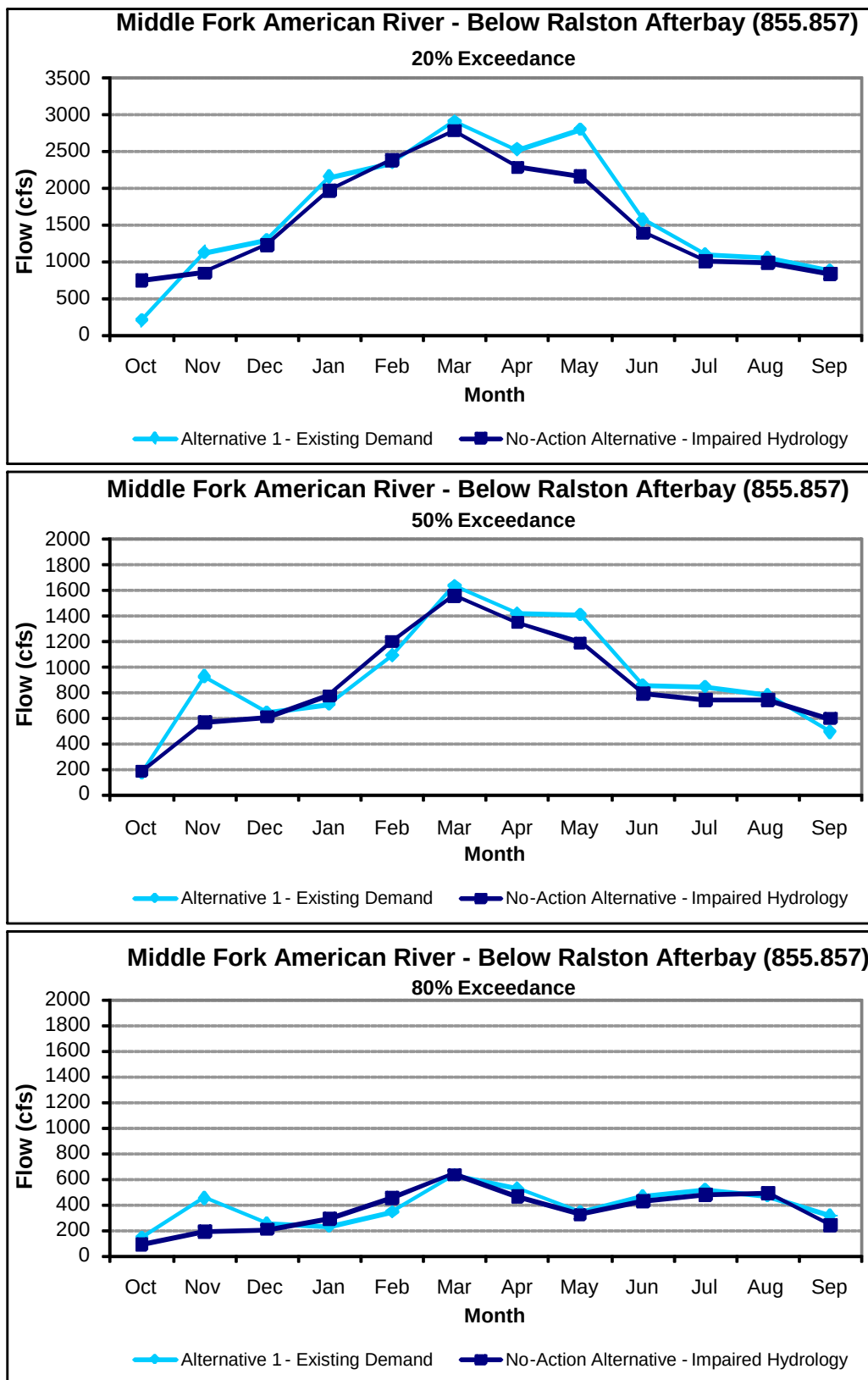


Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).

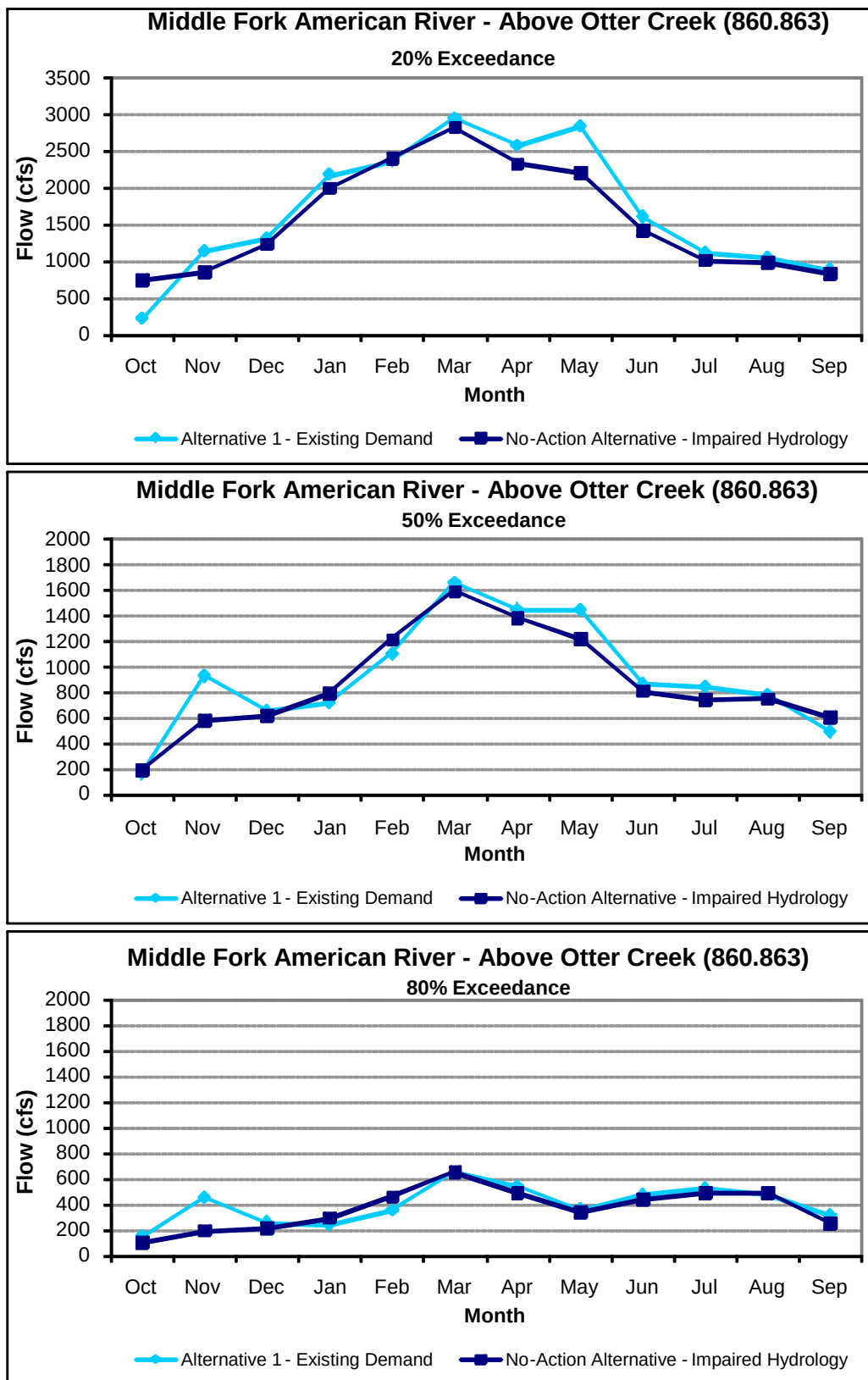
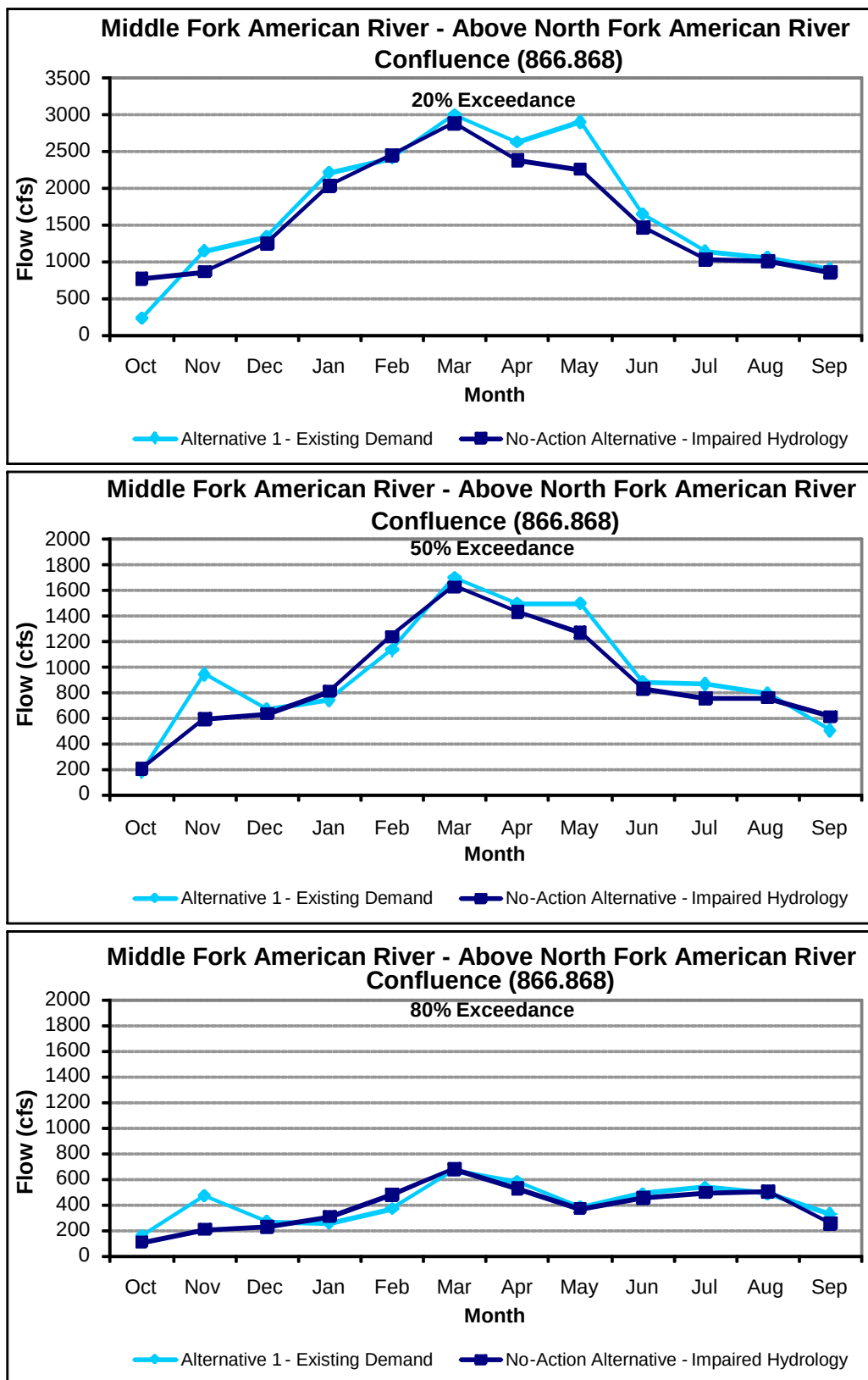
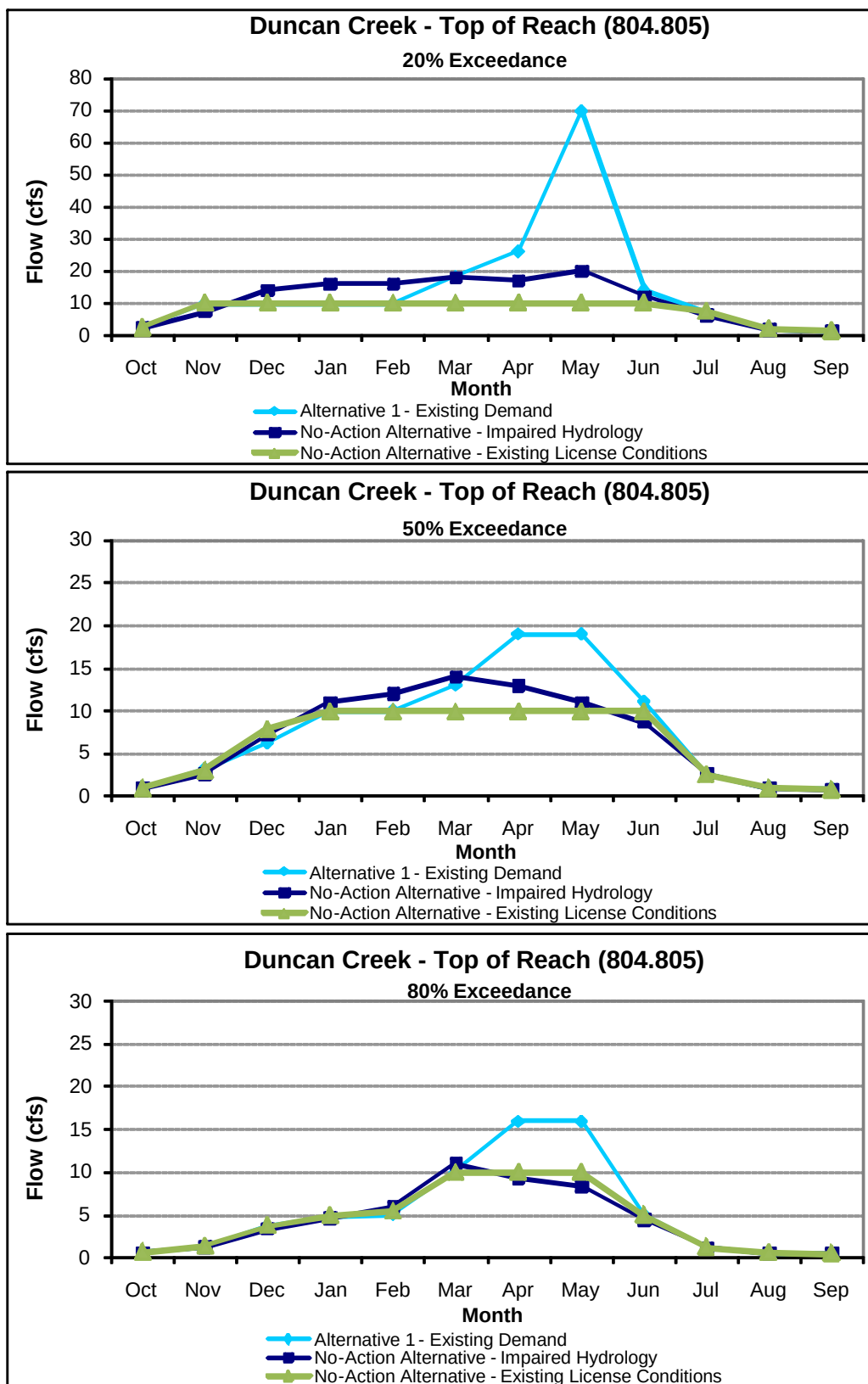


Figure 3.3-1. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Large Bypass and Peaking Reaches (continued).



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-2. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Small Bypass Reaches.



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-2. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Small Bypass Reaches (continued).

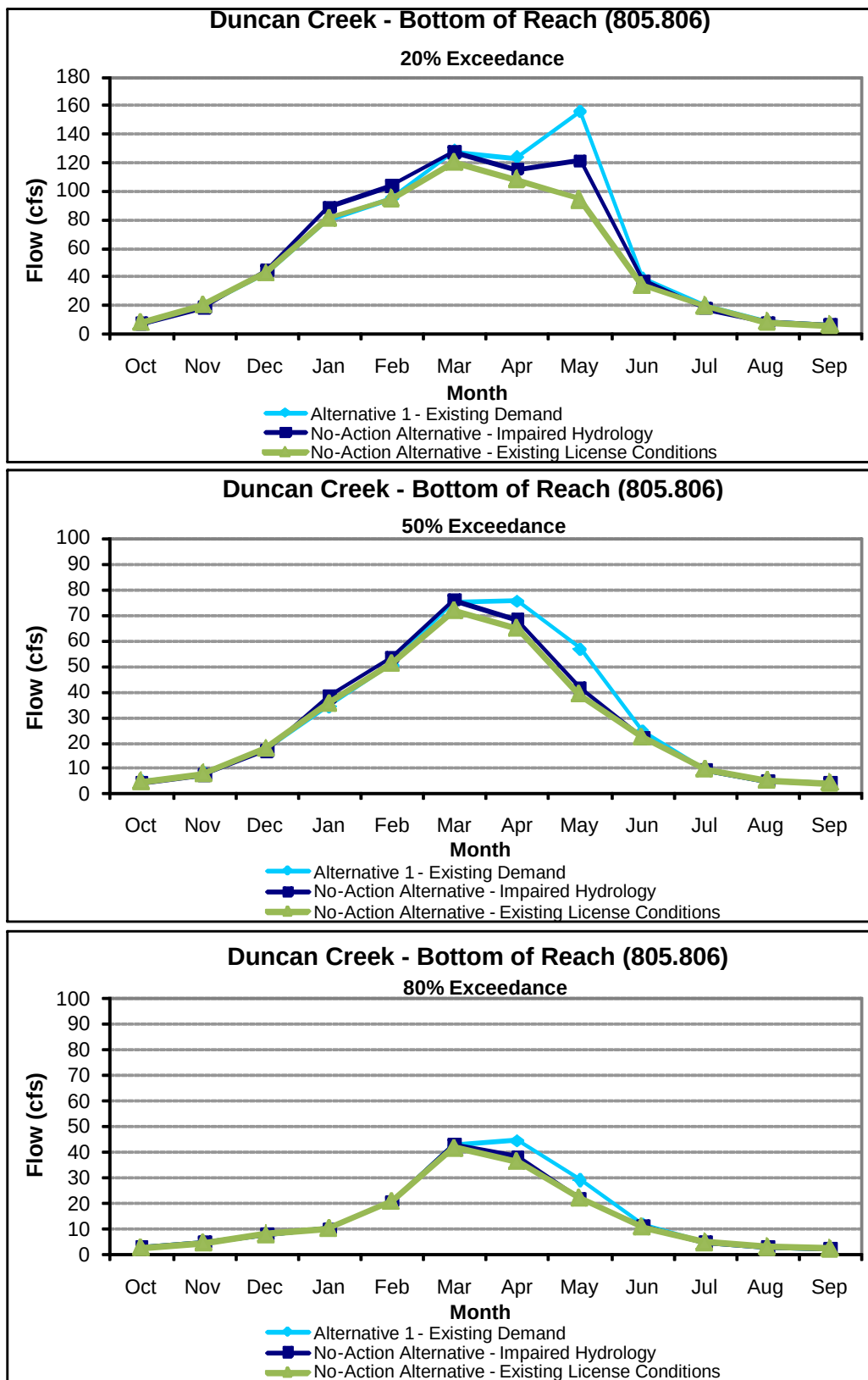


Figure 3.3-2. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Small Bypass Reaches (continued).

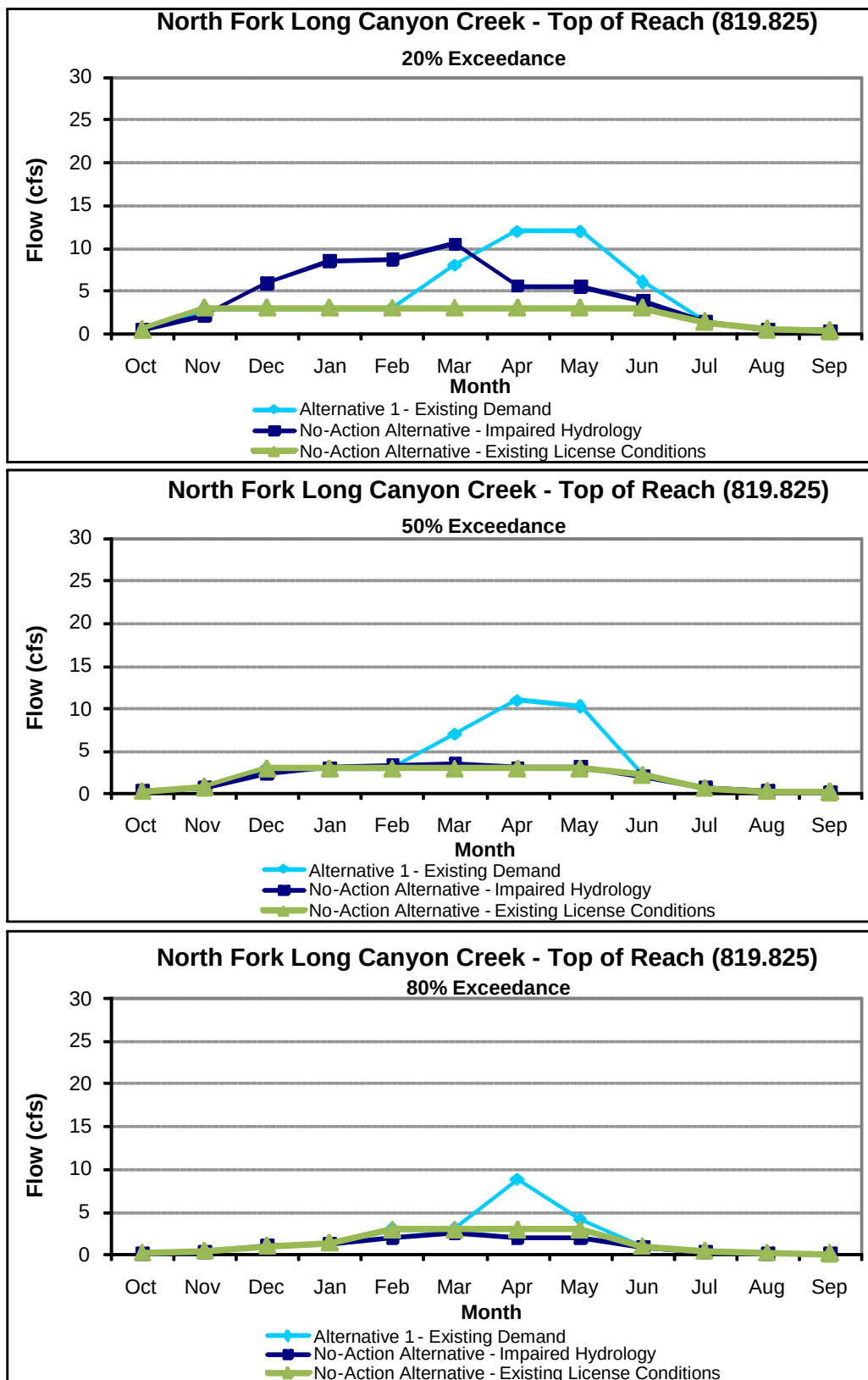


Figure 3.3-2. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Small Bypass Reaches (continued).

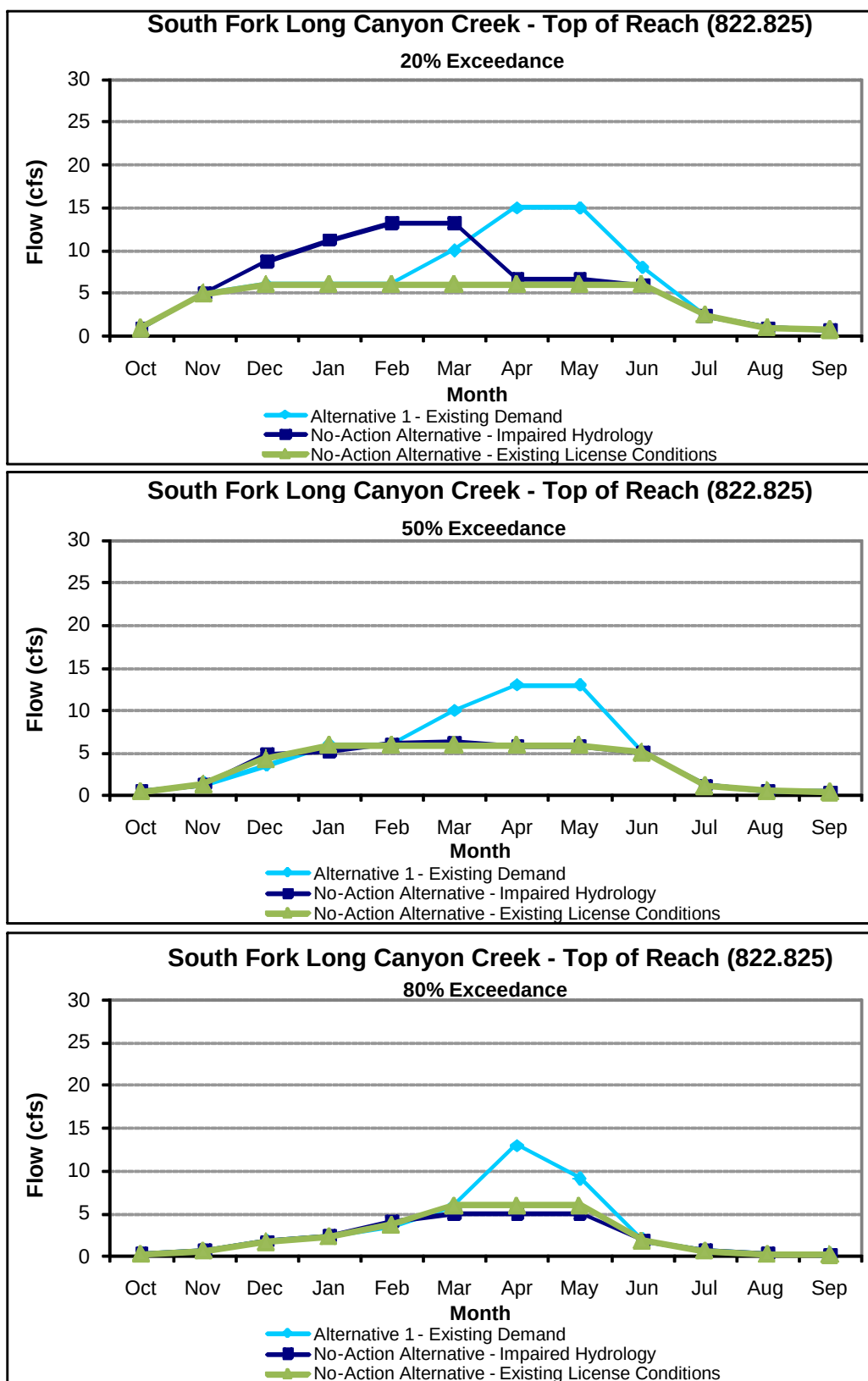
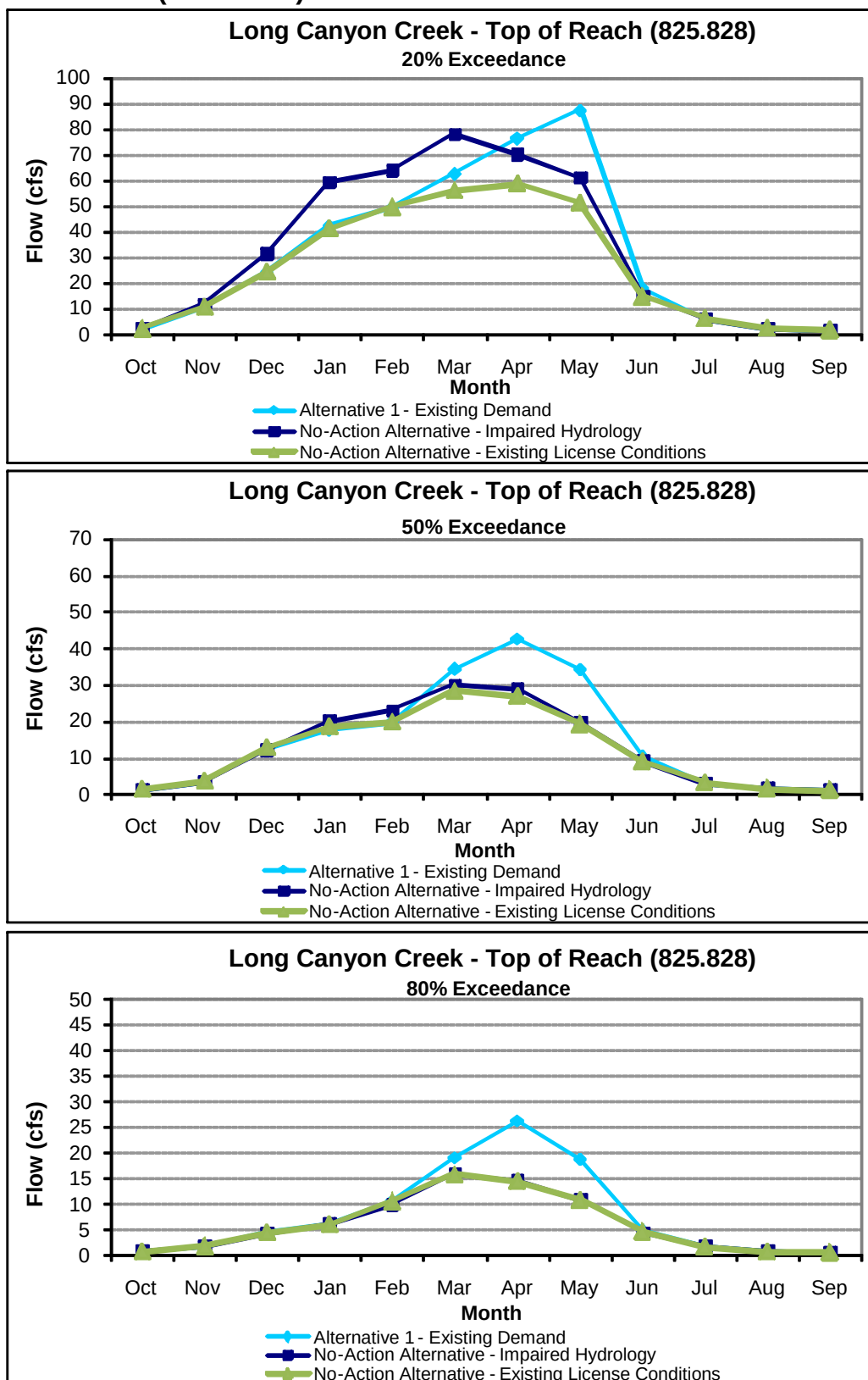


Figure 3.3-2. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Small Bypass Reaches (continued).



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-2. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for Selected Locations in the Small Bypass Reaches (continued).

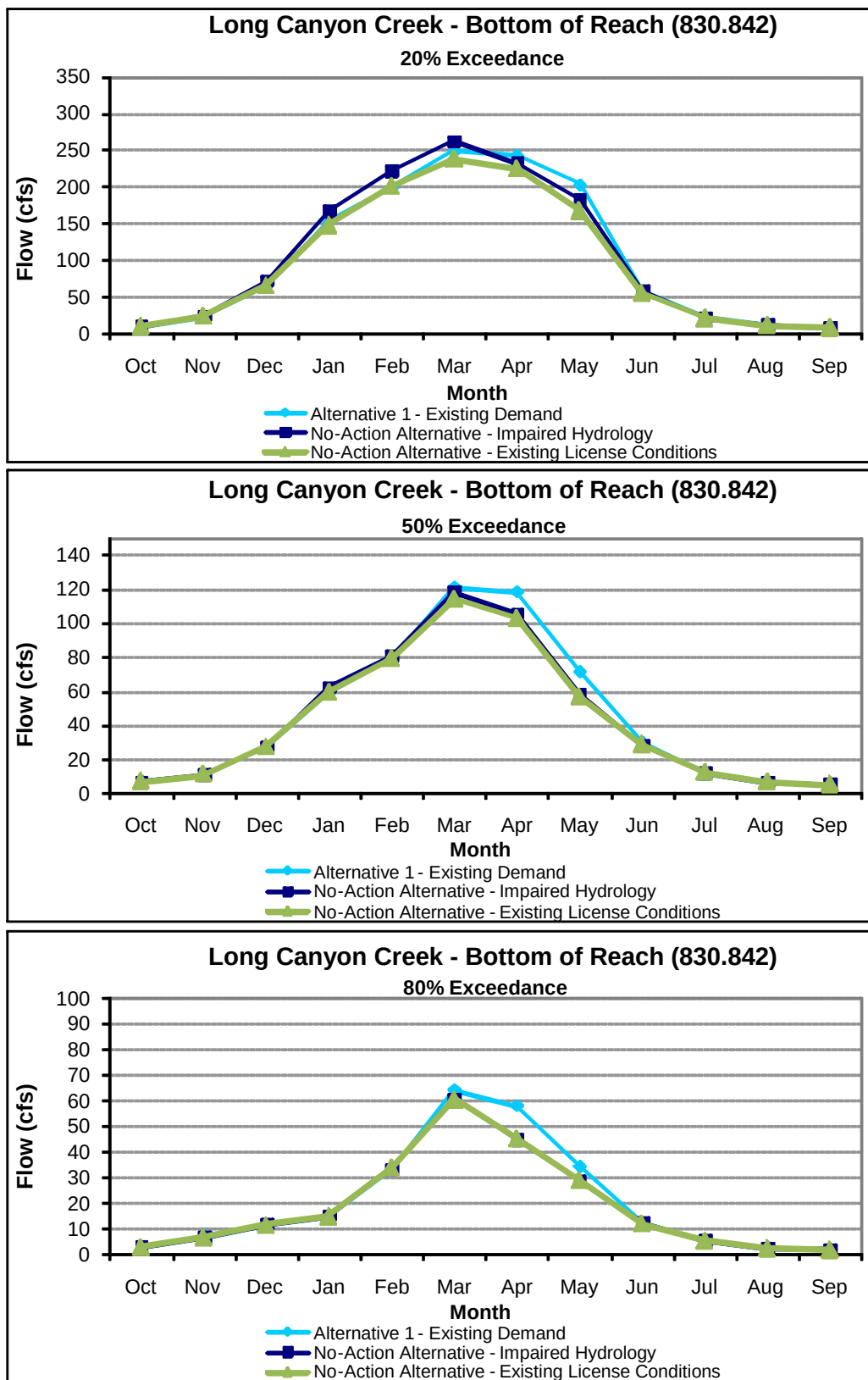
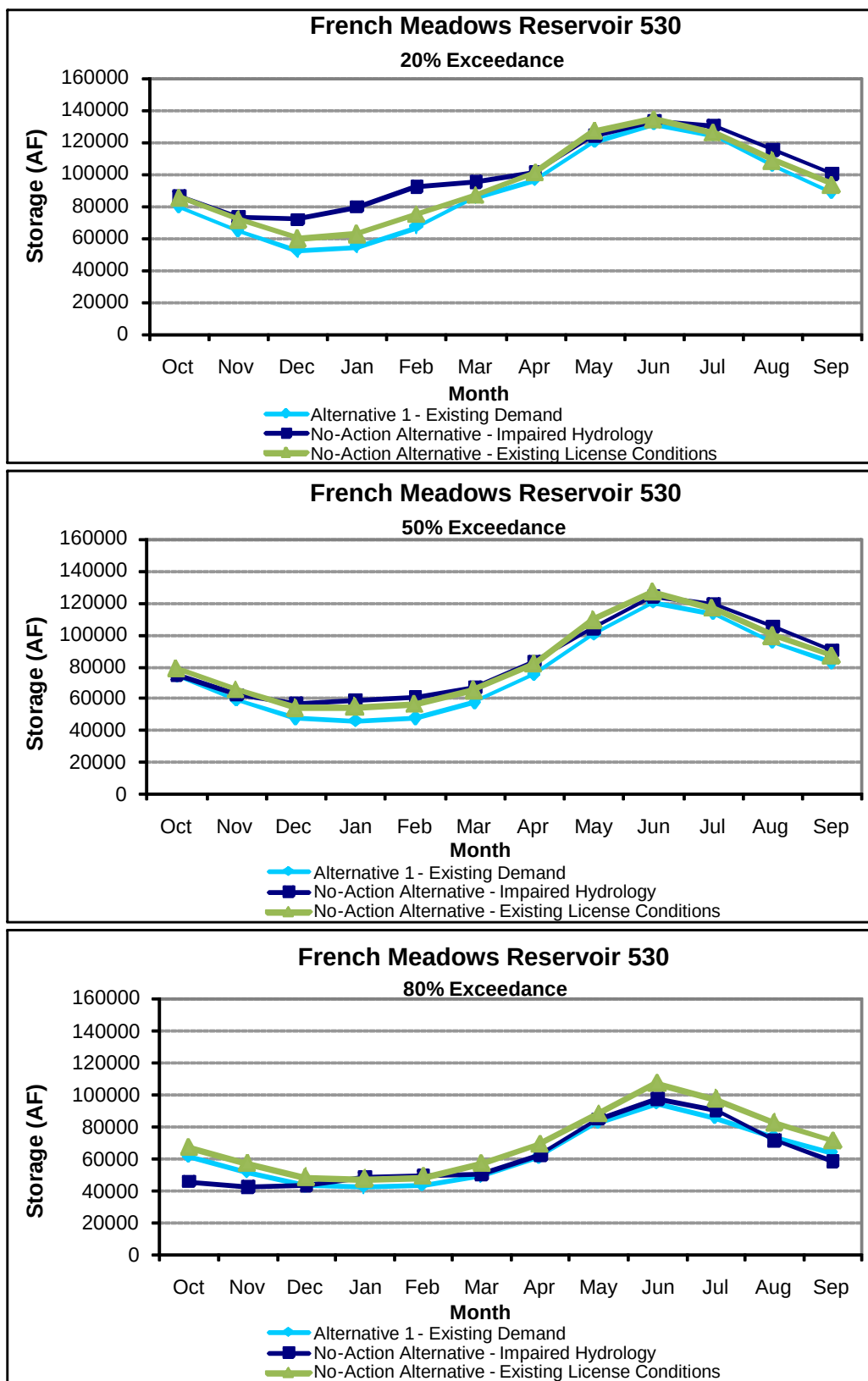
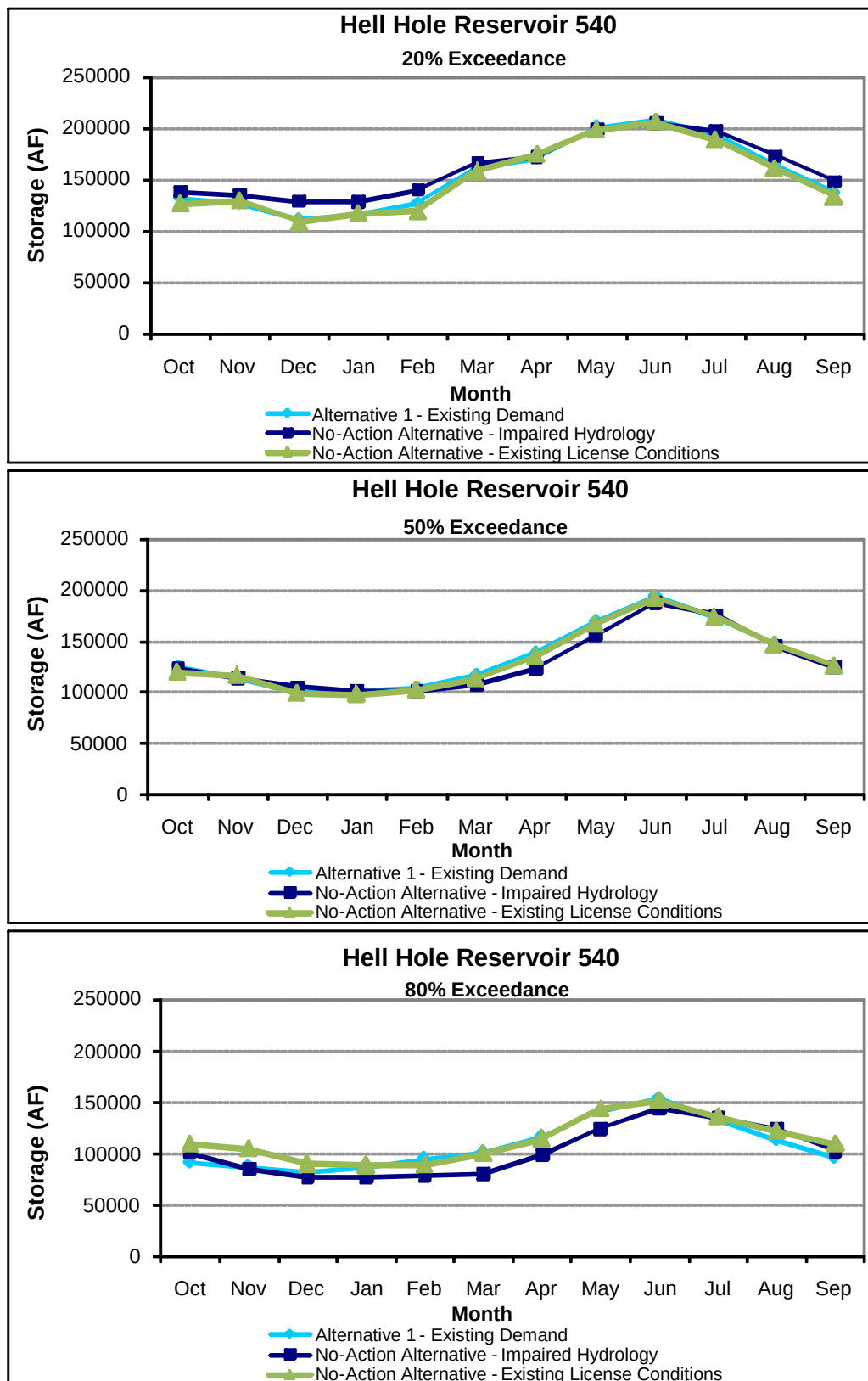


Figure 3.3-3. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Reservoirs.



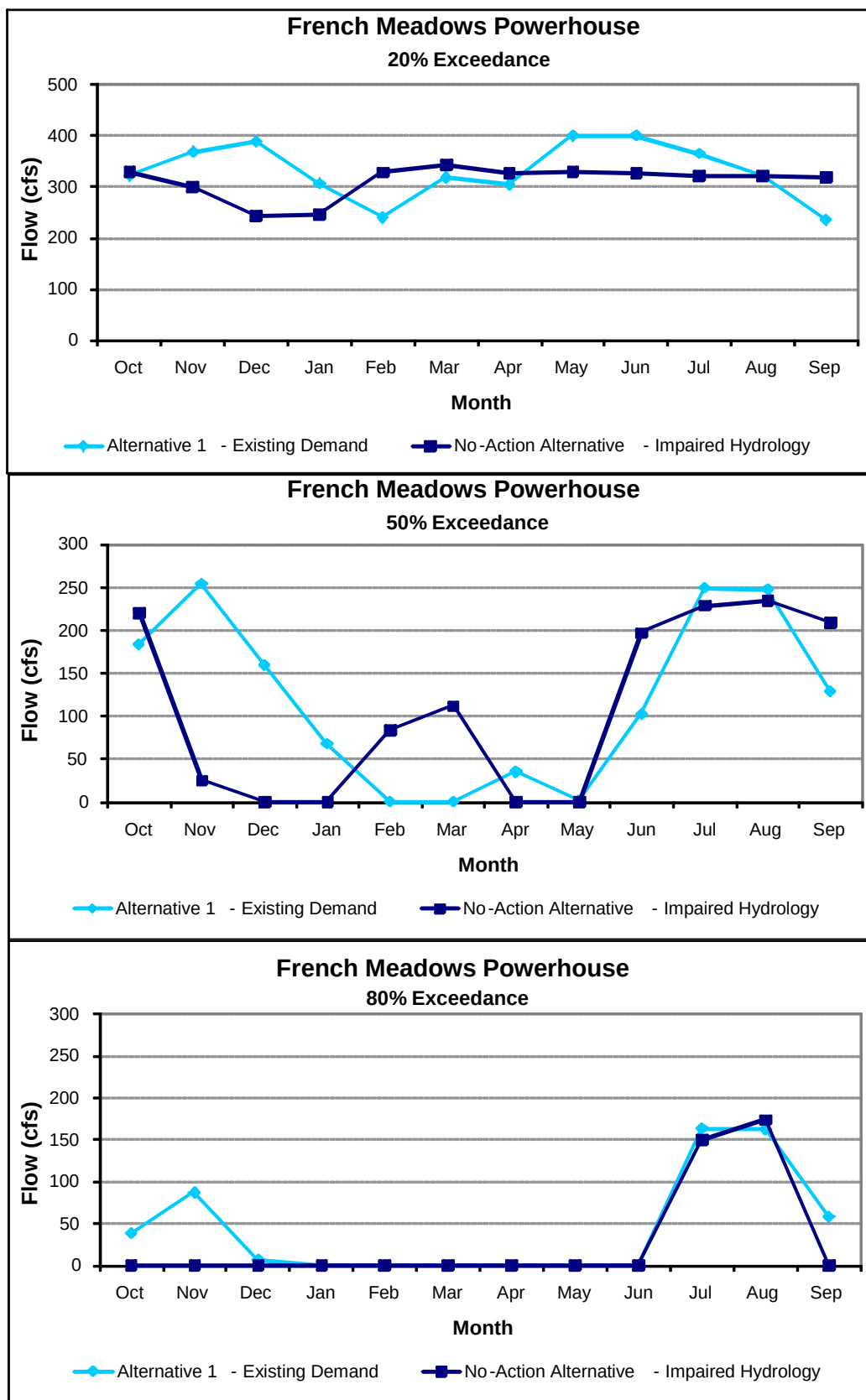
Note: scale of y-axis (storage) is not the same on all graphs.

Figure 3.3-3. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Reservoirs (continued).



Note: scale of y-axis (storage) is not the same on all graphs.

Figure 3.3-4. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Powerhouses.



Note: scale of y-axis (flow) is not the same on all graphs.

Figure 3.3-4. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Powerhouses (continued).

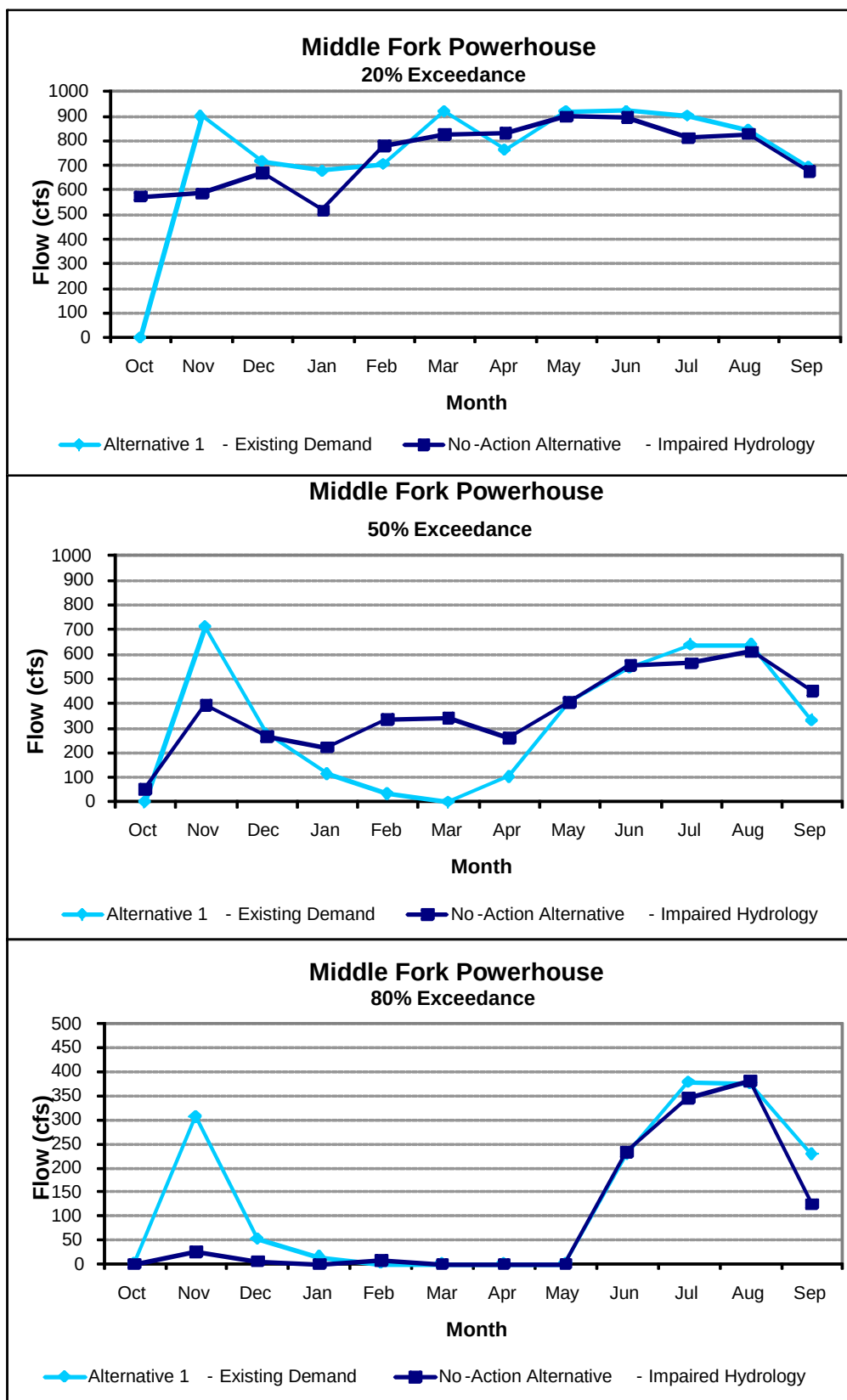


Figure 3.3-4. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Powerhouses (continued).

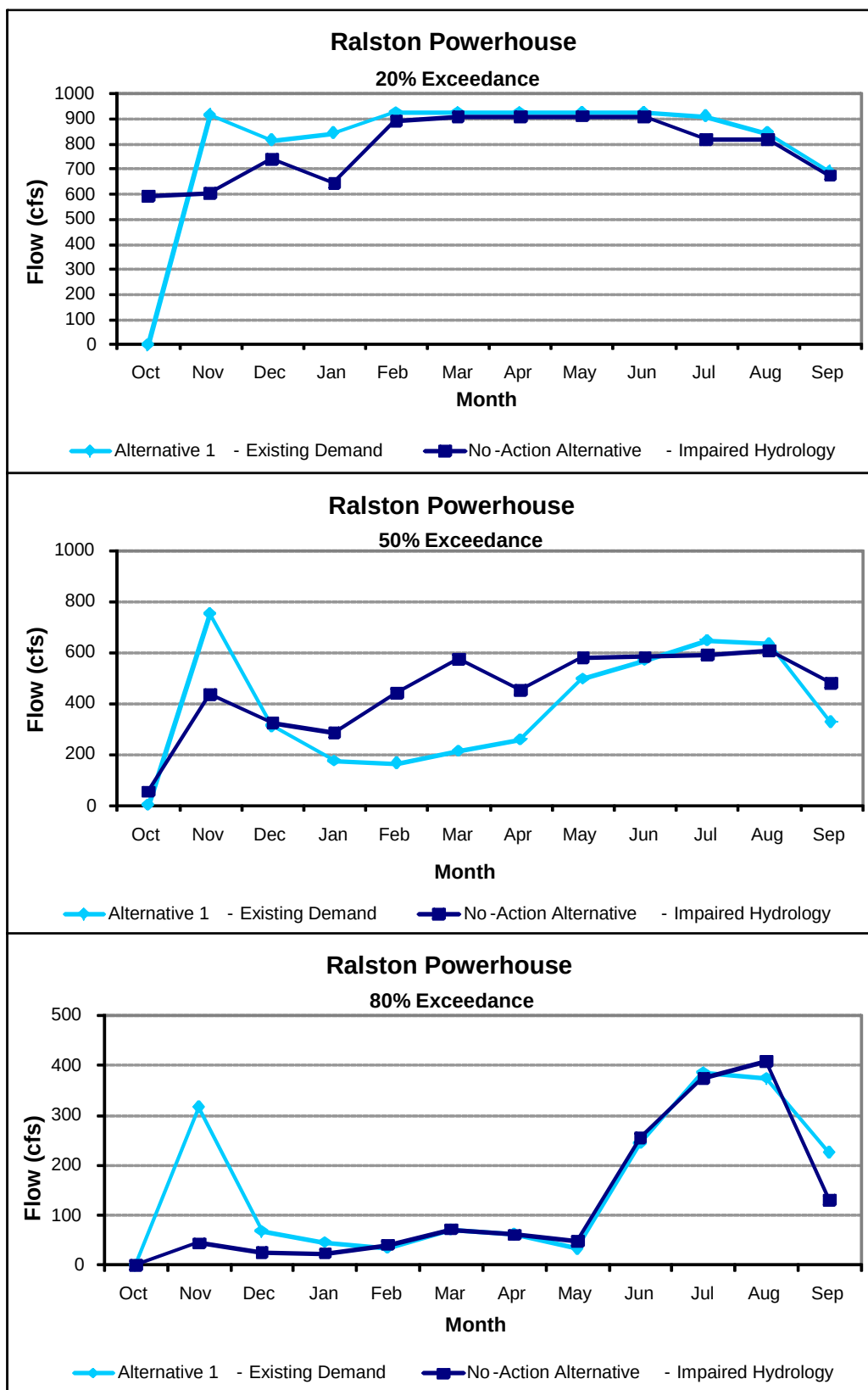


Figure 3.3-4. Graphs of Monthly Exceedance Curves (20%, 50%, and 80%) for MFP Powerhouses (continued).

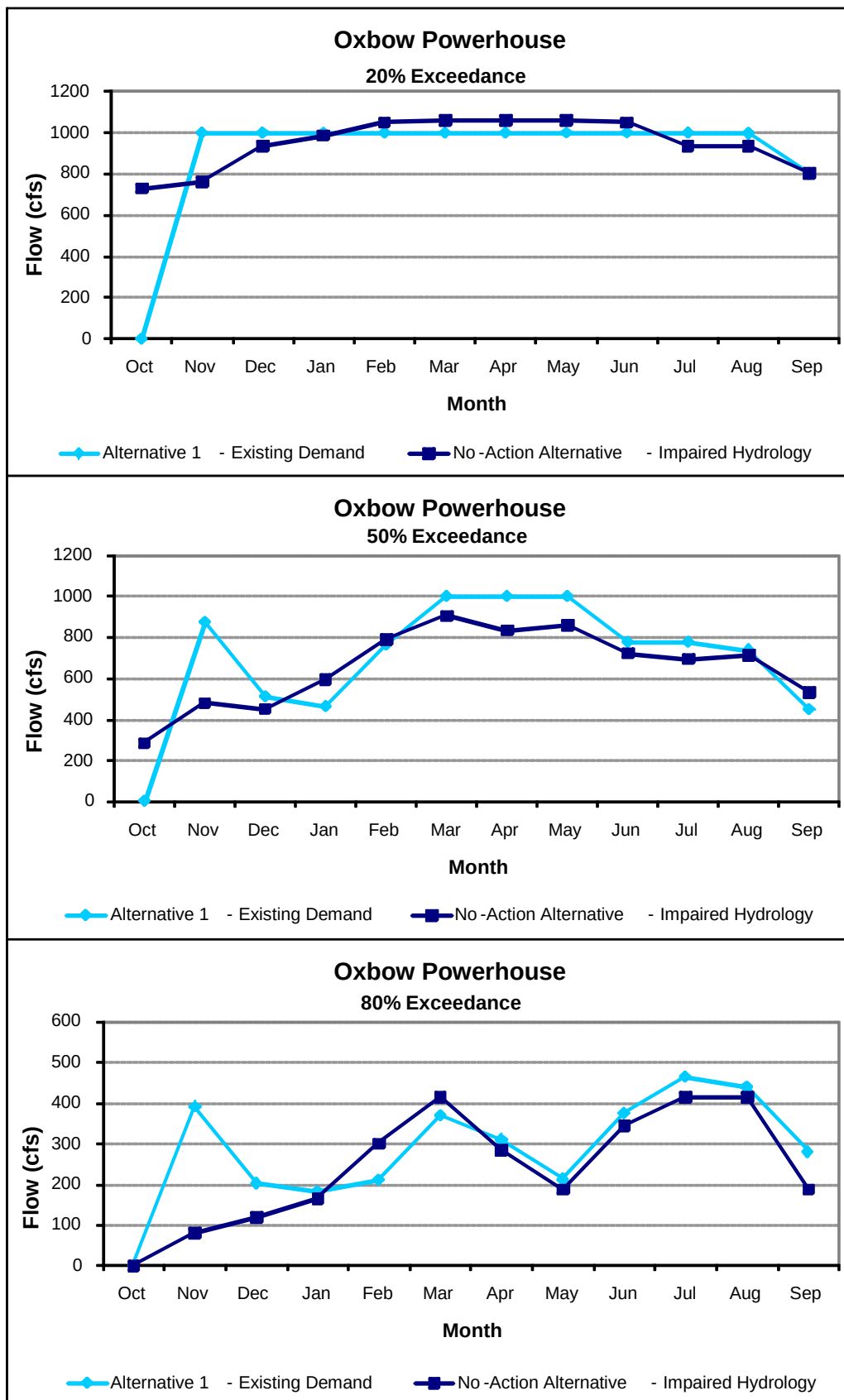


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3.4 WATER QUALITY ENVIRONMENTAL EFFECTS

This section describes the potential impacts to water quality in the bypass and peaking reaches and Project reservoirs under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facility Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to water quality have been identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance at existing Project recreation facilities; maintenance at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section. Specifically, impacts to water quality include the following:

- Potential impacts to water quality as a result of changes in Project operations affecting flows in the bypass and peaking reaches and reservoir storage.
- Potential impacts to surface and ground water quality from changes in Project maintenance affecting erosion and sedimentation and discharge of contaminants, surfactants, fungicides, herbicides, and other potential pollutants.
- Potential impacts to surface and ground water quality as a result of modifications of existing or construction of new Project facilities and Project recreation facilities and features affecting erosion and sedimentation and discharge of contaminants and other potential pollutants.

Potential impacts on water temperature and dissolved oxygen are described in Section 3.5 – Fish and Aquatic Resources. Potential impacts on reservoir and diversion pool shoreline erosion are described in Section 3.7 – Geomorphology. Potential impacts to geology and soils, including erosion from maintenance and construction at Project recreation facilities, changes in local topography, and potential soil contamination are provided in Section 3.2 – Geology and Soils.

A description of potential impacts to water quality resulting from implementation of Alternative 1, considering United States Department of Agriculture-Forest Service (USDA-FS) Water Quality Best Management Practices (BMPs) and AP measures is provided below. Impact conclusions are summarized at the end of this section. There are no unavoidable adverse effects to water quality resulting from implementation of Alternative 1 as discussed at the end of this section.

3.4.1 Project Operations

Alternative 1 includes changes in Project operations that modify flow in the bypass and peaking reaches and modify reservoir storage. These operational changes may potentially impact water quality. Overall water quality is high in the bypass and peaking reaches and MFP reservoirs under existing conditions and meets all regulatory standards and criteria (PCWA 2011a) with two notable exceptions discussed below. Alternative 1 increases flows in the bypass and peaking reaches in most years compared to the No-Action Alternative and, therefore, will maintain the existing high water quality conditions (refer to resource agencies instream flow and reservoir minimum pool conditions [USDA-FS 2011; CDFG 2011; DOI 2011]). Reservoir storage (water surface elevations) in the MFP reservoirs is similar in Alternative 1 and the No-Action Alternative (Section 3.3 – Water Use). The following discussion focuses on the effect of Alternative 1 compared to the No-Action Alternative on existing water quality issues in the vicinity of the MFP, and identifies whether these issues are related to MFP operations, and, if so, whether these conditions are controllable.

The two water quality issues observed at or near Project facilities during the course of technical studies conducted for the MFP relicensing include:

- Elevated levels of iron and manganese immediately below the French Meadows Dam; and
- Elevated levels of methyl mercury in fish tissue in MFP reservoirs and in the peaking reach.

Detailed information on these existing water quality issues is provided in Section 7.4 Water Quality Affected Environment in PCWA's Application for New License (PCWA 2011a). These issues are also discussed in the following subsections with respect to Project operations.

3.4.1.1 Elevated Levels of Iron and Manganese

French Meadows Dam is a rock and gravel-filled structure. Water that seeps through the dam (normal condition for this type of dam) is collected in three leakage weirs (channels) and released into the Middle Fork American River directly downstream of the dam. Leakage flows are highest in the spring/early summer (≤ 0.50 cubic feet per second [cfs]) when the reservoir elevation is high and lowest in the fall/winter (≤ 0.25 cfs) when the reservoir elevation is low (PCWA 2011a).

Water samples collected from three leakage weirs contained elevated concentrations of manganese and iron. The source of the iron and manganese is the rock and gravel dam material (local source material). As water seeps through the dam, iron and manganese become soluble under anoxic conditions. These conditions are Project-related, but not controllable. Specifically:

- Iron concentrations ranged from 16.0–20.4 mg/L, which exceeds the National Toxics Rule (NTR) criteria for protection of aquatic life (1.0 mg/L); and

- Manganese concentrations ranged from 3,610–4,040 µg/L, which exceeds the California drinking water secondary Maximum Concentration Levels (MCL) standard of 50 µg/L. This drinking water standard is the most stringent water quality standard for manganese and was established primarily to protect the taste, odor, and appearance of drinking water.

Water released directly in the Middle Fork American River from French Meadows Reservoir via the French Meadows low-level outlet pipe contained iron and manganese concentrations (0.035 mg/L and 22 µg/L, respectively) that met water quality standards and were protective of aquatic life. Minimum instream flow releases under the No-Action Alternative range from 4–8 cfs. This water mixes with the leakage weir releases. Under existing conditions, approximately 800 feet downstream of the dam, iron concentrations drop to 0.137 mg/L, well below the NTR standard of 1 mg/L (protective of aquatic life). Manganese concentrations drop to 62.6 µg/L, slightly above the MCL for taste, odor, and appearance of drinking water (50 µg/L). Therefore, these conditions are localized under the No-Action Alternative.

Under Alternative 1, minimum instream flow releases from French Meadows Dam are increased (ranging from 8–20 cfs), further diluting the water from the leakage weirs compared to the No-Action Alternative. Therefore, the higher flows under Alternative 1 will enhance water quality relative to the No-Action Alternative.

3.4.1.2 Methyl Mercury in Fish Tissue

As part of the MFP relicensing studies, a screening level assessment of methyl mercury concentrations in sport fish muscle tissues was conducted at French Meadows Reservoir, Hell Hole Reservoir, Middle Fork Interbay, Ralston Afterbay, and the Middle Fork American River at Otter Creek in 2007–2009 (PCWA 2011b). Crayfish were also included in this assessment from Hell Hole and French Meadows reservoirs.

Methyl mercury concentrations in the sampled fish and crayfish were compared to the California's Office of Environmental Health Hazard Assessment (OEHHA) screening guidelines for methyl mercury of 0.08 mg/kg (Cal/EPA 2005; Klasing and Brodberg 2006). Numerous fish tissue and crayfish samples exceeded the OEHHA screening criterion. The Central Valley Regional Water Quality Control Board, Clean Water Act Section 305(b) and 303(d) Integrated Report for the Central Valley Region, includes the North Fork American River, Hell Hole Reservoir, and Oxbow Reservoir (Ralston Afterbay) on the 303(d) list of impaired waters for mercury (RWQCB 2009).

Elevated methyl mercury levels in the Sierra Nevada are often linked to historic mining activities, but may also be attributable to natural causes, including geologic and atmospheric conditions. The source of the mercury in the Middle Fork American River Watershed is unknown, but it is not related to the MFP. Methyl mercury concentrations in sport fish muscle tissues and crayfish are likely to remain elevated in the future. Similar fish tissue results have been reported throughout the Sierra Nevada. Implementation of Alternative 1 will have no effect on methyl mercury levels compared to the No-Action Alternative. In addition, the Mercury Bioaccumulation Monitoring Plan

will be implemented to monitor methylmercury concentrations in muscle tissue of sport fish species (PCWA 2011d).

3.4.2 Project Maintenance

Under Alternative 1, Project maintenance activities that could affect water quality include vegetation and noxious weed management, sediment management, and road and trail maintenance at Project facilities (including post-construction maintenance at modified or newly constructed facilities); and routine annual and heavy maintenance at Project recreation facilities and features (including post-construction maintenance at newly constructed Project recreation facilities and features). As identified in Section 2.0 – Elements Analyzed, Tables 2-3 through 2-7, maintenance activities at Project facilities, Project roads and trails, and Project recreation facilities and features are modified under Alternative 1 compared to the No-Action Alternative. These modifications include changes to the location, timing, and methods for implementation of maintenance activities. The modifications are intended to improve Project capabilities and reliability, and to protect and enhance biological, recreational, and cultural resources. These activities are discussed below with respect to water quality.

3.4.2.1 Vegetation and Noxious Weed Management

The use of herbicides, surfactants, and fungicides (chemical) as part of routine vegetation and noxious weed management under Alternative 1 could affect water quality. Specifically, the use of these chemicals adjacent to the bypass and peaking reaches and MFP reservoirs and diversion pools could potentially degrade water quality. Vegetation management under Alternative 1 will be conducted in accordance with the revised Vegetation and Integrated Pest Management Plan (VIPMP) (Attachment 1A). The type of vegetation management (e.g., trimming by hand or with equipment, herbicide/fungicide/rodenticide use, noxious weed management) that will be implemented under Alternative 1 is summarized by Project facility and features in Section 2.0 – Elements Analyzed, Tables 2.3 through 2.5. The VIPMP includes BMPs and AP measures to protect water quality that minimize the risk of potentially toxic chemical introduction into nearby waterbodies. These measures include:

- Restrictions on use of mechanical equipment near water bodies, rivers and streams, and wetland areas;
- Restrictions on the use of herbicides, surfactants, and fungicides within protective buffers;
- Use of herbicide formulations that are considered by the Environmental Protection Agency (EPA) to be safe for aquatic areas;
- Required supervision of herbicide application by a licensed pest control advisor (PCA) and restrictive application and disposal methods; and
- Implementation of a Water Quality Monitoring Plan for Chemical Treatment Program to evaluate the effectiveness of protective measures included in the VIPMP (Attachment 1A).

Implementation of these measures under Alternative 1 will protect water quality. Therefore, water quality will be maintained under Alternative 1.

3.4.2.2 Sediment Management

Under Alternative 1, sediment management that could potentially impact water quality will be implemented at the small diversions and medium dams. Potential impacts to water quality include increased erosion and sedimentation and discharge of pollutants (e.g., fuels and hazardous materials) into adjacent reservoirs and rivers and the groundwater during maintenance activities.

Small Diversions

At the small diversion pools, sediment management activities under Alternative 1 are less frequent and potentially eliminated (PCWA 2011c). Specifically, the small diversion dams will be modified 2–4 years after license issuance allowing the natural transport of sediment downstream during high-flow events. This substantially reduces the need for future sediment removal activities. Under Alternative 1, these modified sediment removal activities at the small diversion pools reduce the potential for future water quality effects compared to the No-Action Alternative.

Interim and contingency sediment management activities may be conducted at the small diversion pools prior to, and following completion of, the diversion dam modifications. The Sediment Management Plan (SMP) (PCWA 2011c) includes turbidity sampling during both interim and contingency sediment removal activities to protect water quality:

- Should the average of the downstream turbidity samples exceed 25 Nephelometric Turbidity Units (NTU) or exceed the upstream measurements by more than 20% (whichever is higher), work will cease and an immediate site evaluation will be completed to assess the cause and need for implementation of any additional measures to reduce turbidity levels. If necessary, additional BMPs (e.g., silt screens) will be installed.
- Work will resume after NTUs are less than 25 or are within 20% of the upstream measurements. Turbidity sampling will occur once every 30 minutes for three hours after work resumes, to ensure compliance. After which, sampling will return to once every two hours.

Medium Dams

Under Alternative 1, the SMP specifies sediment removal, augmentation, and disposal at Ralston Afterbay and Middle Fork Interbay. Sediment removal at Ralston Afterbay and Middle Fork Interbay includes the drawdown of the reservoirs, establishment of instream flow bypass systems, excavation of sediments, and hauling excavated sediments to disposal areas or sediment augmentation areas by truck. These activities could potentially impact water quality.

Alternative 1 also includes new sediment augmentation activities downstream of Middle Fork Interbay (Middle Fork Interbay Augmentation Area) and Ralston Afterbay (Indian Bar and Junction Bar Augmentation areas) (PCWA 2011a). Placement of material at the Junction Bar Augmentation Area includes the installation of a temporary bridge to span the active channel. During sediment removal activities at these two medium reservoirs, a portion of the removed material (preferentially selected within the preferred spawning particle size requirements of aquatic resources) will be placed in the new sediment augmentation areas. At high flows, the material will be mobilized and transported downstream to enhance aquatic resources. During placement of the material at the sediment augmentation areas, erosion and sedimentation could temporarily increase turbidity levels in the adjacent water bodies. In addition, the accidental release of hazardous materials from heavy equipment used during these activities could degrade water quality.

The SMP specifies water quality protection measures under Alternative 1 for sediment removal, augmentation, and disposal activities at Middle Fork Interbay and Ralston Afterbay Dam. These measures include requirements to:

- Minimize erosion by specifying construction timing;
- Minimize erosion from exposed slopes and disposal areas by stabilizing road slopes and spoil disposal areas;
- Prevent pollutants (e.g., fuels, lubricants, and other hazardous materials) from being discharged into the rivers, streams, or impoundments, including development of Spill Prevention Control and Counter Measure plans;
- Minimize disturbance and associated sediment production by restricting areas of in-channel excavation;
- Minimize downstream sedimentation by diverting flows around construction sites; and
- Minimize erosion after construction by revegetating surface areas disturbed by Project maintenance activities.

The SMP also specifies monitoring to protect water quality during and after sediment management activities at Middle Fork Interbay and Ralston Afterbay, and includes:

- Turbidity monitoring to protect water quality prior to, during, and after sediment removal activities, including the following:
 - Should the average of the downstream turbidity samples exceed 25 Nephelometric Turbidity Units (NTU) or exceed the upstream measurements by more than 20% (whichever is higher), work will cease and an immediate site evaluation will be completed to assess the cause and need for implementation of any additional measures to reduce turbidity levels. If necessary, additional BMPs (e.g., silt screens) will be installed.
 - Work will resume after NTUs are less than 25 or are within 20% of the upstream measurements. Turbidity sampling will occur once every 30 minutes

for three hours after work resumes, to ensure compliance. After which, sampling will return to once every two hours.

- Sediment transport monitoring at the augmentation areas after high flow events to characterize the amount of sediment that was mobilized and to monitor any potential build-up of sediment in the low-flow channel adjacent to the augmentation areas.
- Mercury monitoring during sediment removal activities at Ralston Afterbay (PCWA 2011a). Specifically, bulk samples will be collected from within the reservoir and water samples will be collected from downstream of the Ralston Afterbay.
- Channel condition monitoring prior to and after sediment augmentation activities downstream of the dams, including monitoring of residual fine sediment in pools and channel cross-sections.

Implementation of the monitoring, BMPs, and AP measures specified in the SMP will protect water quality during sediment management activities. Therefore, water quality will be maintained under Alternative 1.

3.4.2.3 Road and Trail Maintenance

Maintenance of Project roads and trails, and Project recreation facility access roads is described in the revised Transportation System Management Plan (TSMP) (Attachment 1B) and summarized in Section 2.0 – Elements Analyzed, Table 2-4. These maintenance activities are the same under Alternative 1 and the No-Action Alternative. Under Alternative 1, road and trail maintenance will be implemented at additional locations (e.g., new Project roads and trails and existing trails that have been added to the MFP) (Section 2.0 – Elements Analyzed, Table 2-4). The TSMP lists BMPs and AP measures that will be implemented during road and trail maintenance to protect water quality. Implementation of these measures will protect water quality, while maintaining the road and trail surfaces and drainage features (e.g., culverts, water bars, ditches, etc.) in good condition. Maintaining the road and trail surfaces and drainage features will further protect water quality by reducing erosion and sedimentation into nearby water bodies. Therefore, water quality will continue to be protected under Alternative 1.

3.4.2.4 Maintenance at Project Recreation Facilities

Routine annual and heavy maintenance at Project recreation facilities and features, existing recreation facilities and features added to the MFP, and post-construction maintenance at new Project recreation facilities are described in the Recreation Plan (USDA-FS 2011; CDFG 2011). Routine annual and heavy maintenance will occur at all Project recreation facilities and features (Section 2.0 – Elements Analyzed, Table 2-5). The specific routine maintenance activities and heavy maintenance activities to be implemented under Alternative 1 are identified in Section 2.0 – Elements Analyzed, Tables 2-6 and 2-7, respectively.

Potential impacts to water quality during maintenance at Project recreation facilities and features include increased erosion and sedimentation into adjacent rivers, streams, and reservoirs; discharge of pollutants (e.g., fuels, lubricants, and other hazardous materials) and other contaminants (e.g., human and animal waste, petroleum products) into adjacent rivers, streams, and reservoirs and groundwater; and contamination of the recreation facility water supply system.

The Recreation Plan includes BMPs and AP measures that will be implemented during routine and heavy maintenance activities at developed Project recreation facilities and features, and areas adjacent to or associated with Project reservoirs and other Project facilities where recreation use occurs to protect water quality. These measures include requirements to:

- Minimize erosion by specifying maintenance timing;
- Minimize erosion and sedimentation from disturbed ground;
- Prevent pollutants (e.g., fuels, lubricants, and other hazardous materials) from being discharged into the rivers, streams, or impoundments;
- Implement protection activities when maintenance activities occur in a stream management zone;
- Reduce the amount of surface erosion at developed sites and the amount of soil entering streams;
- Ensure safe drinking water at Project recreation facilities;
- Protect surface and subsurface water from bacteria, nutrients, and chemical pollutants resulting from sewage; and
- Regulate discharge and disposal of potential pollutants.

In addition, all Project maintenance activities associated with providing potable water will be in accordance with California state laws and all applicable BMPs specified in the Recreation Plan.

Implementation of BMPs and AP measures during all Project maintenance activities will enhance water quality, as follows:

- Routine and heavy maintenance of road and parking lot surfaces, drainage features, gravel parking lots, and boat ramps will ensure that these facilities are maintained in good condition, thereby reducing erosion and sedimentation into nearby waterbodies;
- Maintenance of potable water and sanitation/restroom facilities, and removal/upgrades of antiquated restroom/sanitation facilities will reduce possibility of contamination of ground and surface waters;
- Maintenance of dispersed use areas and upgrades/rehabilitation of trails will contain vehicle and recreation use within specified areas, which will reduce potential for erosion and sedimentation into nearby waterbodies and rivers;

- Maintenance at some Project recreation facilities will result in a reduction in the footprint size and contain recreation use to smaller areas, thereby reducing erosion and sedimentation into nearby water bodies and rivers; and
- Revegetation of disturbed areas will reduce potential for erosion and sedimentation after maintenance activities.

3.4.3 Modification of Existing or Construction of Project Facilities and Project Recreation Facilities and Features

Under Alternative 1, modification or construction projects will be implemented to improve operations and maintenance of the Project, enhance environmental resources, and/or meet the requirements specified in new environmental programs, measures, and facilities. These projects are described in Section 2.0 – Elements Analyzed. Modification of existing or construction new Project facilities and Project recreation facilities and features could potentially affect water quality. Potential construction-related impacts to water quality include increased erosion and sedimentation into adjacent rivers, streams, and reservoirs; discharge of pollutants (e.g., fuels, lubricants, and other hazardous materials) and other contaminants (e.g., human and animal waste, petroleum products) into adjacent rivers, streams, and reservoirs and groundwater; and contamination of water supply system. In addition, grading, vegetation removal, and other ground-disturbing activities could increase the susceptibility of the project areas to increased erosion and sedimentation. Appendix A – Modified or New Facility Construction Activities and Concept Designs provides a detailed description of modification and construction activities at each of the Project facilities and features associated with Alternative 1.

Potential construction-related impacts to water quality will be avoided by implementing the applicable BMPs and AP measures identified in Appendix A. These measures include requirements to reduce the potential for erosion and sedimentation by:

- Restricting activities to minimize erosion by conducting operations during periods of minimal runoff;
- Minimizing erosion and sedimentation from disturbed ground;
- Developing an erosion control plan prior to construction activities;
- Establishing preventative measures to divert surface runoff around bare areas;
- Constructing drainage facilities to control erosion and/or sedimentation during earthwork;
- Implementing measures to prevent or minimize erosion, including vegetative and/or mechanical measures to improve surface soil stability; and
- Revegetating unstable or disturbed soil surfaces as soon as possible to minimize erosion potential.

The modification or construction projects that could potentially impact water quality are discussed below.

3.4.3.1 Project Facilities

Alternative 1 includes construction and modification of the following Project facilities that could affect water quality:

- Construction of Hell Hole Reservoir Seasonal Storage Increase Improvement;
- Modification of Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon diversion dams;
- Modification of outlet works at French Meadows Dam, Hell Hole Dam, and Middle Fork Interbay Dam; and
- Construction of four new gages and associated features (including access trails, gage houses, photovoltaic poles, powerlines, and cableways) at North Fork Long Canyon Creek below Diversion Dam, South Fork Long Canyon Creek below Diversion Dam, Middle Fork American River below Interbay Dam, and North Fork American River above American River Pump Station.

Construction and modification that will be implemented under Alternative 1 and may affect water quality at each of these facilities are described below.

Hell Hole Reservoir Seasonal Storage Increase Improvement

The Hell Hole Reservoir Seasonal Storage Increase Improvement includes the modification of the existing 350-foot-long Hell Hole Dam spillway and the construction of a new control building, powerline, and road. Construction activities will occur on the dam, spillway channel, and other previously developed/disturbed areas (e.g., the area between the spillway and the dam, the Foresthill Field Office Storage Yard). The improvement will allow PCWA to seasonally increase the storage capacity of Hell Hole Reservoir. Potential effects of changes in water surface elevation from implementation of the improvement will be negligible (refer to Section 3.7 – Geomorphology). Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. Therefore, the Hell Hole Reservoir Seasonal Storage Increase Improvement will maintain water quality.

Small Diversion Modification

Construction activities at the three small diversions include: (1) installation of self-cleaning wedge-wire screens at the dams; (2) modification of the dams to accommodate the screens; (3) modification of the low-level outlets to release the required instream flows; and (4) modification or installation of gages. The small diversion modifications will result in diversion pools that are slightly shallower and more riverine. Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. In addition, the SMP (PCWA 2011c) includes post-construction effectiveness monitoring at the small diversions after completion of the modifications. The modifications of the small diversion facilities will reduce/eliminate the need for PCWA to (1) periodically remove debris that accumulated at the intakes of the small diversions and (2) conduct sediment removal at these

locations (refer to Section 3.4.2.2). This will reduce the potential for erosion and sedimentation that may occur during these activities, and in turn, reduce the potential for erosion and sedimentation into nearby water bodies. In addition, the small diversion modifications will allow sediments to be naturally transported past the diversion facilities during high-flow events. This will provide long-term channel geomorphology and aquatic and riparian ecosystem benefits. Therefore, the modifications of the small diversions will enhance water quality.

Outlet Works Modification

The existing outlet works will be modified to enable the release of new instream flow requirements, and where appropriate, install new gages to collect flow data for compliance. Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. The outlet works modifications will allow for the release and measurement of flows that have long-term benefits to the downstream aquatic and riparian ecosystems. Therefore, water quality will be maintained under Alternative 1.

New Gage Construction

Under Alternative 1, construction of new gages and associated features (e.g., photovoltaic poles, powerlines, cableways, trails to access new gages, gage houses) could potentially adversely impact water quality. The four new gages will monitor minimum instream flows and pulse flows for compliance with the new license and collect real-time flow information for public dissemination. Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. The new gage construction will allow for the measurement of flows that have long-term benefits to the downstream aquatic and riparian ecosystems. Therefore, water quality will be maintained under Alternative 1.

3.4.3.2 Project Recreation Facilities and Features

Under Alternative 1, construction activities associated with four recreation facilities could potentially affect water quality: (1) a new trail along the French Meadows Reservoir shoreline, (2) a new parking area near Ellicott Bridge; (3) replacement of the French Meadows Campground South Shore Water Supply Line; and (4) replacement of the French Meadows Campground North Shore Water Supply Line.

French Meadows Reservoir Trail

Under Alternative 1, the French Meadows Trail will be constructed on the south side of French Meadows Reservoir between the reservoir shoreline and Forest Road 96 and will connect French Meadows Campground and French Meadows Dam. The trail will be 5-foot wide for pedestrian and bike use. Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. Once the trail is upgraded/rehabilitated it will contain recreational use within specified areas. This will reduce the potential for erosion and sedimentation into

nearby water bodies and rivers. Therefore, water quality will be enhanced under Alternative 1.

Ellicott Bridge Parking Area

Under Alternative 1, PCWA will design and construct a parking area and install a toilet in the undeveloped parking area adjacent to Eleven Pines Road, south and west of Ellicott Bridge. Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. Improvement of the parking area will help protect water quality in the Rubicon River by focusing parking, river access, and other recreation activities in defined areas, which will in turn, reduce the potential for erosion and sedimentation into the river. Construction of new restroom facilities will ensure that groundwater and surface waters are protected. Therefore, water quality will be maintained under Alternative 1.

Water Supply Replacements

Under Alternative 1, PCWA will replace the entire 1,950 foot long French Meadows Campground South Shore Water Supply Line and the 2.5 mile long French Meadows North Shore Water Supply Line. All infrastructure including drains, valves, pipes, and other items will be replaced. In addition, the roads that access the supply lines will be upgraded to meet current USDA-FS standards (refer to the TSMP). Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. In addition, all construction activities associated with providing potable water will be in accordance with California state laws and all applicable BMPs specified in the Recreation Plan. The replacement of the water supply lines will improve the availability and reliability of a potable water source to the public at numerous recreation facilities (French Meadows Campground, French Meadows Picnic Area, French Meadows Boat Ramp, Lewis Campground, Gates Group Campground, Coyote Group Campground, McGuire Picnic Area, McGuire Boat Ramp, and French Meadows RV Dump Station). The improvements to the existing road surfaces will reduce the potential for erosion and sedimentation into nearby water bodies. Therefore, implementation of this element of Alternative 1 will maintain water quality.

3.4.4 Conclusions—Water Quality

Overall, implementation of Alternative 1 will protect or enhance water quality compared to the No-Action Alternative, as summarized in the following:

- Increased instream flows will enhance water quality downstream of French Meadows Dam;
- Implementation of BMPs and AP measures included in the VIPMP, SMP, Recreation Plan, TSMP, and Appendix A will protect water quality during Project maintenance activities, and during modification of existing or construction of new Project facilities and Project recreation facilities and features;

- Implementation of water quality monitoring specified in the SMP will protect water quality during sediment management activities (removal, augmentation, and disposal) at the small diversion and medium dams;
- Implementation of maintenance activities at Project recreation facilities will ensure that the facilities are maintained in good condition, contain recreation use within specified areas, and revegetate disturbed areas, which will enhance the protection of ground and surface waters; and
- Revegetation of disturbed areas will reduce potential for erosion and sedimentation after maintenance activities.
- In addition, PCWA will monitor physical, chemical, and bacterial water quality conditions in the bypass and peaking reaches and reservoirs associated with the MFP over the term of the license (PCWA 2011d).

3.4.5 Unavoidable Adverse Effects

There are no unavoidable adverse effects to water quality under Alternative 1.

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Appendix C. Habitat Time Series Relationships.

Appendix D. Reservoir Water Surface Elevation Plots.

3.5 FISH AND AQUATIC RESOURCES ENVIRONMENTAL EFFECTS

This section describes potential impacts to riverine and reservoir fish and aquatic resources under Alternative 1 for the Middle Fork American River Project (MFP or Project). Potential impacts to riparian resources are identified in Section 3.8 – Riparian Resources. Potential impacts to geomorphology resources are provided in Section 3.7 – Geomorphology. Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facility Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1 to protect fish and aquatic resources.

Potential impacts to fish and aquatic resources have been identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing recreation facilities; maintenance at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section.

Potential impacts to fish and aquatic resources include loss or degradation of habitat, reduction in productivity (algae, benthos), reduction in habitat and/or species diversity, modification of a species distribution, reduced growth/condition/abundance of a species, modifications to timing of breeding seasons, and loss of individuals. Potential impacts evaluated in this analysis are based on the activities to be implemented under the Alternative 1. Impacts on fish and aquatic resources are evaluated as follows:

- Potential impacts on riverine physical habitat from changes in Project operations affecting:
 - Hydrology
 - Channel geomorphology and sediment transport and supply
 - Riparian vegetation
 - Water temperature and dissolved oxygen
 - Wetted perimeter
- Potential impacts on the riverine aquatic community from changes in Project operations affecting:
 - Productivity (algae and benthos)
 - Habitat and species diversity
 - Seasonal hydrograph shape and year-to-year flow variability
 - Peaking reach flow fluctuations

- Potential impacts on riverine fish from changes in Project operations affecting:
 - Fish distribution
 - Growth/condition/abundance
 - Bypass reach habitat
 - Peaking reach habitat
- Potential impacts on foothill yellow-legged frogs (FYLF) from changes in operations affecting:
 - Distribution, abundance, and breeding timing
- Potential impacts on reservoir fish from changes in operations, sediment management, and fish stocking affecting:
 - Physical habitat and fish populations
- Potential impacts on fish entrainment from modification of small diversion dams and other Project facilities
- Potential impacts on fish and aquatic resources from vegetation and noxious weed management affecting:
 - Water quality and aquatic habitats
- Potential impacts on fish and aquatic resources associated with modification of existing Project facilities, construction of new Project facilities and Project recreation facilities and features, and sediment management activities affecting:
 - Water quality and aquatic habitats
 - Loss of individuals

The hydrology baselines and hydrology operations model runs used to quantify impacts of Alternative 1 compared to the No-Action Alternative are discussed in Section 3.1 – Analytical Approach.

A description of the potential impacts to fish and aquatic resources resulting from implementation of Alternative 1, considering AP and enhancement measures, by resource topic, is provided below. At the end of this section, an impact conclusion is provided for fish and aquatic species, including special-status aquatic species (Section 3.5.10). There are no unavoidable adverse effects to fish and aquatic resources, including special-status aquatic species, resulting from implementation of Alternative 1 as discussed at the end of this section.

3.5.1 Riverine Physical Habitat

Alternative 1 will modify minimum instream flows, environmental pulse flows (including down ramp rates), down ramping of spill flows, operations of the Oxbow Powerhouse, recreation flows, and sediment management. The riverine physical habitat that Alternative 1 could potentially impact includes: (1) hydrology; (2) channel geomorphology and sediment transport and supply; (3) riparian vegetation; (4) water

temperature and dissolved oxygen; and (5) wetted perimeter. Each element is discussed below.

3.5.1.1 Hydrology

The MFP operations effects bypass and peaking reaches (PCWA 2011a, Map 7.3–2). The bypass reaches are sections of streams/rivers below diversions or reservoirs where Project operations result in the diversion of a portion of the water from that reach. The peaking reach is the river below Oxbow Powerhouse. In the peaking reach, flows fluctuate substantially to meet power demand or to support whitewater recreation.

The bypass reaches associated with the MFP include:

- Duncan Creek, North Fork Long Canyon Creek, South Fork Long Canyon Creek, Long Canyon Creek, Middle Fork American River below French Meadows Reservoir, Middle Fork American River below Middle Fork Interbay, and Rubicon River

The peaking reach includes:

- Middle Fork and North Fork American rivers below Oxbow Powerhouse

In the bypass and peaking reaches, Alternative 1 specifies modifications to hydrology including:

- Higher minimum instream flows in all bypass and peaking reaches;
- Environmental pulse flows in the all bypass reaches and down ramping of spill flows in the bypass reaches below French Meadows and Hell Hole reservoirs; and
- Specific operations requirements at Oxbow Powerhouse to reduce flow fluctuation in the peaking reach.

Minimum Instream Flows

Alternative 1 minimum instream flow requirements are either greater than or equal to the No-Action Alternative minimum instream flow requirements in all bypass and peaking reaches. Alternative 1 greatly increases the spring minimum instream flow requirements in all reaches in all water year types. Summer instream flow requirements are also increased in all bypass and peaking reaches in wet and above normal water year types. Summer flow requirements in the drier year types (critical, dry, and above normal) are increased above or maintained at the No-Action Alternative minimum instream flow requirements, depending on location. Winter minimum flow requirements are either increased or maintained compared to the No-Action Alternative (Figures 3.5-1a–g).

Alternative 1 specifies maximum flow releases during short-term outages (less than two weeks) to protect FYLF during the breeding and rearing (tadpole) seasons (May –

September) from Hell Hole Reservoir into the Rubicon River and from French Meadows and Middle Fork Interbay into the Middle Fork American River (USDA-FS 2011; CDFG 2011b).

Figures 3.5-2a–g show the minimum flow for each day of the year in Alternative 1 (resulting from implementation of the resource agencies instream flow and reservoir minimum pool conditions [USDA-FS 2011; CDFG 2011b; DOI 2011]) compared to the measured historical hydrology used to represent the No-Action Alternative. For each water year type, the analysis shows the minimum daily flow that occurred based on all the hydrology for years with the same water year type (i.e., a composite of all the data in each water year type for 1975–2007 hydrology period of record). In the peaking reach, the analysis for Alternative 1 is based on the hourly model data (minimum for each day) and in the No-Action Alternative the analysis is based on the 15-minute historical flow data (minimum for each day) for the 1988–2007 period of record. There are some instances in the small streams (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek) where the minimum daily flow is below the minimum flow line on the figures. The minimum flow requirement in these streams is the “minimum flow or inflow, whichever is less” and in some year types the inflow is less than the specified minimum flow. Also, on the figures, the Alternative 1 minimum flow is often a few cfs higher than the minimum flow requirement; this represents a purposeful over-release of water in the hydrology operations model to mimic how the Project would be operated to avoid minimum flow violations.

Environmental Pulse Flows (including Reservoir Spills)

Scheduled environmental pulse flows are included in Alternative 1 in May–June of wet and above normal water year types in all bypass reaches. The wet and above normal year types encompass approximately 50% of the water years in the 33-year period of record (1975–2007) (PCWA 2011a, Table 7.3-2a). The No-Action Alternative does not specify environmental pulse flows; although, high spring flows have occurred historically as a result of reservoir spills or inflows exceeding the capacity of diversions. Alternative 1 increases the number of years that environmental pulse flows would occur in May by 71–300% (9–18 years during the period of record) compared to the No-Action Alternative (5–7 years during the period of record) depending on the reach (Table 3.5-1). This analysis includes the reservoir spill flows or stream flows that exceed diversion capacity in May.

In the peaking reach, no environmental pulse flows are specified in Alternative 1 because natural high-flow events from unimpaired river inflows (North Fork of the Middle Fork American River, North Fork American River) and accretion flows from smaller watersheds in the reach provide high-flow events. Therefore, the frequency of high-flow events in Alternative 1 is maintained compared to the No-Action Alternative (Section 3.5.1.2).

Alternative 1 specifies streamflow release facility modifications (Section 2.0) and additional flow gaging stations (Streamflow and Reservoir Elevation Gaging Plan [SREGP] [PCWA 2011b]) necessary to release and monitor the environmental pulse

flows into six bypass reaches. Environmental pulse flows and the down ramp of the pulse flows would not be possible under the No-Action Alternative. In particular, modification of release facilities at Hell Hole Dam and modification of the small stream diversion structures (Duncan, North Fork Long Canyon, and South Fork Long Canyon) in Alternative 1 (Section 2.0) will allow pulse flow releases and flow gaging at these locations that could not occur with the No-Action Alternative.

The Alternative 1 also requires that reservoir spills be down ramped at Hell Hole Dam and French Meadows Dam when spill occurs in May–July (USDA-FS 2011; CDFG 2011b; DOI 2011). In addition, at Hell Hole Dam some spills will be extended for four days and then down ramped. In the No-Action Alternative, no down ramping of May–July spills will occur at Hell Hole or French Meadows dams. There are seven years (in the 33-year period of record) that spills are down ramped under the Alternative 1 that, otherwise, would not be down ramped in the No-Action Alternative.

In Alternative 1, the down ramp of environmental pulse flows and reservoir spills provides a slowly declining hydrograph that provides riparian and other environmental/recreational benefits compared to the faster decline of spill flows for the No-Action Alternative. The Alternative 1 down ramp was set at an average rate of approximately 1.6 inches of stage per day. For the spill-event down ramp, the same rate was used for Hell Hole Dam; but a faster down ramp (approximately twice as fast) was used below French Meadows Dam due, in part, to the different environmental resource conditions (e.g., FYLF are not present in the river reach between French Meadows Dam and Middle Fork Interbay; riparian vegetation is sparsely distributed due to the coarse substrate and bedrock-dominated channel).

Accretion flows along the length of the bypass reaches further shape the declining limb (recession) of the pulse flows. The recession of the wet and above normal water year Alternative 1 and unimpaired hydrographs were compared. For comparison, the hydrographs between years were shifted to align the timing of the receding limbs (Figures 3.5-3a–b, 3.5-4a–b, and 3.5-5a–b). In addition, an average hydrograph by water year type was added to each of the figures. The average hydrographs were converted to stage using the average stage-discharge relationships at the instream flow study sites (PCWA 2011c) (Figures 3.5-6a–b, 3.5-7a–b, and 3.5-8a–b).

Accretion flows effects the recession hydrographs in the 29.7-mile-long reach of the Rubicon River. For example, in the lower 20-mile reach of the Rubicon River that contains FYLF (RM 0.6–RM 20.9), the Alternative 1 flow recessions were similar to or slower than the unimpaired hydrograph recessions (Figure 3.5-6a–b and 3.5-7a–b). On average the Rubicon River Alternative 1 recessions at Ellicott Bridge (R20.9) were approximately 1.1 inches stage/day (wet years) and 0.8 inches stage/day (above normal) compared to the unimpaired recessions of approximately 1.1 inches stage/day (wet and above normal years). Below the Long Canyon Creek confluence on the Rubicon River (R3.5), the Alternative 1 hydrograph recessions were approximately 0.8 inches stage/day (wet years) and 0.9 inches stage/day in above normal years compared to the unimpaired recessions of approximately 1.0 inches stage/day (wet years) and 0.9 inches stage/day (above normal years).

For the Middle Fork American River below Middle Fork Interbay at MF26.2, the effect of accretion is shown in Figure 3.5-8a–b. The distance from Middle Fork Interbay to Ralston Afterbay is approximately 9.5 miles (RM 26.0 to RM 35.5). FYLF are present primarily in the lower 3 miles of the reach (RM 26.0 to approximately RM 29.0). The hydrograph recession rate at the bottom of the reach was approximately 0.9 inches stage/day (wet and above normal years) compared to the unimpaired recession of approximately 0.8 inches stage/day (wet years) and 1.4 inches stage/day (above normal years).

Peaking Reach Hydrology

In the peaking reach, Alternative 1 includes specific operational requirements at Oxbow Powerhouse to reduce: (1) flow fluctuations; and (2) powerhouse ramping rates.

FLOW FLUCTUATIONS

Alternative 1 increases minimum instream flow requirements (in all water year types) that were designed to decrease potential flow fluctuations in the peaking reach by about 100 cfs or more compared to the existing license requirements in the No-Action Alternative. Alternative 1 minimum flow requirements are shown in Figure 3.5-1g.

In addition to the minimum flow requirements, Alternative 1 specifies that PCWA will make an effort to regulate Oxbow Powerhouse flow releases during the months of November through February. This will include, to the degree possible, scheduling Oxbow Powerhouse generation to moderate peaking in the Middle Fork American River using available active Ralston Afterbay storage. The effort to moderate Middle Fork American River peaking shall cease for the remainder of the period should Ralston Afterbay spill due to natural flow conditions beyond the control of Placer County Water Agency (PCWA).

An analysis of the effect of Alternative 1 minimum flow requirements on flow fluctuations is provided below. The analysis used operations hourly model results compared to the 15-minute historical flows in the peaking reach between 1988–2007 (when 15-minute flow data are available). This analysis does not include PCWA's effort to regulate Oxbow Powerhouse flow releases during the November – February time period. The effect of regulating Oxbow Powerhouse on flow fluctuations is addressed qualitatively.

Two measures of flow fluctuation were used for the minimum flow/flow fluctuation analysis (Moog 1993; Bain 2009):

Absolute fluctuation = daily maximum – daily minimum

Peaking discharge ratio = daily maximum / daily minimum

The daily flow fluctuations (absolute fluctuation and peaking discharge ratio) were summarized (averaged) for three seasons: summer/fall (June–October), winter (November–February), and spring (March–May) and for each water year type (all, wet, above normal, below normal, dry, critical) (Figures 3.5-9a–b). In addition, flow

fluctuation exceedance plots for each seasons and water year type were created to show all of the daily data (Figure 3.5-10a–c and 3.5-11a–c). Maximum, minimum, median, and exceedance value (e.g., 90% exceedance) of flow fluctuations can be identified in these plots. Time series plots (Figures 3.5-12a–e) of the Alternative 1 and No-Action Alternative hydrographs show the flow fluctuations graphically. Five large run-off events with flows 20,000 cfs or greater were not included in the analysis; these events were not controllable by the MFP, and they biased the flow fluctuation results.

The results of the Alternative 1 minimum flow analysis shows that the daily-flow fluctuations were typically reduced in the summer and spring and were similar during the winter, compared to the No-Action Alternative (Figures 3.5-9a–b). During the winter, the results varied by water year type. In the winter, Alternative 1 fluctuations were greater in the drier water year types but fluctuations were less in the wetter water year types compared to the No-Action Alternative. Overall, for all water year types there was a 189-cfs reduction in absolute fluctuation and a 0.60 decrease in the peaking discharge ratio during the winter. During the summer, the flow fluctuations under Alternative 1 were reduced or remained the same in all water year types compared to the No-Action Alternative. The average reduction (across all water year types) was 84 cfs, absolute fluctuation, and 2.3, peaking discharge ratio (3.3 versus 5.6). The spring Alternative 1 reductions in flow fluctuation were larger than those that occurred during the summer.

The daily-flow fluctuation exceedance plots (Figures 3.5-10a–c and 3.5-11a–c) and time series plots (Figures 3.5-12a–e) show similar results as those described above. For example, the time series plots visually show that Alternative 1 increased minimum flows and modified powerhouse operations result in decreases in daily flow fluctuations compared to the No-Action Alternative.

Qualitatively, flow fluctuations during the November – February time period will be reduced by scheduling Oxbow Powerhouse generation to moderate peaking in the Middle Fork American River using available active Ralston Afterbay storage.

RAMPING RATES

Alternative 1 establishes Oxbow Powerhouse ramping rate requirements that result in ramping rate of approximately 1.0 feet per hour at numerous representative transects within the instream flow study sites in the peaking reach. This is 50% slower than the No-Action Alternative up ramping rate and 41% slower than the No-Action Alternative down ramping rate requirement. Table 3.5-2 shows hourly increments of 1.0 feet per hour flow change at the peaking reach instream flow study sites compared to the corresponding hourly stage change at the Foresthill Gage that is used for compliance in the No-Action Alternative. The 1.0 feet per hour ramping rate in Alternative 1 corresponds to an average 1.5 feet per hour up ramp and -1.77 feet per hour down ramp at the Foresthill Gage (the No-Action Alternative ramp rate requirement is 3.0 feet per hour).

The Alternative 1 ramping rate requirement is based on stepped flow change increments that approximate a 1.0 feet per hour ramping rate (Figure 3.5-13) at the

instream flow study sites. The actual increments of flow change at the Oxbow Powerhouse are compared to a continuous flow change relationship that would create a 1.0 feet per hour stage change at the instream flow sites in Figure 3.5-13. The stepped increments of ramping rate in Alternative 1 correspond closely to the continuous 1.0 feet per hour ramping rate relationship.

The effects of the Alternative 1 hourly ramping rate requirement on peaking reach hydrology is compared to historical impaired hydrology under the No-Action Alternative ramping rate requirement in Figure 3.5-14 for three seasons summer/fall (June–October), winter (November–February), and spring (March–May) (1988–2007 period of record). Alternative 1, when compared to the No-Action Alternative, reduces the percent of time that maximum daily ramping rates are greater than 400 cfs change per hour to 26% versus 40% in the summer/fall, 24% versus 40% in the winter, and 6% versus 29% in the spring. Note that some of the highest ramping rates in the figures are the result of storm events that are not controlled by the MFP.

3.5.1.2 Channel Geomorphology and Sediment Transport and Supply

Alternative 1 results in changes to hydrology and sediment management compared to the No-Action Alternative that could modify: (1) fine sediment in pools and gravels; (2) gravel supply; and (3) channel geometry.

Fine Sediment in Pools and Gravels

In the Middle Fork American and Rubicon rivers, Alternative 1 maintains/schedules a similar frequency of high flow events (5-year recurrence and gravel initiation of motion flows) that has occurred historically in the No-Action Alternative¹ (Tables 3.7-3a and 3.7-4a). Therefore, fine sediment in pools and spawning gravels will be maintained at the level of existing conditions (No-Action Alternative). Under existing conditions, the fine sediment volume in pools was very low (less than 8%, and often much less) (Table 3.7-2); and the percentage of fine sediments in spawning gravels was low and conducive to high spawning success (PCWA 2011d, Table 7.7-8).

In the small streams (Duncan, North Fork Long Canyon, South Fork Long Canyon, and mainstem Long Canyon creeks), the number days and years that the 5-year recurrence flows and the gravel initiation of motion flows occur under Alternative 1 are reduced compared to the existing conditions (No-Action Alternative) (Tables 3.7-3b and 3.7-4b). For example, the number of days of initiation motion in Alternative 1 is 39–85% of days in the No-Action Alternative. However, the number of days/years these flow events occur in Alternative 1 is sufficient to maintain low fine sediment content in pools and spawning gravels equivalent to the No-Action Alternative. In part, this is due to the low fine sediment supply present in the system (also see discussion below). The

¹ The No-Action Alternative does not include specified channel-maintenance flows; and while they have occurred in past operations, there is no guarantee that they would continue in the future under the No-Action Alternative.

Geomorphology/Riparian Monitoring Plan (GRMP) (PCWA 2011e) in Alternative 1 will be used to document fine sediment conditions in the small streams. A report summarizing the data collected each monitoring period will be prepared by PCWA and distributed to the United States Department of Agriculture-Forest Service (USDA-FS), State Water Resources Control Board (State Water Board), and California Department of Fish and Game (CDFG) for review and comment.

Gravel Supply

Alternative 1 specifies modifications to the small diversions and sediment augmentation activities at the medium reservoirs (Middle Fork Interbay and Ralston Afterbay) that will enhance sediment supply (particularly gravels) in the bypass reaches compared to the No-Action Alternative. Gravel supply would increase downstream of the following facilities: Duncan Creek Diversion, North Fork Long Canyon Diversion, South Fork Long Canyon Diversion, Middle Fork Interbay, and Ralston Afterbay. Table 7.7-11 (PCWA 2011d) shows the average annual amount of spawning gravel-sized sediment (75 to 2,645 cubic yards/year depending on location) that will pass downstream of these facilities in Alternative 1 rather than being captured and removed from the reaches under the No-Action Alternative.

Channel Geometry

Alternative 1 would maintain the channel geometry similar to the No-Action Alternative. The bypass and peaking reaches exhibit limited adjustability and they do not have any berm development under existing conditions (No-Action Alternative) (Section 7.7 [PCWA 2011d]). The number of days and years that the 5-year recurrence flows occur for Alternative 1 and No-Action Alternative are similar for all bypass reaches except the small streams (Table 3.7-3b). The GRMP in Alternative 1 will be used to document channel geometry in the small streams. A report summarizing the data collected each monitoring period will be prepared by PCWA and distributed to the USDA-FS, State Water Board, and CDFG for review and comment.

3.5.1.3 Riparian Vegetation

In Alternative 1, the riparian corridor along the bypass and peaking reach streams will be maintained or enhanced (similar vegetation composition and position along the stream channel, better recruitment in most reaches) compared to the No-Action Alternative (Section 3.8 – Riparian Resources).

3.5.1.4 Water Temperature and Dissolved Oxygen

Alternative 1 includes modifications to hydrology² (pulse flows, increased minimum instream flows) in the bypass reaches that have the potential to decrease water

² The effect of increased minimum flows from the South Fork Rubicon River, as a result of recent relicensing of the Upper American River Project, FERC Project No. 2101, was incorporated into both the

temperature. Alternative 1, however, is not anticipated to affect hydrology in a manner that will modify dissolved oxygen concentrations in the bypass reaches. In the peaking reach, Alternative 1 is not anticipated to affect hydrology in a way that will affect either water temperature (i.e., daily magnitude of flow is similar) or dissolved oxygen concentrations (see discussion below).

Decreased water temperature in the bypass reaches could potentially impact the location of the transition zones of coldwater and warmer water species (cold water trout and warmer water FYLF and hardhead). Transition zones are found in the middle/lower portion of the Rubicon River and the lower portion of the Middle Fork American River below Middle Fork Interbay. Secondly, potential decreases in water temperature could delay the timing of life history processes (e.g., breeding timing) or prolong development stages (e.g., egg incubation). The following discusses effects of Alternative 1 on water temperature in the late spring and summer.

Late Spring

In late spring, higher minimum instream flows in Alternative 1 have little effect on stream temperature due to cool air temperatures and accretion flows in the lower portion of the Rubicon River and Middle Fork American River below Middle Fork Interbay (PCWA 2011f). Alternative 1 pulse flows in May and early June; however, because they are high magnitude and occur when the rivers are beginning to warm, potentially can depress the water temperature or delay spring water temperature warming in these bypass reaches.

Analyses show that the Alternative 1 pulse flows in wet and above normal water years decrease the river temperatures up to 4°C and delay spring water temperature warming compared to the No-Action Alternative. Water temperature sensitivity modeling of pulse flows in the lower portion of the Rubicon River (R3.7) and lower portion of the Middle Fork American River below Middle Fork Interbay (MF26) (PCWA 2011f; Figures H-27 and H-16) show that pulse flows of similar or greater magnitude to those in Alternative 1 result in water temperatures that are below the reported FYLF breeding threshold of approximately 12°C (54°F). When the pulse flow begins to recede, water temperatures quickly increase above the pre-pulse water temperature.

Summer/Early Fall

The largest potential water temperature effects of higher minimum instream flows under Alternative 1 occur in the Rubicon River and Middle Fork American River below Middle Fork Interbay during the summer/early fall. Sensitivity modeling of wet years (e.g., 2006) indicate minor effects of the higher minimum flows on water temperature. Higher existing minimum flows and accretions in wet years minimize the effects of flow changes on water temperature. During drier water year types (critical, dry, and below normal water year types); however, when minimum flows are lower, increasing

hydrology and the boundary-condition water temperature inputs to the models in all of the water temperature analyses.

minimum flows could potentially reduce water temperature several degrees Celsius (PCWA 2011f).

Under Alternative 1, however, June–September water temperatures are very similar to the No-Action Alternative water temperatures in the Rubicon River and Middle Fork American River below Middle Fork Interbay in critical, dry, and below normal water year types. The reason for this is that there is little difference between the minimum flows of Alternative 1 and the No-Action Alternative in June–September in these water years (Figures 3.5-1a–g). The potential exception is in the Rubicon River in critical water year types when the Alternative 1 summer minimum flow is 15 cfs versus 10 cfs in the No-Action Alternative (see below). In this case, water temperature in the summer decreases less than 1°C along the length of the river.

Under Alternative 1, the locations of species-specific water temperature transition in the Middle Fork American River below Middle Fork Interbay are similar to the No-Action Alternative. The river miles where the July through August 17°C (FYLF lower optimum³ water temperature) transition and the 20°C (trout upper water temperature) transition occurs are shown in Tables 3.5-3a and 3.5-3b. The greatest difference/change in the location of the 17°C transition is 0.1 mile, and there is no change in the location of the 20°C transition.

For the Rubicon River, the location of the 17°C transition under the Alternative 1 is similar to the No-Action Alternative in dry and below normal water year types but is approximately 1 mile downstream in critical year types due to the increased minimum flow in the critical water year type under the Alternative 1 (10 cfs existing versus 15 cfs Alternative 1). Under the Alternative 1, the 20°C water temperature transition is 1.9 to 2.58 miles downstream compared to the No-Action Alternative, depending on water year type (Tables 3.5-3b).

Basin Plan

The bypass and peaking reach water temperatures in Alternative 1 are maintained compared to the water temperatures in the No-Action Alternative. The temperatures are consistent with the Basin Plan beneficial uses for cold freshwater habitat (COLD), warm freshwater habitat (WARM), and habitat for reproduction and early development of fish (CVRWQCB 2007). There is natural warming of the water along the length of the river reaches. This is consistent with the Basin Plan objectives (CVRWQCB 2007).

In the No-Action Alternative, dissolved oxygen concentrations in the bypass and peaking reaches were greater than 7.0 mg/L (PCWA 2011g), consistent with the Basin Plan objective of 7.0 mg/L (CVRWQCB 2007). Dissolved oxygen concentrations will not

³ Water temperature identified by FYLF experts, Dr. Amy Lind, USDA-FS and Dr. Sarah Yarnell, Cardno ENTRIX as an approximate lower-optimum summer (July through August) water-temperature range for FYLF, which also corresponds approximately to the upstream distribution of FYLF in the Rubicon River and the Middle Fork American River.

be affected by Alternative 1; therefore, they will be maintained compared to the No-Action Alternative.

The Water Quality Monitoring Plan (WQMP) (PCWA 2011h) will periodically characterize water quality in the bypass and peaking reaches and reservoirs associated with the MFP over the term of the new license.

3.5.1.5 Wetted Perimeter

Alternative 1 specifies higher minimum instream flows and provides pulse flows that increase wetted perimeter. The effects of the minimum instream flows on wetted perimeter are quantified below for three seasons in the bypass reaches (spring, summer/fall, and winter) and for four seasons in the peaking reach (spring, summer, fall, and winter). In the bypass reaches, the percent change in the 50% exceedance value (median) of wetted perimeter is compared to the No-Action Alternative and the Existing License Condition for each water year type. The median value of wetted perimeter was derived from a daily time series analysis using the wetted perimeter versus discharge relationships (PCWA 2011c). In the peaking reach, the percent change in wetted bed area at the 2D modeling sites was used instead of wetted perimeter (wetted bed area is a readily available metric from the 2D models).

The analysis shows that Alternative 1 maintains or enhances wetted perimeter/bed area in all river reaches (Tables 3.5-4a–d; Appendix B), as discussed below, by season.

- **Spring:** Wetted perimeter increases approximately 10% or more at the top of the bypass reaches due to the increased minimum instream flows in Alternative 1 compared to the No-Action Alternative. Spring wetted-perimeter enhancement is less in the lower end of the bypass reaches, because natural accretion augments the minimum flows such that the incremental effect of the increased minimum flow is reduced (i.e., “dilutes” the effect of the increases in minimum flow). In the peaking reach the average increase in wetted perimeter is 11%.
- **Summer:** Wetted perimeter increases approximately 3% in the Rubicon River and the Middle Fork American River reaches. In the small streams, there is no change because these streams are typically at natural flow in the summer. In the peaking reach, the average increase is 9%.
- **Winter:** Wetted perimeter increases approximately 3% in the Rubicon River. In the Middle Fork American River reaches the wetted perimeter remains about the same. In the small streams, there are a couple of instances, water year types, where the wetted perimeter decreases slightly due to a couple of water years when historically the diversions were not operated for various reasons; but they would be in Alternative 1. The average wetted perimeter in the small streams, however, ranges from 98 to 99% of the No-Action Alternative.
- **Fall:** Wetted bed area increases approximately 7% in the peaking reach during all water year types compared to No-Action Alternative.

3.5.2 Riverine Aquatic Community

As described above, Alternative 1 modifies instream flows and physical habitat, which has the potential to affect: (1) productivity (algae and benthos); (2) habitat and species diversity; (3) the seasonal hydrograph shape and year-to-year flow variability; and (4) peaking reach flow fluctuations.

3.5.2.1 Productivity (Algae and Benthos)

Alternative 1 increases or maintains wetted perimeter in the bypass and peaking reaches compared to the No-Action Alternative (Section 3.5.1.5). This increase in wetted perimeter in Alternative 1 will result in enhanced productivity (algae and benthos) compared to the No-Action Alternative. Productivity related to flow fluctuations in the peaking reach is discussed in Section 3.5.2.4.

The Benthic Macroinvertebrate Monitoring Plan (BMIMP) (PCWA 2011i) will monitor and report benthic macroinvertebrates (BMI) abundance and community metrics in selected bypass and peaking reaches associated with the MFP during the term of the new license.

3.5.2.2 Habitat and Species Diversity

Alternative 1 maintains or increases minimum instream flows in all river reaches (Section 3.5.1.1). The increases in minimum instream flow, where they occur, result in an overall increase in total stream habitat compared to the No-Action Alternative (PCWA 2011g, Appendix B2; Tables 1A–12B and Figures 1–36) and (PCWA 2011c, Appendix M). Within the range of instream flows encompassed by Alternative 1 and No-Action Alternative, the amount of deeper and faster water-habitat types increase with increased flow. At the same time, the increases in minimum instream flows result in relatively small changes in the amount of shallow and slower water habitat in each of the stream reaches. The increase in deeper and faster water, while maintaining shallow and slow water habitats, increases the diversity of habitat types and is an enhancement to the overall aquatic community under Alternative 1 (e.g., PCWA 2011g, Table 7.5-3).

3.5.2.3 Seasonal Hydrograph Shape and Year-to-Year Flow Variability

Alternative 1 increases the dynamic nature of the flows in the bypass reaches associated with the MFP. Alternative 1 specifies higher minimum instream flows in the wetter water year types and increases instream flows during the spring of all year types compared to the No-Action Alternative. Alternative 1 will create flow regimes in each of the bypass reaches that are more naturally shaped both seasonally and between water year types, which are typically viewed as a benefit to the aquatic community (Poff et al. 1997). The Alternative 1 minimum instream and pulse flow regimes are, therefore, an enhancement to the aquatic community.

3.5.2.4 Peaking Reach Flow Fluctuations

Flow fluctuations related to hydroelectric generation peaking have the potential to reduce overall productivity of rivers (Morgan et al. 1991; Cushman 1985; Gislason 1985; Moog 1993; Bain 2009) and to affect the diversity of aquatic species and/or abundance of juvenile life stages (e.g., shallow, slow water species, and life stages) (Bain et al. 1988; Kinsolving and Bain 1993; Scheidegger and Bain 1995; Bain 2009). Many aquatic species have specific habitat requirements and limited mobility (e.g., Edington 1968) and daily-flow fluctuations modify the location and amount of habitat (depths and velocities and/or location of the channel margin), thereby decreasing overall habitat quality and availability. Habitat for relatively immobile species, such as aquatic macroinvertebrates, was modeled and quantified using an effective habitat analysis (quantifies the habitat that maintains suitability continuously over a specified time period such as a day or season) (PCWA 2011c).

Alternative 1 reduces flow fluctuations in the peaking reach by increasing minimum flows year-round and modifying operations at Oxbow Powerhouse in November – February (Section 3.5.1.1). Increases in effective food-production habitat in the peaking reach were estimated using effective food-production plots (PCWA 2011g, Appendix B2, Figures 43 and 50). If, for example, the Alternative 1 peaking ranged from 1,025 cfs (maximum Oxbow Powerhouse release) to 200 cfs (Alternative 1 dry water year summer minimum instream flow) instead of 1,025 to 75 cfs (75 cfs is the No-Action Alternative summer minimum flow requirement), the increase in effective food-production habitat would range from approximately 70–170% at the instream flows study sites in the peaking reach compared to the No-Action Alternative. Similar reductions in average peaking ratio to 5.1 (1,025 cfs/200 cfs) from 13.7 (1,025 cfs/75 cfs) using the data in Moog (1993) would result in a 160% increase in fish biomass. The actual amount of fish biomass increase under Alternative 1 is unknown, but fish biomass is expected to be enhanced compared to the No-Action Alternative.

The Alternative 1 decrease in flow fluctuations, increased minimum flows, and increased wetted perimeter will also decrease the amount of varial zone area in the peaking reach (the area along the stream margin that is subject to wetting and drying resulting from hydropower peaking). Decreasing the varial zone should increase the abundance of species/life stages that use shallow slow-water habitat (e.g., benthic macroinvertebrates); and, thus, productivity would be expected to increase (Gislason 1985; Blinn et al. 1995; Cushman 1985). The reduction in flow fluctuations and increase in minimum flows under Alternative 1 will enhance productivity and shallow-slow water habitat compared No-Action Alternative (e.g., Bain 2009).

3.5.3 Riverine Fish

Alternative 1 results in changes to instream flows and water temperature, which have the potential to impact riverine fish. Potential impacts from Alternative 1 on riverine fish include changes in the following: (1) distribution; (2) growth/condition/abundance; (3) bypass reach habitat; and (4) peaking reach habitat. The discussion of riverine

habitat is separated into effects in the bypass and peaking reaches because of their different flow regimes (non-peaking and peaking operations).

3.5.3.1 Fish Distribution

Alternative 1 will maintain the existing spatial distribution of fish species in the bypass and peaking reaches. The existing distributions of trout (rainbow trout and brown trout) and minnows (e.g., hardhead and Sacramento pikeminnow) are primarily determined by water temperature and physical barriers (e.g., waterfalls) in the MFP area (PCWA 2011i; PCWA 2011j). Trout are present throughout the bypass and peaking reaches. The upstream distribution of hardhead and Sacramento pikeminnow on the Middle Fork American River and the Rubicon River is controlled by natural barriers in the rivers upstream of Ralston Afterbay. Alternative 1 will not change barriers and will have very limited effect on water temperature (Section 3.5.1.4). A slight decrease in summer temperature in the lower Rubicon River (Table 3.5-3b) is not anticipated to affect hardhead or Sacramento pikeminnow distribution, because the magnitude of the change is small and limited to critical water years.

3.5.3.2 Growth/Condition/Abundance

Growth and condition of fish in the bypass and peaking reaches is primarily determined by water temperature and food availability (productivity). Abundance is primarily controlled by productivity and availability of habitat. Alternative 1 maintains or enhances productivity (Section 3.5.2.1) and water temperature (Section 3.5.1.4) and enhances spawning and/or rearing habitat availability in all river reaches (see below); therefore the growth, condition, and abundance of fish will be enhanced in all river reaches compared to the No-Action Alternative.

3.5.3.3 Bypass Reach Habitat

The discussion of fish habitat in the bypass reaches is organized into: (1) rainbow trout spawning; (2) summer/fall rearing (rainbow trout and hardhead); and (3) winter fish habitat.

Rainbow Trout Spawning

The analysis of spawning habitat in the bypass reaches for Alternative 1 includes: (1) spawning flow releases analysis; (2) spawning habitat time series analysis; and (3) a discussion of scour related to spawning habitat.

SPAWNING FLOW RELEASES

Spring minimum flow releases by water year type were analyzed for the bypass reaches associated with the MFP (Table 3.5-5). Percent of maximum rainbow spawning habitat with and without flow accretion was quantified in each stream reach associated with the minimum flow release. The “without accretion” analysis was based on the percent of maximum spawning habitat at the first instream flow study site below the release location and included only the minimum flow release (no accretion). The “with

accretion” analysis used a conservative measure of accretion (e.g., groundwater and surface inflow) along the length of each of the reaches (95% exceedance value by water year type) and summed the total amount of spawning habitat along the reach using habitat relationships for each of the instream flow study sites/sub-reaches (PCWA 2011c).

Based on either the “without accretion” or the “with accretion” spawning analysis, Alternative 1 enhances rainbow trout spawning habitat in all of the bypass river reaches compared to the No-Action Alternative. The “without accretion” average increase in percent of maximum spawning habitat across all bypass reaches and water year types is 38% (range 6–65%) under Alternative 1 compared to the No-Action Alternative (Table 3.5-5). The “with accretion” analysis shows the spawning habitat is maximized (100%) under Alternative 1 in the wet and above normal year types except in North and South Fork Long Canyon where it is 78-81% of the maximum available habitat. The average increase in total habitat for the “with accretion” analysis under Alternative 1 is 26% (range 6–59%) (Table 3.5-5). The “without accretion” and “with accretion” difference indicates that the spawning habitat benefits resulting from Alternative 1 are greatest at the top of the bypass reaches (where no accretion exists) and are relatively smaller as natural flow accretion increases downstream.

SPAWNING HABITAT TIME SERIES

A rainbow trout spawning habitat time series analysis (1975–2007) was completed for Alternative 1, the No-Action Alternative (historical hydrology), and for the Existing License Condition operations model run (Appendix C). The time series analysis calculates the habitat available on each day for the period of record during the March–May spawning period. Separate analyses were completed for the top and bottom of each subreach to account for accretion flows.

A summary of the Alternative 1 median habitat values (50% exceedance) compared to the No-Action Alternative for each water year type shows that Alternative 1 results in overall large increases in spawning habitat compared to the No-Action Alternative (Tables 3.5-6a–c). The spawning habitat increases occur primarily at the top of the reaches. Spawning habitat increases are less at the lower end of each reach due to higher flows from natural accretion.

In some lower reaches under Alternative 1, the spawning habitat actually decreases for the primary rainbow trout spawning habitat suitability criteria (HSC) (PCWA 2011c), because flows exceed the optimal spawning flow as a result of accretion. The primary spawning HSC indicate that water deeper than 3 feet is not suitable for spawning. A second rainbow trout spawning analysis that makes deep water habitat suitable for spawning (“depth sensitivity HSC”) (PCWA 2011c) indicates that spawning habitat is maintained or enhanced at the bottoms of the subreaches with the increased accretion flow.

During wet water year types under Alternative 1, the longer duration pulse flows reduce spawning habitat (using the primary spawning HSC) due to the increased flow

magnitude. An example is below Middle Fork Interbay (Table 3.5-6b) where the primary spawning analysis (Alternative 1) shows decreased spawning habitat in wet years. However, using the depth sensitivity spawning HSC, there is an increase in wet year spawning habitat compared to the No-Action Alternative.

SCOUR

The Alternative 1 pulse flows (Section 3.5.1.2) could potentially scour rainbow trout redds that were created prior to the pulse flow release. The magnitude and duration of pulse flows, however, are well within the range of unimpaired conditions. The pulse flow are of equal or lower magnitude than would have occurred in the unimpaired condition, and have a relatively natural timing and shape. The pulse flows were designed to initiate motion of gravels (clean fines from gravels), but not excessively remove gravel substrates from the system (e.g., Wilcock et al. 1996). Therefore, the pulse flow releases are not anticipated to result in large-scale redd scour. In the event that the pulse flow releases result in some localized redd scour, it would be typical of natural stream conditions (Seegrist and Gard 1972; Lisle 1989).

Summer/Fall Rearing

A rainbow trout and hardhead rearing habitat time series analysis (1975–2007) was completed for Alternative 1, the No-Action Alternative (historical hydrology), and for the Existing License Condition operations model run (Appendix C).

The Alternative 1 median habitat values (50% exceedance) compared to the No-Action Alternative show that the Alternative 1 results in an overall enhancement of rearing habitat compared to No-Action Alternative (Tables 3.5-6a–c). In the small streams (Table 3.5-6a), there is no change in the summer/fall rearing habitat for rainbow trout adult or juveniles because the MFP has little to no affect on flows during the summer/fall. There is little change in the juvenile hardhead rearing habitat in the lower Rubicon River, because, with accretion, the amount of flow and habitat was relatively high in the existing conditions (No-Action Alternative) and the increased flow from Alternative 1 results in a slightly lower amount of habitat.

Winter

Alternative 1 maintains or enhances flows and wetted perimeter during the winter time period compared to the No-Action Alternative (Section 3.5.1.5). The primary determinant for setting winter minimum instream flows in Alternative 1 was to maintain winter flows similar to the fall flows and thereby maintain wetted channel habitat (e.g., wetted perimeter) and productivity of the river channels.

3.5.3.4 Peaking Reach Habitat

In the peaking reach, fluctuating flows and the rate that the flows change are the primary factors affecting habitat suitability for fish. The reductions in flow fluctuations and ramping rates under Alternative 1 affect: (1) effective spawning habitat; (2) fish abundance and production; and (3) fish stranding in the peaking reach.

Effective Spawning Habitat

Alternative 1 increases minimum instream flow requirements compared to the No-Action Alternative. These higher instream flows reduce potential flow fluctuations in the peaking reach during the spawning season (e.g., March–May) (Section 3.5.1.1). For example, Alternative 1 increases the minimum flow requirements 25 to 375 cfs, depending on water year type, compared to the No-Action Alternative. Alternative 1 average spawning minimum instream flow requirement (across water year types) is 190 cfs greater than the 75 cfs minimum instream flow in the No-Action Alternative. Figures 3.5-2a–g shows the hydrology in the peaking reach (minimum flows) resulting from Alternative 1 for each water year type compared to the historical impaired hydrology (minimum flows).

Using for example, the Alternative 1 dry year minimum instream flow of 210 cfs (135 cfs higher than the No-Action Alternative), and assuming the Alternative 1 peaking ranges from 1,025 cfs to 210 cfs instead of 1,025 to approximately 100 cfs (historical flow in the No-Action Alternative, see Figure 3.5-2g), the increase in effective spawning habitat due to Alternative 1 would range from 51–160% at the instream flows study sites in the peaking reach (PCWA 2011g, Appendix B2, Figures 37 and 44). The actual reduction in flow fluctuations depends on the spring base flow, water year type, and actual powerhouse operations and is difficult to assess quantitatively using “well behaved” operational model runs compared to historical flow data. However, operational model runs of Alternative 1 show potential reductions in flow fluctuations compared to the No-Action Alternative (Figures 3.5-12a–e) (Section 3.5.1.1). The Alternative 1 higher minimum instream flows will reduce the potential flow fluctuations compared to the No-Action Alternative (Section 3.5.1.1); therefore, spawning habitat will be maintained or enhanced under Alternative 1 compared to the No-Action Alternative.

Fish Abundance and Productivity

Alternative 1 results in reductions in flow fluctuations and increased minimum flows that will increase food production (Section 3.5.2.1). Literature studies concluded that increased food production and reduced flow fluctuations or the reduction in the ratio between high and low flows (peaking discharge ratio) lead to increased fish production (e.g., Moog 1993). An approximate estimate of the increase in fish production in the peaking reach based on Moog (1993) is as high as 160% (Section 3.5.2.4). Reductions in flow fluctuations below Glen Canyon Dam resulted in relatively large increases in fish abundance (McKinney et al. 2001) and increased growth of young-of-year fish (Korman and Campana 2009). Therefore, fish abundance and production will be maintained or enhanced under Alternative 1 compared to the No-Action Alternative.

Fish Stranding

Stranding study results (PCWA 2011c) showed that some temporary trapping/ isolation of fish occurred in the upper part of the peaking reach, depending on base flow. In the stranding study (PCWA 2011c), following the decline (down ramping) of daily high flow (900 cfs) to a low base flow of approximately 100 cfs, fish were observed in

permanently wetted locations that were disconnected from the main channel and would not be connected until flows were increased the following day (assuming no predation of the fish occurred). The down ramping rate requirement (river stage reduction per hour) under Alternative 1 (Section 3.5.1.1) is slower than the No-Action Alternative ramping rate requirement. There is also a resulting decrease in the frequency of time that high ramping rates (e.g., >400 cfs/hr) would occur under Alternative 1 (Section 3.5.1.1). This decrease in ramping rates will provide fish additional time during down ramp events to move from portions of the channel that will become disconnected from the main channel or that will become dewatered. Slower down ramping rates have been shown to reduce stranding of fish (e.g., Irvine et al. 2009); however, it is possible in situations where fish are 'trapped' in large channel depressions or side channels that reduced ramping rates can have limited effect on 'trapping' of fish (Addley Pers. Obsv.). However, the reduced ramping rate in Alternative 1 will in general be an enhancement to fish in the peaking reach by reducing the amount of temporary stranding and/or mortality compared to the No-Action Alternative.

Alternative 1 increases minimum flow requirements in the peaking reach compared to the No-Action Alternative. During above normal and wet water years, the minimum flow requirements in Alternative 1 are 150 cfs or greater than those in the No-Action Alternative all year long (excluding in October during Above Normal water years). During dry and below normal water year types, the spring and summer minimum flow requirements are 135 cfs or greater than the No-Action Alternative. Alternative 1 will decrease the number of days that low flows (e.g., 75–150 cfs) will occur (Figures 3.5-2a–g). The increased minimum flows, slower ramping rates, and reduced flow fluctuations under Alternative 1 (Section 3.5.1.1) will reduce temporary stranding and/or mortality compared to the No-Action Alternative.

3.5.4 Foothill Yellow-Legged Frogs

Alternative 1 changes to minimum instream flows, pulse flows, water temperature, spill flows, flows during unplanned outages in late spring and summer, and operations of Oxbow Powerhouse (Section 3.5.1.1) could potentially affect FYLF distribution, abundance, and breeding timing in the bypass and peaking reaches is discussed in the following section.

3.5.4.1 Bypass Reaches

In the Middle Fork American River and Rubicon River above Ralston Afterbay, the existing upstream distribution and abundance of FYLF appears to be largely a function of water temperature (PCWA 2011k, Maps 12-3b and 12-4). Within the range of minimum flows specified in Alternative 1 and the No-Action Alternative, the total amount of FYLF breeding or tadpole habitat created by the minimum flows is, in general, not viewed as a limiting factor to FYLF populations. This is because there is a large amount of habitat along the channel margins compared to the size of the FYLF populations.

Measures in the bypass reaches associated with Alternative 1 that could affect the distribution and abundance of FYLF include minimum flows, pulse flows, spill flow

ramping, and flows during unplanned outages in May-September. However, Alternative 1 was specifically designed to maintain the current No-Action Alternative upstream distribution/abundance of FYLF in the bypass reaches. During critical, dry, and below normal water year types when water temperature modeling showed that changes to minimum flows could affect water temperature (PCWA 2011f), the Alternative 1 summer minimum flows were adjusted to approximately maintain the existing location of the 17°C water temperature transition zone (No-Action Alternative) in the Middle Fork American River below Middle Fork Interbay and Rubicon River. Minimal change to the summer water temperature in these streams is expected to occur (Section 3.5.1.4). Surveys and water temperature monitoring required under Alternative 1 will be used to monitor FYLF (Foothill Yellow-Legged Frog Monitoring Plan [FYLFMP] [PCWA 2011] and (Water Temperature Monitoring Plan [WTMP] [PCWA 2011m]).

Pulse flows (wet and above normal water year types) in Alternative 1 are timed to start between May 1 and May 15 (depending on water year type and reach) prior to FYLF breeding initiation (which begins approximately mid-May through early June depending on the water year). The pulse flows include a down ramp recession designed to the extent practicable to mimic a snowmelt run-off hydrograph. Water temperature modeling indicates that the pulse flows would cool water temperatures and delay warming (Section 3.5.1.4), which could potentially delay the onset of FYLF breeding (PCWA 2011g, Section 7.5). Any potential delay as a result of the pulse flows under Alternative 1 is not anticipated to result in adverse impacts to FYLF breeding, because the pulse flow recedes prior to the end of the breeding season and would result in breeding timing more synchronized with natural hydrology timing (late May and June). The shape and timing of the pulse flows would also provide breeding cues to FYLF similar to natural cues to which FYLF are adapted.

Spill flows from the reservoirs (Hell Hole and French Meadows) will still occur in Alternative 1 similar to the No-Action Alternative (e.g., May–July), except that Alternative 1 includes provisions for down ramping of the spills in May through July. Spill flows could disrupt breeding, impact egg masses, and flush tadpoles downstream. During the recession of spill flows tadpoles could be stranded. Alternative 1 will down ramp spill flows, which will reduce potential stranding of tadpoles. There is also a slight reduction in the number of spill events below Hell Hole Reservoir under the Alternative 1 (Table 3.5-7) compared to the No-Action Alternative.

Alternative 1 specifies maximum flow releases during short-term outages to protect FYLF during the breeding and rearing (tadpole) seasons (May – September). The maximum flow magnitude is 55 cfs (60 cfs in Wet water years) in the Rubicon River and 80 cfs in the Middle Fork American River below Middle Fork Interbay Dam (USDA-FS 2011). Alternative 1 will reduce the occurrence of high flows that could potentially adversely impact FYLF breeding and rearing (tadpole) compared to the No-Action Alternative (Table 3.5-7). These changes to minimum flow and pulse flows (and the subsequent effects on water temperature), maximum flow releases during short-term unplanned outages, and ramping of spills under the Alternative 1 are considered an enhancement to FYLF habitat and will benefit distribution/abundance compared to the No-Action Alternative.

3.5.4.2 Peaking Reach

FYLF are present and breeding occurs in the tributaries to the peaking reach of the Middle Fork American River (below Oxbow Powerhouse). However, FYLF have rarely been observed along the peaking reach and no breeding has been documented. Cold water temperatures and fluctuating flows likely are the primary factors limiting the FYLF in the peaking reach.

Alternative 1 will have negligible effects to existing FYLF populations along the peaking reach and its tributaries compared to the No-Action Alternative. Under Alternative 1, water temperatures would remain essentially the same (too cold) (Section 3.5.1.4) and the reductions in flow fluctuations (magnitude and rate) are not anticipated to be large enough to allow FYLF breeding to occur in the peaking reach. Additionally, Alternative 1 does not affect tributaries to the peaking reach and, thus, is not expected to affect FYLF breeding or rearing that currently occurs in the tributaries to the peaking reach.

The Sediment Management Plan (SMP) (PCWA 2011n) could result in the removal of vegetation and placement of sediment on Indian Bar and Junction Bar in the peaking reach that could potentially impact FYLF. However, AP measures in the SMP specify that sediment management activities will not occur on these bars during the breeding season (May 15 to June 15) and that prior to any sediment management activity the bars will be surveyed for FYLF and any FYLF within 100 m of any sediment management activity will be translocated downstream.

3.5.5 Reservoirs and Diversion Pools

Alternative 1 includes minimum instream flow and minimum pool conditions, the Hell Hole Reservoir Seasonal Storage Increase Improvement, sediment management, and fish stocking that have the potential to affect reservoir physical habitat (reservoir elevations, dissolved oxygen) and fish. The impacts of Alternative 1 on physical habitat and fish populations are discussed below based on the following reservoir size categories: (1) large reservoirs; (2) medium reservoirs; and (3) small diversion pools.

3.5.5.1 Large Reservoirs

Physical Habitat

Under Alternative 1, the reservoir minimum pools, Hell Hole Reservoir Seasonal Storage Increase Improvement, and bypass reach minimum flows and pulse flows could potentially affect physical habitat (reservoir volumes, water temperature, and dissolved oxygen) in French Meadows Reservoir and Hell Hole Reservoir. However, the nature in which the reservoirs are operated on an annual basis will not change under Alternative 1. The reservoirs will still be used to capture winter and spring run-off to meet consumptive water supply and electrical energy demand. The following summarizes the potential impacts associated with Alternative 1.

Minimum pool requirements for Alternative 1 and the No-Action Alternative are shown in Appendix D. In essence, Alternative 1 changes to the minimum pools were designed to do the following:

- Require higher water surface elevations in the summer months of wetter water year types;
- Require higher winter minimum pools in critical dry water year types;
- Reduce the winter minimum pool requirement in the wet and above normal water year types in French Meadows Reservoir (enhance capacity to accommodate spring runoff); and
- Modify the summer/winter minimum pool requirement transition time period to immediately following Labor Day instead of the end of September.

Alternative 1 also includes increasing Hell Hole Reservoir maximum normal water surface elevations by 6 feet by installing gates on the currently un-gated spillway.

Based on operation model runs for the period of record, Alternative 1 results in relatively little change in the actual operational reservoir elevations/volumes compared to Existing License Conditions and the No-Action Alternative. Consequently, Alternative 1 will not affect reservoir fish habitat in French Meadows or Hell Hole reservoirs. Operations model runs showing reservoir elevations for Alternative 1 (existing demand and future demand), Existing License Conditions, and historical water surface elevations (No-Action Alternative) are shown in Appendix D. For example, at Hell Hole Reservoir, the Alternative 1 future demand reservoir elevations would be above the current maximum reservoir elevation in 17 of 33 years for a median number of days of 18 days per year (Figures C-1 to C-6). The percent increase in reservoir depth during these days is 0.1% - 1.5%. At Hell Hole Reservoir during the period of record, the Alternative 1 future demand average depth is 316 feet (volume 133,700 acre-feet [ac-ft]) and the Existing License Condition average depth is 321 feet (volume 135,256 ac-ft). The average percent change in depth is -1.5% to 0.5% and the percent change in volume is -2.0% to 2.7% (Table 3.5-8). At French Meadows Reservoir during the period of record (Figures C-7 to C-12), the Alternative 1 future demand average depth is 171 feet (volume 76,239 ac-ft) and the Existing License Condition average depth is 178 feet (volume 82,621 ac-ft). The average percent change in is -3.5% to -2.8% and the percent change in volume is -7.0% to -5.1% (Table 3.5-8).

Existing conditions water temperature in the reservoirs (42°F in the hypolimnion to typically less than 70°F at the surface) provide good habitat for salmonid fish species (PCWA 2011g, Figures 7.5-10a–b; PCWA 2011f). During the 2005–2008 sampling period, dissolved oxygen concentrations were typically greater than 5–6 mg/L (protective of coldwater species [Bjornn and Reiser 1991]) throughout the water column; and there was generally always large amounts of the water column, either in the epilimnion or hypolimnion, with dissolved oxygen 7.0 mg/L or greater (Basin Plan objective [CVRWQCB 2007]) (PCWA 2011g, Section 7.5.10). Alternative 1 will maintain water temperature compared to the No-Action Alternative and maintain dissolved

oxygen concentrations consistent with the Basin Plan objective (CVRWQCB 2007). Alternative 1 will, therefore, maintain reservoir fish habitat compared to the No-Action Alternative.

Fish Population

Under existing conditions, French Meadows Reservoir supports rainbow and brown trout fishery and Hell Hole Reservoir supports a kokanee salmon, brown trout, and lake trout fishery (also contains rainbow trout, Sacramento sucker, and tui chub). Both reservoirs have abundant crayfish populations. Because little change is expected in the reservoir habitat (reservoir volume, water temperature, dissolved oxygen) and the reservoirs will continue to be stocked (Recreation Plan [USDA-FS 2011; CDFG 2011b]), Alternative 1 is expected to maintain the fish populations (have no impact) in the reservoirs compared to the No-Action Alternative.

3.5.5.2 Medium Reservoirs

Physical Habitat

Under Alternative 1, physical habitat in Middle Fork Interbay and Ralston Afterbay will not change compared to the No-Action Alternative. Reservoir water surface elevations will continue to be operated similar to the No-Action Alternative, and water quality and water temperature will remain the same. Measured dissolved oxygen concentration under existing conditions (No-Action Alternative) were always greater than 7 mg/L (PCWA 2011g, Section 7.5.10) (Basin Plan objective [CVRWQCB 2007]). Dissolved oxygen under Alternative 1 will be maintained compared to the No-Action Alternative and will be consistent with the Basin Plan. The reservoirs will continue to be drained to the bottom of the spill gates annually for gate inspection and maintenance.

Sediment management activities (i.e., periodic lowering of the reservoirs and removal of the sediment) will continue as under existing conditions (No-Action Alternative). The SMP AP measures specify that during sediment removal at Ralston Afterbay, water surface elevation will be maintained at an elevation no lower than the bottom of the spill gates (1,149 feet) to provide a refuge pool for fish. This is the same elevation that Ralston Afterbay is maintained during the Project annual maintenance outage. Oxbow Powerhouse will be shut down when the reservoir elevation reaches below approximately 1,167 feet elevation. The minimum flow requirement applicable to the peaking reach will flow through Ralston Afterbay and the refuge pool (e.g., over the spill gates) to maintain water quality conditions in the refuge pool. A hardhead tagging study is also specified in the SMP during the first sediment removal event at Ralston Afterbay. The tagging study will provide information regarding hardhead movements during sediment management.

The fish habitat (including habitat for hardhead) in the two reservoirs under the Alternative 1 will be maintained compared to the No-Action Alternative.

Fish Population

Middle Fork Interbay supports a rainbow and brown trout fishery. Ralston Afterbay supports a rainbow and brown trout fishery and contains hardhead, Sacramento pikeminnow, and Sacramento sucker. Because no change is expected in the reservoir habitat (water temperature, reservoir volumes), Alternative 1 will have no effect on the fish populations compared to the No-Action Alternative.

3.5.5.3 Small Diversion Pools

Physical Habitat

The North Fork and South Fork Long Canyon creek diversion pools under existing conditions are essentially dewatered during the summer, with the creeks winding through a short section of pool bed under low flow conditions. The diversion pools are very small (<1.0 acres) when full. The Duncan Creek Diversion impounds water year-round, although the elevation of the pool can decrease 5 feet under low flow summer/fall conditions. When full, it is also relatively small (2.2 acres; 20 ac-ft).

Under Alternative 1, the small stream (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek) diversion dams will be modified into self-cleaning, stream-bottom intakes. A concrete retaining wall and sloped wedge-wire screen will be constructed on the upstream side of the existing ogee dam/spillway of each diversion. The top (crest) of the sloped wedge-wire screen will be 1.3–3.1 feet higher than the existing dam (the bottom of the slope screen will be at the elevation of the existing dam) (Figures DC 4, NF 4, and SF 4 in Section 2.0).

Under Alternative 1, the existing diversion pools will aggrade with sediment to near the top of the wedge-wire screen. The new diversion pools will become much shallower and more riverine. The area footprint of the new diversion pools will remain approximately similar to the existing diversion pools. The water surface of the new diversion pools will be 1.3–3.1 feet higher than the existing diversion pools (1.5, 3.0, and 3.1 feet at North Fork Long Canyon, South Fork Long Canyon, and Duncan creeks, respectively). Once the diversion pools are aggraded, sediment moving downstream will pass over the diversion screen and downstream. The reductions in pool habitat that occur at the small diversion pools under Alternative 1 are expected to have negligible effects because: (1) very little pool habitat currently exists under summer/fall low flow conditions; (2) abundant pool habitat exists throughout Duncan, North Fork Long Canyon, and South Fork Long Canyon creeks; and (3) the pool habitat that was lost would be replaced with riverine habitat.

Water temperature and dissolved oxygen in Alternative 1 in the diversion pools will be the same as the temperature and dissolved oxygen concentrations in the inflowing streams. Dissolved oxygen under existing conditions (No-Action Alternative) were 7.0 mg/L and greater. This is consistent with the Basin Plan objective of 7.0 mg/L (CVRWQCB 2007). Alternative 1 will maintain temperature and dissolved oxygen concentrations compared to the No-Action Alternative.

Fish Population

Rainbow trout are present in the Long Canyon Creek diversion pools and rainbow and brown trout are present in the Duncan Creek Diversion Pool. Fish sampling results for each of the diversion pools indicated very low numbers of fish (<15 observed) (PCWA 2011g). The physical habitat changes described above that will occur to the small diversion pools under Alternative 1 are not anticipated to affect fish populations in Duncan, North Fork Long Canyon, and South Fork Long Canyon creeks compared to the No-Action Alternative due to the relatively minor changes to physical habitat relative to the total amount of habitat available to fish in these streams.

3.5.6 Fish Entrainment

Modifications to the small stream diversion facilities under Alternative 1 could potentially affect entrainment of fish and fish populations in these streams. Similarly, current operations at existing Project facilities could potentially result in fish entrainment and affect fish populations. The locations where fish entrainment could result in fish translocation or mortality through MFP powerhouses include: (1) large reservoir tunnel intakes (French Meadows Reservoir and Hell Hole Reservoir); (2) medium reservoir tunnel intakes (Middle Fork Interbay and Ralston Afterbay); and (3) small stream diversions (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek). Potential entrainment effects at each location are discussed in the following section.

3.5.6.1 Large Reservoirs

Alternative 1 will maintain the existing low entrainment vulnerability at the large reservoir intakes (No-Action Alternative). The minor changes in reservoir elevation that result from implementation of Alternative 1 (increased minimum flows, pulse flows, etc.) are not expected to be sufficient enough to result in altered fish behavior; and there are no facility modifications that would result in changes to the physical characteristics with which water is withdrawn from the deep water tunnel intakes. Sonar estimates of fish elevations above the deep water tunnel intakes in French Meadows Reservoir (French Meadow – Hell Hole Tunnel) and Hell Hole Reservoir (Hell Hole – Middle Fork Tunnel), 145 and 308 feet, respectively, indicate that few fish are present at the depth of the intakes (PCWA 2011o; PCWA 2011g, Section 7.5). In French Meadows Reservoir, 98% of the fish observed were at an elevation higher than the elevation of the tunnel intake. In Hell Hole Reservoir, 100% of the fish observed were at an elevation higher than the elevation of the intake. The maximum approach velocities at the tunnel intake grates are ≤ 1.1 feet per second. Only larger fish were present in the deep water portions of the reservoirs near the intakes (smaller fish were near the surface) and the larger fish could easily escape the vicinity of the intake. The outlet works at both of the large reservoirs are located deeper than the tunnel intakes. Entrainment vulnerability is currently low and will remain low under Alternative 1.

3.5.6.2 Medium Reservoirs

Alternative 1 will not alter facilities or operations at Middle Fork Interbay and Ralston Afterbay and, thus, potential fish entrainment at the tunnel intakes in these medium reservoirs will be the same as in the No-Action Alternative. The amount of entrainment currently occurring is expected to be low. The direct sampling study conducted for the MFP relicensing (PCWA 2011o) was not successful due to milling of fish at the low velocity portion of the intakes and the inability of the split-beam sonar setup to accurately track and differentiate milling fish from entrained fish and differentiate entrained debris (e.g., sticks and leaves) from fish.

PCWA has committed to further study fish entrainment at Ralston Powerhouse and Oxbow Powerhouse intakes in consultation with USDA-FS, State Water Board, and CDFG. Regardless of the results of future entrainment studies, Alternative 1 will result in no change to fish entrainment compared to the No-Action Alternative.

3.5.6.3 Small Diversions

In Alternative 1, the small diversions are being modified with self-cleaning 1 mm wedge-wire (inclined plane) screens to bypass sediment and other debris. This will modify the fish entrainment characteristics of the diversions (i.e., reduce potential fish entrainment).

Fish entrainment was studied at the Duncan Creek Diversion intake under its current configuration via a tagging study of approximately 1,000 fish (fall 2008–summer 2009). The study was designed to be used as a surrogate for the North Fork Long Canyon Creek and South Fork Long Canyon Creek diversion intakes. The timing of fry emergence in the spring was also sampled at all of the small diversions (spring 2007 and spring 2009) to illustrate the potential overlap between diversion operations and fry emergence.

Under existing conditions, a total of 0.9% (43 of an estimated 4836 fish extrapolated from the tagging study results and fish population data) of the trout population within the first 2 miles upstream of the Duncan Creek Diversion was estimated to be entrained annually (PCWA 2011o). A similar small percentage (<1%) would be expected to be entrained at the North and South Fork Long Canyon Creek diversions. The timing of emergence in each of the streams occurred after the diversions had been closed for the year (in both years studied); therefore, no entrainment of emerging fish occurred.

Under Alternative 1, the modification of the small diversions with wedge-wire (inclined plane) screens will reduce existing entrainment. The wedge-wire diversion screens (1-mm-diameter screen openings) meet (and exceed) federal and state fish screen design criteria. As a result, any fish entrainment that is currently occurring will be eliminated. Thus, Alternative 1 will be an enhancement to fish populations compared to the No-Action Alternative.

3.5.7 Vegetation and Noxious Weed Management

The use of herbicides, surfactants, and fungicides as part of routine vegetation and noxious weed management in the vicinity of bypass and peaking reaches and large and medium reservoirs could potentially degrade water quality and aquatic habitats associated with the MFP. Refer to the revised Vegetation and Integrated Pest Management Plan (VIPMP) (Attachment 1A) for a description of vegetation and noxious weed management under Alternative 1. A summary of vegetation and noxious weed management activities, including changes from the No-Action Alternative are provided in Tables 2.5-4 through 2.5-6.

The VIPMP includes AP measures to protect aquatic habitats by preventing the entry of potentially toxic chemicals into the Middle Fork American River Watershed. These measures include:

- Restrictions on the use of herbicides, surfactants, and fungicides within protective buffers around bypass and peaking reaches and Special Aquatic Features⁴;
- Use of herbicide formulations that are considered by the Environmental Protection Agency to be safe for aquatic areas;
- Specific measures requiring supervision of herbicide application by a licensed pest control advisor and restrictive application and disposal methods; and
- Implementation of a Water Quality Monitoring Plan for Chemical Treatment Program to evaluate the effectiveness of protective measures included in the VIPMP.

Implementation of these measures in Alternative 1 will protect water quality and aquatic resources.

3.5.8 Existing Facility Modification, Construction of New Facilities, and Sediment Management Activities

Under Alternative 1, sediment management activities (small diversions and medium reservoirs), modification of existing MFP facilities (e.g., dam outlet structures), and construction of new facilities (small diversion structures, gages/weirs, outlet works modification, recreation facilities and features, Hell Hole Reservoir Seasonal Storage Increase Improvement) could potentially impact water quality and result in temporary loss of habitat for aquatic species during construction. Refer to the SMP for a description of sediment management activities, Appendix A for a description of facility modifications and construction projects, and the Recreation Plan for a description of new and modified recreation facilities.

⁴ Special Aquatic Features are Intermittent and ephemeral streams, meadows, seeps, springs, and seasonal wetlands.

Heavy equipment and ground disturbing activities during periodic sediment management activities and modifications/construction of existing and new MFP facilities, including recreation facilities, identified in Alternative 1 could potentially temporarily degrade water quality from increased turbidity, erosion, and sedimentation, and potential contamination from accidental hazardous material spills. Under Alternative 1, the SMP, Recreation Plan, and Appendix A describe USDA-FS Water Quality Best Management Practices (BMPs) that will be implemented to protect water quality during sediment management activities and modifications/construction of Project facilities. Requirements of the BMPs include (but are not limited to): (1) development of an Erosion Control Plan and a Spill Prevention, Containment, and Countermeasure Plan; (2) timing construction activities to occur in the dry season; (3) implementation of slope stabilization measures; and (4) minimization of in-channel excavation.

Downstream of Middle Fork Interbay, where sediment (gravel) is being placed in the channel, the SMP includes methods to ensure minimum instream flows and protect water quality during placement. These methods include installation of a streamflow bypass pipe from upstream of Middle Fork Interbay to a point downstream of the augmentation area and placement of a silt screen to capture fine sediment. The bypass pipe will not be removed until water quality in the adjacent stream channel meets background levels.

In Alternative 1, sediment management and facility modification/construction activities will result in temporary loss of habitat during dewatering of small diversion pools (Duncan Creek, North Fork Long Canyon Creek, South Fork Long Canyon Creek), reservoirs (Middle Fork Interbay, Ralston Afterbay), and/or very short stream segments (immediately downstream of Middle Fork Interbay) to implement sediment management or construction activities. Measures incorporated into the SMP and Appendix A will avoid loss of fish species during dewatering construction activities. These measures will include capturing all fish prior to dewatering of diversion pools or reservoirs and relocating the fish. Appropriate data (e.g., records of fish rescued) will be obtained during the fish rescue and provided to appropriate resource agencies following completion of the sediment management or modification/construction activities.

The SMP AP measures specify that during sediment removal at Ralston Afterbay, water surface elevation will be maintained at an elevation no lower than the bottom of the spill gates (1,149 feet elevation) to provide a refuge pool for fish. This is the same elevation that Ralston Afterbay is maintained currently during the Project annual maintenance outage. Oxbow Powerhouse will be shut down when the reservoir elevation reaches below approximately 1,167 feet elevation. The minimum flow requirement applicable to the peaking reach will flow through Ralston Afterbay and the refuge pool (e.g., over the spill gates) to maintain water quality conditions in the refuge pool. A hardhead tagging study is also specified in the SMP during the first sediment removal event at Ralston Afterbay. The tagging study will provide information regarding hardhead movements during sediment management. AP measures are also included in the SMP for FYLF at the gravel placement location downstream of Ralston Afterbay. FYLF will be surveyed prior to any sediment placement activities and if any are present in the placement area they will be translocated downstream.

Although Alternative 1 sediment management and facility modification/construction activities will result in a small temporary loss of habitat for fish species, overall these activities:

- Provide increased sediment supply (e.g., spawning gravels) in several bypass stream reaches (Duncan Creek, North Fork Long Canyon Creek, South Fork Long Canyon Creek, and Middle Fork American River below Middle Fork Interbay) and in the peaking reach;
- Eliminate the need for periodic sediment removal activities at the small stream diversions (Duncan Creek, North Fork Long Canyon Creek, South Fork Long Canyon Creek); and
- Provide the ability to implement new minimum instream flows, new environmental pulse flows, and the down ramp of spill flows.

With implementation of the BMPs to protect water quality and minimize potential fish mortality, Alternative 1 sediment management, facility modification, and facility construction activities will be an overall enhancement to the fish and aquatic species and their habitat compared to the No-Action Alternative.

3.5.9 Special-Status Species

There are six special-status aquatic species that potentially occur in the MFP:

- Hardhead (*Mylopharodon conocephalus*) – FSS, CSC
- Foothill yellow-legged (FYLF) (*Rana boylei*) – FSS, CSC
- California red-legged frog (CRLF) (*Rana aurora draytonii*) – FT, CSC
- Western pond turtle (WPT) (*Actinemys marmorata*) – FSS, CSC
- Mount Lyell Salamander (*Hydromantes platycephalus*) – CSC⁵
- California Roach (*Lavinia symmetricus*)/ Sacramento Roach (*L. s. symmetricus*)

Implementation of Alternative 1 could potentially impact the habitat or the distribution/abundance of special-status aquatic species. The impacts of Alternative 1 on FYLF and hardhead were addressed in Section 3.5.3, 3.5.4, and 3.5.5; a brief synopsis is presented below. Potential impacts to CRLF, WPT, Mount Lyell salamander and California roach are also addressed in the following section.

3.5.9.1 Hardhead

Impacts to hardhead and their habitat under Alternative 1 are discussed in detail in Section 3.5.3 and Section 3.5.5. Alternative 1 will maintain approximately the same

⁵ Where: FT = Federal Threatened Species, FSS = USDA Forest Service Sensitive Species, CSC = California Department of Fish and Game Species of Special Concern.

water temperatures and hardhead physical habitat in the lower portions of the Rubicon River and Middle Fork American River below Middle Fork Interbay, in the peaking reach, and in Ralston Afterbay as exists currently under the No-Action Alternative. Under Alternative 1, the distribution and abundance of hardhead in the MFP will be maintained as compared to the No-Action Alternative.

The SMP includes tagging studies designed to understand the movements of hardhead in Ralston Afterbay. These studies will benefit the understanding of hardhead behavior and applicable hardhead management approaches.

3.5.9.2 Foothill Yellow-legged Frog

FYLF are discussed in detail in Section 3.5.4. Alternative 1 will maintain approximately the same water temperatures and FYLF physical habitat in the Rubicon River, Middle Fork American River below Middle Fork Interbay, and peaking reach as exists currently under the No-Action Alternative. Under Alternative 1, the distribution and abundance of FYLF will be maintained (and monitored) as compared to the No-Action Alternative.

The FYLFMP (PCWA 2011l) will characterize and report FYLF distribution and abundance in the bypass and peaking reaches associated with the MFP over the term of the license.

3.5.9.3 California Red-legged Frog

There is only one known CRLF record within 1 mile of the MFP study area. This record is a single adult CRLF that was observed on the western end of Ralston Ridge in the right-of-way below a Pacific Gas & Electric (PG&E) transmission line (not a component of the MFP). No individuals have been observed at this location since 2001. This site was burned in the Ralston Ridge wildfire of 2006.

A site assessment and field studies were completed as part of the MFP relicensing to determine the presence of CRLF populations and potential habitat in the vicinity of the MFP (PCWA 2011k; PCWA 2011p). Based on the site assessments, field surveys, and consultation with United States Fish and Wildlife Service (USFWS), it was determined that rivers and reservoirs associated with the MFP do not represent CRLF aquatic breeding habitat. As defined by USFWS (2002), these large rivers and reservoirs (e.g., the Middle Fork American River, Rubicon River, Hell Hole Reservoir and Ralston Afterbay) represent barriers that would restrict the northward and/or southward movement of CRLF throughout the study area.

Potential aquatic breeding habitat was identified by USFWS at only three of the off-channel ponds at Horseshoe Bar (ponds C, E, and F) (PCWA 2011k). As requested by USFWS, protocol-level surveys were completed at these sites. No CRLF were observed (PCWA 2011p). Potential CRLF upland habitats in the MFP would include riparian areas, grasslands that contain seeps and springs (USFWS 2002), or deeply shaded forest streams immediately adjacent to aquatic breeding areas (PCWA 2011p). However, any upland habitat that does not contain significant barriers to dispersal may potentially be used by CRLF (USFWS 2002).

Under Alternative 1, routine MFP operations or maintenance activities will not impact areas identified by USFWS as potential aquatic breeding habitat or adjacent upland areas. Additionally, CRLF are not known to exist near any Project facilities or Project recreation facilities and features. Therefore, implementation of Alternative 1 will not affect CRLF breeding habitat or individuals.

3.5.9.4 Western Pond Turtle

WPT were observed downstream of Ralston Afterbay in the peaking reach and in the Horseshoe Bar ponds. WPT also were observed in a pond in Wallace Canyon (a tributary to Long Canyon Creek); however, Wallace Canyon is not affected by the MFP. Although, habitat exists for WPT in the bypass reaches and in the MFP reservoirs (PCWA 2011g, Section 7.5), WPT were not observed during field studies in any other location surveyed for the MFP.

Alternative 1 minimum instream flows and pulse flows in the bypass reaches create more natural shaped hydrographs within water years (e.g., higher spring flows) and between water year types (higher flows in wetter water year types) as compared to the No-Action Alternative. In the peaking reach, Alternative 1 reduces flow fluctuations and modifies minimum instream flows to create more natural shaped hydrographs compared to the No-Action Alternative. In addition, Alternative 1 will increase wetted perimeter (Section 3.5.1.5) and enhance productivity (algae and benthos), increase habitat diversity (Section 3.5.2.2), and maintain the river channels and create a more natural sediment supply (Section 3.5.1.2). These changes will maintain or enhance WPT and WPT habitat in the bypass and peaking reaches compared to the No-Action Alternative. Additionally, implementation of Alternative 1 will not affect the Horseshoe Bar ponds.

In the MFP reservoirs, Alternative 1 will maintain the reservoir physical habitat (water surface elevations, water quality, water temperature) (Section 3.5.5) similar to current conditions (No-Action Alternative). Therefore, Alternative 1 will maintain WPT potential habitat in reservoirs compared to the No-Action Alternative.

The Western Pond Turtle Monitoring Plan (WPTMP) (PCWA 2011q) will periodically characterize and report WPT distribution and abundance in the bypass and peaking reaches and Project reservoirs associated with the MFP during the term of the new license.

3.5.9.5 Mount Lyell Salamander

The Mount Lyell salamander (*Hydromantes platycephalus*) has the potential to occur in the vicinity of the MFP (PCWA 2007). However, there are no known occurrences in the immediate vicinity of the MFP. The closest known occurrence is more than 50 miles from the nearest MFP facility (one observations in Blackwood Canyon, approximately three miles south of Tahoe City in Placer County) (Californiaherps.com 2011). The geographic and elevational range of the Mount Lyell salamander extends from 4,130 to 11,940 feet in elevation (Morey 2000). The highest elevations associated with MFP facilities (5,500 ft) are in the lower range of the known elevation boundary.

The Mount Lyell salamander is primarily known to occur in areas with massive rock outcrops within mixed conifer, red fir, lodgepole pine, and subalpine communities (Morey 2000). The species is associated with granite talus with water seeping through it, typically downslope from snowfields that melt well into the summer. It inhabits caves, granite boulders, rock fissures, rocky stream edges, and seepage from springs and melting snow. The species frequents cliff faces and vertical cavern walls. In the Yosemite Valley, the species is found within the spray zones of several waterfalls and under moss on wet rock faces (Californiaherps.com 2011). Most locations tend to be open, not shaded. Additional information on their distribution and habitat is available in PCWA's PAD, SD F, Appendix 6-C (PCWA 2007).

PCWA conducted extensive surveys over a three-year period along the bypass and peaking reaches associated with the MFP and around all MFP facilities in support of PCWA's aquatic fish, amphibian, mollusk, riparian, and terrestrial technical studies, including the AQ 2 – Fish Population TSR (PCWA 2011j); AQ 3 – Macroinvertebrate TSR (PCWA 2011r); AQ 3 – Aquatic Mollusk TSR (PCWA 2011s); AQ 10 – Riparian Resources TSR (PCWA 2011t); AQ 12 – Special-Status Amphibians and Aquatic Reptiles TSR (PCWA 2011k); TERR 2 – Special-Status Plants (PCWA 2011u); TERR 3 – Noxious Weed (PCWA 2011v); and TERR 4 – Special-Status Wildlife (PCWA 2011w). Sightings of aquatic, amphibian, and aquatic reptile species were recorded during these surveys. No Mount Lyell salamanders were observed. Alternative 1 does not include any operation or maintenance activities in the vicinity of Mount Lyell salamander potential habitat; and therefore implementation of the Alternative 1 would not affect this species.

3.5.9.6 California Roach/Sacramento Roach

The California roach (*Lavina symmetricus*) “complex” consists of several subspecies (Moyle 2002). The subspecies found in the vicinity of the MFP is the Sacramento roach (*L. s. symmetricus*). This subspecies is not designated as a CSC by CDFG (CDFG 2011a) or as a sensitive species by any other government agency (e.g., USDA-FS, United States Fish and Wildlife Service); therefore it was not included in PCWA's Application for a New License as a sensitive species. The distribution, abundance, and instream flow habitat information for this subspecies is described in the AQ 2 – Fish Population TSR 2007–2009 (PCWA 2011j) and AQ 1 – Instream Flow TSR (PCWA 2011c). The affected environment of the subspecies is included in Sections 7.5.3, 7.5.5, 7.5.7, and 7.5.8 (PCWA 2011j) and the environmental effects of the MFP on riverine physical habitat, the riverine aquatic community, and fish species are described in Sections 3.5.1, 3.5.2, and 3.5.3. Alternative 1 includes measures to enhance instream flow habitat and sediment conditions in the bypass and peaking reaches. These measures include increased minimum instream flows, environmental pulse flows, and modified sediment management practices. These measures will enhance California roach/Sacramento roach habitat.

3.5.10 Conclusions—Fish and Aquatic Resources

Overall, Alternative 1 enhances fish and aquatic resources compared to the No-Action Alternative. For each of the individual fish and aquatic resources analyzed, Alternative 1 either maintains or enhances the resource. In some cases where the resources are maintained (e.g., sediment initiation of motion flows), Alternative 1 schedules flow releases that have historically occurred under the No-Action Alternative, but are not guaranteed to occur in the future for the No-Action Alternative (i.e., not a requirement in the existing Federal Energy Regulatory Commission [FERC] License). General resource categories and the effects of Alternative 1 on the resources compared to the No-Action Alternative are listed below:

- River physical aquatic habitat (channel geomorphology, riparian vegetation, and water temperature) will all be maintained/scheduled;
- General river aquatic community resources (e.g., productivity) will be enhanced;
- Fish resources in the bypass and peaking reaches will be enhanced;
- FYLF resources will be maintained or enhanced;
- Reservoir physical habitat and fish resources will be maintained; and
- Special-status species will be protected and maintained.

Figures 3.5-15a–g present a graphical summary, by river reach, of the specific fish and aquatic resources that are maintained or enhanced under Alternative 1.

In addition, PCWA will conduct monitoring of the conditions of aquatic species and habitat in consultation with resource agencies over the term of the license including water temperature (PCWA 2011m); water quality (PCWA 2011h); foothill yellow-legged frogs (PCWA 2011l); western pond turtles (PCWA 2011q); fish populations (PCWA 2011x); benthic macroinvertebrates (PCWA 2011i); and stream conditions and riparian habitat (PCWA 2011e).

3.5.11 Unavoidable Adverse Effects

There are no unavoidable adverse effects to fish and aquatic resources under Alternative 1.

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TABLES

Table 3.5-1. Number of Days, Years and Average Number of Days May Pulse Flows Occur by Water Year Type under Alternative 1 and the No-Action Alternative.

Site / Release Location	Pulse Flow Threshold (cfs)	WYT	Alternative 1				No-Action Alternative			
			Total Number of Days	Average Number of Days ¹	Average Number of Days in Event Years ²	Number of Years ³	Total Number of Days	Average Number of Days ¹	Average Number of Days in Event Years ²	Number of Years ³
Small Streams										
Duncan Creek	149	Wet	53	5	8	7 / 10	29	3	6	5 / 10
		Abv Normal	26	4	5	5 / 6	12	2	6	2 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	79	---	---	12/33	41	---	---	7/33
North Fork Long Canyon Creek	29	Wet	38	4	8	5 / 10	89	9	18	5 / 10
		Abv Normal	13	2	3	4 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	51	---	---	12/33	89	---	---	5/33
South Fork Long Canyon Creek	40	Wet	64	6	9	7 / 10	107	11	21	5 / 10
		Abv Normal	27	5	5	5 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	91	---	---	12/33	107	---	---	5/33
Middle Fork American River										
Middle Fork American River below French Meadows	343	Wet	88	9	9	10 / 10	47	5	9	5 / 10
		Abv Normal	23	4	4	6 / 6	22	4	11	2 / 6
		Blw Normal	4	1	2	2 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	115	---	---	18/33	69	---	---	7/33
Middle Fork American River below Middle Fork Interbay	450	Wet	139	14	14	10 / 10	81	8	14	6 / 10
		Abv Normal	27	5	5	6 / 6	7	1	7	1 / 6
		Blw Normal	2	0	2	1 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	168	---	---	17/33	88	---	---	7/33
Rubicon River below Hell Hole Dam										
Rubicon River below Hell Hole Dam	200	Wet	214	21	21	10 / 10	82	8	21	4 / 10
		Abv Normal	108	18	18	6 / 6	7	1	7	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	322	---	---	16/33	89	---	---	7/33

¹Total number of pulse flow days / number of years in water year type.

²Number of pulse flow events / number of years that pulse flows occurred in water year type.

³Number of years pulse flows occurred / number of years in water year type.

Table 3.5-2. Alternative 1 1-foot-per-hour Stage Change at Instream Flow Study Sites and Corresponding Stage Change at Middle Fork American River Gage (No-Action Alternative FERC License ≤ 3 feet per hour).

Middle Fork Gage Starting Flow (cfs)	Up Ramp			Down Ramp		
	Flow Change Increment (cfs/hr)	Ending Flow (cfs)	Middle Fork Gage Stage Change (ft/hr)	Flow Change Increment (cfs/hr)	Ending Flow (cfs)	Middle Fork Gage Stage Change (ft/hr)
75	272	347	1.94	-158	<75	-2.05
100	297	397	1.87	-161	<75	-2.06
150	346	496	1.77	-175	<75	-2.06
200	393	593	1.71	-193	<75	-2.02
250	431	681	1.66	-217	<75	-1.99
300	455	755	1.58	-245	<75	-1.98
350	487	837	1.54	-274	76	-1.94
400	532	932	1.54	-299	101	-1.86
450	568	1018	1.53	-322	128	-1.80
500	591	1091	1.49	-348	152	-1.77
550	614	1164	1.47	-373	177	-1.74
600	637	1237	1.44	-396	204	-1.71
650	652	1302	1.41	-421	229	-1.70
700	667	1367	1.39	-437	263	-1.64
750	681	1431	1.37	-453	297	-1.59
800	696	1496	1.35	-470	330	-1.55
850	705	1555	1.32	-493	357	-1.54
900	714	1614	1.30	-517	383	-1.54
950	723	1673	1.27	-540	410	-1.54
1000	732	1732	1.25	-560	440	-1.53
1050	741	1791	1.23	-578	472	-1.51
1100	748	1848	1.22	-594	506	-1.49
1150	756	1906	1.20	-610	540	-1.47
1200	764	1964	1.19	-626	574	-1.46
1250	773	2023	1.18	-640	610	-1.44
1300	787	2087	1.17	-651	649	-1.41
1350	800	2150	1.16	-663	687	-1.40
1400	814	2214	1.15	-674	726	-1.38
1450	827	2277	1.14	-685	765	-1.36
1500	841	2341	1.13	-696	804	-1.35
1550	846	2396	1.12	-704	846	-1.32
1600	851	2451	1.10	-712	888	-1.30
1650	856	2506	1.09	-720	930	-1.28
1700	860	2560	1.07	-727	973	-1.26
1750	864	2614	1.05	-735	1015	-1.25
1800	867	2667	1.04	-742	1058	-1.23
1850	871	2721	1.02	-749	1101	-1.22
1900	875	2775	1.01	-755	1145	-1.21
1950	879	2829	0.99	-762	1188	-1.19
2000	882	2882	0.98	-768	1232	-1.18
Average Between 75-1000 cfs			1.50			-1.77

Table 3.5-3a. Middle Fork American River below Middle Fork Interbay Water Temperature Profiles (July–August) and the Corresponding River Mile at which the Water Temperature Reaches 17°C and 20°C.

Modeled Temperature Profile	17°C		20°C	
	River Mile	% Difference (mi)	River Mile	% Difference (mi)
Critical				
No-Action Alternative (12 cfs)	22.84	-	20.73	-
Alternative 1 (12 cfs)	22.84	0% (0.0)	20.73	0% (0.0)
Dry				
No-Action Alternative (23 cfs or Natural Inflow) (Typically about 18 cfs)	22.07	-	NA ¹	-
Alternative 1 (18 cfs)	22.07	0% (0.0)	18.92	-
Below Normal				
No-Action Alternative (23 cfs)	21.16	-	NA ¹	-
Alternative 1 (24 cfs)	21.06	0.5% (0.1)	NA ¹	-

¹Not applicable because the temperature doesn't reach 20°C.

Table 3.5-3b. Rubicon River Water Temperature Profiles (July–August) and the Corresponding River Mile at which the Water Temperature Reaches 17°C and 20°C.

Modeled Temperature Profile	17°C		20°C	
	River Mile	% Difference (mi)	River Mile	% Difference (mi)
Critical				
No-Action Alternative (10 cfs)	22.68	-	19.42	-
Alternative 1 (15 cfs)	21.66	4.5% (1.02)	17.52	9.8% (1.9)
Dry				
No-Action Alternative (20 cfs)	21.33	-	16.25	-
Alternative 1 (20 cfs)	21.28	0.2% (0.05)	14.89	8.4% (1.36)
Below Normal				
No-Action Alternative (20 cfs)	21.33	-	16.25	-
Alternative 1 (20 cfs)	21.33	0% (0.0)	13.67	15.9% (2.58)

Table 3.5-4a. Small Streams Wetted Perimeter Time Series Summary Comparing the 50% Exceedance Wetted Perimeter of Alternative 1 to the Existing License Condition and No-Action Alternative Wetted Perimeter.

Instream Flow Study Reaches / Sites	Top / Bottom Reach by Site	Water Year Type	Alternative 1 50% Habitat Exceedance					
			Summer/Fall Wetted Perimeter		Winter Wetted Perimeter		Spring Wetted Perimeter	
			% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative
Duncan Creek								
Duncan Creek below Diversion	D6.3 Top	All Years	100%	101%	96%	98%	113%	109%
		Wet	100%	101%	100%	95%	120%	112%
		Ab Norm	100%	100%	90%	90%	120%	110%
		BI Norm	100%	101%	100%	100%	114%	110%
		Dry	100%	100%	100%	100%	109%	107%
	D6.3 Bottom	Critical	100%	100%	100%	101%	107%	109%
		All Years	100%	100%	100%	99%	105%	103%
		Wet	100%	100%	100%	99%	106%	104%
		Ab Norm	100%	100%	100%	98%	104%	101%
		BI Norm	100%	100%	100%	99%	103%	102%
		Dry	100%	100%	100%	101%	103%	102%
		Critical	100%	101%	100%	100%	103%	104%
North Fork Long Canyon Creek								
North Fork Long Canyon Creek below Diversion	NFLC1.9	All Years	100%	100%	100%	102%	119%	118%
		Wet	100%	100%	100%	93%	127%	116%
		Ab Norm	100%	100%	100%	98%	127%	125%
		BI Norm	100%	100%	100%	102%	125%	125%
		Dry	100%	100%	100%	100%	116%	116%
		Critical	100%	100%	100%	100%	103%	110%
South Fork Long Canyon Creek								
South Fork Long Canyon Creek below Diversion	SFLC2.3	All Years	100%	100%	98%	100%	111%	111%
		Wet	100%	100%	100%	99%	113%	113%
		Ab Norm	100%	100%	95%	93%	113%	113%
		BI Norm	100%	100%	100%	102%	111%	113%
		Dry	100%	100%	100%	100%	107%	107%
		Critical	100%	100%	100%	100%	102%	104%
Long Canyon Creek								
Long Canyon Creek below North and South Fork Long Canyon Creeks	LC9.0 Top	All Years	100%	100%	99%	99%	110%	109%
		Wet	100%	100%	100%	96%	106%	100%
		Ab Norm	100%	100%	100%	96%	106%	105%
		BI Norm	100%	100%	100%	100%	111%	110%
		Dry	100%	100%	100%	100%	110%	110%
	LC9.0 Bottom	Critical	100%	100%	100%	100%	108%	108%
		All Years	100%	100%	100%	99%	102%	102%
		Wet	100%	100%	100%	99%	103%	101%
		Ab Norm	100%	100%	100%	98%	102%	102%
		BI Norm	100%	100%	100%	100%	102%	102%
		Dry	100%	100%	100%	99%	103%	103%
		Critical	100%	100%	100%	100%	103%	104%

Values greater than 5%.

Values less than 5%.

Table 3.5-4b. Middle Fork American River Wetted Perimeter Time Series Summary Comparing the 50% Exceedance Wetted Perimeter of Alternative 1 to the Existing License Condition and No-Action Alternative Wetted Perimeter.

Instream Flow Study Reaches / Sites	Top / Bottom Reach by Site	Water Year Type	Alternative 1 50% Habitat Exceedance					
			Summer/Fall Wetted Perimeter		Winter Wetted Perimeter		Spring Wetted Perimeter	
			% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative
Middle Fork American River Upstream of Middle Fork Interbay								
Middle Fork American River below French Meadows Reservoir	MF44.7 Top	All Years	104%	105%	102%	103%	106%	106%
		Wet	106%	107%	106%	104%	113%	109%
		Ab Norm	104%	104%	102%	102%	113%	109%
		BI Norm	102%	104%	102%	103%	106%	106%
		Dry	101%	102%	104%	104%	106%	106%
	Critical	108%	107%	101%	102%	104%	104%	
	MF44.7 Bottom	All Years	105%	106%	103%	103%	106%	106%
		Wet	105%	106%	103%	102%	108%	107%
		Ab Norm	105%	106%	102%	102%	106%	105%
		BI Norm	103%	104%	102%	102%	102%	104%
		Dry	102%	103%	105%	105%	102%	102%
	Critical	106%	106%	103%	104%	104%	104%	
Middle Fork American River Immediately above Middle Fork Interbay	MF36.2 Top	All Years	103%	102%	101%	98%	103%	100%
		Wet	103%	101%	100%	98%	104%	101%
		Ab Norm	102%	102%	100%	97%	103%	100%
		BI Norm	102%	101%	101%	98%	101%	100%
		Dry	102%	101%	102%	101%	102%	100%
	Critical	103%	102%	101%	100%	104%	102%	
	MF36.2 Bottom	All Years	102%	102%	101%	98%	103%	100%
		Wet	102%	102%	100%	98%	104%	101%
		Ab Norm	102%	102%	100%	98%	103%	100%
		BI Norm	102%	101%	101%	98%	101%	100%
		Dry	102%	101%	102%	101%	101%	99%
	Critical	103%	102%	101%	100%	104%	102%	
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay								
Middle Fork American River between Middle Fork Interbay and Ralston Afterbay	MF26.2 Top	All Years	103%	101%	101%	101%	110%	109%
		Wet	107%	106%	101%	98%	106%	105%
		Ab Norm	102%	102%	101%	101%	118%	117%
		BI Norm	102%	101%	101%	101%	110%	109%
		Dry	100%	99%	101%	101%	102%	102%
	Critical	100%	99%	101%	100%	101%	101%	
	MF26.2 Bottom	All Years	104%	103%	103%	102%	104%	103%
		Wet	104%	103%	106%	105%	108%	106%
		Ab Norm	104%	103%	104%	102%	105%	106%
		BI Norm	103%	102%	104%	104%	102%	103%
		Dry	103%	101%	100%	100%	105%	103%
	Critical	103%	101%	99%	97%	104%	104%	
Values greater than 5%								
Values less than 5%.								

Table 3.5-4c. Rubicon River Wetted Perimeter Time Series Summary Comparing the 50% Exceedance Wetted Perimeter of Alternative 1 to the Existing License Condition and No-Action Alternative Wetted Perimeter.

Instream Flow Study Reaches / Sites	Top / Bottom Reach by Site	Water Year Type	Alternative 1 50% Habitat Exceedance					
			Summer/Fall Wetted Perimeter		Winter Wetted Perimeter		Spring Wetted Perimeter	
			% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative
Rubicon River								
Rubicon River below Hell Hole Reservoir	R25.7 Top	All Years	106%	106%	110%	107%	123%	116%
		Wet	106%	106%	114%	107%	130%	117%
		Ab Norm	106%	106%	110%	108%	128%	120%
		Bl Norm	100%	100%	110%	109%	123%	118%
		Dry	100%	100%	114%	112%	120%	114%
		Critical	105%	103%	110%	108%	120%	117%
	R25.7 Bottom	All Years	106%	106%	104%	104%	114%	113%
		Wet	106%	106%	105%	102%	120%	118%
		Ab Norm	106%	106%	103%	103%	118%	115%
		Bl Norm	100%	100%	105%	106%	111%	110%
		Dry	100%	100%	109%	108%	110%	108%
		Critical	105%	102%	110%	109%	117%	114%
Rubicon River Near Ellicott Bridge	R20.9 Top	All Years	105%	105%	103%	103%	107%	107%
		Wet	105%	105%	103%	102%	105%	105%
		Ab Norm	105%	105%	102%	102%	108%	108%
		Bl Norm	103%	103%	103%	102%	106%	106%
		Dry	104%	104%	105%	104%	106%	105%
		Critical	106%	103%	104%	104%	108%	107%
	R20.9 Bottom	All Years	103%	103%	102%	102%	104%	104%
		Wet	104%	104%	101%	100%	102%	102%
		Ab Norm	104%	104%	101%	101%	103%	103%
		Bl Norm	102%	102%	102%	102%	102%	102%
		Dry	103%	103%	101%	101%	104%	104%
		Critical	105%	101%	102%	102%	104%	104%
Rubicon River Near Ralston Afterbay	R3.5 Top	All Years	105%	105%	101%	101%	103%	103%
		Wet	105%	105%	101%	100%	101%	102%
		Ab Norm	104%	105%	100%	100%	103%	103%
		Bl Norm	104%	103%	101%	101%	102%	102%
		Dry	103%	103%	102%	102%	102%	102%
		Critical	104%	101%	103%	103%	104%	104%
	R3.5 Bottom	All Years	105%	105%	101%	101%	103%	103%
		Wet	105%	105%	101%	100%	101%	101%
		Ab Norm	104%	105%	100%	100%	103%	103%
		Bl Norm	104%	103%	101%	101%	102%	102%
		Dry	103%	103%	102%	102%	102%	102%
		Critical	104%	101%	103%	103%	104%	104%
Values greater than 5%								
Values less than 5%								

Table 3.5-4d. Middle Fork American River Peaking Reach Percent Change in Wetted Bed Area Based on the Existing License Condition Minimum Flows versus Alternative 1 Minimum Flows.

Instream Flow Study Reaches / Sites	Water Year Type	Alternative 1			
		Summer (Jun - Aug)	Fall (Sept - Oct)	Winter (Nov - Mar 14)	Spring (Mar 15 - May)
		% of No-Action Alternative and ELC	% of No-Action Alternative and ELC	% of No-Action Alternative and ELC	% of No-Action Alternative and ELC
Middle Fork American River					
Middle Fork American River below Ralston Afterbay	All Years	#NAME?	#NAME?	#NAME?	#NAME?
	Wet	#NAME?	#NAME?	#NAME?	#NAME?
	Ab Norm	#NAME?	#NAME?	#NAME?	#NAME?
	BI Norm	#NAME?	#NAME?	#NAME?	#NAME?
	Dry	#NAME?	#NAME?	#NAME?	#NAME?
	Critical	#NAME?	#NAME?	#NAME?	#NAME?
	Extreme Critical	#NAME?	#NAME?	#NAME?	#NAME?
Values greater than 5%.					
Values less than 5%.					

Table 3.5-5. Rainbow Trout Spawning Weighted Usable Area under Alternative 1 and No-Action Alternative Spring Minimum Flows.

Site / Release Location	WYT	Spawning Minimum Flow (cfs)		Resulting Weighted Usable Area (% Max)			
		Alternative 1	No-Action Alternative	Rainbow Trout Spawning Without Accretion ¹		Rainbow Trout Spawning With Accretion ²	
				Alternative 1	No-Action Alternative	Alternative 1	No-Action Alternative
Small Streams							
Duncan Creek	Wet	24	8	97	53	100	77
	Abv Normal	24		97		100	80
	Blw Normal	17		87		95	76
	Dry	14		80		89	72
	Critical	13	4	76	32	82	43
North Fork Long Canyon Creek	Wet	11	2	78	19	78	19
	Abv Normal	11		78		78	19
	Blw Normal	10		74		74	19
	Dry	10		74		74	19
	Critical	6	2	52	19	52	19
South Fork Long Canyon Creek	Wet	14	5	81	43	81	43
	Abv Normal	14		81		81	43
	Blw Normal	12		75		75	43
	Dry	12		75		75	43
	Critical	6	2.5	49	25	49	25
Long Canyon Creek	Wet	NA	NA	NA	NA	91	68
	Abv Normal					92	70
	Blw Normal					87	64
	Dry					87	63
	Critical					74	42
Middle Fork American River below French Meadows							
River Mile 47.1 - 36.0	Wet	20	8	96	63	100	89
	Abv Normal	20		96		100	93
	Blw Normal	13		81		95	88
	Dry	13		81		93	84
	Critical	11	4	76	42	83	61
Middle Fork American River below Middle Fork Interbay							
River Mile 35.5 - 26.0	Wet	65	23	98	69	100	88
	Abv Normal	65		98		100	88
	Blw Normal	40		88		95	84
	Dry	27		75		76	70
	Critical	18	12	60	45	62	48
Rubicon River below Hell Hole Dam							
River Mile 28.8 - 14.0	Wet	60	10	99	34	100	76
	Abv Normal	55		97		100	81
	Blw Normal	42		88		96	69
	Dry	35		80		92	65
	Critical	31	6	75	23	82	44

¹Resulting percent of maximum weighted usable area calculated without accretion at the Instream Flow Study Site nearest to the release point.

²Resulting percent of maximum weighted usable area calculated using 95% exceedance accretion and all Instream Flow Study Sites within the reach (total reach spawning habitat).

Table 3.5-6a. Small Streams Habitat Summary Table Comparing the 50% Habitat Exceedance of Alternative 1 Habitat to the Existing License Conditions and No-Action Alternative Habitat Values.

Instream Flow Study Reaches / Sites	Top / Bottom Reach by Site	Biological Reach Management Species	Water Year Type	Alternative 1 50% Exceedance							
				Rainbow Trout Spawning		Rainbow Trout Spawning Depth Sensitivity		Rainbow Trout Adult		Rainbow Trout Juvenile	
				% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative
Duncan Creek											
Duncan Creek below Diversion	D6.3 Top	Rainbow Trout	All Years	136%	118%	156%	125%	100%	100%	100%	100%
			Wet	152%	125%	187%	142%	100%	103%	100%	102%
			Ab Norm	144%	110%	187%	129%	100%	100%	100%	100%
			Bi Norm	144%	119%	161%	128%	100%	100%	100%	100%
			Dry	131%	115%	139%	119%	100%	100%	100%	100%
			Critical	126%	130%	132%	136%	100%	102%	100%	101%
	D6.3 Bottom	Rainbow Trout	All Years	95%	98%	102%	102%	100%	101%	100%	100%
			Wet	92%	96%	105%	103%	100%	101%	100%	101%
			Ab Norm	91%	95%	105%	103%	100%	100%	100%	100%
			Bi Norm	96%	98%	102%	101%	100%	100%	100%	100%
			Dry	98%	100%	102%	102%	100%	100%	100%	100%
			Critical	102%	103%	106%	107%	100%	100%	100%	100%
North Fork Long Canyon Creek											
North Fork Long Canyon Creek below Diversion	NFLC1.9	Rainbow Trout	All Years	232%	212%	236%	216%	100%	100%	100%	100%
			Wet	283%	126%	291%	128%	100%	100%	100%	100%
			Ab Norm	283%	245%	291%	251%	100%	100%	100%	100%
			Bi Norm	271%	264%	278%	271%	100%	100%	100%	100%
			Dry	202%	190%	205%	193%	100%	100%	100%	100%
			Critical	120%	133%	120%	133%	100%	100%	100%	100%
South Fork Long Canyon Creek											
South Fork Long Canyon Creek below Diversion	SFLC2.3	Rainbow Trout	All Years	159%	159%	161%	161%	100%	100%	100%	100%
			Wet	169%	152%	172%	149%	100%	100%	100%	100%
			Ab Norm	169%	164%	172%	167%	100%	100%	100%	100%
			Bi Norm	159%	167%	161%	170%	100%	100%	100%	100%
			Dry	139%	139%	140%	140%	100%	100%	100%	100%
			Critical	111%	127%	111%	128%	100%	100%	100%	100%
Long Canyon Creek											
Long Canyon Creek below North and South Fork Long Canyon Creeks	LC9.0 Top	Rainbow Trout	All Years	106%	108%	109%	111%	100%	100%	100%	100%
			Wet	103%	109%	105%	108%	100%	100%	100%	100%
			Ab Norm	102%	102%	106%	104%	100%	100%	100%	100%
			Bi Norm	108%	107%	112%	110%	100%	100%	100%	100%
			Dry	107%	107%	110%	109%	100%	100%	100%	100%
			Critical	111%	115%	112%	116%	100%	100%	100%	100%
	LC9.0 Bottom	Rainbow Trout	All Years	94%	96%	100%	100%	100%	100%	100%	100%
			Wet	95%	100%	95%	100%	100%	100%	100%	100%
			Ab Norm	97%	98%	97%	98%	100%	100%	100%	100%
			Bi Norm	92%	93%	101%	101%	100%	100%	100%	100%
			Dry	100%	101%	102%	102%	100%	100%	100%	100%
			Critical	104%	104%	106%	106%	100%	100%	100%	100%

Values greater than 5%

Values less than 5%

Values greater than 5% in reaches where rainbow trout are not the primary target species

Values less than 5% in reaches where rainbow trout are not the primary target species

Table 3.5-6b. Middle Fork American River Habitat Summary Table Comparing the 50% Habitat Exceedance of Alternative 1 Habitat to the Existing License Conditions and No-Action Alternative Habitat Values.

Instream Flow Study Reaches / Sites	Top / Bottom Reach by Site	Biological Reach Management Species	Water Year Type	Alternative 1 50% Exceedance											
				Rainbow Trout Spawning		Rainbow Trout Spawning Depth Sensitivity		Rainbow Trout Adult		Rainbow Trout Juvenile		Hardhead Juvenile		Hardhead Adult	
				% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative	% of ELC	% of No-Action Alternative
Middle Fork American River Upstream of Middle Fork Interbay															
Middle Fork American River below French Meadows Reservoir	MF44.7 Top	Rainbow Trout	All Years	118%	118%	125%	118%	126%	132%	106%	108%	NA	NA		
			Wet	126%	121%	151%	130%	132%	139%	107%	109%				
			Ab Norm	124%	111%	151%	125%	132%	133%	107%	107%				
			Bl Norm	118%	113%	125%	118%	114%	121%	104%	106%				
			Dry	118%	118%	125%	125%	107%	112%	102%	104%				
			Critical	111%	115%	115%	120%	164%	161%	123%	122%				
	MF44.7 Bottom	Rainbow Trout	All Years	95%	97%	101%	102%	119%	124%	104%	105%	NA	NA		
			Wet	77%	82%	101%	101%	117%	121%	103%	104%				
			Ab Norm	83%	89%	100%	100%	116%	121%	103%	104%				
			Bl Norm	97%	97%	101%	101%	114%	119%	103%	104%				
			Dry	100%	100%	102%	102%	111%	115%	102%	103%				
			Critical	101%	102%	106%	107%	137%	150%	113%	117%				
Middle Fork American River Immediately above Middle Fork Interbay	MF36.2 Top	Rainbow Trout	All Years	94%	104%	101%	101%	113%	109%	104%	103%	NA	NA		
			Wet	73%	101%	100%	103%	112%	105%	103%	102%				
			Ab Norm	76%	112%	99%	102%	110%	105%	103%	103%				
			Bl Norm	96%	107%	101%	101%	111%	107%	103%	102%				
			Dry	98%	102%	103%	99%	113%	109%	104%	103%				
			Critical	102%	103%	107%	101%	118%	116%	106%	105%				
	MF36.2 Bottom	Rainbow Trout	All Years	90%	102%	100%	101%	112%	108%	104%	103%	NA	NA		
			Wet	68%	97%	98%	102%	111%	104%	102%	101%				
			Ab Norm	73%	112%	98%	101%	108%	105%	102%	102%				
			Bl Norm	96%	109%	101%	101%	108%	105%	103%	102%				
			Dry	97%	102%	102%	100%	113%	109%	104%	103%				
			Critical	101%	103%	105%	101%	117%	113%	105%	104%				
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay															
Middle Fork American River between Middle Fork Interbay and Ralston Afterbay	MF26.2 Top	Rainbow Trout	All Years	108%	106%	134%	130%	112%	107%	104%	102%	101%	101%	105%	103%
			Wet	78%	78%	97%	104%	133%	129%	108%	107%	103%	103%	115%	113%
			Ab Norm	133%	129%	162%	158%	110%	110%	103%	103%	101%	101%	104%	104%
			Bl Norm	128%	125%	134%	130%	109%	103%	103%	101%	101%	100%	104%	102%
			Dry	108%	106%	110%	107%	98%	91%	99%	97%	100%	98%	99%	96%
			Critical	105%	102%	105%	102%	100%	93%	100%	98%	100%	99%	100%	97%
	MF26.2 Bottom	Hardhead	All Years	101%	99%	104%	102%	112%	109%	102%	101%	101%	100%	106%	104%
			Wet	67%	76%	98%	102%	115%	110%	102%	101%	100%	100%	108%	106%
			Ab Norm	89%	88%	102%	102%	112%	112%	102%	101%	102%	101%	107%	106%
			Bl Norm	102%	102%	102%	102%	110%	107%	102%	101%	102%	101%	105%	103%
			Dry	103%	104%	110%	107%	112%	101%	103%	100%	101%	100%	106%	101%
			Critical	106%	105%	110%	107%	113%	109%	104%	103%	102%	101%	106%	104%

Values greater than 5%

Values less than 5%

Values greater than 5% in reaches where rainbow trout are not the primary target species

Values less than 5% in reaches where rainbow trout are not the primary target species

Table 3.5-6c. Rubicon River Habitat Summary Table Comparing the 50% Habitat Exceedance of Alternative 1 Habitat to the Existing License Conditions and No-Action Alternative Habitat Values.

Instream Flow Study Reaches / Sites	Top / Bottom Reach by Site	Biological Reach Management Species	Water Year Type	Alternative 1 50% Exceedance											
				Rainbow Trout Spawning		Rainbow Trout Spawning Depth Sensitivity		Rainbow Trout Adult		Rainbow Trout Juvenile		Hardhead Juvenile		Hardhead Adult	
				% of ELC	% of No- Action Alternative	% of ELC	% of No- Action Alternative	% of ELC	% of No- Action Alternative	% of ELC	% of No- Action Alternative	% of ELC	% of No- Action Alternative	% of ELC	% of No- Action Alternative
Rubicon River															
Rubicon River below Hell Hole Reservoir	R25.7 Top	Rainbow Trout	All Years	212%	177%	259%	204%	128%	128%	108%	108%	NA	NA		
			Wet	254%	165%	307%	181%	128%	124%	108%	107%				
			Ab Norm	251%	222%	307%	254%	128%	128%	108%	108%				
			BI Norm	230%	216%	259%	242%	100%	100%	100%	100%				
			Dry	212%	161%	233%	174%	100%	100%	100%	100%				
			Critical	212%	187%	233%	205%	157%	100%	122%	100%				
	R25.7 Bottom	Rainbow Trout	All Years	128%	122%	150%	141%	126%	124%	107%	106%	NA	NA		
			Wet	110%	100%	123%	116%	127%	124%	107%	106%				
			Ab Norm	112%	109%	142%	137%	126%	124%	107%	106%				
			BI Norm	133%	127%	149%	141%	102%	100%	101%	100%				
			Dry	143%	131%	156%	141%	100%	99%	100%	100%				
			Critical	156%	145%	169%	157%	151%	101%	119%	100%				
Rubicon River Near Ellicott Bridge	R20.9 Top	Rainbow Trout	All Years	105%	104%	115%	114%	120%	118%	103%	103%	100%	100%	107%	106%
			Wet	89%	89%	105%	105%	119%	117%	103%	103%	99%	99%	106%	105%
			Ab Norm	87%	88%	107%	107%	119%	117%	104%	103%	99%	99%	106%	106%
			BI Norm	102%	101%	116%	114%	111%	108%	102%	102%	100%	100%	104%	103%
			Dry	107%	104%	128%	123%	113%	112%	103%	102%	101%	101%	105%	105%
			Critical	117%	117%	136%	135%	110%	108%	103%	102%	101%	101%	104%	103%
	R20.9 Bottom	Hardhead	All Years	88%	88%	103%	103%	113%	111%	102%	102%	100%	100%	104%	103%
			Wet	79%	73%	102%	103%	108%	107%	102%	102%	100%	100%	103%	103%
			Ab Norm	80%	80%	101%	101%	110%	109%	102%	102%	101%	101%	103%	103%
			BI Norm	91%	91%	102%	102%	110%	107%	102%	101%	100%	100%	103%	102%
			Dry	97%	97%	106%	106%	110%	108%	102%	102%	100%	100%	104%	103%
			Critical	102%	102%	116%	115%	107%	104%	101%	101%	100%	101%	103%	102%
Rubicon River Near Ralston Afterbay	R3.5 Top	Hardhead	All Years	74%	74%	102%	102%	113%	111%	101%	101%	99%	99%	107%	106%
			Wet	84%	87%	97%	97%	111%	109%	101%	101%	97%	98%	106%	106%
			Ab Norm	73%	75%	96%	96%	110%	110%	101%	101%	98%	98%	105%	105%
			BI Norm	75%	75%	101%	101%	113%	108%	102%	101%	100%	100%	107%	104%
			Dry	85%	86%	102%	102%	110%	109%	103%	102%	100%	100%	105%	104%
			Critical	92%	92%	106%	106%	109%	104%	103%	101%	100%	100%	104%	102%
	R3.5 Bottom	Hardhead	All Years	74%	74%	102%	102%	112%	111%	101%	101%	99%	99%	107%	106%
			Wet	83%	86%	97%	97%	111%	109%	101%	101%	97%	97%	106%	105%
			Ab Norm	75%	77%	96%	96%	110%	110%	101%	101%	98%	98%	105%	105%
			BI Norm	75%	75%	101%	101%	113%	108%	102%	101%	100%	100%	107%	104%
			Dry	85%	86%	102%	102%	110%	109%	103%	102%	100%	100%	104%	104%
			Critical	91%	92%	106%	105%	109%	104%	103%	101%	100%	100%	104%	102%

Values greater than 5%

Values less than 5%

Values greater than 5% in reaches where rainbow trout are not the primary target species

Values less than 5% in reaches where rainbow trout are not the primary target species

Table 3.5-7. Qualitative Assessment of Spill Events With Potential to Impact Foothill-Yellow Legged Frog Tadpoles and Egg Masses.

Rubicon River							
Water Year Type	Year	Alternative 1			No-Action Alternative		
		High Risk	Low Risk	No Risk	High Risk	Low Risk	No Risk
Wet	1982	-	X	-	-	X	-
Wet	1983	X	-	-	X	-	-
Wet	1984	-	-	X	-	-	X
Wet	1986	-	-	X	X	-	-
Wet	1995	X	-	-	X	-	-
Wet	1996	X	-	-	X	-	-
Wet	1997	-	-	X	-	-	X
Wet	1998	X	-	-	X	-	-
Below Normal	2003	No Spill Event			X	-	-
Above Normal	2005	X	-	-	X	-	-
Wet	2006	-	X	-	-	X	-
Total		5	2	3	7	2	2
Middle Fork American River below Middle Fork Interbay							
Water Year Type	Year	Alternative 1			No-Action Alternative		
		High Risk	Low Risk	No Risk	High Risk	Low Risk	No Risk
Wet	1980	-	-	X	-	-	X
Wet	1982	-	X	-	X	-	-
Wet	1983	X	-	-	X	-	-
Wet	1984	-	-	X	-	-	X
Wet	1986	-	-	X	X	-	-
Below Normal	1989	-	X	-	-	-	X
Dry	1991	No Spill Event			-	-	X
Above Normal	1993	-	-	X	-	-	X
Wet	1995	X	-	-	X	-	-
Wet	1996	X	-	-	X	-	-
Wet	1997	-	-	X	-	-	X
Wet	1998	-	X	-	X	-	-
Above Normal	1999	-	-	X	-	-	X
Above Normal	2000	-	-	X	-	-	X
Below Normal	2003	X	-	-	-	-	X
Above Normal	2005	X	-	-	X	-	-
Wet	2006	X	-	-	X	-	-
Dry	2007	No Spill Event			-	-	X
Total		6	3	7	8	0	10

Table 3.5-8. Average Percent Change by Month in Reservoir Volume and Depth for Alternative 1 Versus the No-Action Alternative and Existing License Conditions (1975–2007).

French Meadows Reservoir													
Alternative 1 Compared to:	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average
Percent Change in Reservoir Volume													
No-Action Alternative	3%	-4%	-15%	-15%	-13%	-6%	-2%	0%	-1%	-1%	-3%	-2%	-5.1%
Existing License Conditions	-7%	-10%	-12%	-10%	-9%	-7%	-6%	-6%	-4%	-3%	-4%	-5%	-7.0%
Percent Change in Reservoir Depth													
No-Action Alternative	1%	-2%	-7%	-8%	-6%	-3%	-1%	-1%	-1%	-1%	-2%	-1%	-2.8%
Existing License Conditions	-4%	-5%	-6%	-5%	-5%	-4%	-3%	-3%	-2%	-2%	-2%	-3%	-3.5%
Hell Hole Reservoir													
Scenario	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average
Percent Change in Reservoir Volume													
No-Action Alternative	-2%	0%	-1%	3%	4%	9%	9%	8%	6%	2%	-1%	-3%	2.7%
Existing License Conditions	-5%	-8%	-3%	-1%	-1%	0%	1%	1%	0%	-1%	-2%	-5%	-2.0%
Percent Change in Reservoir Depth													
No-Action Alternative	-1%	-1%	-1%	0%	1%	3%	3%	3%	2%	0%	-1%	-2%	0.5%
Existing License Conditions	-3%	-4%	-2%	-1%	-1%	-1%	-1%	0%	-1%	-1%	-2%	-3%	-1.5%

FIGURES

Figure 3.5-1a. Duncan Creek Alternative 1 (colored) and No-Action Alternative (gray) Minimum Instream Flows.

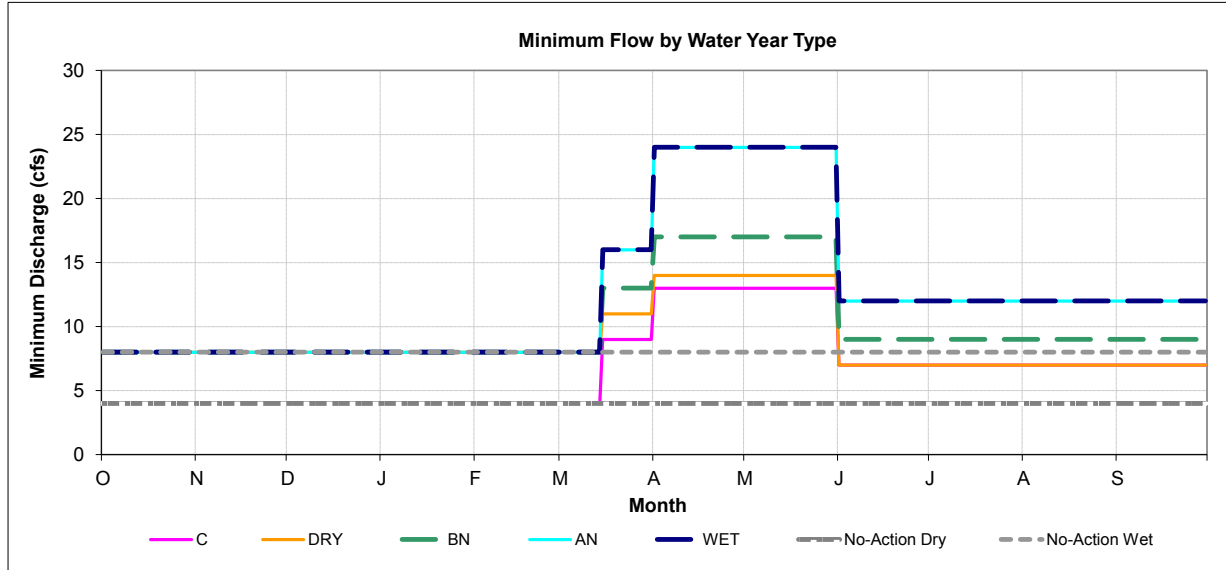


Figure 3.5-1b. North Fork Long Canyon Creek Alternative 1 (colored) and No-Action Alternative (gray) Minimum Instream Flows.

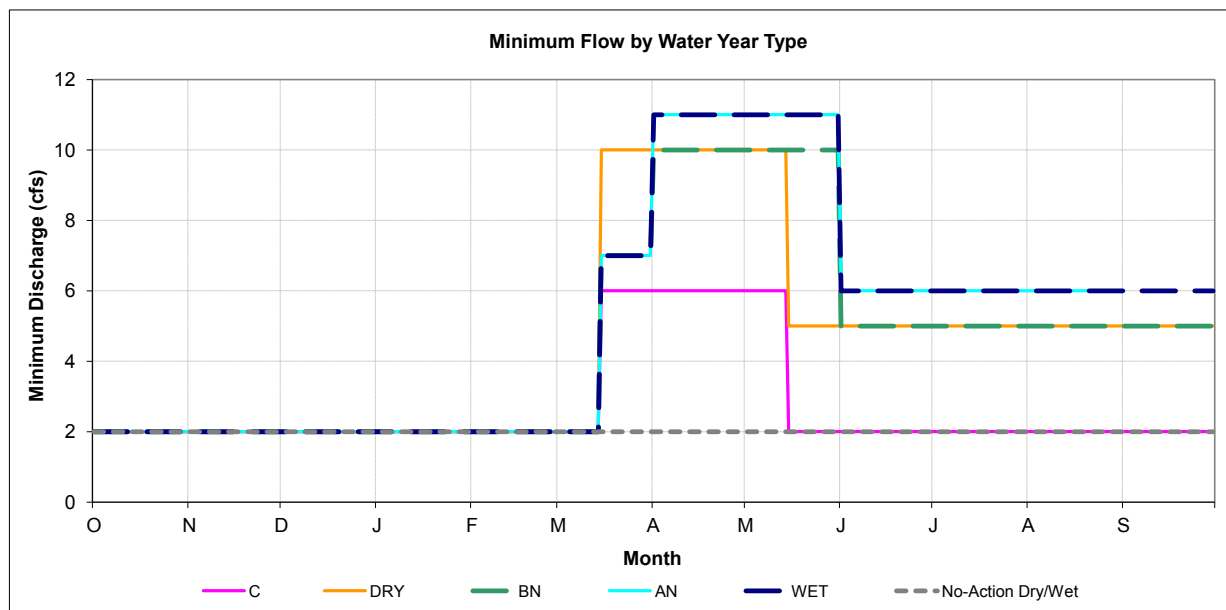


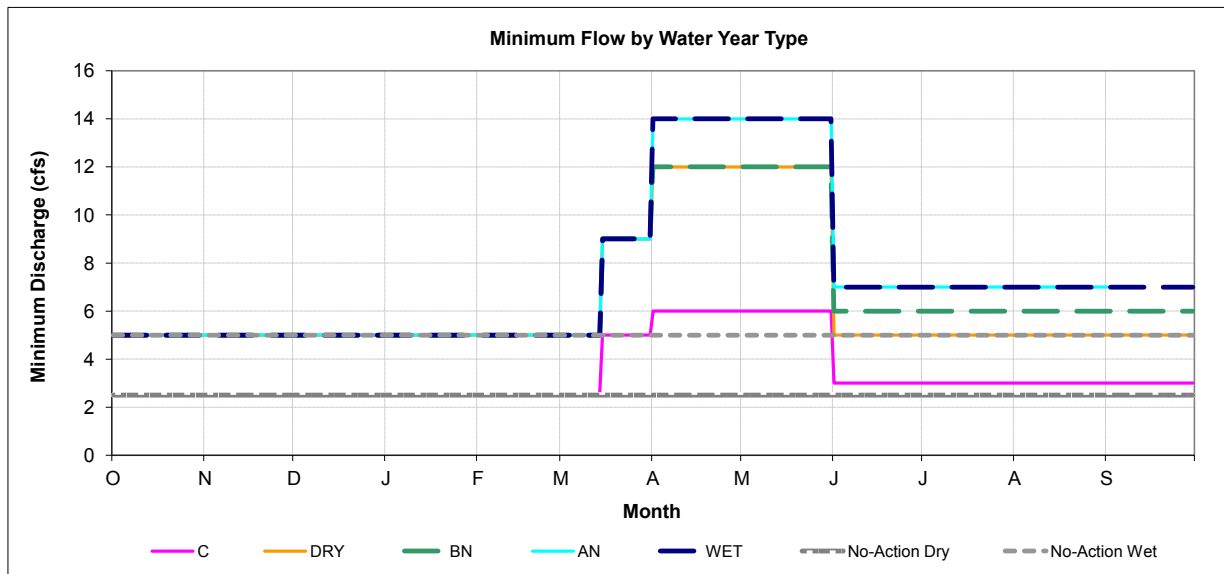
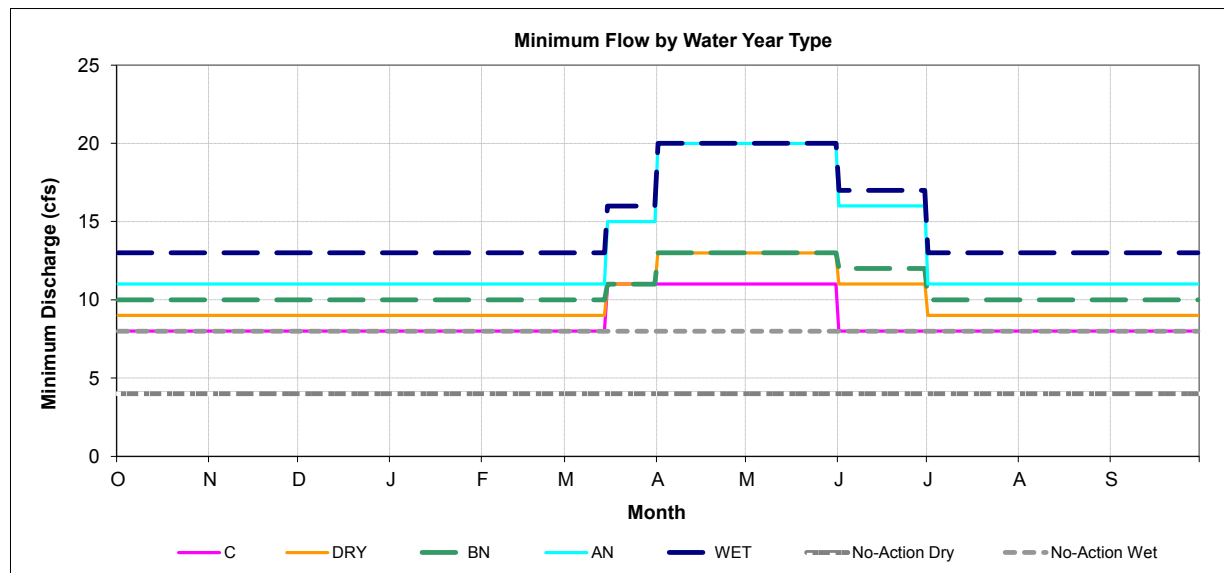
Figure 3.5-1c. South Fork Long Canyon Creek Alternative 1 (colored) and No-Action Alternative (gray) Minimum Instream Flows.**Figure 3.5-1d. Middle Fork American River Below French Meadows Reservoir Alternative 1 (colored) and No-Action Alternative (gray) Minimum Instream Flows.**

Figure 3.5-1e. Middle Fork American River Below Middle Fork Interbay Alternative 1 (colored) and No-Action Alternative (gray) Minimum Instream Flows.

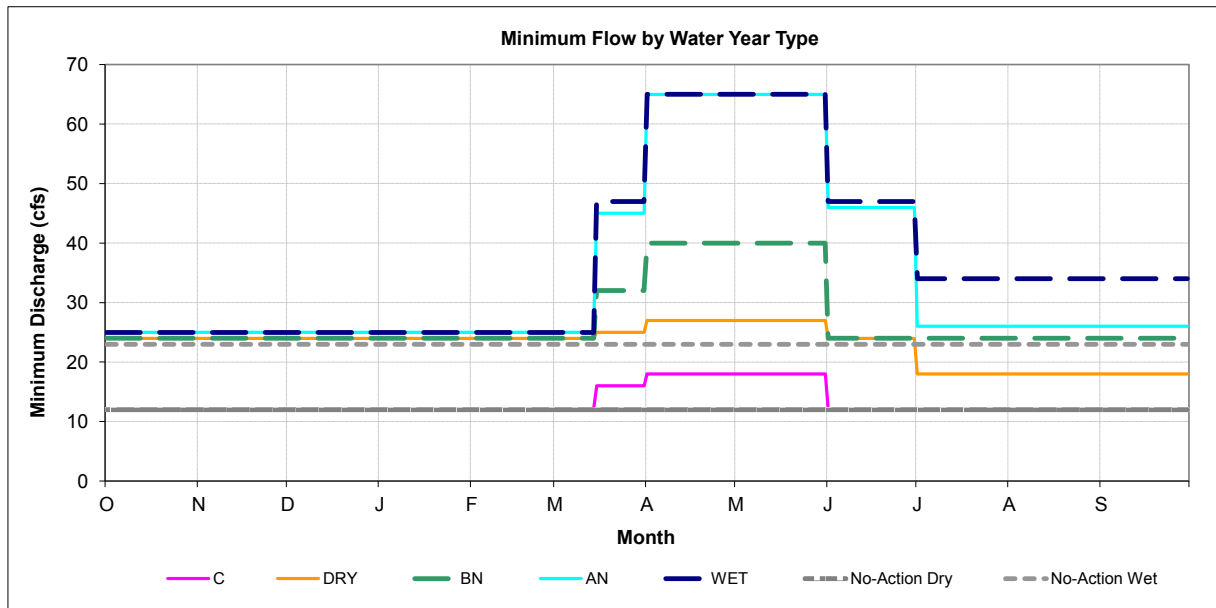


Figure 3.5-1f. Rubicon River Below Hell Hole Reservoir Alternative 1 (colored) and No-Action Alternative (gray) Minimum Instream Flows.

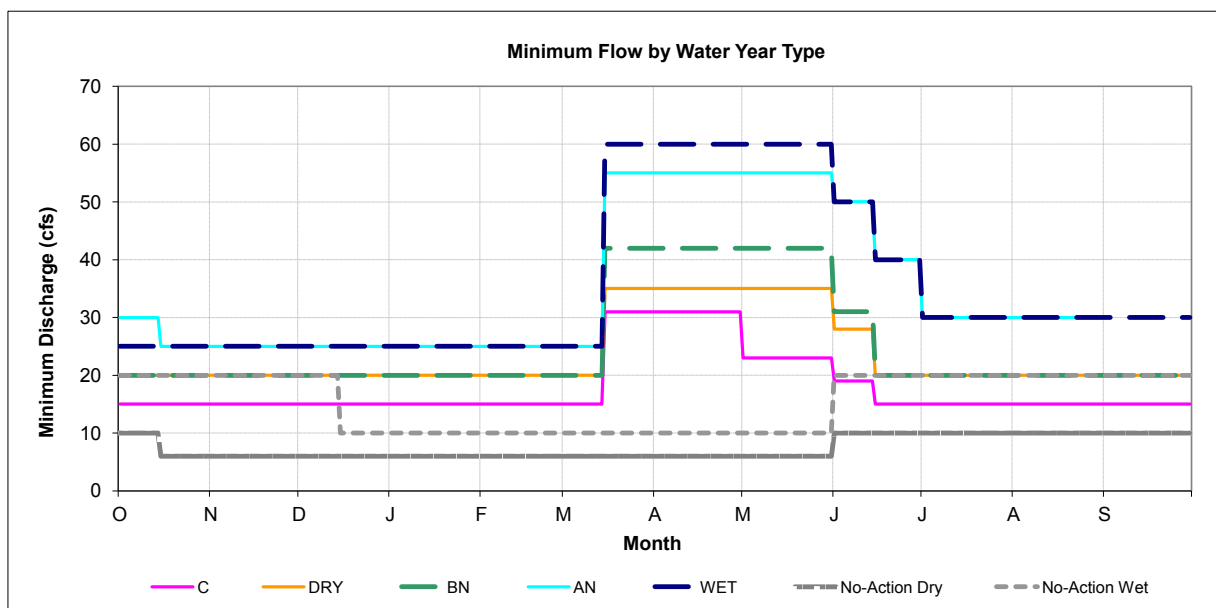


Figure 3.5-1g. Middle Fork American River Below Ralston Afterbay Alternative 1 (colored) and No-Action Alternative (gray) Minimum Instream Flows.

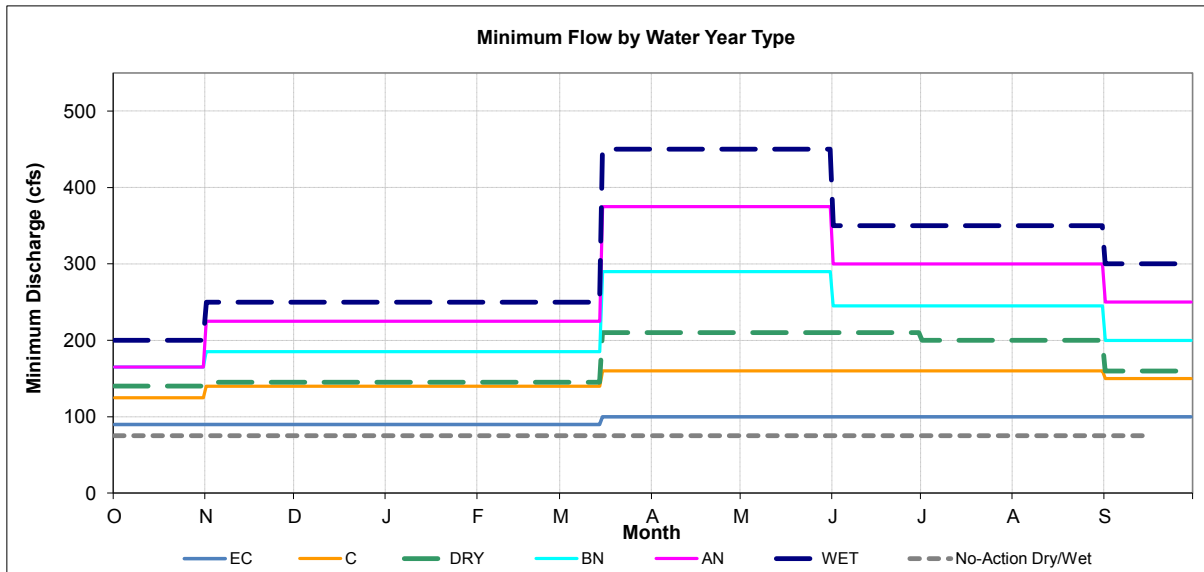


Figure 3.5-2a. Minimum Daily Flow under Alternative 1 and No-Action Alternative in the Rubicon River Downstream of Hell Hole Dam (Based on the 1975-2007 Hydrology Data Combined by Water Year Type).

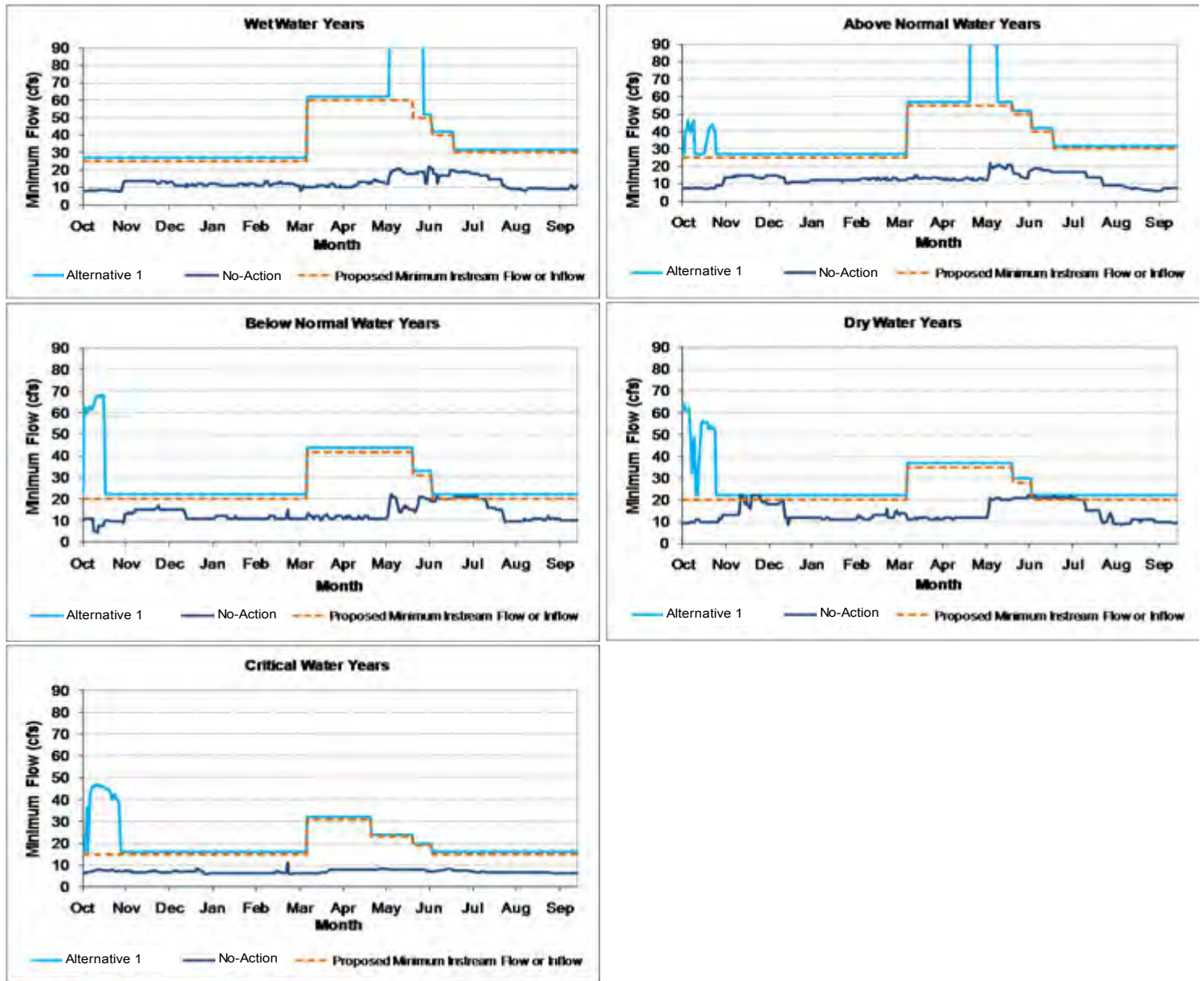


Figure 3.5-2b. Minimum Daily Flow under Alternative 1 and No-Action Alternative in the Middle Fork American River downstream of French Meadows Reservoir (Based on the 1975-2007 Hydrology Data Combined by Water Year Type).

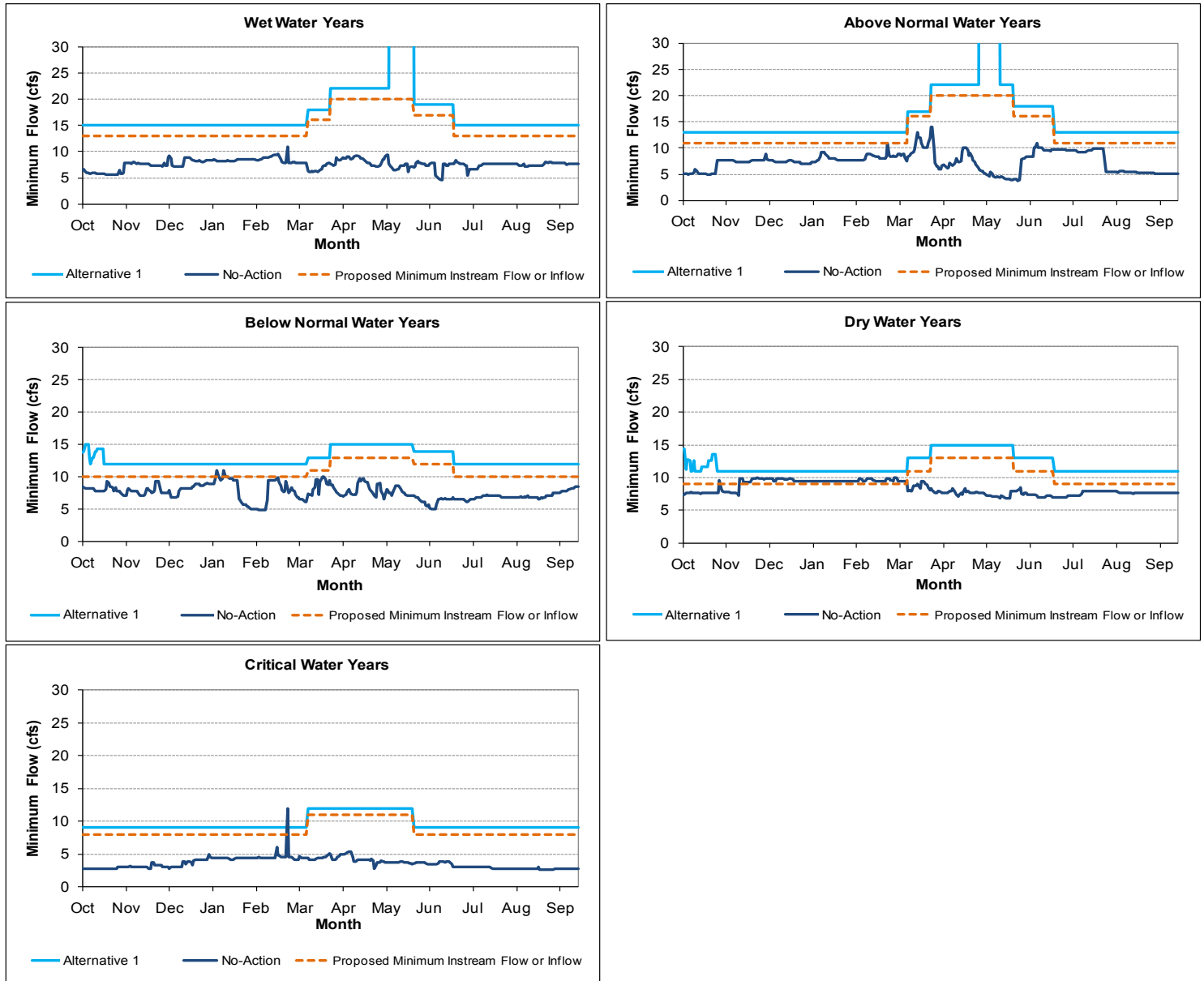


Figure 3.5-2c. Minimum Daily Flow under Alternative 1 and No-Action Alternative in the Middle Fork American River downstream of Middle Fork Interbay Dam (Based on the 1975-2007 Hydrology Data Combined by Water Year Type).

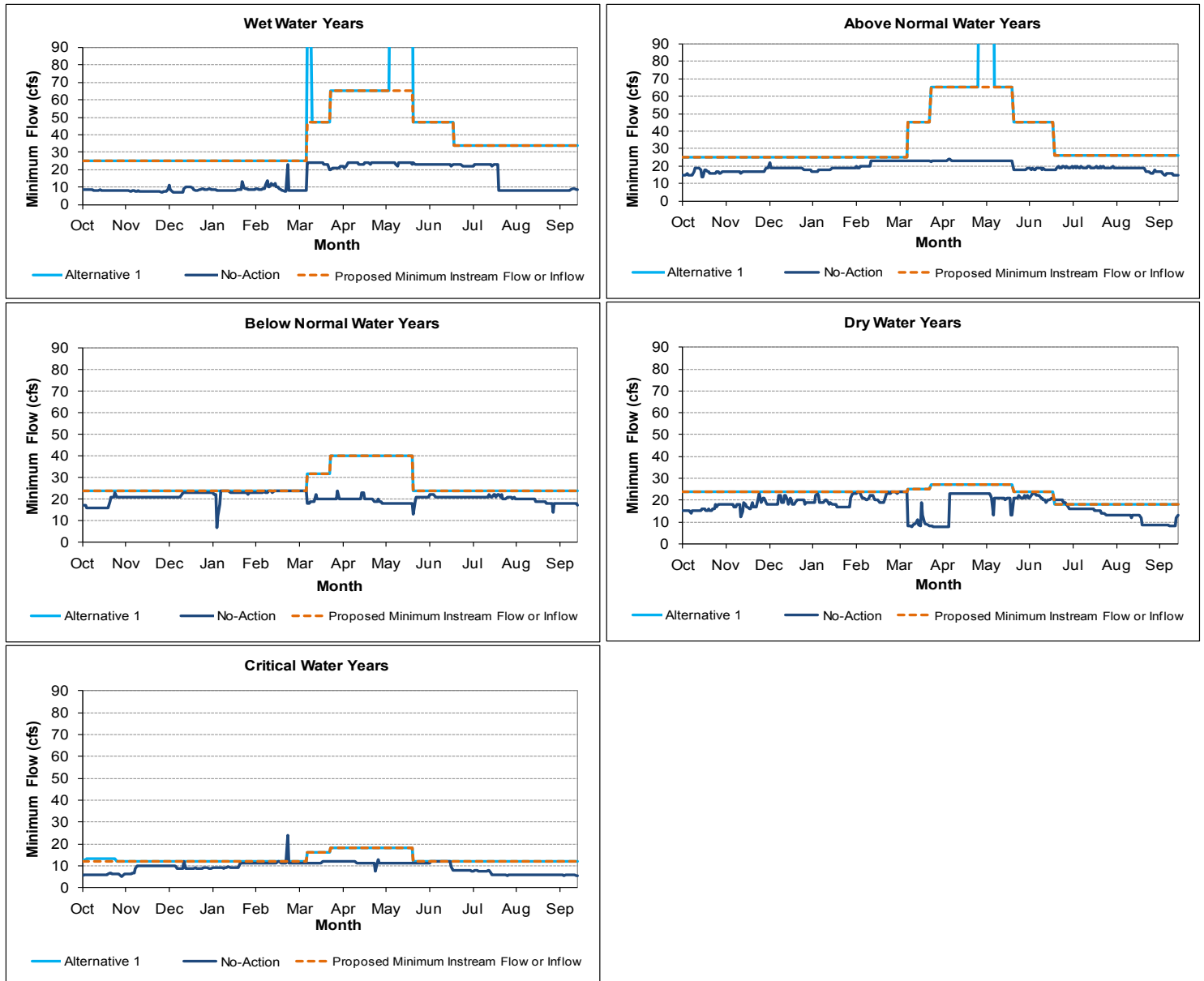


Figure 3.5-2d. Minimum Daily Flow under Alternative 1 and No-Action Alternative in Duncan Creek downstream of the Diversion (Based on the 1975-2007 Hydrology Data Combined by Water Year Type).

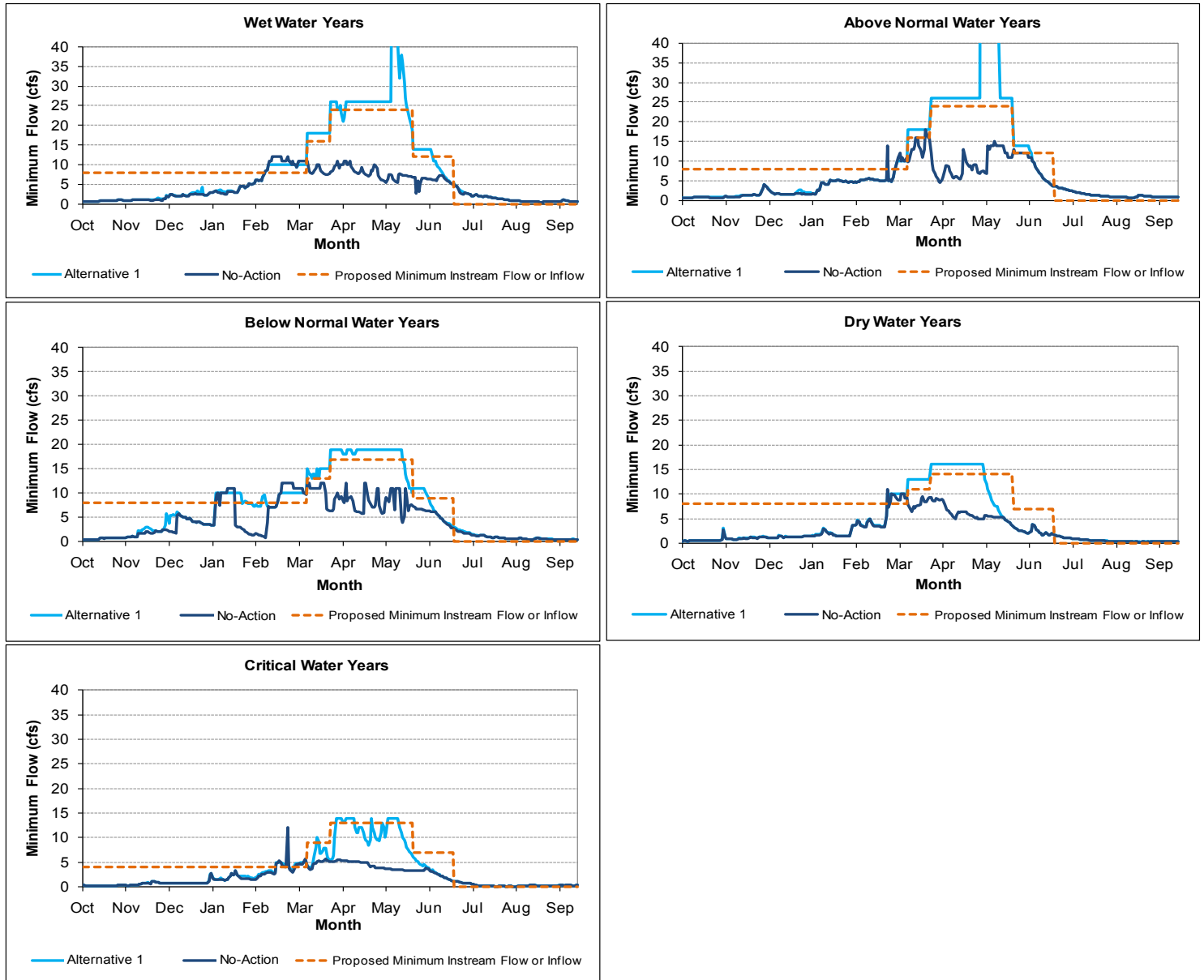


Figure 3.5-2e. Minimum Daily Flow under Alternative 1 and No-Action Alternative in North Fork Long Canyon Creek downstream of the Diversion (Based on the 1975-2007 Hydrology Data Combined by Water Year Type).

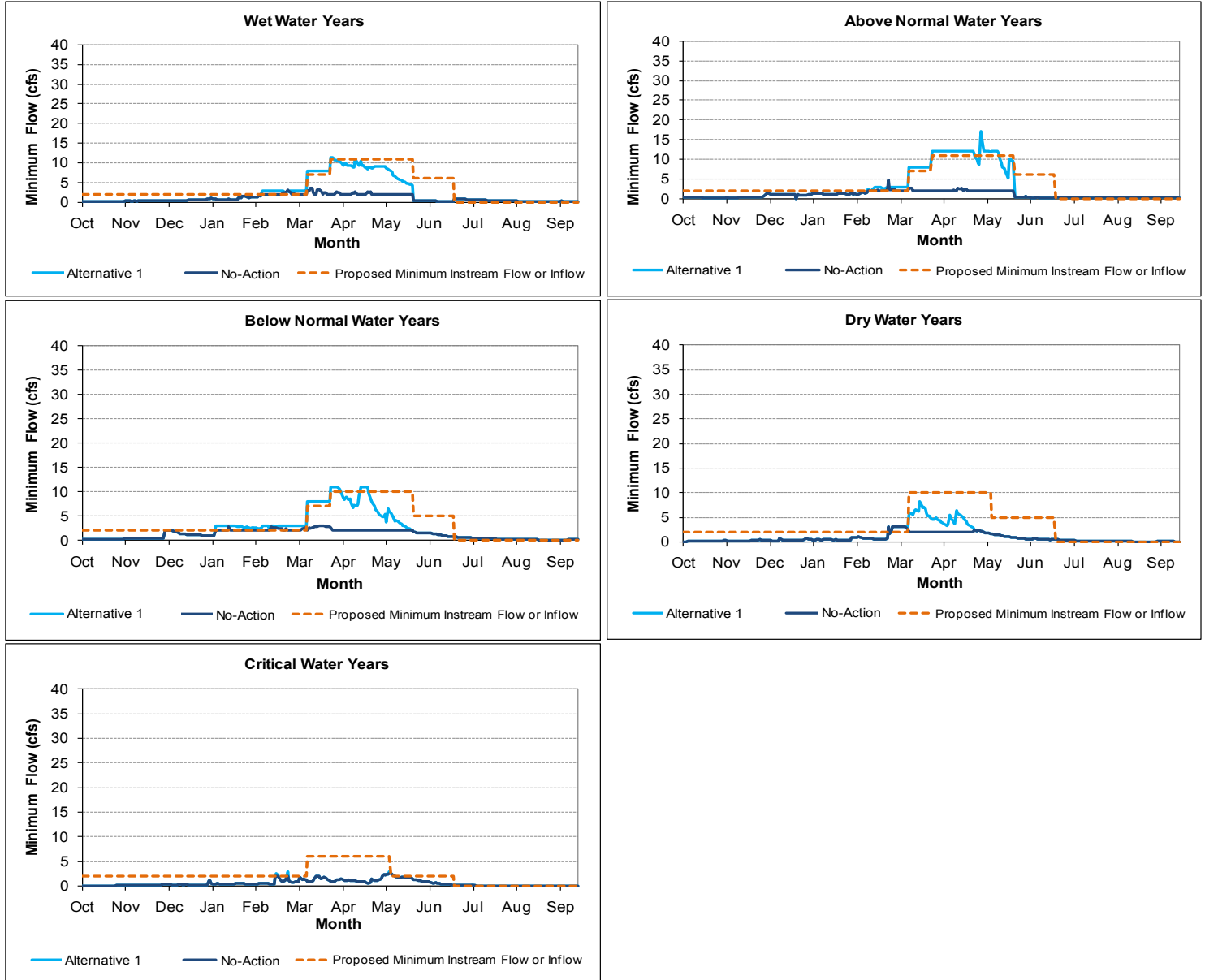


Figure 3.5-2f. Minimum Daily Flow under Alternative 1 and No-Action Alternative in South Fork Long Canyon Creek downstream of the Diversion (Based on the 1975-2007 Hydrology Data Combined by Water Year Type).

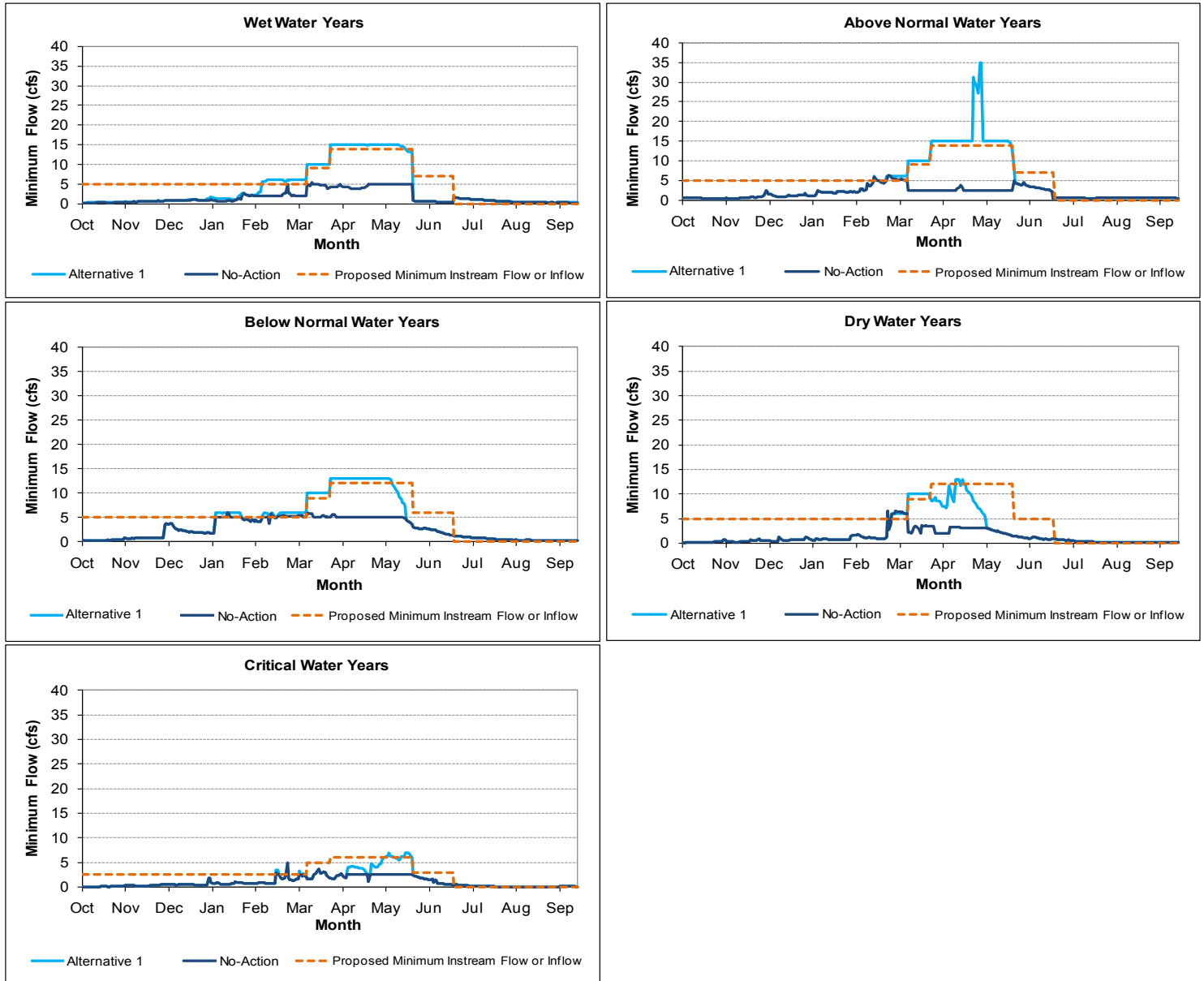


Figure 3.5-2g. Minimum Flow under Alternative 1 (Hourly Data) and No-Action Alternative (15-Minute Data) in the Middle Fork American River Peaking Reach (Based on the 1975-2007 Hydrology Data Combined by Water Year Type).

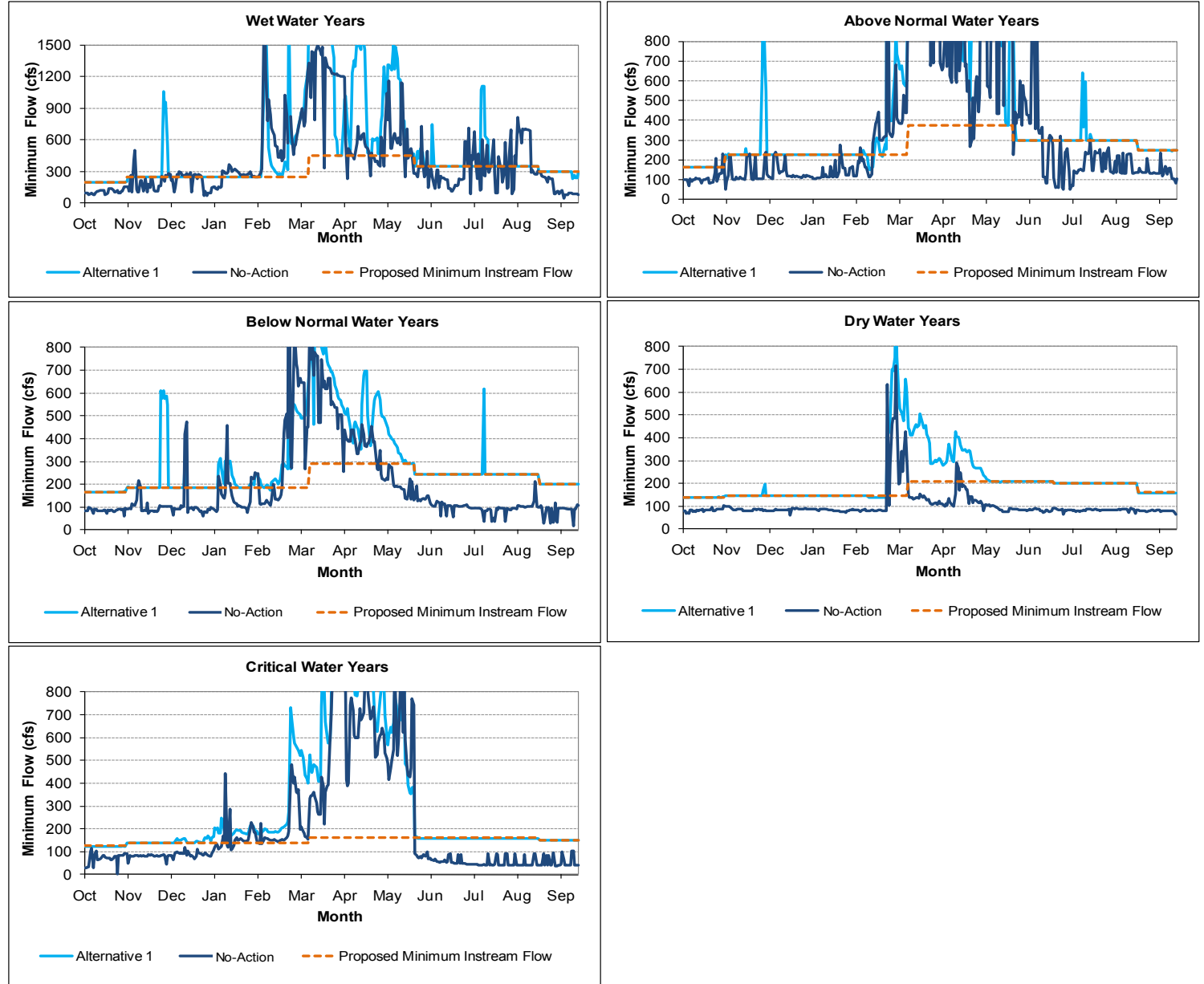


Figure 3.5-3a. Rubicon River Near Ellicott Bridge (R20.9) Flow Recession in Wet Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

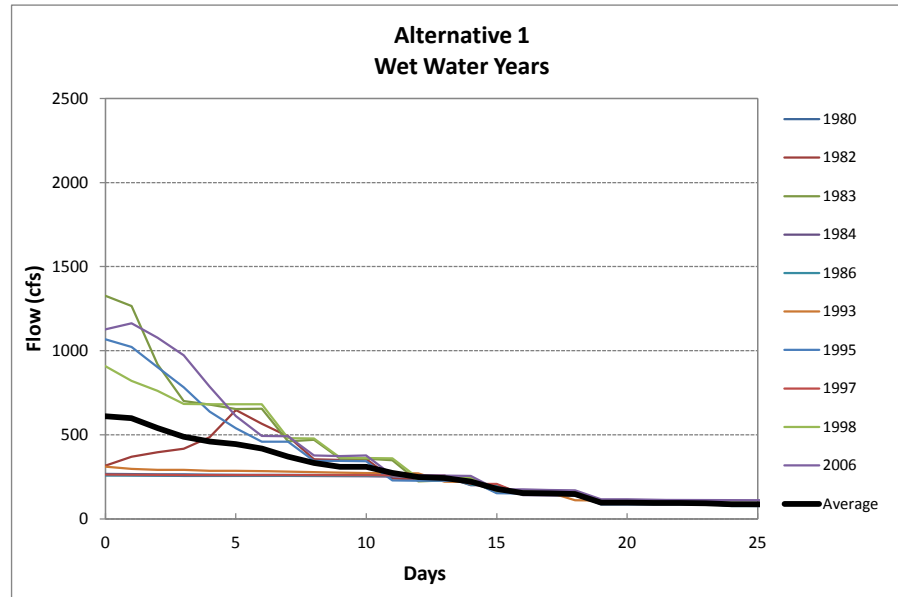


Figure 3.5-3b. Rubicon River Near Ellicott Bridge (R20.9) Flow Recession in Above Normal Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

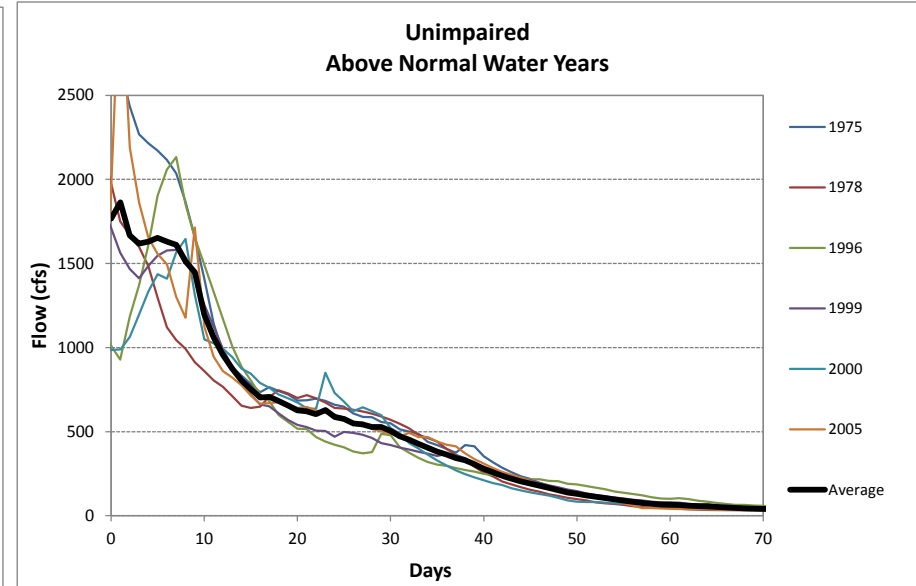
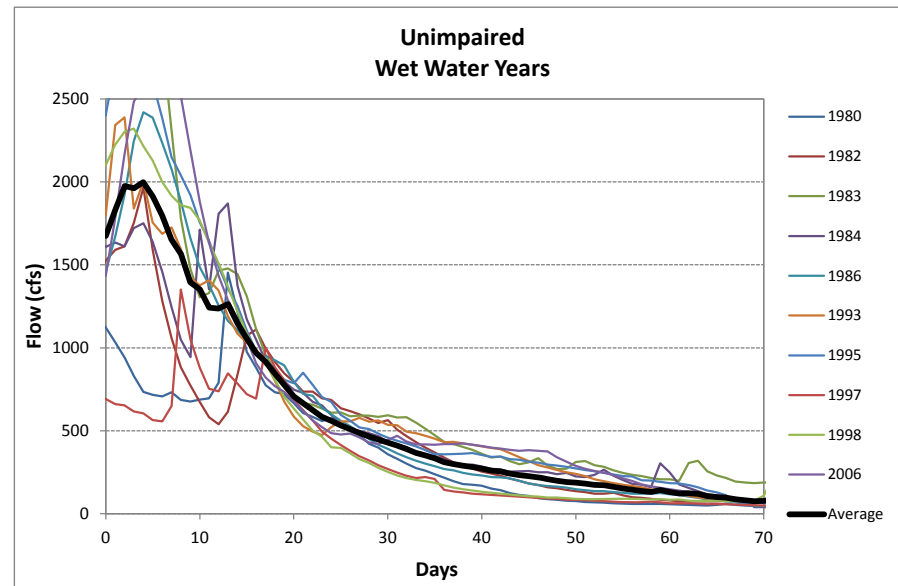
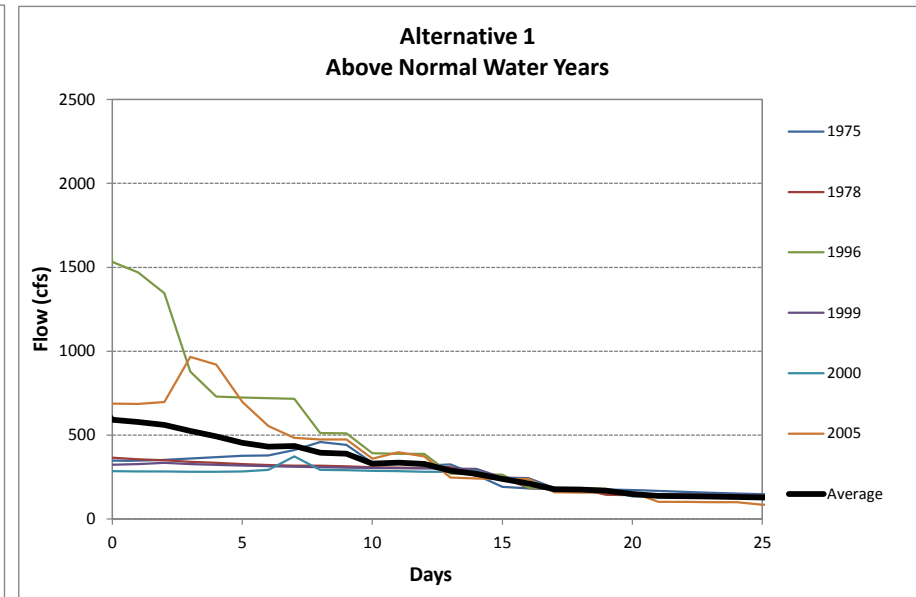


Figure 3.5-4a. Rubicon River Below Long Canyon Creek (R3.5) Flow Recession in Wet Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

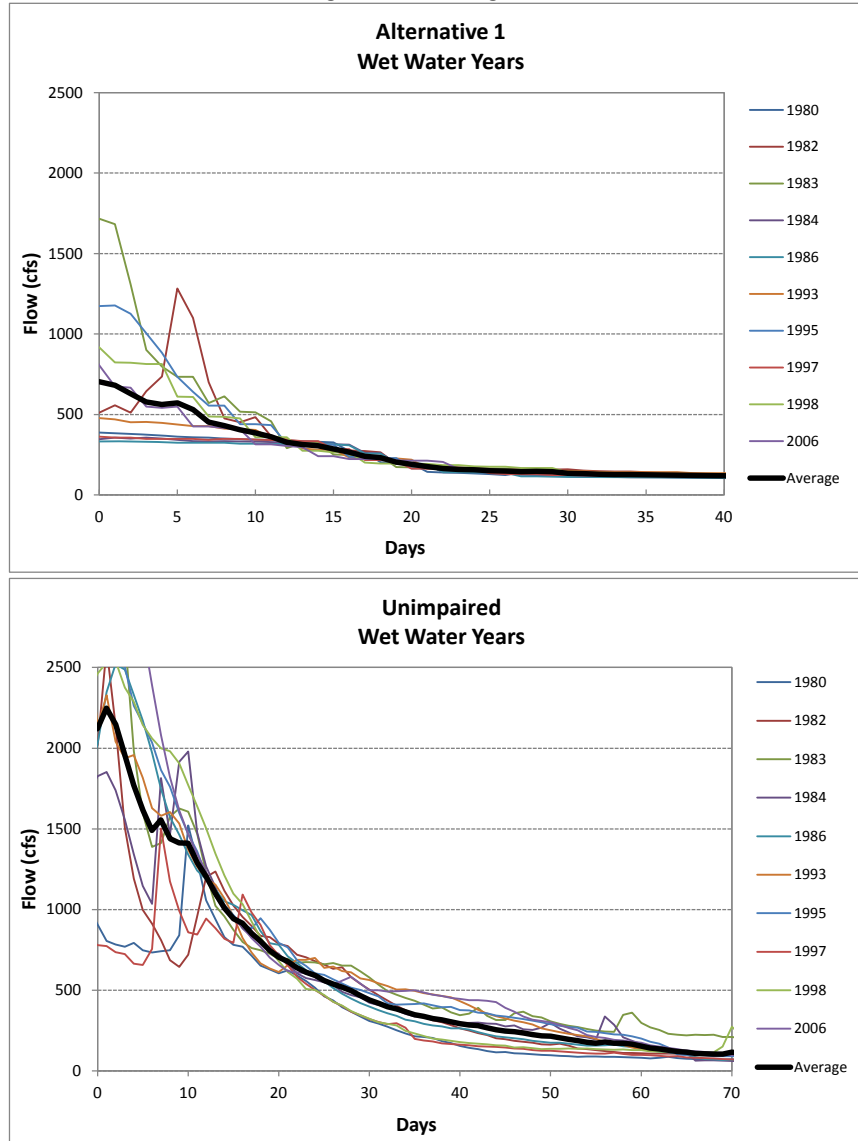


Figure 3.5-4b. Rubicon River Below Long Canyon Creek (R3.5) Flow Recession in Above Normal Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

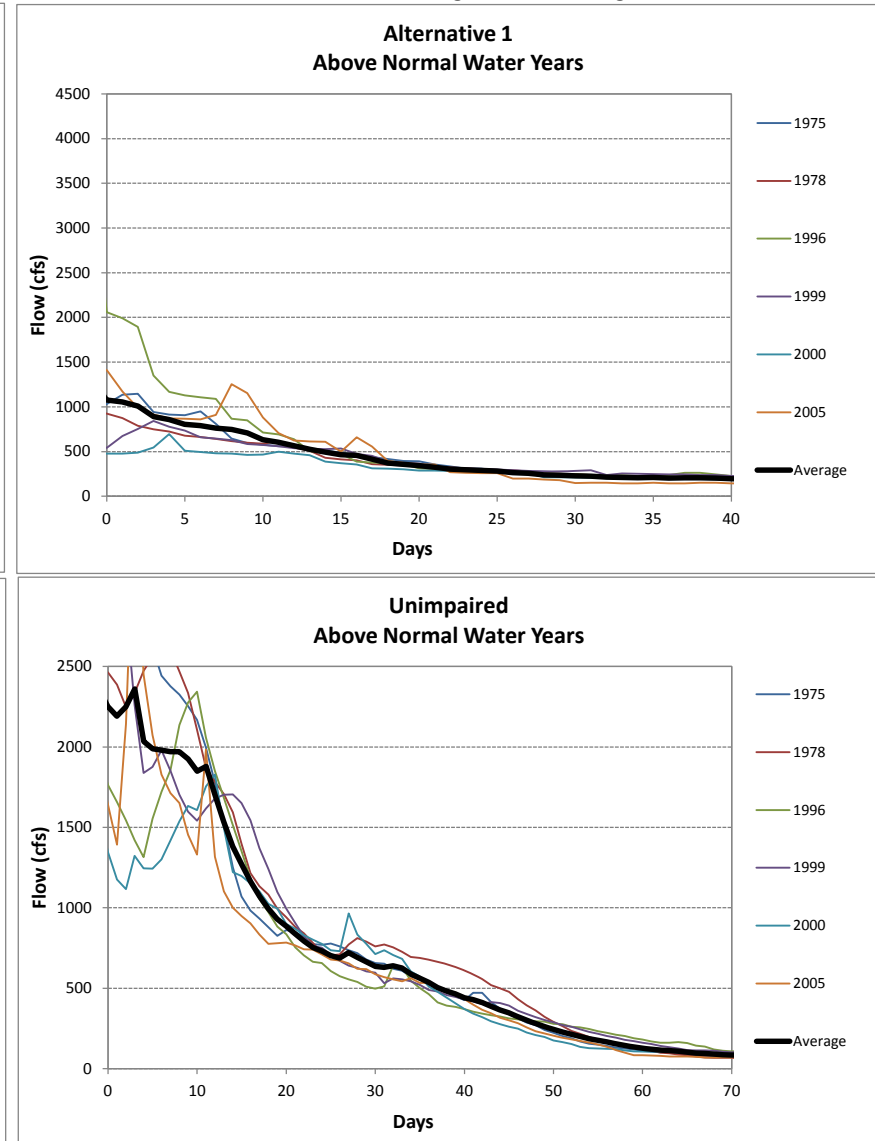


Figure 3.5-5a. Middle Fork American River Above Ralston Afterbay (MF26.2) Flow Recession in Wet Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

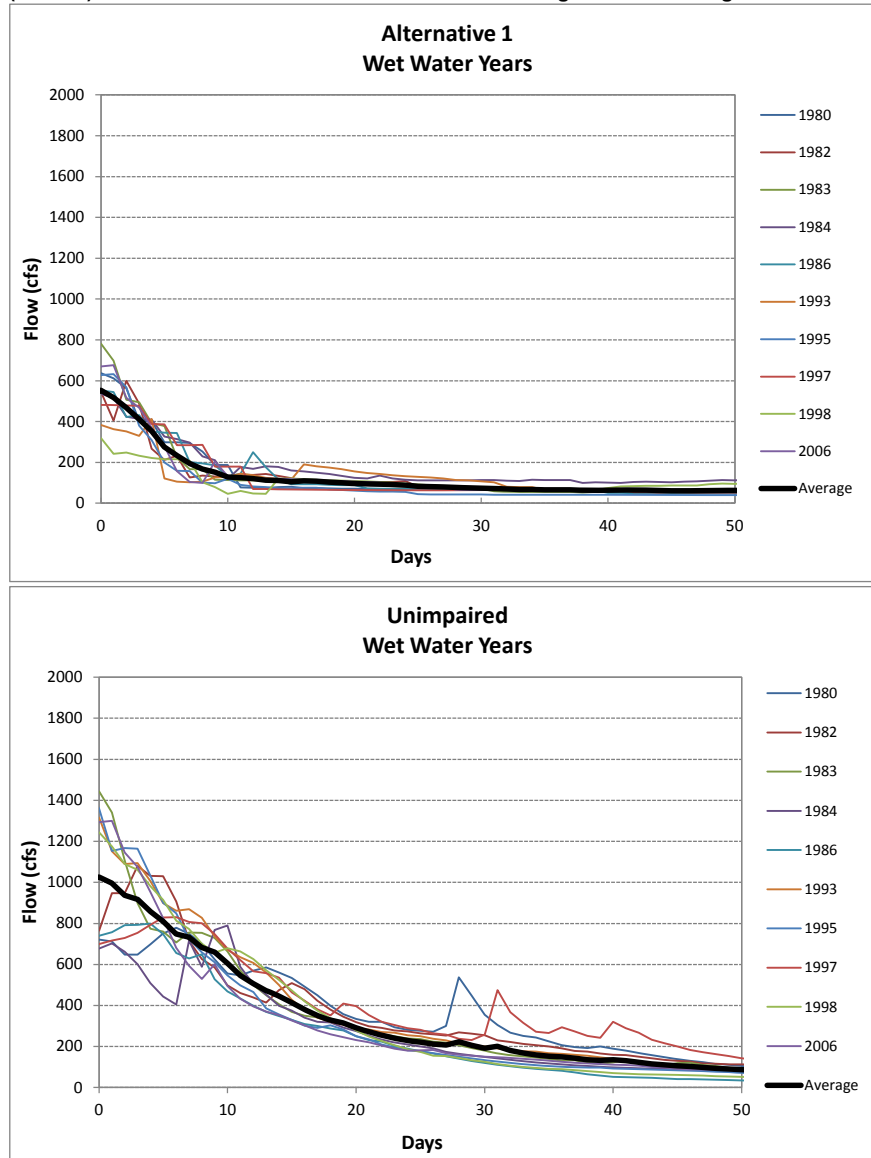


Figure 3.5-5b. Middle Fork American River Above Ralston Afterbay (MF26.2) Flow Recession in Above Normal Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

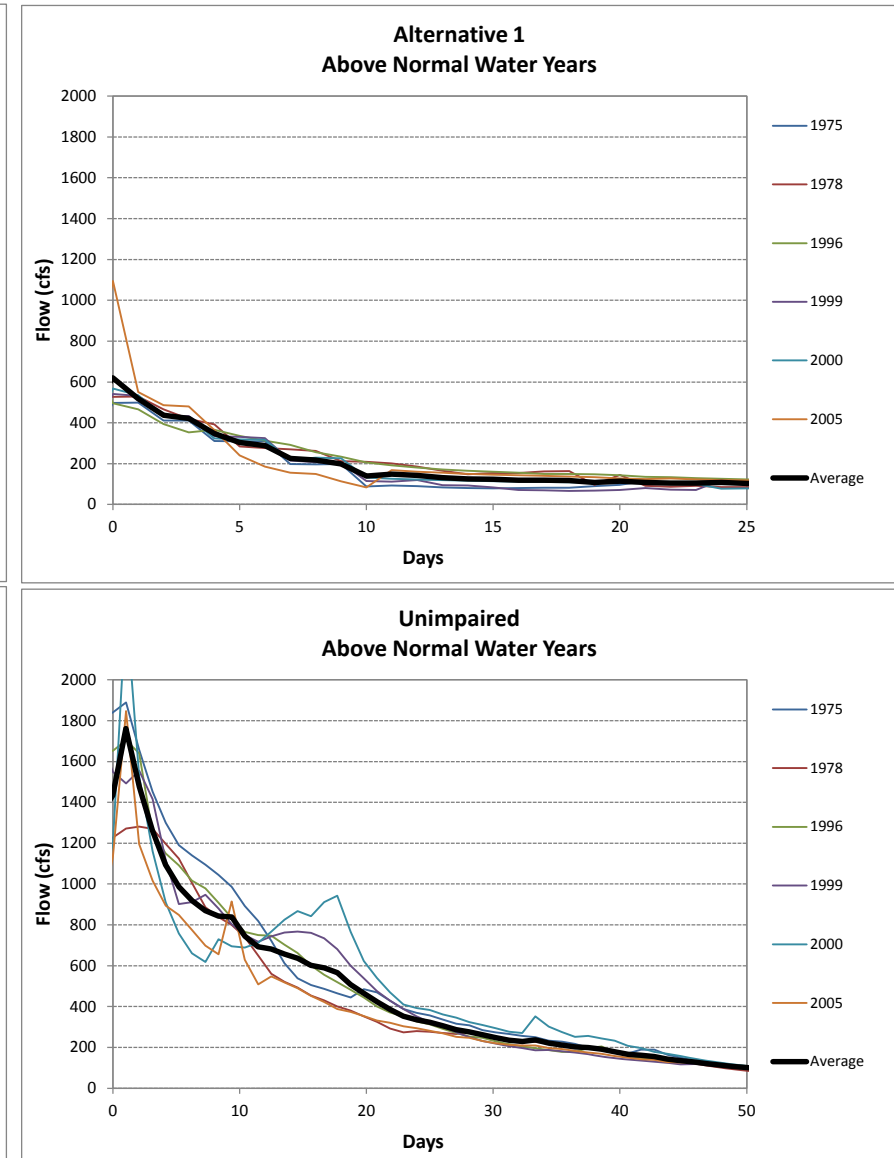


Figure 3.5-6a. Rubicon River Near Ellicott Bridge (R20.9) Average Flow Recession (top) and Relative Stage Change (bottom) in Wet Water Years for Alternative 1 and Unimpaired Conditions.

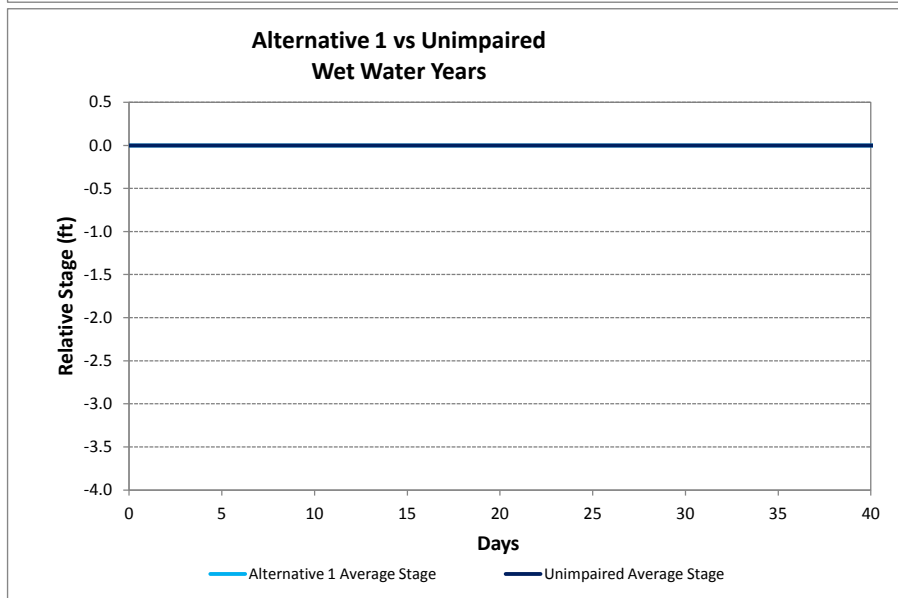
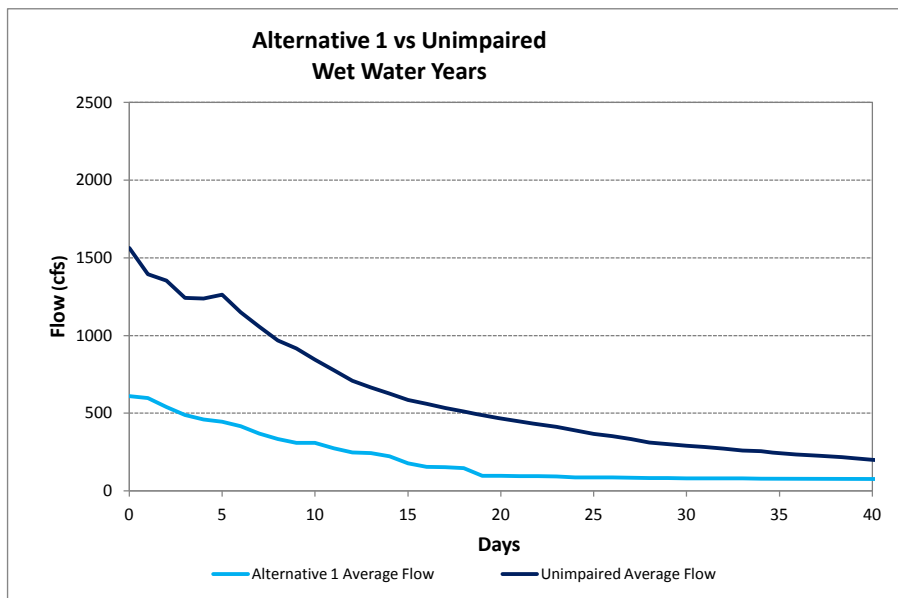


Figure 3.5-6b. Rubicon River Near Ellicott Bridge (R20.9) Average Flow Recession (top) and Relative Stage Change (bottom) in Above Normal Water Years for Alternative 1 and Unimpaired Conditions.

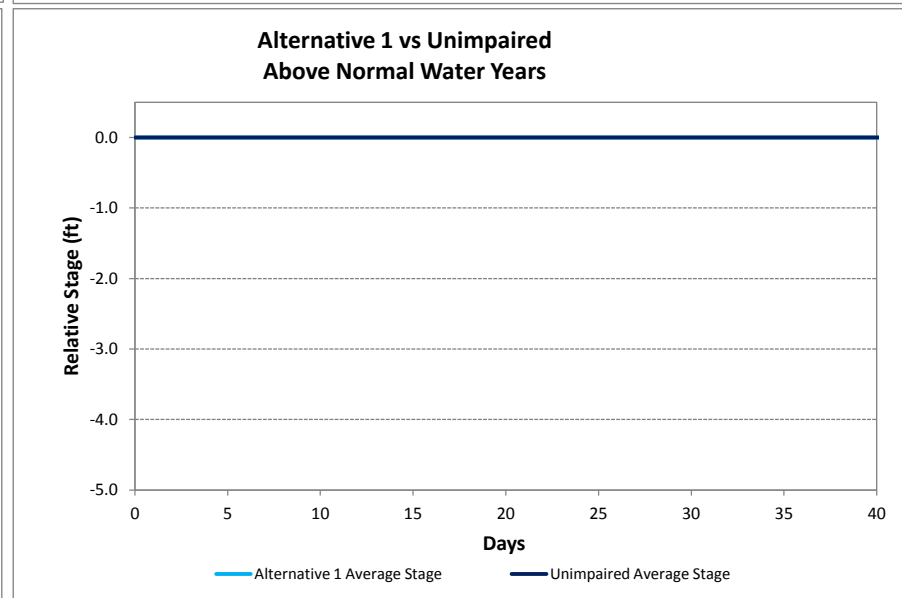
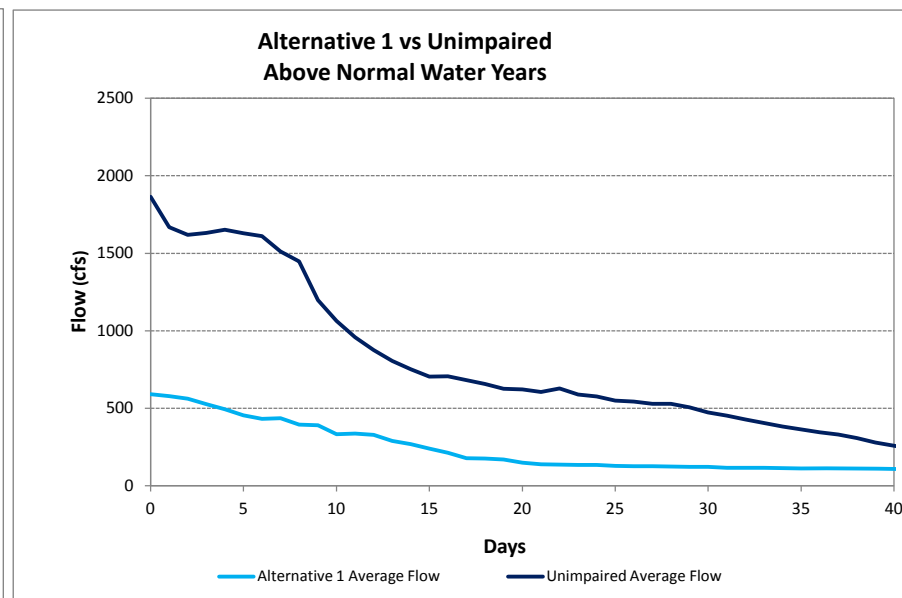


Figure 3.5-7a. Rubicon River Below Long Canyon Creek (R3.5) Average Flow Recession (top) and Relative Stage Change (bottom) in Wet Water Years for Alternative 1 and Unimpaired Conditions.

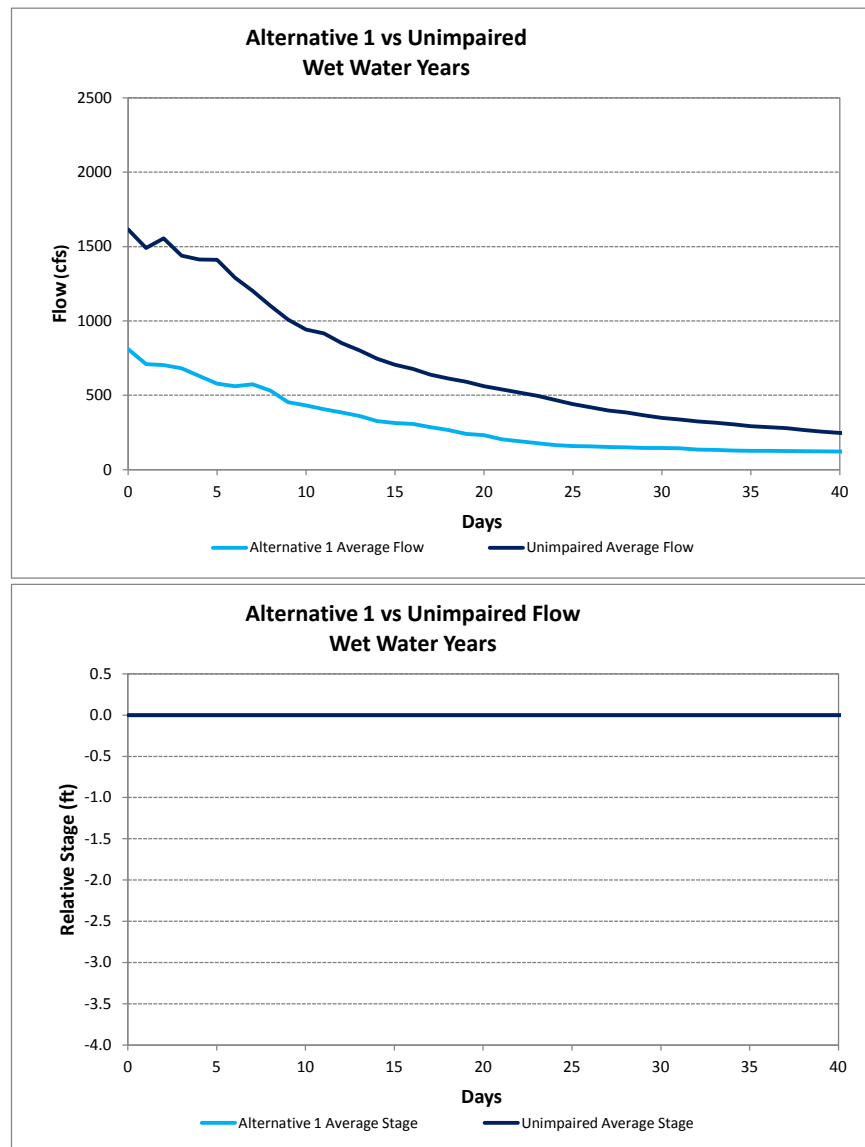


Figure 3.5-7b. Rubicon River Below Long Canyon Creek (R3.5) Average Flow Recession (top) and Relative Stage Change (bottom) in Above Normal Water Years for Alternative 1 and Unimpaired Conditions.

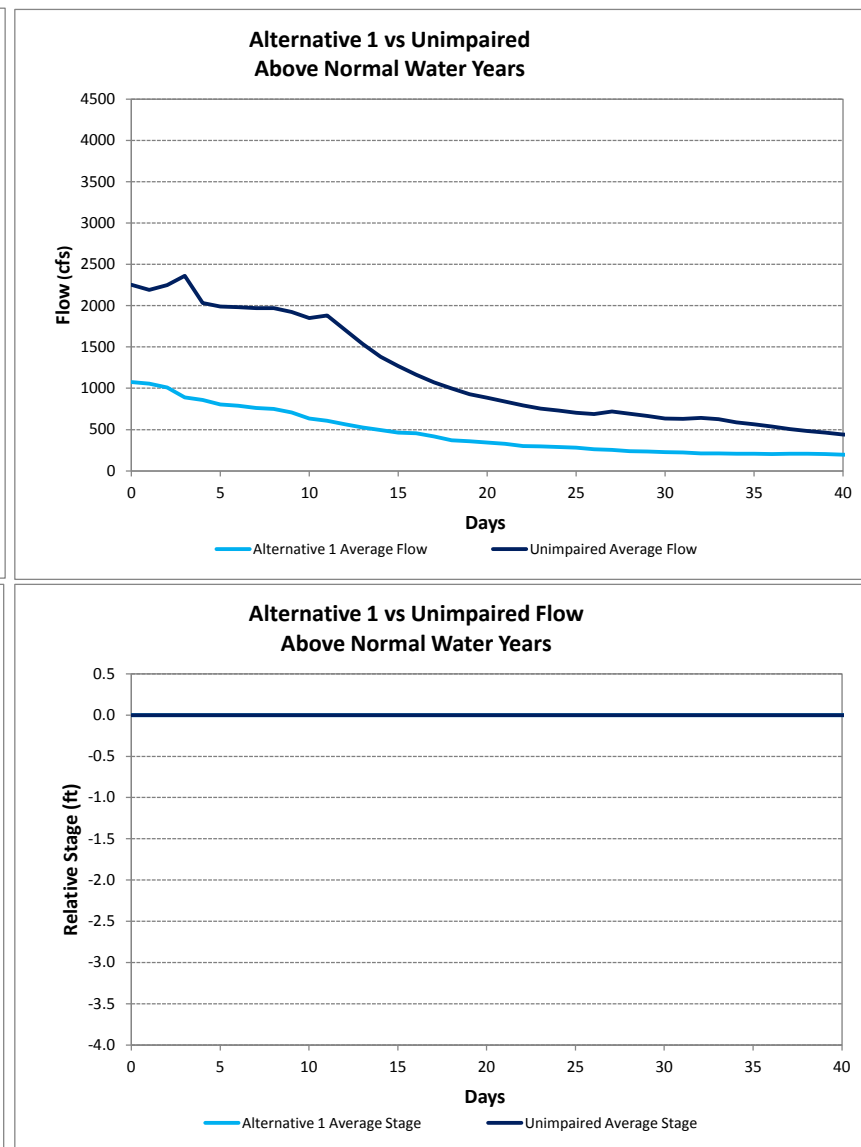


Figure 3.5-8a. Middle Fork American River Above Ralston Afterbay (MF26.2) Flow Recession in Wet Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

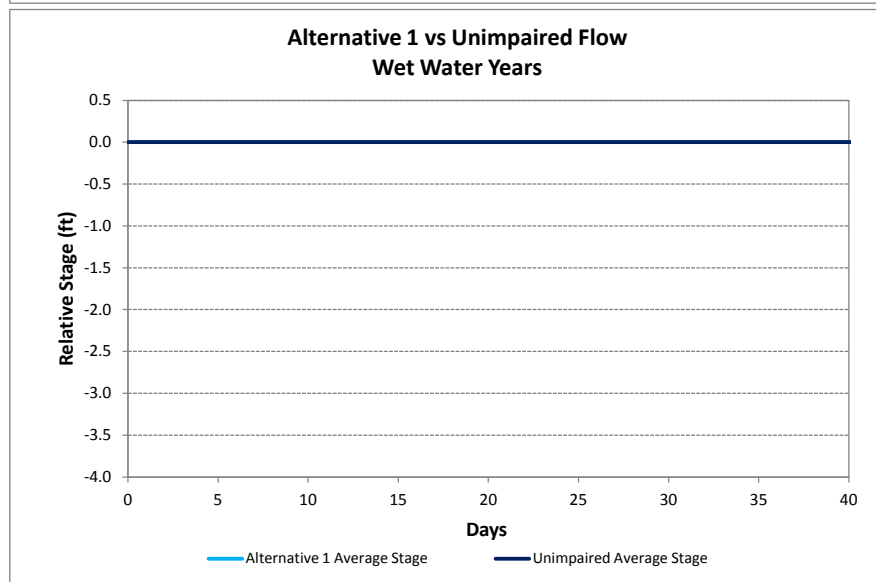
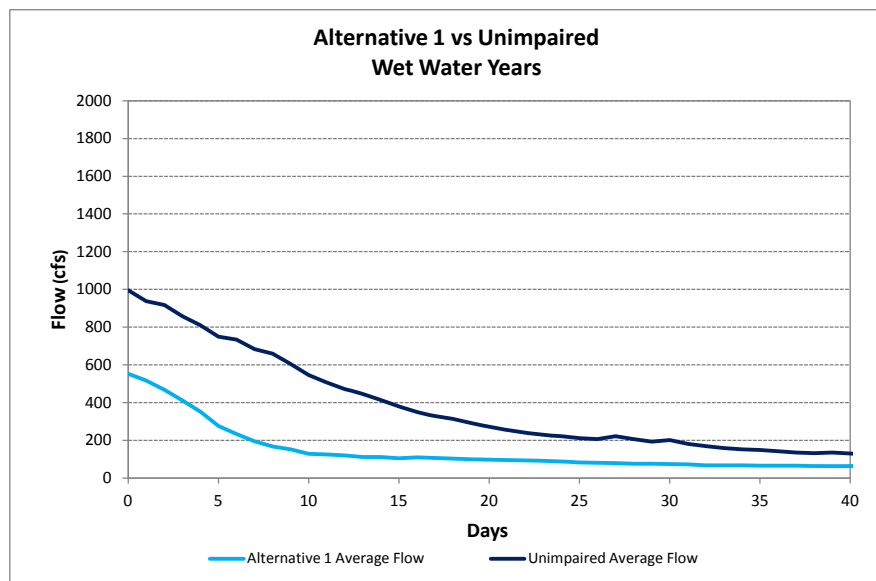


Figure 3.5-8b. Middle Fork American River Above Ralston Afterbay (MF26.2) Flow Recession in Above Normal Water Years for Alternative 1 (top) and Unimpaired Conditions (bottom). Flows were Time-Shifted to Match the Timing of the Receding Limb.

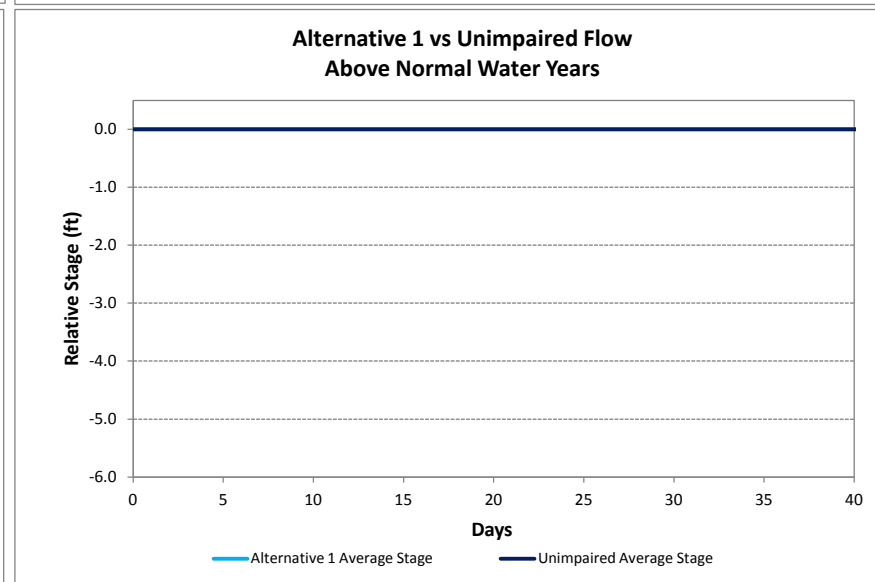
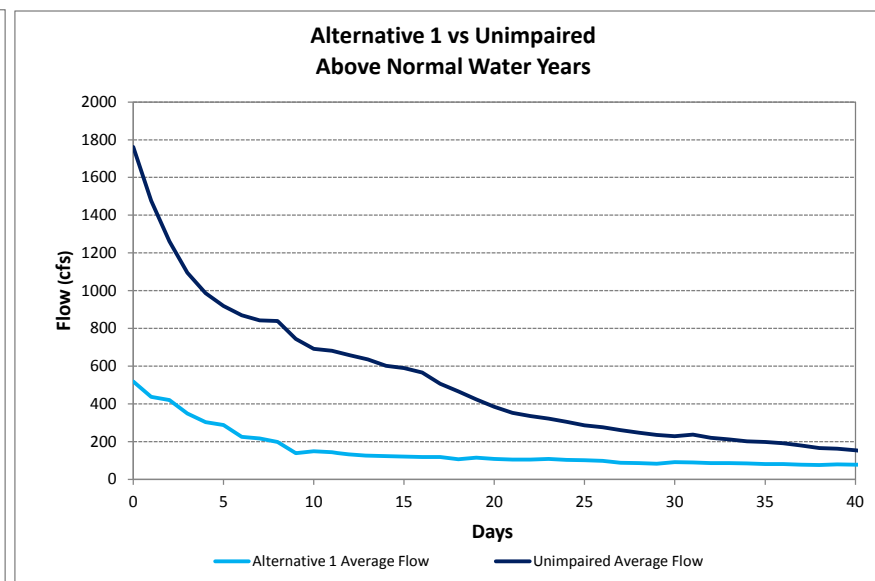


Figure 3.5-9a. Average Flow Fluctuations in the Peaking Reach for Alternative 1 and No-Action Alternative in Summer/Fall (Jun-Oct), Winter (Nov-Feb), and Spring (Mar-May).

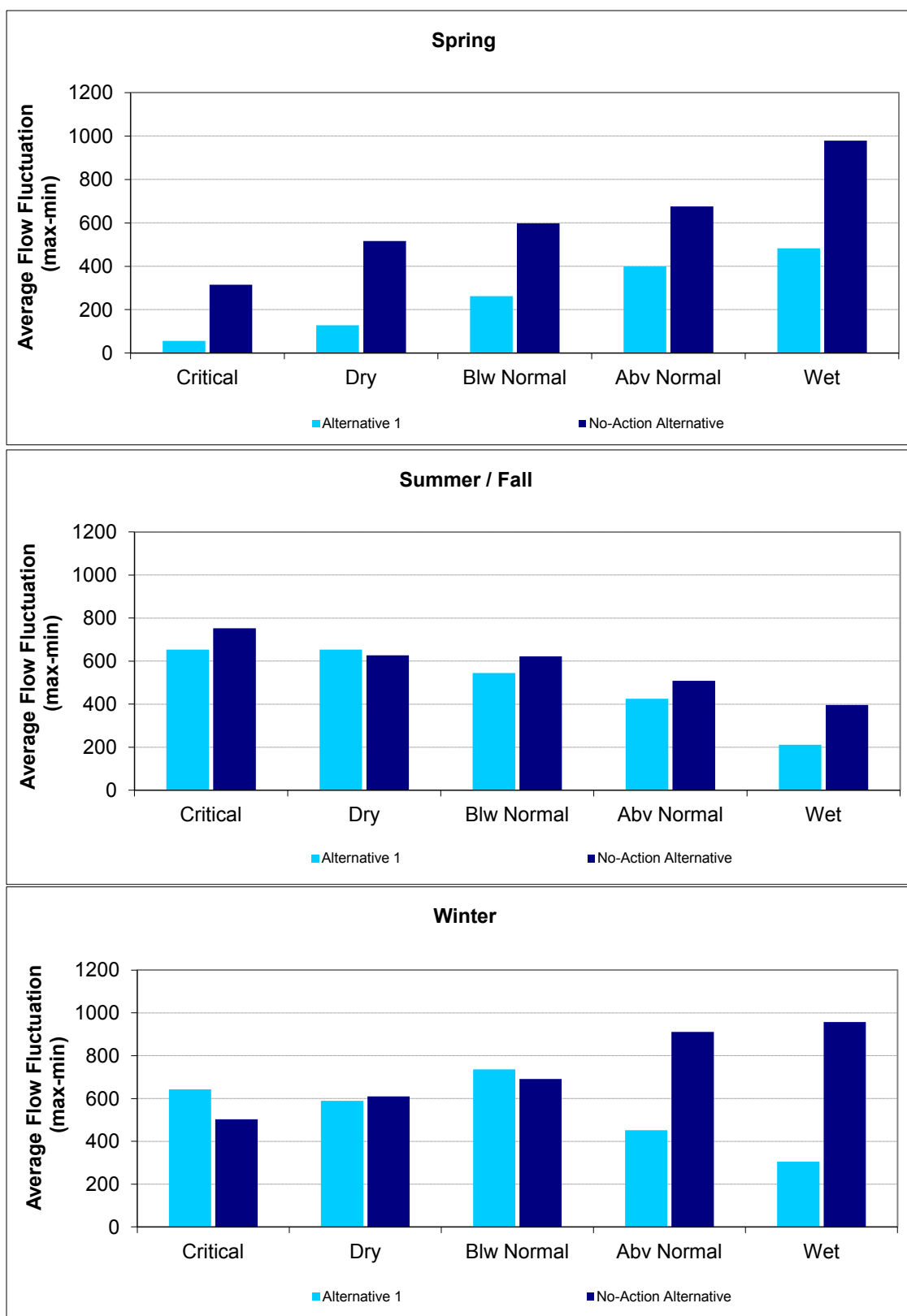


Figure 3.5-9b. Average Ratio of Flow Fluctuations in the Peaking Reach for Alternative 1 and No-Action Alternative in Spring (Mar-May), Summer/Fall (Jun-Oct), and Winter (Nov-Feb).

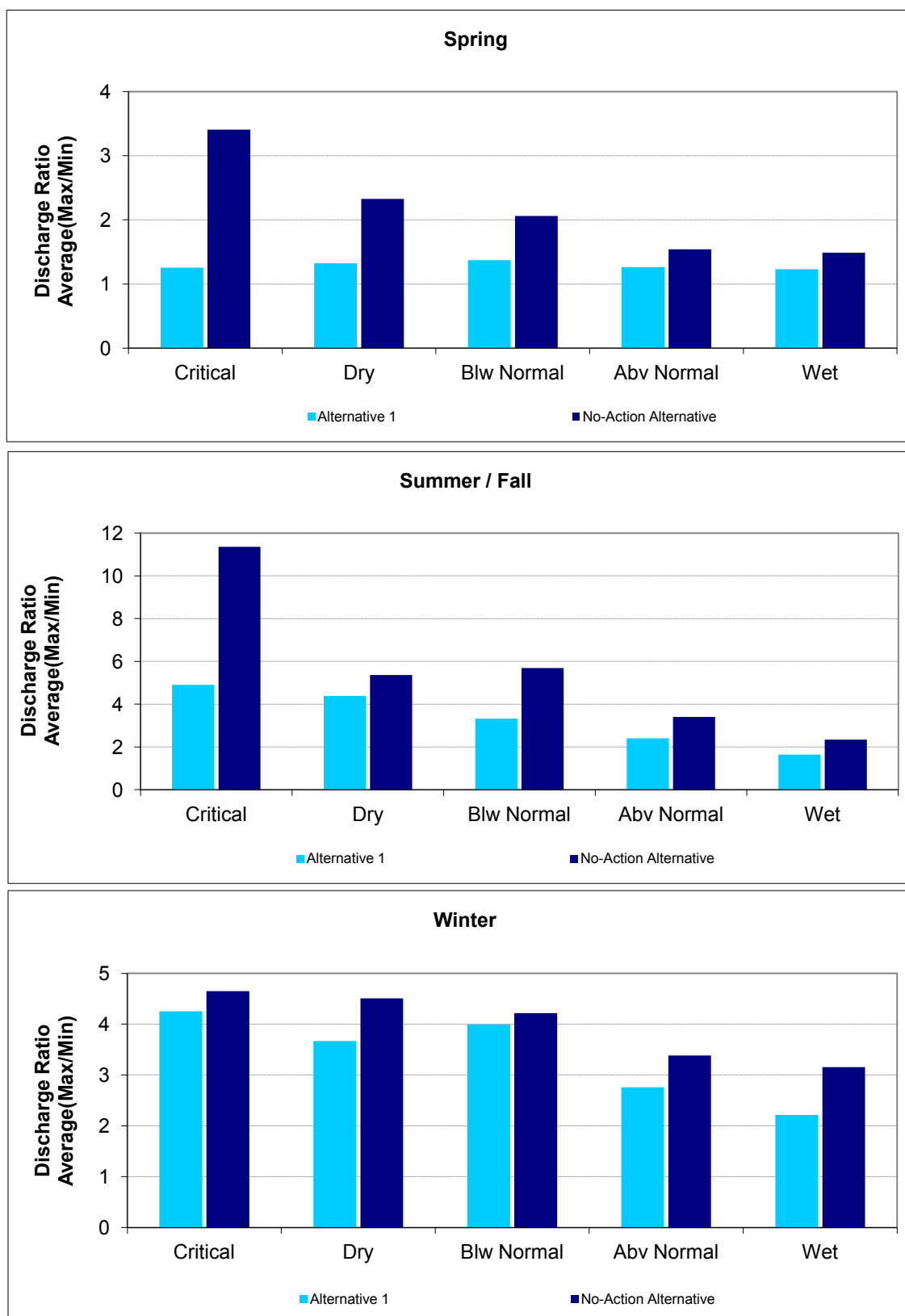
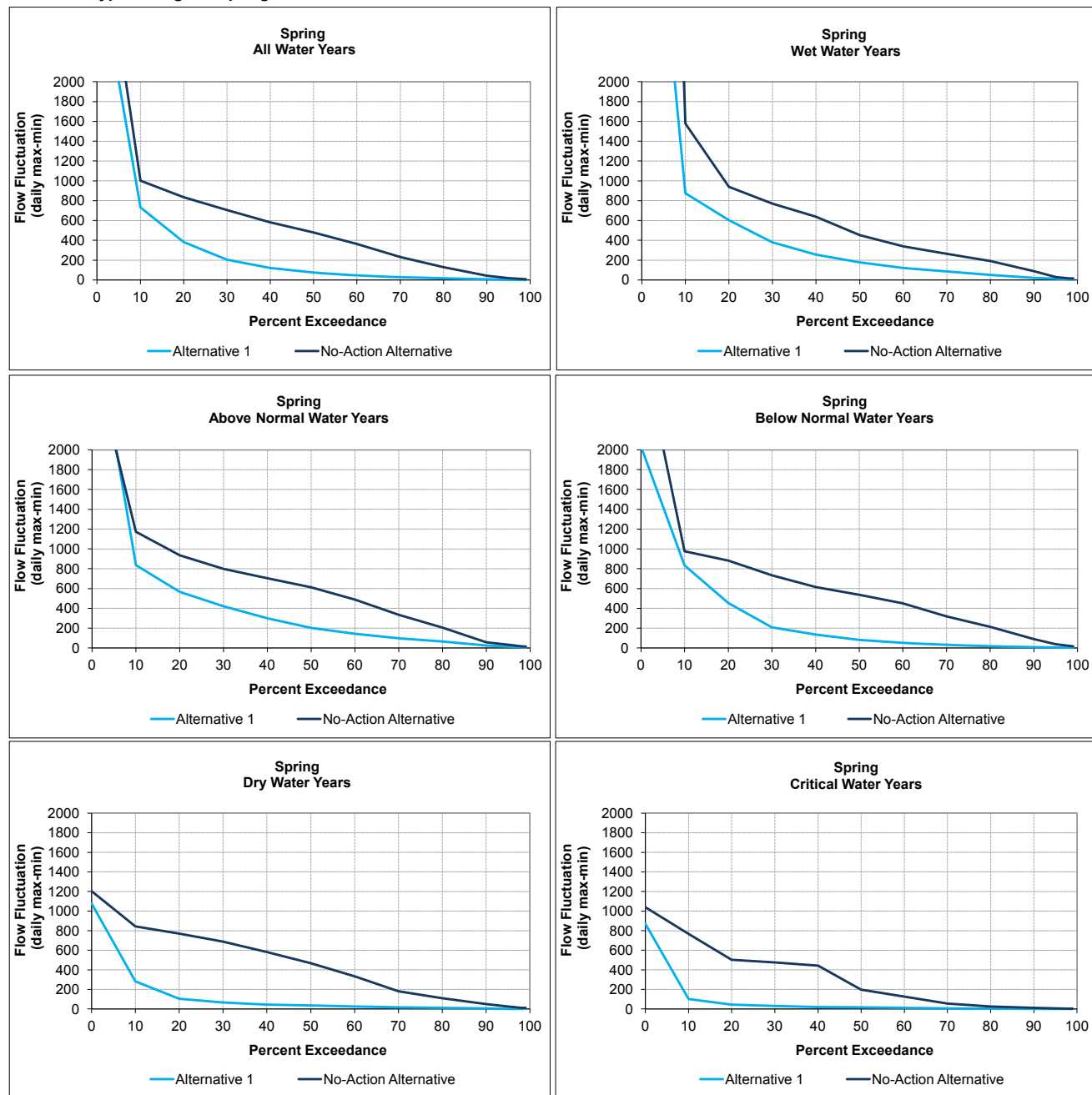
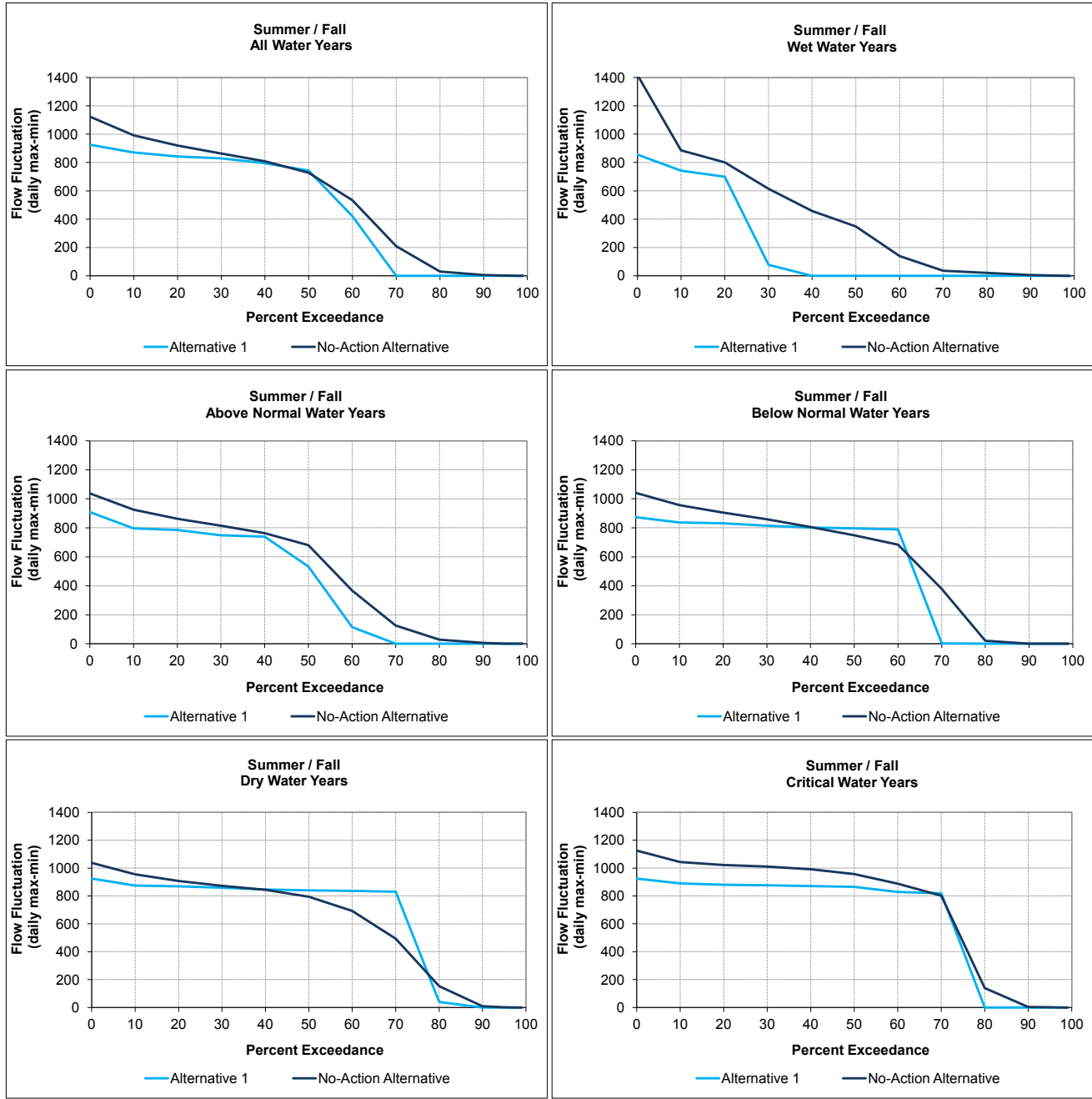


Figure 3.5-10a. Daily Flow Fluctuation (daily maximum - daily minimum) Exceedances in the Middle Fork American River Peaking Reach by Water Year Type during the Spring¹.



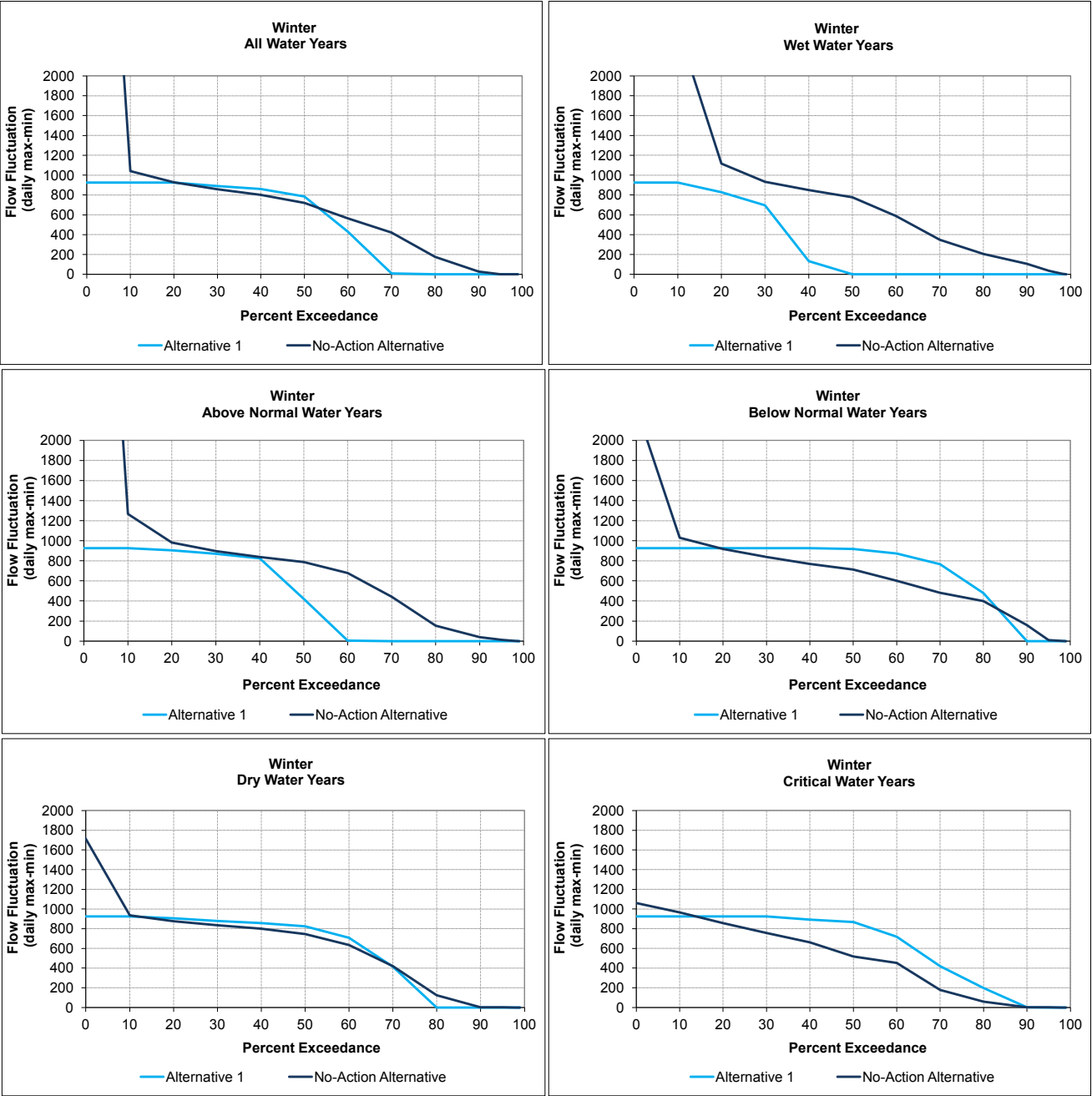
¹Spring = March - May

Figure 3.5-10b. Daily Flow Fluctuation (daily maximum - daily minimum) Exceedances in the Middle Fork American River Peaking Reach by Water Year Type during the Summer / Fall¹.



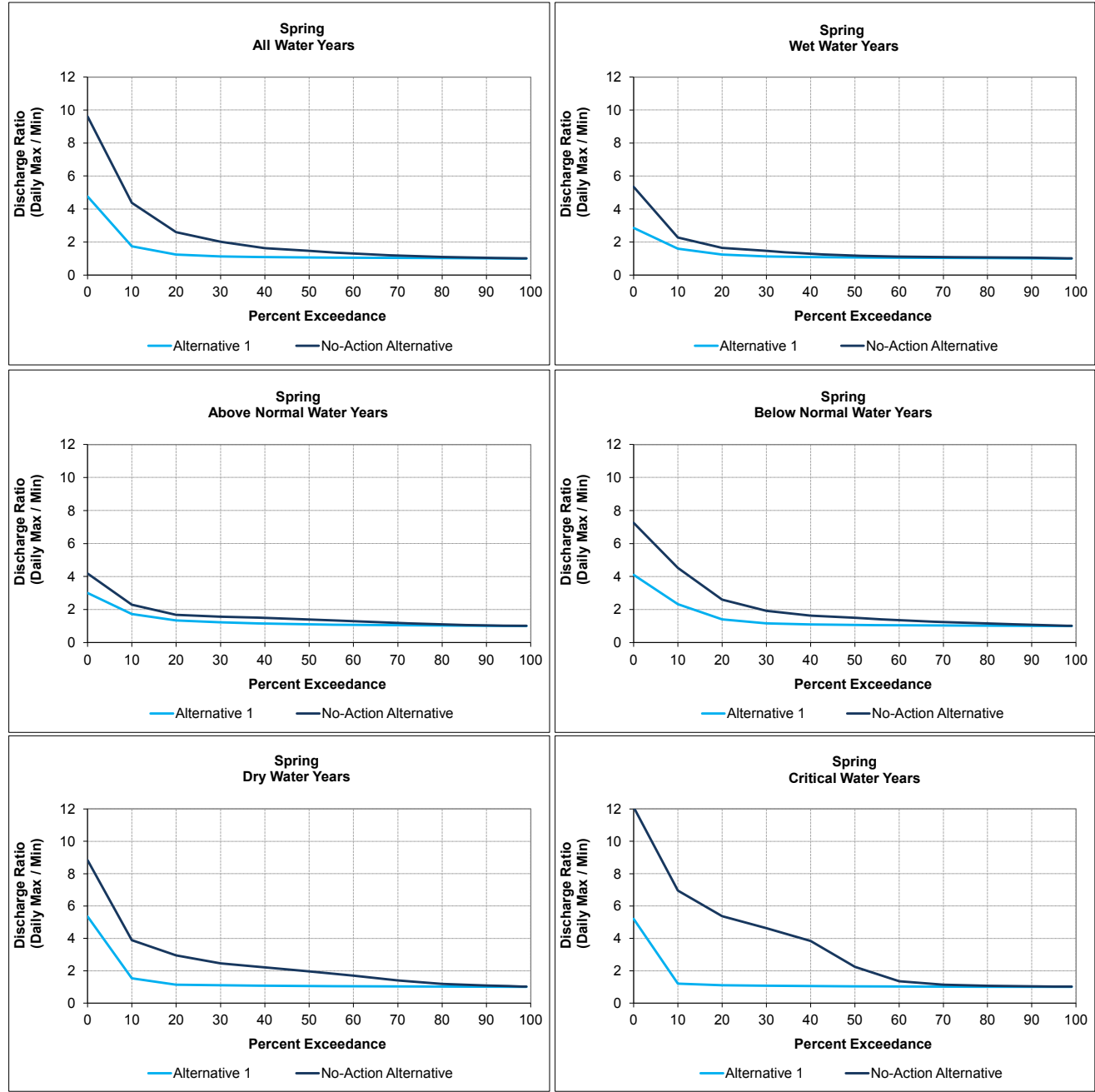
¹Summer / Fall = June - October

Figure 3.5-10c. Daily Flow Fluctuation (daily maximum - daily minimum) Exceedances in the Middle Fork American River Peaking Reach by Water Year Type during the Winter¹.



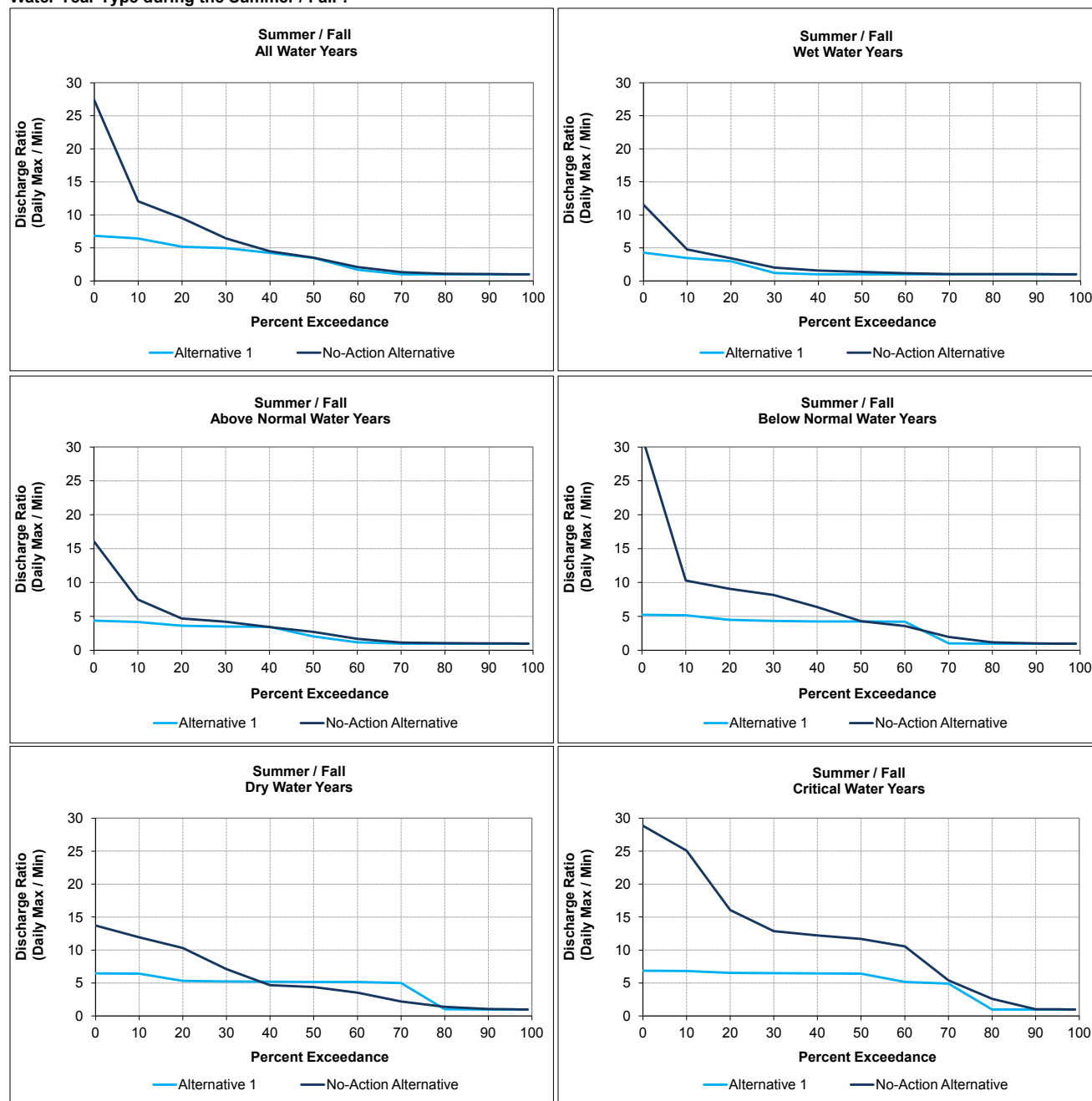
¹Winter = November - February

Figure 3.5-11a. Daily Discharge Ratio (daily maximum / daily minimum) Exceedances in the Middle Fork American River Peaking Reach by Water Year Type during the Spring¹.



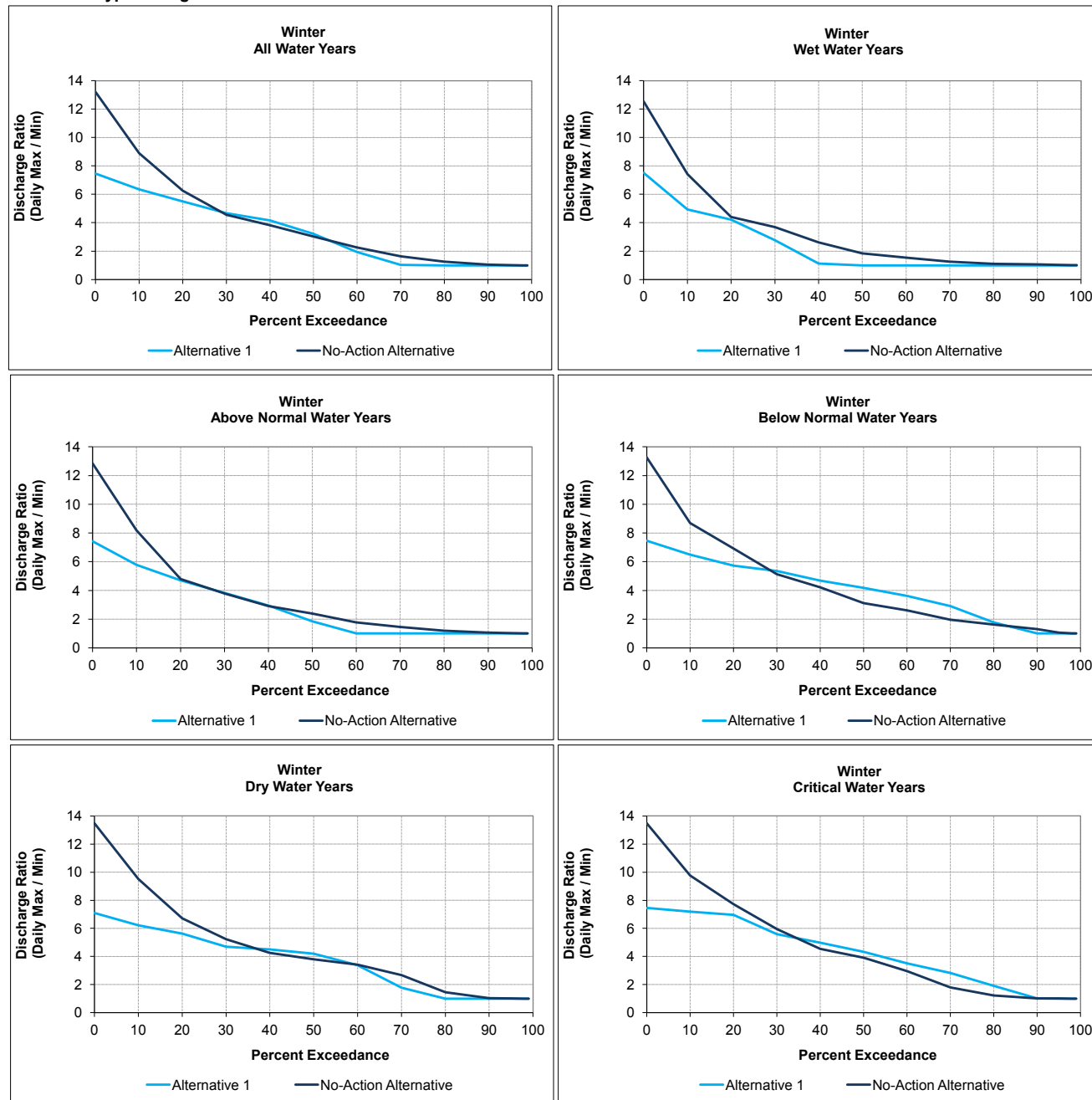
¹Spring = March - May

Figure 3.5-11b. Daily Discharge Ratio (daily maximum / daily minimum) Exceedances in the Middle Fork American River Peaking Reach by Water Year Type during the Summer / Fall¹.



¹Summer / Fall = June - October

Figure 3.5-11c. Daily Discharge Ratio (daily maximum / daily minimum) Exceedances in the Middle Fork American River Peaking Reach by Water Year Type during the Winter¹.



¹Winter = November - February

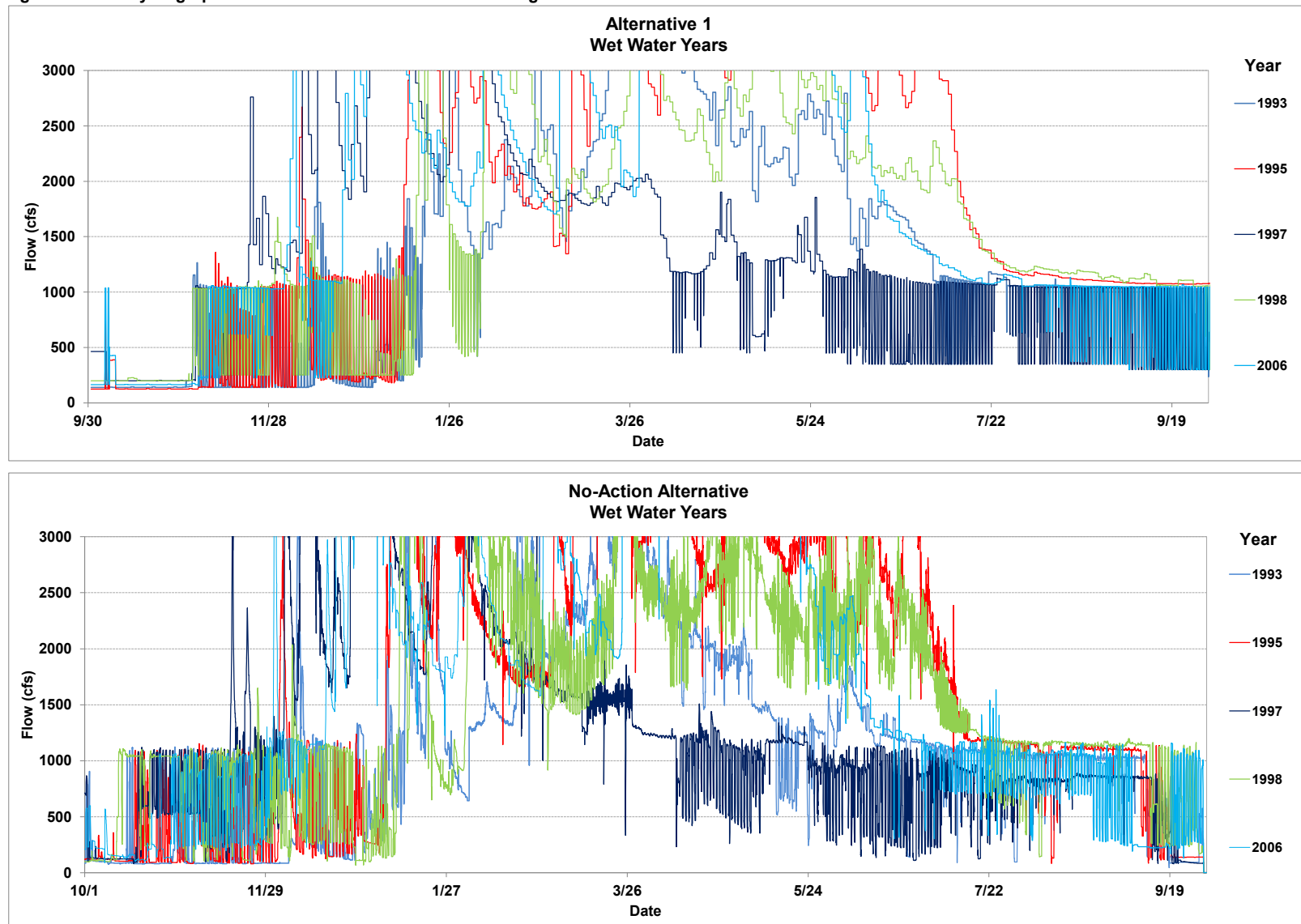
Figure 3.5-12a. Hydrographs for the Middle Fork American Peaking Reach in Wet Water Years under Alternative 1 and No-Action Alternative.

Figure 3.5-12b. Hydrographs for the Middle Fork American Peaking Reach in Above Normal Water Years under Alternative 1 and No-Action Alternative.

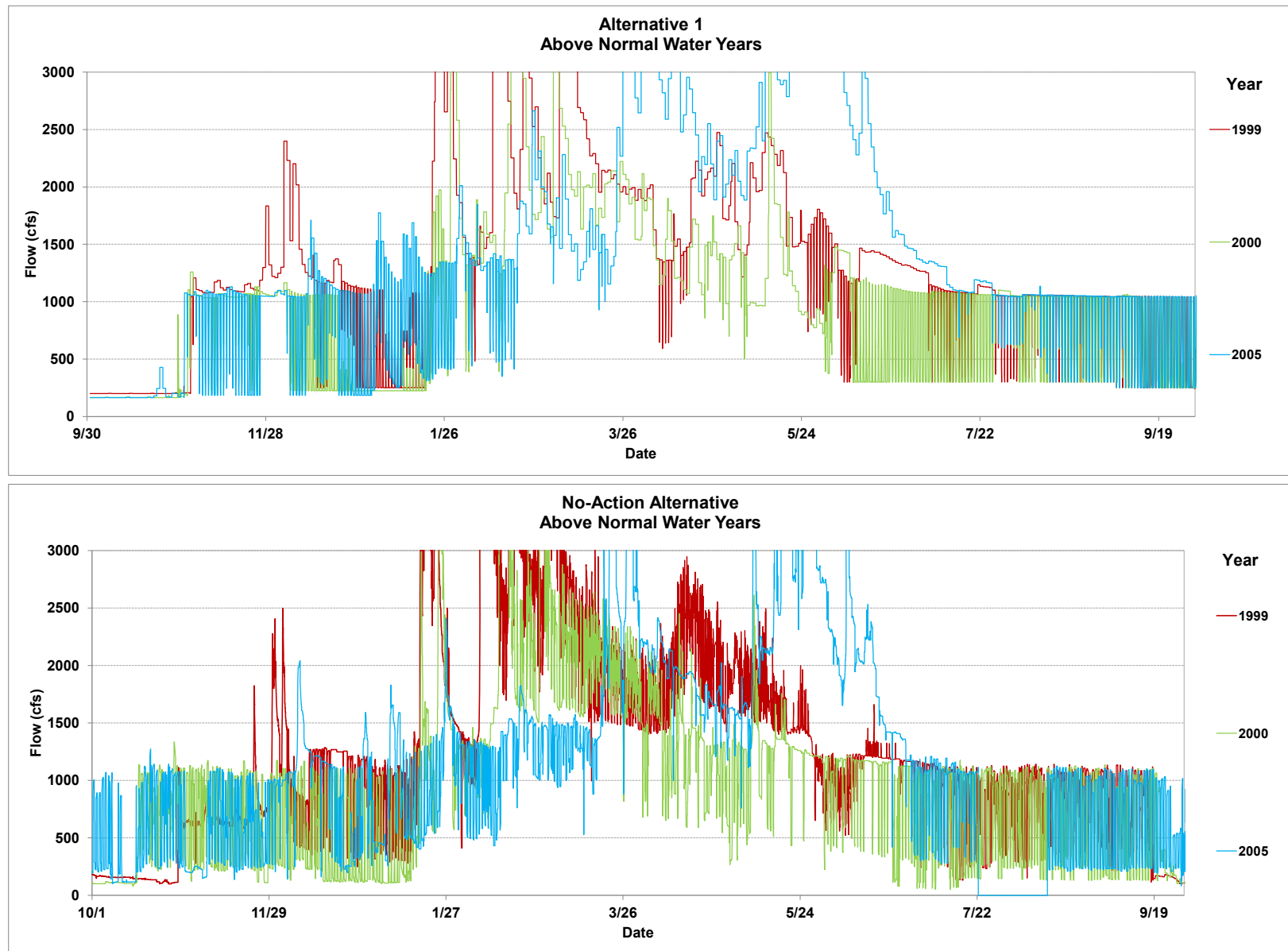


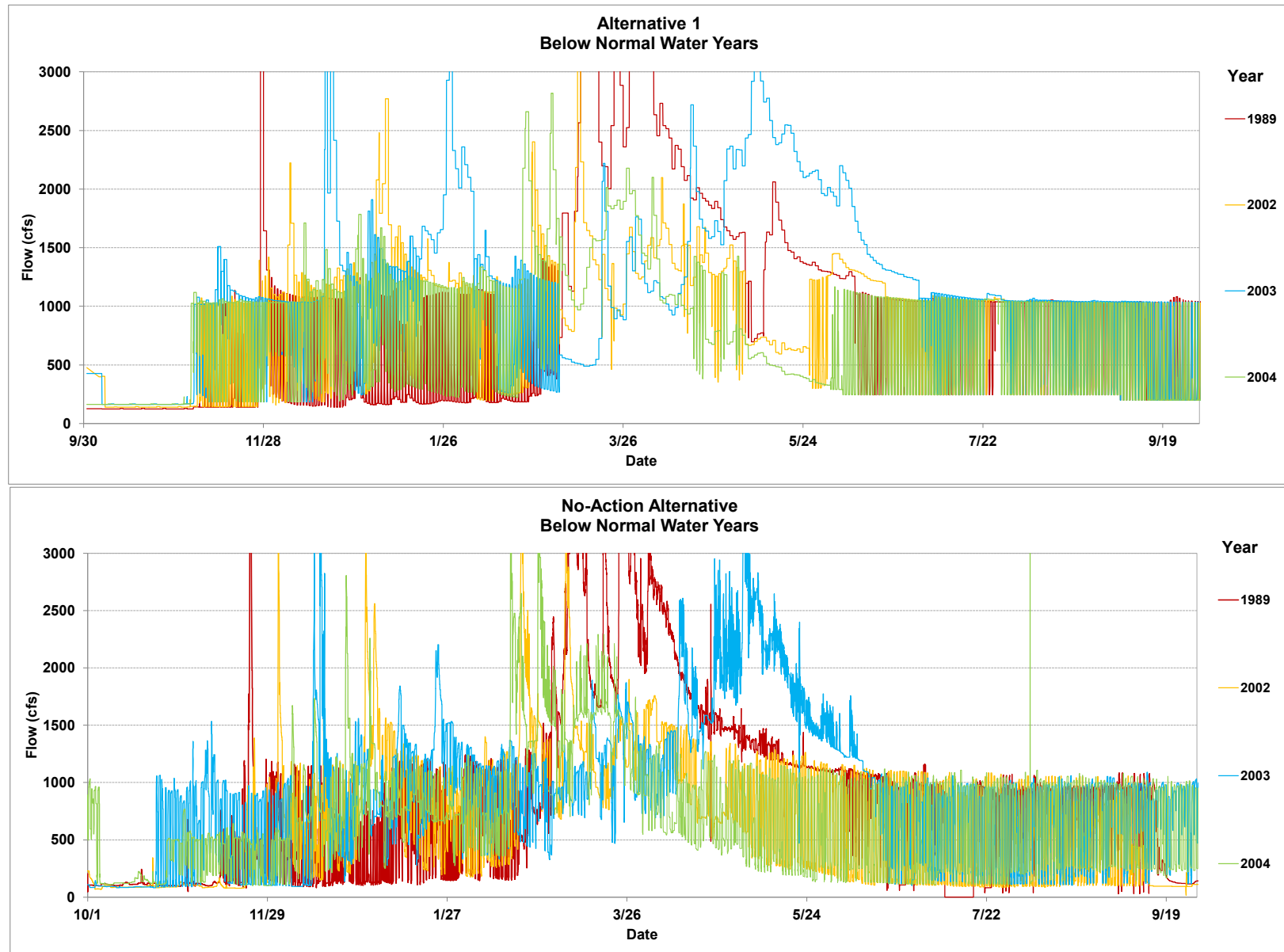
Figure 3.5-12c. Hydrographs for the Middle Fork American Peaking Reach in Below Normal Water Years under Alternative 1 and No-Action Alternative.

Figure 3.5-12d. Hydrographs for the Middle Fork American Peaking Reach in Dry Water Years under Alternative 1 and No-Action Alternative.

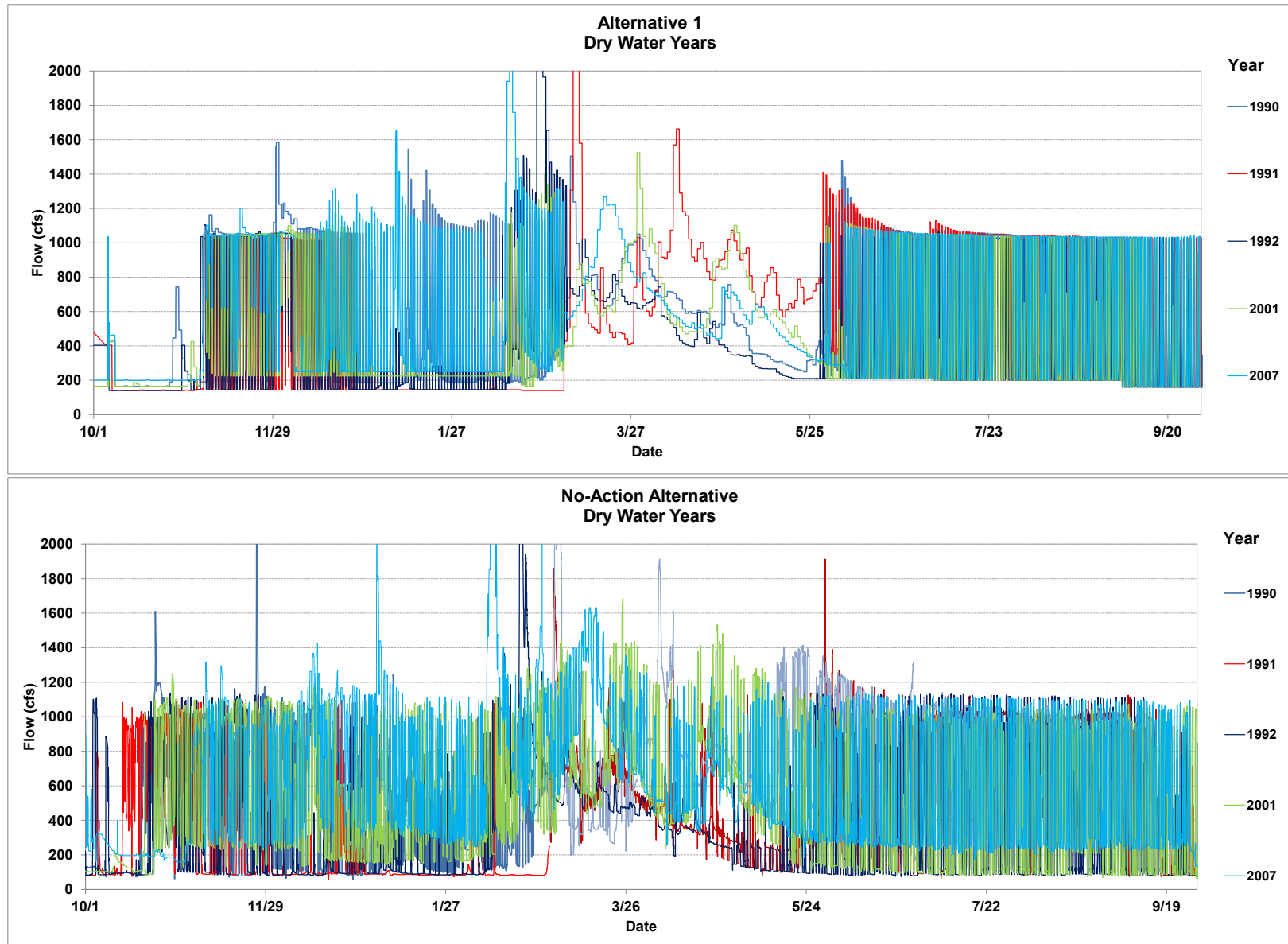


Figure 3.5-12e. Hydrographs for the Middle Fork American Peaking Reach in Critical Water Years under Alternative 1 and No-Action Alternative.

Figure 3.5-13. Alternative 1 Oxbow Powerhouse Up Ramp and Down Ramp Categories Compared to 1-foot-per-hour Stage Change at Instream Flow Study Sites.

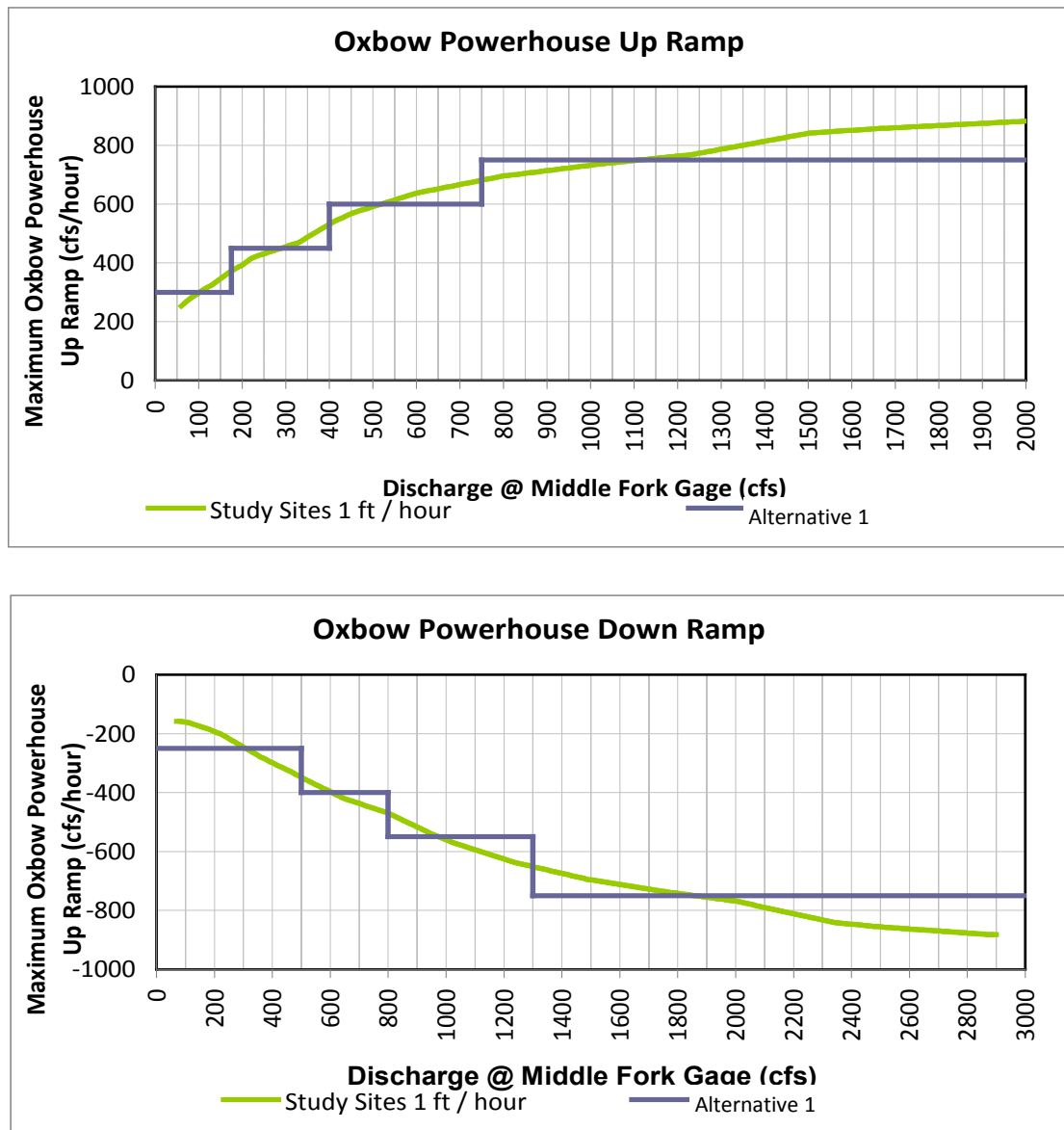


Figure 3.5-14. Maximum Daily One Hour Ramping Rates for Alternative 1 and No-Action Alternative during the Spring (Mar-May), Summer/Fall (Jun-Oct), and Winter (Nov-Feb).

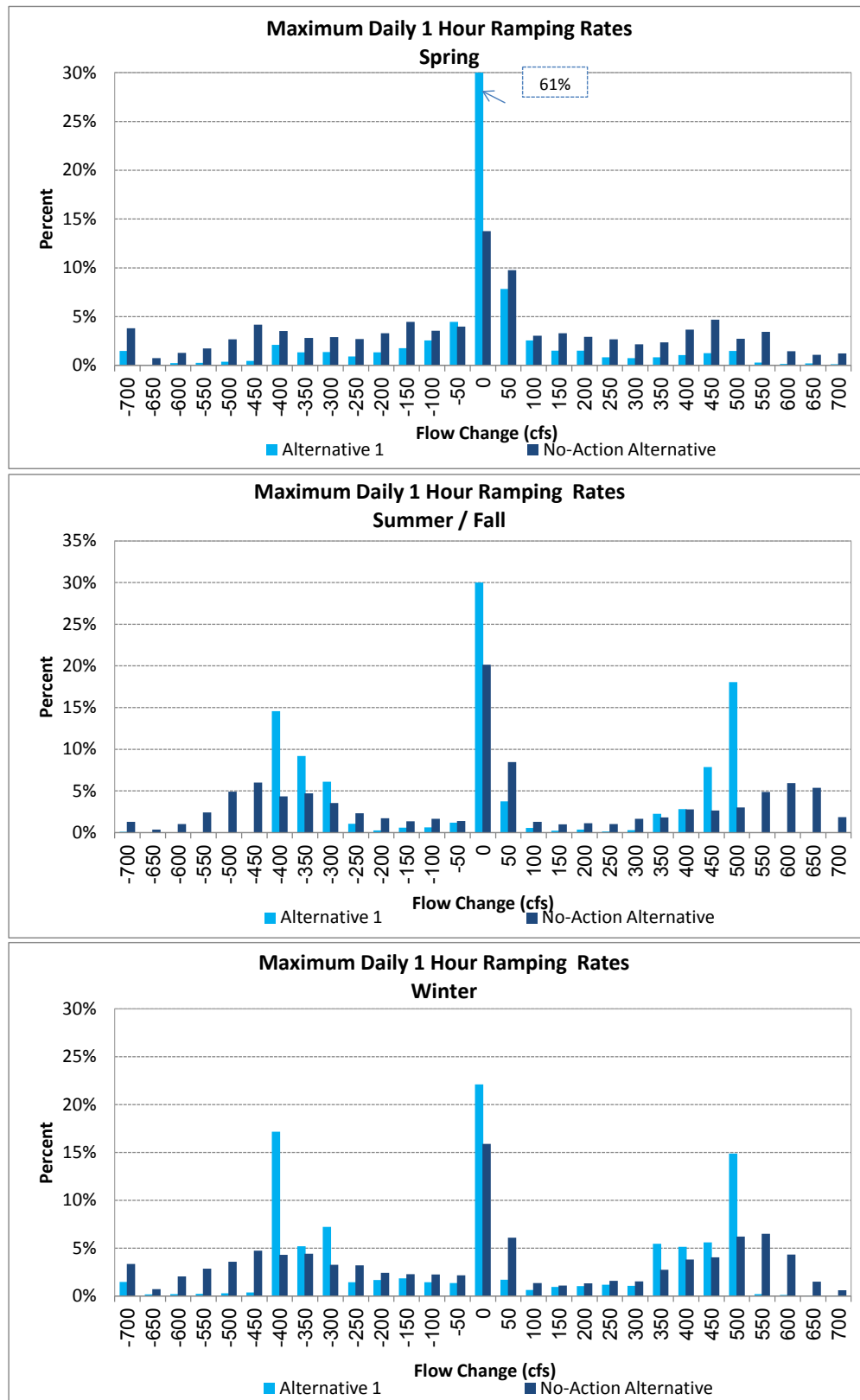


Figure 3.5-15a. Duncan Creek Resulting Effects.

Key Considerations	Winter			Spring				Summer/Fall					Winter	
	Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Channel/Riparian Maintenance Flow														
Initiation of Motion	Maintain					Maintain/Schedule							Maintain	
Scouring/Resetting Flow	Maintain												Maintain	
Riparian														
Recruitment (seed setting)						Enhance/Schedule								
Rainbow Trout														
Distribution	Maintain													
Spawn				Enhance										
Incubation				Enhance										
Adult	Maintain						Enhance	Maintain						
Juvenile							Maintain							
Other Fish Species (brown trout)	Maintain													
Productivity (algae and benthos)	Maintain													
Recreation														
Angling	Enhance													
Hydrograph (shape)				Enhance										
Water Temperature								Enhance	Maintain					

Figure 3.5-15b. South and North Fork Long Canyon Creek Resulting Effects.

Key Considerations	Winter			Spring				Summer/Fall					Winter	
	Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Channel/Riparian Maintenance Flow														
Initiation of Motion	Maintain					Maintain/Schedule							Maintain	
Scouring/Resetting Flow	Maintain												Maintain	
Riparian														
Recruitment (seed setting)						Enhance/Schedule								
Rainbow Trout														
Distribution						Maintain								
Spawn				Enhance										
Incubation				Enhance										
Adult	Maintain						Enhance	Maintain						
Juvenile						Maintain								
Productivity (algae and benthos)						Maintain								
Recreation														
Angling						Enhance								
Hydrograph (shape)				Enhance										
Water Temperature								Enhance	Maintain					

Figure 3.5-15c. Long Canyon Creek Resulting Effects.

Key Considerations	Winter			Spring				Summer/Fall					Winter	
	Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Channel/Riparian Maintenance Flow														
Initiation of Motion	Maintain					Maintain/Schedule							Maintain	
Scouring/Resetting Flow	Maintain												Maintain	
Riparian														
Recruitment (seed setting)						Enhance/Schedule								
Rainbow Trout														
Distribution						Maintain								
Spawn				Enhance										
Incubation				Maintain										
Adult						Maintain								
Juvenile						Maintain								
Productivity (algae and benthos)						Maintain								
Recreation														
Angling						Maintain								
Hydrograph (shape)			Enhance											
Water Temperature								Enhance	Maintain					

Figure 3.5-15d. Middle Fork American River below French Meadows Reservoir Resulting Effects.

Middle Fork American River														
Key Considerations	Winter			Spring				Summer/Fall					Winter	
	Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Channel/Riparian Maintenance Flow														
Initiation of Motion	Maintain					Maintain/Schedule								Maintain
Scouring/Resetting Flow	Maintain													Maintain
Riparian														
Recruitment (seed setting)						Schedule	Maintain							
Rainbow Trout														
Distribution							Maintain							
Spawn				Enhance										
Incubation					Enhance									
Adult	Maintain						Enhance					Maintain		
Juvenile							Maintain							
Other Fish Species							Maintain							
Productivity (algae and benthos)	Maintain			Enhance										
Recreation														
Angling							Enhance							
Hydrograph (shape)							Enhance							
Water Temperature								Maintain						
French Meadows Reservoir														
Key Considerations	Winter			Spring				Summer/Fall					Winter	
	Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Physical Habitat							Maintain							
Fish Species							Maintain							

Figure 3.5-15e. Middle Fork American River below Middle Fork Interbay Resulting Effects.

Key Considerations	Key Driver	Winter			Spring				Summer/Fall					Winter	
		Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Channel/Riparian Maintenance Flow															
Initiation of Motion															
Scouring/Resetting Flow															
Riparian															
Recruitment (seed setting)															
Rainbow Trout															
Distribution	Upper Reach														
Spawn															
Incubation															
Adult															
Juvenile															
Hardhead															
Distribution	Lower Reach (0.6 mile)														
Adult															
Juvenile															
Other Fish Species															
Productivity (algae and benthos)															
FYLF															
Distribution	Lower Reach (3 miles)														
Breeding															
Tadpoles															
Recreation															
Middle Fork Interbay Reservoir															
Angling															
Hydrograph (shape)															
Water Temperature															

Middle Fork Interbay

Key Considerations	Key Driver	Winter			Spring				Summer/Fall					Winter	
		Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Physical Habitat															
Fish Species															

Figure 3.5-15f. Rubicon River below Hell Hole Reservoir Resulting Effects.

Rubicon River															
Key Considerations	Key Driver	Winter			Spring				Summer/Fall					Winter	
		Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Channel/Riparian Maintenance Flow															
Initiation of Motion		Maintain				Maintain/Schedule								Maintain	
Scouring/Resetting Flow		Maintain												Maintain	
Riparian															
Recruitment (seed setting)							Enhance/Schedule	Maintain							
Rainbow Trout															
Distribution	Upper Reach					Maintain									
Spawn						Enhance									
Incubation						Enhance									
Adult						Maintain				Enhance				Maintain	
Juvenile						Maintain									
Hardhead															
Distribution	Lower Reach					Maintain									
Adult						Maintain									
Juvenile						Maintain									
Other Fish Species						Maintain									
Productivity (algae and benthos)	Upper Reach					Enhance									
FYLF															
Distribution	Lower Reach					Maintain									
Breeding						Maintain									
Tadpoles										Maintain					
Recreation															
Angling						Enhance									
Hydrograph (shape)						Enhance									
Water Temperature										Maintain					

Hell Hole Reservoir															
Key Considerations	Key Driver	Winter			Spring				Summer/Fall					Winter	
		Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Physical Habitat								Maintain							
Fish Species								Maintain							

Figure 3.5-15g. Middle Fork American River below Ralston Afterbay (Peaking Reach) Resulting Effects.

Key Considerations	Winter			Spring				Summer/Fall					Winter	
	Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Channel/Riparian Maintenance Flow														
Initiation of Motion				Maintain									Maintain	
Scouring/Resetting Flow				Maintain									Maintain	
Riparian														
Recruitment (seed setting)						Maintain								
Rainbow Trout														
Distribution								Maintain						
Spawn				Enhance										
Incubation				Enhance										
Adult								Maintain						
Juvenile								Maintain						
Fry								Enhance						
Hardhead/Pikeminnow														
Distribution								Maintain						
Adult								Maintain						
Juvenile								Maintain						
Other Fish Species								Maintain						
Productivity (algae and benthos)								Enhance						
FYLF														
Distribution								Maintain						
Breeding						Maintain								
Tadpoles								Maintain						
Recreation														
Angling								Enhance						
Ramping Rate								Enhance						
Hydrograph														
Fluctuations (reduced)								Enhance						
Seasonal Shape								Maintain						
Water Temperature									Maintain					

Ralston Afterbay

Key Considerations	Winter			Spring				Summer/Fall					Winter	
	Jan	Feb	Mar	Mar	Apr	May	Jun	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Physical Habitat								Maintain						
Fish Species								Maintain						

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3.6 BOTANICAL AND WILDLIFE RESOURCES

This section describes potential impacts to botanical and wildlife resources (including rare, threatened, and endangered terrestrial species) under Alternative 1 for the Middle Fork American River Project (MFP or Project).

For the purposes of this document, a special-status species is defined as any plant species that is granted protection by a federal or state agency:

- Federally listed species granted status by the U.S. Fish and Wildlife Service (USFWS) under the Federal Endangered Species Act (ESA) include federally threatened (FT), endangered (FE), proposed threatened or endangered (FPT, FPE), candidate (FC), or listed species proposed for delisting (FPD). The U.S. Department of Agriculture-Forest Service (USDA-FS) grants status to Forest Service Sensitive (FSS) plants and mosses, as designated on lists developed by each forest (USDA-FS 2006a and 2006b).
- Plant species that are granted status by the California Department of Fish and Game (CDFG) under the California Endangered Species Act (CESA) include state threatened (ST), endangered (SE), rare (SR), and California Species of Special Concern (CSC).
- The California Native Plant Society (CNPS) also maintains a rating system for rare, threatened, or endangered plants in California. Under the California Environmental Quality Act (CEQA), special-status plants include species listed on CNPS Lists 1B and 2. The ratings included on those lists are: 1B - rare, threatened, or endangered in California and elsewhere, and 2 - rare in California but more common elsewhere.

For the purpose of this document, a special-status wildlife species is defined as any animal species that is granted status by a federal, state, or local agency:

- Federally listed species granted status by USFWS under the ESA include Federal Threatened (FT), Federal Endangered (FE), Federal Threatened (Proposed) (FPT), Federal Endangered (Proposed) (FPE), Federal Candidate for Listing (FC), or Federal Proposed for Delisting (FPD). In addition, the USDA-FS grants special status to Forest Service Sensitive (FSS) wildlife species and National Forest Management Indicator Species (MIS) for each specific forest under their jurisdiction.
- State of California listed terrestrial wildlife species which are granted status by the CDFG under the California Endangered Species Act (CESA) include State Threatened (ST), State Endangered (SE), California Fully Protected species (CFP), and California Species of Concern (CSC).

Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facilities Construction Activities and

Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to protect botanical and wildlife resources during construction.

Potential impacts on botanical and wildlife resources under Alternative 1 are identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include: routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing Project recreation facilities; maintenance activities at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section.

Potential impacts to botanical and wildlife resources are identified if activities implemented under Alternative 1 result in loss or degradation of habitat, loss of individuals, and/or disturbance during critical periods. Impacts on botanical and wildlife resources are evaluated based on the resources present in the vicinity of the MFP and activities to be implemented under Alternative 1. Note that upland special-status plant species including Stebbins' phacelia (*Phacelia stebbinsii* [FSS, CNPS 1B.2]) and bald eagle (*Haliaeetus leucocephalus* [FD, FSS, BCC, SE, CFP]) are each addressed separately (Sections 3.6.1 and 3.6.2) because there are known occurrences of these species in close proximity to MFP facilities and features where activities under Alternative 1 will be implemented, and because unique evaluation criteria are applicable to these species. Section 3.6.3 provides an analysis of potential impacts of Alternative 1 to all other special-status plant and wildlife species, grouped to include species that use similar habitats or for which impacts are similar.

Impacts on botanical and wildlife resources are evaluated as follows:

- Potential impacts on upland special-status plant species
 - Potential loss of individuals and/or habitat from:
 - Project maintenance activities;
 - Modification of existing Project facilities or construction of new Project facilities and Project recreation facilities and features; and
 - Changes in flows in the bypass and peaking reaches and modified reservoir water surface elevations from Project operations.
 - Additional protection and management of special-status plants through implementation of additional measures and monitoring programs.
- Potential impacts on bald eagle nests, roosts, and habitat
 - Potential loss of individuals from:
 - Electrocution on Project powerlines or removal of active nests during power line maintenance activities; and

- Secondary poisoning.
- Potential disturbance from:
 - Ground disturbing activities and an increased level of human activity associated with changes in Project maintenance activities;
 - Recreation use at existing and new Project recreation facilities; and
 - Modification of existing Project facilities or construction of new Project facilities and Project recreation facilities and features.
- Potential loss or degradation of aquatic foraging habitat from:
 - Changes in flows in the bypass and peaking reaches, modified reservoir water surface elevations, and modified diversion pools; and
 - Routine vegetation and noxious weed management (herbicide use).
- Additional protection and management of bald eagles through implementation of additional measures and monitoring programs.
- Potential impacts to other special-status plant and wildlife species
 - Potential loss of individuals from:
 - Electrocution of raptors on Project powerlines;
 - Secondary poisoning of scavengers (raptors, mesocarnivores, and game species); and
 - Removal of riparian-nesting songbird nests during sediment augmentation site development; Project maintenance activities; modification of existing Project facilities; or construction of new Project facilities and Project recreation facilities and features.
 - Potential disturbance:
 - Disturbance of raptors during Project maintenance activities; modification of existing Project facilities; or construction of new Project facilities and Project recreation facilities and features; and
 - Disturbance of mule deer and important habitat areas during Project maintenance activities, modification of existing Project facilities; or construction of new Project facilities and Project recreation facilities and features.
 - Potential loss or degradation of:
 - Riparian habitat for special-status riparian plants and mosses, riparian nesting songbirds, and riparian mammals from changes in operations, implementation of Project maintenance activities, and activities associated with modification of existing Project facilities or construction of new Project facilities and Project recreation facilities and features;
 - Aquatic foraging habitat for osprey and other aquatic foraging birds and bats from changes in Project operations and activities associated with

modification of existing Project facilities or construction of new Project facilities and Project recreation facilities and features; and

- Forest habitat for forest dwelling birds and mammals during implementation of Project maintenance activities, and activities associated with modification of existing Project facilities or construction of new Project facilities and Project recreation facilities and features.
- Additional protection and management, of resources through implementation of additional measures and monitoring programs.

Potential impacts to rare, threatened, and endangered aquatic species are discussed in Section 3.5 – Fish and Aquatic Resources. Potential impacts to riparian resources are identified in Section 3.8 – Riparian Resources.

A description of potential impacts to botanical and wildlife resources resulting from implementation of Alternative 1, considering AP and enhancement measures, by resource topic, is provided below. There are no unavoidable adverse effects to botanical and wildlife resources resulting from implementation of Alternative 1 as discussed at the end of this section.

3.6.1 Impacts to Upland Plant Species

Table 3.6-1 provides a list of special-status upland plant species known to occur or potentially occurring in the vicinity of the MFP. No federal or state listed plants species have been identified in areas affected by operation and maintenance of the MFP. Therefore, Alternative 1 will have no effect on federal or state listed plant species.

Four FSS plants (Brandeggee's clarkia [*Clarkia biloba* ssp. *brandegeeeae* (FSS, CNPS 1B.2)], Butte County fritillary [*Fritillaria eastwoodiae* (FSS, CNPS 3.2)], saw-toothed lewisia [*Lewisia serrata* (FSS, CNPS 1B.1)], and Stebbins' phacelia) have been documented within approximately 200 feet of bypass rivers and streams and the peaking reach (CNDDDB 2010; USDA-FS 2006). These populations would not be affected by changes in Project maintenance activities, modification of existing Project facilities, or construction of new Project facilities and Project recreation facilities and features associated with Alternative 1. However, these populations may potentially be affected by changes in operation of the MFP.

Stebbins' phacelia, was documented during special-status plant surveys conducted in the vicinity of Project facilities and features and Project recreation facilities and features where Project maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features will be implemented (PCWA 2011a; Attachment 2A). Refer to Table 3.6-2 and to Maps 2a through 2c of the Supplemental Biological Technical Study Report – 2011 (Attachment 2A) for updated information on the location of Stebbins' phacelia populations. This includes populations at the following locations:

- Two populations at Brushy Canyon;

- One individual at French Meadows Reservoir;
- Two populations in the vicinity of the Rubicon River Gage above Ellicott Bridge; and
- Fifty-eight populations in the vicinity of Hell Hole Reservoir.

A description of the potential effects associated with Alternative 1 on upland special-status plants and their habitat, including direct effects (i.e., loss of individuals) and indirect effects (i.e., loss or degradation of habitat) is provided in the sections below.

3.6.1.1 Project Maintenance Activities

Under Alternative 1, implementation of Project maintenance activities could potentially result in loss of Stebbins' phacelia individuals.

A summary of Project maintenance activities under Alternative 1, including changes from the No-Action Alternative, is provided in Section 2.0 – Elements Analyzed. Details on maintenance activities are provided in the Sediment Management Plan (SMP) (PCWA 2011b), the revised Vegetation and Integrated Pest Management Plan (VIPMP) (Attachment 1A), the Recreation Plan (USDA-FS 2011; CDFG 2011), and the revised Transportation System Management Plan (TSMP) (Attachment 1B).

Project maintenance activities that may impact Stebbins' phacelia include vegetation management; noxious weed management; annual and periodic road and trail maintenance; and routine and heavy recreation facility maintenance. Routine vegetation management, which includes trimming of vegetation by hand or with equipment, as well as limited application of herbicides, surfactants, or fungicides, could result in direct loss of Stebbins' phacelia individuals. Similar impacts could result from implementation of noxious weed management, which includes both mechanical (trimming by hand) and chemical (application of herbicides and surfactants) treatment of target noxious weed populations. Road and trail maintenance, which consists of annual or periodic maintenance, could result in loss of individuals in or along the shoulder of roads or trails. Recreation facility maintenance, including both annual and heavy maintenance (Tables 2-6 and 2-7), could result in loss of individuals from ground disturbance and use of heavy equipment.

AP measures incorporated into the VIPMP, Recreation Plan, and TSMP will protect Stebbins' phacelia population during the Project maintenance activities. These measures, organized by plan, include:

- VIPMP
 - Restrict vegetation trimming by hand or with equipment and manual noxious weed treatments within 50 feet of an existing population;
 - Restrict application of herbicides and surfactants for vegetation and noxious weed management within 100 feet of an existing population;

- Implement vegetation management activities as soon as practical following snow melt (i.e., prior to seed germination);
- Implement specific fungicide application methods to avoid non-target species;
- Implement specific pesticide measures requiring supervision of herbicide application by a licensed pest control advisor (PCA) and restrictive application and disposal methods; and
- Conduct consultation with resource agencies to develop site-specific protective buffers around any new special-status plant populations identified during inventory surveys.
- Recreation Plan
 - Conduct consultation with resource agencies to develop site-specific protective buffers around any new special-status plant populations identified during inventory surveys that may be affected by modifications and enhancements at existing Project recreation facilities and improvement of new Project recreation facilities trails.
 - Implement vegetation and noxious weed management at MFP recreation facilities consistent with the VIPMP.
- TSMP
 - Restrict annual road maintenance and periodic road maintenance (i.e., grading) activities to the road surface and adjacent shoulder within 50 feet of an existing population, or to the smallest area necessary for maintenance of the road or trail; and
 - Implement vegetation and noxious weed management at MFP roads and trails consistent with the VIPMP.

With implementation of AP measures included in the VIPMP, Recreation Plan, and TSMP, impacts to Stebbins' phacelia from Project maintenance activities under Alternative 1 would be avoided except at the following four locations:

- Brushy Canyon Adit Road

Approximately 100 individuals are growing within the gravel surface of the road (populations BC01 and BC02) where routine vegetation management and road maintenance activities will be implemented.
- Hell Hole Dam Spillway Discharge Channel Road

Approximately 30 individuals are growing within the gravel surface of the road (populations HH01–HH06) where routine vegetation management and road maintenance activities will be implemented.
- Hell Hole Vista

Stebbins' phacelia individuals (population HH 14, with a total of 47,000–94,000 individuals) are growing in and along the path, the viewpoint, and the picnic area

where routine vegetation management and heavy recreation facility maintenance activities will be implemented.

- Hell Hole Reservoir Trail

Stebbins' phacelia individuals (12 populations, with a total of 603,550–1,202,550 individuals) are growing in and along the Hell Hole Reservoir Trail where routine vegetation management and rehabilitation and reconstruction activities will be implemented.

Vegetation management, road maintenance, and recreation facility maintenance have been ongoing at these four locations under the No-Action Alternative (either by PCWA or the USDA-FS). The Hell Hole Reservoir Trail, which will be reconstructed and rehabilitated under Alternative 1, is an existing recreation trail that has been added to the MFP. Project maintenance activities at these locations will be modified under Alternative 1 which incorporates additional AP measures for the protection of Stebbins' phacelia. Specifically, implementation of AP measures included in the VIPMP, Recreation Plan, and TSMP will limit the area where routine maintenance and reconstruction/rehabilitation activities occur from 29.5 acres under the No-Action Alternative to 0.6 acres under Alternative 1. The AP measures will therefore protect and avoid approximately 28.9 additional acres, and approximately 637,329–1,270,392 individual Stebbins' phacelia (out of a total of 650,550–1,296,550 individuals in the populations) under Alternative 1 as compared to the No-Action Alternative.

Management of noxious weeds may promote establishment of new special-status plant populations through improved habitat conditions by reducing competition with invasive noxious weeds. Elements of the noxious weed management that improve habitat conditions in the vicinity of the MFP include:

- Manual/chemical treatment of noxious weeds and associated monitoring of treated sites;
- Measures to prevent the introduction or spread of noxious weeds (truck and equipment cleaning, maintenance of stockpiles, inspection of workers clothing and boots, use of weed-free material for erosion control); and
- Educating employees about noxious weed prevention measures.

If new populations of Stebbins' phacelia or other upland special-status plant populations are identified in the future, PCWA would consult with resource agencies to review the measures included in VIPMP, Recreation Plan, and TSMP for adequacy in protecting special-status plants and develop new site-specific measures, if necessary.

3.6.1.2 Modification of Existing Project Facilities and Construction of New Project Facilities and Project Recreation Facilities and Features

Modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features could potentially affect upland special-status plants, including Stebbins' phacelia. Potential impacts would include direct loss of

plants through trampling, crushing, or removal of individual plants as a result of foot traffic, use of heavy equipment and ground disturbance associated with modification and construction activities. Refer to Section 2.0 and Appendix A for a description of modification and construction activities to be implemented under Alternative 1.

There are no known populations of upland special-status plants, including Stebbins' phacelia, in the vicinity of construction or staging areas for modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. If new upland special-status plant populations are identified in construction areas prior to construction, PCWA would consult with resource agencies to review the measures included in Appendix A for adequacy in protecting special-status plants and develop new site-specific measures, if necessary. PCWA would also obtain all appropriate permits or agreements prior to construction. Any measures required by these permits or agreements would be implemented as part of the project.

3.6.1.3 Project Reservoir Operations

Project operations under Alternative 1 have the potential to impact Stebbins' phacelia through loss of individuals or habitat only at Hell Hole Reservoir. Specifically, changes in operations that affect water surface elevation (WSE) at Hell Hole Reservoir (i.e., frequency and duration of inundation within the new maximum normal operating WSE) may result in loss of Stebbins' phacelia individuals or habitat.

Stebbins' phacelia is an herbaceous annual plant, which typically germinates in early spring (April), with seed set occurring in late summer (August). Under existing conditions (No-Action Alternative), Stebbins' phacelia grows along the shoreline of Hell Hole Reservoir, including portions of the shoreline that are inundated for some part of the growing season (i.e., April through August) in wet, above normal, and below normal water year types.

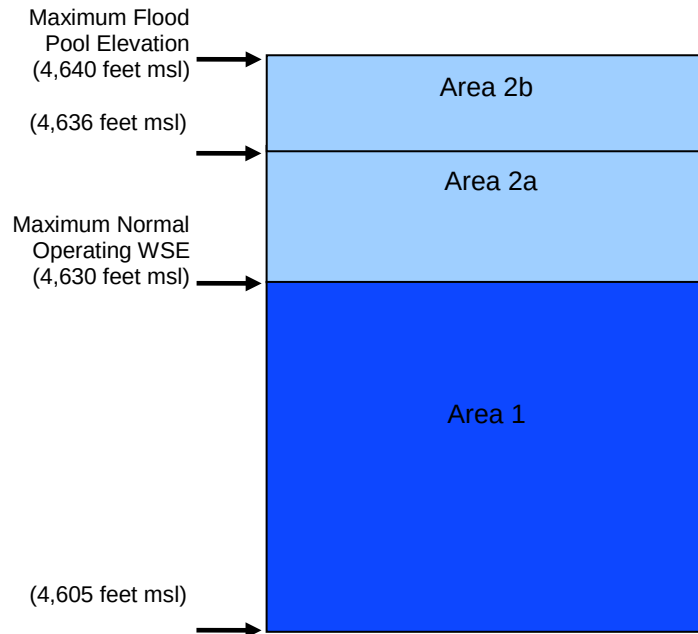
Under Alternative 1, operation of the Hell Hole Reservoir Seasonal Storage Increase Improvement (spillway crest gates) will allow storage of up to an additional 7,600 ac-ft of water in certain years. The spillway crest gates will result in an increase in the existing maximum normal operating WSE from 4,630 feet above mean sea level (msl) to 4,636 feet msl in the early summer.

A schematic of specific elevations around Hell Hole Reservoir associated with the No-Action Alternative and Alternative 1 is provided below.

Refer to Table 3.6-3 for a list of Stebbins' phacelia populations within different WSE ranges at Hell Hole Reservoir, including the area (in square feet and acres) and estimated number of individuals. The elevation ranges include:

- Area 1 includes those portions of special-status plant populations occurring at or below the current maximum normal operating WSE of 4,630 feet msl down to approximately 4,605 feet msl;

- Area 2a includes those portions of special-status plant populations occurring from the maximum normal operating WSE (4,630 feet msl) to 4,636 feet msl; and
- Area 2b includes those portions of special-status plant populations occurring from 4,636 feet msl to the maximum flood pool elevation at 4,640 feet msl.



Refer to Appendix D and Table 3.6-4 for a comparison of the frequency and duration of inundation at different reservoir elevations (areas) during the growing season of Stebbins' phacelia (April through August) under the No-Action Alternative and Alternative 1. The analysis includes two levels of water demand: (1) current Placer County Water Agency (PCWA) water delivery demand (42,000 acre-feet [ac-ft]/year) and (2) future PCWA water delivery demand (120,000 ac-ft/year). Because the resulting Hell Hole Reservoir WSE differences between the current and future demand are minimal (Appendix D) this discussion primarily focuses on reservoir elevation levels at current demand. The following summarizes this information by area:

- **Area 1:** Under current operations, approximately 0.4 acre of habitat that support an estimated 9,000 to 18,000 Stebbins' phacelia individuals are located in Area 1 (between reservoir elevation 4,605 feet msl and 4,630 feet msl). Middle Fork Project Operations Model (Model) results for Alternative 1 indicate that the overall frequency of inundation (i.e., number of years in which inundation occurs) in Area 1 will be similar to the No-Action Alternative. Refer to Appendix D and Section 3.5 – Fish and Aquatic Resources for additional analysis.
- **Area 2a:** Under current operations, approximately 2 acres of habitat that support an estimated 53,000 to 106,000 individuals are located in Area 2a (from the current maximum normal operating WSE [4,630 feet msl] to 4,636 feet msl). Model results for Alternative 1 indicate that the overall frequency of inundation in Area 2a during

the growing season for Stebbins' phacelia for all water year types combined will increase from 11 to 13 years over the period of record (33 years modeled). This increase in inundation frequency occurs in above normal and below normal water years under Alternative 1. The average duration of inundation (average days per year) will increase under Alternative 1 by 6 days in wet years, by 21 days in above normal years, and by 7 days in below normal years. Similar to the No-Action Alternative, Area 2a will not be inundated in dry or critical water years under Alternative 1.

- **Area 2b:** Under current operations, approximately 5 acres of habitat, supporting an estimated 117,000 to 234,000 individuals, are located in Area 2b (between 4,636 feet msl WSE and the maximum flood pool elevation 4,640 feet msl WSE). Model results for Alternative 1 indicate that portions of Area 2b, which was not inundated in any water year type in the period of record under the No-Action Alternative, will now be inundated in years when Hell Hole Reservoir spills (i.e., in 6 of 10 wet water years and in 1 of 6 above normal water years) during the growing season for Stebbins' phacelia. The average duration of inundation under Alternative 1 will be 22 days per year in wet water years and 15 days in above normal water years. Similar to the No-Action Alternative, Area 2b will not be inundated in below normal, dry, or critical water years under Alternative 1.

Therefore, changes in operations that affect WSEs in Hell Hole Reservoir will result in only minor changes in the frequency and duration of inundation in areas that support Stebbins' phacelia in Areas 1 and 2a. Therefore, conditions in Areas 1 and 2a will not change substantially from the No-Action Alternative. It is expected that Stebbins' phacelia populations (and the seed bank) in these areas would continue to persist under Alternative 1. Small increases in the duration of inundation in some years under Alternative 1 would not result in effects to Stebbins' phacelia populations in Areas 1 and 2a. Habitat in Area 2b, which is not inundated under existing conditions, will be inundated under Alternative 1 in years when Hell Hole Reservoir would have spilled. However, the new inundation conditions in Area 2b are similar (but shorter in frequency and duration) to existing inundation conditions in Areas 1 and 2a. Therefore, while some changes in the populations (i.e., loss of individuals) may occur, Stebbins' phacelia populations and their seed bank will persist in Area 2b under Alternative 1. The new inundation resulting from operation of the new Hell Hole Reservoir Spillway Crest Gates would, therefore, result in only negligible impacts to the Stebbins' phacelia populations in Area 2b.

The analysis provided in this section was developed based on best available information, including the known presence of Stebbins' phacelia populations along the Hell Hole Reservoir shoreline and modeled Hell Hole Reservoir WSE fluctuations. During the term of the license, PCWA will conduct surveys for Stebbins' phacelia populations along the perimeter of Hell Hole Reservoir, in conjunction with special-status plant inventory surveys. Results of these surveys will be provided to resources agencies for review and comment.

3.6.1.4 Project Operations in the Bypass and Peaking Reaches

Changes in MFP operation under Alternative 1 include increased minimum instream flows, pulse flows with recession rates (in the bypass reaches only), and down-ramping of spills below French Meadows and Hell Hole reservoirs. These changes could potentially affect special-status plants, including Brandegee's clarkia, Butte County fritillary, saw-toothed lewisia, and Stebbins' phacelia. Populations of these species are located within 200 feet of bypass and peaking reaches (PCWA 2011c, Map 7.6-1). However, a review of CNDDDB records (CNDDDB 2010) indicates that these populations grow primarily in rocky areas on the steep river canyon walls and in upland canyon live oak woodlands, both of which are elevated above the wetted perimeter of the bypass and peaking reaches. Some of these populations may experience inundation during infrequent, high-magnitude flows under the No-Action Alternative. However, because the frequency and magnitude of high-magnitude flows will not change, Alternative 1 will not result in effects to these populations.

3.6.1.5 Additional Measures for the Protection of Upland Special Status Plants

The VIPMP contains additional measures to protect Stebbins' phacelia and other upland-special status plants that may be identified during the term of the license, including:

- Conducting special-status plant inventory surveys in the vicinity of the MFP every five years, beginning the first year following license issuance, to identify any new populations of special-status plants;
- Consulting annually with resource agencies to: (1) discuss the effectiveness of AP measures to protect special-status plants; (2) modify or develop new AP measures as needed; and (3) develop site-specific protective measures for any new special-status plant populations identified during inventory surveys;
- Reviewing resource agency special-status species lists annually; and
- Educating employees and contractors about the presence of upland special-status plants and measures to protect them (i.e., Employee Training Program [ETP]).

3.6.1.6 Conclusion—Upland Special-Status Plants

Impacts of Alternative 1 on upland special-status plants (including Stebbins' phacelia) would be considered negligible for the following reasons:

- Patterns of inundation of Stebbins' phacelia at Hell Hole Reservoir under Alternative 1 are similar to those under the No-Action Alternative where populations currently persist;
- AP measures will reduce effects on Stebbins' phacelia by reducing the area and number of individuals affected by ongoing maintenance activities;

- Periodic special-status plant inventory surveys, consultation with resource agencies, and the ETP implemented under Alternative 1 will further protect Stebbins' phacelia or other upland special-status plants identified during the license term (both existing and new populations that may be identified during the term of the license); and
- Ongoing consultation with resource agencies, following completion of site-specific engineering plans to verify the adequacy of AP measures and development of new measures, if appropriate.

In addition, Alternative 1 will have no effect on special-status plants (i.e., Brandegees' clarkia, Butte County fritillary, saw-toothed lewisia, and Stebbins' phacelia) occurring in rocky, upland areas along the bypass and peaking reaches.

3.6.2 Impacts to Bald Eagle Nests, Roosts, and Habitat

One active bald eagle nest and three winter roosts were identified in the vicinity of Hell Hole Reservoir. Bald eagles are known to forage in Hell Hole and French Meadows reservoirs, as well as stream reaches along the Middle Fork American River and the Rubicon River. Provided below is a description of potential direct and indirect impacts to bald eagles under Alternative 1. Potential direct effects include loss of individuals or disturbance of nesting or roosting eagles, and potential indirect effects include loss or degradation of aquatic foraging habitat.

3.6.2.1 Electrocuting on Project Powerlines or Removal of Nests

Under existing conditions (No-Action Alternative), several MFP power poles and powerlines have design elements that may pose a potential risk for raptor electrocution (PCWA 2011d). However, there are no known mortalities resulting from electrocution of bald eagles or other raptors on MFP power poles and powerlines. Refer to the Bald Eagle Management Plan (BEMP) (PCWA 2011e) for a description of MFP power poles and powerlines, potential risk for electrocution, and measures to enhance the protection of bald eagles and other raptors in the vicinity of power poles and powerlines.

Under the No-Action Alternative, existing power poles and powerlines are replaced as necessary (i.e., when they are damaged or have exceeded their useable lifespan) using traditional design configurations. Under Alternative 1, all MFP power poles and powerlines that have one or more elements that pose a risk of avian electrocution will be replaced/retrofitted pursuant to Avian Power Line Interaction Committee (APLIC) guidelines within 15 years of license issuance. The BEMP provides a detailed schedule for retrofitting or replacement of MFP power poles and powerlines. Raptor-safe design configurations as described in the APLIC guidelines (APLIC 2006) will be used for any new power poles and powerlines or when replacement of existing poles, phase conductors, and associated equipment is required. Specifically, the new Hell Hole Dam Spillway Crest Gates Control Building Communication Line/Powerline to be constructed as part of the Hell Hole Reservoir Seasonal Storage Increase Improvement will be designed to conform to APLIC guidelines.

Additional AP measures included in the BEMP associated with bald eagle management in the vicinity of MFP power poles and powerlines during the license term include:

- Restrictions on the removal of bald eagle nests or other raptor nests from powerline poles;
- Evaluation and replacement/retrofitting of any power pole/powerline involved in an electrocution; and
- Annual agency consultation to discuss powerline replacement or retrofit activity.

In addition, while electrocution of bald eagles or other raptors on MFP power poles/powerlines is considered unlikely, replacement/retrofitting and construction of new power poles and powerlines using APLIC design configurations, and implementation of other measures included in the BEMP will protect bald eagles and their nests, as well as other raptor species, during the term of the license.

3.6.2.2 Secondary Poisoning

Under Alternative 1, metal phosphide fumigants (i.e., gas cartridges) will be used in rodent burrows on earthen dams (i.e., French Meadows and Hell Hole dams) to control rodents at the request of Division of Safety of Dams (DSOD). Potential impacts to bald eagles could occur from secondary poisoning if eagles consume rodents that have been killed by the metal phosphide fumigants.

The VIPMP includes specific application methods to be used on earthen dams to protect bald eagles or other scavengers from secondary poisoning. These methods include:

- Requiring metal phosphide fumigants to be administered by a PCA;
- Restriction of the use of fumigants to active rodent burrows; and
- Conducting follow-up monitoring of the application area, and collecting and disposing of rodent carcasses.

Implementation of the methods described above during the application of rodenticides will protect bald eagles in the vicinity of French Meadows and Hell Hole dams from secondary poisoning.

3.6.2.3 Project Maintenance Activities

Implementation of Project maintenance activities under Alternative 1 could potentially disturb breeding or roosting bald eagles at Hell Hole Reservoir, or new bald eagle nests or winter roosts that may be identified during the term of the license. Section 2.0 and applicable management plans (i.e., VIPMP, Recreation Plan, TSMP, and SMP) provide a summary of these activities under Alternative 1 compared to the No-Action Alternative.

USFWS National Bald Eagle Management Guidelines (Guidelines) (USFWS 2007) recommend that activities be restricted within 660 feet of bald eagle nests, and also provide general guidelines for modifying activities in the vicinity of bald eagle roosts. In addition, during the development of the BEMP, resource agencies requested that a 0.25-mile (1,320-foot) activity buffer around the bald eagle nest be used for MFP impact analyses. Therefore, potential disturbance of bald eagles would result if equipment noise and/or increased human presence during these activities occurred within 0.25 mile of an active nest or roost, particularly during the sensitive period for breeding bald eagles (e.g., nest building and courtship through the nesting period, January through July).

Under Alternative 1, project maintenance activities at the Hell Hole Reservoir Trail will occur throughout the term of the license. This trail passes within approximately 850 feet of the known bald eagle nest located near the confluence of the Rubicon River and the reservoir, as well as within 18 feet and 53 feet of two bald eagle winter roosts. To avoid potential effects to the known bald eagle nest from Project maintenance activities at reconstruction, rehabilitation, and routine maintenance activities associated with the Hell Hole Reservoir Trail, all activities on the trail within 0.25 mile of the nest would be conducted outside the bald eagle breeding season (i.e., activities would be conducted in August or September prior to snowfall). Implementation of this measure would avoid disturbance of breeding bald eagles.

No activities would be implemented during the winter months, and therefore Project maintenance activities, including reconstruction and rehabilitation, would not result in disturbance of roosting eagles. No other MFP facilities or recreation facilities where activities are implemented are located within 0.25 of any of the three documented winter roosts at Hell Hole Reservoir.

The next closest MFP facility is Upper Hell Hole Campground (located approximately 0.5 mile from the nest). This recreation facility will be removed as part of Alternative 1. Because the campground is located more than 0.25 mile from the bald eagle nest, noise or increased human activity during campground removal will not result in disturbance of the bald eagle nest.

If new bald eagle nests or winter roosts are identified within 0.25 mile of the locations where facility maintenance activities would be implemented, PCWA would consult with resource agencies to review the measures included in the BEMP and the Recreation Plan for adequacy in avoiding disturbance of these nests and roosts. PCWA would also obtain all appropriate permits or agreements prior to implementing Project maintenance activities.

3.6.2.4 Recreation Use

The Recreation Plan provides a description of recreation use at MFP recreation facilities and features. Ongoing recreation facility use at MFP reservoirs and surrounding MFP recreation facilities could result in disturbance of breeding bald eagles at Hell Hole Reservoir, or new bald eagle nests that may be identified during the term of the license.

MFP reservoirs and surrounding lands provide recreation opportunities such as fishing, boating, hiking, and camping. Hell Hole Reservoir supports a number of MFP-related recreation activities including developed and dispersed camping, boating, fishing, and hiking. There are no restrictions on the type or size of boats used on the reservoir, and no speed limits. Developed recreation facilities are typically open from May 15 to November 1, depending on snow conditions. The peak recreation period is between Memorial Day and Labor Day. Bald eagles forage, roost, and nest at Hell Hole Reservoir under existing recreational use.

Under Alternative 1, recreation use at Hell Hole Reservoir will be similar to the No-Action Alternative, and peak recreation use will continue to occur between Memorial Day and Labor Day, overlapping with the bald eagle breeding season. However, Upper Hell Hole Campground (located approximately 0.5 mile from the nest) will be removed under Alternative 1. This will result in decreased recreation activity in the vicinity of the nest. The Hell Hole Reservoir Trail will be reconstructed and rehabilitated under Alternative 1. Recreation use along the existing Hell Hole Reservoir Trail is currently low and is not expected to substantially increase as a result of the improvements. In addition, the existing trail route is currently poorly defined. The proposed improvements will better define the trail route, which will, in turn, help confine recreation use to the trail.

Removal of Upper Hell Hole Campground and improvements to the Hell Hole Reservoir Trail will decrease recreational activity in the vicinity of the bald eagle nest, and would therefore be considered an enhancement for bald eagles at Hell Hole Reservoir.

3.6.2.5 Modification of Existing Project Facilities and Construction of New Project Facilities and Project Recreation Facilities and Features

Modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features could potentially disturb breeding bald eagles at Hell Hole Reservoir. Potential disturbance of bald eagles would result if equipment noise and/or increased human presence during these activities occurred within 0.25 mile of an active nest or roost, particularly during the sensitive period for breeding bald eagles.

Modification and construction projects under Alternative 1 will include implementation of the Hell Hole Reservoir Seasonal Storage Increase Improvement, outlet works modifications, small diversion modifications, installation of new stream gages and associated features, and construction of new recreation and water supply facilities. Refer to Section 2.0 and Appendix A for a description of these modification and construction projects. Three of these projects (i.e., Hell Hole Reservoir Seasonal Storage Increase Improvement, Hell Hole Dam Outlet Works Modification, and installation of the Rubicon River Gage at Hell Hole Dam Outlet Works) will occur near Hell Hole Reservoir. However, all construction activities will be located more than 4 miles from the active nest. This greatly exceeds the 660-foot activity buffer recommended by USFWS, as well as the 0.25 mile buffer analyzed at the request of CDFG, for prevention of disturbance of bald eagles during construction activities. Therefore, implementation of these projects would not result in disturbance of bald

eagles. If new bald eagle nests or winter roosts are identified within 0.25 mile of the locations where modification of existing MFP facilities and construction of new facilities will occur, PCWA would consult with resource agencies to review the measures included in Appendix A and the BEMP for adequacy in avoiding disturbance of these nests and roosts. PCWA would also obtain all appropriate permits or agreements prior to construction.

3.6.2.6 Project Operations

Modifications of MFP operations under Alternative 1 could potentially affect aquatic foraging habitat and fish populations that form the prey base for bald eagles. Refer to Section 3.3 for a description of flow and reservoir WSE under Alternative 1. Section 3.5 – Fish and Aquatic Resources provides a detailed analysis of the affects of Alternative 1 on fish populations in the bypass and peaking reaches and large and medium reservoirs.

As described in Section 3.5 – Fish and Aquatic Resources, increased minimum instream flows in the bypass and peaking reaches, as well as reduced flow fluctuations in the peaking reach, will increase effective habitat and food production (aquatic macroinvertebrates) and will likely increase fish abundance.

Minimum pool requirements and other changes in reservoir WSEs from implementation of Alternative 1 will result in little or no changes in reservoir volume, water temperature, dissolved oxygen levels or other parameters that could potentially affect reservoir fish populations. In addition, as described in the Recreation Plan, PCWA will stock fish in Hell Hole and French Meadows reservoirs at a rate equivalent to 100 percent of CDFG's annual management targets or 100 percent of the historical average stocking into these reservoirs (2001–2009), whichever is less. Fish species and size class stocking targets will be determined in consultation with the CDFG but are expected to be similar to historic stocking efforts. Therefore, changes in routine operations under Alternative 1 will maintain or enhance aquatic habitats and fish populations during the license term. Maintenance or enhancement of fish populations in bypass streams and rivers, as well as MFP reservoirs, will potentially enhance bald eagles by increasing their prey base.

3.6.2.7 Routine Vegetation and Noxious Weed Management

The use of herbicides, surfactants, and fungicides as part of routine vegetation and noxious weed management at MFP facilities and features located adjacent to bypass streams or large and medium reservoirs could potentially degrade water quality and aquatic habitats where bald eagles forage. Refer to the Section 2.0 and the VIPMP for a description of vegetation and noxious weed management under Alternative 1. Tables 2-3 through 2-5 provide a summary of vegetation and noxious weed management activities, including changes from the No-Action Alternative.

The VIPMP includes AP measures to protect water quality and aquatic habitats by preventing the entry of potentially harmful chemicals into water bodies. These measures include:

- Restrictions on the use of herbicides, surfactants, and fungicides within protective buffers around bypass and peaking reaches and Special Aquatic Features (i.e., reservoir);
- Use of herbicide formulations that are considered by the Environmental Protection Agency (EPA) to be safe for aquatic areas;
- Supervision of herbicide application by a licensed PCA and restrictive application and disposal methods; and
- Implementation of a Water Quality Monitoring Plan for Chemical Treatment Program to evaluate the effectiveness of protective measures included in the VIPMP.

Implementation of these measures will protect water quality and aquatic habitats where bald eagles are known to forage. Potential impacts associated with routine vegetation and noxious weed management are considered negligible.

3.6.2.8 Additional Measures for the Protection of Bald Eagles

The BEMP also includes measures to further protect the bald eagle nest and winter roosts at Hell Hole Reservoir and any new nests or roosts identified in the vicinity of the MFP during the license term. These include:

- Conducting five-year bald eagle wintering and nesting surveys in the vicinity of MFP reservoirs and bypass and peaking reaches;
- Coordinating with resource agencies annually to monitor the status of known nests in the vicinity of the MFP;
- Obtaining a permit from USFWS pursuant to the Bald and Golden Eagle Protection Act, if required, and consulting with CDFG regarding any pending activity under the federal permit;
- Consulting annually with agencies to discuss annual and five-year nest monitoring and reporting results, mortality monitoring results, identification of any new nests in the vicinity of the MFP and the appropriateness of AP measures, and power pole retrofit or replacement activities; and
- Implementing the ETP to increase awareness and sensitivity to bald eagle protection requirements and reporting procedures for bald eagle or other raptor mortalities.

Implementation of these measures will protect bald eagles by providing an opportunity to evaluate the location of nests and roosts and modify AP measures, as necessary, and ensure PCWA employees and contractors understand and implement AP measures.

3.6.2.9 Conclusion–Bald Eagle

Implementation of Alternative 1 will protect bald eagles and their roosts and nests for the following reasons:

- Rodenticide application methods will reduce the potential for secondary poisoning of bald eagles;
- Retrofitting and replacement of existing power poles/powerlines or construction of new powerlines consistent with APLIC design configurations will further reduce the risk of electrocution and protect bald eagles;
- Implementation of AP measures would avoid impacts to breeding eagles during Project maintenance activities;
- Removal of the Upper Hell Hole Campground will reduce recreation use and potential disturbance in the vicinity of the Hell Hole Reservoir bald eagle nest;
- Implementation of Alternative 1 will maintain or enhance the prey base for bald eagles in the bypass and peaking reaches and Project reservoirs;
- AP measures for vegetation and noxious weed management and implementation of a Water Quality Monitoring Plan for Chemical Treatment Program will protect water quality in aquatic habitats where bald eagles forage;
- Periodic bald eagle wintering and nesting surveys, consultation with resource agencies, and the ETP implemented under Alternative 1 will further protect and manage bald eagles at Hell Hole Reservoir or new nests and roosts identified during the license term; and
- Ongoing consultation with resource agencies, following completion of site-specific engineering plans to verify the adequacy of AP measures and development of new measures, if appropriate, will protect any new nests or roosts identified within 0.25 mile of these activities.

3.6.3 Impacts to Other Special-Status Plant and Wildlife Species

This section provides an analysis of potential impacts of Alternative 1 on all other special-status plant and wildlife species, grouped to include species that use similar habitats or for which impacts are similar. Refer to Table 3.6-1 for a list of special-status plants and to (PCWA 2011c, Table 7.6-5) for a list of special-status wildlife species known to occur or potentially occurring in the vicinity of the MFP, and their status and habitat requirements. Potential direct effects include:

- Loss of raptors on MFP power poles or powerlines;
- Loss of scavengers from secondary poisoning (e.g., raptors, mesocarnivores, and game mammals);
- Loss of riparian-nesting songbirds or nests;
- Disturbance of raptor nests; and

- Disturbance of mule deer in critical habitat areas.

Potential indirect effects include:

- Loss or degradation of riparian habitat for special-status riparian plants, riparian-nesting songbirds, and riparian mammals;
- Loss or degradation of aquatic foraging habitat for osprey and other aquatic-foraging birds and bats; and
- Loss or degradation of forest habitats for forest-dwelling birds and mammals.

This section also identifies additional measures provided in Alternative 1 for the protection of these species. Overall impacts conclusions are provided at the end of this section for each species or group of species.

3.6.3.1 Electrocuting of Raptors on MFP Powerlines

Under existing conditions (No-Action Alternative), several MFP power poles and powerlines have design elements that may pose a potential risk for raptor electrocution. Special-status raptors (bald eagles are addressed in Section 3.6.2.1) that could potentially occur in the vicinity of MFP powerlines include northern goshawk (*Accipiter gentilis* [FSS, CSC]), golden eagle (*Aquila chrysaetos* [CFP]), osprey (*Pandion haliaetus*), California spotted owl (*Strix occidentalis occidentalis* [FSS, MIS, BCC, CSC]), flammulated owl (*Otus flammeolus* [BCC]), great gray owl (*Strix nebulosa* [FSS, SE]), and American peregrine falcon (*Falco peregrinus anatum* [FD, FSS, BCC, SE]).

Refer to the Section 3.6.2.1 for a discussion of measures included in the BEMP (i.e., replacement/retrofitting and construction of new power poles and powerlines using APLIC design configurations, and implementation of other measures, such as annual consultation with resource agencies) that will protect all special-status raptor species during the license term.

3.6.3.2 Secondary Poisoning of Scavengers (Raptors, Mesocarnivores, and Game Mammals)

Under Alternative 1, metal phosphide fumigants (i.e., gas cartridges) will be used in rodent burrows on earthen dams (i.e., French Meadows and Hell Hole dams) to control rodent populations and meet DSOD requirements. Secondary poisoning of scavengers could occur if they consume rodents that have been killed by the metal phosphide fumigants.

Species potentially impacted include special-status raptors, mesocarnivores, or other game mammals. Refer to Table 7.6-5 in PCWA's Application for New License (PCWA 2011c) for a list of raptor species potentially occurring in the vicinity of the MFP. Two federal or state listed mesocarnivores, Pacific fisher (*Martes pennanti [pacifica]* [FC, FSS]), and California wolverine (*Gulo gulo luteus* [FSS, ST, CFP]), as well as one other special-status mesocarnivore, American marten (*Martes americana [sierrae]* [FSS, MIS]) may potentially occur in forested habitats in the vicinity of the MFP. Pacific fisher

and American marten are known to occur within 5 miles of Duncan Creek Diversion and French Meadows Reservoir (but outside of Federal Energy Regulatory Commission's [FERC] Project boundaries). In addition, a number of game species (e.g., coyote [*Canis latrans*] or black bear [*Ursus americanus*]) could potentially scavenge in the vicinity of French Meadows and Hell Hole reservoirs or are known to occur or have the potential to occur in the vicinity of the MFP. Refer to Table 7.6-8 in PCWA's Application for New License (PCWA 2011c) for a list of game species potentially occurring in the vicinity of the MFP.

Section 3.6.2.2 describes the specific application methods to be used on earthen dams to protect scavengers from secondary poisoning. These include requiring metal phosphide fumigants to be administered by a PCA; restriction of the use of fumigants to active rodent burrows; and conducting follow-up monitoring of the application area; and collecting and disposing of rodent carcasses. Implementation of these application methods will protect special-status species and game mammals scavenging in the vicinity of French Meadows and Hell Hole dams from secondary poisoning.

3.6.3.3 Loss of Riparian-Nesting Songbirds and Nests

Riparian habitats along diversion pools, reservoirs, bypass and peaking reaches, and Project recreational facilities associated with the MFP under Alternative 1 provide potential breeding habitat for special-status riparian-nesting songbirds including yellow warbler (*Dendroica petechia brewsteri* [MIS, CSC]) and yellow-breasted chat (*Icteria virens* [CSC]). Yellow warbler and yellow-breasted chat were detected in the vicinity of the MFP at Ralston Afterbay, French Meadows Reservoir, and Hell Hole Reservoir during surveys conducted for the relicensing. Provided below is a discussion of potential loss of yellow warbler or yellow breasted chat or their nests from Project maintenance activities, modification of existing facilities, and construction of new facilities under Alternative 1. Refer to Section 3.8 – Riparian Resources for a detailed discussion of potential impacts to riparian resources.

PROJECT MAINTENANCE ACTIVITIES

Under Alternative 1, removal of riparian vegetation associated with Project maintenance activities could potentially result in loss of riparian-nesting songbirds or their nests. This includes:

- Removal of approximately 0.04 acre of riparian habitat from Junction Bar (0.01 acre), Indian Bar (0.01 acre), and Willow Bar (0.02 acre) for the placement of the temporary bridge necessary to provide access to Junction Bar during sediment augmentation activities. This vegetation will continue to be removed periodically for installation of the temporary bridge during sediment augmentation activities over the term of the license.
- Removal of approximately 0.87 acre of riparian vegetation that is established along the channel margins of Junction and Indian bars to maximize the potential for sediment transport during high-flow events and to prevent berm formation (0.34 acre at Junction Bar and 0.53 acre at Indian Bar). At Indian Bar, this

vegetation has established since the last sediment augmentation activity in 2002 (Jones and Stokes 2002). Routine annual vegetation management at the sediment augmentation areas will prevent future establishment of riparian vegetation. Vegetation removal will be completed as described in the VIPMP.

- Potential loss of riparian vegetation during contingency sediment management activities to be implemented at Duncan Creek Diversion, and South Fork Long Canyon Diversion, and North Fork Long Canyon Diversion.

Removal of riparian vegetation during the breeding season (May 15 through July 15 for yellow-breasted chat and April 1 through July 31 for yellow warbler) could result in the destruction of nests and potential loss of individual eggs or nestlings. Measures incorporated in the VIPMP and SMP require removal of riparian vegetation resulting from the above-listed activities to be implemented between August and March, outside the breeding season for yellow-breasted chat and yellow warbler. This prevents any direct impacts to these birds and nests. Implementation of this measure will avoid any loss of riparian-nesting songbirds during vegetation removal associated with sediment management activities.

In addition, prior to implementation of sediment management activities, PCWA will consult with resource agencies and obtain appropriate permits. This may include a CDFG Streambed Alteration Agreement, USACE Section 404 Permit, RWQCB 401 Certification, or a USDA-FS Special Use Authorization. Measures required in these permits will also be implemented.

Project maintenance activities at recreational facilities could also potentially impact riparian songbirds or their nests. The Indian Bar Rafting Access, the Ralston Afterbay Sediment Removal Access Point Boat Ramp, the Duncan Creek Diversion Primitive Recreation Site, and the Middle Fork American River above Ralston Afterbay Access Trail support riparian habitat. However, AP measures included in the Recreation Plan that specify that riparian vegetation will not be removed or destroyed will be implemented under Alternative 1 to protect riparian resources occurring at these locations. Implementation of Project maintenance activities at these facilities will also protect riparian resources by containing and defining the area in which recreation use occurs.

In addition, the removal of the Upper Hell Hole Campground and removal and relocation of the French Meadows Picnic Area will improve drainage and enhance riparian resources, which will benefit riparian nesting songbirds and their nests.

MODIFICATION OF EXISTING PROJECT FACILITIES AND CONSTRUCTION OF NEW PROJECT FACILITIES AND PROJECT RECREATION FACILITIES AND FEATURES

Removal of riparian vegetation associated with modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features could also potentially result in loss of riparian-nesting songbirds or their nests. Refer to Section 2.0 and Appendix A for a description of modification and construction activities

to be implemented under Alternative 1. Refer to Section 3.8 – Riparian Resources for a more detailed description of impacts to riparian habitats under Alternative 1.

Removal of up to approximately 0.41 acre of riparian vegetation would occur as a result of modification and construction activities at the following locations:

- Duncan Creek Diversion Dam Modification, which will result in loss of 0.03 acre of willow-alder riparian habitat;
- South Fork Long Canyon Diversion Dam Modification, which will result in loss of approximately 0.03 acre of willow-alder riparian habitat;
- Hell Hole Dam Outlet Works Modification, which will result in loss of up to 0.24 acre of white alder riparian habitat);
- South Fork Long Canyon Creek below Diversion Dam Gage (SFLCC) (and associated features), which could potentially result in the loss of up to 0.01 acre of riparian habitat;
- Middle Fork American River below Interbay Dam Gage (MFARIB) (and associated features), which could potentially result in loss of up to 0.01 acre of riparian habitat;
- French Meadows Reservoir Trail, which could potentially impact up to 0.07 acre of riparian habitat; and
- French Meadows North Shore Water Supply Line, which could potentially impact up to 0.02 acre of riparian vegetation.

Overall, modification of existing or construction of the new Project facilities and features could result in the removal of up to 1.32 acres of riparian vegetation. Measures incorporated into Appendix A would minimize the amount of riparian vegetation removed during implementation of each of the projects, and require removal of riparian vegetation outside of the nesting season. Therefore, implementation of measures will avoid direct impacts to riparian-nesting songbirds or their nests during modification or construction of MFP facilities. PCWA will also obtain all appropriate permits prior to implementation of construction activities. Measures included in these permits will be implemented.

3.6.3.4 Disturbance of Raptor Nests

PROJECT MAINTENANCE ACTIVITIES

Project maintenance activities could potentially result in disturbance of special-status raptors and nests known to occur in the vicinity of the MFP, including northern goshawk, golden eagle, osprey, and California spotted owl. Special-status raptors potentially occurring in the vicinity of the MFP include flammulated owl, great gray owl, and American peregrine falcon.

There are ten osprey nests documented in the vicinity of the MFP, including seven in the vicinity of French Meadows Reservoir, and three in the vicinity of Hell Hole

Reservoir. Refer to Table 3.6-5 in PCWA's Application for New License (PCWA 2011c) and to Map 6 in the Supplemental Biological Technical Study Report – 2011 (Attachment 2A) for the location of osprey nests in relation to MFP facilities where Project maintenance activities are implemented. In addition, USDA-FS data show a number of California spotted owl and northern goshawk nest areas and PACs present near MFP facilities. Refer to Table 3.6-5 and to Maps 7.6-4 and 7.6-5 in PCWA's Application for New License (PCWA 2011c) for the location of California spotted owl and northern goshawk nest areas PACs in relation to Project facilities.

Because there are known nest locations for only osprey, California spotted owl, and northern goshawk in the vicinity of the MFP, this discussion is focused primarily on potential impacts to these three raptor species. However, AP measures described for osprey, California spotted owl, and northern goshawk will also protect other special-status raptors during the term of the license.

Refer to Section 2.0 and to applicable management plans (i.e., SMP, VIPMP, Recreation Plan, and TSMP) for a description of Project maintenance activities under Alternative 1. Tables 2-3 through 2-5 provide a summary of changes from the No-Action Alternative.

Under Alternative 1, implementation of Project maintenance activities could result in disturbance of breeding raptors from equipment noise and increased human activity. In consultation with resource agencies, it was decided that a 500-foot-activity buffer would be sufficient to avoid disturbance of raptor nests. Therefore, disturbance would occur if maintenance activities are conducted within 500 feet of a nest during the breeding season (i.e., March 1 through August 31 for osprey, California spotted owl, and other special-status raptors; February 15 through September 15 for northern goshawk).

There are currently no known northern goshawk nests within 500 feet of facilities where Project maintenance activities or construction of new Project recreation facilities and trails will be implemented. Therefore, Alternative 1 will not result in impacts to northern goshawk.

Routine vegetation management (i.e., trimming by hand and with equipment, and use of herbicides and surfactants) and annual and periodic road maintenance activities occurring within 500 feet of an osprey nest will continue to be implemented under Alternative 1 (Table 3.6-5) at the following facilities:

- Duncan Creek – Middle Fork Tunnel Portal;
- French Meadows – Hell Hole Tunnel Gatehouse;
- Radio Communication Tower near French Meadows – Hell Hole Tunnel Gatehouse;
- Duncan Creek – Middle Fork Tunnel Portal Road;
- French Meadows – Hell Hole Tunnel Gatehouse Road;
- French Meadows Powerhouse Road;

- French Meadows Reservoir Trail; and
- Hell Hole Reservoir Trail.

Similarly, vegetation management and annual and periodic road maintenance activities will continue to be implemented at the Middle Fork Interbay Dam Road, which is within 500 feet of a California spotted owl nest. Under Alternative 1, noxious weed management will also be conducted at these locations.

Measures incorporated into the TSMP and VIPMP will protect osprey and California spotted owl nests during implementation of routine vegetation and noxious weed management and annual and periodic road maintenance by limiting the duration and extent of activities and by establishing limited operating periods. These measures will also apply to any new raptor nests that may be identified during the term of the license. These measures include:

- VIPMP
 - If routine vegetation or noxious weed management activities are implemented within 500 feet of a known nest, locate staging areas away from and limit the duration and extent of activities within the nest buffer;
 - Vegetation supporting nests will not be trimmed, unless approved by the appropriate state or federal agencies; and
 - Pesticides will be applied using methods that will avoid impacts to nests.
- TSMP
 - If annual road or trail maintenance activities are implemented within 500 feet of a known nest, staging areas will be located away from and the duration and extent of activities within the nest buffer will be limited;
 - Periodic and special project activities will be implemented outside the breeding season to the extent possible; and
 - Pre-construction clearance surveys will be required prior to implementation of periodic road or trail maintenance implemented during the breeding season. If active nests are found, activities requiring the use of heavy equipment will not be implemented within 500 feet of the nest during the applicable nesting season.

One osprey nest has been identified within 500 feet of the Hell Hole Reservoir Trail, which will be reconstructed and rehabilitated under Alternative 1. To avoid disturbance of this nest from ground disturbing activities or use of heavy equipment, no activities would be implemented within 500 feet of the nest during the osprey breeding season (March 1 through August 31).

The Recreation Plan and the SMP include additional measures to protect raptor nests. These measures include:

- SMP
 - All sediment management activities will be conducted from September 15 to February 15, outside the raptor nesting season.
- Recreation Plan
 - Pre-construction clearance surveys will be required prior to implementation of ground disturbing and construction activities implemented during the breeding season. If active nests are found, activities requiring the use of heavy equipment will not be implemented within 500 feet of the nest during the nesting season.

Implementing these measures under Alternative 1 will protect osprey, California spotted owl, and northern goshawk, as well as other special-status raptors, during the term of the license.

MODIFICATION OF EXISTING PROJECT FACILITIES AND CONSTRUCTION OF NEW PROJECT FACILITIES AND PROJECT RECREATION FACILITIES AND FEATURES

Modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features could also potentially disturb osprey, California spotted owl, northern goshawk, or other special-status raptors if construction activities were implemented within 500 feet of a nest during the breeding season. Refer to Section 2.0 and Appendix A for a description of modification and construction activities to be implemented under Alternative 1.

No osprey, California spotted owl, or northern goshawk nests occur within 500 feet of any construction or staging areas for the small diversion and outlet works modifications, new gages and associated features, new facilities associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement, new recreation facilities, or water supply replacements, with one exception. One northern goshawk nest and four osprey nests are located within 500 feet of the new French Meadows Reservoir Trail, which would be constructed under Alternative 1. To avoid impacts to nesting goshawks or osprey, no construction activities would be conducted within 500 feet of the nests during the breeding season (i.e., March 1 through August 31 for osprey, February 15 through September 15 for northern goshawk).

With implementation of the above measure, facility modification and construction activities will not result in impacts to known spotted owl, northern goshawk, or osprey nests.

Measures incorporated into Alternative 1 (Appendix A) will protect any new special-status raptor nests potentially identified in the vicinity of the facility modification and construction projects. These include:

- Implementing construction activities outside the breeding season to the extent possible; and

- Conducting pre-construction clearance surveys prior to implementing facility modification or construction activities. If active nests are found, construction activities will not be implemented within 500 feet of the nest during the applicable nesting season.

Implementation of these measures will minimize the disturbance of any special-status raptor nests.

3.6.3.5 Disturbance of Mule Deer in Important Habitat Areas

PROJECT MAINTENANCE ACTIVITIES

Under Alternative 1, implementation of Project maintenance activities could potentially result in disturbance to mule deer (*Odocoileus hemionus* [MIS]) from equipment noise, ground disturbance, or increased human activity if implemented in important mule deer habitat areas (i.e., deer fawning areas, holding areas, and critical ranges).

Mule deer are one of the most widespread game species in the vicinity of the MFP. A State Game Refuge, intended primarily to protect habitat used by the Blue Canyon mule deer herd, extends from the west end of French Meadows Reservoir to the northwest portion of the Granite Chief Wilderness. Refer to Table 3.6-5 and Maps 7.6-6a and 7.6-6b in PCWA's Application for New License (PCWA 2011c) for the location of mule deer fawning areas, holding areas, critical ranges, and migration routes in relation to MFP facilities and features and MFP recreation facilities and features. Refer to Section 2.0 and to applicable land and resource management plans (i.e., SMP, VIPMP, Recreation Plan, and TSMP) for a description of Project maintenance activities under Alternative 1. Tables 2-3 through 2-5 provide a summary of changes from the No-Action Alternative.

In relation to the MFP, important mule deer habitats occur primarily in the following areas:

- **Hell Hole Area:** There are mule deer intermediate holding areas (i.e., areas where deer gather in late summer prior to migration) in the vicinity of Hell Hole Reservoir facilities where routine maintenance activities (i.e., routine vegetation management, annual and periodic road maintenance, and annual and heavy recreation facility maintenance) are ongoing.
- **French Meadows Area:** There are critical summer ranges (i.e., areas critical to the breeding cycle of mule deer) in the vicinity of the State Game Refuge at French Meadows Reservoir. This includes portions of recreation facilities where annual and heavy recreation facility maintenance are ongoing and where recreation facility enhancements are proposed under Alternative 1.
- **Middle Fork Interbay Area:** There are critical winter ranges (i.e., areas critical to the life cycle of deer during winter months) in the vicinity of Middle Fork Interbay where routine road maintenance activities are ongoing.

Project maintenance activities at these locations have been ongoing under the No-Action Alternative and will not change significantly under Alternative 1. Noxious weed management will also be implemented in conjunction with vegetation management at facilities where target noxious weed populations have been identified.

Mule deer have tolerated Project maintenance activities under existing conditions (No-Action Alternative), as well as other ongoing human activities, such as recreational use and hunting. In addition, all Project maintenance activities under Alternative 1 will be restricted to the area necessary to complete the work within the facility footprint. Any disturbance of mule deer in forested habitat surrounding MFP facilities and features or MFP recreation facilities and features will be minimal under Alternative 1 and will not represent a significant change from the level of Project activities under the No-Action Alternative. Therefore, impacts are considered negligible.

MODIFICATION OF EXISTING PROJECT FACILITIES AND CONSTRUCTION OF NEW PROJECT FACILITIES AND PROJECT RECREATION FACILITIES AND FEATURES

Modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features could also potentially disturb mule deer. Refer to Section 2.0 and Appendix A for a description of modification and construction activities to be implemented under Alternative 1.

Three facilities to be modified or constructed in the vicinity of French Meadows Reservoir are located within critical summer range for mule deer (critical summer range is a subset of summer range that consists of areas believed to be especially critical to the life cycle of migratory deer). The facilities located within the critical summer range include the French Meadows Reservoir Trail, the French Meadows North Shore Water Supply, and the French Meadows South Shore Water Supply. Activities associated with the construction of these facilities, including ground disturbance, tree removal, and use of heavy equipment, could potentially result in disturbance of breeding mule deer or in alteration of their habitat.

Mule deer breeding season occurs in early spring to midsummer, with fawning peaking from late April through mid-June (CDFG 1990). Construction of all three facilities is scheduled to occur, in separate years, between June and November. Therefore, the majority of construction activities within the critical summer range would occur outside the peak fawning season. Construction activities would be limited to the minimum area necessary to complete the work. French Meadows Reservoir supports ongoing recreation activities during the mule deer breeding season, as well as ongoing maintenance of Project facilities and features and Project recreation facilities and features. Therefore, mule deer in the vicinity of the reservoir are accustomed to and tolerate a baseline level of human activity during the summer breeding season. Furthermore, disturbance from construction activities would be further minimized because the activities would only occur during working hours, when mule deer are less active (mule deer are generally most active at dawn and dusk (CDFG 1990).

Construction of the trail and water supplies, as well as tree removal necessary for construction of the trail and the water supply lines, would result in loss and/or alteration of mule deer habitat. However, construction activities would be limited to the area necessary to complete the work, and would not affect surrounding forests. In addition, upon completion, the trail and the water supply pipes (which would be located underground) would not impede the movement of mule deer. Therefore, while facility modification and construction activities at French Meadows could potentially result in disturbance of or loss/alteration of critical summer habitat for mule deer, these impacts would be temporary and limited temporally and spatially to the area necessary for completion of the projects, and will not result in long-term effects to (i.e., will not impede the movement or reproduction of) mule deer.

3.6.3.6 Loss of Habitat for Special-Status Riparian Plants and Mosses, Riparian Nesting Songbirds, and Riparian Mammals

Changes in MFP operations, implementation of Project maintenance activities, and modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features under Alternative 1, may affect riparian areas that support special-status riparian plants and mosses or that represent foraging and/or breeding habitat for riparian nesting songbirds and riparian mammals.

No special-status riparian plants or mosses were identified in the vicinity of the MFP. However, if special-status riparian plants or mosses are identified during future special-status plant inventory surveys that will be conducted over the license term, additional agency consultation will be conducted to determine if additional AP measures should be developed.

The only riparian nesting songbirds detected in the vicinity of the MFP were yellow warbler and yellow-breasted chat. These songbirds were observed at Ralston Afterbay, French Meadows Reservoir, and Hell Hole Reservoir during surveys conducted for the relicensing (Section 3.6.3.3). Two special-status mammals, Sierra Nevada mountain beaver or sewellel (*Aplodontia rufa californica* [CSC]) and ringtail (*Bassariscus astutus* [CFP]) may breed and forage in riparian habitats in the vicinity of the MFP.

Section 3.8 – Riparian Resources provides a detailed description of the effects of Alternative 1 on riparian habitats. Although as described in Section 3.6.3.3, Alternative 1 would result in the loss of up to approximately 1.32 acre of riparian habitat, the alternative includes measures that will avoid, protect, and enhance riparian habitat along approximately 108 miles of rivers and streams associated with the MFP. In addition, riparian vegetation will be re-planted following completion of the re-contouring of the Rubicon River channel downstream of Hell Hole Dam associated with the outlet works modification. The specifics of revegetation (i.e., planting plan species, number of plants, extent of area, etc.) will be developed through a permitting process with CDFG and USACE (refer to Section 2.0 and Appendix A). Overall, Alternative 1 enhances riparian habitat compared to the No-Action Alternative and will protect species dependent on riparian habitats including special-status riparian plants and mosses, riparian-nesting songbirds, and riparian mammals.

3.6.3.7 Loss of Aquatic Foraging Habitat for Osprey and Other Aquatic Foraging Birds and Bats

OSPREY AND OTHER AQUATIC FORAGING BIRDS

Changes in MFP operations and implementation of vegetation and noxious weed management under Alternative 1 could potentially affect aquatic foraging habitat, aquatic macroinvertebrates, and fish populations that represent a prey base for several special-status birds in the vicinity of the MFP.

In addition to bald eagle (discussed in Section 3.6.2), other special-status bird species potentially foraging in aquatic habitats in the vicinity of the MFP (i.e., large and medium reservoirs and/or MFP bypass and peaking reaches) include osprey, American white pelican (*Pelecanus erythrorhynchos* [CSC]), harlequin duck (*Histrionicus histrionicus* [CSC]), black swift (*Cypseloides niger* [CSC]) and Vaux's swift (*Chaetura vauxi* [CSC]). Osprey are known to forage at the medium and large MFP reservoirs (i.e., Middle Fork Interbay, Ralston Afterbay, Hell Hole Reservoir, and French Meadows Reservoir). American white pelicans, which are a migrant species, were documented foraging in the vicinity of Hell Hole Reservoir. Black swifts are potential summer residents that may forage over aquatic habitats in the MFP. However, there are no current records for this species within the MFP. A flock of Vaux's swifts were seen foraging over French Meadows Reservoir. Harlequin ducks breed along swift, shallow rivers of the Sierra Nevada and could potentially occur in the vicinity of MFP; however, there are no current records for this species in the vicinity of the MFP.

As described in Section 3.5 – Fish and Aquatic Resources, increased minimum instream flows in the bypass and peaking reaches and reduced flow fluctuations in the peaking reach will increase habitat and aquatic macroinvertebrates productivity, which will in turn increase fish abundance.

Minimum pool requirements and other changes in reservoir WSEs from implementation of Alternative 1 will result in little or no changes in reservoir volume, water temperature, dissolved oxygen levels or other parameters that could potentially affect macroinvertebrate or reservoir fish populations. In addition, fish in French Meadows and Hell Hole reservoirs will continue to be stocked by PCWA and CDFG as described in the Recreation Plan. Therefore, changes in MFP operations under Alternative 1 will maintain or enhance aquatic habitats, aquatic macroinvertebrate productivity, and fish populations during the license term. Maintenance or enhancement of aquatic macroinvertebrate and fish populations in bypass streams and rivers, as well as MFP reservoir, will enhance aquatic-foraging birds by increasing their prey base.

As described in Section 3.6.1.2, the use of herbicides, surfactants, and fungicides as part of routine vegetation and noxious weed management in the vicinity of bypass and peaking reaches and reservoirs could potentially degrade water quality and aquatic habitats. Refer to Section 3.6.1.2 for a summary of AP measures incorporated into the VIPMP to protect aquatic habitats by preventing the entry of chemicals into water

bodies. Implementation of these measures will protect aquatic foraging habitats during implementation of vegetation and noxious weed management.

Therefore, implementation of measures to protect aquatic habitats during routine vegetation and noxious weed management and modifications of Project operations will not affect special-status bird foraging habitat in the vicinity of the MFP.

BATS

Under Alternative 1, implementation of instream flow measures, minimum pool requirements, and sediment management activities could potentially affect aquatic foraging habitat for special-status bats by affecting their prey base (aquatic macroinvertebrates) or through temporary loss of aquatic foraging habitat during sediment management activities. In addition, small diversion modifications at Duncan, North Fork Long Canyon, and South Fork Long Canyon creeks could result in changes in aquatic foraging habitat for special-status bats.

No federal or state-listed bat species were identified utilizing (e.g., roosting in) any MFP facilities or features during MFP relicensing studies. Several bat species considered sensitive by USDA-FS and CDFG, including pallid bat (*Antrozous pallidus* [FSS, CSC]), Townsend's big-eared bat (*Corynorhinus townsendii* [FSS, CSC]), and western red bat (*Lasiurus blossevillei* [FSS, CSC]) were detected foraging at the small diversion pools and medium and large reservoirs (PCWA 2011f). In addition, spotted bat (*Euderma maculatum* [CSC]) and greater western mastiff bat (*Eumops perotis californicus* [CSC]) may potentially occur in the MFP vicinity.

Refer to Section 2.0 and the SMP for a description of changes in operations and sediment management to be implemented under Alternative 1, and to Tables 2-3 through 2-5 for a summary of changes from the No-Action Alternative. Appendix A provides a description of the construction of the modified diversion dams. Section 3.5 – Fish and Aquatic Resources provides a detailed analysis of the affects of Alternative 1 on aquatic macroinvertebrate productivity in the bypass and peaking reaches, as well as large and medium reservoirs and small diversion pools.

As described previously, enhanced minimum instream flows under Alternative 1 will increase the wetted perimeter of bypass rivers and streams. These conditions would maintain or enhance macroinvertebrate productivity in bypass reaches. Therefore, special-status bats foraging in these locations would be maintained or enhanced.

Small diversion modifications (Duncan, North Fork Long Canyon, and South Fork Long Canyon creeks) will result in a temporary, short-term dewatering of the diversions pools where special-status bats are known to forage. Specifically, the modifications will require one-time dewatering of the diversions between July and November. Western red bat and spotted bat typically are not present in the vicinity of the MFP in the fall. However, pallid bat, Townsend's big-eared bat, and greater western mastiff bat are year-round residents that would be present in the MFP during the months when dewatering will occur. Therefore, dewatering associated with initial modification of the

diversion pools would result in temporary impacts to aquatic foraging habitat for pallid bat, Townsend's big-eared bat, and greater western mastiff bat.

However, under the No-Action Alternative, these diversions are routinely dewatered to conduct sediment management activities. Prior to diversion modification, sediment management activities will continue under Alternative 1, but will be reduced (duration, extent of equipment needed, volume of sediment removed and disposal areas). After diversion modification the need for future sediment management is considered to be unlikely. Therefore, while implementation of Alternative 1 would result in a temporary loss of habitat during the fall for pallid bat, Townsend's big-eared bat, and greater western mastiff bat during modification of the diversions, the resulting diversion improvements will reduce the frequency and need for dewatering of the small diversion pools over the term of the license, as compared to the No-Action Alternative.

As described in Section 3.5 – Fish and Aquatic Resources, following construction of the modified small diversions, the existing diversion pools will aggrade with sediment to near the top of the wedge-wire screen, resulting in new diversion pools becoming shallower. The footprint of the new diversion pools will remain approximately similar to the existing diversion pools. These changes in the depth of the diversion pool are expected to maintain, or potentially enhance, aquatic macroinvertebrate populations that form a prey base for special-status bats.

Although diversion modification will result in short-term, temporary loss of special-status bat foraging habitat, the diversion modifications will substantially reduce the need to conduct future routine sediment management, which requires dewatering of the diversions. Therefore, special-status bat foraging habitat will be maintained or enhanced under Alternative 1. Therefore, impacts to special-status bats are considered negligible. In addition, implementation of instream flow measures and minimum reservoir pool requirements under Alternative 1 will maintain or enhance aquatic macroinvertebrate populations that form a prey base for special-status bats.

3.6.3.8 Loss of Forest Habitat for Forest Dwelling Birds and Mammals

Implementation of Project maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features, could potentially result in the loss or degradation of forested areas that represent habitat for a number of special-status species. These include birds that forage and/or breed in forested habitats in the vicinity of the MFP, as well as mammals such as mesocarnivores, game mammals (including mule deer), and other special-status mammals including ringtail and northern flying squirrel.

Special-status birds that breed and forage in forested habitats include special-status raptors such as northern goshawk and California spotted owl (Section 3.6.3.4); and other special-status birds including sooty (blue) grouse (*Dendragapus obscurus* [MIS]), mountain quail (*Oreortyx pictus* [MIS]), calliope hummingbird (*Stellula calliope* [BCC]), Lewis' woodpecker (*Melanerpes lewis* [BCC]), Williamson's sapsucker (*Sphyrapicus thyroideus* [BCC]), hairy woodpecker (*Picoides villosus* [MIS]), black-backed

woodpecker (*Picoides arcticus* [MIS]), olive-sided flycatcher (*Contopus cooperi* [BCC, CSC]), fox sparrow (*Passerella iliaca* [MIS]), and Cassin's finch (*Carpodacus cassinii* [BCC]). Of these, sooty (blue) grouse, mountain quail, hairy woodpecker, olive-sided flycatcher, and Cassin's finch, were documented during surveys conducted for the MFP relicensing.

American marten, pacific fisher, and California wolverine may potentially occur in forested habitats in the vicinity of the MFP. Pacific fisher and American marten are known to occur within 5 miles of Duncan Creek Diversion and French Meadows Reservoir (but outside of FERC Project boundaries). However, there are no known denning areas for Pacific fisher or American marten and there are no recorded wolverine occurrences or dens in the vicinity of the MFP.

A number of game species are known to occur or have the potential to occur in the vicinity of the MFP. Refer to Table 7.6-8 in PCWA's Application for New License (PCWA 2011c) for a list of game species potentially occurring in the vicinity of the MFP. Mule deer are one of the most widespread game species in the vicinity of the MFP. Refer to Table 3.6-5 and to Maps 7.6-6a and b in PCWA's Application for New License (PCWA 2011c) for the location of mule deer fawning areas, holding areas, critical ranges, and migration routes in relation to MFP facilities and features, MFP roads and trails, and MFP recreation facilities and features.

In addition to mesocarnivores and game species, several other special-status mammals may potentially occur in forested habitats in the vicinity of the MFP. These include ringtail and northern flying squirrel (*Glaucomys sabrinus* [MIS]). These species were not documented during MFP relicensing studies, but are likely to occur in appropriate habitat in the vicinity of the MFP.

Refer to Section 2.0, the VIPMP, and Recreation Plan for a description of vegetation and noxious weed management and recreation maintenance under Alternative 1. Tables 2-3 through 2-5 provide a summary of changes from the No-Action Alternative. Section 2.0 and Appendix A provide a description of modification of existing facilities or construction of new facilities under Alternative 1.

Vegetation management at Project facilities and features and Project recreation facilities and features includes trimming of shrubs and herbaceous vegetation and cutting of overhanging limbs to provide safe access and maintain efficient operation of MFP facilities and features. These activities would be restricted to the perimeter of the facility or feature. In addition, hazard tree removal and fuels reduction (brushing and thinning) will be conducted within 150 and 100 feet (respectively) of Project recreation facilities or features to provide safe recreation opportunities and reduce fire risk. These activities are restricted to a maximum of 150 feet around the perimeter of the Project recreation facilities and features. While implementation of these activities could potentially alter forest habitat in the immediate vicinity of Project recreation facilities and features, it would not result in loss or degradation of habitat for forest-dwelling birds and mammals. In addition, fuels thinning would help reduce the risk of fire in the vicinity of Project recreation facilities and features, which would benefit surrounding forest habitats.

Construction and staging areas for modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features are located in disturbed, graveled or paved areas to avoid impacts to forest habitats or other natural vegetation. However, construction of the French Meadows Reservoir Trail, Ellicott Bridge Parking Area, the French Meadows North Shore Water Supply and the French Meadows South Shore Water Supply, would result in loss and/or alteration of forest habitats. However, construction activities would be limited to the area necessary to complete the work, and would not affect surrounding forests. These minor changes in forest habitats are considered to be negligible in consideration of the extensive amount of forested habitats in the vicinity of the MFP. Forest habitats and their associated birds and mammals surrounding MFP facilities and features and MFP recreation facilities and features will therefore not be affected by Alternative 1.

3.6.3.9 Additional Measures for the Protection of Other Special-Status Plant and Wildlife Species

The management plans for the MFP included in Alternative 1 contain additional measures to protect special-status plants and wildlife, including new plant populations, raptor nests, or other resources (e.g., bat roosts or mesocarnivore dens) identified during the term of the license. These include:

- Conducting periodic special-status plant inventory surveys, as described in the VIPMP;
- Requiring annual agency consultation to discuss appropriate measures to protect new special-status plant populations; new nest, roost, or den sites; or other resources to be protected during implementation of routine maintenance activities; and
- Implementation of the ETP for PCWA employees and contractors regarding special-status plants and wildlife of the MFP and associated AP measures and specific work methods to be implemented for their protection.

These measures will protect other plant and wildlife populations and ensure the protection of any new populations, nests, or roosts identified during the license term.

3.6.3.10 Impact Conclusions—Other Special-Status Plant and Wildlife Species

As described above, implementation of Alternative 1, including operation of the MFP, Project maintenance activities, modification of existing facilities, and construction of new facilities could potentially result in impacts to other special-status plant and wildlife species including raptors, riparian songbirds, riparian plants and mosses, aquatic foraging birds, bats, riparian mammals, forest-dwelling species (i.e., birds, mesocarnivores, game mammals, and other mammal species), and mule deer. This section provides an overall impact conclusion by species or group of species associated with implementation of Alternative 1.

SPECIAL-STATUS RIPARIAN PLANTS AND MOSSES

Alternative 1 will protect and enhance riparian areas that represent habitat for special-status riparian plants and mosses through changes in operation of the MFP, and will protect special-status riparian plants and mosses through implementation of measures included in the proposed management plans. A summary of Alternative 1 components that enhance or protect riparian special-status plants is provided below:

- Implementation of measures included in Alternative 1 (e.g., increased minimum instream flows, pulse flows with recession rates, and down-ramping of spills) will protect and enhance riparian resources along approximately 108 miles of rivers and streams associated with the MFP;
- Measures included in the SMP and VIPMP will ensure protection of riparian habitats during implementation of routine vegetation, noxious weed, and sediment management activities; and
- Periodic special-status plant surveys, implementation of the ETP, and annual consultation with agencies will protect any new special-status riparian plants or moss populations identified during the license term.

OTHER RAPTORS

Alternative 1 will protect northern goshawk, California spotted owl, and osprey, and other special-status raptors including golden eagle, flammulated owl, great gray owl, and American peregrine falcon, through implementation of measures included in management plans. A summary of measures that will protect raptors is provided below:

- Retrofitting and replacement of existing power poles/powerlines or construction of new powerlines consistent with APLIC design configurations will reduce the risk of electrocution and thereby protect other special-status raptors;
- Rodenticide application methods will reduce the potential for secondary poisoning of other special-status raptors;
- Measures included in the TSMP and VIPMP will prevent disturbance of raptor nests by limiting the duration and extent of routine maintenance activities within 500 feet of known nests, as well as prohibiting trimming of vegetation from trees supporting nests and requiring application methods to avoid nests during pesticide applications;
- Measures included in the SMP, Recreation Plan, and TSMP will prevent disturbance of raptor nests during ground disturbing activities or use of heavy equipment; and
- Annual consultation with resource agencies to discuss the effectiveness of AP measures and implementation of the ETP will further protect special-status raptors.

AQUATIC-FORAGING BIRDS

Alternative 1 will protect aquatic-foraging bird species (including American white pelican, harlequin duck, osprey, and Vaux's swift) and their habitats through changes in operations of the MFP and through measures included in the management plans. A summary of measures that will protect aquatic-foraging birds is provided below:

- Alternative 1 will increase effective habitat and food production (aquatic macroinvertebrates) and will likely increase fish abundance;
- AP measures for vegetation and noxious weed management and implementation of a Water Quality Monitoring Plan for Chemical Treatment Program will protect water quality in aquatic habitats; and
- Annual resource agency consultation and implementation of the ETP will further protect aquatic-foraging birds.

OTHER FOREST-DWELLING BIRDS

Implementation of Alternative 1 would not affect other forest-dwelling birds for the following reasons:

- Routine vegetation removal (i.e., hazard tree removal or fuels reduction) is restricted a maximum of 150 feet around the perimeter of Project recreation facilities and features and would not result in loss or degradation of habitat for forest-dwelling birds. In addition, fuels thinning would help reduce the risk of fire in the vicinity of Project recreation facilities and features, which would benefit surrounding habitats for forest-dwelling birds;
- Removal of forested habitats necessary for the construction or modification of new Project facilities and features or Project recreation facilities and features would be limited to the area necessary to complete the work, and would not affect surrounding forests; and
- Annual resource agency consultation and implementation of the ETP will further protect forest-dwelling species.

RIPARIAN-NESTING SONGBIRDS

Alternative 1 will enhance riparian areas that represent habitat for riparian-nesting songbirds through changes in operation of the MFP, and will protect riparian-nesting songbirds through AP measures included in the management plans. A summary of these measures that enhance or protect riparian-nesting songbirds is provided below:

- Implementation of measures included in Alternative 1 (e.g., increased minimum instream flows, pulse flows with recession rates, and down-ramping of spills) will protect and enhance riparian resources along approximately 108 miles of rivers and streams associated with the MFP;

- Measures included in the VIPMP will protect riparian habitats during implementation of routine vegetation and noxious weed management activities;
- Removal of riparian vegetation necessary for implementation of sediment management activities and modification of existing facilities, or construction of new facilities will occur between August and March, outside the breeding season for riparian-nesting songbirds, to avoid impacts to individuals or nests; and
- Annual consultation with resource agencies and implementation of the ETP will further protect riparian-nesting songbirds.

BATS

Alternative 1 will maintain and protect special-status bat populations for the following reasons:

- Changes in operation of the MFP under Alternative 1 will maintain or enhance the prey base for special-status bats foraging in aquatic habitats;
- Implementation of routine sediment management and modification of small diversions will reduce the need for dewatering of diversions and reservoirs that represent appropriate foraging habitat over the license term; and
- Annual resource agency consultation and implementation of the ETP will further protect special-status bats.

RIPARIAN MAMMALS

Alternative 1 will enhance riparian areas that represent habitat for riparian mammals through changes in operation of the MFP, and will protect riparian mammals through protective measures included in the management plans. A summary of measures that enhance or protect riparian mammals is provided below:

- Implementation of measures included in Alternative 1 (e.g., increased minimum instream flows, pulse flows with recession rates, and down-ramping of spills) will protect and enhance riparian resources along approximately 108 miles of rivers and streams associated with the MFP;
- Measures included in the VIPMP will protect riparian habitats during implementation of routine vegetation, and noxious weed management activities; and
- Annual consultation with resource agencies and implementation of the ETP will further protect riparian mammals.

MESOCARNIVORES, GAME MAMMALS, AND OTHER SPECIAL-STATUS MAMMALS

Alternative 1 will protect mesocarnivores, game mammals, or other forest-dwelling special-status mammals through implementation of measures included in the

management plans. A summary of measures that would protect mesocarnivores, game mammals, or other forest-dwelling special-status mammals is provided below:

- Rodenticide application methods will reduce the potential for secondary poisoning of mesocarnivores and game mammals such as black bear and coyote;
- Routine vegetation removal (i.e., hazard tree removal or fuels reduction) is restricted to a maximum of 150 feet around the perimeter of Project recreation facilities and features and would not result in loss or degradation of habitat for forest-dwelling birds. In addition, fuels thinning would help reduce the risk of fire in the vicinity of Project recreation facilities and features, which would benefit surrounding habitats for forest-dwelling birds;
- Removal of forested habitats necessary for the construction or modification of new Project facilities and features or Project recreation facilities and features would be limited to the area necessary to complete the work, and would not affect surrounding forests; and
- Annual resource agency consultation and implementation of the ETP will further protect forest-dwelling species.

MULE DEER

Implementation of Alternative 1 will not affect mule deer for the following reasons:

- Routine vegetation removal (i.e., hazard tree removal or fuels reduction) is limited to that necessary for safe and efficient operation of the MFP, safe recreation, or reduction of fire risk, and will not impact forested habitats outside the perimeter of Project facilities and features;
- Removal of forested habitats necessary for the construction or modification of new Project facilities and features or recreation facilities and features would be limited to the area necessary to complete the work, and would not affect surrounding forests. In addition, upon completion, these facilities would not impede the movement or reproduction of mule deer;
- Routine maintenance activities have been ongoing under existing conditions at important mule deer habitats in the vicinity of French Meadows Reservoir, Hell Hole Reservoir, and Middle Fork Interbay; and these activities will not change significantly under Alternative 1; and
- Annual resource agency consultation and implementation of the ETP will further protect mule deer.

3.6.4 Unavoidable Adverse Effects

There are no unavoidable adverse effects to botanical and wildlife resources under Alternative 1.

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TABLES

Table 3.6-1. Special-status Plant Species in the Vicinity of the MFP.

Scientific Name	Common Name	Federal Status	State Status	CNPS List	Blooming Period/Fertile	Habitat	Occurrence Notes
Special-status Plants Known to Occur Within the MFP during the Term of the New License							
<i>Clarkia biloba</i> ssp. <i>brandegeae</i>	Brandegee's clarkia	FSS ²	–	1B.2	May–July	Chaparral, cismontane woodland, often roadcuts. From 950 to 3,200 feet in elevation.	Known to occur in the vicinity of the MFP. Documented by CNDDDB in rocky, upland areas along the MFAR river canyon.
<i>Fritillaria eastwoodiae</i>	Butte County fritillary	FSS ²	–	3.2	March–May	Chaparral, cismontane woodland, lower montane coniferous forest (openings), wet and dry slopes red clay or sandy loam. From 100 to 5,000 feet in elevation.	Known to occur in the vicinity of the MFP. Documented by CNDDDB in rocky, upland areas along the MFAR.
<i>Lewisia serrata</i>	Saw-toothed lewisia	FSS3	–	1B.1	May–June	Broad-leaved upland forest, lower montane coniferous forest, and riparian forest on mesic steep, nearly vertical cliffs and inner gorges. From 2,800 to 4,800 feet in elevation.	Known to occur in the vicinity of the MFP. Documented by USDA-FS and CNDDDB in rocky, upland areas along Long Canyon Creek.
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	FSS ³	–	1B.2	June–July	Cismontane woodland and lower montane coniferous forest, and meadows and seeps. Found on dry, open rocky sites (bedrock outcrops, rubble, or talus) on ledges and moderate or steep slopes as well as inner gorges and near seeps on ENF and TNF. From 2,000 to 7,050 feet in elevation.	Known to occur in the vicinity of the MFP. A total of 63 populations (115 acres) were documented during the TERR 2 – Special-Status Plants surveys (PCWA 2011a) and subsequent surveys conducted in 2009 and 2011 in the vicinity of new or existing facilities to be added to the MFP. Known populations include: § Two small populations in the vicinity of Brushy Creek (approximately 200 individuals) § Four individuals in the vicinity of the Rubicon River at Ellicott Bridge § 1 individuals in the vicinity of French Meadows Reservoir § 58 populations in the vicinity of Hell Hole Reservoir (approximately 2.5 to 5.0 million individuals) Additional populations are documented by USDA-FS and CNDDDB in rocky, upland areas along the Rubicon River, Long Canyon Creek, and Duncan Creek.
Special-status Plants Potentially Occurring Within the MFP during the Term of the New License							
<i>Allium tribracteatum</i>	Three-bracted onion	FSS	–	1B.2	April–August	Chaparral, lower montane coniferous forest and upper montane coniferous forest. From 3,600 to 9,800 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Arctostaphylos nissenana</i>	Nissenan manzanita	FSS	–	1B.2	February–March	Open, rocky ridges and acidic shale and slate soils in chaparral and closed-cone coniferous forests. Found in almost pure colonies on hard shale substrate primarily where other shrubs and trees are absent. From 1,450 to 3,600 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Astragalus webberi</i>	Webber's milk-vetch	FSS	–	1B.2	May–July	Lower montane coniferous forest. From 2,400 to 3,700 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Campylopodiella stenocarpa</i>	Flagella-like atractylocarpus	–	–	2.2	N/A	Cismontane woodlands. From 300 to 1,600 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.

Table 3.6-1. Special-status Plant Species in the Vicinity of the MFP (continued).

Scientific Name	Common Name	Federal Status	State Status	CNPS List	Blooming Period/Fertile	Habitat	Occurrence Notes
Special-status Plants Potentially Occurring Within the MFP during the Term of the New License (continued)							
<i>Chlorogalum grandiflorum</i>	Red Hills soaproot	–	–	1B.2	May–June	Cismontane woodland, chaparral, and lower montane coniferous forests on serpentine or gabbro soils. From 850 to 3,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys. Several populations of Red Hills soaproot are documented by CNDDb in the vicinity of the MFP. These populations occur along PG&E powerline rights-of-way on the rocky ledge above the river canyon near Ralston Afterbay and near the confluence of the Rubicon River and Long Canyon Creek. These populations will not be affected by the Proposed Action (i.e., routine operation and maintenance of the MFP).
<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	Big-scale balsamroot	FSS	–	1B.2	March–June	Chaparral, cismontane woodland, valley and foothill grassland, and vernal moist meadows on sandstone, serpentine, or basalt outcrops. From 300 to 4,600 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Botrychium ascendens</i>	Upswept moonwort	FSS	–	2.3	Fertile July–August	Lower montane coniferous forests near streams, grassy fields, meadows and seeps. From 4,800 to 7,300 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys. However, this species may occur along Project streams and bypass reaches.
<i>Botrychium crenulatum</i>	Scalloped moonwort	FSS	–	2.2	Fertile June–July	Lower and upper montane coniferous forests, bogs, fens, and moist meadows. From 4,900 to 10,800 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Botrychium lunaria</i>	Common moonwort	FSS	–	2.3	August	Meadows and seeps, moist riparian areas, subalpine coniferous forest and upper montane coniferous forest. From 7,500 to 11,000 feet elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys. However, this species may occur along Project streams and bypass reaches.
<i>Botrychium minganense</i>	Mingan moonwort	FSS	–	2.2	July–September	Mesic areas in lower and upper montane coniferous forest, moist riparian areas, and meadows and seeps. From 4,000 to 6,700 feet in elevation	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys. However, this species may occur along Project streams and bypass reaches.
<i>Botrychium montanum</i>	Mountain moonwort (western goblin)	FSS	–	2.1	July–September	Lower and upper montane coniferous forests, and meadows and seeps. From 4,500 to 7,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Bruchia bolanderi</i>	Bolander’s bruchia	FSS	–	2.2	N/A	Lower and upper montane coniferous forest, meadows, seeps, and fens in damp soils. From 4,000 to 9,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Calochortus clavatus</i> var. <i>avius</i>	Pleasant Valley mariposa lily	FSS	–	1B.2	March–June	In openings, often south-facing slopes and ridgetops, of lower montane coniferous forests with Josephine silt loam and volcanic soils. From 1,000 to 6,300 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.

Table 3.6-1. Special-status Plant Species in the Vicinity of the MFP (continued).

Scientific Name	Common Name	Federal Status	State Status	CNPS List	Blooming Period/Fertile	Habitat	Occurrence Notes
Special-status Plants Potentially Occurring Within the MFP during the Term of the New License (continued)							
<i>Cypripedium fasciculatum</i>	Clustered lady's-slipper	FSS	–	4.2	March–August	Lower montane coniferous forest, serpentine seeps and streambanks. From 500 to 7,200 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys. However, this species may occur along Project streams and bypass reaches.
<i>Cypripedium montanum</i>	Mountain lady's-slipper	FSS	–	4.2	March–August	Broad-leaved upland and lower montane coniferous forests in moist areas or on dry shaded slopes with northern aspects and loam soils. From 600 to 7,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Epilobium howellii</i>	Subalpine fireweed	FSS	–	4.3	July–August	Mesic areas in subalpine coniferous forest, wet meadows, fens, and mossy seeps. From 6,000 to 9,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Epilobium oreganum</i>	Oregon fireweed		–	1B.2	June–September	Bogs, fens, meadows, small streams and ditches in lower and upper montane coniferous forests. From 1,600 to 8,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys. However, this species may occur along Project streams and bypass reaches.
<i>Erigeron miser</i>	Starved fleabane	FSS	–	1B.3	June–October	Upper montane coniferous forest, rocky soils. From 6,000 to 8,600 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Eriogonum tripodum</i>	Tripod buckwheat	FSS	–	4.2	May–July	Chaparral, cismontane woodlands, often on serpentine outcroppings. From 650 to 5,250 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Eriogonum umbellatum</i> var. <i>torreyanum</i>	Donner Pass buckwheat	FSS	–	1B.2	July–September	Upper montane coniferous forests, chaparral, and meadows. Volcanic and rocky soils. From 6,000 to 8,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Fissidens aphelotaxifolius</i>	Brook pocket-moss	FSS	–	2.2	N/A	Lower and upper montane coniferous forest, rock, stream channels and waterfalls. From 6,500 to 7,200 feet in elevation	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys. However, this species may occur along Project streams and bypass reaches.
<i>Helodium blandowii</i>	Blandow's bog-moss	FSS	–	2.3	N/A	Meadows, seeps, fens, and subalpine coniferous forest; damp soil. From 6,500 to 8,900 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Horkelia parryi</i>	Parry's horkelia	FSS	–	1B.2	April–June	Chaparral, cismontane woodland on stony, disturbed sites with slightly acidic soils. From 250 to 3,600 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Ivesia aperta</i> var. <i>aperta</i>	Sierra Valley mousetail	FSS	–	1B.2	June—September	Great Basin scrub, lower montane coniferous forest, meadows and seeps, pinyon and juniper woodland, vernal pools - vernal mesic, usually volcanic. From 4,500 to 7,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.

Table 3.6-1. Special-status Plant Species in the Vicinity of the MFP (continued).

Scientific Name	Common Name	Federal Status	State Status	CNPS List	Blooming Period/Fertile	Habitat	Occurrence Notes
Special-status Plants Potentially Occurring Within the MFP during the Term of the New License (continued)							
<i>Ivesia aperta</i> var. <i>canina</i>	Dog Valley mousetail	FSS	–	1B.1	June–August	Openings in lower montane coniferous forests and in meadows and seeps. Volcanic and rocky soils. From 4,500 to 7,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Ivesia sericoleuca</i>	Plumas mousetail	FSS	–	1B.2	May–September	Great Basin scrub, lower montane coniferous forest, meadows and seeps, and vernal pools. From 4,500 to 7,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Ivesia webberi</i>	Webber’s mousetail	FC FSS		1B.1	May–July	Great Basin scrub, lower montane coniferous forest, in sandy or gravelly soils. From 4,500 to 7,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Lewisia cantelovii</i>	Cantelow’s lewisia	FSS	–	1B.2	May–October	Broadleaf upland, chaparral, cismontane woodlands, and lower montane coniferous forests. From 1,000 to 4,500 feet in elevation	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Lewisia kelloggii</i> ssp. <i>Hutchisonii</i>	Hutchison’s lewisia (subspecies <i>hutchisonii</i>)	FSS	–	3.3	July–August	Decomposed granite and slate soils (volcanic soils), at the north sides of passes and ridge-tops from 5,200 to 7,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Lewisia kelloggii</i> ssp. <i>Kelloggii</i>	Hutchison’s lewisia (subspecies <i>kelloggii</i>)	FSS	–	–	July–August	Upper montane coniferous forest, rocky open ridges and granitic and volcanic balds. From 5,000 to 9,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Lupinus dalesiae</i>	Quincy lupine	FSS	–	4.2	May–August	Lower and upper montane coniferous forests. From 3,000 to 8,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Meesia triquetra</i>	Three-ranked hump moss	FSS	–	4.2	N/A	In acidic montane meadows. From 4,250 to 9,700 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Meesia uliginosa</i>	Broad-nerved hump moss	FSS	–	2.2	N/A	Bogs, fens, and rock fissures, upper montane and subalpine coniferous forests, meadows and seeps in damp soil. From 4,250 to 9,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Mielichhoferia elongata</i>	Elongate copper-moss	FSS		2.2	N/A	Cismontane woodland, rock with copper/heavy metals. From 1,500 and 4,250 feet in elevation	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Monardella folletti</i>	Follett’s mountainbalm	FSS	–	1B.2	June–September	Lower montane coniferous forests in rocky, serpentine soils. From 1,650 to 6,550 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.

Table 3.6-1. Special-status Plant Species in the Vicinity of the MFP (continued).

Scientific Name	Common Name	Federal Status	State Status	CNPS List	Blooming Period/Fertile	Habitat	Occurrence Notes
Special-status Plants Potentially Occurring Within the MFP during the Term of the New License (continued)							
<i>Navarretia prolifera</i> ssp. <i>lutea</i>	Yellow bur navarretia	FSS	–	4.3	May–July	Chaparral, cismontane woodland. Dry rocky flats, often on Ledmount soils. Often on lava caps or other openings, rocky ridgelines, saddles, and eroding ephemeral drainages. From 2,300 to 5,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Ophioglossum pusillum</i>	Northern adder's tongue	–	–	2.2	July	Margins of marshes and swamps and mesic areas of Valley and foothill grasslands. From 3,280 to 6,500 feet in elevation	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Packera layneae</i> (<i>Senecio layneae</i>)	Layne's ragwort	FT FSS	SR	1B.2	April–July	Chaparral and cismontane woodland on rocky, gabbroic, serpentine or ultramafic soils. From 650 to 3,400 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Peltigera hydrothyria</i> (<i>Hydrothyria venosa</i>)	Veined water lichen	FSS	–	–	N/A	Aquatic, in spring-fed streams with clear, cold water. From 1,150 to 7,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Penstemon personatus</i>	Close-throated beardtongue	FSS	–	1B.2	June–September	Chaparral and upper and lower montane coniferous forests. From 3,400 to 7,000 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Pyrrocoma lucida</i>	Sticky goldenweed	FSS	–	1B.2	July–October	Great Basin scrub, lower montane coniferous forest, and meadows and seeps. May grow in alkaline clays. From 2,250 to 6,250 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Rorippa subumbellata</i>	Tahoe yellow cress	FC	SE	1B.1	May–September	Lower montane coniferous forests, meadows and seeps, sandy (granitic) lake margins. From 6,050 to 6,250 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Scutellaria galericulata</i>	Marsh skullcap	–	–	2.2	June–September	Lower montane coniferous forest, marshes and swamps, meadows and seeps. From 0 to 6,900 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
<i>Tauschia howelli</i>	Howell's tauschia	FSS	–	1B.3	June–August	Subalpine /upper montane coniferous forest, granitic, gravelly soils. From 5,500 to 8,500 feet in elevation.	The MFP is within the known geographic and elevation range of this species. This species was not observed during the TERR 2 special-status plant surveys.
Special-status Plants Unlikely to Occur Within the MFP during the Term of the New License							
<i>Arabis rigidissima</i> var. <i>demota</i>	Trinity Mountain rockcress	FSS	–	1B.2	August	Broad-leaved upland forest, and upper montane coniferous forest in rocky soils. From 7,500 to 8,500 feet in elevation.	FERC Project boundaries are outside the known elevation range of this species.
<i>Draba asterophora</i> var. <i>asterophora</i>	Lake Tahoe draba	FSS	–	1B.2	July–August	Subalpine coniferous forest and alpine boulder and rock fields in the high Sierra Nevada. From 8,000 to 11,500 feet in elevation.	FERC Project boundaries are outside the known elevation range of this species.
<i>Draba asterophora</i> var. <i>macrocarpa</i>	Cup Lake draba	FSS	–	1B.1	July–August	Subalpine coniferous forests and rock crevices. From 8,000 to 9,000 feet in elevation.	FERC Project boundaries are outside the known elevation range of this species.

Table 3.6-1. Special-status Plant Species in the Vicinity of the MFP (continued).

Scientific Name	Common Name	Federal Status	State Status	CNPS List	Blooming Period/Fertile	Habitat	Occurrence Notes
Special-status Plants Unlikely to Occur Within the MFP during the Term of the New License (continued)							
<i>Lewisia longipetala</i>	Long-petaled lewisia	FSS	–	1B.3	July–August	Alpine boulder and rock fields and subalpine coniferous forests, crevices in granitic rock. From 8,000 to 9,600 feet in elevation.	FERC Project boundaries are outside the known elevation range of this species.
<i>Lomatium stebbinsii</i>	Stebbins’ lomatium	–	–	1B.1	March–May	Chaparral, lower montane coniferous forests, and yellow pine forests. Volcanic or gravelly soils. From 3,750 to 5,850 feet in elevation.	FERC Project boundaries are outside the known geographic range of this species. Known from the Stanislaus National Forest, per S. Durham (ENF botanist).
<i>Sphaeralcea munroana</i>	Munroe’s desert mallow	–	–	2.2	May–June	Great Basin scrub, about 6,000 feet in elevation.	No appropriate habitat within FERC Project boundaries. Known only from Squaw Creek in Placer County only, to the north of the watershed.

LEGEND:

Federal Status

FT = Federal Threatened

FE = Federal Endangered

FC = Federal Candidate

FSS = Forest Service Sensitive

State Status

SR = listed by California as Rare

ST = California Threatened

SE = California Endangered

CNPS Status (California Native Plant Society)

1B = rare, threatened or endangered in California and elsewhere.

2 = rare in California but more common elsewhere.

3 = need more information

4 = plants of limited distribution; a watch list.

_1 = Seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat)

_2 = Fairly endangered in California (20-80% occurrences threatened)

_3 = Not very endangered in California (<20% of occurrences threatened or no current threats known)

Table 3.6-2. Stebbins' Phacelia in the Vicinity of the MFP.

Scientific Name	Common Name	Polygon Identification Number ¹	Area ²		Number of Individuals (estimated) ³
			Square Feet	Acres	
Brushy Canyon Area (2 populations)					
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	BC01	11,236	0.26	150
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	BC02	26,703	0.61	40
Ellicott Bridge Area (2 populations)					
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	EB01	0.00	0.00	3
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	EB02	0.00	0.00	1
French Meadows Area (1 population)					
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	FM01	0.00	0.00	1
Hell Hole Area (58 populations)					
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH01	25	0.00	2
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH02	250	0.00	5
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH03	600	0.012	25
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH04	4	0.00	5
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH05	25	0.00	5
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH06	50	0.00	5
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH07	35,038	0.80	17,500–35,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH08	65,082	1.5	33,000–65,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH09	126,886	2.9	63,000–127,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH10	304,335	7.0	152,000–304,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH14	93,831	2.2	47,000–94,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH15	49,849	1.1	25,000–50,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH17	3,902	0.09	2,000–4,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH18	1,813	0.04	1,000–2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH19	21,313	0.49	11,000–21,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH21	14,375	0.33	7,000–14,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH22	62,334	1.4	31,000–62,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH23	23,824	0.55	12,000–24,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH24	244,131	5.6	122,000–244,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH25	19,457	0.45	10,000–19,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH26	71,357	1.6	36,000–71,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH27	93,382	2.1	47,000–93,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH28	167,013	3.8	83,000–167,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH29	423,790	9.7	212,000–424,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH30	358,404	8.2	179,000–358,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH31	246,920	5.7	123,000–247,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH32	82,348	1.9	41,000–82,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH33	50,889	1.2	25,000–51,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH34	399,123	9.2	200,000–399,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH35	439,293	10	220,000–439,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH36	11,224	0.26	6,000–11,000

Table 3.6-2. Stebbins' Phacelia in the Vicinity of the MFP (continued).

Scientific Name	Common Name	Polygon Identification Number ¹	Area ²		Number of Individuals (estimated) ³
			Square Feet	Acres	
Hell Hole Area (continued)					
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH37	1,413	0.03	500–1,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH38	160,315	3.7	80,000–160,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH39	17,919	0.41	9,000–18,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH40	27,979	0.64	14,000–28,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH41	891,483	20	446,000–891,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH42	36,557	0.84	18,000–37,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH43	17,561	0.40	9,000–18,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH44	89,308	2.1	45,000–89,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH45	48,850	1.1	24,000–49,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH46	36,949	0.85	18,000–37,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH47	95,286	2.2	48,000–95,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH48	36,085	0.8	18,000–36,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH49	16,235	0.4	8,000–16,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH50	60,985	1.4	30,000–60,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH51	7,348	0.17	4,000–7,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH52	11,585	0.27	6,000–12,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH53	79	0.00	50
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH54	266	0.01	100
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH55	9	0.00	150
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH56	280	0.01	150
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH57	56	0.00	100
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH58	45	0.00	100
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH59	8	0.00	100
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH60	1634	0.04	500
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH61	6140	0.14	1000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH62	1879	0.04	600
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH63	958	0.02	300
Totals:		63	5,016,018	115	2,486,392–4,964,392

¹Refer to PCWA 2011a, Maps TERR 2-2a-e for the location of each population within the study area. Only those populations associated with Project facilities and features are included.

²If the population extended beyond the survey area, the entire extent of the population is included.

³Number of individuals for polygons HH7 through HH52 was estimated by acreage, assuming a density of 0.5 to 1.0 individuals per square foot. Numbers are rounded to the nearest thousand. Numbers of populations for other polygons were determined in the field.

Table 3.6-3. Location of Stebbin's Phacelia Populations in the Vicinity of Hell Hole Reservoir.**Area 1**

Includes those portions of special-status plant populations occurring at or below the current maximum normal operating WSE of 4,630 feet msl down to approximately 4,605 feet msl

Species		Population Number ¹	Area ²		Number of Individuals ³
Scientific Name	Common Name		Square Feet	Acres	
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH39	17,910	0.41	9,000 – 18,000
Total:			17,910	0.41	9,000 – 18,000

Area 2a

Includes those portions of special-status plant populations occurring from the maximum normal operating WSE (4,630 feet msl) to 4,636 feet msl

Species		Population Number ¹	Area ²		Number of Individuals ³
Scientific Name	Common Name		Square Feet	Acres	
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH08	17	–	8 – 17
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH10	3,404	0.08	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH15	393	0.01	200 – 400
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH19	737	0.02	350 – 700
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH21	922	0.02	450 – 900
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH22	1,921	0.04	1,000 – 2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH23	356	0.01	200 – 400
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH24	9,139	0.21	4,500 – 9,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH25	9,476	0.22	4,500 – 9,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH26	1,780	0.04	1,000 – 2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH27	208	0.00	100 – 200
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH28	2,630	0.06	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH29	70	–	35 – 70
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH30	3,117	0.07	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH31	3,257	0.07	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH32	3,708	0.09	2,000 – 4,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH33	441	0.01	200 – 400
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH34	150	–	100 – 200
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH35	788	0.02	400 – 800
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH36	4,822	0.11	2,500 – 5,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH37	1,129	0.03	500 – 1,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH38	2,049	0.05	1,000 – 2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH39	9	–	4 – 9
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH40	412	0.01	200 – 400
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH41	3,574	0.08	2,000 – 4,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH42	13,417	0.31	6,500 – 13,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH43	5,275	0.12	2,500 – 5,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH45	10,251	0.24	5,000 – 10,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH46	14,225	0.33	7,000 – 14,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH47	10,049	0.23	5,000 – 10,000
Total:			107,727	2.0	53,000 – 106,000

Table 3.6-3. Location of Stebbin's Phacelia Populations in the Vicinity of Hell Hole Reservoir (continued).**Area 2b**

Includes those portions of special-status plant populations occurring from
4,636 feet msl to the maximum flood pool elevation at 4,640 feet msl

Species		Population Number ¹	Area ²		Number of Individuals ³
Scientific Name	Common Name		Square Feet	Acres	
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH08	4,909	0.11	2,500 – 5,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH10	8,552	0.20	4,500 – 9,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH15	4,878	0.11	2,500 – 5,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH19	4,206	0.10	2,000 – 4,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH21	3,723	0.09	2,000 – 4,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH22	6,264	0.14	3,000 – 6,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH23	4,012	0.09	2,000 – 4,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH24	26,984	0.62	13,500 – 27,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH25	9,972	0.23	5,000 – 10,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH26	9,967	0.23	5,000 – 10,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH27	6,002	0.14	3,000 – 6,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH28	3,737	0.09	2,000 – 4,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH29	1,081	0.02	500 – 1,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH30	12,509	0.29	6,500 – 13,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH31	6,734	0.15	3,500 – 7,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH32	8,806	0.20	4,500 – 9,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH33	2,924	0.07	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH34	3,265	0.07	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH35	3,690	0.08	18,500 – 37,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH36	2,943	0.07	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH37	279	0.01	150 – 300
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH38	1,829	0.04	1,000 – 2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH40	1,576	0.04	1,000 – 2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH41	11,247	0.26	5,500 – 11,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH42	9,671	0.22	5,000 – 10,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH43	5,816	0.13	3,000 – 6,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH45	9,872	0.23	5,000 – 10,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH46	10,567	0.24	5,500 – 11,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH47	12,272	0.28	6,000 – 12,000
Total:			198,290	5.0	117,000 – 234,000

Table 3.6-3. Location of Stebbin's Phacelia Populations in the Vicinity of Hell Hole Reservoir (continued).**Area 3**

Includes those portions of special-status plant populations occurring from the maximum flood pool elevation (4,640 feet msl) to the upper limit of the study area

Species		Population Number ¹	Area ²		Number of Individuals ³
Scientific Name	Common Name		Square Feet	Acres	
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH08	60,155	1.38	30,000 – 60,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH10	157,092	3.61	78,500 – 157,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH15	36,009	0.83	18,000 – 36,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH19	16,370	0.38	8,000 – 16,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH21	9,693	0.22	5,000 – 10,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH22	53,958	1.24	27,000 – 54,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH23	19,372	0.44	9,500 – 19,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH24	133,628	3.07	67,000 – 134,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH25	9	0.00	5 – 9
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH26	58,783	1.35	29,500 – 59,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH27	86,712	1.99	43,500 – 87,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH28	81,216	1.86	40,500 – 81,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH29	104,403	2.40	52,000 – 104,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH30	157,382	3.61	78,500 – 157,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH31	184,850	4.24	92,500 – 185,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH32	64,727	1.49	32,500 – 65,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH33	45,630	1.05	23,000 – 46,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH34	206,916	4.75	103,500 – 207,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH35	135,118	3.10	67,500 – 135,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH36	3,388	0.08	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH38	37,041	0.85	18,500 – 37,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH40	25,917	0.59	13,000 – 26,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH41	169,159	3.88	84,500 – 169,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH42	13,468	0.31	6,500 – 13,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH43	6,470	0.15	3,000 – 6,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH44	7,269	0.17	3,500 – 7,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH45	25,295	0.58	12,500 – 25,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH46	12,157	0.28	6,000 – 12,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH47	67,556	1.55	34,000 – 68,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH51	5,672	0.13	2,800 – 5,600
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH52	8,848	0.20	4,500 – 9,000
Total:			1,994,262	45.78	997,000 – 1,994,000

Table 3.6-3. Location of Stebbins' Phacelia Populations in the Vicinity of Hell Hole Reservoir (continued).**Area 4**

Includes those portions of the special-status plant populations intersecting Areas 1, 2, and/or 3 that extend beyond Area 3.

Species		Population Number ¹	Area ²		Number of Individuals ³
Scientific Name	Common Name		Square Feet	Acres	
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH10	135,286	3.1	67,500 – 135,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH15	8,569	0.2	4,500 – 9,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH21	37	0.00	18 – 37
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH22	191	0.00	95 – 191
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH24	74,379	1.71	37,000 – 74,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH23	84	0.00	42 – 84
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH26	826	0.02	413 – 826
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH27	460	0.01	230 – 460
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH28	79,429	1.82	40,000 – 80,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH29	318,235	7.31	159,000 – 318,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH41	707,499	16.24	354,000 – 707,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH40	74	0.00	37 – 74
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH30	185,394	4.26	92,500 – 185,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH31	52,078	1.20	26,000 – 52,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH32	5,108	0.12	2,500 – 5,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH33	1,895	0.04	1,000 – 2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH35	299,696	6.88	150,000 – 300,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH34	188,789	4.33	94,000 – 188,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH38	119,396	2.74	59,500 – 119,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH44	82,039	1.88	41,000 – 82,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH45	3,432	0.08	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH47	5,409	0.12	2,500 – 5,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH48	36,085	0.8	18,000 – 36,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH49	16,235	0.4	8,000 – 16,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH50	60,985	1.4	30,000 – 60,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH51	1,676	0.04	1,000 – 2,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH52	2,737	0.06	1,500 – 3,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH59	8	0.00	100
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH60	1634	0.04	500
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH61	6140	0.14	1,000
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH62	1879	0.04	600
<i>Phacelia stebbinsii</i>	Stebbins' phacelia	HH63	958	0.02	300
Total:			2,396,642	55	1,194,335–2,385,172

¹Refer to Maps 7.6-1d-e (PCWA 2011c) for the location of each population within the study area. Only those populations associated with Project facilities and features are included.

²Includes only the portion of the population that falls between the specified elevations.

³Numbers of individuals for polygons HH8 through HH52 were estimated by acreage assuming a density of 0.5 to 1.0 individuals per square foot. Numbers are rounded to the nearest thousand. Numbers of individuals in all other polygons were determined in the field.

Table 3.6-4. Comparison of the Frequency and Duration of Inundation of Hell Hole Reservoir Areas 2a and 2b at Various Reservoir Elevation Levels.

Alternatives	Water Year Type	Number of Years	Minimum Number of Day	Maximum Number of Day	Average Number of Days
Proposed Action Existing Demand	Wet (n=10)	7	25	79	49
	Above Normal (n=6)	2	31	39	35
	Below Normal (n=6)	4	7	19	14
	Dry (n=5)	0	0	0	0
	Critical ³ (n=6)	0	0	0	0
Proposed Action Future Demand	Wet (n=10)	7	25	79	48
	Above Normal (n=6)	2	31	39	35
	Below Normal (n=6)	3	7	18	14
	Dry (n=5)	0	0	0	0
	Critical ³ (n=6)	0	0	0	0
No-Action Alternative Existing License Conditions	Wet (n=10)	7	27	72	43
	Above Normal (n=6)	3	5	27	14
	Below Normal (n=6)	1	7	7	7
	Dry (n=5)	0	0	0	0
	Critical ³ (n=6)	0	0	0	0

Inundation Frequency and Duration of Area 2b².

Alternatives	Water Year Type	Number of Years	Minimum Number of Day	Maximum Number of Day	Average Number of Days
Proposed Action Existing Demand	Wet (n=10)	6	5	37	22
	Above Normal (n=6)	1	15	15	15
	Below Normal (n=6)	0	0	0	0
	Dry (n=5)	0	0	0	0
	Critical ³ (n=6)	0	0	0	0
Proposed Action Future Demand	Wet (n=10)	6	5	37	21
	Above Normal (n=6)	1	15	15	15
	Below Normal (n=6)	0	0	0	0
	Dry (n=5)	0	0	0	0
	Critical ³ (n=6)	0	0	0	0
No-Action Alternative Existing License Conditions	Wet (n=10)	0	0	0	0
	Above Normal (n=6)	0	0	0	0
	Below Normal (n=6)	0	0	0	0
	Dry (n=5)	0	0	0	0
	Critical ³ (n=6)	0	0	0	0

¹Area 2a: 4,630-4,636 ft msl.²Area 2b: 4,636-4,640 ft msl.³Includes 1977 extreme critical year.

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Project Recreation Facilities and Features.

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Dams, Reservoirs, and Diversion Pools									
Large Dams									
French Meadows Dam and Outlet Works (modified)									
Hell Hole Dam and Outlet Works (modified)									
Medium Dams									
Middle Fork Interbay Dam and Outlet Works (modified)									
Ralston Afterbay Dam and Outlet Works									
Small Dams									
Duncan Creek Diversion Dam (modified)							X	X	
North Fork Long Canyon Diversion Dam (modified)									
South Fork Long Canyon Diversion Dam (modified)						X		X	
Large Reservoirs									
French Meadows Reservoir			X						
Hell Hole Reservoir	X	X	X						
Medium Reservoirs									
Middle Fork Interbay									
Ralston Afterbay									
Small Diversion Pools									
Duncan Creek Diversion Pool (modified)								X	
North Fork Long Canyon Diversion Pool (modified)									
South Fork Long Canyon Diversion Pool (modified)						X		X	

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Water Conveyance Systems									
Tunnels									
Duncan Creek - Middle Fork Tunnel									
French Meadows - Hell Hole Tunnel									
Hell Hole - Middle Fork Tunnel									
Middle Fork - Ralston Tunnel									
Ralston – Oxbow Tunnel									
Diversion Pipes and Drop Inlets									
North Fork Long Canyon Diversion Pipe and Drop Inlet						X			
South Fork Long Canyon Diversion Pipe and Drop Inlet						X		X	
Surge Shafts and Adits									
Brushy Canyon Adit						X		X	
Hell Hole - Middle Fork Tunnel Surge Shaft and Tank						X			
Middle Fork - Ralston Tunnel Surge Shaft and Tank									
Removable Sections and Portals									
Duncan Creek - Middle Fork Tunnel Portal			X						
French Meadows - Hell Hole Tunnel Removable Section									
Hell Hole - Middle Fork Tunnel Removable Section									
Middle Fork - Ralston Tunnel Removable Section									
North Fork Long Canyon Crossing Removable Section									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Water Conveyance Systems (continued)									
Intakes and Gatehouses									
Duncan Creek - Middle Fork Tunnel Intake							X	X	
French Meadows - Hell Hole Tunnel Gatehouse			X						
French Meadows - Hell Hole Tunnel Intake									
Hell Hole - Middle Fork Tunnel Gatehouse									X
Hell Hole - Middle Fork Tunnel Intake									
Middle Fork - Ralston Tunnel Intake and Gatehouse									
Ralston - Oxbow Tunnel Intake									
Penstocks and Valve Houses									
French Meadows Powerhouse Penstock and Butterfly Valve House									
Middle Fork Powerhouse Penstock and Butterfly Valve House									
Ralston Powerhouse Penstock and Butterfly Valve House									
Powerhouses, Switchyards, and Substations									
French Meadows Powerhouse and Switchyard									
Hell Hole Powerhouse									
Hell Hole Substation									
Middle Fork Powerhouse and Upper and Lower Switchyards									
Ralston Powerhouse and Switchyard									
Oxbow Powerhouse and Switchyard									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Gaging Stations and Weirs									
Stream Gages and Weirs									
Duncan Creek near French Meadows (USGS Gage No. 11427700) (interim)							X	X	
Duncan Creek below Diversion Dam (USGS Gage No. 11427750)							X		
Middle Fork American River at French Meadows (USGS Gage No. 11427500)									
Middle Fork American River at French Meadows Dam (new)									
Rubicon River at Hell Hole Dam Spillway (HHDS) (new)									
Rubicon River below Hell Hole Dam (USGS Gage No. 11428800) (interim)									
Rubicon River at Hell Hole Dam (new)									
North Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433085) (interim)									
North Fork Long Canyon Creek below Diversion Dam (NFLCC) (new)									
South Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433065) (interim)						X		X	
South Fork Long Canyon Creek below Diversion Dam (SFLCC) (new)						X	X	X	
Middle Fork American River below Interbay Dam (USGS Gage No. 11427770) (interim)									
Middle Fork American River above Middle Fork Powerhouse (USGS Gage No. 11427760)									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Gaging Stations and Weirs (continued)									
Stream Gages and Weirs (continued)									
Middle Fork American River below Interbay Dam (MFARIB) (new)									
Middle Fork American River near Foresthill (USGS Gage No. 11433300)									
Middle Fork American River at Ralston Afterbay Dam (new)									
Rubicon River above Ralston Powerhouse (RRRP) (existing, added to MFP)									
North Fork American River above American River Pump Station (NFARPS) (new)									
Rubicon River above Ellicott Bridge (RREB) (existing, added to MFP)									
Diversion Gages									
Duncan Creek Diversion Tunnel (DCDT) (new)							X	X	
North Fork Long Canyon Creek Diversion Tunnel (USGS Gage No. 11433080) (modified)									
South Fork Long Canyon Creek Diversion Tunnel (USGS Gage No. 11433060) (modified)						X		X	
Reservoir Gages									
French Meadows Reservoir (USGS Gage No. 11427400)									
French Meadows Reservoir Staff Gage									
Hell Hole Reservoir (USGS Gage No. 11428700)									
Hell Hole Reservoir Staff Gage									
Middle Fork Interbay Reservoir									
Ralston Afterbay Reservoir									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Gaging Stations and Weirs (continued)									
Powerhouse Gages									
French Meadows Powerhouse (USGS Gage No. 11427200)									
Middle Fork Powerhouse (USGS Gage No. 11428600)									
Ralston Powerhouse (USGS Gage No. 11427765)									
Oxbow Powerhouse (USGS Gage No. 11433212)									
Oxbow Powerhouse Penstock (OXBPP) (new)									
Leakage Weirs									
French Meadows Dam Leakage Weirs Nos. 1–6									
Hell Hole Dam Leakage Weir									
Project Communication Lines and Powerlines									
French Meadows Area									
French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline									
French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline									
Hell Hole Area									
French Meadows Powerhouse to French Meadows Powerhouse Penstock and Butterfly Valve House Communication Line/Powerline									
French Meadows Powerhouse and Switchyard to Hell Hole - Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator's Cottages, and Hell Hole Powerhouse Communication Line/Powerline									X
Dormitory and Cottages Water Supply Tank Powerline									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Project Communication Lines and Powerlines (continued)									
Hell Hole Area (continued)									
Hell Hole Powerhouse to Rubicon River Gage below Hell Hole Dam Communication Line/Powerline									
Hell Hole Dam Spillway Crest Gates Control Building Communication Line/Powerline (new)									
Middle Fork Interbay Area									
Middle Fork Powerhouse to Middle Fork Powerhouse Butterfly Valve House Communication Line/Powerline									
Middle Fork Powerhouse Butterfly Valve House to Radio Repeater near Hell Hole - Middle Fork Tunnel Surge Tank (underground) Communication Line/Powerline						X			
Middle Fork Powerhouse to Middle Fork - Ralston Tunnel Intake and Gatehouse Communication Line/Powerline									
Middle Fork Powerhouse to Middle Fork American River Gage above Middle Fork Powerhouse Communication Line/Powerline							X		
Ralston – Oxbow Area									
Ralston - Oxbow Tunnel Intake to Ralston Powerhouse Communication Line									
Ralston Powerhouse to Ralston Powerhouse Butterfly Valve House Communication Line/Powerline									
Ralston Afterbay Dam Generator Building to Ralston - Oxbow Tunnel Intake Communication Line/Powerline									
Oxbow Powerhouse to Ralston Afterbay Dam Generator Building Communication Line/Powerline									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Photovoltaic Poles and Powerlines									
Photovoltaic Poles and Powerline at Duncan Creek Gage near French Meadows							X	X	
Photovoltaic Pole and Powerline at Duncan Creek Gage below Diversion Dam							X		
Photovoltaic Pole and Powerline at Duncan Creek Gage at Diversion Tunnel (new)							X	X	
Photovoltaic Pole and Powerline at Middle Fork American River Gage at French Meadows									
Photovoltaic Pole and Powerline at Middle Fork American River Gage above Middle Fork Powerhouse									
Photovoltaic Pole and Powerline at Middle Fork American River Gage below Interbay Dam (new)									
Photovoltaic Pole and Powerline at North Fork Long Canyon Creek Gage below Diversion Dam									
Photovoltaic Pole and Powerline at North Fork Long Canyon Creek Gage below Diversion Dam (new)									
Photovoltaic Pole and Powerline at South Fork Long Canyon Creek Gage below Diversion Dam						X		X	
Photovoltaic Pole and Powerline at South Fork Long Canyon Creek Gage below Diversion Dam (new)						X	X	X	
Photovoltaic Pole and Powerline at Rubicon River Gage above Ralston Powerhouse (existing, added to MFP)									
Photovoltaic Pole and Powerline at Middle Fork American River Gage near Foresthill									
Photovoltaic Pole and Powerline at North Fork American River Gage above American River Pump Station (new)									
Photovoltaic Pole and Powerline at Rubicon River Gage above Ellicott Bridge (existing, added to MFP)									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Microwave Reflectors and Radio Towers									
Passive Microwave Reflector Station above Middle Fork Interbay									
Radio Communications Tower near French Meadows - Hell Hole Tunnel Gatehouse			X						
Radio Communications Tower and Repeater near Hell Hole - Middle Fork Tunnel Surge Shaft and Tank						X			
Passive Microwave Reflector Station above Ralston Afterbay									
Disposal Areas									
Duncan Diversion Dam Sediment Disposal Area							X	X	
North Fork Long Canyon Crossing Sediment Disposal Area						X			
Middle Fork Interbay Sediment Disposal Area									
Ralston Ridge Sediment Disposal Area									
Sediment Augmentation Areas									
Middle Fork Interbay Augmentation Areas (new)									
Junction Bar Augmentation Area (new)									
Indian Bar Augmentation Area (existing, added to MFP)									
Ancillary Facilities									
French Meadows Dam Generator Building									
French Meadows Dam Staging Area									
Dormitory Facility									
Dormitory and Cottages Water Supply Tank									
Hell Hole Staging Areas									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Ancillary Facilities (continued)									
Operator Cottages and Shop									
Hell Hole Dam Spillway Crest Gates Control Building (new)									
Ralston Afterbay Dam Generator Building									
Storage Building at Middle Fork - Ralston Tunnel Surge Shaft and Tank									
Ralston Afterbay Sediment Removal Access Point (converted)									
Project Fences									
Slope Fences									
French Meadows Powerhouse Penstock Rock Fence									
French Meadows Powerhouse Slope Fence									
Long Canyon Crossing Slope Fence									
Middle Fork Powerhouse Upper Switchyard Slope Fence									
Middle Fork Interbay Dam Slope Fence									
Ralston Powerhouse Penstock and Butterfly Valve House Slope Fences									
Ralston Powerhouse Slope Fence									
Oxbow Powerhouse Slope Fence									
Public Safety Fences									
Dormitory Facility Barrier Fence									
Hell Hole Dam General Parking Area Barrier Fence									
North Fork Long Canyon Crossing Removable Section Barrier Fence									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Project Roads									
Duncan Creek Area									
Duncan Creek Diversion Intake Road							X	X	
Duncan Creek Diversion Dam Road							X	X	
Duncan Creek Diversion Pool Road							X	X	
French Meadows Area									
Duncan Creek - Middle Fork Tunnel Portal Road			X						
French Meadows - Hell Hole Tunnel Gatehouse Road			X				X		
French Meadows Dam Outlet Works and South Leakage Weir Road									
French Meadows Dam Staging Area and Spillway West Access Road									
French Meadows Spillway East Access Road									
French Meadows Dam North Leakage Weir Road									
French Meadows Campground Water Supply Facility Access Road							X		
Hell Hole Area									
Hell Hole Dam and Powerhouse Road									
Rubicon River Gage below Hell Hole Dam Road									
Hell Hole Dam Leakage Weir Road									
Hell Hole Dam Spillway Northern Access Point Road									
French Meadows - Hell Hole Tunnel Portal Road									X
French Meadows Powerhouse Road			X						X
Hell Hole - Middle Fork Tunnel Gatehouse Road									X
Dormitory Facility Road									

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Project Roads (continued)									
Hell Hole Area (continued)									
Operator Cottages and Shop Road									
Spur on North Side of Operator Cottages									
Spur on South Side of Operator Cottages									
Hell Hole Dam Spillway Discharge Channel Road Spur to Communication Line/Powerline									
Hell Hole Dam Spillway Discharge Channel Road									
Big Meadows Campground Water Supply Facility Access Road									
Hell Hole Dam Spillway Gates Road (new)									
Long Canyon Area									
North Fork Long Canyon Diversion North Road									
North Fork Long Canyon Diversion South Road									
North Fork Long Canyon Diversion Drop Inlet Road									
South Fork Long Canyon Diversion and Drop Inlet Road						X	X	X	
South Fork Long Canyon Diversion and Drop Inlet Cutoff Road						X	X	X	
South Fork Long Canyon Diversion Drop Inlet Access Road						X	X	X	
North Fork Long Canyon Crossing Removable Section North Road									
North Fork Long Canyon Crossing Removable Section South Road									
Middle Meadows Group Campground Water Supply Facility Access Road						X	X	X	

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Project Roads (continued)									
Middle Fork Interbay Area									
Middle Fork Interbay Dam Road				X			X		
Middle Fork Interbay Dam to Powerhouse Road									
Middle Fork Powerhouse Butterfly Valve House Road									X
Middle Fork Powerhouse Penstock and Butterfly Valve House Road							X		
Middle Fork Powerhouse Upper Switchyard Road									
Ralston-Oxbow Area									
Brushy Canyon Adit Road						X			
Ralston Powerhouse Butterfly Valve House Road									
Ralston Afterbay Dam and Access Road									
Indian Bar Access Road									
Oxbow Powerhouse Road									
Ralston - Oxbow Tunnel Intake Road									
Ralston Afterbay Private Boat Ramp Road									
Ralston Afterbay Dam and Access Point Road									
Project Trails									
Duncan Creek Area									
Duncan Creek Diversion Dam North Trail							X	X	
Duncan Creek Diversion Dam South Trail								X	
Photovoltaic Poles and Powerline to Duncan Creek Gage near French Meadows Trail							X	X	

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Project Trails (continued)									
Duncan Creek Area (continued)									
Duncan Creek Gage near French Meadows Trail							X	X	
Duncan Creek Gage below Diversion Dam Trail							X		
Long Canyon Area									
North Fork Long Canyon Creek Gage below Diversion Dam Trail (new)									
South Fork Long Canyon Creek Gage below Diversion Dam Trail (new)						X	X	X	
Middle Fork Interbay Area									
Middle Fork American River Gage above Middle Fork Powerhouse Trail							X		
Passive Microwave Reflector Station above Middle Fork Interbay Trail									
Middle Fork American River Gage below Interbay Dam Trail (new)									
Ralston Afterbay Area									
Passive Microwave Reflector Station above Ralston Afterbay Trail									
Rubicon River Gage above Ralston Powerhouse Trail (existing, added to MFP)									
North Fork American River Gage above American River Pump Station Trail (new)									
Project Recreation Facilities and Features									
Duncan Creek Area									
Duncan Creek Diversion Primitive Recreation Site (new)							X	X	
French Meadows Area									
Ahart Campground (reduce, enhance)									X
Coyote Group Campground (enhance)									X
Poppy Campground (reduce, enhance)						X	X		X
French Meadows Campground (reduce, enhance)									X

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Project Recreation Facilities and Features (continued)									
French Meadows Area (continued)									
Gates Group Campground (enhance)									X
Lewis Campground (reduce, enhance)								X	X
French Meadows Picnic Area (reduce, enhance)									
French Meadows Boat Ramp (enhance)									
French Meadows RV Dump Station (enhance)						X			X
McGuire Picnic Area and Beach (converted)									
McGuire Group Campground (new)									X
McGuire Boat Ramp and Associated Parking (modified)									X
Poppy Trail (existing, added to MFP)						X	X		X
French Meadows Reservoir Trail (new)			X		X	X	X	X	X
Hell Hole Area									
Big Meadows Campground (enhance)						X			X
Hell Hole Campground (enhance, potentially convert, potentially reduce)									X
Upper Hell Hole Campground (removed)									
Hell Hole Vista (enhance)									X
Hell Hole Boat Ramp (enhance)									
Hell Hole General Parking Area and Hell Hole Boat Ramp Parking Area (enhance)									
Ellicott Bridge Parking Area (new)									
Hell Hole Reservoir Trail (existing, added to MFP)	X	X	X						

Table 3.6-5. Raptor Nests and Roosts and USDA-FS Land Allocations and Important Habitat in Relation to Project Facilities and Features and Recreation Facilities and Features (continued).

Project Facilities and Features	Raptor Nests and Roosts					USDA-FS Land Allocations and Important Habitats			
	Bald Eagle Nest ¹	Bald Eagle Night Roost ¹	Osprey Nest ²	CSO Nest ³	NOGO Nest ³	CSO PAC ⁴	CSO HRCA ⁵	NOGO PAC ⁴	Important Mule Deer Habitat ⁶
Project Recreation Facilities and Features (continued)									
Long Canyon Area									
Middle Meadows Group Campground						X	X	X	
Ralston Afterbay Area									
Ralston Picnic Area (reduce, enhance)									
Ralston Afterbay Sediment Removal Access Point Boat Ramp (new)									
Indian Bar Rafting Access (enhance)									
Middle Fork American River above Ralston Afterbay Access Trail (existing, added to MFP)									
Project Recreation Facility Water Supplies									
French Meadows North Shore Water Supply (Dolly Creek Water Supply) (replace)						X		X	X
French Meadows South Shore Water Supply (French Meadows Campground Water Supply) (replace)							X		X
Big Meadows Campground Water Supply						X			X
Middle Meadows Group Campground Water Supply						X	X	X	

¹Within ¼ mile of bald eagle nests or night roosts.²Within 500 feet of osprey nests.³Within 500 feet of a California spotted owl or northern goshawk nest.⁴Within an established California spotted owl or northern goshawk protected activity center (PAC).⁵Within an established California spotted owl home range core area (HRCA).⁶Within a mule deer important habitat (fawning area, holding areas, and winter and summer critical ranges).

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3.7 GEOMORPHOLOGY ENVIRONMENTAL EFFECTS

This section describes potential impacts to channel geomorphology (sediment supply, channel geometry/sediment conditions, and large woody debris) and reservoir and diversion pool shoreline erosion (water surface elevation [WSE] fluctuations) under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facility Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to geomorphology have been evaluated based on changes in Project operations; changes in Project maintenance activities, modification of existing Project facilities; and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include: routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing Project recreation facilities; maintenance activities at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section.

Potential impacts on channel geomorphology include the accumulation of fine sediments in gravels and pools and channel aggradation. Potential impacts also include shoreline erosion in diversion pools and reservoirs. Impacts to geomorphology are evaluated as follows:

- Potential impacts of changes in Project operations, Project maintenance activities, modification of existing Project facilities, and construction of new Project facilities on channel geomorphology in the bypass and peaking reaches, including:
 - Sediment supply;
 - Channel geometry and sediment conditions; and
 - Large woody debris supply and transport.
- Potential impacts of changes in Project operations, modification of existing Project facilities, and construction of new Project facilities on reservoir and diversion pool shoreline erosion.

Potential impacts to geology and soils, including soil erosion, topography, and soil contamination from changes in Project maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features are provided in Section 3.2 – Geology and Soils. Potential impacts to surface water quality from erosion and sedimentation that may result from changes in Project maintenance, modification of existing Project facilities, and

construction of new Project facilities and Project recreation facilities and features are provided in Section 3.4 – Water Quality.

A description of potential impacts to geomorphology resources resulting from implementation of Alternative 1, considering AP and enhancement measures along the bypass and peaking reaches and reservoir and diversion pool shorelines, is provided below. This section is organized according to resulting effects on geomorphology resources from implementation of Alternative 1. There are no unavoidable adverse effects to channel geomorphology (sediment supply, channel geometry/sediment conditions, and large woody debris) and reservoir and diversion pool shoreline erosion, resulting from implementation of Alternative 1 as discussed at the end of this section.

3.7.1 Channel Geomorphology

Alternative 1 specifies changes in Project operations, Project maintenance activities, modification of existing Project facilities, and construction of new Project facilities that potentially affect sediment supply to the small bypass streams downstream of the diversions and the river reaches downstream of the medium dams (PCWA 2011a). Alternative 1 also specifies new instream flows, including environmental pulse flows, that potentially affect channel geometry and sediment conditions in the bypass and peaking reaches (refer to resource agencies instream flow and reservoir minimum pool conditions [USDA-FS 2011; CDFG 2011; DOI 2011]). Alternative 1 may also potentially affect large woody debris supply and transport. The following describes each of these potential effects.

3.7.1.1 Sediment Supply

Under Alternative 1, the sediment supply in small bypass streams downstream of the diversion dams (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek) will be affected by small diversion infrastructure modifications. Sediment supply in the rivers below the medium sized reservoirs (Middle Fork Interbay and Ralston Afterbay) will be affected by sediment augmentation activities. Overall, Alternative 1 restores sediment supply to the reaches downstream of the small diversions and improves sediment supply to the reaches downstream of the medium dams and is an enhancement compared to the No-Action Alternative, as described in further detail below.

Small Diversion Infrastructure Modifications

Installation of self-cleaning wedge-wire screens at the Duncan Creek, South Fork Long Canyon Creek, and North Fork Long Canyon Creek diversion dams under Alternative 1 will allow bedload material and fine sediments, including gravel-sized material, to be naturally transported past the diversion facilities during high-flow events. An estimate of the annual amount of material, including gravels, which will be transported downstream of the facilities during high flows is provided in Table 3.7-1. Between 374–622 cubic yards of spawning gravel (8–64 mm) is estimated to be transported per year in the small streams, depending on location. Under the No-Action Alternative, this sediment would

be captured and removed from streams. The increase in sediment supply under Alternative 1 will provide long-term channel geomorphology and aquatic and riparian ecosystem benefits in the small bypass streams.

Sediment Augmentation Activities

In the Middle Fork American River downstream of Middle Fork Interbay and Ralston Afterbay dams, a portion of sediment removed during periodic sediment management activities will be placed downstream of the dams in augmentation areas under Alternative 1 (Table 3.7-1). The sediment will consist primarily of gravels and small cobbles (less than 7 inches) with a limited amount of finer sediments. These sediments will be placed within the high-water channel to allow subsequent high-flow events to transport the material naturally downstream. The two augmentation areas in the Middle Fork American River, downstream of Middle Fork Interbay Dam have an approximate capacity for 10,000–16,000 cubic yards of sediment. The two augmentation areas below Ralston Afterbay Dam (Junction Bar and Indian Bar) have an approximate capacity for 60,000 cubic yards of sediment. Sediments will be placed at the augmentation areas following the first sediment management activities at Middle Fork Interbay and Ralston Afterbay and will be periodically replenished as sediment is transported downstream.

The augmentation areas will be monitored and managed under Alternative 1 to enhance natural transport and to avoid any potential adverse effects of augmentation on the channel or water quality downstream (PCWA 2011a). Sediment transport monitoring will be implemented to characterize the amount of sediment mobilized from the augmentation areas and any potential build-up of coarse boulders or sediments adjacent to the low flow channel. If armoring or aggradation is observed next to the low flow channel, then those sediments will be removed and transported to an approved disposal area. If a substantial amount of sediment has been mobilized from an augmentation area based on monitoring, then the sediment will be replenished. Re-grading may also be scheduled to facilitate sediment transport during subsequent high-flow events. Placer County Water Agency (PCWA) will also monitor pool sediment conditions after sediment augmentation activities in the Middle Fork American River below Middle Fork Interbay and Ralston Afterbay as part of the Sediment Management Plan (SMP) (PCWA 2011a). Turbidity monitoring and AP measures will address any potential effects resulting from implementation of sediment management activities including potential effects to water quality (i.e., turbidity, erosion, sedimentation, or hazardous materials) and biological resources (i.e., riparian habitats and special-status plants and wildlife species). The potential effects to water quality are described in Section 3.4 – Water Quality. The potential effects to biological resources are discussed in Section 3.5 – Fish and Aquatic Resources; Section 3.6 – Botanical and Wildlife Resources Environmental Effects; and Section 3.8 – Riparian Resources.

Prior to implementation of sediment management activities, PCWA will consult with resource agencies and obtain appropriate permits. This may include a California Department of Fish and Game (CDFG) Streambed Alteration Agreement, United States Army Corps of Engineers (USACE) Section 404 Permit, USDA-FS Road Use Permit,

USDA-FS Special Use Authorization, etc. In addition, PCWA anticipates that preparation of a project-specific Water Quality Protection Plan (WQPP) will be a condition of the State Water Resources Control Board (State Water Board) 401 Certification. PCWA will develop a WQPP in consultation with the State Water Board prior to commencement of any construction activities.

3.7.1.2 Channel Geometry and Sediment Conditions

In the absence of sediment transporting flows, sediments (including fines) may accumulate in pools and spawning gravels, potentially degrading aquatic and riparian habitat. Under existing conditions (No-Action Alternative), the fine sediment volume in pools was very low (less than 8% and often much less) (PCWA 2011c, Tables 7.7-2 and 7.7-7). Fine sediment in spawning gravels was also very low in all river reaches and was consistent with high successful fish spawning (PCWA 2011c, Table 7.7-8).

Sediment accumulation may also cause a change in channel morphology in the absence of high magnitude, infrequent flows that maintain the channel by scouring the banks and channel bed, including emerging vegetation and some established vegetation. Smaller cross-sectional areas and aggradation (berm development) may result if riparian encroachment also occurs. Under existing conditions (No-Action Alternative), the results of the geomorphology and riparian studies indicated that the channel/sediment conditions in the bypass and peaking reaches are being maintained by the current flow regime (PCWA 2011d; PCWA 2011e). The bypass and peaking reaches have limited adjustability, and no berm or new bank development was observed.

Alternative 1 includes changes in Project operations (environmental pulse flows) and modifications to facilities (Hell Hole Reservoir Seasonal Storage Increase Improvement, small diversion infrastructure modifications) that could potentially affect channel geometry and sediment conditions. These potential effects are described below.

Project Operations

Under Alternative 1, changes in environmental pulse flows could affect the frequency of high magnitude scouring flows and, to a lesser extent, initiation of motion flows (gravels). Changes in environmental pulse flows could also affect the frequency of bank erosion in the bypass and peaking reaches. The following describes these potential effects.

INITIATION OF MOTION AND SCOURING FLOWS

Alternative 1 specifies (schedules) pulse flows developed to provide for initiation of motion (gravels), in addition to other benefits in wet and above normal water year types in the bypass river reaches (USDA-FS 2011; CDFG 2011). Pulse flows are anticipated to occur approximately 50% of the time based on the period of record. The exception is the Rubicon River where infrastructure constraints limit the magnitude of flow that can be released.

To analyze the frequency of high magnitude infrequent “scouring” flows, the number of days/years the impaired 5-year recurrence flow¹ occurred under Alternative 1 and the No-Action Alternative were compared (1975–2007). A similar analysis was conducted to evaluate the frequency of initiation of motion under Alternative 1 and No-Action Alternative. In the small bypass streams, both the No-Action Alternative (historical hydrology) and the Existing License Conditions (model runs) were compared to Alternative 1. This was done because the historical hydrology is not the best representation of how the small diversions would be operated in the future under the No-Action Alternative². The Existing License Conditions model run is the best representation of how the No-Action Alternative would be operated in the future. The effects of Alternative 1 on the frequency of scouring flows and initiation of gravel motion are summarized below.

- Middle Fork American River and Rubicon River
 - **Scouring Flows:** Alternative 1 maintains/schedules a similar frequency of scouring flows that have historically occurred in the No-Action Alternative (Table 3.7-3a).
 - **Initiation of Motion:** Alternative 1 maintains/schedules a similar frequency of initiation of motion flows (number of years) that have historically occurred in the No-Action Alternative (Table 3.7-4a). On the Middle Fork American River, the total number of days during the period of record increases under Alternative 1 compared to the No-Action Alternative at the top of the reaches (11–37%). On the Rubicon River, the total number of days decreases slightly under Alternative 1 compared to the No-Action Alternative (4–10%).
- Duncan, North Fork Long Canyon, South Fork Long Canyon, and Long Canyon creeks
 - **Scouring Flows:** The frequency (number of years and total number of days) of scouring flows under Alternative 1 and the Existing License Conditions are similar. Compared to the No-Action Alternative (historical hydrology), scouring flows occur at the same or slightly less frequency (1 less year) compared to Alternative 1. However, fewer total number of days of scouring flows are provided under Alternative 1 compared to the No-Action Alternative

¹ The 5-year recurrence interval flow (Q5) was selected to represent a flow that would scour the channel. Based on the results of the relicensing studies (PCWA 2011d; PCWA 2011e; PCWA 2011f) the Q5 flow for each reach is estimated to be able to mobilize the channel bed (McBain and Trush 1997; Schmidt and Potyondy 2004) and exceed bankfull elevations. The Q5 flow is also within the range of high flows that are typically associated with large-scale cottonwood and willow regeneration in the literature (i.e., Mahoney and Rood 1998).

² See Section 3.0 – Environmental Effects Analysis of Alternative 1 for more details regarding the historical hydrology in the small streams. Historic diversions in the small streams were reduced compared to those allowed in the Existing License Conditions due to debris maintenance problems at the intake screens. In the future, debris maintenance would not be an issue under the No-Action Alternative due to the small diversion modifications that would occur.

(historical hydrology) (1–6 fewer days over the period of record, depending on the reach) (Table 3.7-3b).

- **Initiation of Motion:** The total number of days for initiation of motion flows typically increases substantially (1.4 to 5 more days, depending on the reach) under Alternative 1 compared to Existing License Conditions (Table 3.7-4b). The total number of years during which initiation of motion flows occur typically increased under the Alternative 1 compared to the Existing License Conditions (1.3 to 1.9 more years), except in Long Canyon Creek (2 fewer years). Compared to the No-Action Alternative (historical hydrology), the frequency of initiation of gravel motion flows is less (fewer days and years). For example, the numbers of days and years of initiation motion in Alternative 1 is 39–85% of days and 68–89% of years, depending on the reach, in the No-Action Alternative.
- Therefore, the frequency of high flows that will scour and initiate gravel motion in the small bypass streams is less under Alternative 1 compared to historical conditions (No-Action Alternative), but the frequency of these flows (number of days and years) under Alternative 1 is much greater than would occur in the future under the No-Action Alternative (Existing License Conditions). The frequency under Alternative 1 is sufficient to maintain the channel geometry and low fine sediment content in pools and spawning gravels equivalent to the historical hydrology (No-Action Alternative) for the following reasons:
 - Fine sediment supply is low throughout the system (PCWA 2011c); and
 - The frequency of “scouring” and initiation of gravel motion flows in the small streams (days and years) under Alternative 1 is similar to that which has been occurring in the larger rivers (Middle Fork American and Rubicon rivers) under historical conditions (No-Action Alternative) (Tables 3.7-3a–b and 3.7-4a–b) and the frequency of flow events has maintained fine sediment at low levels (Table 3.7-2) (PCWA 2011c, Tables 7.7-7 and 7.7-8).

In the peaking reach, pulse flows are not specified in Alternative 1 because naturally high flow events from unimpaired river inflows (North Fork of the Middle Fork American River and North Fork American River) and tributaries provide high-flow events (scouring and spring flows). These flows maintain low sediment concentrations in pools and spawning gravels (PCWA 2011c), which will continue to be maintained under Alternative 1.

The Geomorphology/Riparian Monitoring Plan (GRMP) (PCWA 2011g) in Alternative 1 includes monitoring of channel and sediment conditions, including channel geometry (channel width, berm development), bank erosion, and fine sediment in pools in the bypass and peaking reaches. A Geomorphology/Riparian Monitoring Report summarizing the data collected during each monitoring period will be prepared by PCWA and distributed to the USDA-FS, State Water Board, and CDFG for review and

comment. Based on the results of the monitoring and/or comments received during the review process, PCWA and the agencies may call a meeting to discuss the results.

BANK EROSION

Changes in Project operations under Alternative 1 potentially could affect bank erosion in the bypass and peaking reaches. Bank erosion along the bypass and peaking reaches is low under existing conditions, and hillslope processes are the primary sources of sediments (PCWA 2011c; PCWA 2011d). This is in part due to the type of channels present in the vicinity of the MFP. The majority of the bypass reaches are confined within narrow, fluvially dissected V-shaped valleys with frequent bedrock and boulder exposures. The valley walls are typically comprised of exposed bedrock near the toe of the hillslope/bankfull channel interface. Although the peaking reach is an alluvial channel, lateral shifts in channel planform appear to occur infrequently, as few were observed in a comparison of historic and recent aerial photography (PCWA 2006). In addition, sediment delivery from bank erosion was considerably less compared to mass wasting sources (i.e., debris slides) (PCWA 2011c, Table 7.7-2).

In the larger bypass and peaking reaches, the Middle Fork American River and Rubicon River, Alternative 1 maintains/schedules a similar frequency of high-flow events (scouring flows and gravel initiation of motion flows) as historically occurred under the No-Action Alternative (Tables 3.7-3a and 3.7-4a). Therefore, bank erosion will remain low under Alternative 1 similar to the No-Action Alternative. In the small bypass streams, the frequency of scouring flows and gravel initiation of motion flows under Alternative 1 is greater than that which will occur under Existing License Conditions, but is less than historical conditions (Tables 3.7-3b and 3.7-4b). As a result, bank erosion will remain low under Alternative 1 similar to the No-Action Alternative.

Modification of Existing Project Facilities

Only modification of the Hell Hole Dam Outlet Works has the potential to effect channel geometry and sediment conditions. This project includes re-contouring the Rubicon River downstream of the outlet works (approximately 650 feet) so that environmental pulse flows can be released without damaging the road or powerhouse (PCWA 2011c). The channel will be deepened and widened to accommodate flows up to approximately 600 cubic feet per second. Measures to protect soils and to address potential erosion during construction and modification activities are described in Section 3.2 – Geology and Soils . The changes in channel geometry are very localized, will not adversely affect the downstream reaches of the Rubicon River, and will allow for the release of flows that will have long-term benefits to the aquatic and riparian ecosystems in the Rubicon River.

3.7.1.3 Large Woody Debris Supply and Transport

In the large bypass and peaking reaches, the supply and transport of large woody debris will be maintained under Alternative 1. Maintenance activities and the frequency of high-flow events will remain the same as under the No-Action Alternative. In the

small bypass streams, the infrastructure modifications of the small diversions (described above) will allow woody debris, which is trapped within the diversion pool under the No-Action Alternative, to be transported downstream under Alternative 1. In addition, as part of the SMP, post construction effectiveness monitoring will be conducted at the small diversions (once the diversion modifications have been completed) to document the ability of structures to pass large woody debris. Effectiveness monitoring will be accomplished by making visual observations and photo documentation once the impoundment is full of sediment to verify the movement of large woody debris placed downstream of the diversion during contingency sediment activities and large woody debris movement over the wedge-wire screen (i.e., verify that structure is not an impediment to large woody debris movement). A report summarizing the data collected each monitoring period will be prepared by PCWA and distributed to the USDA-FS, State Water Board, and CDFG for review and comment. Based on the results of the monitoring and/or comments received during the review process, PCWA and the agencies may call a meeting to discuss the results.

3.7.2 Reservoir and Diversion Pool Shoreline Erosion

Alternative 1 specifies changes in Project operations that result in changes in WSEs that have the potential to affect shoreline erosion at the large and medium reservoirs. The small diversion infrastructure modifications may also change WSEs and have the potential to affect shoreline erosion at the small diversion pools. The following identifies potential effects of Alternative 1 on shoreline erosion of the large reservoirs, medium reservoirs, and diversion pools.

3.7.2.1 Reservoir Water Surface Elevation Fluctuations

Project Operations

FRENCH MEADOWS RESERVOIR

Under Alternative 1 and No-Action Alternative, normal operating WSEs at French Meadows Reservoir will be very similar (Appendix D). The overall potential for shoreline erosion is low because the reservoir is surrounded by rock outcrops with steep slopes, the banks consist primarily of granitic and volcanic rock, and the soils are derived from the weathering of the rock. The shorelines are primarily comprised of large substrates that are highly resistant to any erosion (PCWA 2011c).

HELL HOLE RESERVOIR

At Hell Hole Reservoir, changes in operations under Alternative 1, after construction of the new 6-foot-high crest gates on the existing Hell Hole Dam Spillway, have the potential to increase shoreline erosion caused by wave action between about 4,630 feet mean sea level (msl) (the current maximum normal operating WSE) and 4,636 feet msl. This area will be inundated more frequently compared to the No-Action Alternative. Under the No-Action Alternative, the reservoir WSEs only exceed 4,630 feet msl maximum normal operation elevation during spill events (average 1.5 feet higher,

4,631.5 feet msl during spill events). Water surface elevation traces under Alternative 1 and the No-Action Alternative are shown in Appendix D.

The majority of the shoreline around Hell Hole Reservoir is resistant to erosion. It is surrounded by rock outcrops with steep slopes, with very little soil development on steep slopes that border the reservoir shoreline. Large portions of the shoreline are bedrock or boulder-sized materials that are highly resistant to any erosion. Most of the material that would be subject to erosion is decomposed granitic material that is comprised of coarse sands found in small, interspersed pockets along bedrock joints and fractures, or coarse sands intermixed with glacial (in moraines) gravel and cobble deposits on steep slopes (PCWA 2011c).

To evaluate the potential effects of changes in WSEs on the amount of sediment susceptible to shoreline erosion, the length of potentially erodible shoreline and the volume of potentially erodible sediment were calculated (PCWA 2011d). Based on this analysis, about 20% of the 11-mile shoreline is susceptible to potential erosion. Conservatively assuming an average 1-foot depth of erodible materials, the volume of potentially erodible sediments under Alternative 1 is about 2,600 cubic yards, which is a very small amount of sediment volume relative to the entire volume of the reservoir. At full pool, Hell Hole Reservoir has a gross storage capacity of 207,590 acre-feet, which is equivalent to 335,000,000 cubic yards of storage volume. The 2,600 cubic yards of potentially erodible sediments represent 0.0009% of the reservoir storage volume, and therefore, effects of Alternative 1 on the amount of additional sediment due to shoreline erosion will be negligible.

MEDIUM RESERVOIR SHORELINES

Normal operating reservoir WSEs will not change at Middle Fork Interbay and Ralston Afterbay under Alternative 1 compared to the No-Action Alternative. Ralston Afterbay and Middle Fork Interbay are surrounded by rock outcrops with steep side slopes, and the shorelines are comprised of large substrates that are highly resistant to erosion. Therefore, there will be no change in shoreline erosion potential under Alternative 1.

Small Diversion Infrastructure Modifications

Under Alternative 1, the small diversion dams will be modified into self-cleaning, stream-bottom intakes and sediment will be transported downstream during high flows. The top (crest) of the sloped wedge-wire screen will be 1.3 to 3.1 feet higher than the existing dam, depending on the facility (Appendix A, Figures DC 2, NF 2, and SF 2). The existing diversion pools will aggrade with sediment to near the top of the wedge-wire screen, and the resulting diversion pools will be shallower and more riverine. The area footprint of the new diversion pools will remain approximately similar to the existing diversion pools; but the water surface of the new diversion pools will be 1.3 to 3.1 feet higher; and therefore, effects to shoreline erosion will be negligible.

3.7.3 Conclusions—Geomorphology

Alternative 1 specifies modifications to MFP operations and maintenance, and includes implementation of construction activities that could affect geomorphology resources. These changes under Alternative 1 will maintain/enhance geomorphic conditions by:

- Restoring more natural sediment supply and transport in the bypass reaches;
- Preserving or restoring high magnitude flows (scouring flows and initiation of motion flows) in the bypass and peaking reaches;
- Providing frequency of scouring and initiation of motion flows in the small bypass streams sufficient to maintain channel geometry and low fine sediment concentrations (Section 3.7.1.2);
- Maintaining stream bank and reservoir/ diversion pool shoreline erosion at very low levels; and
- Conducting periodic monitoring of resource condition and agency consultation over the term of the license to:
 - Document channel geometry (channel width, berm development), bank erosion, and fine sediment in pools in the bypass and peaking reaches (PCWA 2011g); and
 - Document sediment transport at augmentation areas and pool sediment conditions after sediment augmentation activities (PCWA 2011a).

3.7.4 Unavoidable Adverse Effects

There are no unavoidable adverse effects to channel geomorphology or stream bank or reservoir/diversion pool shoreline erosion under Alternative 1.

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TABLES

Table 3.7-1. Summary of Historic Sediment Removal Activities at MFP Diversion Pools and Medium Reservoirs (through 2009)¹.

Year	Month ²	Loose, Uncompacted Volume of Sediment Removed (cubic yds)
Duncan Creek Diversion Pool (period of record 1997-2009)		
1988	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1998	Aug	4,500
2007	Sept	1,570
Total		6,070
Frequency of Sediment Removal Activities: 3 times between 1988-2009 (22 years)		once every 7.3 years
Volume Removed per Maintenance Activity²		3,035 cubic yards
Average Annual Volume Removed		416 cubic yards/year
Average Annual Spawning Gravel Volume Removed		148 cubic yards/year
North Fork Long Canyon Creek Diversion Pool (period of record 1980-2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1990	-	
1992	-	
1995	-	
1997	-	1,600
2004	Sept	400
2006	Sept	1,370
Total		3,370
Frequency of Sediment Removal Activities: 10 times between 1980-2009 (30 years)		once every 3 years
Average Volume Removed per Maintenance Activity²		1,123 cubic yards
Average Annual Volume Removed		374 cubic yards/year
Average Annual Spawning Gravel Volume Removed		75 cubic yards/year
South Fork Long Canyon Creek Diversion Pool (period of record 1980-2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1995	-	
1997	-	2,500
2006	Sept	2,850
Total		5,350
Frequency of Sediment Removal Activities: 7 times between 1980-2009 (30 years)		once every 4.3 years
Average Volume Removed per Maintenance Activity²		2,675 cubic yards
Average Annual Volume Removed		622 cubic yards/year
Average Annual Spawning Gravel Volume Removed		386 cubic yards/year
Middle Fork Interbay (period of record 1987-2009)		
1987	Oct	25,000
1988	Oct	35,000
1997	Feb	16,000
2000	Oct	68,000
Total		144,000
Frequency of Sediment Removal Activities: 4 times between 1987-2009 (23 years)		once every 5.8 years
Average Volume Removed per Maintenance Activity²		36,000 cubic yards
Average Annual Volume Removed		6,207 cubic yards/year
Average Annual Spawning Gravel Volume Removed		1,303 cubic yards/year

Table 3.7-1. Summary of Historic Sediment Removal Activities at MFP Diversion Pools and Medium Reservoirs (through 2009) (continued).¹

Year	Month ²	Loose, Uncompacted Volume of Sediment Removed (cubic yds)
Ralston Afterbay (period of record 1969-2009)		
1969	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1981	Oct	10,000
1984	Oct	13,000
1985	Oct	12,000
1986	Mar	45,000
1986	Oct	80,000
1989	Oct	35,000
1994	Sept	77,000
1997	Feb	65,000
2002	Oct	101,000 ³
Total		438,000
Frequency of Sediment Removal Activities: 10 times between 1969-2009 (41 years)		once every 4.6 years
Average Volume Removed per Maintenance Activity²		48,667 cubic yards
Average Annual Volume Removed		10,580 cubic yards/year
Average Annual Spawning Gravel Volume Removed		2,645 cubic yards/year

¹Source: PCWA 2011e.²Includes only the years with known sediment volumes.³Volume equals 45,000 cubic yards compacted, in-place sediment at Indian Bar; and 29,000 cubic yards compacted, in-place sediment at Ralston Ridge.

Table 3.7-2. Summary Results from V* Studies Conducted in 2006 and 2007.

Stream	Calculated V* 2006				Calculated V* 2007			
	Minimum	Maximum	Weighted 2006 V*	Number of Pools	Minimum	Maximum	Weighted 2007 V*	Number of Pools
Duncan Creek								
Duncan Creek					0.000	0.005	0.0002	10
Middle Fork American River (MFAR)								
French Meadows Reservoir to Middle Fork Interbay	0.020	0.030	0.027	2	0.000	0.071	0.003	15
Middle Fork Interbay to Ralston Afterbay	0.003	0.070	0.025	6	0.000	<0.001	0.000	3
Below Ralston Afterbay					0.0003	0.071	0.002	8
Rubicon River								
Hell Hole Reservoir to South Fork Rubicon River					0.000	0.023	0.005	9
South Fork Rubicon River to Ralston Afterbay					0.000	0.081	0.019	17
Rubicon at Ralston Afterbay	NA	NA	0.030	1				
Long Canyon Creek								
North Fork Long Canyon Creek (NFLC)					0.000	0.025	0.004	10
South Fork Long Canyon Creek (SFLC)					0.000	0.007	0.002	10
Long Canyon Creek (LCC)					0.000	<0.001	0.000	9
Comparison Stream								
North Fork American River (NFAR)					0.000	0.020	0.010	5
North Fork of the Middle Fork American River (NFMF)	0.030	0.070	0.046	3				

Note that two different V* studies were performed: a quantitative V* assessment performed in 2006 immediately following the Ralston Ridge Fire, but prior to the runoff period; and, a visual V* estimation assessment performed in 2007. The quantitative V* analysis of fine sediment was conducted in 12 pools along the Middle Fork American and Rubicon rivers above Ralston Afterbay in the fall of 2006 using the methodology developed by the USDA-FS (Lisle and Hilton 1991, 1992; Hilton and Lisle 1993). Therefore, a calculated V* is available using either 2006 or 2007 data for most streams. In two sections of the MFAR, the calculated V* is available for both years.

Table 3.7-3a. Total Number of Days that Scouring Flows Occur under the Alternative 1 and No-Action Alternative in Large Bypass Streams.¹

Site/Release Location	Flow (cfs)	Water Year Type	Alternative 1				No-Action Alternative ²			
			Total # of Days	Average # of Days ³	Scour Year Average # of Days ⁴	Number of Years ⁵	Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵
Large Bypass Streams										
Middle Fork American River below French Meadows Dam										
MF44.7	632	Wet	34	3	6	6 / 10	22	2	4	6 / 10
		Abv Normal	5	1	5	1 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	39	---	---	7 / 33	22	---	---	6 / 33
MF36.2	1,758	Wet	14	1	3	5 / 10	21	2	4	6 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	14	---	---	5 / 33	21	---	---	6 / 33
Middle Fork American River below Middle Fork Interbay Dam										
MF26.2	2,970	Wet	15	2	3	5 / 10	18	2	3	6 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	15	---	---	5 / 33	18	---	---	6 / 33

Table 3.7-3a. Total Number of Days that Scouring Flows Occur under the Alternative 1 and No-Action Alternative in Large Bypass Streams (continued).¹

Site/Release Location	Flow (cfs)	Water Year Type	Alternative 1				No-Action Alternative ²			
			Total # of Days	Average # of Days ³	Scour Year Average # of Days ⁴	Number of Years ⁵	Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵
Large Bypass Streams (continued)										
Rubicon River below Hell Hole Dam										
R25.7	1,922	Wet	14	1	3	5 / 10	13	1	3	5 / 10
		Abv Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	15	---	---	6 / 33	14	---	---	6 / 33
R20.9	4,479	Wet	19	2	3	7 / 10	16	2	3	6 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	19	---	---	7 / 33	16	---	---	6 / 33
R3.5	11,341	Wet	15	2	3	6 / 10	15	2	3	6 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	15	---	---	6 / 33	15	---	---	6 / 33

Table 3.7-3a. Total Number of Days that Scouring Flows Occur under the Alternative 1 and No-Action Alternative in Large Bypass Streams (continued).¹

Site/Release Location	Flow (cfs)	Water Year Type	Alternative 1				No-Action Alternative ²			
			Total # of Days	Average # of Days ³	Scour Year Average # of Days ⁴	Number of Years ⁵	Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵
Large Bypass Streams (continued)										
Middle Fork American River below Ralston Afterbay										
MF14.1	19,789	Wet	15	2	3	5 / 10	19	2	3	6 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	15	---	---	5 / 33	19	---	---	6 / 33
MF4.8	20,241	Wet	15	2	3	5 / 10	19	2	3	6 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	15	---	---	5 / 33	19	---	---	6 / 33

¹For this analysis, a 'scouring flow' was a flow that exceeded the impaired Q5 (5-year recurrence interval) flow.

²No-Action Alternative = Historical hydrology (1975–2007).

³Total number of scour days / number of years in water year type.

⁴Total number of scour days / number of years with scour events in water year type.

⁵Number of years with scour events / total number of years in water year type.

Table 3.7-3b. Total Number of Days that Scouring Flows Occur under the Alternative 1, No-Action Alternative, Existing License Conditions in Small Bypass Streams.¹

Site/Release Location	Flow (cfs)	Water Year Type	Alternative 1				No-Action Alternative ²				Existing License Conditions ³			
			Total # of Days	Average # of Days ⁴	Scour Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶
Small Bypass Streams														
Duncan Creek	774	Wet	9	1	2	5 / 10	14	1	3	5 / 10	9	1	2	5 / 10
		Abv Normal	0	0	0	0 / 6	1	0	1	1 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	9	---	---	5 / 33	15	---	---	6 / 33	9	---	---	5 / 33
North Fork Long Canyon Creek	225	Wet	12	1	2	5 / 10	16	2	3	6 / 10	11	1	2	5 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	12	---	---	5 / 33	16	---	---	6 / 33	11	---	---	5 / 33
South Fork Long Canyon Creek	396	Wet	10	1	2	5 / 10	16	2	3	6 / 10	9	1	2	5 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	10	---	---	5 / 33	16	---	---	6 / 33	9	---	---	5 / 33
Long Canyon Creek	1,144	Wet	14	1	2	6 / 10	15	2	3	6 / 10	14	1	2	6 / 10
		Abv Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	14	---	---	6 / 33	15	---	---	6 / 33	14	---	---	6 / 33

¹For this analysis, a 'scouring flow' was a flow that exceeded the impaired Q5 (5-year recurrence interval) flow.²No-Action Alternative = Historical hydrology (1975–2007).³Existing License Conditions = Operations model run using existing FERC license conditions and current demand.⁴Total number of scour days / number of years in water year type.⁵Total number of scour days / number of years with scour events in water year type.⁶Number of years with scour events / total number of years in water year type.

Table 3.7-4a. Average Number of Days that Initiation of Motion (gravels) Occur by Water Year Type under the Alternative 1 and No-Action Alternative in Large Bypass Streams.¹

Site/ Release Location	Gravel Initiation of Motion (cfs) ²	Water Year Type	Alternative 1				No-Action Alternative ³			
			Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶
Large Bypass Streams										
Middle Fork American River below French Meadows Dam										
MF44.7	343	Wet	141	14	14	10 / 10	107	11	13	8 / 10
		Abv Normal	31	5	5	6 / 6	24	4	12	2 / 6
		Blw Normal	8	1	4	2 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	180	---	---	18 / 33	131	---	---	10 / 33
MF36.2	702	Wet	106	11	11	10 / 10	179	18	18	10 / 10
		Abv Normal	22	4	4	6 / 6	9	2	2	4 / 6
		Blw Normal	1	0	1	1 / 6	2	0	2	1 / 6
		Dry	0	0	0	0 / 5	2	0	1	2 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	129	---	---	17 / 33	192	---	---	17 / 33
Middle Fork American River below Middle Fork Interbay Dam										
MF26.2	532	Wet	506	51	51	10 / 10	493	49	49	10 / 10
		Abv Normal	52	9	9	6 / 6	15	3	3	6 / 6
		Blw Normal	7	1	2	3 / 6	0	0	0	0 / 6
		Dry	2	0	1	2 / 5	4	1	2	2 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	567	---	---	21 / 33	512	---	---	18 / 33

Table 3.7-4a. Average Number of Days that Initiation of Motion (gravels) Occur by Water Year Type under the Alternative 1 and No-Action Alternative in Large Bypass Streams (continued).¹

Site/ Release Location	Gravel Initiation of Motion (cfs) ²	Water Year Type	Alternative 1				No-Action Alternative ³			
			Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶
Large Bypass Streams (continued)										
Rubicon River below Hell Hole Dam										
R25.7	500	Wet	175	18	18	10 / 10	192	19	21	9 / 10
		Abv Normal	16	3	16	1 / 6	14	2	14	1 / 6
		Blw Normal	0	0	0	0 / 6	2	0	2	1 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	191	---	---	11 / 33	208	---	---	11 / 33
R20.9	678	Wet	263	26	26	10 / 10	281	28	28	10 / 10
		Abv Normal	29	5	6	5 / 6	22	4	4	5 / 6
		Blw Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Dry	1	0	1	1 / 5	1	0	1	1 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	294	---	---	17 / 33	305	---	---	17 / 33
R3.5	2,198	Wet	178	18	18	10 / 10	201	20	20	10 / 10
		Abv Normal	22	4	4	6 / 6	22	4	4	6 / 6
		Blw Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Dry	1	0	1	1 / 5	1	0	1	1 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	202	---	---	18 / 33	225	---	---	18 / 33

Table 3.7-4a. Average Number of Days that Initiation of Motion (gravels) Occur by Water Year Type under the Alternative 1 and No-Action Alternative in Large Bypass Streams (continued).¹

Site/ Release Location	Gravel Initiation of Motion (cfs) ²	Water Year Type	Alternative 1				No-Action Alternative ³			
			Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶
Large Bypass Streams (continued)										
Middle Fork American River below Ralston Afterbay										
MF14.1	6,674	Wet	120	12	12	10 / 10	110	11	11	10 / 10
		Abv Normal	11	2	2	6 / 6	9	2	2	6 / 6
		Blw Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Dry	1	0	1	1 / 5	1	0	1	1 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	133	---	---	18 / 33	121	---	---	18 / 33
MF4.8	6,797	Wet	120	12	12	10 / 10	110	11	11	10 / 10
		Abv Normal	11	2	2	6 / 6	9	2	2	6 / 6
		Blw Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Dry	1	0	1	1 / 5	1	0	1	1 / 5
		Total	0	0	0	0 / 6	0	0	0	0 / 6
		Critical	133	---	---	18 / 33	121	---	---	18 / 33

¹PCWA 2011g, Table G-1.²Flow required to initiate motion of 25% of the gravel substrate.³No-Action Alternative = Historical hydrology (1975–2007).⁴Total number of event days / number of years in water year type.⁵Total number of event days / number of years with events in water year type.⁶Number of years with events / total number of years in water year type.

Table 3.7-4b. Average Number of Days that Initiation of Motion (gravels) Occur by Water Year Type under the Alternative 1, No-Action Alternative, and Existing License Conditions in Small Bypass Streams.¹

Site/ Release Location	Gravel Initiation of Motion (cfs) ²	Water Year Type	Alternative 1				No-Action Alternative ³				Existing License Conditions ⁴			
			Total # of Days	Average # of Days ⁵	Event Year Average # of Days ⁶	Number of Years ⁷	Total # of Days	Average # of Days ⁵	Event Year Average # of Days ⁶	Number of Years ⁷	Total # of Days	Average # of Days ⁵	Event Year Average # of Days ⁶	Number of Years ⁷
Small Bypass Streams														
Duncan Creek	149	Wet	96	10	10	10 / 10	128	13	13	10 / 10	35	4	4	10 / 10
		Abv Normal	26	4	5	5 / 6	14	2	4	4 / 6	3	1	3	1 / 6
		Blw Normal	1	0	1	1 / 6	3	1	2	2 / 6	1	0	1	1 / 6
		Dry	1	0	1	1 / 5	1	0	1	2 / 5	1	0	1	1 / 5
		Critical	0	0	0	0 / 6	0	0	0	1 / 6	0	0	0	0 / 6
		Total	124	---	---	17 / 33	146	---	---	19 / 33	40	---	---	13 / 33
North Fork Long Canyon Creek	29	Wet	149	15	17	9 / 10	401	40	45	9 / 10	47	5	6	8 / 10
		Abv Normal	13	2	3	4 / 6	5	1	2	3 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	6	1	2	4 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	3	1	2	2 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	1	0	1	1 / 6	0	0	0	0 / 6
		Total	162	---	---	13 / 33	416	---	---	19 / 33	47	---	---	8 / 33
South Fork Long Canyon Creek	40	Wet	195	20	20	10 / 10	490	49	54	9 / 10	44	4	6	8 / 10
		Abv Normal	27	5	5	5 / 6	13	2	7	2 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	7	1	2	4 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	2	0	2	1 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	1	0	1	1 / 6	0	0	0	0 / 6
		Total	222	---	---	15 / 33	513	---	---	17 / 33	44	---	---	8 / 33
Long Canyon Creek	197	Wet	141	14	14	10 / 10	278	28	28	10 / 10	92	9	9	10 / 10
		Abv Normal	19	3	5	4 / 6	20	3	4	5 / 6	18	3	4	5 / 6
		Blw Normal	4	1	4	1 / 6	4	1	4	1 / 6	4	1	4	1 / 6
		Dry	1	0	1	1 / 5	2	0	1	2 / 5	1	0	1	2 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	165	---	---	16 / 33	304	---	---	18 / 33	115	---	---	18 / 33

¹PCWA 2011g, Table G-1.²Flow required to initiate motion of 25% of the gravel substrate.³No-Action Alternative = Historical hydrology (1975–2007).⁴Existing License Conditions = Operations model run using existing FERC license conditions and current demand.⁵Total number of event days / number of years in water year type.⁶Total number of event days / number of years with events in water year type.⁷Number of years with events / total number of years in water year type.

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3.8 RIPARIAN RESOURCES ENVIRONMENTAL EFFECTS

This section describes the potential impacts to riparian resources under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facility Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1 to protect riparian resources.

Potential impacts to riparian resources have been identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include: routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing recreation facilities; maintenance at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section.

Potential impacts to riparian resources include changes in the abundance or distribution of riparian species and/or communities or direct loss of individuals. Alternative 1 also incorporates measures to avoid, protect, and enhance riparian and wetland resources during Project activities. The riparian impact analysis focuses on the areas where riparian vegetation and wetland habitat is present within Riparian Conservation Areas (RCA). RCAs are areas and habitat specifically designated for protection and management of riparian resources by the United States Department of Agriculture-Forest Service (USDA-FS).

Potential impacts to riparian resources are evaluated in this analysis as follows:

- Potential impacts on the abundance and distribution of riparian vegetation in bypass and peaking reaches from changes in Project operations affecting sediment supply and transport, scouring flows, pulse flows, and base flows (summer and fall).
- Potential impacts on the abundance and distribution of riparian vegetation along reservoir and diversion pool shorelines from changes in Project operations affecting water surface elevations (WSE).
- Potential impacts on riparian vegetation and wetland habitats (direct loss) from: changes in maintenance activities; modification of existing Project facilities; and construction of new Project facilities and Project recreation facilities and features.

The hydrology baselines and hydrology operations model runs used to quantify impacts of Alternative 1 compared to the No-Action Alternative are discussed in Section 3.1 – Analytical Approach.

Potential impacts on rare-, threatened-, or endangered-aquatic species are discussed in Section 3.5 – Fish and Aquatic Resources. Potential impacts to special-status riparian plants and mosses are identified in Section 3.6 – Botanical and Wildlife Resources.

A description of potential impacts to riparian resources resulting from implementation of Alternative 1, considering AP and enhancement measures along the bypass and peaking reaches and reservoir and diversion pool shorelines, and at Project facilities and Project recreation facilities and features is provided below. There are no unavoidable adverse effects to riparian resources resulting from implementation of Alternative 1 as discussed at the end of this section.

3.8.1 Project Operations

3.8.1.1 Riparian Vegetation along Bypass and Peaking Reaches

Riparian vegetation patterns (i.e., distribution, abundance, community composition, and age class structure) in the vicinity of the MFP are largely controlled by the geomorphic characteristics of the watershed and the hydrologic regime. In the vicinity of the MFP, the distribution and abundance of riparian vegetation are limited by the narrow valley bottoms with limited floodplain development and alluvial deposits, steep side slopes, and prevalence of bedrock and coarse substrate along long sections of the rivers (PCWA 2011a). Riparian vegetation patterns also reflect the recent hydrologic regime, which influences recruitment and establishment success. Flows can affect the formation and destruction of geomorphic landforms (e.g., floodplains and bars), the quantity and quality of substrate available for supporting riparian vegetation (e.g., recruitment sites), transport of seeds and stems, and viability of riparian vegetation once established. Flow attributes that are important for maintaining the distribution and structural and compositional complexity of riparian resources include: (1) the frequency of high magnitude scouring or “re-setting” flows; (2) the frequency, magnitude, and timing of seed setting flows (recruitment flows); (3) hydrograph shape/recession rates of spring flows; and (4) inter-annual flow variability. Riparian vegetation often establishes in elevation zones where water is available during the drier months and the plants are not too close to the channel and susceptible to damage by high flows.

Alternative 1 includes small diversion infrastructure modifications (Appendix A), sediment management activities below medium dams (PCWA 2011b), and new instream flow and reservoir minimum pool conditions included in resource agencies preliminary conditions and recommendations (USDA-FS 2011; CDFG 2011; DOI 2011) that will maintain or enhance riparian resources, depending on the reach, in the bypass and peaking reaches. Specifically, implementation of these actions will: (1) restore natural sediment supply and transport downstream of the small diversions and enhance sediment supply and transport downstream of the medium dams; (2) preserve the frequency of high magnitude scouring (“re-setting”) flows in river and stream reaches;

(3) restore riparian recruitment flows in wet and above normal water years by providing pulse flows with natural recession rates and more natural down ramping of spills; and (4) provide higher minimum flows, particularly during the spring, summer, and fall. Provided below is an analysis of how these actions will maintain or enhance riparian resources.

Sediment Supply and Transport

Alternative 1 specifies facility modifications and sediment maintenance activities that will enhance sediment supply, including gravels, to the small streams downstream of the diversions (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek) and river reaches downstream of the medium dams (Middle Fork American River downstream of Middle Fork Interbay and Ralston Afterbay dams). These facility modifications and sediment maintenance activities in Alternative 1 will provide long-term benefits for and enhancement of riparian resources by restoring sediment delivery to the channels and enhance the quality of sites for riparian establishment (e.g., recruitment sites) in the bypass and peaking reaches.

At the small diversions, infrastructure modifications will allow bedload material and suspended sediments, including gravel-sized material, to be naturally transported past the diversion facilities during high-flow events. At the medium dams, a portion of sediment removed during periodic removal activities (approximately every 5–6 years) will be placed downstream of the dams within the high-water channel to allow subsequent high-flow events to transport the material naturally downstream (sediment augmentation). Table 3.7-1 shows an estimate of the annual amount of material, including gravels, which will be passed downstream of these facilities under Alternative 1 rather than being captured and removed from the river system (No-Action Alternative) (PCWA 2011c).

Scouring Flows

Alternative 1 will maintain instream channel maintenance conditions and vegetation coverage along and within the channel by maintaining the frequency of high magnitude events that can scour banks, channel bed, and some existing vegetation as occurred under the No-Action Alternative. Under the No-Action Alternative, the results of the geomorphology and riparian studies indicated that sediment/channel conditions in the bypass and peaking reaches are being maintained by the current flow regime (e.g., no berm or new bank development) (PCWA 2011c; PCWA 2011d).

To analyze the frequency of these scouring flows, the total number of days and years that scouring flows (based on impaired five-year recurrence interval¹) and the average number of days per event that occurred under Alternative 1 and the No-Action Alternative were compared. The total number of years and average number of days per event are similar for the large bypass and peaking reaches when comparing Alternative 1 and the No-Action Alternative (Table 3.7-3a). On the Middle Fork American River below French Meadows Dam, the total number of days during the period of record increases under Alternative 1 compared to the No-Action Alternative at the top of the reach (17 more days). At the bottom of the reach and below Middle Fork Interbay, the total number of days during the period of record decreases under Alternative 1 compared to the No-Action Alternative (3-7 fewer days). On the Rubicon River, the total number of days during the period of record is maintained (no difference) or increases slightly under Alternative 1 compared to the No-Action Alternative (0–3 more days). On the small bypass streams, under Alternative 1 the frequency and total number of scouring days is similar to the No-Action Alternative (Existing License Conditions²); although, fewer days (1–6 fewer days over the period of record, depending on the reach) occur compared to the No-Action Alternative (historical conditions) (Table 3.7-3b).

The Geomorphology/Riparian Monitoring Plan (GRMP) (PCWA 2011e) includes monitoring of riparian species composition, age class structure, relative cover, community structure, position along the stream channel, and health of riparian vegetation in the bypass and peaking reaches under Alternative 1. The GRMP also includes monitoring of channel and sediment conditions, specifically, the general channel shape, bank erosion, and fine sediment in pools in the bypass and peaking reaches under Alternative 1. A Geomorphology/Riparian Monitoring Report summarizing the data collected each monitoring period will be prepared by Placer County Water Agency (PCWA) and distributed to the USDA-FS, State Water Resources Control Board (State Water Board), and the California Department of Fish and Game (CDFG) for review and comment.

¹ The 5-year recurrence interval flow (Q5) was selected to represent a flow that would scour the channel. Based on the results of the relicensing studies (PCWA 2011c; PCWA 2011d; PCWA 2011f), the Q5 flow for each reach is estimated to be able to mobilize the channel bed (McBain and Trush 1997; Schmidt and Potyondy 2004) and exceed bankfull elevations. The Q5 flow is also within the range of high flows that are typically associated with large-scale cottonwood and willow regeneration in the literature (i.e., Mahoney and Rood 1998) and was also associated with recruitment events on rivers in the vicinity of the MFP (PCWA 2011d).

² See Section 3.1 – Analytical Approach for an explanation of the No-Action Alternative with historical (impaired) hydrology or Existing License Conditions.

Pulse Flows

Alternative 1 will benefit riparian resources within the bypass reaches by providing scheduled pulse flows (recruitment flows), which increase the frequency and number of days of spring flows and specify flow magnitudes and recession rates (down ramping rates) for spring flows and summer spill flows in the Rubicon River and Middle Fork American River compared to the No-Action Alternative. This will result in more naturally shaped and timed hydrographs that improve conditions for riparian recruitment compared to the No-Action Alternative. The timing of the pulse flows coincides with seed release for riparian species (PCWA 2011g).

Alternative 1 specifies scheduled pulse flows in May-June of wet and above normal water year types in all the bypass river reaches (USDA-FS 2011; CDFG 2011). These water year types constitute about 50% of the water years. Alternative 1 also specifies a peak magnitude and duration of the peak flow for each bypass reach. The peak magnitude flow of the pulse flow release (recruitment flow for riparian resources) for each bypass reach is approximately the flow at which additional increases in flow provide very little addition to the width and depth of inundation of the channel (PCWA 2011d, Appendix B). A “recruitment day” is defined as a day when daily average flow exceeds this magnitude. This is also the flow that is equal to or greater than the magnitude of the flow required to initiate gravel motion (PCWA 2011d). The duration of the peak flows in Alternative 1 typically ranges from 1–9 days in wet water years and 2 days in above normal water years, depending on the reach (PCWA 2011b). On the Rubicon River, the peak flow (200 cfs) will be provided for 38 days in wet water years, and 16 days in above normal water years.

To analyze the frequency of recruitment flow events, the total number of days and years that recruitment flows and the average number of days per recruitment flow that occurred under Alternative 1 and the No-Action Alternative were compared. For most bypass reaches, the Alternative 1 maintains or increases the total number of days during the period of record and the average number of days per year with recruitment flows (May and June only) compared to the No-Action Alternative³ (Tables 3.8-3a and 3.8-3b). The effects of Alternative 1 on the frequency of recruitment flows within each reach are summarized below.

- On the Middle Fork American River, the total number of recruitment days in the period of record increases by 44–77% under Alternative 1, depending on location within the reach (25 to 113 more days). The average number of days during wet water years with recruitment flows varies by reach increasing slightly in the upper reach below French Meadows Dam (1–3 more days), increasing by 1 day at the bottom of the reach, and decreasing by 2 days immediately below Middle Fork Interbay (Table 8.3-3a). In above normal water years, recruitment flows will

³ This analysis includes reservoir spill flows that occur in May and June.

occur more frequently (92–100% of above normal water years under Alternative 1 compared to 17–37% under the No-Action Alternative).

- On the Rubicon River, the average number of days per year when recruitment flows occurred in above normal and wet water years is maintained or increases under Alternative 1 (0–46% [0–6 more days]) compared to the No-Action Alternative. No change in the number of days occurs at the lower end of the reach near the confluence with Long Canyon Creek (No-Action Alternative [Existing License Conditions]) (Table 3.8-3a).
- Under Alternative 1, the total number of recruitment flow days moderately increases in Duncan Creek at the bottom of the reach and Long Canyon Creek at the top of the reach (9–10 more days in total) and substantially increases in Duncan Creek at the top of the reach, North Fork Long Canyon Creek, and South Fork Long Canyon Creek (49-89 more days in total) during the period of record compared to the No-Action Alternative (Existing License Conditions) (Table 3.8-3b). On Long Canyon Creek near the Rubicon River confluence, the total number of recruitment days is maintained under Alternative 1 compared to the No-Action Alternative (Existing License Conditions). Under Alternative 1, on the small bypass streams there is typically an increase in the average number of days of recruitment flows in wet water years (1–7 more days) compared to the No-Action Alternative (Existing License Conditions) (no difference on Long Canyon Creek at the Rubicon River confluence). In above normal water years, the average number of years with recruitment flows is maintained (no difference) on Long Canyon Creek at the Rubicon River confluence, or increases slightly (1–5 more days on North Fork Long Canyon and South Fork Long Canyon creeks, Duncan Creek, and at the top of Long Canyon Creek reach). The GRMP includes monitoring of riparian vegetation in the bypass streams over the term of the new license. A report summarizing the data collected each monitoring period will be prepared by PCWA and distributed to the USDA-FS, State Water Board, and CDFG for review and comment.

Alternative 1 also specifies a down ramp rate for the pulse flows in the bypass reaches, which provides a slowly declining hydrograph. This will provide riparian benefits compared to the faster decline of spring spill flows that occur in some of the reaches under the No-Action Alternative, particularly immediately downstream of the large dams and Duncan Creek. Alternative 1 pulse flow down ramp rates are an average of approximately 1.6 inches of down ramp per day and are within the range of riparian seedling root growth rates identified in the literature (PCWA 2011g, Table 7.8-3). These down ramp rates will ensure that soil moisture can be available to the seedling roots during the first growing season, a critical factor for establishing riparian vegetation.

In addition, Alternative 1 specifies a similar slow recession rate for Hell Hole Dam spills that occur in May through July (approximately 1.6 inches of down ramp per day). There are seven years (in the 33-year period of record) that spills occur and will not be down ramped in the No-Action Alternative. Under the No-Action Alternative, there are no specifications for down ramping rates associated with these spill events. Spill ramp

down operations under Alternative 1 will provide benefits to the riparian resources in the Rubicon River.

A down ramp rate is also specified for May through July spills below French Meadows Dam. The Middle Fork American River channel downstream of French Meadows Dam is narrow and entrenched with a prevalence of bedrock and coarse substrate in this reach. Consequently, riparian vegetation is sparsely distributed. The flow rate change specified for these summer spill events is about twice as fast as that which produces a down ramp rate of 1.6 inches per hour, and is similar or slower than those that occurred under existing conditions (and the No-Action Alternative) and will maintain riparian resources.

In the peaking reach, pulse flows are not specified in Alternative 1 because naturally high-flow events from unimpaired river inflows (North Fork of the Middle Fork American River and North Fork American River) and tributaries provide spring flow events that support riparian resources (PCWA 2011d). Therefore, under Alternative 1, the distribution and abundance of riparian resources will be maintained in the peaking reach.

Base Flows

Under Alternative 1, minimum instream flows in the bypass and peaking reaches are equal to or greater than those under the No-Action Alternative, and therefore, will maintain riparian resources.

3.8.1.2 Riparian Vegetation along Reservoirs and Diversion Pool Shorelines

Under Alternative 1, MFP operations (reservoir water surface elevation fluctuations) at the Project reservoirs and diversion pools have the potential to affect riparian resources, particularly in the spring (time of seed release) and summer growing period. Daily and seasonal fluctuations in reservoir WSEs at Middle Fork Interbay and Ralston Afterbay are not expected to change under Alternative 1 compared to the No-Action Alternative; therefore, riparian resources will be maintained around these reservoirs (PCWA 2011h) (Section 3.5 – Fish and Aquatic Resources). The effects to riparian vegetation at the small diversion pools and the large reservoirs under Alternative 1 are discussed in the following sections.

Small Diversions

At the small diversions, changes in WSEs resulting from the new infrastructure modifications under Alternative 1 will maintain riparian resources. The modifications and long-term operational changes are described in detail in Appendix A. Under Alternative 1, the small stream diversion dams (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek) will be modified into self-cleaning, stream-bottom intakes. A concrete retaining wall and sloped wedge-wire screen will be constructed on the upstream side of the existing ogee dam/spillway of each diversion. The top (crest) of the sloped wedge-wire screen will be 1.3 to 3.1 feet higher than the existing dam, depending on the facility (Appendix A, Figures DC 4, NF 4, and SF 4).

The existing diversion pools will aggrade with sediment to near the top of the wedge-wire screen, and the resulting diversion pools will be shallower and more riverine. The area footprint of the new diversion pools will remain approximately similar to the existing diversion pools, but the water surface of the new diversion pools will be 1.3 to 3.1 feet higher. It is anticipated that the general distribution (i.e., locations of individual trees) of riparian vegetation will be similar under Alternative 1 and No-Action Alternative.

French Meadows Reservoir

Small changes in WSEs at French Meadows Reservoir under Alternative 1 will maintain riparian resources along the shoreline. There is relatively little riparian vegetation (6%) along the shoreline of French Meadows Reservoir due to the rock outcrops and steep side slopes and bedrock and coarse substrate along the shoreline. Most mature vegetation (primarily willows) is present in the upper end of the reservoir where gradients are lower and alluvium accumulates (between 5,252–5,256 feet mean sea level (msl)). These elevations will typically be inundated in late spring and early summer of wetter years (wet, above normal, and below normal water years) and become exposed through the summer under the No-Action Alternative. Under Alternative 1 (existing and future demand), average WSEs in the late spring and summer (April–August) will typically be slightly lower during all months compared to the No-Action Alternative (Existing License Conditions) (Appendix D). Due to the nature of the riparian vegetation and the habitat along the shoreline of French Meadows Reservoir and the small seasonal changes in reservoir WSE under Alternative 1, there will be no change to riparian vegetation compared to the No-Action Alternative.

Hell Hole Reservoir

Riparian resources around Hell Hole Reservoir will be maintained under Alternative 1 (existing and future demand) compared to the No-Action Alternative (Existing License Conditions). At Hell Hole Reservoir, riparian vegetation is present along approximately 17% of the shoreline, primarily at the upper end of the reservoir at the confluences of Five Lakes Creek, the Rubicon River, and another un-named tributary.

Changes in operations under Alternative 1 have the potential to affect riparian resources on the reservoir shoreline and along tributaries that flow into the reservoir by inundating vegetation more frequently (number of years), for longer periods of time, and under deeper water. Although riparian trees and shrubs are well adapted to surviving anoxic soil conditions that may occur with prolonged inundation, young sprouts that might be completely inundated for long periods of time will be susceptible to drowning. Operation changes could also reduce the amount of area for establishment if WSEs are high when seeds are dispersed and if WSEs continue to remain high through the growing season (timing). The potential effects of changes in operations under Alternative 1 on the riparian vegetation were analyzed by evaluating the frequency (number of years), duration (number of days per year) of inundation of the vegetation found at different elevations around the reservoir during the spring and summer (April–August), and timing of reservoir drawdown. A schematic of specific elevations around Hell Hole Reservoir associated with the No-Action Alternative (Existing License Conditions) and

Alternative 1 is provided and described in Section 3.6.1. In general, three areas were evaluated, Areas 1, 2a, and 2b. These areas and the existing riparian vegetation within each are described below.

- **Area 1** includes those portions of the riparian vegetation occurring at or below the current maximum normal operating WSE of 4,630 feet msl under the No-Action Alternative (Existing License Conditions). Approximately 2.4 acres of willows, with alders and black cottonwoods interspersed, occur along tributaries to Hell Hole Reservoir and 6.0 acres of willows are present along the shoreline of the reservoir.
- **Area 2a** includes those portions of the riparian vegetation occurring from the maximum normal operating WSE under the No-Action Alternative (4,630 feet msl) to 4,636 feet msl that will be seasonally inundated under Alternative 1 in some years. Approximately 0.14 acre of riparian vegetation, comprised of alders, willows, and cottonwoods (young, medium-aged, and old trees and shrubs), will be inundated during years when additional water is captured in Hell Hole Reservoir. Under the No-Action Alternative, this water will spill (Table 3.8-1).
- **Area 2b** includes those portions of the riparian vegetation occurring from 4,636 feet msl under Alternative 1 to the maximum flood pool WSE at 4,640 feet msl (both Alternative 1 and No-Action Alternative). Approximately 0.26 acre of woody riparian vegetation is present (primarily along Five Lake Creek) within Area 2b (Table 3.8-1).

Reservoir WSEs under Alternative 1 are likely to have minimum effect on existing riparian vegetation and riparian recruitment along the reservoir shoreline. Under existing conditions, riparian vegetation (willows, alders, and cottonwoods of various ages) is established at elevations that are inundated when the reservoir fills (below 4,630 feet msl). In addition, the timing of reservoir draw down is similar under the Alternative 1 and the No-Action Alternative; and therefore should not change the amount of area available for establishment. The effects Alternative 1 on the frequency and duration of inundation within each of these areas and along the tributaries is described below.

- **Area 1.** For elevations below 4,630 feet msl, based on reservoir modeled WSE traces, the frequency, duration, and timing of inundation will be very similar under Alternative 1 (future demand) compared to the No-Action Alternative (Appendix D).
- **Area 2a.** Riparian vegetation established between 4,630 and 4,636 feet msl (approximately 0.14 acre) will be inundated more frequently under Alternative 1 with future demand (1 more year) compared to the No-Action Alternative (Table 3.6-4 and Appendix D). The average duration of inundation during wet water years (7 years) is slightly more (5 days) under Alternative 1 (future demand) than under the No-Action Alternative (Existing License Conditions). The average duration of inundation during above normal (35 days) and below normal (14 days) water years is also longer under the Alternative 1 (future

demand) compared to the No-Action Alternative (Existing License Conditions) (14 and 7 days on average, respectively).

- **Area 2b.** The riparian vegetation (0.26 acre) within Area 2b (WSE 4,636 to 4,640 feet msl) is not inundated under the No-Action Alternative (Existing License Condition). Under Alternative 1 (future demand), vegetation within this area will be inundated during approximately 20% of the years (mostly wet water years) for approximately 21 days (and for as few as 5 days and as many as 37 days per year).
- **Tributaries.** Reservoir WSEs under Alternative 1 are likely to have a minimal effect on existing mature riparian trees and shrubs and riparian recruitment on the tributaries (e.g., Five Lakes Creek). Based on dating of tree cores from along Five Lakes Creek, tree recruitment along the tributaries is related to river high-flow events (e.g., after the 1985–1986 and 1995–1996 high water years) (PCWA 2011d) and not necessarily to reservoir WSEs.

3.8.2 Project Maintenance

Under Alternative 1, implementation of maintenance activities at Project facilities and features and Project recreation facilities and features could potentially result in the loss of riparian vegetation and wetland habitat. A summary of Project maintenance activities under Alternative 1 is provided in Section 2.0 – Elements Analyzed.

Project maintenance activities under the Alternative 1 that could affect riparian resources include sediment management activities, vegetation and noxious weed management, and annual and/or heavy routine maintenance activities at Project recreation facilities and features.

Sediment management under Alternative 1 is detailed in the Sediment Management Plan (SMP) (PCWA 2011b). Prior to implementation of sediment management activities, PCWA will consult with resource agencies and obtain appropriate permits. This may include a CDFG Streambed Alteration Agreement, United States Army Corps of Engineers (USACE) Section 404 Permit, Regional Water Quality Control Board 401 Certification, USDA-FS Road Use Permit, USDA-FS Special Use Authorization, etc. PCWA anticipates that preparation of a project-specific Water Quality Protection Plan (WQPP) will be a condition of the State Water Board 401 Certification. PCWA will develop a WQPP in consultation with the State Water Board prior to commencement of any construction activities.

Vegetation management, including noxious weed management, under Alternative 1 is detailed in the revised Vegetation and Integrated Pest Management Plan (VIPMP) (Attachment 1A). Routine annual and heavy maintenance at recreation facilities under Alternative 1 is detailed in the Recreation Plan (USDA-FS 2011; CDFG 2011). Refer to Section 2.0 – Elements Analyzed for Project maintenance activities and changes from the No-Action Alternative.

3.8.2.1 Sediment Management Activities

At the small diversion facilities, contingency sediment management activities specified in the SMP can include the removal of riparian vegetation that may accumulate within the diversion pools and restricts or threatens operations of the diversion facility or natural sediment transport downstream. Under existing conditions, some riparian vegetation is scattered along the western side and upper end of the Duncan Creek Diversion Pool; and a narrow riparian corridor is present along the stream banks of the South Fork Long Canyon Diversion Pool. However, minimal amounts of vegetation are established within the pools. Little to no riparian vegetation occurs around the North Fork Long Canyon Diversion Pool. Under Alternative 1, riparian vegetation is not expected to establish in areas that will threaten or restrict operation of facilities and need to be removed.

Under Alternative 1, sediment management activities and annual removal of riparian vegetation that may establish at the toe of the slopes at the Middle Fork Interbay Augmentation Areas (two locations), Junction Bar Augmentation Area, and Indian Bar Augmentation Area will affect riparian vegetation.

Activities associated with establishing the Indian Bar and Junction Bar Sediment Augmentation areas will result in the loss of approximately 0.91 acre of riparian habitat (Map 3.8-1 and Table 3.8-2) (PCWA 2011b). This includes 0.87 acre of vegetation that is established along the channel margins of the bars that will be removed to maximize the potential for sediment transport during high-flow events and to prevent berm formation (0.34 acre at Junction Bar and 0.53 acre at Indian Bar) and 0.04 acre that will be removed for the placement of the temporary bridge necessary to provide access to Junction Bar during sediment management activities.

At the Junction Bar Augmentation Area, the vegetation along the channel margins that will be removed includes alders and willows (0.34 acre), includes:

- Approximately 42 alders along the Middle Fork American River banks, averaging 12 to 15 feet in height and between 6 and 10 inches in diameter at breast height (dbh);
- Approximately 48 large, shrubby willows (10–12 feet tall, with varying stem densities [approximately 9–45 stems per individual]) along the river banks; and
- Seven shorter (smaller) willows (approximately 6–8 feet tall with 20–36 stems per individual) within the augmentation area.

At the Indian Bar Augmentation Area, approximately 0.53 acre of 4–5-foot-tall willow shrubs have become established along the channel edge of the bar since the last sediment augmentation activity in 2002 (Jones and Stokes 2002). These shrubs will be removed to maximize the potential for sediment transport during high-flow events and to prevent berm formation.

For the placement of the temporary bridge that will be necessary to provide access to Junction Bar during sediment management activities, approximately 0.01 acre will be removed from Junction Bar, 0.01 acre from Indian Bar, and 0.02 acre from Willow Bar.

At the sediment augmentation areas below Middle Fork Interbay, minimal riparian vegetation (herbaceous vegetation and potentially small willows and alders) exists due to the steep side slopes, coarse substrate, and periodic high flows (spills) that scour any vegetation that may establish.

Routine annual vegetation management at the sediment augmentation areas will prevent future establishment of riparian vegetation at the Junction Bar and Indian Bar Augmentation Areas, and at the augmentation areas below Middle Fork Interbay under Alternative 1 (Attachment 1A). In addition, vegetation will continue to be removed periodically for installation of the temporary bridge during sediment management activities.

3.8.2.2 Vegetation and Noxious Weed Management

Routine vegetation management, which includes trimming of vegetation by hand or with equipment, as well as limited application of herbicides, surfactants, or fungicides, could result in direct loss of riparian individuals. Other effects to riparian resources could include direct loss of individuals from trampling, and crushing or cutting resulting from vehicle and equipment use. Similar impacts could result from implementation of noxious weed management, which includes both manual (trimming by hand) and chemical (application of herbicides and surfactants) treatment of priority noxious weed populations.

The following AP measures included in the VIPMP in Alternative 1 will protect or enhance riparian resources occurring in or adjacent to vegetation management areas:

- Specific measures that restrict use of mechanical equipment within Riparian Conservation Areas;
- Specific fungicide application methods are required;
- Riparian vegetation at Project facilities, roads, trails, and recreation facilities and features will not be destroyed or removed (except at the six locations specified in the VIPMP; and
- Specific pesticide measures requiring supervision of herbicide application by a licensed pest control advisor (PCA) and restrictive application and disposal methods are required.

If it is determined that riparian vegetation must be removed during maintenance activities (excluding Project facilities specified in the VIPMP), PCWA will consult with the USDA-FS and the CDFG prior to removal. In addition, measures to limit the introduction and spread of noxious weeds near riparian resources will enhance riparian habitats through improving habitat conditions (i.e., reducing competition with noxious weeds).

3.8.2.3 Routine and Heavy Maintenance at Recreation Facilities

Routine annual and heavy maintenance at Project recreation facilities and features could affect riparian vegetation. Potential effects could include direct removal of vegetation and direct loss of individuals from trampling, and crushing or cutting resulting from vehicle and equipment use and ground disturbance associated with maintenance activities.

Implementation of Project maintenance activities at recreation facilities under Alternative 1 has the potential to result in the loss of riparian vegetation or wetland habitat at eight recreation facilities (PCWA 2006; PCWA 2007; PCWA 2011b) (Attachment 2A). Potential impacts to riparian and wetland resources and AP measures to be implemented are described below.

Hell Hole Campground

A seasonal wetland with a mixed conifer pine overstory is adjacent to the southern boundary of the campground. The wetland is located outside of the facility footprint (Recreation Plan, REC Plan Map 7 [USDA-FS 2011; CDFG 2011]). Under Alternative 1, facility enhancements at Hell Hole Campground include construction of access roads and parking areas within the campground footprint and providing a reliable and adequate drinking water source and delivery system to the campground. Additional enhancements that may also be implemented, depending on use, include conversion to a group campground or reduction in facility size. All Project recreation facility maintenance activities will occur within the campground footprint; and none will occur within the wetland.

Big Meadows Campground

An approximate 11.9 acre seasonal wetland occurs outside of the Big Meadows Campground footprint, approximately 140 feet south of the campground boundary (USFWS 2010) (Recreation Plan, REC Plan Map 8). Under Alternative 1, PCWA will enhance the campground by improving the campsites and access within the campground. All Project recreation facility maintenance activities will occur within the campground footprint.

Indian Bar Rafting Access

Narrow corridors of white alder and willow line the Indian Bar Rafting Access area (Map 3.8-1). Under Alternative 1, PCWA will replace the existing boat ramp and install a supplemental raft slide ramp downstream of the existing boat ramp within four years of license issuance. Potential locations for the supplemental raft slide ramp downstream of the existing boat ramp on Indian Bar are within the areas identified for sediment management activities and associated vegetation management, as described in Section 3.8.3.2.

Upper Hell Hole Campground

Several small, seasonally wet meadows and an ephemeral stream are located within Upper Hell Hole Campground (Recreation Plan, REC Plan Map 6). Under Alternative 1, PCWA will remove all the campsites and associated amenities at the campground and treat paths, barren and/or compacted areas to promote natural revegetation. These maintenance activities will reduce/eliminate recreation activities within the stream and meadows and allow for natural revegetation of the area.

French Meadows Picnic Area

An ephemeral stream with scattered willow shrubs and white alders drains into the south side of French Meadows Reservoir between French Meadows Picnic Area and the associated parking area (Map 3.8-2). Under Alternative 1, the French Meadows Picnic Area will be fully decommissioned and relocated. New pathways will be established between facilities to reduce impacts to surrounding area and existing barren and/or compacted areas will be treated to promote natural revegetation. These maintenance activities will improve the condition of the drainage and associated riparian vegetation.

Duncan Creek Diversion Primitive Recreation Site

Under Alternative 1, PCWA will address sanitation issues and reduce potential resource impacts related to dispersed recreation near the Duncan Creek Diversion Pool. As part of the maintenance activities, PCWA will install a toilet and barrier rocks around the perimeter of the recreation area to contain vehicle and recreation use within the primitive recreation area. Implementation of these activities will coincide with the Duncan Creek Diversion Modification (refer to Section 3.8.6 for a description of existing riparian resources and analysis of potential impacts). These maintenance activities will contain recreation use and parking to smaller areas at the dispersed recreation area.

Ralston Afterbay Sediment Removal Access Point Boat Ramp

A narrow continuous riparian corridor occurs along the perimeter of the bar where Ralston Afterbay Sediment Removal Access Point Boat Ramp maintenance activities will be implemented (Map 3.8-3). Specifically, medium-aged and mature alders and willows are located immediately adjacent to, but outside of, the unimproved boat ramp footprint. Under Alternative 1, PCWA will grade the existing unimproved ramp by removing cobbles and boulders, delineate the boat ramp and parking area, and stabilize the surface of the boat ramp and parking area. Maintenance activities will occur within the existing Project facility footprint and will not result in the removal of riparian vegetation. These maintenance activities will contain recreation use and parking to a smaller area on the bar.

Middle Fork American River above Ralston Afterbay Trail

Under existing conditions, a narrow riparian corridor comprised of young and medium-aged alders and willows is present along the perimeter of the bar where the new trail

terminates. Under Alternative 1, PCWA will upgrade the existing unimproved trail that extends from the Ralston Afterbay Picnic Area to base of the hillslope near Middle Fork America River gage upstream of Ralston Afterbay for pedestrian use (Map 3.8-3). No activities will occur along the perimeter of the bar near the channel where riparian vegetation is established.

3.8.3 Modification of Existing Project Facilities and Construction of New Project Facilities and Project Recreation Facilities and Features

Modification of existing facilities and construction of new facilities could potentially affect riparian resources. Potential impacts include direct loss of riparian individuals and degradation of habitat through trampling, crushing, or removal of individual plants as a result of use of heavy equipment and ground disturbance associated with modification and construction activities. Refer to Section 2.0 – Elements Analyzed, Appendix A, and the Recreation Plan for descriptions of the modification and construction activities to be implemented at Project recreation facilities and features under Alternative 1.

3.8.3.1 Project Facilities

Under Alternative 1, modification of existing or construction of new Project facilities could potentially affect riparian resources at only the following five locations: (1) Duncan Creek Diversion Dam Modification; (2) South Fork Long Canyon Creek Diversion Dam Modification; (3) Hell Hole Dam Outlet Works Modification; (4) South Fork Long Canyon Creek Gage below Diversion Dam; and (5) Middle Fork American River below Interbay Dam gage.

Small Diversion Modification

Under Alternative 1, modification of the existing small diversions will result in the removal of riparian vegetation at only two proposed facility modifications. Construction activities associated with the modification of these existing two facilities will result in a permanent loss of a total of approximately 0.06 acre of riparian vegetation at Duncan Creek Diversion Pool and South Fork Long Canyon Creek Diversion Pool. At Duncan Creek Diversion Pool, approximately 0.03 acre of riparian vegetation will be permanently removed for construction of the modified dam structure (Map 3.8-4 and Table 3.8-2). At South Fork Long Canyon Creek Diversion Pool, approximately 0.03 acre of willows and alders will be permanently removed for construction of the modified diversion structure (Map 3.8-5 and Table 3.8-2).

OUTLET WORKS MODIFICATION

Under Alternative 1, modification of the existing outlet works will result in the removal of riparian vegetation at only one location. At Hell Hole Dam Outlet Works, re-contouring of the Rubicon River channel in close proximity (approximately 650 feet) to the outlet works to accommodate the pulse flows will result in the removal of approximately 0.24 acre of riparian vegetation (Map 3.8-6 and Table 3.8-2). Riparian vegetation will be re-planted following completion of the re-contoured Rubicon River reach. The specifics of the revegetation (i.e., planting plan, species, number of plants, extent of area, etc.)

will be developed through the permitting process with the CDFG and USACE (Appendix A).

New Gage Construction

Under Alternative 1, construction of new gages and associated features (e.g., photovoltaic poles, powerlines, cableways, trails to access new gages, gage houses) could potentially adversely impact existing riparian resources at only two locations (PCWA 2006; PCWA 2011b) (Attachment 2A), and are described below.

SOUTH FORK LONG CANYON CREEK GAGE BELOW DIVERSION DAM AND ASSOCIATED FEATURES

A narrow continuous riparian corridor comprised of mature and young white alder and willows of mixed age classes is present within the areas where construction activities are proposed downstream of the diversion dam (Map 3.8-5) (PCWA 2011d, Appendix E; PCWA 2006). Construction of the gage and associated features could result in the removal of up to 0.01 acre of riparian vegetation.

MIDDLE FORK AMERICAN RIVER BELOW INTERBAY DAM GAGE AND ASSOCIATED FEATURES

Scattered young and medium-aged white alder trees and small willows are present along the stream margins in the vicinity of the new gage and associated features (Map 3.8-7). The vegetation is established on the stream bank or on relatively narrow alluvial or colluvial deposits at the base of the hillslopes (PCWA 2006). The new trail will extend from an existing unpaved turnout located along the Middle Fork Interbay Dam Road (Forest Service Road 96-17), to approximately 200 feet to the Middle Fork American River below Interbay Dam gage. The gage house will be located adjacent to the Middle Fork Interbay Dam Road. A bank operated cableway will be anchored into the rock wall on the left bank and into a large boulder on the right bank. Construction of the gage and associated features could impact up to 0.01 acre of riparian vegetation.

3.8.3.2 New Recreation Facilities

Under Alternative 1, construction of only two of the new recreation facilities could potentially affect riparian resources: (1) a new trail along the French Meadows Reservoir shoreline; and (2) replacement of the French Meadows Campground North Shore Water Supply Line.

French Meadows Reservoir Trail

Small patches of willows and alders are established along the French Meadows Reservoir shoreline and along intermittent small drainages that flow into French Meadows Reservoir (Map 3.8-2). The French Meadows Reservoir Trail will be approximately 5-feet wide, and will be constructed for pedestrian and bike use. The trail will be constructed on the south side of French Meadows Reservoir between the reservoir shoreline and Forest Road 96 and will connect French Meadows Campground and French Meadows Dam; although the final location of the trail has not been

determined. Trail construction will include clearing of trees and vegetation to allow for trail alignment and trail construction equipment. A maximum area of riparian and wetland vegetation that could potentially be impacted during trail construction was determined assuming a 10-foot wide construction area at each of the six drainages that flows into the south side of French Meadows Reservoir and the other riparian and wetland areas shown on Map 3.8-2. Based on this analysis, construction of the trail could impact up to 0.07 acre of riparian vegetation.

Water Supply Replacements

Under Alternative 1, PCWA will replace the 2.5-mile-long French Meadows North Shore Water Supply Line. All infrastructure including drains, valves, pipes, and other items will be replaced. In addition, the roads that access the supply lines will be upgraded to meet current USDA-FS standards (refer to the revised Transportation System Management Plan [TSMP] [Attachment 1B]).

Under Alternative 1, two segments of the existing approximately 2.5-mile-long French Meadows North Shore Water Supply Line (approximately 550 feet in total length) intersect areas that are likely jurisdictional wetlands⁴ (Map 3.8-8). One segment of the water supply line that intersects a seasonal wetland (75 feet in length) is located to the west of Lewis Campground (USFWS 2010) (Map 3.8-8, Sheet 1). The other segment (475 feet in length) is located east of Gates Group Campground and intersects a seasonally inundated wetland with willows and alders and a saturated wetland (USFWS 2010) (Map 3.8-8, Sheet 2). If PCWA identifies that replacement of one or both of these sections of the water line is required, the alignment of the new water line will be adjusted to avoid the existing riparian and wetland areas. The existing water line will remain in place and no construction activities will occur within the riparian and wetland areas. Therefore, wetland and riparian vegetation occurring in or adjacent to the water supply line and access road in the vicinity of these areas will not be removed or destroyed during replacement activities. A narrow riparian corridor, comprised of willows, alders, and cottonwoods, lines the channel margins upstream and downstream of the water supply line where the FS 96 Road crosses over the Middle Fork American River (Map 3.8-8) (PCWA 2007). Construction of the water supply line at this location could impact up to 0.02 acre of riparian vegetation.

Appendix A, Table A-2 includes best management practices and AP measures to be implemented for modification of existing or construction of new Project facilities. Following completion of site-specific engineering designs for construction projects identified in Section 2.0 – Elements Analyzed and Appendix A, PCWA will consult with resource agencies and review the measures included in Table A-2, and other applicable resource management plans, for adequacy in protecting riparian resources. If additional

⁴ Jurisdictional wetlands are those that are regulated by United States Army Corp of Engineers under Section 404 of the Clean Water Act.

site-specific construction measures are necessary, they will be developed in consultation with resource agencies and implemented as part of the project. Additionally, other appropriate permits necessary for modification of existing or construction of new Project facilities (e.g., CDFG Streambed Alteration Agreement, USACE Section 404 Permit, USDA-FS Road Use Permit, USDA-FS Special Use Authorization, etc.) will be obtained. Measures required in these permits or agreements to protect riparian resources will be implemented. PCWA also anticipates that preparation of a project-specific WQPP will be a condition of the State Water Board 401 Certification. PCWA will develop a WQPP with the State Water Board prior to commencement of any construction activities.

3.8.4 Conclusion—Riparian Resources

Although Alternative 1 could result in the loss of up to 1.32 acres of riparian/wetland habitat from Project maintenance activities and modification of existing or construction of new Project facilities and Project recreation facilities, implementation of Alternative 1 will result in an overall enhancement of riparian/wetland resources within the MFP by:

- Enhancing instream flow conditions in approximately 108 miles of rivers and streams associated with the MFP:
 - Restoring more natural sediment supply and transport in the bypass and peaking reaches;
 - Preserving or restoring high magnitude flows (scouring flows and recruitment flows) in the bypass and peaking reaches; and
 - Providing a more naturally shaped hydrograph, with a slowly declining recession.
- Constructing new outlet works modifications and gages that allow for the release and measurement of instream flows that will have long-term benefits to the riparian and aquatic ecosystems;
- Specifying AP measures for riparian vegetation during routine operations and maintenance activities and during modification/construction activities (Appendix A; VIPMP; and Recreation Plan);
- Implementing maintenance activities at Project recreation facilities that will contain recreational activities within smaller areas, which will reduce recreational use and potential disturbance to riparian and wetland areas in the vicinity of recreation facilities;
- Removing two campgrounds that will allow for disturbed riparian and meadow resources to naturally revegetate;
- Treating barren and compacted areas to promote natural revegetation (Appendix A; Recreation Plan), including:
 - Re-planting riparian vegetation following completion of the re-contoured Rubicon River reach.

- Conducting periodic monitoring of resource condition and agency consultation over the term of the license to:
 - Document riparian condition composition, age class structure, relative cover, community structure, position along the stream channel, and health) in the bypass and peaking reaches (PCWA 2011e).

These enhancements of riparian resources will more than adequately mitigate for the loss of riparian/wetland habitat and, therefore, will result in an overall enhancement of riparian and wetland resources (including distribution, abundance, and recruitment processes).

3.8.5 Unavoidable Adverse Effects

No unavoidable adverse effects to riparian resources have been identified under Alternative 1.

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TABLES

**Table 3.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir
Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement¹.**

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 1: Below Maximum Normal Operating Water Surface Elevation (4,630 feet msl)			
Rubicon River Upstream from Hell Hole Reservoir			
Alder and Willow	UH47	0.00	159
none	UH42	0.17	7,350
none	UH41	0.29	12,541
none	UH43	0.19	8,249
none	UH44	0.17	7,490
none	UH45	0.10	4,480
none	UH46	0.13	5,852
none	UH48	0.07	3,155
none	UH49	0.03	1,292
Total none		1.16	50,409
Total Woody Riparian Vegetation Area 1 Rubicon River		0.00	159
Five Lakes Creek			
Alder	UH18	0.06	2,728
Alder and Black Cottonwood	UH12	0.02	736
Alder and Willow	UH07	0.04	1,609
Alder and Willow	UH19	0.15	6,636
Alder and Willow	UH23	0.05	2,210
Alder and Willow	UH25	0.06	2,503
Alder and Willow	UH28	0.08	3,669
Alder and Willow	UH29	0.21	8,944
Alder and Willow	UH30	0.06	2,528
Total Alder and Willow		0.65	28,100
Alder, Willow and Black Cottonwood	UH08	0.02	782
Alder, Willow and Black Cottonwood	UH16	0.10	4,419
Alder, Willow and Black Cottonwood	UH27	0.09	3,911
Total Alder, Willow, and Black Cottonwood		0.21	9,111
Black Cottonwood	UH13	0.01	634
Black Cottonwood	UH21	0.01	554
Black Cottonwood	UH24	0.06	2,619
Total Black Cottonwood		0.09	3,807
none	UH09	0.02	941
none	UH10	0.02	846
none	UH14	0.01	461
none	UH26	0.06	2,634
Total none		0.11	4,881
Willow	UH17	0.11	4,707
Willow	UH20	0.08	3,343
Total Willow		0.18	8,050
Willow and Black Cottonwood	UH11	0.02	1,009
Willow and Black Cottonwood	UH15	0.39	16,787
Total Willow and Black Cottonwood		0.41	17,796
Total Area 1 Woody Riparian Vegetation Five Lakes Creek		1.61	70,328

**Table 3.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir
Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement¹
(continued).**

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Un-named Tributary			
Alder	UH36	0.03	1,232
California Wild Grape	UH32	0.19	8,372
California Wild Grape	UH34	0.09	3,989
Total California Wild Grape		0.28	12,361
none	UH35	0.09	4,067
none	UH37	0.06	2,617
none	UH39	0.16	6,854
Total None		0.31	13,538
Ponderosa Pine	UH31	0.03	1,406
Willow	UH33	0.09	3,794
Willow	UH40	0.55	23,903
Total Willow		0.64	27,698
Willow and California Wild Grape	UH38	0.07	3,175
Total Woody Riparian Vegetation Area 1 Un-named Tributary		0.77	33,510
Hell Hole Reservoir Shoreline			
Alder	H37	0.00	198
Alder and Willow	H42	0.41	17,994
Alder, Willow and Black Cottonwood	H52	0.13	5,479
Black Cottonwood	H38	0.04	1,696
Black Cottonwood	H50	0.01	641
Black Cottonwood	H67	0.01	456
Black Cottonwood	H95	0.00	186
Total Black Cottonwood		0.07	2,979
California Wild Grape	H11	0.02	1,042
California Wild Grape	H29	0.01	554
California Wild Grape	H30	0.05	2,389
California Wild Grape	H39	0.03	1,193
California Wild Grape	H63	0.05	1,986
California Wild Grape	H65	0.04	1,840
California Wild Grape	H66	0.04	1,919
California Wild Grape	H81	0.01	403
California Wild Grape	H82	0.02	724
California Wild Grape	H83	0.03	1,188
California Wild Grape	H84	0.01	447
Total California Wild Grape		0.31	13,684

Table 3.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement¹ (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Willow	H01	0.00	189
Willow	H04	0.24	10,654
Willow	H05	0.01	361
Willow	H06	0.01	361
Willow	H07	0.01	493
Willow	H08	0.01	302
Willow	H09	0.01	552
Willow	H10	0.02	804
Willow	H13	0.10	4,378
Willow	H14	0.06	2,806
Willow	H15	0.00	179
Willow	H16	0.05	2,326
Willow	H17	0.08	3,286
Willow	H18	0.02	922
Willow	H19	0.01	414
Willow	H20	0.01	327
Willow	H21	0.01	340
Willow	H22	0.03	1,477
Willow	H23	0.01	288
Willow	H24	0.01	384
Willow	H25	0.01	283
Willow	H26	0.04	1,751
Willow	H27	0.34	14,676
Willow	H28	0.02	669
Willow	H33	0.03	1,100
Willow	H35	0.25	11,025
Willow	H36	0.02	814
Willow	H41	0.01	316
Willow	H43	0.00	102
Willow	H44	0.25	10,963
Willow	H45	0.10	4,530
Willow	H47	0.26	11,268
Willow	H48	0.02	662
Willow	H49	0.04	1,942
Willow	H51	0.02	824
Willow	H53	0.00	215
Willow	H54	0.01	242
Willow	H55	0.01	514
Willow	H56	0.01	290
Willow	H57	0.04	1,541
Willow	H58	0.05	2,141
Willow	H59	0.01	653
Willow	H60	0.37	15,956
Willow	H61	0.01	497
Willow	H62	0.01	556
Willow	H68	0.12	5,304
Willow	H69	0.05	2,066

Table 3.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement¹ (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Willow	H70	0.01	576
Willow	H71	0.02	677
Willow	H72	0.02	858
Willow	H73	0.01	399
Willow	H74	0.02	682
Willow	H75	0.03	1,120
Willow	H76	0.01	457
Willow	H77	0.01	496
Willow	H78	0.02	1,070
Willow	H79	0.02	659
Willow	H80	0.02	795
Willow	H85	0.03	1,482
Willow	H87	0.02	763
Willow	H88	0.16	6,873
Willow	H89	0.00	62
Willow	H90	0.02	849
Willow	H91	0.00	65
Willow	H93	0.13	5,823
Willow	H94	0.61	26,434
Willow	H96	0.00	90
Willow	H97	0.01	411
Willow	H98	0.00	31
Willow	H99	0.01	337
Total Willow		3.97	172,754
Willow and Black Cottonwood	H02	0.10	4,514
Willow and Black Cottonwood	H03	0.42	18,186
Willow and Black Cottonwood	H12	0.10	4,438
Willow and Black Cottonwood	H32	0.18	8,009
Willow and Black Cottonwood	H34	0.01	341
Willow and Black Cottonwood	H64	0.15	6,541
Willow and Black Cottonwood	H92	0.03	1,375
Total Willow and Black Cottonwood		1.00	43,405
Willow, Black Cottonwood and California Wild Grape	H86	0.41	17,834
Total Woody Riparian Vegetation Area 1 Hell Hole Reservoir Shoreline		5.98	260,643
Total Woody Riparian Vegetation Area 1		8.37	364,640

Table 3.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement¹ (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 2a: Between Maximum Normal Operating Water Surface Elevation (4,630 feet msl) and New Maximum Operating Water Surface Elevation Associated with the Installation of a 6-foot Spillway Gate (4,636 feet msl)			
Rubicon River Upstream from Hell Hole Reservoir			
none	UH43	0.01	526
none	UH44	0.00	31
none	UH45	0.05	2,056
none	UH46	0.04	1,582
none	UH48	0.02	725
none	UH49	0.03	1,399
Total none		0.15	6,318
Total Woody Riparian Vegetation Area 2a Rubicon River		0.00	0
Five Lakes Creek			
Alder and Willow	UH07	0.03	1,095
Alder, Willow and Black Cottonwood	UH08	0.03	1,262
Black Cottonwood	UH13	0.01	518
none	UH09	0.00	87
none	UH10	0.01	328
Total none		0.01	415
Willow and Black Cottonwood	UH11	0.00	171
Total Riparian Vegetation Area 2a Five Lakes Creek		0.07	3,045
Un-named Tributary			
Ponderosa Pine	UH31	0.00	2
California Wild Grape	UH32	0.00	1
Total Woody Riparian Vegetation Area 2a Un-named Tributary		0.00	0
Hell Hole Reservoir Shoreline			
Alder and Willow	H42	0.03	1,219
Black Cottonwood	H67	0.00	4
California Wild Grape	H63	0.00	159
California Wild Grape	H66	0.03	1,154
California Wild Grape	H81	0.02	1,081
California Wild Grape	H84	0.01	384
Total California Wild Grape		0.06	2,779
Willow	H04	0.00	68
Willow	H17	0.01	228
Willow	H20	0.00	80
Willow	H45	0.01	575
Willow	H58	0.00	14
Willow	H73	0.01	422
Willow	H75	0.00	21
Total Willow		0.03	1,407
Willow, Black Cottonwood and California Wild Grape	H86	0.01	438
Total Woody Riparian Vegetation Area 2a Hell Hole Reservoir Shoreline		0.07	3,069
Total Woody Riparian Vegetation Area 2a		0.14	6,114

Table 3.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement¹ (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 2b: New Maximum Operating Water Surface Elevation Associated with the Installation of a 6-foot Spillway Gate (4,636 feet msl) to Approximately 100 feet Above Normal Maximum Operating Water Surface Elevation (4,640 feet msl)			
Rubicon River Upstream from Hell Hole Reservoir			
none	UH45	0.01	423
none	UH46	0.01	349
none	UH48	0.03	1,447
none	UH49	0.02	956
Total none		0.07	3,175
Alder	UH53	0.00	187
Alder	UH52	0.00	179
Alder	UH51	0.00	144
Alder	UH55	0.01	576
Total Alder		0.02	1,086
Total Woody Riparian Vegetation Area 2b Rubicon River		0.02	1,086
Five Lakes Creek			
Alder	UH03	0.08	3,275
Alder and Black Cottonwood	UH02	0.04	1,586
Alder and Willow	UH04	0.01	274
Alder and Willow	UH06	0.01	586
Alder and Willow	UH05	0.04	1,806
Alder and Willow	UH07	0.04	1,923
Total Alder and Willow		0.10	4,320
Alder, Willow and Black Cottonwood	UH08	0.01	330
Willow	UH01	0.00	172
Total Woody Riparian Vegetation Area 2b Five Lakes Creek		0.23	9,953
Hell Hole Reservoir Shoreline			
California Wild Grape	H66	0.00	53
California Wild Grape	H81	0.00	14
Total California Wild Grape		0.01	67
Willow, Black Cottonwood and California Wild Grape	H86	0.00	206
Total Woody Riparian Vegetation Area 2b Hell Hole Reservoir Shoreline		0.00	206
Total Woody Riparian Vegetation Area 2b		0.26	11,244

¹Refer to PCWA 2011d for additional information.

²Map polygon numbers refer to the polygons labeled on maps (PCWA 2011d, Appendices H and I).

Table 3.8.2. Potential Loss of Individuals from Existing Facility Modification and Construction of New Facilities and Sediment Management Activities.

Location	Species	Potential Loss (Acres)
Existing Facility Modification and Construction of New Project Facilities		
South Fork Long Canyon Diversion Pool	Willow and Alder	0.03
Duncan Creek Diversion Pool	Willow and Alder	0.03
Hell Hole Dam Outlet Works	Alder	0.24
South Fork Long Canyon Creek Gage below Diversion Dam and Associated Features	Willow and Alder	0.01
Middle Fork American River below Interbay Dam Gage and Associated Features	Willow and Alder	0.01
Sub-Total		0.32
Sediment Management Activities¹		
Temporary Bridge Placement		
Junction Bar	Willow	0.01
Willow Bar	Willow	0.02
Indian Bar	Willow	0.01
Sub-Total		0.04
Establishment/Maintenance of Sediment Augmentation Areas²		
Junction Bar	Willow and Alder	0.34
Indian Bar	Willow	0.53
Sub-Total		0.87
Construction of New Project Recreation Facilities		
French Meadows Reservoir Trail	Willow and Alder	0.07
French Meadows North Shore Water Supply Line	Willow, Alder, Cottonwood	0.02
Sub-Total		0.09
TOTAL		1.32

¹Riparian vegetation that may develop within small diversion pools will be removed, as part of Contingency Sediment Management activities.

²Riparian vegetation will be removed from the channel margins of the bars to maximize the potential for sediment transport during high-flow events and to prevent berm formation.

Table 3.8-3a. Average Number of Riparian Recruitment Days (May and June Only) by Water Year Type and Total Number of Riparian Recruitment Days by Year for Existing Flow Conditions (Impaired) (1975–2007) in the Large Bypass Streams.

Site/Release Location	Flow Threshold ¹ (cfs)	WYT	Alternative 1				No-Action Alternative ²			
			Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵	Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵
Large Bypass Streams										
Middle Fork American River below French Meadows Dam										
MF44.7	343	Wet	118	12	12	10 / 10	77	8	11	7 / 10
		Abv Normal	31	5	5	6 / 6	24	4	12	2 / 6
		Blw Normal	8	1	4	2 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	157	---	---	18 / 33	101	---	---	9 / 33
MF36.2	702	Wet	59	6	12	5 / 10	53	5	9	6 / 10
		Abv Normal	21	4	4	5 / 6	3	1	3	1 / 6
		Blw Normal	1	0	1	1 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	81	---	---	11 / 33	56	---	---	7 / 33
Middle Fork American River below Middle Fork Interbay Dam										
MF35.5	322	Wet	261	26	26	10 / 10	197	20	28	7 / 10
		Abv Normal	58	10	10	6 / 6	17	3	17	1 / 6
		Blw Normal	8	1	4	2 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	327	---	---	18 / 33	214	---	---	8 / 33
MF26.2	532	Wet	196	20	22	9 / 10	125	13	21	6 / 10
		Abv Normal	31	5	6	5 / 6	7	1	7	1 / 6
		Blw Normal	6	1	3	2 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	233	---	---	16 / 33	132	---	---	7 / 33

Table 3.8-3a. Average Number of Riparian Recruitment Days (May and June Only) by Water Year Type and Total Number of Riparian Recruitment Days by Year for Existing Flow Conditions (Impaired) (1975–2007) in the Large Bypass Streams (continued).

Site/Release Location	Flow Threshold ¹ (cfs)	WYT	Alternative 1				No-Action Alternative ²			
			Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵	Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵
Large Bypass Streams (continued)										
Rubicon River below Hell Hole Dam										
R25.7	500	Wet	111	11	19	6 / 10	120	12	17	7 / 10
		Abv Normal	16	3	16	1 / 6	14	2	14	1 / 6
		Blw Normal	0	0	0	0 / 6	2	0	2	1 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	127	---	---	7 / 33	136	---	---	9 / 33
R20.9	678	Wet	123	12	21	6 / 10	124	12	21	6 / 10
		Abv Normal	19	3	19	1 / 6	13	2	13	1 / 6
		Blw Normal	0	0	0	0 / 6	1	0	1	1 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	142	---	---	7 / 33	138	---	---	8 / 33
R3.5	2,198	Wet	30	3	8	4 / 10	37	4	7	5 / 10
		Abv Normal	3	1	3	1 / 6	3	1	3	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	33	---	---	5 / 33	40	---	---	6 / 33

Table 3.8-3a. Average Number of Riparian Recruitment Days (May and June Only) by Water Year Type and Total Number of Riparian Recruitment Days by Year for Existing Flow Conditions (Impaired) (1975–2007) in the Large Bypass Streams (continued).

Site/Release Location	Flow Threshold ¹ (cfs)	WYT	Alternative 1				No-Action Alternative ²			
			Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵	Total # of Days	Average # of Days ³	Event Year Average # of Days ⁴	Number of Years ⁵
Large Bypass Streams (continued)										
Middle Fork American River below Ralston Afterbay										
MF24.2	6,581	Wet	7	1	2	3 / 10	7	1	2	3 / 10
		Abv Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	8	---	---	4 / 33	8	---	---	4 / 33
MF14.1	6,674	Wet	7	1	2	3 / 10	7	1	2	3 / 10
		Abv Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	8	---	---	4 / 33	8	---	---	4 / 33
MF4.8	6,797	Wet	7	1	2	3 / 10	7	1	2	3 / 10
		Abv Normal	1	0	1	1 / 6	1	0	1	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6
		Total	8	---	---	4 / 33	8	---	---	4 / 33

¹For the purposes of this analysis, the magnitude of the recruitment flow was at least equal to or greater than the magnitude of the flow required to initiate gravel motion (PCWA 2011c) and approximately the flow at which increases in the width and depth of inundation with increased flow changed very little (PCWA 2011d, Appendix B).

²No-Action Alternative = Historical hydrology (1975–2007).

³Total number of event days / number of years in water year type.

⁴Total number of event days / number of years with events in water year type.

⁵Number of years with events / total number of years in water year type.

Table 3.8-3b. Average Number of Riparian Recruitment Days (May and June Only) by Water Year Type and Total Number of Riparian Recruitment Days by Year for Existing Flow Conditions (Impaired) (1975–2007) in the Small Bypass Streams.

Site/Release Location	Flow Threshold ¹ (cfs)	WYT	Alternative 1				No-Action Alternative ²				Existing License Conditions ³			
			Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶
Small Bypass Streams														
Duncan D6.3	149	Wet	53	5	8	7 / 10	42	4	7	6 / 10	4	0	2	2 / 10
		Abv Normal	26	4	5	5 / 6	12	2	6	2 / 6	3	1	3	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	79	---	---	12 / 33	54	---	---	8 / 33	7	---	---	3 / 33
Duncan D0.0	383	Wet	12	1	3	4 / 10	13	1	3	4 / 10	4	0	2	2 / 10
		Abv Normal	3	1	2	2 / 6	4	1	4	1 / 6	1	0	1	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	15	---	---	6 / 33	17	---	---	5 / 33	5	---	---	3 / 33
North Fork Long Canyon Creek	29	Wet	38	4	8	5 / 10	91	9	18	5 / 10	2	0	2	1 / 10
		Abv Normal	13	2	3	4 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	51	---	---	9 / 33	91	---	---	5 / 33	2	---	---	1 / 33
South Fork Long Canyon Creek	40	Wet	64	6	9	7 / 10	112	11	22	5 / 10	2	0	2	1 / 10
		Abv Normal	27	5	5	5 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	91	---	---	12 / 33	112	---	---	5 / 33	2	---	---	1 / 33

Table 3.8-3b. Average Number of Riparian Recruitment Days (May and June Only) by Water Year Type and Total Number of Riparian Recruitment Days by Year for Existing Flow Conditions (Impaired) (1975–2007) in the Small Bypass Streams (continued).

Site/Release Location	Flow Threshold ¹ (cfs)	WYT	Alternative 1				No-Action Alternative ²				Existing License Conditions ³			
			Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶	Total # of Days	Average # of Days ⁴	Event Year Average # of Days ⁵	Number of Years ⁶
Small Bypass Streams (continued)														
Long Canyon Creek LC9.0	197	Wet	11	1	4	3 / 10	38	4	8	5 / 10	3	0	2	2 / 10
		Abv Normal	4	1	4	1 / 6	4	1	4	1 / 6	3	1	3	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	15	---	---	4 / 33	42	---	---	6 / 33	6	---	---	3 / 33
Long Canyon LC0.0	652	Wet	4	0	2	2 / 10	9	1	5	2 / 10	4	0	2	2 / 10
		Abv Normal	2	0	2	1 / 6	2	0	2	1 / 6	2	0	2	1 / 6
		Blw Normal	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Dry	0	0	0	0 / 5	0	0	0	0 / 5	0	0	0	0 / 5
		Critical	0	0	0	0 / 6	0	0	0	0 / 6	0	0	0	0 / 6
		Total	6	---	---	3 / 33	11	---	---	3 / 33	6	---	---	3 / 33

¹For the purposes of this analysis, the magnitude of the recruitment flow was at least equal to or greater than the magnitude of the flow required to initiate gravel motion (PCWA 2011c) and approximately the flow at which increases in the width and depth of inundation with increased flow changed very little (PCWA 2011d, Appendix B).

²No-Action Alternative = Historical hydrology (1975–2007).

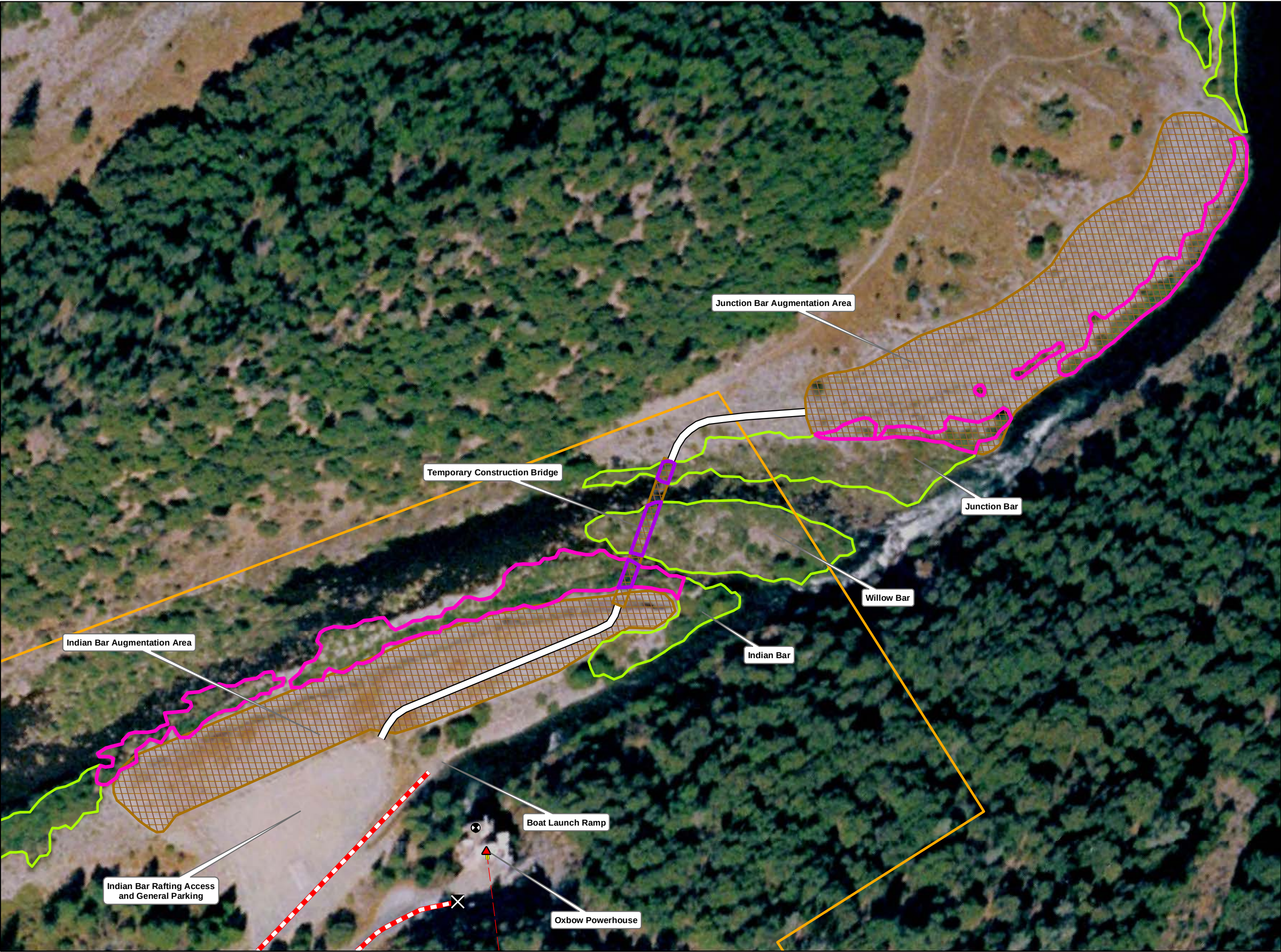
³Existing License Conditions = Operations model run using existing FERC license conditions and current demand.

⁴Total number of event days / number of years in water year type.

⁵Total number of event days / number of years with events in water year type.

⁶Number of years with events / total number of years in water year type.

MAPS



PCWA Facilities and Features

- Dam
- Ancillary and Other Facilities
- Powerhouse
- Gage
- Penstock
- Tunnel
- Pipeline
- Gate
- FERC Boundary - Current

Transportation

- Non-Project General Access Road
- Project Road
- Project Trail / Proposed Project Trail
- Recreation Access Road
- Recreation Facility Water Supply Access Road or Trail
- Other Road

Sediment Management: Related Features

- Staging Area
- Construction Area
- Temporary Construction Road

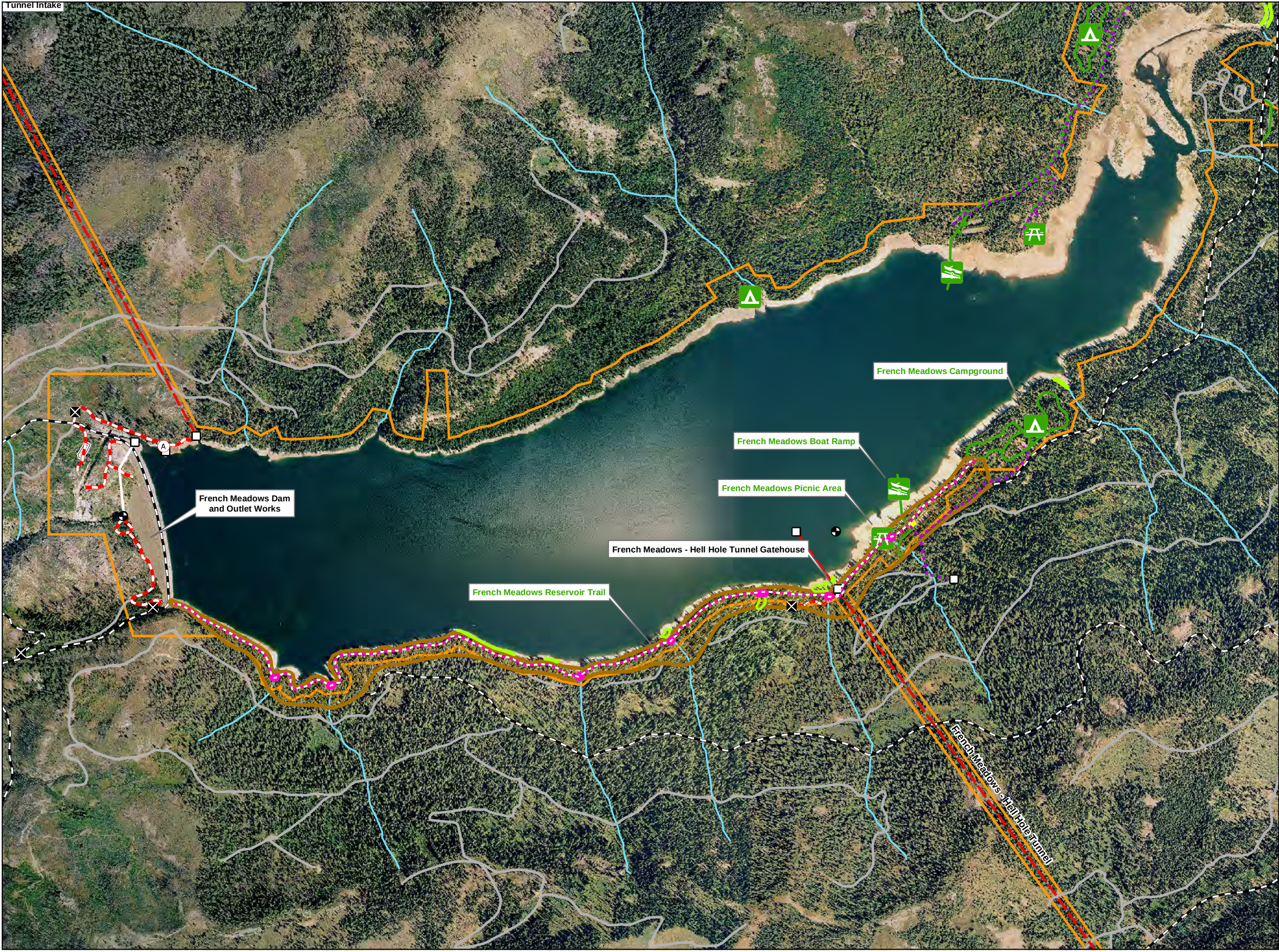
Riparian Vegetation

- Extant
- Extant - to be removed for Temporary Bridge Placement
- Extant - to be removed for Establishment / Maintenance of Sediment Augmentation Areas


Placer County Water Agency
Middle Fork American River Project

Map 3.8-1
Riparian Vegetation in the Vicinity of Junction Bar and Indian Bar Sediment Augmentation Areas

 0 25 50 100 Feet
Projection: Ca. Stateplane, Zone 2
Datum: NAD 83
Date: 10/14/11



PCWA Facilities and Features

Dam

Ancillary and Other Facilities

Powerhouse

Gage

Penstock

Tunnel

Pipeline

Gate

FERC Boundary - Current

Transportation

Non-Project General Access Road

Project Road

Project Trail / Proposed Project Trail

Recreation Access Road

Recreation Facility Water Supply Access Road or Trail

Other Road

Site Construction

Staging Area

Construction Area

Temporary Construction Road

Riparian Vegetation

Extant

Extant - to be removed



Placer County Water Agency
Middle Fork American River Project

Map 3.8-2

Riparian Vegetation in the Vicinity of
the French Meadows Reservoir Trail

W

E

N

S

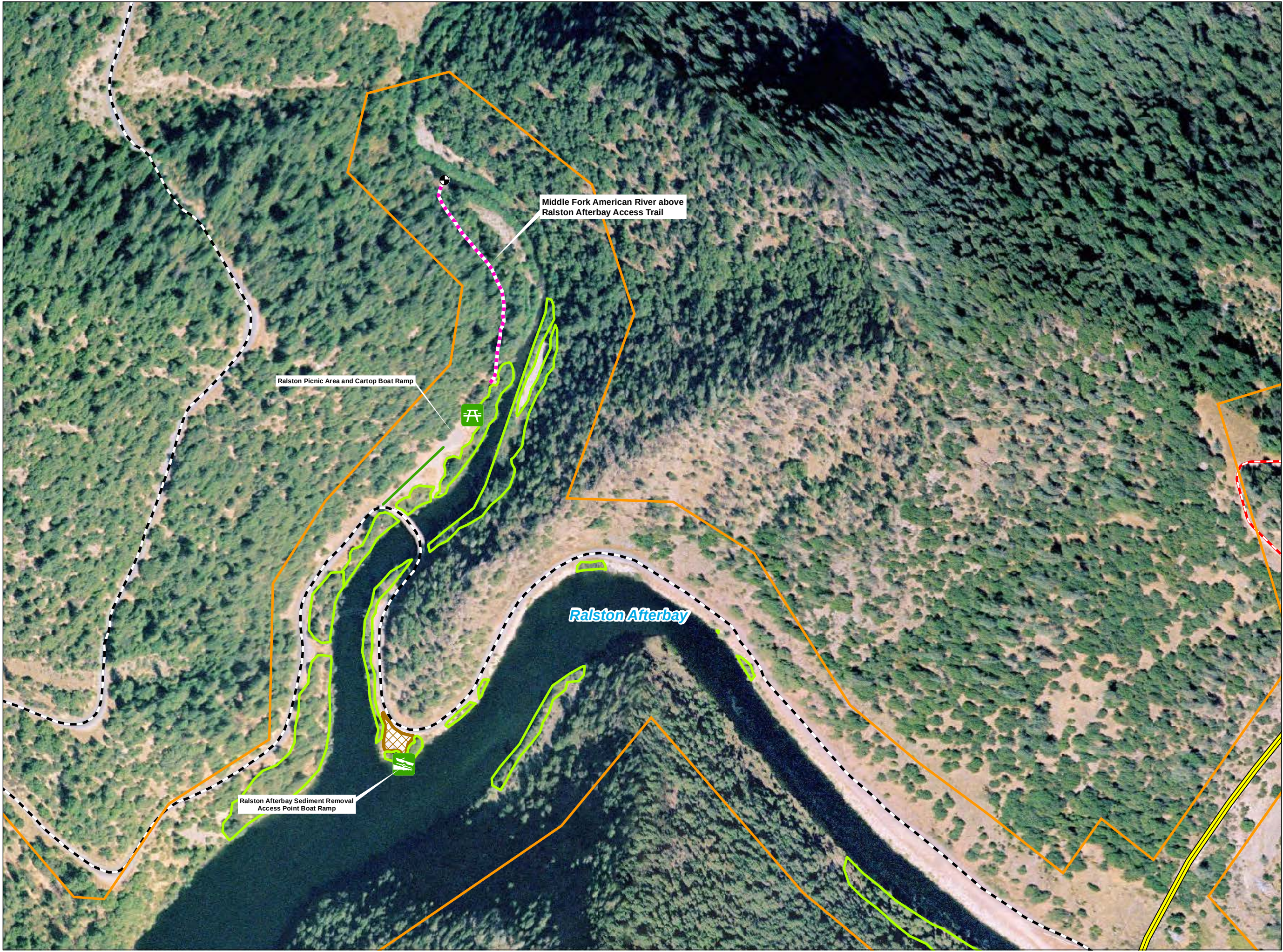
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Feet

Projection: Ca. Stateplane, Zone 2

Date: 10/31/11

Datum: NAD 83



PCWA Facilities and Features

Dam

Ancillary and Other Facilities

Powerhouse

Gage

Penstock

Tunnel

Pipeline

Gate

FERC Boundary - Current

Transportation

Non-Project General Access Road

Project Road

Project Trail / Proposed Project Trail

Recreation Access Road

Recreation Facility Water Supply Access Road or Trail

Other Road

Site Construction

Staging Area

Construction Area

Temporary Construction Road

Riparian Vegetation

Extant

Extant - to be removed

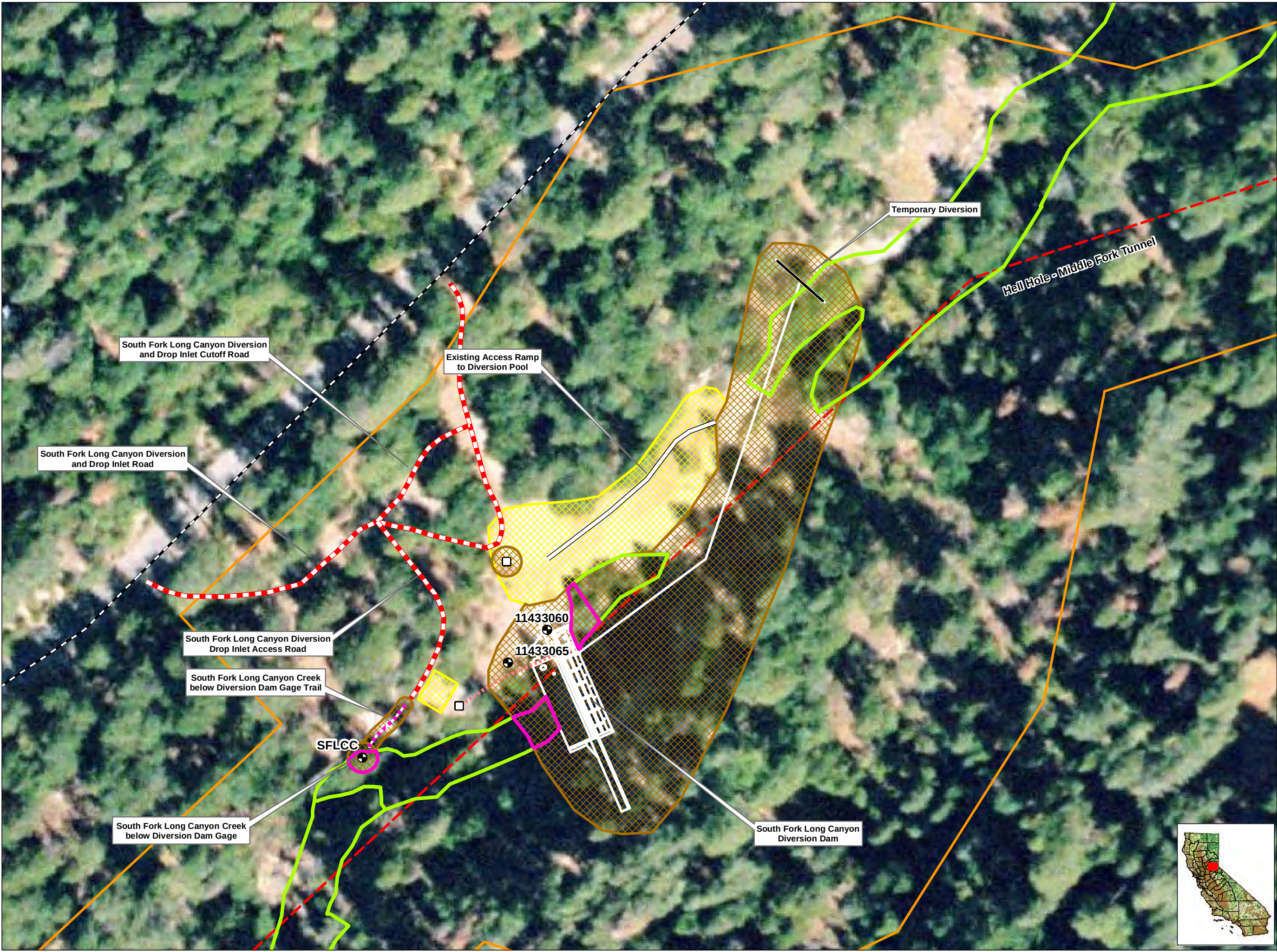
Placer County Water Agency
Middle Fork American River Project

Map 3.8-3

Riparian Vegetation in the Vicinity of the
Ralston Afterbay Picnic Area and Ralston
Afterbay Sediment Removal Access Point
Boat Ramp

Projection: CA State Plane, Zone 2
Datum: NAD 83

Date: 10/14/21



PCWA Facilities and Features

Dam

Ancillary and Other Facilities

Powerhouse

Gage

Penstock

Tunnel

Pipeline

Gate

FERC Boundary - Current

Transportation

Non-Project General Access Road

Project Road

Project Trail / Proposed Project Trail

Recreation Access Road

Recreation Facility Water Supply Access Road or Trail

Other Road

Sediment Management: Related Features

Staging Area

Construction Area

Temporary Construction Road

Riparian Vegetation

Extant

Extant - to be removed

PCWA
Placer County Water Agency
Middle Fork American River Project

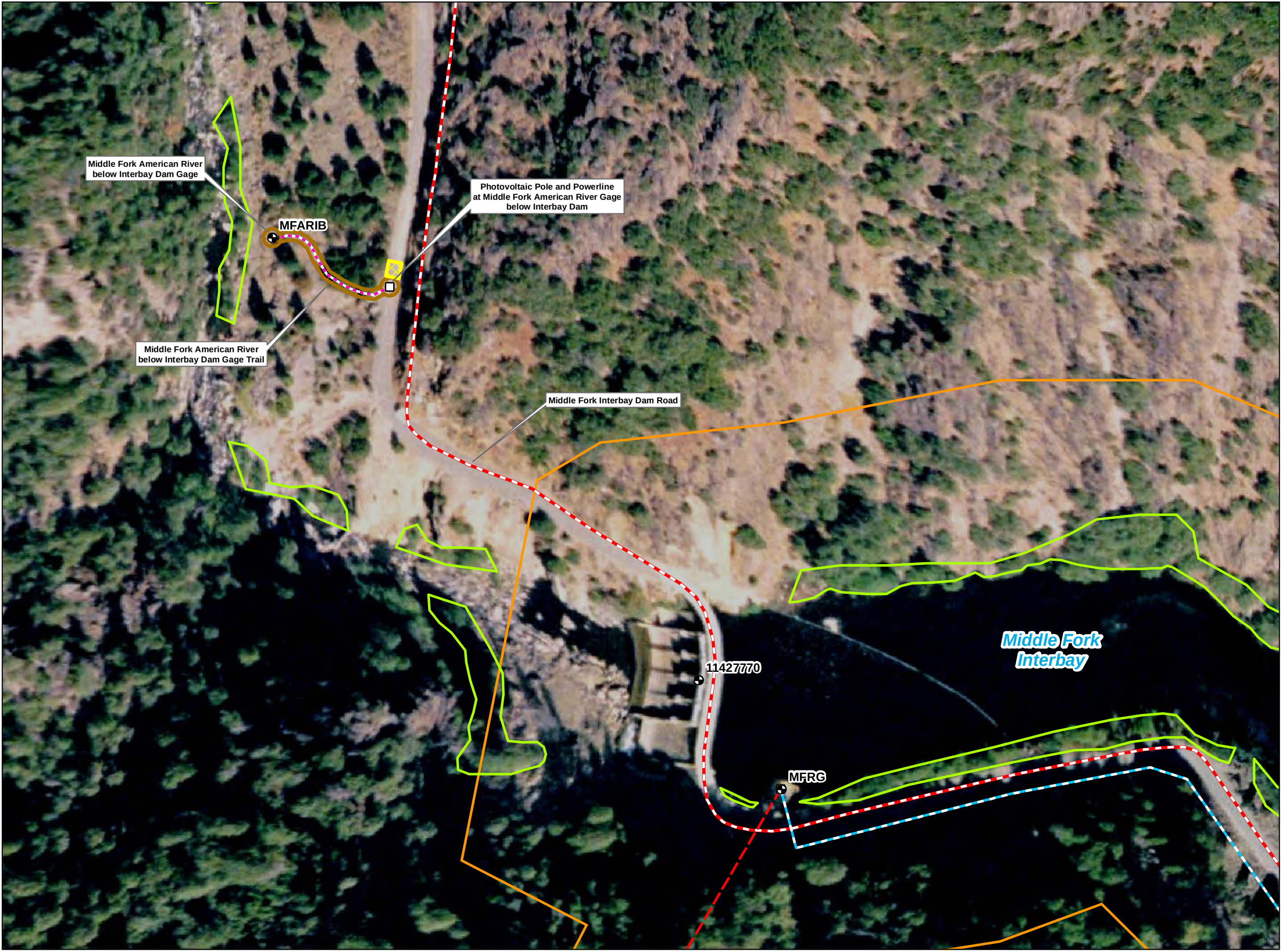
Map 3.8-5
**Riparian Vegetation in the Vicinity of
South Fork Long Canyon Diversion and
the South Fork Long Canyon Creek Diversion
Gage and Associated Features**

0 25 50
Feet

Date: 10/31/11

Projection: Ca. Stateplane, Zone 2
Datum: NAD 83

Z:\Entrix\3116501\map\BetermentsMaps\Intake Sediment Control\PCWA_IntakeSedControl_17i11i_10_SFLongCanyon_Riparian.mxd



PCWA Facilities and Features

- Dam
- Ancillary and Other Facilities
- Powerhouse
- Gage
- Penstock
- Tunnel
- Pipeline
- Gate
- FERC Boundary - Current

Transportation

- Non-Project General Access Road
- Project Road
- Project Trail / Proposed Project Trail
- Recreation Access Road
- Recreation Facility Water Supply Access Road or Trail
- Other Road

Site Construction

- Staging Area
- Construction Area
- Temporary Construction Road

Riparian Vegetation

- Extant
- Extant - to be removed

Placer County Water Agency
Middle Fork American River Project

Map 3.8-7
Riparian Vegetation in the Vicinity of the Middle Fork American River below Interbay Dam Gage and Associated Features

Projection: Ca. Stateplane, Zone 2
Datum: NAD 83

Date: 10/17/11



PCWA Facilities and Features

Dam

Ancillary and Other Facilities

Powerhouse

Gage

Penstock

Tunnel

Pipeline

Gate

FERC Boundary - Current

Transportation

Non-Project General Access Road

Project Road

Project Trail / Proposed Project Trail

Recreation Access Road

Recreation Facility Water Supply Access Road or Trail

Other Road

Site Construction

Staging Area

Construction Area

Temporary Construction Road

Riparian Vegetation

Extant*

Extant - to be removed

Wetland Habitat*

Extant

Extant - to be removed

* SOURCE: USFWS, 1977 - Present

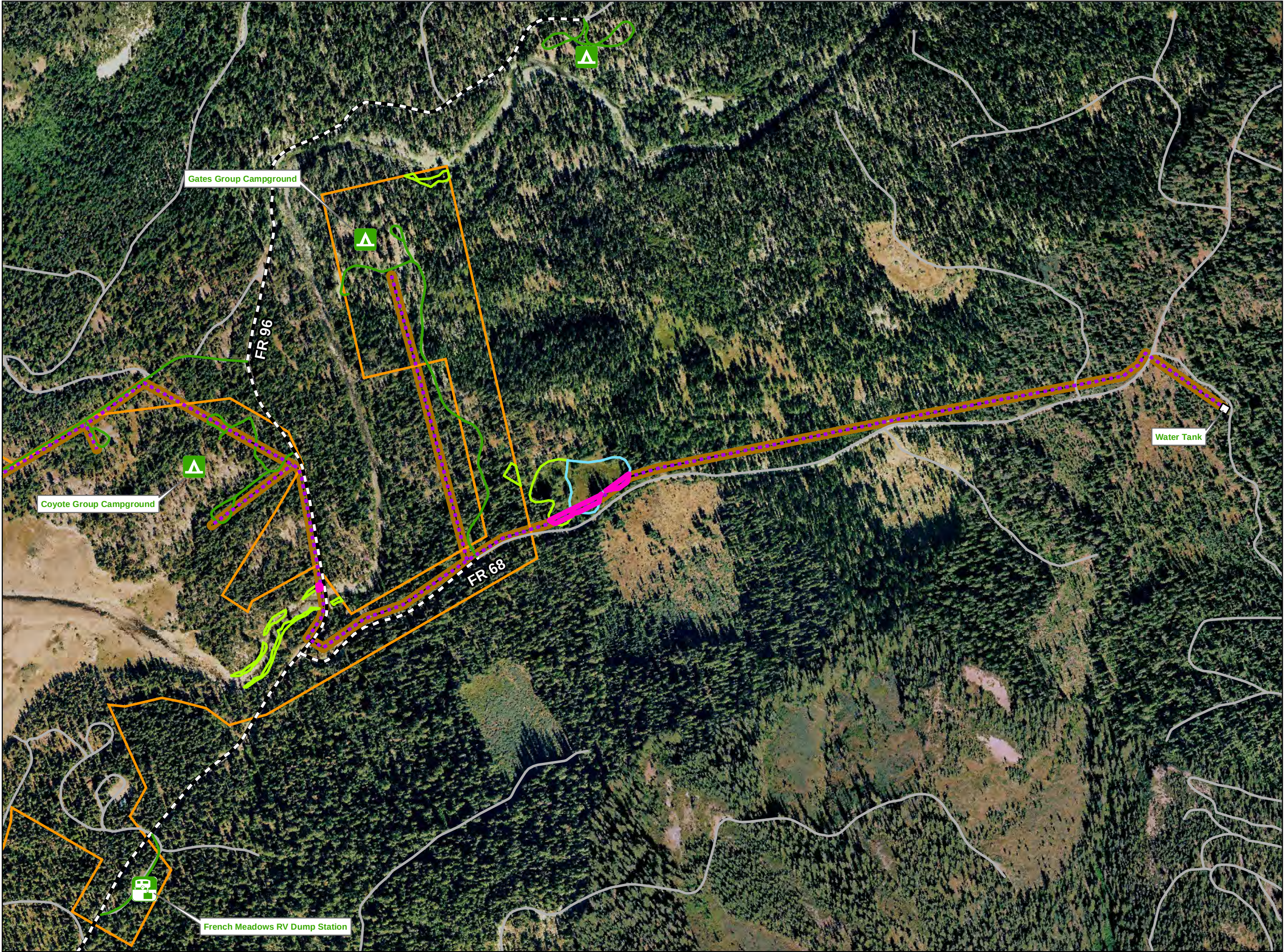
Placer County Water Agency
Middle Fork American River Project

Map 3.8-8
**Riparian Vegetation and Wetland Habitats
in the Vicinity of the French Meadows
North Shore Water Supply Line**
Sheet 1 of 2

0 250 500
Feet

Projection: Ca. Stateplane, Zone 2
Datum: NAD 83

Date: 10/17/11



PCWA Facilities and Features

Dam

Ancillary and Other Facilities

Powerhouse

Gage

Penstock

Tunnel

Pipeline

Gate

FERC Boundary - Current

Transportation

Non-Project General Access Road

Project Road

Project Trail / Proposed Project Trail

Recreation Access Road

Recreation Facility Water Supply Access Road or Trail

Other Road

Site Construction

Staging Area

Construction Area

Temporary Construction Road

Riparian Vegetation

Extant*

Extant - to be removed

Wetland Habitat*

Extant

Extant - to be removed

* SOURCE: USFWS, 1977 - Present

Placer County Water Agency
Middle Fork American River Project

Map 3.8-8
**Riparian Vegetation and Wetland Habitats
in the Vicinity of the French Meadows
North Shore Water Supply Line**
Sheet 2 of 2

Projection: Ca. Stateplane, Zone 2
Datum: NAD 83

Date: 10/17/11

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3.9 RECREATION RESOURCES ENVIRONMENTAL EFFECTS

This section describes potential impacts to recreation resources under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facilities Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to recreation resources were identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance at existing Project recreation facilities; maintenance at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section.

Potential impacts to recreation resources consider whether implementation of Alternative 1 will modify recreation use or opportunities. Alternative 1 includes measures that will enhance MFP recreation opportunities. Therefore, this section also describes potential benefits of Alternative 1 compared to the No-Action Alternative.

The following were evaluated:

- Potential impacts to the values for which the Rubicon River is considered eligible for inclusion in the National Wild and Scenic River System from:
 - Changes in Project operations that affect flow; and
 - Construction of the Ellicott Bridge Parking Area.
- Potential impacts to the values for which the Middle Fork American River and North Fork American River are considered eligible for inclusion in the National Wild and Scenic River System from:
 - Changes in Project operations that affect flow;
 - Dissemination of real-time flow information;
 - Sediment augmentation activities at Indian Bar and Junction Bar; and
 - Installation of the North Fork American River Gage upstream of American River Pump Station.
- Potential impacts related to status of the Rubicon River as a Wild Trout Stream from:
 - Changes in Project operations that affect flow in the Rubicon River; and
 - Construction of the Ellicott Bridge Parking Area.

- Potential impacts related to use of the Western States Trail (WST) from:
 - Changes in Project operations that affect flow in the peaking reach where the WST crosses the Middle Fork American River;
 - Implementation of trail improvements; and
 - Development of recreation opportunity marketing information.
- Potential impacts to management and use of the Granite Chief Wilderness Area from:
 - Changes in Project operations that affect water surface elevations (WSE) at Hell Hole Reservoir.
- Potential impacts to a State Game Refuge from:
 - Changes in Project operations;
 - Changes in Project maintenance activities; and
 - Modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features.
- Potential impacts related to management of the Auburn State Recreation Area (ASRA) from:
 - Changes in Project operations that affect flow in the peaking reach;
 - Installation of a new gage on the North Fork American River;
 - Dissemination of real-time flow information;
 - Sediment augmentation activities at Indian Bar and Junction Bar;
 - Enhancements to the Indian Bar Rafter Access; and
 - Funding of administrative oversight and routine operation and maintenance activities.
- Potential impacts to existing Project recreation facilities associated with:
 - Recreation facility upgrades;
 - Recreation facility removal;
 - Recreation facility reductions;
 - Recreation facility consolidation; and
 - Recreation facility conversion.
- Potential impacts to reservoir recreation access and opportunities associated with:
 - Changes in Project operations that affect reservoir WSEs;
 - Boat ramp improvements;
 - Trail improvements;

- Dissemination of real-time WSE information;
 - Recreation opportunity marketing; and
 - Fish stocking.
- Potential impacts to stream-based recreation opportunities along the bypass and peaking reaches from:
 - Trail improvements;
 - Installation of new streamflow gages on the bypass and peaking reaches;
 - Dissemination of real-time flow information; and
 - Changes in Project operations that affect flow.
- Potential impacts to recreation use and opportunities from:
 - Modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features, including:
 - Hell Hole Reservoir Seasonal Storage Increase Improvement;
 - Small diversion modifications;
 - Outlet works modifications;
 - New gage installation; and
 - New Project recreation facilities and features.

A description of potential impacts to recreation resources resulting from implementation of Alternative 1, considering avoidance and protection (AP) and enhancement measures is provided below. There are no unavoidable adverse effects to recreation resources resulting from implementation of Alternative 1 as discussed at the end of this section.

3.9.1 Specially Designated Areas in the Watershed

This section describes the potential effects of Alternative 1 on specially designated areas. The discussion is organized as follows:

- National Wild and Scenic River System (Rubicon River and portions of the Middle Fork American River and North Fork American River);
- State Protected River Segments (Rubicon River Wild Trout Stream);
- National Trail System (Western States Trail);
- Wilderness Areas (Granite Chief Wilderness);
- State Game Refuge; and
- Regionally or Nationally Important Recreation Areas (ASRA).

3.9.1.1 National Wild and Scenic Rivers

The Rubicon River from Hell Hole Dam to a point immediately upstream of Ralston Afterbay was found eligible and suitable for inclusion in the National Wild and Scenic River (W&SR) system by the United States Department of Agriculture-Forest Service (USDA-FS or Forest Service). In addition, the United States Bureau of Reclamation (USBR) identified two segments in the peaking reach as eligible for inclusion in the National W&SR system:

- **Middle Fork American River:** From Oxbow Dam (Ralston Afterbay Dam) to the confluence with the North Fork American River (approximately 23 miles).
- **North Fork American River:** From the confluence of the Middle Fork American River to the intake of the Auburn Dam diversion tunnel (approximately 5 miles).

None of these river segments has been formally included in the National W&SR system. Regardless, the USDA-FS and the USBR manage these rivers and a 0.25-mile corridor on either side of the river, to protect the values for which each segment was found eligible for inclusion in the National W&SR system, as required in the W&SR Act (USBR 1993; USDA-FS 1988; USDA-FS 2006). Potential effects of Alternative 1 on Wild and Scenic River eligibility are discussed below by river.

Rubicon River

The outstandingly remarkable value (ORV) for which the Rubicon River is eligible for inclusion in the W&SR system is “fisheries”. Two elements of Alternative 1 could effect this ORV: (1) changes in operations that affect flow; and (2) construction of the Ellicott Bridge Parking Area. These elements are discussed in the following subsections.

CHANGES IN PROJECT OPERATIONS THAT AFFECT FLOW

Under Alternative 1, changes in Project operations will affect flow on the Rubicon River. Specifically, under Alternative 1, minimum instream flows on the Rubicon River and Long Canyon Creek will be the same or higher than those that will exist under the No-Action Alternative, depending upon water year type. In addition, Alternative 1 includes environmental pulse flows and down ramping of spills from Hell Hole Reservoir. The shape of the down ramp for both environmental pulse flows and reservoir spills under Alternative 1 provides a slowly declining hydrograph that provides riparian and other environmental benefits compared to the faster decline of spill flows that will occur under the No-Action Alternative.

The instream flow measures included in Alternative 1 were designed to maintain or improve aquatic habitat, which will in turn improve the Rubicon River fishery. Accordingly, changes in Project operations that affect flow on the Rubicon River will maintain or enhance the ORV for which the Rubicon River is considered eligible for inclusion in the W&SR system.

CONSTRUCTION OF THE ELLICOTT BRIDGE PARKING AREA

Alternative 1 includes development of Ellicott Bridge Parking Area, a six-vehicle river access parking area along Forest Road 14N08 at the Ellicott Bridge crossing of the Rubicon River. The parking area will be located on the west side of the Rubicon River, south of Ellicott Bridge, on public land managed by the USDA-FS (Appendix A, Figure EBPA-1). The parking area will be designed, constructed, and maintained to meet USDA-FS standards for accessibility.

The parking area will be located near the Rubicon River, which is eligible for inclusion in the National W&SR. The ENF manages the Rubicon River, and the area within 0.25 mile of the river to maintain this status. Specific management direction, standards and guidelines regarding developments along the Rubicon River are contained in the Eldorado National Forest (ENF) Land and Resource Management Plan (USDA-FS 1988). The Ellicott Bridge Parking Area will be designed and constructed in consultation with the USDA-FS, in accordance with the direction, standards and guidelines contained in the ENF LRMP. Specifically, the facility will be sited more than 100 feet from the river. In addition, it will be designed and constructed with materials and finishes that blend with the existing environment. Removal of trees and other vegetative screening will be minimized to ensure that the facility is not readily visible from the Rubicon River. Therefore, construction of the Ellicott Bridge Parking Area will maintain the ORV (fisheries) for which the Rubicon River is eligible as a W&SR.

MIDDLE FORK AMERICAN RIVER AND NORTH FORK AMERICAN RIVER.

The ORVs for which the segments on the peaking reach are eligible include: recreation (WST and whitewater boating), scenic (land form and water forms, including Ruck-a-Chucky and Tunnel Chute rapids), wildlife (including foothill yellow-legged frog [FYLF]), unique biological communities (Clarkia, butterflies), and cultural resources (Horseshoe Bar tunnels and No Hands Bridge). In addition, “fish” is an ORV on the Middle Fork American River due to the presence of rainbow trout and because of its “high quality and cold water releases from Oxbow Powerhouse” (USBR 1993).

Changes in Project operations that affect flow could affect the wildlife (FYLF), and fish ORVs, and the recreation (WST and whitewater boating). In addition, dissemination of real-time flow information, sediment augmentation activities at Indian Bar and Junction Bar, and installation of the North Fork American River Gage upstream of American River Pump Station could potentially affect the recreation ORV. These elements of Alternative 1 are discussed in the following subsections, except for the WST, which is discussed in Section 3.9.1.3. Scenic resources, unique biological communities (Clarkia and butterflies), and cultural resources (Horseshoe Bar tunnels and No Hands Bridge) will not be affected by implementation of Alternative 1, so these ORVs are not discussed further.

CHANGES IN PROJECT OPERATIONS THAT AFFECT FLOW

On the peaking reach, minimum instream flows under Alternative 1 will be higher than under the No-Action Alternative in all years and flow fluctuations will be reduced (Section 3.5 – Fish and Aquatic Resources). In addition, under Alternative 1, the ramping rate (river stage change per hour) of Oxbow Powerhouse flow releases will be substantially reduced (50% reduction of up ramp rate and 41% reduction of the down ramp rate) (Section 3.5 – Fish and Aquatic Resources). These flow-related measures will enhance fish habitat, particularly for rainbow trout, while preserving whitewater boating and other recreational opportunities on the peaking reach. Foothill yellow-legged frogs are not present in the peaking reach, but are present in some of the tributary streams. Implementation of Alternative 1 will not affect FYLF habitat in tributaries to the peaking reach.

Under Alternative 1, PCWA will continue to schedule MFP operations to accommodate whitewater boating activities. However, under Alternative 1, whitewater boating flows will be released according to a detailed release schedule, which is included in resource agencies instream flow and reservoir minimum pool conditions. This schedule was developed in consultation with the resource agencies and commercial and private boaters and formalizes PCWA's commitments regarding flow rates and timing. Formal commitments regarding flow releases for whitewater boating do not exist under the No-Action Alternative. Therefore, Alternative 1 enhances boating opportunities for both commercial and private boaters compared to the No-Action Alternative by mandating the magnitude and timing of flows for whitewater boating.

Under Alternative 1, flows will be released earlier than they were historically to support Class II boating opportunities on the Confluence Run. Specifically, PCWA will release boating flows by 3 or 4 am, depending on water year type, from Oxbow Powerhouse, in accordance with the schedule included in the resource agencies instream flow and reservoir minimum pool conditions. In addition, these flows will provide private boaters with additional boating opportunities compared to the No-Action Alternative, while maintaining commercial boating opportunities on the Tunnel Chute Run. Therefore, Alternative 1 enhances boating opportunities compared to the No-Action Alternative by mandating earlier flow releases for whitewater boating.

The instream flow conditions included in Alternative 1 were designed to improve aquatic habitat and to preserve recreational opportunities and FYLF habitat. Accordingly, changes in Project operations that affect flow on the peaking reach will maintain or enhance the fish, recreation, and wildlife ORVs on the Middle Fork American River and North Fork American River.

DISSEMINATION OF REAL-TIME FLOW INFORMATION

Under Alternative 1, Placer County Water Agency (PCWA) will provide real-time flow information to the public using data available from two stream gages on the peaking reach. In addition PCWA will provide a matrix showing when flows released from

Oxbow Powerhouse could be expected to arrive downstream at specific locations in the peaking reach.

The real-time flow data and travel time information will allow recreation visitors to better utilize recreation opportunities on the peaking reach, including whitewater boating and trail users, by providing recreation visitors with data that can be used for trip planning and scheduling purposes. Therefore, implementation of Alternative 1 will maintain or enhance the recreation ORV on the Middle Fork American River and the North Fork American River.

SEDIMENT AUGMENTATION ACTIVITIES AT INDIAN BAR AND JUNCTION BAR

Under Alternative 1, both Indian Bar and Junction Bar will be used as sediment augmentation areas. These two bars are located immediately downstream of Ralston Afterbay. The Indian Bar Augmentation Area is located within the existing Federal Energy Regulatory Commission (FERC or Commission) boundary but the Junction Bar Augmentation Area is not. Under Alternative 1, both sedimentation areas will be included in the FERC Project boundary. The adjusted FERC Project boundary will intersect a small portion of the Middle Fork American River that is eligible for inclusion in the W&SR.

Both of these areas have previously been disturbed. Indian Bar has been previously used by PCWA as a sediment augmentation area. In addition, mining activities have historically occurred at Junction Bar. Implementation of Alternative 1 will not substantially alter the use or character of these disturbed areas. Incorporation of these areas into the FERC boundary will have no effect on the river's W&SR eligibility status. Furthermore, implementation of sediment augmentation activities at Indian Bar and Junction Bar will not affect recreation or any of the other ORVs for which the Middle Fork American River is considered eligible for inclusion in the W&SR system. Therefore, implementation of sediment management activities at Indian Bar and Junction Bar is consistent with the Middle Fork American River's W&SR river eligibility status.

INSTALLATION OF THE NORTH FORK AMERICAN RIVER GAGE UPSTREAM OF AMERICAN RIVER PUMP STATION (NFARPS)

Alternative 1 includes the installation of a new gage, access trail, and photovoltaic pole on the North Fork American River upstream of the American River Pump Station. These features will be located approximately 0.15 miles downstream of the Auburn Dam Intake Tunnel, which defines the end of the segment of the North Fork American River that is eligible for the W&SR. Therefore, installation of the NFARPS gage and associated features will have no effect on the segment of the North Fork American River that is eligible for inclusion in the W&SR system.

3.9.1.2 State Protected River Segments (Rubicon River Wild Trout Stream)

The Rubicon River, from Hell Hole Reservoir to Ralston Afterbay, is designated by the State of California as a Wild Trout Stream. The California Department of Fish and

Game (CDFG) manages the Rubicon River in accordance with the “Rubicon River Wild Trout Management Plan” (CDFG 1979). The stated goals of the Rubicon River Wild Trout Management Plan are to:

- Protect the aquatic environment of the Rubicon River and its tributaries;
- Perpetuate a naturally sustained, balanced population of rainbow trout; and
- Provide a quality backcountry angling experience characterized by a naturally scenic streamside environment.

These goals could be affected by two elements of Alternative 1: (1) changes in operations that affect flow; and (2) construction of the Ellicott Bridge Parking Area. These elements are discussed in the following subsections with respect to the Rubicon River Wild Trout Stream designation.

CHANGES IN PROJECT OPERATIONS THAT AFFECT FLOW

Under Alternative 1, changes in Project operations will affect flow in the Rubicon River and Long Canyon Creek, a tributary to the Rubicon River. Under Alternative 1, minimum instream flows on the Rubicon River and on Long Canyon Creek will be the same or higher than those that will exist under the No-Action Alternative, depending upon water year type. In addition, Alternative 1 includes:

- Environmental pulse flows on the Rubicon River and Long Canyon Creek; and
- Down ramping of spills from Hell Hole Reservoir.

Combined, these changes will: (1) maintain or improve the aquatic environment of the Rubicon River and Long Canyon Creek, including rainbow trout, FYLF, and hardhead habitat; and (2) perpetuate a naturally sustained, balanced population of rainbow trout. Improved aquatic habitat and the presence of a balanced rainbow trout population will, in turn, provide for a quality backcountry angling experience in a naturally scenic streamside environment. Therefore, implementation of Alternative 1 will be consistent with goals of the Rubicon River Wild Trout Management Plan. Furthermore, implementation of Alternative 1 will maintain or enhance the values for which the Rubicon River was designated as a Wild Trout Stream.

CONSTRUCTION OF THE ELLICOTT BRIDGE PARKING AREA

As discussed in Section 3.9.1.1, Alternative 1 includes development of Ellicott Bridge Parking Area. The parking area will be located on the west side of the Rubicon River, south of Ellicott Bridge, on public land managed by the USDA-FS (Appendix A, Figure EBPA-1). This parking area will be sized to facilitate parking for six vehicles and will include sanitation facilities. Construction of a parking area in this location will help reduce erosion into the Rubicon River and installation of sanitation facilities will address potential sanitation issues. In addition, this facility will improve angling access to the Rubicon River. Therefore, construction of the Ellicott Bridge Parking Area will enhance

the angling experience on the Rubicon River, which is consistent with the goals of the Rubicon River Wild Trout Management Plan.

3.9.1.3 National Trail System (Western States Trail)

One National Recreation Trail, the WST, traverses the Middle Fork American River watershed in the vicinity of the MFP. The WST, including its route variations, are discussed in PCWA's Application for New License (PCWA 2011a).

The elements of Alternative 1 that could potentially affect the WST are:

- Changes in Project operations that affect flow in the peaking reach;
- Implementation of trail improvements; and
- Development of recreation opportunity marketing information.

Potential impacts associated with these elements are discussed in the following subsections.

Changes in Project Operations that Affect Flow in the Peaking Reach

The WST is used for two world-class endurance races: the Tevis Cup Equestrian Ride and the Western States 100 Endurance Run. Both races cross the Middle Fork American River downstream of Oxbow Powerhouse at the Ruck-a-Chucky Recreation Area (also known as Greenwood Bridge or Drivers Flat) or Poverty Bar. After crossing, both race routes traverse the south side of the Middle Fork American River to the confluence of the North Fork American River where racers cross the river again. Historically, MFP operations were modified, as much as practicable, to reduce flow releases into the Middle Fork American River downstream of Oxbow Powerhouse to facilitate river crossing during the races. This practice was implemented voluntarily and will continue to occur on a voluntary basis under the No-Action Alternative. Under Alternative 1, MFP operations will continue to be modified to facilitate river crossing during the Tevis Cup and Western States 100 Endurance races. However, this practice is formalized in the resource agencies instream flow and reservoir minimum pool conditions (USDA-FS 2011; CDFG 2011; DOI 2011). Therefore, implementation of Alternative 1 will maintain recreation opportunities associated with the WST by mandating reduced flows when practicable during the Tevis Cup and Western States 100 Endurance races.

Potential impacts of Alternative 1 on general trail crossing opportunities are discussed in Section 3.9.4.

Implementation of Trail Improvements

A 0.7 mile portion of the WST connects the Poppy Campground Trailhead Parking Area to Poppy Campground. This segment of the WST is referred to as the Poppy Trail (FS 16E10). Poppy Trail (FS 16E10) is a Project recreation facility under Alternative 1.

Under Alternative 1, PCWA will remove the Poppy Trailhead Parking Area and will consolidate any remaining features (e.g., signage, bathrooms, and water faucets) at the two remaining parking areas. Implementation of this measure will involve extending the Poppy Trail from the existing trailhead to one of the remaining parking areas and relocating WST signage. In addition, PWA will rehabilitate the existing trail to Poppy Campground. This trail will be designed, constructed and maintained to meet FS standards for public pedestrian use. Motorized use of this trail will be prohibited.

Extending the Poppy Trail will not involve relocating the WST. Accordingly, the existing trail and access to the trail will be retained. Furthermore, the trail will be improved to meet USDA-FS standards. Therefore, implementation of this element of Alternative 1 will improve a segment of the WST and, as a result will improve recreation experience associated with the WST.

Development of Recreation Opportunity Marketing Information

Under Alternative 1, PCWA will develop marketing materials regarding recreation opportunities available in the vicinity of the MFP. The marketing material will include: (1) Geographic Information System (GIS)-based maps showing the locations of the developed Project recreation facilities and the access roads and trails (including the WST) in the vicinity of the MFP; (2) Project vicinity trail maps; and (3) information brochures. These materials will include information about the WST.

Implementation of this measure under Alternative 1 will provide recreation users with information about the WST that is not available under the No-Action Alternative. Therefore, implementation of Alternative 1 will enhance recreation opportunities associated with the WST.

3.9.1.4 Wilderness Areas (Granite Chief Wilderness Area)

None of the Project facilities are located within a designated Wilderness Area. However, the Granite Chief Wilderness Area is located in the upper portion of the Middle Fork American River Watershed (Watershed), immediately east of MFP facilities (PCWA 2011a; Map 7.9-3). At its closest points, the Granite Chief Wilderness boundary is located approximately 0.25 mile east of Hell Hole Reservoir and approximately 4.5 miles east of French Meadows Reservoir.

The only element of Alternative 1 that could potentially affect the Granite Chief Wilderness Area is changes in Project operations that affect WSE at Hell Hole Reservoir associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement. This improvement will seasonally increase WSE at Hell Hole Reservoir by up to 6 feet when the crest gates are raised and the reservoir is full.

Operation of the crest gates will seasonally increase the reservoir's inundation area within the existing flood pool by approximately 36 acres. However, based on detailed elevation information that was collected during the relicensing studies, the larger pool will not inundate any portion of the Granite Chief Wilderness Area. Furthermore, the larger pool will remain within the existing maximum flood pool of Hell Hole Reservoir

and within the existing FERC Project boundary. Therefore, implementation of Alternative 1 will have no effect on the Granite Chief Wilderness Area.

3.9.1.5 State Game Refuge

A portion of the area around the MFP has been designated as a State Game Refuge. The designation is intended primarily to protect habitat used by the Blue Canyon mule deer herd (potential disturbances to mule deer populations and their habitat are discussed in detail in Section 3.6 – Botanical and Wildlife Resources). The refuge boundary encompasses French Meadows Reservoir, French Meadows Dam, a portion of the Middle Fork American River downstream of the dam, and North Fork Long Canyon Creek (including the North Fork Long Canyon Creek Diversion Dam and Pool). South Fork Long Canyon Creek (including South Fork Long Canyon Diversion Dam and Pool) forms the southwest boundary of the refuge. Duncan Creek (including the Duncan Creek Diversion Dam and Pool) is located outside of the State Game Refuge boundary.

Under Alternative 1, instream flows in the Middle Fork American River downstream of French Meadows Dam, North Fork Long Canyon Creek, and South Fork Long Canyon Creek will be modified to enhance aquatic resources (Section 3.5 – Fish and Aquatic Resources). The timing and magnitude of these modified flows occur within the range of unimpaired flows and will not impede mule deer migration.

Project maintenance activities in the refuge have been ongoing under the No-Action Alternative and will not change significantly under Alternative 1. Mule deer have tolerated Project maintenance activities under existing conditions (No-Action Alternative), as well as other ongoing human activities, such as recreation use and hunting.

Modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features could potentially disturb mule deer in the refuge. Refer to Section 2.0 and Appendix A for a description of modification and construction activities to be implemented under Alternative 1. Three facilities to be modified or constructed in the refuge are located within the critical summer range for mule deer (critical summer range is a subset of summer range that consists of areas believed to be especially critical to the life cycle of migratory deer). Activities associated with the construction of these facilities, including ground disturbance, tree removal, and use of heavy equipment, could potentially result in disturbance of breeding mule deer or in alteration of their habitat.

The majority of construction activities within the critical summer range would occur outside the peak fawning season. Construction activities would be limited to the minimum area necessary to complete the work. Mule deer in the refuge are accustomed to and tolerate a baseline level of human activity during the summer breeding season.

None of the activities under Alternative 1 will affect land use within or around the State Game Refuge, access to the refuge, or management of the refuge. Alternative 1 will also not impede mule deer migration or their use of the refuge. Therefore, implementation of Alternative 1 will have no effect on the State Game Refuge.

3.9.1.6 Regionally or Nationally Important Recreation Areas (ASRA)

The peaking reach bisects the ASRA, and includes the North and Middle Fork American rivers (PCWA 2011a, Map 7.9-2b). The area offers a wide variety of recreation opportunities to approximately 900,000 visitors a year.

The California Department of Parks and Recreation (California State Parks) currently administers the area under contract with the USBR, the primary land owner in accordance with an Interim Resource Management Plan (RMP) (USBR 1992). In accordance with the RMP, management along the peaking reach emphasizes stream-based recreation, including whitewater boating. Private boating use is minimal on the peaking reach relative to commercial whitewater boating. Therefore, use by the commercial sector (e.g., commercial whitewater boating operations) is recognized as the optimal public use on the Middle Fork American River (USBR 1992).

The elements of Alternative 1 that potentially affect recreation and other land uses in ASRA are:

- Changes in Project operations that affect flow;
- Installation of a new streamflow gage on the North Fork American River;
- Dissemination of real-time flow information;
- Sediment augmentation activities at Indian Bar and Junction Bar;
- Enhancements to the Indian Bar Rafter Access; and
- Funding of administrative oversight, routine operation, and maintenance activities.

Potential impacts associated with these elements of Alternative 1 are discussed in the following subsections.

Changes in Project Operations that Affect Flow

California State Parks manages recreation associated with the peaking reach with a focus on commercial rafting opportunities. Consistent with this philosophy, PCWA currently coordinates with California State Parks and a designated commercial whitewater boating representative to schedule MFP operations during the summer and early fall to accommodate commercial whitewater boating activities. Whitewater boating releases are scheduled on a voluntary basis such that they minimize effects to power production and do not compromise maintenance activities or consumptive water deliveries.

Under Alternative 1, PCWA will continue to schedule MFP operations to accommodate whitewater boating activities. However, under Alternative 1, whitewater boating flows will be released according to a detailed release schedule, which is included in resource agencies instream flow and reservoir minimum pool conditions. This schedule was developed in consultation with the resource agencies and commercial and private boaters and formalizes PCWA's commitments regarding flow rates and timing. Formal commitments regarding flow releases for whitewater boating do not exist under the No-Action Alternative. Therefore, Alternative 1 enhances boating opportunities for both commercial and private boaters compared to the No-Action Alternative by mandating the magnitude and timing of flows for whitewater boating.

Under Alternative 1, flows will be released earlier than they were historically to support Class II boating opportunities on the Confluence Run. Specifically, PCWA will release boating flows by 3 or 4 am, depending on water year type, from Oxbow Powerhouse, in accordance with the schedule included in the resource agencies instream flow and reservoir minimum pool conditions. These flows will provide private boaters with additional boating opportunities compared to the No-Action Alternative, while maintaining commercial boating opportunities on the Tunnel Chute Run. Therefore, Alternative 1 enhances boating opportunities compared to the No-Action Alternative by mandating earlier flow releases for whitewater boating.

Alternative 1 also includes flow-related provisions for special events. Specifically, PCWA will: (1) provide early releases for whitewater boating on scheduled special event days (e.g., Western States 100 and Tevis Cup) (USDA-FS 2011; CDFG 2011; DOI 2011); (2) reduce flows, if possible, during the Tevis Cup and Western States 100 endurance races to facilitate stream crossing; and (3) provide up to two unscheduled days per year for special whitewater flow events. PCWA will select the event(s) based on available water supply and existing consumptive demands, hydro-electric generation demands, generating unit availability, and consultation with resource agencies and members of the boating community. Formal commitments regarding releases for special events do not exist under the No-Action Alternative. Therefore, Alternative 1 enhances recreation opportunities compared to the No-Action Alternative by mandating flow releases for special events.

In summary, compared to the No-Action Alternative, implementation of Alternative 1 will: (1) maintain commercial boating opportunities on the Tunnel Chute Run; (2) enhance whitewater boating opportunities for private boaters by providing earlier flows on the Confluence Run; and (3) enhance recreation opportunities by mandating flow releases for special events. These enhancements are consistent with the recreation-related goals identified in the ASRA RMP.

Potential impacts of Alternative 1 on stream-based recreation opportunities are discussed in more detail in Section 3.9.4.

Installation of a New Streamflow Gage on the North Fork American River

Under Alternative 1, PCWA will install a new gage on the North Fork American River above the American River Pump Station. This gage will provide the public with real-time flow information for a segment of the North Fork American River for which flow data is currently unavailable to the general public. The real-time flow data can be used for trip planning and scheduling purposes, which will allow recreation users to better utilize existing opportunities. Accordingly, implementation of Alternative 1 will enhance the existing stream-based recreation opportunities in ASRA, particularly for whitewater boaters running the Confluence Run, anglers, and trail users who cross the North Fork American River at the Coffey Dam crossing.

Dissemination of Real-Time Flow Information

Under Alternative 1, PCWA will provide real-time flow information to the public using data available from two stream gages on the peaking reach. In addition, PCWA will provide a matrix showing when flows released from Oxbow Powerhouse could be expected to arrive downstream at specific locations in the peaking reach.

Real-time flow data and associated information can be used for trip planning and scheduling purposes, which will allow recreation users to better utilize existing opportunities. Accordingly, implementation of Alternative 1 will enhance the existing stream-based recreation opportunities in ASRA.

Sediment Augmentation Activities at Indian Bar and Junction Bar

Alternative 1 includes changes in sediment management activities. These changes are described in detail in the Sediment Management Plan (SMP) (PCWA 2011b). Under Alternative 1, Indian Bar and Junction Bar will be used as sediment augmentation areas. A portion of the Indian Bar Rafter Access is located on the Indian Bar Augmentation Area. The Junction Bar Augmentation Area is located immediately downstream, on the south side of the Middle Fork American River.

The Indian Bar Augmentation Area is an existing augmentation area that will be incorporated into the MFP to enhance sediment delivery and transport under Alternative 1. Sediment augmentation activities in this location will be the same under Alternative 1 and the No-Action Alternative. Therefore, implementation of Alternative 1 will have no effect on recreation resources compared to the No-Action Alternative.

Under Alternative 1, a portion of Junction Bar will also be used for sediment augmentation associated with sediment management activities at Ralston Afterbay. Junction Bar is a large gravel/cobble bar located immediately downstream of Ralston Afterbay on the south side of the Middle Fork American River that has been previously disturbed by historical mining activities. Augmentation material will be placed close to the river's edge in a manner that will maximize sediment transport during high-flow events. Materials will be transported down the existing Indian Bar Access Road (a Project road), across the Indian Bar Rafter Access unloading area, across Indian Bar, and across the Middle Fork American River via a temporary bridge (refer to SMP

Map 5). These activities will occur in the fall during the annual maintenance outage, after the whitewater boating season. Therefore, using Junction Bar as an augmentation area will have no effect on whitewater boating opportunities in ASRA and a negligible effect on other stream-based recreation opportunities.

Enhancements to the Indian Bar Rafter Access

Under Alternative 1, PCWA will enhance the Indian Bar Rafting Access area to improve existing conditions for commercial whitewater boaters and for other day-use visitors. These enhancements include: installing an additional accessible vault toilet or modifying the existing vault toilet to accommodate peak use; installing powered ventilation systems in the existing toilets; reconstructing the existing boat ramp; installing a supplemental slide ramp downstream of the existing ramp; refurbishing existing information boards; installing new regulatory signage; and installing a changing pavilion.

Implementation of Alternative 1 will relieve congestion in the unloading area and at the existing boat ramp and will improve sanitation conditions. These enhancements are consistent with the ASRA RMP, which specifically identifies congestion at this put-in and sanitation issues as management problems.

Funding of Administrative Oversight, Routine Operation, and Maintenance Activities

Alternative 1 includes funding for administrative oversight and routine operation and maintenance of recreation facilities located in the peaking reach, as discussed in the following.

PCWA is currently finalizing a collection agreement with the ENF to: (1) fund resource agency administrative oversight activities and routine operation and maintenance activities at the Indian Bar Rafter Access, and (2) provide funding for installation of sanitation facilities and safety signage and for administrative oversight and operation and maintenance activities at Cache Rock. Cache Rock is not an MFP facility but is used by whitewater boaters who benefit from MFP flow releases.

PCWA entered into an agreement with the USBR and BLM regarding funding for annual operation, maintenance, and administration of Project-affected federal lands and facilities along the peaking reach. These lands are currently managed by USBR for recreation purposes and to provide for the health and safety of the public engaging in recreational activities at those lands and facilities (DOI 2011).

These funding agreements will help the USDA-FS, USBR, and other land management agencies to manage recreation activities and operate recreation facilities in the peaking reach. These funding agreements do not exist under the No-Action Alternative. Therefore, implementation of Alternative 1 enhances recreation in the peaking reach compared to the No-Action Alternative.

3.9.2 Existing Project Recreation Facilities

The MFP currently includes seven campgrounds, three group campgrounds, three picnic areas, four boat ramps, a vista, and a dump station. The Project recreation facilities are identified and discussed in PCWA's Application for New License (PCWA 2011a, Table 7.9-1, Map 7.9-1). In addition, detailed information about the Project recreation facilities and associated use is available in the REC 1 – Recreation Use and Facilities Technical Study Report (TSR) (PCWA 2011c). Alternative 1 includes routine annual and heavy maintenance at Project recreation facilities and features, existing recreation facilities and features added to the MFP, construction of new recreation facilities and features, and post-construction maintenance at new Project recreation facilities, as identified in Table 2.6 and Table 2.7, respectively. Additional information about these activities is available in the Recreation Plan (USDA-FS 2011; CDFG 2011). Construction of new Project recreation facilities and features is discussed in Section 3.9.5

Routine and heavy maintenance activities at existing Project recreation facilities and features are ongoing and will continue under the new license. Under Alternative 1, PCWA will provide the appropriate land management agencies with funding for administrative activities related to oversight of the Project recreation facilities. In addition, PCWA will be 100% responsible for all routine and heavy operation and maintenance activities associated with the Project recreation facilities, including post-construction maintenance at new Project recreation facilities, through the term of the new license. These commitments are formalized in the Recreation Plan included in Alternative 1. Therefore, compared to the No-Action Alternative, implementation of Alternative 1 will enhance operation and maintenance of the Project recreation facilities.

Under Alternative 1, all of the existing Project recreation facilities and/or features will be upgraded to meet current USDA-FS design and accessibility standards and/or modified to accommodate current or projected recreation use. Modifications include:

- Upgrades to existing Project recreation facilities;
- Removal of one Project recreation facility (Upper Hell Hole Campground);
- Reduction, consolidation, or conversion of select Project recreation facilities;
- Formalization of the Ralston Afterbay Sediment Removal Access Point as a public boat launch;
- Extension of Hell Hole and French Meadows boat ramps; and
- Trail improvements.

Modifications to be implemented under Alternative 1 are identified on Table 2-1 and are described in detail in the Recreation Plan. The facility modifications that will be implemented under Alternative 1 will improve the condition of the existing facilities and will limit dispersed use to specific areas, thereby reducing resource impacts. In addition the modifications will: (1) help reduce operation and maintenance costs, and will allow PCWA to focus operation and maintenance efforts on the more heavily used facilities;

and (2) provide appropriately scaled facilities that meet user needs. Potential impacts and benefits related to modification of the existing Project recreation facilities are discussed in the following subsections, organized by category to reduce redundancy.

3.9.2.1 Recreation Facility Upgrades

Under Alternative 1, all of the existing Project recreation facilities and/or features will be upgraded to meet current USDA-FS design and accessibility standards. With a few exceptions, most of these upgrades would occur under both the No-Action Alternative and Alternative 1. The exceptions include additional, more substantive upgrades to specific facilities that would not necessarily occur under the No-Action Alternative, as discussed in the following subsections, by facility.

Ahart Campground

Ahart Campground is located along the Middle Fork American River, upstream of French Meadows Reservoir. The campground consists of 12 sites. Potable water is not available. A portion of the access road (Forest Route [FR] 96) and the campground loop roads are unpaved.

Under Alternative 1, PCWA will install a groundwater well and hand pump in Ahart Campground to provide recreation visitors with a potable water source. In addition, under Alternative 1, PCWA will: (1) pave about 0.6 mile of FR 96 from the end of the existing pavement to approximately 200 feet past the Ahart Campground entrance; and (2) surface the campground loop road and spurs. Implementation of Alternative 1 will enhance Ahart Campground and conditions for recreation visitors and will provide a potable water source that would not be available under the No-Action Alternative.

Indian Bar Rafting Access and General Parking

Indian Bar Rafting Access (also referred to as the Oxbow Put-in by California State Parks) is located immediately downstream of Ralston Afterbay, adjacent to the Oxbow Powerhouse. This facility is primarily used as a put-in by whitewater boaters running the Tunnel Chute Run, a 15.2-mile run that extends from the Indian Bar Rafter Put-in to the Ruck-a-Chucky Recreation Area. This facility is located on Forest Service land within the existing MFP boundary.

Under Alternative 1, this facility will be upgraded by: installing an additional accessible vault toilet or modifying the existing vault toilet to accommodate peak use; installing powered ventilation systems in the existing toilets; reconstructing the existing boat ramp; installing a supplemental slide ramp downstream of the existing ramp; and installing a changing pavilion. These improvements will enhance the existing boat launching experience and will improve existing conditions for recreation visitors at Indian Bar Rafter Access, while reducing sanitation issues and relieving congestion in the unloading area.

Formalization of Ralston Afterbay Sediment Removal Access Point Boat Ramp

Under Alternative 1, Ralston Afterbay Sediment Removal Access Point will be improved to accommodate boat launching by the public. The improvements to this boat ramp relate to reservoir access and are therefore discussed under Section 3.9.3 – Reservoir Recreation Opportunities.

Extension of French Meadows and Hell Hole Boat Ramps

Under Alternative 1, French Meadows and Hell Hole boat ramps will be extended. Extension of these boat ramps relates to reservoir access and is therefore discussed in Section 3.9.3 – Reservoir Recreation Opportunities.

Duncan Creek Diversion Primitive Recreation Site

A limited amount of dispersed use occurs in the vicinity of the diversion dam and impoundment. According to the Tahoe National Forest (TNF), dispersed use has resulted in sanitation issues and resource impacts.

Under Alternative 1, a primitive use site will be developed near Duncan Creek Diversion to address sanitation issues and to reduce potential resource impacts related to dispersed recreation. Development of the site will include installation of the following features: one single-unit accessible vault toilet; barrier rocks to limit vehicle use and camping to specific areas; a bear-resistant garbage container; and signage.

Development of the Duncan Creek Diversion Primitive Site will provide sanitation facilities for recreation visitors and will reduce resource impacts by limiting dispersed use to a defined area. Under the No-Action Alternative, sanitation issues will persist and resource impacts will continue to occur. Therefore, implementation of the Alternative 1 will enhance existing MFP recreation opportunities, while reducing resource impacts and sanitation issues.

Trail Improvements

Under Alternative 1, three existing trails will be added to the MFP and subsequently upgraded and maintained to meet USDA-FS design standards: Poppy Trail, Hell Hole Reservoir Trail; and Middle Fork American River Upstream of Ralston Afterbay Trail. These three trails are existing trails but are not currently maintained by PCWA. Under Alternative 1, these trails will be upgraded and maintained by PCWA to facilitate recreation access. These trails would not be upgraded or maintained by PCWA under the No-Action Alternative. Therefore, implementation of Alternative 1 will enhance recreation opportunities relative to the No-Action Alternative.

3.9.2.2 Recreation Facility Removal

Under Alternative 1, Upper Hell Hole Campground will be removed due to low use levels and to protect nearby sensitive biological and cultural resources. Upper Hell Hole Campground is relatively remote with limited amenities. Vehicle access and potable

water are not available. Accordingly, this campground is utilized by visitors who are seeking solitude and a relatively primitive camping experience. Under Alternative 1, dispersed camping will be allowed in the vicinity of the former Upper Hell Hole Campground. Therefore, primitive camping will continue to be available and visitors seeking solitude and a primitive camping experience will not be displaced, except during the period when the facility amenities are being removed. Accordingly, removal of Upper Hell Hole Campground will have a negligible effect on recreation use and opportunities in the Hell Hole Reservoir area while protecting sensitive resources.

3.9.2.3 Recreation Facility Reductions

Under Alternative 1, the following Project recreation facilities will be reduced in size due to low use levels and/or to protect nearby sensitive resources:

- Ahart Campground
- Poppy Campground
- French Meadows Campground
- Lewis Campground
- French Meadows Picnic Area
- Hell Hole Campground (potentially reduce)
- Ralston Picnic Area

Facility reductions will be achieved by: (1) removing select camp sites or picnic sites; or (2) consolidating or reconfiguring one or more campsites to create larger sites. Specific information about the number of sites to be removed at each Project recreation facility and an implementation schedule is available in the Recreation Plan.

Implementation of Alternative 1 will reduce the capacity of select Project recreation facilities. However, the reduction in facility capacity will have a negligible effect on recreation use and opportunities because: (1) the facilities that will be reduced are currently under-utilized; and (2) the remaining capacity of the facilities can more than adequately accommodate recreation use. Furthermore, the remaining sites will be enhanced, and in some cases enlarged, to meet USDA-FS design and accessibility requirements. Therefore, the reduction of select Project recreation facilities under Alternative 1 will maintain or enhance MFP recreation opportunities.

3.9.2.4 Recreation Facility Consolidation

Under Alternative 1, McGuire Boat Ramp and Associated Parking Areas will be consolidated due to low use levels. The McGuire Boat Ramp and Associated Parking area includes three parking areas. One of these areas is referred to as the Poppy Campground Parking Area because it provides parking for the Poppy Campground, which is a hike-in campground. Together, the three parking areas are substantially oversized considering the low levels of use at Poppy Campground and McGuire Boat

Ramp (PCWA 2011c). Consolidating this area includes: removing the Poppy Campground Trailhead Parking Area and access road; installing barrier rock at the entrance to the Parking Area access road to prohibit future vehicle use; treating the surface of the road and parking area to allow for natural revegetation; consolidating and relocating toilets and water faucets; extending the Poppy Trail to one of the McGuire Boat Ramp Parking Areas; and relocating the trailhead signage and information boards.

Under Alternative 1, parking capacity at the McGuire Boat Ramp and Associated Parking Areas will be reduced from a total of 65,000 square feet to 55,000 square feet, thereby reducing parking capacity by 15%. Therefore, implementation of Alternative 1 will reduce parking capacity compared to the No-Action Alternative. However, this reduction will have a negligible effect on recreation use and opportunities because the remaining parking capacity can more than adequately accommodate recreation use at both the McGuire Boat Ramp and at Poppy Campground.

3.9.2.5 Recreation Facility Conversion

Under Alternative 1, McGuire Picnic Area and Beach will be converted to the McGuire Group Campground to provide additional group camping opportunities. Currently, the picnic area and beach is low. In addition, Hell Hole Campground may be converted to a group campground, pending the results of recreation visitor surveys and consultation with the USDA-FS.

Implementation of Alternative 1 will remove day-use capacity in the French Meadows Area relative to the No-Action Alternative. However, based on use studies and visitor surveys conducted in 2007 and 2008, demand for MFP day-use facilities is low (PCWA 2011c). Most people who visit the MFP vicinity camp at a developed facility and engage in day-use activities. Based on PCWA visitor surveys, there appears to be demand for providing group camping opportunities in the French Meadows Area (PCWA 2011c). Conversion of the McGuire Picnic Area to a group campground will have a negligible effect on day-use while providing additional group camping opportunities in the French Meadows Area. Therefore, implementation of this component of Alternative 1 will enhance MFP recreation opportunities compared to the No-Action Alternative.

The Hell Hole Campground conversion will remove small group (family) camping opportunities in the Hell Hole Reservoir Area. However, ample small group camping capacity is available at the nearby Big Meadows Campground, where recreation use levels rarely meet capacity (PCWA 2011c). Conversely, group camping opportunities in the Hell Hole Reservoir Area are limited to Middle Meadows Campground, which is the most heavily used MFP facilities and sometimes meets capacity, particularly on holiday weekends (PCWA 2011c). Based on visitor surveys, there appears to be demand for group camping opportunities in the Hell Hole Reservoir Area (PCWA 2011c). Converting Hell Hole Campground to a group campground will enhance recreation opportunities compared to the No-Action Alternative.

3.9.3 Reservoir Recreation Opportunities

The following describes how implementation of Alternative 1 will potentially affect recreation opportunities at French Meadows Reservoir, Hell Hole Reservoir, and Ralston Afterbay. The impoundments formed behind the small diversion dams are too small to support reservoir recreation opportunities. Middle Fork Interbay is located in a remote canyon and does not support reservoir recreation use. Therefore, the small diversion pools and Middle Fork Interbay are not addressed in this section.

Alternative 1 includes changes in Project operations that could affect WSEs at French Meadows and Hell Hole reservoirs. In addition, Alternative 1 includes a number of measures that will improve existing access to the MFP reservoirs and will enhance existing recreation opportunities at the Project reservoirs, particularly fishing and boating opportunities. These include:

- Boat ramp extensions;
- Formalization of the Ralston Afterbay Sediment Removal Access Point as a public boat ramp;
- Trail improvements;
- Dissemination of WSE and other related information;
- Recreation opportunity marketing; and
- Fish stocking.

These elements are discussed in the following subsections.

3.9.3.1 Changes in Project Operations that Effect Water Surface Elevation

Alternative 1 includes reservoir water surface objectives that were specifically developed to enhance recreation opportunities and experience in French Meadows and Hell Hole reservoirs. These objectives are specified in the resource agencies reservoir minimum pool conditions. The objectives guide reservoir operation scheduling at French Meadows and Hell Hole reservoirs to support mid-summer reservoir WSE for reservoir-based recreation. If the operational objectives cannot be met (based on forecasts), PCWA must consult with the USDA-FS to identify alternative operational objectives that consider the primary operational purposes of the Project (e.g. water supply, water rights, hydroelectric generation). Formal commitments regarding reservoir levels for recreation do not exist under the No-Action Alternative. Therefore, Alternative 1 enhances reservoir recreation opportunities compared to the No-Action Alternative by identifying WSEs that benefit recreation, and mandating consultation with the USDA-FS if the objectives cannot be met.

3.9.3.2 Boat Ramp Improvements

Under Alternative 1, French Meadows Boat Ramp and Hell Hole Boat Ramp will be extended to facilitate recreation access during the late summer and fall. In addition, the

Ralston Sediment Disposal Access Point will be improved to enhance public access to Ralston Afterbay. These improvements are discussed in the following subsections.

French Meadows Boat Ramp

Under Alternative 1, French Meadows Boat Ramp will be extended up to 365 linear feet, to an elevation of about 5,175 feet, which is 25 vertical feet lower than the bottom of the existing boat ramp. The extension will be constructed using compacted aggregate and will include two turn-around areas.

The length of the extension was determined using the historic impaired hydrology and modeled future demand WSE data. Specifically, the historic impaired hydrology and the modeled future demand WSE data were used to determine the number of years (by water year type based on the May forecast) that the extended boat ramp will be functional during two time periods: (1) the peak recreation season (Memorial Day through Labor Day); and (2) the extended recreation season defined as the peak recreation season plus the fall shoulder season (e.g., through November 1). The French Meadows Area is typically not accessible after about November 1, due to snow.

The analysis compared the functionality (i.e., WSE is above the bottom of the boat ramp) of the French Meadows Boat Ramp under the No-Action Alternative and Alternative 1. For the No-Action Alternative analysis, the bottom of the boat ramp is at 5,200 feet and modeled WSE is based on the impaired hydrology. For the Alternative 1 analysis, the bottom of the boat ramp is at 5,175 feet and modeled WSE is based on modeled future demand. For comparison purposes, the functionality of the extended boat ramp under Alternative 1 was also evaluated using the impaired hydrology. The results are summarized in Table 3.9-1 expressed in percent of years.

The results of the boat ramp functionality analysis show that Alternative 1 increases the amount of time that the boat ramp will be functional during the peak recreation season and during the extended recreation season. Specifically, under the Alternative 1 – Future Demand scenario, the boat ramp will be functional during the peak recreation season for 100% of the time during all years, except during extreme critical water years when the boat ramp may only be functional for part of the recreation season. During the extended recreation season, the boat ramp will be functional 100% of the time in all but critical and extreme critical water years. Functionality of the extended boat ramp is also improved when using the impaired hydrology for the analysis.

Using either the impaired hydrology or the modeled future demand run WSEs, extending the boat ramp will allow recreation visitors to launch their boats during the entire peak recreation season in more dry, critical, and extreme critical water years than under the No-Action Alternative. In addition, extending the boat ramp will allow recreation visitors to launch their boats through the fall shoulder season in more wet, below normal, dry, and critical years.

Under Alternative 1, the extended boat ramp will be functional for a longer period of time during all water year types as compared to the No-Action Alternative. Therefore,

implementation of Alternative 1 will improve access to French Meadows Reservoir and will enhance existing MFP reservoir recreation opportunities relative to the No-Action Alternative.

Hell Hole Boat Ramp

Under Alternative 1, Hell Hole Boat Ramp will be extended up to 250 linear feet, to an elevation of about 4,485 feet, which is 45 vertical feet lower than the bottom of the existing boat ramp. Due to the steep slope, the extension will be constructed using concrete and will include one turn-around area. If Hell Hole Reservoir WSE reaches 4,455 feet during the fall, PCWA will extend the boat ramp further, potentially to an elevation of 4,455 feet, if possible. However, it may not be possible to extend the boat ramp to an elevation of 4,455 feet due to currently unknown factors such as slope and reservoir bed conditions. Given this uncertainty, the analysis focuses on extending the boat ramp to 4,485 feet.

The length of the extension was determined using the historic impaired hydrology and modeled future demand WSE. Specifically, the historic impaired hydrology and the modeled future demand WSE were used to determine the number of years (by water year type based on the May forecast) that the extended boat ramp will be functional during two time periods: (1) the peak recreation season (Memorial Day through Labor Day); and (2) extended recreation season defined as the peak recreation season plus the fall shoulder season (e.g. through November 1). The Hell Hole Reservoir area is typically not accessible after about November 1 due to snow.

The analysis compared the functionality (i.e., WSE is above the bottom of the boat ramp) of the Hell Hole Boat Ramp under the No-Action Alternative and Alternative 1. For the No-Action Alternative analysis, the bottom of the boat ramp is at 4,530 feet and WSE is based on the impaired hydrology. For the Alternative 1 analysis, the bottom of the boat ramp is at 4,485 feet and WSE is based on modeled future demand. For comparison purposes, the functionality of the extended boat ramp was also evaluated using the impaired hydrology. The results are summarized in Table 3.9-2 expressed in percent of years.

The results of the boat ramp functionality analysis show that Alternative 1 increases the amount of time that the boat ramp will be functional during the peak recreation season and during the extended recreation season. Under Future Demand conditions, extending the boat ramp will allow recreation visitors to launch their boats during the entire peak recreation season in more dry water years than under the No-Action Alternative. In addition, extending the boat ramp will allow recreation visitors to launch their boats through the fall shoulder season in more wet, below normal, dry, and critical years.

Functionality of the extended boat ramp is also improved when using the impaired hydrology for the analysis. Using the impaired hydrology, the extended boat ramp will be functional for the entire recreation season in more dry, critical, and extreme critical years than the No-Action Alternative. In addition, the extended boat ramp will be

functional for the entire fall shoulder season in more wet, below normal, dry, critical, and extreme critical years.

Under Alternative 1, the extended boat ramp will be functional for a longer period of time as compared to the No-Action Alternative. Therefore, implementation of Alternative 1 will improve access to Hell Hole Reservoir and will enhance existing MFP reservoir recreation opportunities relative to the No-Action Alternative.

Ralston Afterbay Sediment Removal Access Point Boat Ramp

The Ralston Afterbay Sediment Removal Access Point is located along FR 23, about 700 feet south of the Ralston Afterbay Picnic Area. This ramp is not a Project recreation facility but PCWA does not prohibit its use by the public. The access point consists of an unimproved ramp that is used by PCWA during periodic sediment management activities at Ralston Afterbay. Some recreation visitors utilize the access point as an informal boat ramp .

Under Alternative 1, the Ralston Afterbay Sediment Removal Access Point will be improved to accommodate boat launching by the public. This includes: delineating the boat ramp and parking area with barrier rocks or other barrier devices; grading the ramp to remove large cobbles and rocks; and installing signage and barriers to limit parking and direct visitors to the Ralston Afterbay Picnic Area for additional parking. Formalizing the Ralston Afterbay Sediment Removal Access Point as a public boat launch under Alternative 1 will improve access to Ralston Afterbay and will enhance existing recreational opportunities in the Ralston Afterbay area.

3.9.3.3 Trail Improvements

Alternative 1 includes a number of trail improvements, including enhancement of existing trails and construction of new trails. Two trail improvements will provide additional public access to the MFP reservoirs, as discussed in the following subsections.

Hell Hole Reservoir Trail

Under Alternative 1, PCWA will reconstruct and rehabilitate the Hell Hole Reservoir Trail (Forest Trail 14E02) from Hell Hole Reservoir Dam to its junction with the McKinstry Trail (Forest Trail 15E02). This trail will be designed, constructed, and maintained to meet USDA-FS standards for public pedestrian use. Improving this trail will improve public access to Hell Hole Reservoir compared to the No-Action Alternative. Therefore, Alternative 1 will enhance recreation opportunities at Hell Hole Reservoir.

French Meadows Reservoir Trail

Under Alternative 1, PCWA will construct a trail between French Meadows Campground and French Meadows Dam. The trail will be situated on the south side of French Meadows Reservoir between the reservoir and the Forest Road 96 and will be constructed by connecting previously cleared and graded roadways. This trail will be

designed, constructed, and maintained to meet FS standards for public pedestrian and bicycle use. This trail will improve public access to French Meadows Reservoir compared to the No-Action Alternative. Therefore, Alternative 1 will enhance recreation opportunities at French Meadows Reservoir.

3.9.3.4 Dissemination of Real-time Water Surface Elevation Information

Under Alternative 1, PCWA will provide weekly (at a minimum) WSE information at French Meadows and Hell Hole reservoirs to the public on a PCWA website. In addition, PCWA will provide the following information on the website:

- Example photographs showing the reservoir conditions at various WSEs; and
- Information about whether the boat ramps are functional based on the current WSE.

This information will enhance recreation opportunities on the Project reservoirs by providing recreation visitors with WSE information that can be used for trip planning purposes that is not currently available. Accordingly, providing real-time information associated with Alternative 1 will enhance existing reservoir recreation opportunities.

3.9.3.5 Development of Recreation Opportunity Marketing Information

Under Alternative 1, PCWA will develop marketing materials regarding recreation opportunities available in the vicinity of the MFP. The marketing material will include: (1) GIS-based maps showing the locations of the developed Project recreation facilities and the access roads and trails in the vicinity of the MFP; (2) trail maps showing the locations of the primary trails in the vicinity of the MFP; and (3) information brochures. The maps will be mounted on the information boards in the developed MFP recreation facilities. The information brochures will be provided to the USDA-FS, the Auburn Chamber of Commerce, the Foresthill Divide Chamber of Commerce, and the Georgetown Divide Chamber of Commerce for distribution to the public. In addition, an electronic version of the brochure will be posted on PCWA's website along with links to other pertinent websites.

This information will enhance existing recreation opportunities associated with the Project reservoirs, by providing recreation visitors with information regarding MFP recreation facilities and opportunities that is not currently available in a consolidated format. Accordingly, developing and distributing reservoir opportunity marketing materials associated with Alternative 1 will enhance existing reservoir recreation opportunities.

3.9.3.6 Fish Stocking

Hell Hole and French Meadows reservoirs have historically been stocked with fish by CDFG to enhance angling opportunities. Under Alternative 1, PCWA will fund the stocking of fish in Hell Hole and French Meadows reservoirs on an annual basis during the term of the new license, as specified in the Recreation Plan. The fish stocking program will be supported at a rate equivalent to 100 percent of CDFG's annual

management targets for Hell Hole and French Meadows reservoirs or 100 percent of the historical average stocking into these reservoirs (2001-2009), whichever is less. Fish species and size class stocking targets will be determined by CDFG. Accordingly, implementation of Alternative 1 will maintain reservoir angling opportunities at Hell Hole and French Meadows reservoirs.

Stream-Based Recreation Opportunities

This section describes the effects of Alternative 1 on stream-based recreation opportunities relative to the No-Action Alternative, focusing on the following elements of Alternative 1:

- Trail improvements;
- Installation of new stream gages;
- Dissemination of real-time flow information; and
- Changes in Project operations that affect flow.

3.9.3.7 Trail Improvements

Alternative 1 includes a number of trail improvements, including enhancement of existing trails and construction of new trails. These trail improvements will provide additional public access to the bypass and peaking reaches, as discussed in the following subsections.

Middle Fork American River Gage above Ralston Afterbay Access Trail

Under Alternative 1, PCWA will upgrade the Middle Fork American River Gage above Ralston Afterbay Access Trail, from the Ralston Afterbay Picnic Area to the Middle Fork American River Gage above Ralston Afterbay. (Note that this gage is not a Project gage.) This trail will be designed, constructed, and maintained to meet USDA-FS standards for public pedestrian use. The trail will provide increased public access to the Middle Fork American River upstream of Ralston Afterbay. The trail would not be upgraded under the No-Action Alternative. Therefore, Alternative 1 will enhance access to the Middle Fork American River compared to the No-Action Alternative.

Duncan Creek Gage below Diversion Dam Access Trail (13E33)

This trail is currently maintained to facilitate PCWA access to the gage. Under Alternative 1, PCWA will upgrade the Duncan Creek Gage access trail below Diversion Dam Trail (13E33) for public pedestrian use. This upgrade will occur concurrent with the Duncan Creek Diversion Dam Modification. The trail will be designed, constructed, and maintained to meet minimum USDA-FS standards for public pedestrian use. The trail will provide increased public access to Duncan Creek below the Duncan Creek Diversion. The trail would not be upgraded under the No-Action Alternative. Therefore, Alternative 1 will enhance access to Duncan Creek compared to the No-Action Alternative.

Middle Fork American River Access Trail below Middle Fork Interbay

Under Alternative 1, PCWA will construct a trail to provide access to the Middle Fork American River below Middle Fork Interbay Dam. The trail will be constructed concurrent with the installation of a new Project gage to be located approximately 900 feet downstream of Middle Fork Interbay Dam. The access trail will be designed, constructed, and maintained to facilitate PCWA access to the gage and to meet minimum (primitive) USDA-FS standards for public pedestrian use, with consideration to the site-specific design constraints (e.g. steep slopes). The trail will provide increased public access to the Middle Fork American River downstream of Middle Fork Interbay. The trail would not be constructed under the No-Action Alternative. Therefore, Alternative 1 will enhance access to the Middle Fork American River compared to the No-Action Alternative.

3.9.3.8 Installation of New Stream Gages

Alternative 1 includes the construction of four new gages which will be used to provide real-time flow information to the public, as follows:

- North Fork Long Canyon Creek below Diversion Dam;
- South Fork Long Canyon Creek below Diversion Dam;
- Middle Fork American River below Middle Fork Interbay Dam; and
- North Fork American River above American River Pump Station.

Installation of these stream gages under Alternative 1 will enable PCWA to provide real-time flow information to the public that is currently unavailable under the No-Action Alternative. Real-time flow data can be used for trip planning and scheduling purposes, which will allow recreation users to better utilize existing opportunities. Therefore, implementation of Alternative 1 will enhance the recreation experience on the bypass and peaking reaches.

3.9.3.9 Dissemination of Real-Time Flow Information

Under Alternative 1, PCWA will provide real-time flow information to the public using data available from ten stream gages, four of which are new gages that will be installed as part of Alternative 1. Eight of these gages are on the bypass reaches and two are on the peaking reach, as follows:

- Bypass Reaches
 - Rubicon River above Ellicott Bridge (existing, added to MFP);
 - Rubicon River above Ralston Powerhouse (existing, added to MFP);
 - South Fork Long Canyon Creek below Diversion Dam (new);
 - North Fork Long Canyon Creek below Diversion Dam (new);
 - Duncan Creek below Diversion Dam (USGS Gage No. 11427750) (existing);

- Middle Fork American River below French Meadows Dam (USGS Gage No. 11427500) (existing);
- Middle Fork American River above Middle Fork Powerhouse (USGS Gage No. 11427760) (existing); and
- Middle Fork American River below Middle Fork Interbay Dam (new).
- Peaking Reach
 - Middle Fork American River near Foresthill (USGS Gage No. 11433300) (existing); and
 - North Fork American River above American River Pump Station (new).

In addition to providing flow information, PCWA will provide the following information on a website maintained by PCWA:

- Notification that one (or more) of the Project reservoirs is spilling or that a spill event is eminent (if predictable);
- Notification of a special release, for example pulse flows; and
- A matrix showing when flows released from Oxbow Powerhouse could be expected to arrive downstream at the following specific locations in the peaking reach: Fords Bar; Ruck-a-Chucky Recreation Area; Mammoth Bar; Poverty Bar; the Confluence; Birdsall Access; and Oregon Bar Access Point.

The real-time flow data and associated information will be available to whitewater boaters, anglers, equestrian users and other stream-based users. This information can be used for trip planning and scheduling purposes, which will allow recreation visitors to better utilize existing stream-based recreation opportunities.

3.9.3.10 Changes in Project Operations that Affect Flow

Alternative 1 includes operational changes that will affect flow in the bypass and peaking reaches. These changes have the potential to affect stream-based recreation, as discussed in the following subsections.

Bypass Reaches

Alternative 1 generally increases minimum instream flows in the bypass reaches compared to the No-Action Alternative in all water year types (wet, above normal, below normal, dry, and critical). Scheduled environmental pulse flows are also included in Alternative 1 in May–July of wet and above normal water year types in the bypass reaches. The wet and above normal year types occurred approximately 50% of the time over the 33-year period of record (1975–2007) (Table 3.5-1).

Under Alternative 1, spills from Hell Hole Reservoir and French Meadows Reservoir will be down ramped when spill occurs in May–July (USDA-FS 2011; CDFG 2011). In addition, spills from Hell Hole Reservoir will be extended and then down ramped to

provide additional benefit to downstream aquatic resources. Under Alternative 1, the down ramp for both environmental pulse flows and reservoir spills provides slowly declining hydrographs that have additional environmental/recreational benefit compared to the faster decline of spill flows that occur under the No-Action Alternative.

Overall, these flow changes will: (1) improve aquatic habitat, which in turn, will improve fishing quality and success; and (2) provide predictable, scheduled flows that support stream-based recreation opportunities. These benefits are discussed further in the following subsections.

ANGLING

The effects of Alternative 1 on aquatic resources are discussed in detail in Section 3.5 – Fish and Aquatic Resources. In general, the increased minimum instream flows and the environmental pulse flows will increase wetted perimeter and, therefore, enhance aquatic macroinvertebrate production (food for fish). The increased minimum instream flows also enhance fish spawning habitat and rearing and overwintering habitat (particularly in the wetter water year types). The ramp down of spill flows benefits aquatic species by minimizing the chances of stranding. The environmental pulse flows will maintain channel conditions, remove fines from pools and gravels, and will maintain or enhance riparian vegetation conditions. Overall, Alternative 1 will enhance the fishery in the bypass reaches and will therefore enhance the angling experience compared to the No-Action Alternative.

WHITEWATER BOATING

A limited amount of whitewater boating by advanced and expert boaters occurs on the Rubicon River, Long Canyon, and the Middle Fork American River above Ralston Afterbay. Based on information developed through the Whitewater Boating Focus Group and through consultation with boaters after the focus group session, only one reach, the Rubicon River between Ellicott Bridge and Ralston Afterbay, is boated with any regularity (PCWA 2011d). None of the bypass reaches is boated commercially.

The boatable flow ranges for each of these reaches are identified below, based on information developed by PCWA during focus group sessions, through follow-up consultation, or through PCWA's whitewater boating flow studies (PCWA 2011d). The Rubicon River boatable flow range is based on survey information collected by PCWA in 2011, which is documented in the REC 4 – Contingency Whitewater Boating Study – Rubicon River – Ellicott Bridge to Ralston Afterbay (Attachment 2A).

River/Stream	Reach or Segment	Boatable Flow Range (cfs)	As Measured At:
Rubicon River	Ellicott Bridge to Ralston Afterbay	500 – 1,800	Put -in
Long Canyon Creek	Confluence of North and South Fork Long Canyon Creeks to Confluence with Rubicon River	200–600	Put-in
Middle Fork American River	French Meadows Dam to Middle Fork Interbay	215 - 450	Take-out
	Middle Fork Interbay to Ralston Afterbay	450 - 600	Take-out

The boatable flow ranges shown above were used to evaluate boating opportunities under the No-Action Alternative – Impaired Hydrology compared to Alternative 1 – Existing Demand, except on Long Canyon Creek, where both the No-Action Alternative – Impaired Condition and the No-Action Alternative – Existing License Conditions (model run) were compared to Alternative 1 – Existing Demand model run (Section 3.1).

The following criteria were used to analyze boating opportunities:

- The analysis was limited to the period of April 1–October 1; and
- Flows within the defined boatable range must be present for a minimum of three consecutive days to allow the boating opportunity to be utilized.

The boating opportunities analysis results were tabulated by reach and by water year type, and are summarized on Tables 3.9-3a–d. In addition, the results are graphically depicted on Figure 3.9-1a–d. Boating opportunities are expressed in the number of days that flows meet the criteria defined above.

Overall, the changes in Project operations that affect flow will maintain or enhance existing boating opportunities on the bypass reaches, as summarized below:

- **Rubicon River – Ellicott Bridge to Ralston Afterbay.** Alternative 1 will increase boating opportunities during above normal and wet water years (Figure 3.9-1a) compared to the No-Action Alternative. Boating opportunities are not available during the drier years under either the No-Action Alternative or Alternative 1.
- **Long Canyon Creek.** Alternative 1 will increase boating opportunities on this reach during wet water years compared to the No-Action Alternative (Figure 3.9-1b).
- **Middle Fork American River – French Meadows Dam to Middle Fork Interbay.** On average, Alternative 1 will result in fewer boating opportunities on this reach during below normal and above normal water years and will increase boating opportunities during wet water years (Figure 3.9-1c). This occurs because under Alternative 1, flows exceed the boating flow range during May and June due to the cumulative effect of pulse flows released from French Meadows Reservoir and Duncan Creek. Boating opportunities are not available in the drier years under the No-Action Alternative or Alternative 1.

- **Middle Fork American River – Middle Fork Interbay to Ralston Afterbay.** Alternative 1 will increase boating opportunities during above normal and wet water years (Figure 3.9-1d). Boating opportunities are not available in the drier years under the No-Action Alternative or Alternative 1.

Other measures included in Alternative 1 will further enhance boating opportunities on the bypass reaches. Under Alternative 1, whitewater boaters will be able to use real-time flow, pulse flow, and spill information to determine when boating flows are available, thereby allowing them to better utilize boating flows. In addition, the pulse flows and spill events will be managed to provide additional boating days that will not be available under the No-Action Alternative. Therefore, overall, Alternative 1 will enhance boating opportunities on the bypass reaches compared to the No-Action Alternative.

Peaking Reach

Alternative 1 increases minimum instream flows in the peaking reach compared to the No-Action Alternative in all water year types. The increase in minimum instream flows in the spring ranges from 25–375 cfs, in the summer from 25–275 cfs, and in the fall/winter from 15–125 cfs, depending on the water year type. In addition, Alternative 1 includes a reduction in the ramping rate of Oxbow Powerhouse flow releases (50% reduction of up ramp rate and 41% reduction of the down ramp rate).

The potential effects of these flow-related operational changes on angling, whitewater boating, and trail crossing are discussed in the following subsections.

ANGLING

The effects of Alternative 1 on aquatic resources in the peaking reach are discussed in detail in Section 3.5 – Fish and Aquatic Resources. The increased minimum instream flows and operational changes at Oxbow Powerhouse are designed to reduce the magnitude of flow fluctuations and powerhouse ramping rates. Reducing the magnitude of flow fluctuations will improve food production for fish (aquatic macroinvertebrates), increase effective spawning habitat, benefit young-of-the-year fish, and enhance fish abundance in the peaking reach. Reducing ramping rates will reduce the potential for stranding of fish during the down ramp. Therefore, implementation of Alternative 1 will enhance aquatic habitat compared to the No-Action Alternative. Enhancing aquatic habitat will enhance fish abundance in the peaking reach, which in turn, will improve the angling experience.

Two primary flow-related concerns were expressed by the focus group and in subsequent letters provided by the anglers: (1) ramping affects fishing quality and success; and (2) high flows make it difficult to cross the river and to move up and down the river (e.g., wade). These two topics are addressed further in the following subsections.

RAMPING

The primary flow-related effect on fishing quality in the peaking reach reported by the focus group participants is associated with ramping. Specifically, fishing quality and success reportedly decline as ramping begins, and remains depressed through the ramping period (about two hours), and for about one to two hours after ramping is complete. Based on this information, PCWA addressed flow-related fishing issues in the peaking reach by analyzing ramping conditions. The study methods and results are described in detail in the REC 4 – Whitewater Flow Studies Contingency TSR (PCWA 2011e) and summarized with respect to current Project operations in PCWA's Application for New License (PCWA 2011a).

As described above, Alternative 1 includes an increase in minimum instream flows in the peaking reach and operational changes at Oxbow Powerhouse to decrease potential flow fluctuations in the peaking reach. Reducing the ramping rate enhances recreation in the peaking reach by slowing the rate at which flows change, thereby, providing recreationists more time to adjust their activities to changing flow conditions. Therefore, Alternative 1 will enhance the angling experience in the peaking reach compared to the No-Action Alternative.

WADING/ANGLING OPPORTUNITIES

According to the anglers present at the March 4, 2010 angler focus group meeting, high flows can make it difficult to wade and cross the river while fishing, which limits angling opportunities. Accordingly, PCWA evaluated wading and crossing opportunities at various flows using data developed as part of the 2 D modeling studies conducted for the AQ 1 – Instream Flow TSR (PCWA 2011f) combined with stream crossing criteria developed for the REC 4 – TSR PCWA (PCWA 2011e).

Based on the information provided by the angler focus group participants, anglers prefer flows between 300 and 600 cfs for fishing in the peaking reach. However, these flows do not appear to be suitable for wading and crossing as it relates to angling (PCWA 2011a). A flow range of 75 to 300 cfs provides more wading area and is more suitable for wading and crossing (PCWA 2011a, Figures 7.9-2, 7.9-3, and 7.9-4).

PCWA analyzed angling opportunities at four angling locations in the peaking reach under the No-Action Alternative (impaired hydrology) and Alternative 1. The four locations in the peaking reach are:

- Below Oxbow Powerhouse;
- Cache Rock;
- Ruck-a-Chucky Recreation Area (Drivers Flat); and
- Above Confluence of North Fork American River and Middle Fork American River.

Two flow ranges were analyzed: (1) the 300 – 600 cfs flow range identified by the anglers; and (2) the lower flow range of 75 - 300 cfs, which appears to be a more suitable flow range for wading and crossing in the peaking reach. The following parameters were used in the analysis:

- Limited to the period of April 1 through November 30.
- Limited to two time periods identified by the anglers as preferable for fishing: sunrise 11:00 A.M. and 3:00 P.M. to sunset. Sunrise and sunset times were adjusted as appropriate by month.
- Two time windows were analyzed, a two- and three-hour window. In both cases, the desired flow range must be available for the entire time window.

The MFP Operations Model used to determine the percent of time angling opportunities would be available under the No-Action Alternative and Alternative 1, given the criteria identified above. The results are tabulated on Table 3.9-4 and are graphically depicted on Figures 3.9-2a and 3.9-2b. As indicated, flows within the 300–600 cfs range (Figure 3.9-2a) are rarely available under either the No-Action or Alternative 1. This is primarily because flows typically transition through the 300-600 cfs range when releases from Oxbow Powerhouse are ramped up or down. Opportunities in the lower flow range (75–300 cfs) are available more often because they occur at the minimum instream flow releases required in Alternative 1 (Figure 3.9-2b).

Implementation of Alternative 1 does not substantially change angling opportunities (flows in the 300–600 or 75–300 cfs ranges) relative to the No-Action Alternative. Any minor differences between the No-Action Alternative and Alternative 1 can be attributed to: (1) increased minimum instream flows under Alternative 1; and (2) comparing smooth, precise modeled hydrology data to actual measured hydrology data. Accordingly, implementation of Alternative 1 will maintain angling opportunities compared to the No-Action Alternative.

WHITEWATER BOATING

Whitewater boating occurs along the entire peaking reach, from Oxbow Powerhouse to the Oregon Bar Access point in the China Bar Recreation Area. The peaking reach is typically divided into four runs, as follows:

- Tunnel Chute Run: Middle Fork American River – Indian Bar Rafter Access to Ruck-a-Chucky Recreation Area;
- Mammoth Bar Run: Middle Fork American River – Ruck-a-Chucky Recreation Area to Mammoth Bar;
- Murderer's Bar Run: Middle Fork American River – Mammoth Bar to the North Fork American River Confluence; and
- Confluence Run: North Fork American River – Middle Fork American River Confluence to Oregon Bar.

Acceptable flow ranges for these four runs as identified through PCWA's whitewater flow studies are summarized below:

Run	Minimum Acceptable Flow (cfs)	Optimum Flow (cfs)	Maximum Acceptable Flow (cfs)
Tunnel Chute Run	800–900	1,000–1,250	1,500–2,500
Mammoth Bar Run	500–600	800–1,200	1,500–2,500
Murderer's Bar Run	500–600	800–1,200	1,500–2,500
Confluence Run	350–600	800–1,500	1,700–2,500

The boatable flow ranges were utilized to evaluate boating opportunities under the No-Action Alternative – Impaired Hydrology and Alternative 1 – Existing Demand conditions. For the purposes of this analysis, the boatable flow range was defined as the minimum acceptable flow to maximum acceptable flow. In addition, the following criteria were applied:

- **Boating Season.** The analysis was limited to the period of April through September. This timeframe was selected because the vast majority of whitewater boating use on the peaking reach is related to commercial rafting and almost all commercial rafting activity takes place between these dates.
- **Flow Continuity.** The analysis considered the amount of time that a target flow range must be continuously present to constitute a boating opportunity. The amount of time required to boat a specific run is dependent upon the length of the run. Therefore, the amount of time used in the analysis varies by run, as identified in Table 3.9-5.
- **Flow Timing.** The analysis considers the time of day that water typically arrives at each of the put-ins. Flow timing varies by run, depending upon distance from Oxbow Powerhouse and the length of the run, as identified in Table 3.9-5.

The results of the boating opportunities analysis were tabulated by five water year types and by month (April–September), and are provided in Tables 3.9-6a–d. In addition, the results are graphically depicted on Figures 3.9-3a–d. Boating opportunities are expressed in the number of days that flows meet the criteria defined above.

Overall, the changes in Project operations under Alternative 1 will maintain existing commercial boating opportunities on the peaking reach (Tunnel Chute Run). The effect of Alternative 1 on the Mammoth Bar Run, Murderer's Bar Run, and the Confluence Run varies. Specifically, Alternative 1 maintains boating opportunities for private boaters on the Mammoth Bar Run, decreases opportunities on the Murderer's Bar Run, and increases opportunities on the Confluence Run, especially during below normal and critical water years. Under Alternative 1, water is released earlier in the day. As such, it water arrives at the Confluence earlier in the day, which increases boating opportunities. By design, the earlier release does not adversely affect boating opportunities on the Tunnel Chute Run.

Under Alternative 1, whitewater boating flows will be released according to detailed release schedules, which are included in the resource agencies instream flow conditions. These schedules formalize PCWA's commitments regarding flow rates and timing. Formal commitments regarding flow releases for whitewater boating do not exist under the No-Action Alternative. Therefore, Alternative 1 enhances boating opportunities compared to the No-Action Alternative by mandating flow release magnitude and timing for whitewater boating. Access to real-time flow and related information will allow recreation visitors to better utilize existing opportunities.

Overall, changes in Project operations under Alternative 1 will maintain or enhance boating opportunities in the peaking reach compared to the No-Action Alternative. Flow magnitude and the timing of releases under Alternative 1 maintain or increase boating opportunity days for both commercial and private boaters, especially on the Tunnel Chute and Confluence Runs, respectively. In addition, flow release schedules included in the resource agencies instream flow conditions ensure that flows in the boatable range are available in the peaking reach during the time of day they can be utilized. Access to real-time flow and related information will allow recreation visitors to better utilize existing opportunities. Therefore, implementation of Alternative 1 will enhance boating opportunities compared to the No-Action Alternative.

TRAIL CROSSINGS

PCWA conducted stream crossing flow studies at five trail crossings in the peaking reach. Specifically, PCWA developed stage/discharge relationships for each crossing location and then used hydraulic modeling results combined with the wading/crossing criteria to determine the range of flows that were crossable by pedestrians and equestrians.

Two crossing flows were determined at each site, as shown below. These flows represent: (1) the flow at which crossing suitability shifts from easy/moderate to moderate/difficult; and (2) the flow at which crossing shifts from moderate/difficult to difficult. The lower threshold is appropriate for the average hiker and equestrian in a recreational setting. The higher threshold is appropriate for more athletic and experience individuals and equestrians.

Location	Easy/Moderate to Moderate/Difficult Crossing Threshold Flow (cfs)	Moderate/Difficult to Difficult Crossing Threshold Flow (cfs)
Fords Bar	275	550
Ruck-a-Chucky	125	450
Poverty Bar	225	550
Mammoth Bar	175	375
Coffer Dam	175	375

The crossing threshold flows were utilized to determine the average number of hours per day that easy/moderate and moderate/difficult crossing conditions were available at

each stream crossing location by season under No-Action Alternative – Impaired Hydrology compared to Alternative 1 – Existing Demand conditions.

For the purposes of this analysis, a “day” was defined as the 12-hour period between 7:00 AM and 7:00 PM. The results of this analysis were tabulated annually and seasonally and are provided in Table 3.9-7a–b, and graphically depicted on Figures 3.9-4a–e and 3.9-5a–e.

Alternative 1 includes increased minimum instream flows and recreation flow releases that were designed to improve aquatic habitat and provide whitewater boating opportunities while, to the extent possible, preserving trail crossing opportunities. As shown on Table 3.9-7a–b and on Figures 3.9-4a–e and 3.9-5a–e, under both the No-Action Alternative and Alternative 1, trail crossing opportunities vary by water year, crossing location, and by season. Crossing opportunities under Alternative 1 occurring less frequently during some periods but more frequently during other periods. The average change in trail crossing opportunities (all years combined) under Alternative 1 compared to the No-Action Alternative is summarized below.

Change in Trail Crossing Opportunities
No-Action Alternative Compared to Alternative 1
 (all water years combined)

Trail Crossing	Change in Amount of Time (Average Hours/Day)	
	Easy/Moderate	Moderate/Difficult
Fords Bar	- 0.24	- 0.41
Ruck-a-Chucky	-1.86	- 0.03
Poverty Bar	- 0.42	- 0.11
Mammoth Bar	- 1.34	+ 0.23
Coffer Dam	-1.36	- 0.10
Average	-1.04	- 0.08

As indicated, over all of the water year types, implementation of Alternative 1 will reduce easy/moderate crossing opportunities at the crossings in the peaking reach by an average of 1.04 hour per day (62 minutes/day) compared to the No-Action Alternative. Implementation of Alternative 1 will reduce moderate/difficult crossing opportunities at the crossings in the peaking reach by an average of 0.08 hour a day (5 minutes/day).

As indicated, the largest change in easy/moderate crossing opportunities occurs at Ruck-a-Chucky. Due to the channel configuration, the crossing thresholds at Ruck-a-Chucky are relatively low (125 cfs and 450 cfs). Therefore, minimum instream flows under Alternative 1 are often higher than the easy/moderate crossing threshold. This is also the case at the Mammoth Bar and Coffer Dam crossings, where the easy/moderate crossing threshold is 175 cfs and the moderate/difficult crossing threshold is 375 cfs. Crossing opportunities at the Coffer Dam Crossing are also influenced by contributions from the North Fork American River, particularly during the spring (Figure 3.9-5e), when

there are essentially no crossing opportunities under either Alternative 1 or No-Action Alternative.

Alternative 1 includes provisions to disseminate real-time flow information and travel time information for the peaking reach. In addition, flow release magnitude and timing are specified in the resource agencies instream flow conditions. This information will enable equestrians and hikers to plan trips and to schedule trail crossings when flows are at their lowest. These provisions will maintain trail crossing opportunities in the peaking reach despite the slight decrease in easy/moderate crossing opportunities under Alternative 1 compared to the No-Action Alternative.

3.9.4 Modification of Existing or Construction of New Project Facilities and Project Recreation Facilities and Features

Under Alternative 1, modification of existing or construction of new Project facilities and Project recreation facilities and features will be implemented to improve operations and maintenance of the MFP, enhance environmental resources, and/or meet the requirements specified in new environmental programs and measures. These projects are described in Section 2.0 – Elements Analyzed and Appendix A, and include:

- Hell Hole Reservoir Seasonal Storage Increase Improvement;
- Small Diversion Modifications;
- Outlet Works Modifications;
- New Gage Installation; and
- New Recreation Facilities.

During construction activities traffic volumes will increase relative to the No-Action Alternative, which may affect recreation visitors travelling to and from the MFP reservoirs or recreation facilities. Similarly, construction noise may adversely affect recreation visitors using nearby developed recreation facilities. However, these effects will be short-term, and are therefore considered negligible.

Additionally, the timing and sequencing of the construction activities will result in minimal disruptions to recreation visitors, as follows:

- To the extent practicable, construction activities will be timed to occur during the late summer or early fall, which is after the peak recreation season.
- Construction activities will not occur simultaneously. Instead, construction activities will be staggered over a fifteen-year period. Therefore, alternative Project recreation facilities and opportunities are always available to recreation users.
- Most construction activities will occur over a relatively short period of time (e.g., less than about four weeks).

- Where applicable, construction of new Project recreation facilities will coincide with other Project-related construction activities.

With these timing considerations, recreation visitors will be negligibly affected by construction activities associated with implementation of Alternative 1.

Potential impacts to recreation users associated with the implementation of these elements of Alternative 1 are discussed in the following subsections.

3.9.4.1 Hell Hole Reservoir Seasonal Storage Increase Improvement

Under Alternative 1, spillway crest gates will be installed on the Hell Hole Spillway to seasonally increase the storage capacity of Hell Hole Reservoir. This improvement will be implemented three to five years after license issuance. Construction activities will occur between July and October, which overlaps the recreation season.

The reservoir will not be drawn down to facilitate construction. In addition, none of the construction activities associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement will occur in the immediate vicinity of a developed Project recreation facility. Therefore, implementation of the Hell Hole Reservoir Seasonal Storage Increase Improvement will not directly affect recreation visitors using Hell Hole Reservoir or the developed recreation facilities at Hell Hole Reservoir. Overall, implementation of this element will have a negligible effect on recreation use, primarily due short-term increases in noise and traffic levels.

3.9.4.2 Small Diversion Modifications

Under Alternative 1, the Duncan Creek Diversion Dam, the North Fork Long Canyon Diversion Dam, and the South Fork Long Canyon Diversion Dam will be modified to allow for more natural transport of sediment past the diversion structures, and to reduce the need for future sediment removal activities. The Duncan Creek Diversion Dam will be modified two to three years after license issuance and the North and South Fork Long Canyon diversion dams will be modified three to four years after license issuance. In all three cases, construction will occur between July and November, which overlaps the recreation season.

There are no developed MFP recreation facilities in the immediate vicinity of any of the small diversions, except Middle Meadows Campground, which is located just upstream of the South Fork Long Canyon Diversion Dam. None of the developed Project recreation facilities will be directly affected by the modification of the small diversions. Visitors at Middle Meadows Campground may be affected by noise associated with construction activities. However, this effect will be short-term and is therefore considered negligible. The access road to Middle Meadows Campground will not be affected by construction activities.

A limited amount of dispersed use occurs in the vicinity of the small diversions. During the construction period, the areas in the immediate vicinity of the small diversions and the access roads will be temporarily closed to the public for safety reasons. However,

dispersed recreation opportunities will continue to be available elsewhere in the Duncan Creek and Long Canyon areas. Therefore, modification of the small diversions will have a negligible effect on recreation use.

In the past, sediment removal has occurred ten times in 30 years at the North Fork Long Canyon Diversion, seven times in 30 years at the South Fork Long Canyon Diversion, and three times in 22 years at the Duncan Creek Diversion (refer to SMP Table 2 for frequency). On each of these occasions, public access to these areas has been temporarily closed. The small diversion modifications will alleviate or reduce the need for sediment management activities in these areas in the future, which in turn will reduce the need to close the areas to dispersed use. Therefore, over the long term, fewer users will be displaced under Alternative 1 compared to the No-Action Alternative.

3.9.4.3 Outlet Works Modifications

Alternative 1 includes modification of outlet works at French Meadows Dam, Hell Hole Dam, and Middle Fork Interbay Dam. The purpose of these modifications is to enhance the ability of the outlet works to release new instream flow requirements, and where necessary, install new gages to collect flow data necessary for documenting compliance under the new license. The outlet works modifications will be staggered to be completed one–three years after license issuance (Table 3.9-8). The French Meadows and Middle Fork Interbay Outlet works will be modified between June and December. The Hell Hole Outlet works will be modified between July and November. In all three cases, the construction window overlaps the recreation season.

Construction activities associated with the outlet works modifications will primarily be limited to the downstream side of the dams. None of the construction activities associated with the outlet works modifications will occur in the immediate vicinity of a developed Project recreation facility. Therefore, implementation of the outlet works modifications will not directly affect the developed recreation facilities at Hell Hole or French Meadows reservoirs, or visitors using these facilities. A limited amount of dispersed use occurs downstream of Hell Hole, French Meadows, and Middle Fork Interbay dams. However, similar dispersed use opportunities will continue to be available elsewhere in the Project vicinity. Therefore, the outlet works modifications will have a negligible effect on dispersed recreation opportunities.

3.9.4.4 New Gage Installation

Alternative 1 includes installation of four new gages to monitor flows for compliance with the new license and/or collect flow data for real-time flow dissemination to the public. These gages are identified as follows:

- North Fork Long Canyon Creek Gage below Diversion Dam (NFLCC);
- South Fork Long Canyon Dam Gage below Diversion Dam (SFLCC);
- Middle Fork American River Gage above American River Pump Station (MFARIB); and

- North Fork American River Gage above American River Pump Station (NFARPS).

With the exception of the NFARPS, these gages will be installed concurrent with the small diversion and outlet works modifications described above. Therefore, potential impacts will be the same as those described above. The NFARPS gage is not located near a developed recreation facility. The North Fork American River is utilized by whitewater boaters and other stream-based recreation users. However, the gage will be installed in October, after the peak recreation season, during the MFP maintenance outage, when recreation use is low. Implementation of Alternative 1 will not substantially disrupt recreation use on the North Fork American River compared to the No-Action Alternative. Overall, installation of this gage under Alternative 1 will improve recreation opportunities on the North Fork American River by providing a mechanism for collecting and disseminating real-time flow data to the public.

3.9.4.5 New Recreation Facilities and Features

Alternative 1 includes construction of two new recreation facilities, the French Meadows Reservoir Trail and the Ellicott Bridge Parking Area. In addition, two recreation facility water supplies in the French Meadows Area will be replaced. These construction projects are discussed in the following subsections.

French Meadows Reservoir Trail

Under Alternative 1, PCWA will design and construct a trail between French Meadows Campground and French Meadows Dam. The trail will be situated on the south side of French Meadows Reservoir between the reservoir and the Forest Road 96 and will be constructed by connecting previously cleared and graded roadways. This trail will be designed, constructed, and maintained to meet FS standards for public pedestrian and bicycle use. Motorized use of this trail will be prohibited with signage and barriers.

This trail will be constructed between July and November, which overlaps part of the recreation season. The construction period will be relatively short (about 14 days). In addition, construction will not require road or trail closures, nor will it require closing any of the recreation facilities in the French Meadows Area. Therefore, construction of this facility will not substantially affect recreation use or opportunities.

Overall, this trail will improve access to the French Meadows shoreline and will provide additional hiking and biking opportunities in the French Meadows Area. This trail will not be constructed under the No-Action Alternative. Therefore, implementation of Alternative 1 will enhance recreation opportunities relative to the No-Action Alternative.

Ellicott Bridge Parking Area

Under Alternative 1, PCWA will design and construct a six-vehicle river access parking area along Forest Road 14N08 (Eleven Pines Road) at the Ellicott's Bridge crossing of the Rubicon River. The parking area will include an accessible toilet, informational signage, and barrier rock to corral parking. Development of the Ellicott Bridge Parking

Area will provide sanitation facilities for recreation visitors and will reduce resource impacts by limiting parking to a defined area. The Ellicott Bridge Parking Area would not be constructed under the No-Action Alternative.

The Ellicott Bridge Parking Area will be constructed between July and November, which overlaps part of the recreation season. The construction period will be relatively short (about 10 days). In addition, construction will not require road or trail closures. Therefore, construction of this facility will not substantially affect recreation use or opportunities. Overall, construction of the Ellicott Bridge Parking Area under Alternative 1 will enhance existing MFP recreation opportunities and experience along the Rubicon River, while reducing resource impacts and sanitation issues.

Replacement of Project Recreation Facility Water Supplies

Under Alternative 1, PCWA will replace the French Meadows North Shore Water Supply (Dolly Creek Water Supply) and the French Meadows South Shore Water Supply (French Meadows Campground Water Supply) infrastructure, including all drains, valves, pipe, and other items, as necessary. These two water supplies are currently unreliable and are in constant need of repair. Replacing these water systems will require temporarily closing recreation facilities in the French Meadows Area. Therefore, to minimize disruptions to recreation users:

- The French Meadows North Shore Water Supply and the French Meadows South Shore Water Systems will not be replaced simultaneously; and
- Infrastructure replacement will occur after Labor Day, when recreation use in the French Meadows Area substantially decreases.

Replacing the infrastructure associated with these two water systems will result in the following benefits at the Project recreation facilities served by these water supplies:

- Provide a reliable and sufficient water supply;
- Help reduce service disruptions; and
- Reduce the need for repairs, thereby reducing operation and maintenance costs and potential environmental impacts associated with emergency repairs.

These water supplies would not be replaced under the No-Action Alternative. Therefore, these benefits would not occur under the No-Action Alternative.

3.9.5 Conclusions—Recreation Resources

Alternative 1 is consistent with the management goals and objectives contained in the Rubicon River Wild Trout Management Plan (CDFG 1979) and ASRA's Interim Management Plan (USBR 1992). In addition, Alternative 1 will not affect the Granite Chief Wilderness, the WST, or any of the ORVs for which the Rubicon River, Middle Fork American River, and North Fork American River are eligible for the national W&SR system.

Overall, implementation of Alternative 1 will maintain or enhance recreation opportunities associated with the MFP, as summarized in the following:

- Changes in Project operations that effect flow will enhance stream-based recreation opportunities on the bypass and peaking reaches, including whitewater boating and angling. Trail crossing opportunities will be maintained under Alternative 1. Predictable flows and the dissemination of real-time flow and other related information will enhance stream-based recreation experience on the bypass and peaking reaches by providing stream-based recreation users with information that can be used for trip planning and scheduling purposes.
- Flows suitable for commercial and private whitewater boating in the peaking reach will be provided on a regular, scheduled basis as specified in the resource agencies instream flow conditions which will enhance boating opportunities on the peaking reach.
- Boating flows will be released earlier in the day to provide boating opportunities for boaters on the Confluence Run, while maintaining commercial boating opportunities on the Tunnel Chute Run.
- Changes in Project operations that affect flow will enhance the fishery on the bypass and peaking reaches, which will improve fishing quality and success.
- Implementation of Alternative 1 will maintain angling opportunities in the 75-300 cfs and the 300–600 cfs range in the peaking reach.
- Flow releases for whitewater boating and provisions for special events (e.g. Tevis Cup and Western States 100) are mandated in the resource agencies instream flow conditions, which will enhance recreation opportunities by providing reliable and predictable flows.
- The consolidation and reduction of Project recreation facilities will enhance recreation opportunities by providing appropriately scaled facilities that meet user needs, while protecting nearby sensitive resources.
- Converting the McGuire Picnic Area to a group campground and potentially converting Hell Hole Campground to a group campground will enhance Project recreation opportunities by providing additional group camping opportunities.
- Developing the Duncan Creek Primitive Use Site and the Ellicott Bridge Parking Area will enhance conditions for dispersed recreation users, while reducing potential resource impacts and addressing sanitation issues.
- Formalizing the Ralston Afterbay Sediment Removal Access Point as a public boat launch will provide better boat launching opportunities at Ralston Afterbay.
- Improvements to Ahart Campground will enhance facility conditions for recreation users, while reducing dust, erosion, and sedimentation along the access and loop roads.

- Improvements to the Indian Bar Rafter Access will improve conditions for commercial whitewater boaters and other stream-based recreation users by relieving congestion in the unloading area and at the existing boat launch.
- Enhancement of the Duncan Creek Diversion Gage Access Trail and the Middle Fork American River Access Trail, and construction of the Middle Fork American River below Interbay Dam Access Trail will provide additional recreational access to the bypass reaches.
- Construction of the French Meadows Reservoir Trail and enhancement of the Hell Hole Reservoir Trail will provide additional access to French Meadows Reservoir and Hell Hole Reservoir, respectively, and will provide better hiking and biking opportunities.
- French Meadows and Hell Hole reservoirs will be operated to meet WSE objectives that benefit summer reservoir recreation.
- Extending French Meadows and Hell Hole boat ramps will improve access to French Meadows and Hell Hole reservoirs by enabling recreation visitors to launch boats during the entire recreation season and during the fall shoulder season in all but the driest water years. The dissemination of real-time WSE and other related information will further enhance reservoir recreation opportunities.
- Replacement of the French Meadows North Shore Water Supply and the French Meadows South Shore Water Supply Systems will ensure that the Project recreation facilities in the French Meadows Area have a reliable water supply.
- Funding for administrative oversight and routine operation and maintenance activities will enhance recreation opportunities and experiences at the MFP recreation facilities and in the peaking reach.

3.9.6 Unavoidable Adverse Effects

There are no unavoidable adverse effects to recreation resources under Alternative 1.

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TABLES

Table 3.9-1. French Meadows Boat Ramp Functionality (% of years).

Water Year Type	No-Action Alternative Existing Ramp	No-Action Alternative plus Extended Ramp	Alternative 1
	Impaired Hydrology	Impaired Hydrology	Modeled Future Demand
	Bottom of Ramp = 5,200 ft	Bottom of Ramp = 5,175 ft	Bottom of Ramp = 5,175 ft
Peak Recreation Season (Memorial Day through Labor Day)			
Wet (n=12)	100%	100%	100%
Above Normal (n = 4)	100%	100%	100%
Below Normal (n = 6)	100%	100%	100%
Dry (n=6)	33%	83%	100%
Critical (n = 4)	25%	100%	100%
Extreme Critical (n = 1)	0%	0%	0%
Extended Recreation Season (Memorial Day through November 1)			
Wet (n=12)	92%	100%	100%
Above Normal (n = 4)	100%	100%	100%
Below Normal (n = 6)	83%	100%	100%
Dry (n=6)	17%	50%	100%
Critical (n = 4)	0%	75%	75%
Extreme Critical (n = 1)	0%	0%	0%

Table 3.9-2. Hell Hole Boat Ramp Functionality (% of years).

Water Year Type	No-Action Alternative Existing Ramp	No-Action Alternative plus Extended Ramp	Alternative 1
	Impaired Hydrology	Impaired Hydrology	Modeled Future Demand
	Bottom of Ramp = 4,525 ft	Bottom of Ramp = 4,485 ft	Bottom of Ramp = 4,485 ft
Peak Recreation Season (Memorial Day through Labor Day)			
Wet (n=12)	100%	100%	100%
Above Normal (n = 4)	100%	100%	100%
Below Normal (n = 6)	100%	100%	100%
Dry (n=6)	50%	83%	100%
Critical (n = 4)	75%	100%	75%
Extreme Critical (n = 1)	0%	100%	0%
Extended Recreation Season (Memorial Day through November 1)			
Wet (n=12)	92%	100%	100 %
Above Normal (n = 4)	100%	100%	100 %
Below Normal (n = 6)	67%	100%	100 %
Dry (n=6)	17%	50%	100%
Critical (n = 4)	25%	100%	50%
Extreme Critical (n = 1)	0%	100%	0%

Table 3.9-3a. Whitewater Boating Opportunities by Year and Water Year Type - Bypass Reaches
Rubicon River: Ellicott Bridge to Ralston Afterbay.

Water Year and Year Type	Flow Range	Days Flows Meet Criteria							Days Flows Meet Criteria						
		NO-ACTION ALTERNATIVE (IMPAIRED)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Extreme Critical															
1977	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical															
1976	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average (500 - 1800 cfs)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry															
1981	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average (500 - 1800 cfs)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal															
1979	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	500 - 1800 cfs	0	0	4	0	0	0	4	0	0	0	0	0	0	0
2004	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average (500 - 1800 cfs)		0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal															
1975	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	500 - 1800 cfs	0	3	13	0	0	0	16	0	4	12	0	0	0	16
Average (500 - 1800 cfs)		0.0	0.5	2.2	0.0	0.0	0.0	2.7	0.0	0.7	2.0	0.0	0.0	0.0	2.7
Wet															
1980	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	500 - 1800 cfs	11	29	0	0	0	0	40	9	25	3	0	0	0	37
1983	500 - 1800 cfs	0	11	8	7	0	0	26	0	12	20	11	0	0	43
1984	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	500 - 1800 cfs	3	3	17	10	0	0	33	3	0	25	8	0	0	36
1996	500 - 1800 cfs	0	12	3	0	0	0	15	0	10	0	0	0	0	10
1997	500 - 1800 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	500 - 1800 cfs	0	0	7	8	0	0	15	0	0	3	6	0	0	9
2006	500 - 1800 cfs	28	19	10	0	0	0	57	21	29	8	0	0	0	58
Average (500 - 1800 cfs)		4.2	7.4	4.5	2.5	0.0	0.0	18.6	3.3	7.6	5.9	2.5	0.0	0.0	19.3

**Table 3.9-3b. Whitewater Boating Opportunities by Year and Water Year Type – Bypass Reaches
Long Canyon Creek.**

Water Year and Year Type	Flow Range	Days Flows Meet Criteria							Days Flows Meet Criteria						
		NO-ACTION ALTERNATIVE (EXISTING LICENSE CONDITIONS)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Extreme Critical															
1977	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical															
1976	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry															
1981	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal															
1979	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal															
1975	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet															
1980	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	200 - 600 cfs	0	0	0	0	0	0	0	5	0	0	0	0	0	5
1983	200 - 600 cfs	0	0	0	0	0	0	0	0	7	0	0	0	0	7
1984	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	200 - 600 cfs	3	0	0	0	0	0	3	4	0	0	0	0	0	4
1996	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	200 - 600 cfs	6	0	0	0	0	0	6	7	0	0	0	0	0	7
Average		0.9	0.0	0.0	0.0	0.0	0.0	0.9	1.6	0.7	0.0	0.0	0.0	0.0	2.3

Table 3.9-3c. Whitewater Boating Opportunities by Year and Water Year Type - Bypass Reaches
Middle Fork American River: French Meadows Dam to Middle Fork Interbay.

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Extreme Critical															
1977	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical															
1976	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry															
1981	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal															
1979	215 - 450 cfs	0	4	0	0	0	0	4	0	0	0	0	0	0	0
1985	215 - 450 cfs	8	0	0	0	0	0	8	0	0	0	0	0	0	0
1989	215 - 450 cfs	10	0	0	0	0	0	10	12	0	0	0	0	0	12
2002	215 - 450 cfs	9	0	0	0	0	0	9	4	0	0	0	0	0	4
2003	215 - 450 cfs	7	16	0	0	0	0	23	0	13	0	0	0	0	13
2004	215 - 450 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		5.7	3.3	0.0	0.0	0.0	0.0	9.0	2.7	2.2	0.0	0.0	0.0	0.0	4.8
Above Normal															
1975	215 - 450 cfs	7	24	5	0	0	0	36	3	7	0	0	0	0	10
1978	215 - 450 cfs	14	8	0	0	0	0	22	15	11	0	0	0	0	26
1993	215 - 450 cfs	26	5	0	0	0	0	31	23	5	5	0	0	0	33
1999	215 - 450 cfs	11	11	1	0	0	0	23	4	6	0	0	0	0	10
2000	215 - 450 cfs	0	0	0	0	0	0	0	0	6	0	0	0	0	6
2005	215 - 450 cfs	30	17	11	0	0	0	58	28	5	4	0	0	0	37
Average		14.7	10.8	2.8	0.0	0.0	0.0	28.3	12.2	6.7	1.5	0.0	0.0	0.0	20.3
Wet															
1980	215 - 450 cfs	5	0	0	0	0	0	5	0	8	1	0	0	0	9
1982	215 - 450 cfs	6	15	13	0	0	0	34	20	13	12	0	0	0	45
1983	215 - 450 cfs	26	20	10	0	0	0	56	22	14	24	0	0	0	60
1984	215 - 450 cfs	0	0	0	0	0	0	0	0	7	0	0	0	0	7
1986	215 - 450 cfs	6	2	2	0	0	0	10	5	5	0	0	0	0	10
1995	215 - 450 cfs	26	14	5	4	0	0	49	24	11	7	0	0	0	42
1996	215 - 450 cfs	16	8	0	0	0	0	24	13	11	0	0	0	0	24
1997	215 - 450 cfs	0	0	0	0	0	0	0	0	5	0	0	0	0	5
1998	215 - 450 cfs	14	15	6	3	0	0	38	10	16	15	0	0	0	41
2006	215 - 450 cfs	0	7	4	0	0	0	11	15	14	4	0	0	0	33
Average		9.9	8.1	4.0	0.7	0.0	0.0	22.7	10.9	10.4	6.3	0.0	0.0	0.0	27.6

Table 3.9-3d. Whitewater Boating Opportunities by Year and Water Year Type - Bypass Reaches
Middle Fork American River: Middle Fork Interbay to Ralston Afterbay.

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Extreme Critical															
1977	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical															
1976	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Dry															
1981	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Below Normal															
1979	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Above Normal															
1975	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	450 - 600 cfs	0	0	0	0	0	0	0	0	4	0	0	0	0	4
1993	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	450 - 600 cfs	0	5	0	0	0	0	5	0	0	3	0	0	0	3
Average		0.0	0.8	0.0	0.0	0.0	0.0	0.8	0.0	0.7	0.5	0.0	0.0	0.0	1.2

Wet															
1980	450 - 600 cfs	0	0	0	0	0	0	0	0	5	0	0	0	0	5
1982	450 - 600 cfs	0	14	8	0	0	0	22	3	0	0	0	0	0	3
1983	450 - 600 cfs	16	15	7	1	0	0	39	5	13	6	0	0	0	24
1984	450 - 600 cfs	0	0	0	0	0	0	0	0	10	0	0	0	0	10
1986	450 - 600 cfs	4	0	0	0	0	0	4	3	8	0	0	0	0	11
1995	450 - 600 cfs	6	7	3	0	0	0	16	6	7	3	0	0	0	16
1996	450 - 600 cfs	0	0	0	0	0	0	0	0	6	0	0	0	0	6
1997	450 - 600 cfs	0	0	0	0	0	0	0	0	8	0	0	0	0	8
1998	450 - 600 cfs	0	0	0	0	0	0	0	0	5	0	0	0	0	5
2006	450 - 600 cfs	0	0	3	0	0	0	3	0	4	0	0	0	0	4
Average		2.6	3.6	2.1	0.1	0.0	0.0	8.4	1.7	6.6	0.9	0.0	0.0	0.0	9.2

Table 3.9-4. Angling Opportunities¹ at Select Locations in the Peaking Reach.

75 - 300 cfs				
Angling Location	Two Hour Window²		Three Hour Window³	
	Alternative 1	No-Action Alternative	Alternative 1	No-Action Alternative
Below Oxbow Powerhouse	19%	23%	19%	19%
Cache Rock	22%	25%	18%	24%
Ruck-a-Chucky Recreation Area (Drivers Flat)	23%	26%	22%	23%
Above NFAR/MFAR Confluence	24%	30%	23%	27%

300 - 600 cfs				
Angling Location	Two Hour Window		Three Hour Window	
	Alternative 1	No-Action Alternative	Alternative 1	No-Action Alternative
Below Oxbow Powerhouse	11%	8%	5%	6%
Cache Rock	13%	9%	5%	8%
Ruck-a-Chucky Recreation Area (Drivers Flat)	12%	8%	7%	6%
Above NFAR/MFAR Confluence	12%	11%	8%	8%

¹Time period used for analysis = Sunrise - 11 am and 3 pm - Sunset, adjusted as appropriate by month.

²Flow is available for two hour period.

³Flow is available for three hour period.

Table 3.9-5. Whitewater Boating Opportunity Days Analysis Criteria – Peaking Reach.

River	Run	Distance (miles)	Flow Range (cfs)	Season	Flow Continuity	Timing
Middle Fork American River	Tunnel Chute	15	800–2,500	April 1– October 1	Four (4) consecutive hours of flow within flow range	Flow block initiates at Oxbow PH between the hours of 8:00 AM and 2:00 PM
	Mammoth Bar	7	500–2,500	April 1– October 1	Four (4) consecutive hours of flow within flow range	Flow block initiates at Ruck-a-Chucky between the hours of 8:00 AM and 5:00 PM
	Murderer's Bar	2	500–2,500	April 1– October 1	Two (2) consecutive hours of flow within flow range	Flow block initiates at Mammoth Bar between the hours of 8:00 AM and 5:00 PM
North Fork American River	Confluence	5	350–2,500	April 1– October 1	Three (3) consecutive hours of flow within flow range	Flow block initiates at the Confluence between the hours of 8:00 AM and 3:00 PM

**Table 3.9-6a. Whitewater Boating Opportunities by Year and Water Year Type – Peaking Reach
Tunnel Chute Run (Indian Bar Rafting Access to Ruck-a-Chucky).**

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Critical Dry															
1988	800 - 2500 cfs	0	0	21	25	21	17	84	0	2	17	24	18	5	66
1992	800 - 2500 cfs	0	9	15	25	23	10	82	0	2	21	24	23	15	85
1994	800 - 2500 cfs	0	4	27	27	23	3	84	0	2	17	24	18	6	67
Average		0	4	21	26	22	10	83	0	2	18	24	20	9	73
Dry															
1990	800 - 2500 cfs	0	2	18	28	28	16	92	0	3	28	26	26	19	102
1991	800 - 2500 cfs	14	14	24	26	27	12	117	28	6	28	29	31	18	140
2001	800 - 2500 cfs	12	22	22	28	29	28	141	13	2	22	25	25	14	101
2007	800 - 2500 cfs	5	16	20	29	31	26	127	0	0	30	31	31	24	116
Average		8	14	21	28	29	21	119	10	3	27	28	28	19	115
Below Normal															
1989	800 - 2500 cfs	25	31	27	16	31	15	145	26	26	29	30	31	25	167
2002	800 - 2500 cfs	24	28	28	28	26	7	141	30	8	30	30	31	21	150
2003	800 - 2500 cfs	28	25	28	30	31	30	172	28	22	29	30	30	21	160
2004	800 - 2500 cfs	22	29	29	30	30	30	170	20	2	29	30	31	18	130
Average		25	28	28	26	30	21	157	26	15	29	30	31	21	152
Above Normal															
1993	800 - 2500 cfs	22	30	29	30	31	11	153	7	20	30	31	31	24	143
1999	800 - 2500 cfs	25	31	29	29	30	19	163	30	31	30	31	31	24	177
2000	800 - 2500 cfs	27	31	29	31	31	20	169	30	28	29	31	31	22	171
2005	800 - 2500 cfs	30	14	26	22	17	26	135	16	5	22	31	31	30	135
Average		26	27	28	28	27	19	155	21	21	28	31	31	25	157
Wet															
1995	800 - 2500 cfs	0	0	5	30	30	15	80	0	0	0	27	31	30	88
1997	800 - 2500 cfs	30	31	29	29	31	18	168	30	27	29	31	31	22	170
1998	800 - 2500 cfs	9	15	18	31	30	26	129	12	1	30	31	31	27	132
2006	800 - 2500 cfs	0	5	30	31	29	17	112	0	2	23	31	31	29	116
Average		10	13	21	30	30	19	122	11	8	21	30	31	27	127

Table 3.9-6b. Whitewater Boating Opportunities by Year and Water Year Type – Peaking Reach Mammoth Bar Run (Ruck-a-Chucky to Mammoth Bar).

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Critical Dry															
1988	500 - 2500 cfs	3	0	24	25	18	13	83	3	2	17	21	17	5	65
1992	500 - 2500 cfs	6	8	22	24	17	9	86	11	4	21	23	22	5	86
1994	500 - 2500 cfs	0	9	29	25	30	9	102	7	3	17	21	17	6	71
Average		3	6	25	25	22	10	90	7	3	18	22	19	5	74
Dry															
1990	500 - 2500 cfs	12	3	23	28	29	19	114	30	3	22	25	24	16	120
1991	500 - 2500 cfs	29	31	26	28	27	18	159	30	26	24	27	24	16	147
2001	500 - 2500 cfs	19	23	24	28	29	29	152	30	19	22	24	23	16	134
2007	500 - 2500 cfs	12	2	22	28	29	19	112	26	14	27	31	31	23	152
Average		18	15	24	28	29	21	134	29	16	24	27	26	18	138
Below Normal															
1989	500 - 2500 cfs	23	31	28	18	30	16	146	23	30	29	29	31	24	166
2002	500 - 2500 cfs	30	29	30	31	30	8	158	30	29	30	30	31	24	174
2003	500 - 2500 cfs	28	23	30	31	29	30	171	28	18	29	30	30	21	156
2004	500 - 2500 cfs	23	31	28	18	30	16	146	30	14	28	28	30	19	149
Average		26	29	29	25	30	18	155	28	23	29	29	31	22	161
Above Normal															
1993	500 - 2500 cfs	19	30	30	30	31	20	160	5	17	30	31	31	25	139
1999	500 - 2500 cfs	25	31	30	31	31	19	167	29	29	30	31	31	25	175
2000	500 - 2500 cfs	30	31	30	31	31	21	174	30	29	30	31	31	22	173
2005	500 - 2500 cfs	19	31	30	30	31	20	161	13	4	20	31	31	28	127
Average		23	31	30	31	31	20	166	19	20	28	31	31	25	154
Wet															
1995	500 - 2500 cfs	0	0	4	28	31	17	80	0	0	0	26	31	30	87
1997	500 - 2500 cfs	30	31	29	31	31	21	173	30	31	30	31	31	30	183
1998	500 - 2500 cfs	8	13	18	30	31	28	128	9	0	29	31	31	28	128
2006	500 - 2500 cfs	0	0	5	29	31	17	82	0	0	23	31	31	27	112
Average		10	11	14	30	31	21	116	10	8	21	30	31	29	128

**Table 3.9-6c. Whitewater Boating Opportunities by Year and Water Year Type – Peaking Reach
Murderer's Bar Run (Mammoth Bar to Confluence).**

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Critical Dry															
1988	500 - 2500 cfs	3	0	24	25	18	13	83	3	0	9	12	9	0	33
1992	500 - 2500 cfs	6	8	22	24	17	9	86	11	0	13	18	12	9	63
1994	500 - 2500 cfs	0	9	29	25	30	9	102	7	1	9	13	9	1	40
Average		3	6	25	25	22	10	90	7	0	10	14	10	3	45
Dry															
1990	500 - 2500 cfs	12	7	24	29	30	20	122	30	1	16	16	14	8	85
1991	500 - 2500 cfs	29	31	27	28	27	20	162	30	26	14	18	15	8	111
2001	500 - 2500 cfs	21	20	21	22	28	21	133	30	17	13	16	14	8	98
2007	500 - 2500 cfs	12	5	24	29	30	20	120	26	13	21	24	27	13	124
Average		19	16	24	27	29	20	134	29	14	16	19	18	9	105
Below Normal															
1989	500 - 2500 cfs	23	31	28	18	30	16	146	23	30	19	17	18	14	121
2002	500 - 2500 cfs	30	29	30	31	30	8	158	30	28	25	15	16	12	126
2003	500 - 2500 cfs	28	23	30	31	29	30	171	29	18	29	28	30	11	145
2004	500 - 2500 cfs	23	31	28	18	30	16	146	30	14	8	14	14	5	85
Average		26	29	29	25	30	18	155	28	23	20	19	20	11	119
Above Normal															
1993	500 - 2500 cfs	22	31	30	31	31	21	166	5	17	30	28	31	15	126
1999	500 - 2500 cfs	26	31	30	30	31	17	165	29	29	30	31	31	13	163
2000	500 - 2500 cfs	30	31	29	29	31	21	171	30	30	11	19	19	12	121
2005	500 - 2500 cfs	23	31	30	31	31	21	167	13	4	20	31	31	11	110
Average		25	31	30	30	31	20	167	19	20	23	27	28	13	130
Wet															
1995	500 - 2500 cfs	0	0	9	31	31	17	88	0	0	0	26	31	30	87
1997	500 - 2500 cfs	30	31	29	31	31	21	173	30	31	19	19	17	11	127
1998	500 - 2500 cfs	16	19	23	31	31	26	146	9	0	29	31	31	28	128
2006	500 - 2500 cfs	0	0	10	31	31	17	89	0	0	23	31	31	20	105
Average		12	13	18	31	31	20	124	10	8	18	27	28	22	112

**Table 3.9-6d. Whitewater Boating Opportunities by Year and Water Year Type – Peaking Reach
Confluence Run (Confluence to Oregon Bar).**

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							ALTERNATIVE 1 (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
Critical Dry															
1988	350 - 2500 cfs	30	1	23	18	8	2	82	30	31	24	22	17	7	131
1992	350 - 2500 cfs	30	22	7	2	3	3	67	30	31	21	24	22	16	144
1994	350 - 2500 cfs	30	31	21	12	4	3	101	30	31	21	22	17	7	128
Average		30	18	17	11	5	3	83	30	31	22	23	19	10	134
Dry															
1990	350 - 2500 cfs	30	1	29	29	30	21	140	30	31	29	24	24	16	154
1991	350 - 2500 cfs	26	30	30	28	26	17	157	26	31	30	29	24	17	157
2001	350 - 2500 cfs	28	31	16	5	15	1	96	27	31	26	24	22	16	146
2007	350 - 2500 cfs	30	31	28	29	30	21	169	30	31	30	30	31	20	172
Average		29	23	26	23	25	15	141	28	31	29	27	25	17	157
Below Normal															
1989	350 - 2500 cfs	4	1	29	22	31	18	105	1	21	30	30	31	24	137
2002	350 - 2500 cfs	14	31	28	0	6	4	83	8	29	27	30	31	22	147
2003	350 - 2500 cfs	12	0	21	21	12	27	93	7	0	19	29	30	22	107
2004	350 - 2500 cfs	5	24	29	22	31	17	128	27	30	30	29	29	21	166
Average		9	14	27	16	20	17	102	11	20	27	30	30	22	139
Above Normal															
1993	350 - 2500 cfs	0	0	14	31	31	21	97	0	0	8	31	31	30	100
1999	350 - 2500 cfs	6	0	22	31	31	19	109	9	0	17	31	31	21	109
2000	350 - 2500 cfs	16	17	30	18	13	5	99	6	18	30	31	31	22	138
2005	350 - 2500 cfs	0	0	12	31	31	21	95	0	0	8	31	31	27	97
Average		6	4	20	28	27	17	100	4	5	16	31	31	25	111
Wet															
1995	350 - 2500 cfs	0	0	0	20	31	18	69	0	0	0	19	31	30	80
1997	350 - 2500 cfs	24	27	30	31	31	18	161	21	21	30	31	31	30	164
1998	350 - 2500 cfs	0	0	0	22	31	28	81	0	0	0	21	31	30	82
2006	350 - 2500 cfs	0	0	0	28	31	18	77	0	0	16	31	31	30	108
Average		6	7	8	25	31	21	97	5	5	12	26	31	30	109

Table 3.9-7a. Average Number of Hours per Day (7:00 AM - 7:00 PM) that River Crossing was Possible at Trail Crossings in the Peaking Reach - No-Action Alternative.**Wet Water Years (1995, 1997, 1998, 2006)**

Trail Crossing Location	Summer (460 days)		Fall (408 days)		Winter (346 days)		Spring (510 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	0.3	0.7	5.3	7.0	0.8	2.7	0.0	0.2	6.4	1.6	10.5	2.6
Ruck-a-Chucky	0.0	0.7	1.2	6.5	0.0	2.6	0.0	0.0	1.2	0.3	9.9	2.5
Poverty Bar	0.2	0.9	4.0	7.5	0.4	3.0	0.0	0.2	4.6	1.1	11.6	2.9
Mammoth Bar	0.1	0.7	3.1	6.6	0.2	1.9	0.0	0.0	3.4	0.9	9.3	2.3
Coffer Dam	0.0	0.2	0.9	5.8	0.0	0.2	0.0	0.0	0.9	0.2	6.2	1.5

Above Normal Water Years (1993, 1999, 2000, 2005)

Trail Crossing Location	Summer (276 days)		Fall (320 days)		Winter (360 days)		Spring (212 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	2.3	4.0	6.4	7.8	4.2	5.7	0.0	0.1	12.9	3.2	17.6	4.4
Ruck-a-Chucky	1.2	4.1	1.6	8.5	0.1	5.7	0.0	0.0	2.9	0.7	18.2	4.6
Poverty Bar	1.8	4.9	4.2	9.3	3.1	6.0	0.0	0.1	9.1	2.3	20.3	5.1
Mammoth Bar	1.8	4.1	3.5	8.7	1.8	5.4	0.0	0.0	7.1	1.8	18.1	4.5
Coffer Dam	1.0	2.9	0.4	7.6	0.0	2.8	0.0	0.0	1.4	0.3	13.4	3.3

Below Normal Water Years (1989, 2002, 2003, 2004)

Trail Crossing Location	Summer (368 days)		Fall (364 days)		Winter (391 days)		Spring (396 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	4.3	5.6	6.6	8.2	2.2	4.6	0.3	2.7	13.4	3.3	21.0	5.3
Ruck-a-Chucky	1.3	6.5	2.6	8.2	0.7	3.8	0.0	1.8	4.6	1.1	20.2	5.1
Poverty Bar	4.7	7.6	5.8	9.3	1.7	4.9	0.1	2.9	12.4	3.1	24.7	6.2
Mammoth Bar	4.2	7.4	5.0	8.5	1.4	3.1	0.0	1.3	10.7	2.7	20.2	5.1
Coffer Dam	0.4	5.5	2.2	7.2	0.0	1.2	0.0	0.0	2.6	0.7	13.9	3.5

Dry Water Years (1990, 1991, 2001, 2007)

Trail Crossing Location	Summer (460 days)		Fall (318 days)		Winter (299 days)		Spring (538 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	4.3	5.4	7.8	9.0	7.0	9.1	3.0	7.8	22.1	5.5	31.3	7.8
Ruck-a-Chucky	2.7	6.1	7.0	9.0	5.2	8.6	0.2	6.0	15.1	3.8	29.7	7.4
Poverty Bar	4.1	7.0	8.2	9.8	6.5	9.4	2.1	7.5	20.9	5.2	33.8	8.4
Mammoth Bar	4.0	7.1	8.0	9.3	5.9	8.0	1.3	4.8	19.2	4.8	29.2	7.3
Coffer Dam	2.2	6.0	6.4	8.7	3.0	5.9	0.0	0.3	11.6	2.9	20.9	5.2

Critical Water Years (1988, 1992, 1994)

Trail Crossing Location	Summer (184 days)		Fall (289 days)		Winter (318 days)		Spring (92 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	5.9	6.7	10.4	11.1	4.1	6.6	0.2	3.0	20.5	5.1	27.4	6.8
Ruck-a-Chucky	4.6	7.9	7.8	11.4	0.9	6.0	0.0	1.7	13.4	3.4	26.9	6.7
Poverty Bar	7.2	8.9	10.8	11.8	3.7	6.9	0.1	2.4	21.8	5.4	30.0	7.5
Mammoth Bar	7.1	9.1	10.7	11.7	2.7	5.4	0.1	1.0	20.6	5.2	27.3	6.8
Coffer Dam	4.7	8.3	8.4	11.0	0.8	2.0	0.0	0.0	13.9	3.5	21.4	5.3

Notes:

Easy/Mod = Average number of hours trail crossing was available below the easy to moderate/moderate to difficult threshold.

Mod/Dif = Average number of hours trail crossing was available below the moderate to difficult/difficult threshold.

Summer = June, July, August

Fall = September, October, November

Winter = December, January, February

Spring = March, April, May

Table 3.9-7b. Average Number of Hours per Day (7:00 AM - 7:00 PM) that River Crossing was Possible at Trail Crossings in the Peaking Reach - Alternative 1.**Wet Water Years (1995, 1997, 1998, 2006)**

Trail Crossing Location	Summer (460 days)		Fall (408 days)		Winter (346 days)		Spring (510 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	0.0	0.7	4.5	5.7	3.4	4.3	0.0	0.0	7.9	2.0	10.7	2.7
Ruck-a-Chucky	0.0	1.1	0.0	6.1	0.0	4.5	0.0	0.0	0.0	0.0	11.7	2.9
Poverty Bar	0.0	1.3	4.0	6.5	0.0	4.9	0.0	0.1	4.0	1.0	12.7	3.2
Mammoth Bar	0.0	1.0	0.0	6.4	0.0	4.4	0.0	0.0	0.0	0.0	11.8	3.0
Coffer Dam	0.0	0.0	0.0	5.3	0.0	0.2	0.0	0.0	0.0	0.0	5.5	1.4

Above Normal Water Years (1993, 1999, 2000, 2005)

Trail Crossing Location	Summer (276 days)		Fall (320 days)		Winter (360 days)		Spring (212 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	0.0	1.8	5.6	6.4	6.0	6.5	0.0	0.0	11.6	2.9	14.7	3.7
Ruck-a-Chucky	0.0	2.3	0.0	6.9	0.0	6.9	0.0	0.0	0.0	0.0	16.0	4.0
Poverty Bar	0.0	2.7	3.9	7.4	0.0	7.1	0.0	0.0	3.9	1.0	17.2	4.3
Mammoth Bar	0.0	2.5	0.0	7.1	0.0	6.9	0.0	0.0	0.0	0.0	16.5	4.1
Coffer Dam	0.0	0.1	0.0	6.6	0.0	3.7	0.0	0.0	0.0	0.0	10.4	2.6

Below Normal Water Years (1989, 2002, 2003, 2004)

Trail Crossing Location	Summer (368 days)		Fall (364 days)		Winter (391 days)		Spring (396 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	2.4	3.2	6.2	7.2	2.5	4.8	0.0	2.4	11.1	2.8	17.6	4.4
Ruck-a-Chucky	0.0	4.4	0.0	7.7	0.0	5.1	0.0	1.1	0.0	0.0	18.3	4.6
Poverty Bar	0.0	5.2	6.9	8.4	1.9	6.3	0.0	2.2	8.8	2.2	22.0	5.5
Mammoth Bar	0.0	5.2	0.0	8.2	0.0	5.1	0.0	0.6	0.0	0.0	19.1	4.8
Coffer Dam	0.0	2.8	0.0	7.5	0.0	0.9	0.0	0.0	0.0	0.0	11.2	2.8

Dry Water Years (1990, 1991, 2001, 2007)

Trail Crossing Location	Summer (460 days)		Fall (318 days)		Winter (299 days)		Spring (538 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	4.0	5.2	8.0	9.3	6.2	8.7	1.2	6.4	19.5	4.9	29.6	7.4
Ruck-a-Chucky	0.0	6.7	0.0	10.1	0.0	9.2	0.0	4.3	0.0	0.0	30.2	7.6
Poverty Bar	4.3	7.6	9.4	10.7	6.2	10.0	0.0	6.0	20.0	5.0	34.3	8.6
Mammoth Bar	0.0	8.4	9.6	10.7	5.7	9.0	0.0	2.9	15.3	3.8	31.0	7.8
Coffer Dam	0.0	7.0	0.0	10.6	0.0	5.7	0.0	0.2	0.0	0.0	23.5	5.9

Critical Water Years (1988, 1992, 1994)

Trail Crossing Location	Summer (184 days)		Fall (289 days)		Winter (318 days)		Spring (92 days)		Total Easy/Mod	Average Easy/Mod	Total Cumulative	Average Cumulative
	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif	Easy/Mod	Mod/Dif				
Fords Bar	5.4	6.8	9.9	10.9	5.2	6.8	0.0	2.6	20.6	5.1	27.1	6.8
Ruck-a-Chucky	0.0	8.1	0.0	11.7	0.0	7.6	0.0	0.5	0.0	0.0	28.0	7.0
Poverty Bar	7.9	9.0	11.2	12.1	4.7	8.4	0.0	2.5	23.8	5.9	32.0	8.0
Mammoth Bar	5.7	10.1	11.3	12.1	2.0	8.0	0.0	0.0	19.0	4.8	30.3	7.6
Coffer Dam	0.0	9.7	3.2	11.6	0.0	1.9	0.0	0.0	3.2	0.8	23.2	5.8

Notes:

Easy/Mod = Average number of hours trail crossing was available below the easy to moderate/moderate to difficult threshold.

Mod/Dif = Average number of hours trail crossing was available below the moderate to difficult/difficult threshold.

Summer = June, July, August

Fall = September, October, November

Winter = December, January, February

Spring = March, April, May

Table 3.9-8. Construction Window and Duration by Project Activity.

Activity	Construction Window	Actual Working Days	Implementation Schedule Year Following License Issuance
Hell Hole Reservoir Seasonal Storage Increase Improvement	July - October	80	3, 4, or 5
Small Diversion Modifications			
Duncan Creek Diversion Modification	July - November	80	2 or 3
North Fork Long Canyon Creek Diversion Modification	July - November	80	3 or 4
South Fork Long Canyon Creek Diversion Modification	July - November	80	3 or 4
Outlet Works Modifications			
French Meadows Outlet Works Modification	June - December	20	1 or 2
Hell Hole Outlet Works Modification	July - November	40	2 or 3
Middle Fork Interbay Outlet Works Modification	June - December	20	1 or 2
Gages			
North Fork Long Canyon Creek below Diversion Dam (NFLCC)	July - October	7	3 or 4
South Fork Long Canyon Creek below Diversion Dam (SFLCC)	July - October	7	3 or 4
Middle Fork American River below Interbay Dam (MFARIB)	July - October	7	1 or 2
North Fork American River above American River Pump Station (NFARPS)	October	7	1 or 2
Recreation Facilities			
Ellicott Bridge Parking Area	July - November	10	Within 14 years of license issuance
French Meadows Reservoir Trail	July - November	14	Within 14 years of license issuance
Water Supply Replacements			
French Meadows North Shore Water Supply (Dolly Creek Water Supply)	June - October	21	Within 9 years of license issuance
French Meadows South Shore Water Supply (French Meadows Water Supply)	June - October	21	Within 5 years of license issuance

FIGURES

Figure 3.9-1a. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).
Rubicon River: Ellicott Bridge - Ralston Afterbay for Rafts

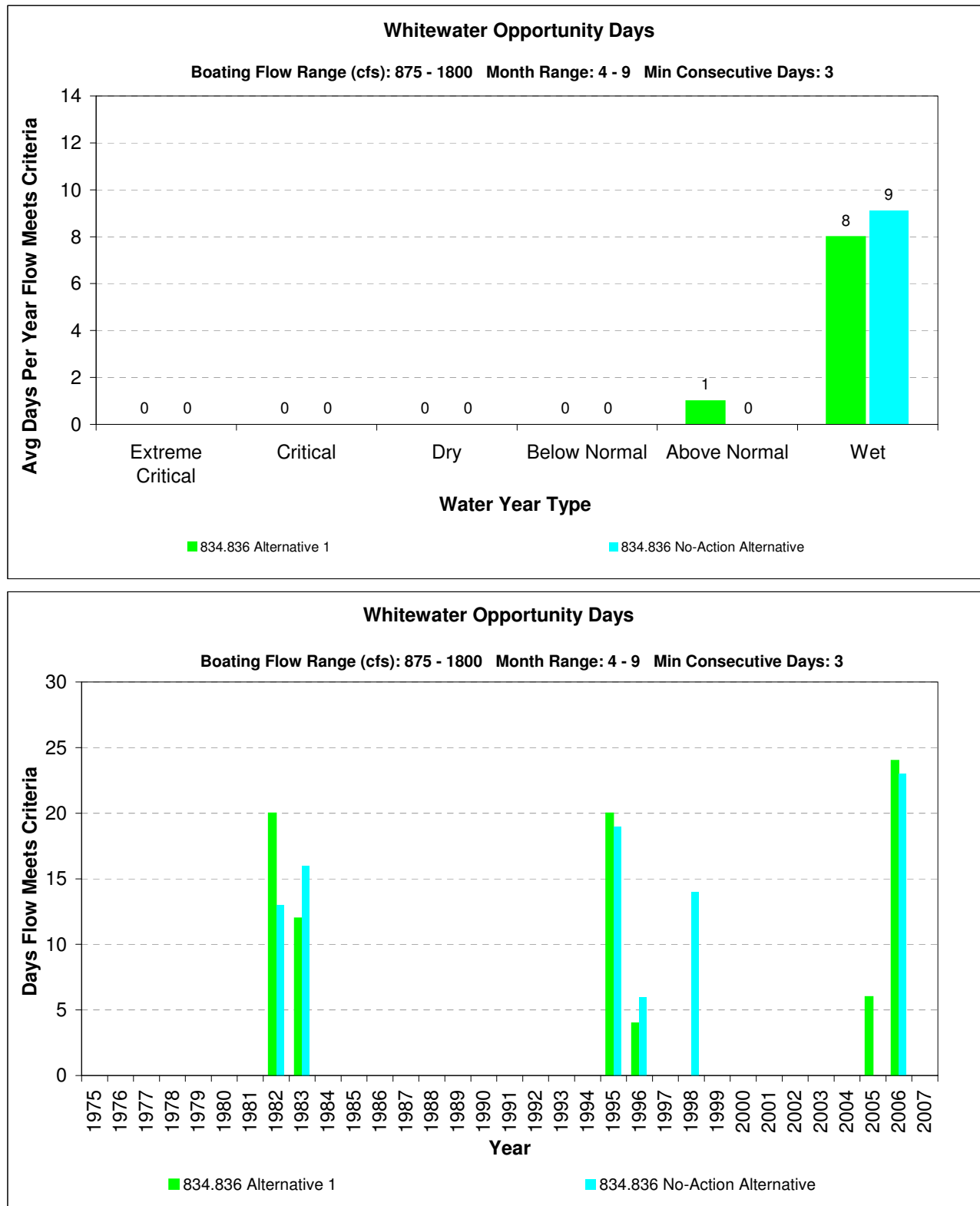


Figure 3.9-1b. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).
Rubicon River: Ellicott Bridge - Ralston Afterbay for Kayaks

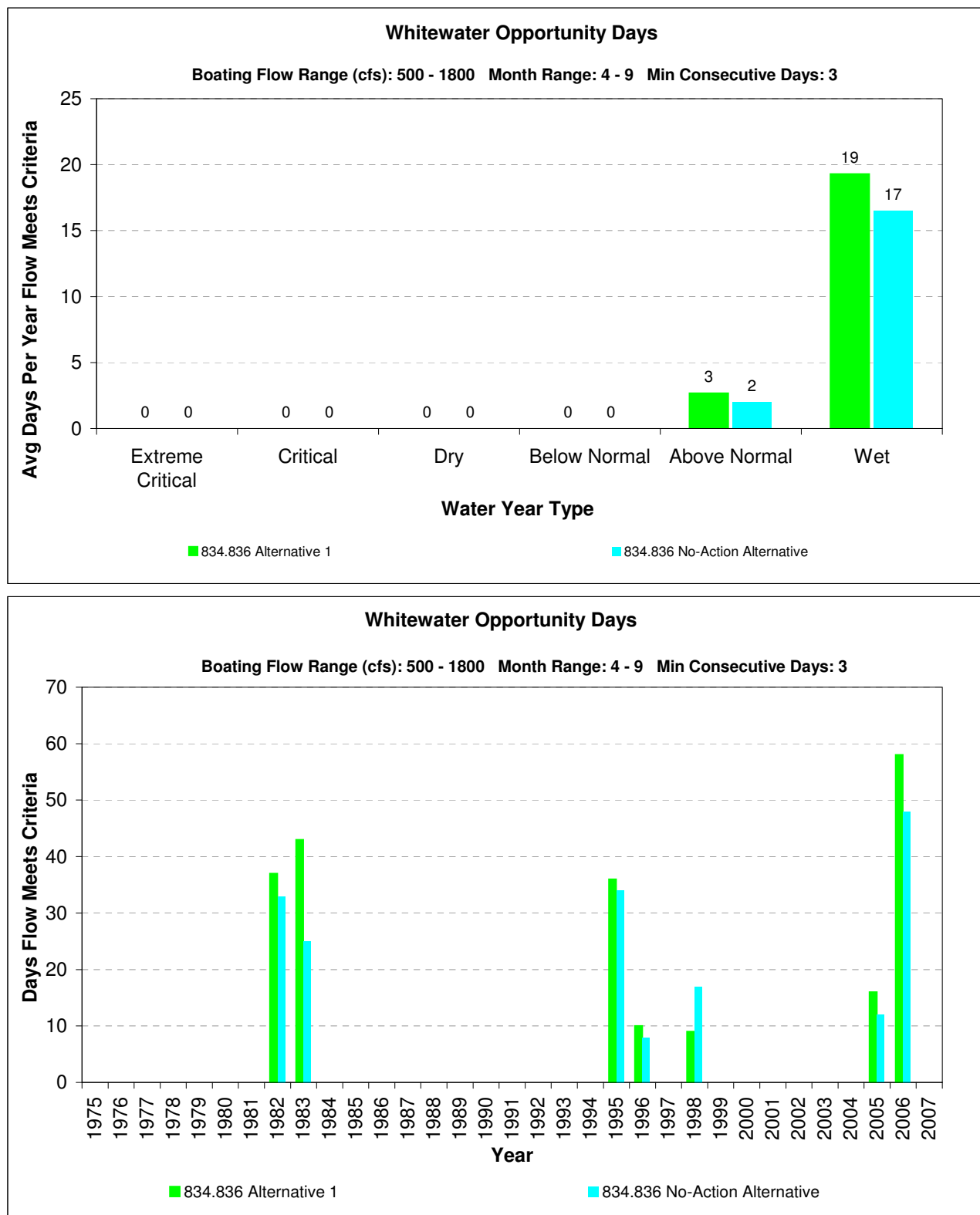


Figure 3.9-1c. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Day by Year (bottom).
Long Canyon Creek

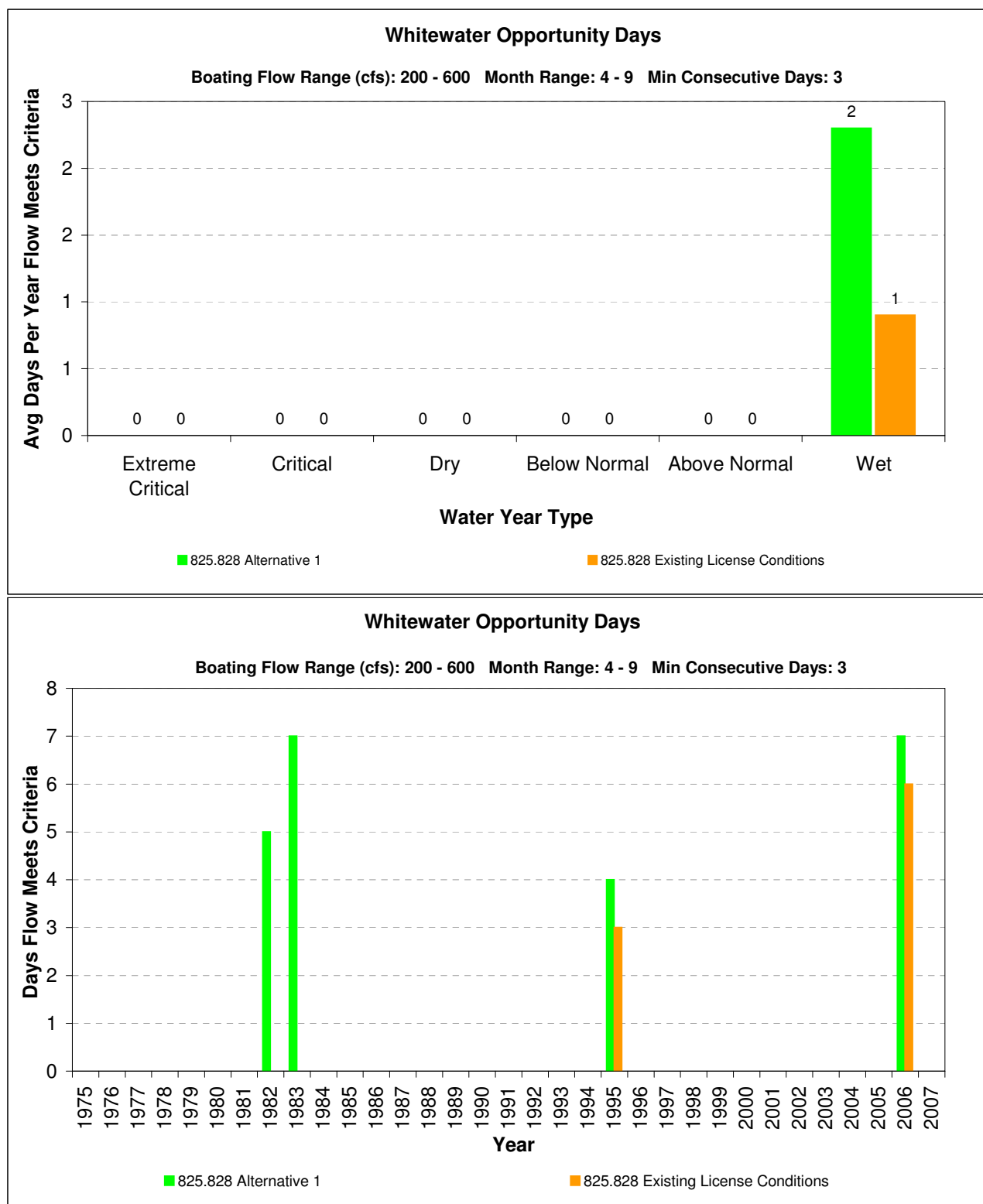


Figure 3.9-1d. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).
Middle Fork American River: French Meadows Reservoir - Middle Fork Interbay

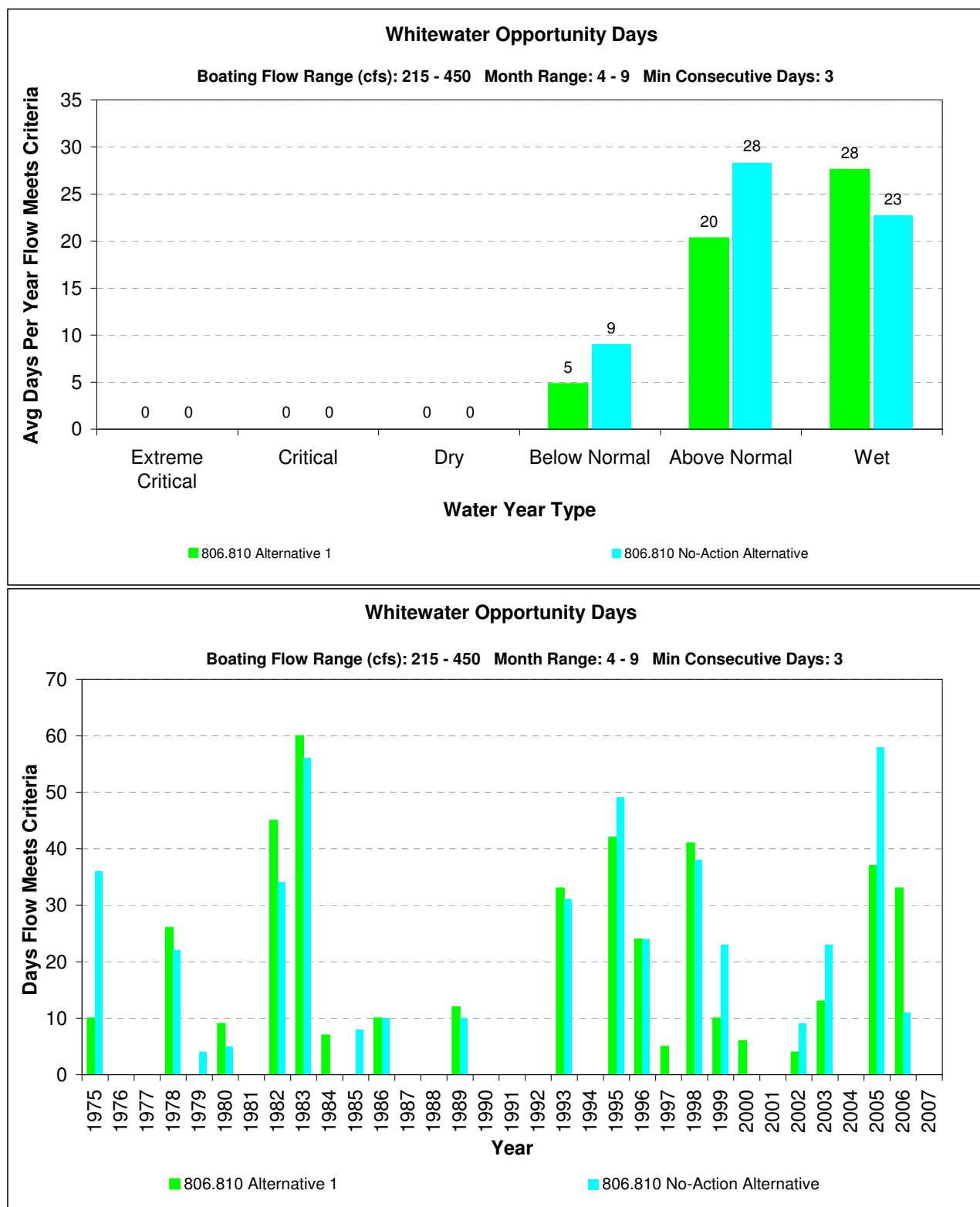


Figure 3.9-1e. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).
Middle Fork American River: Middle Fork Interbay - Ralston Afterbay

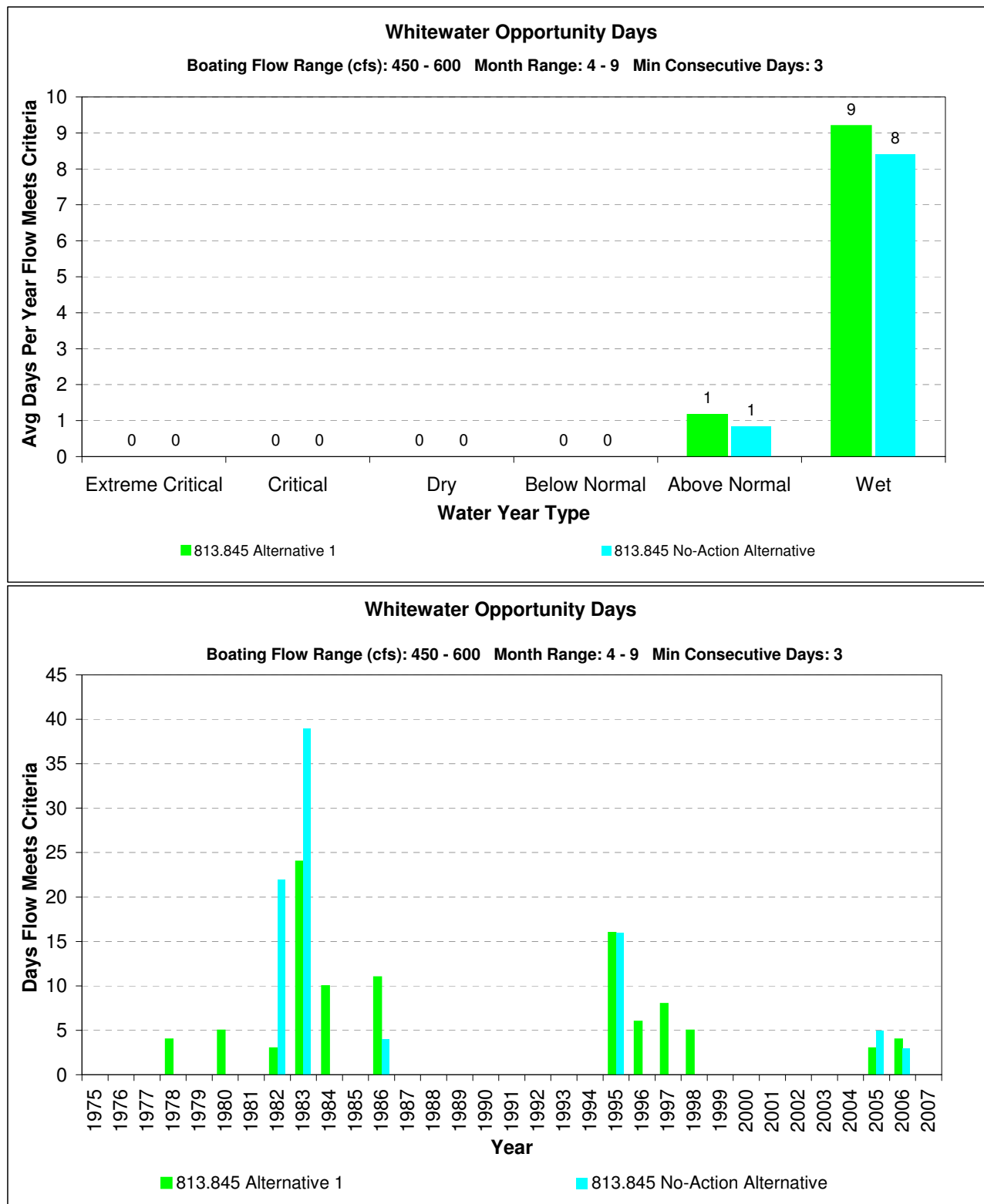
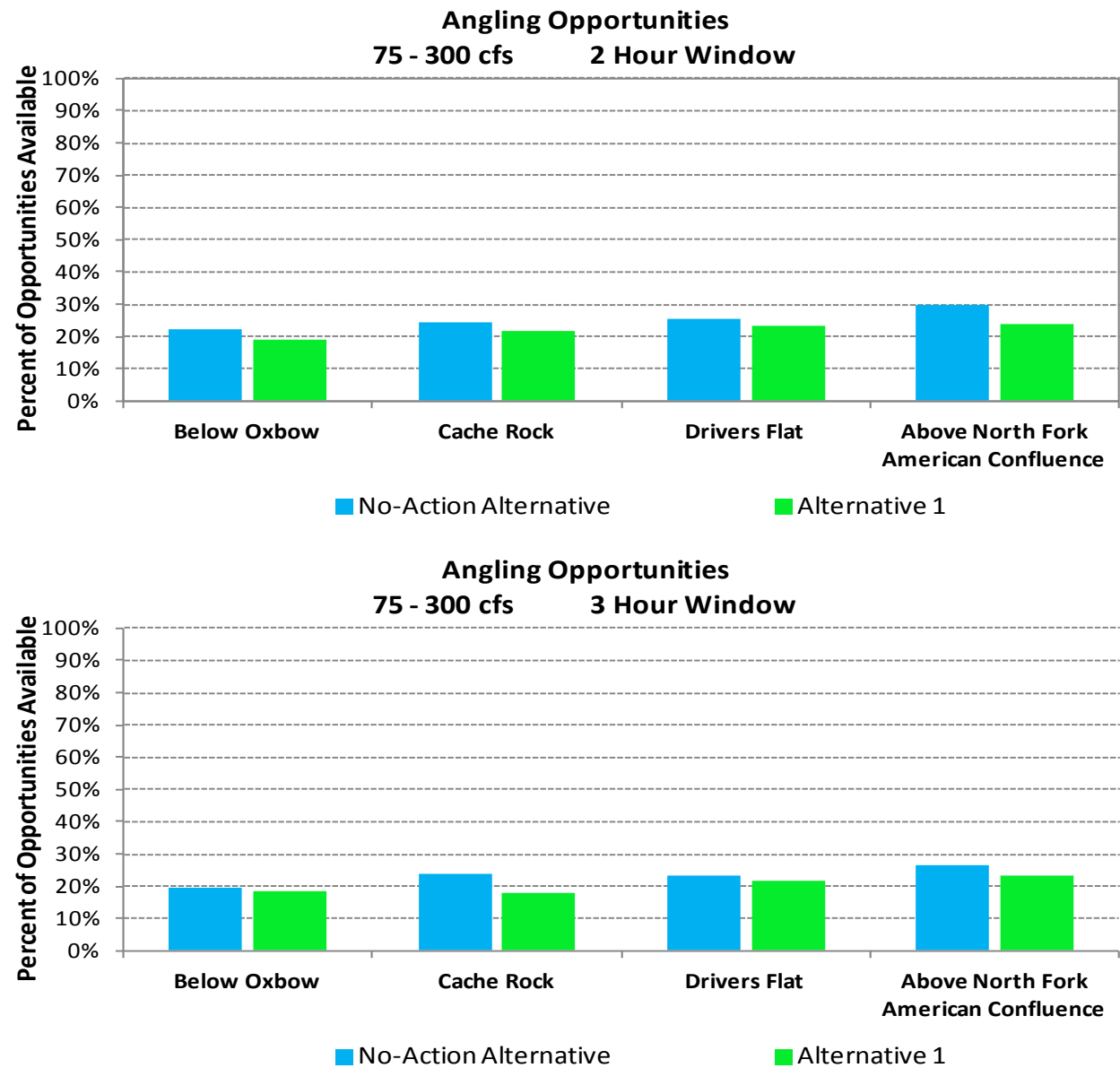
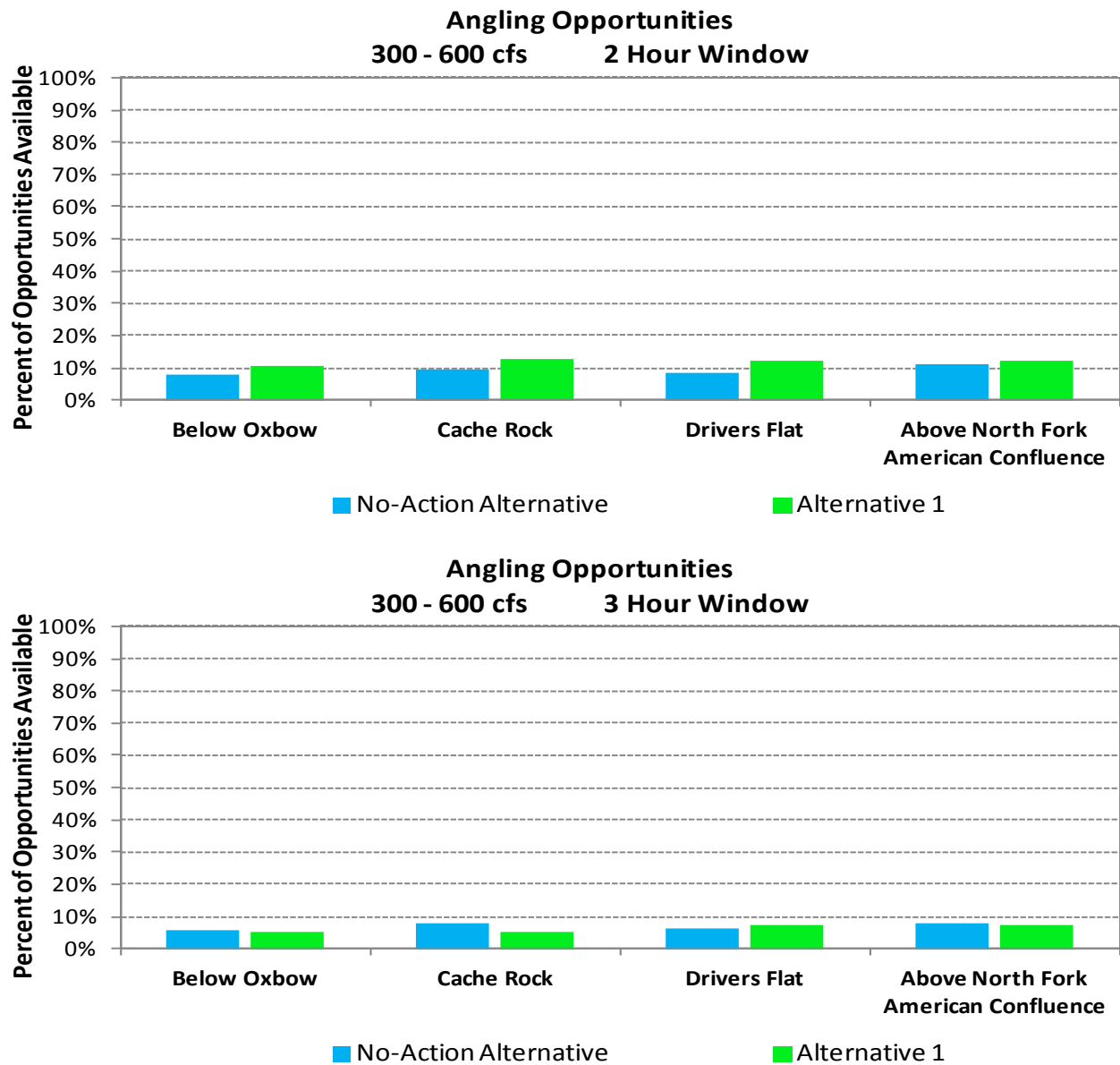


Figure 3.9-2a. Angling Opportunities¹ at Select Location in the Peaking Reach (75 - 300 cfs).



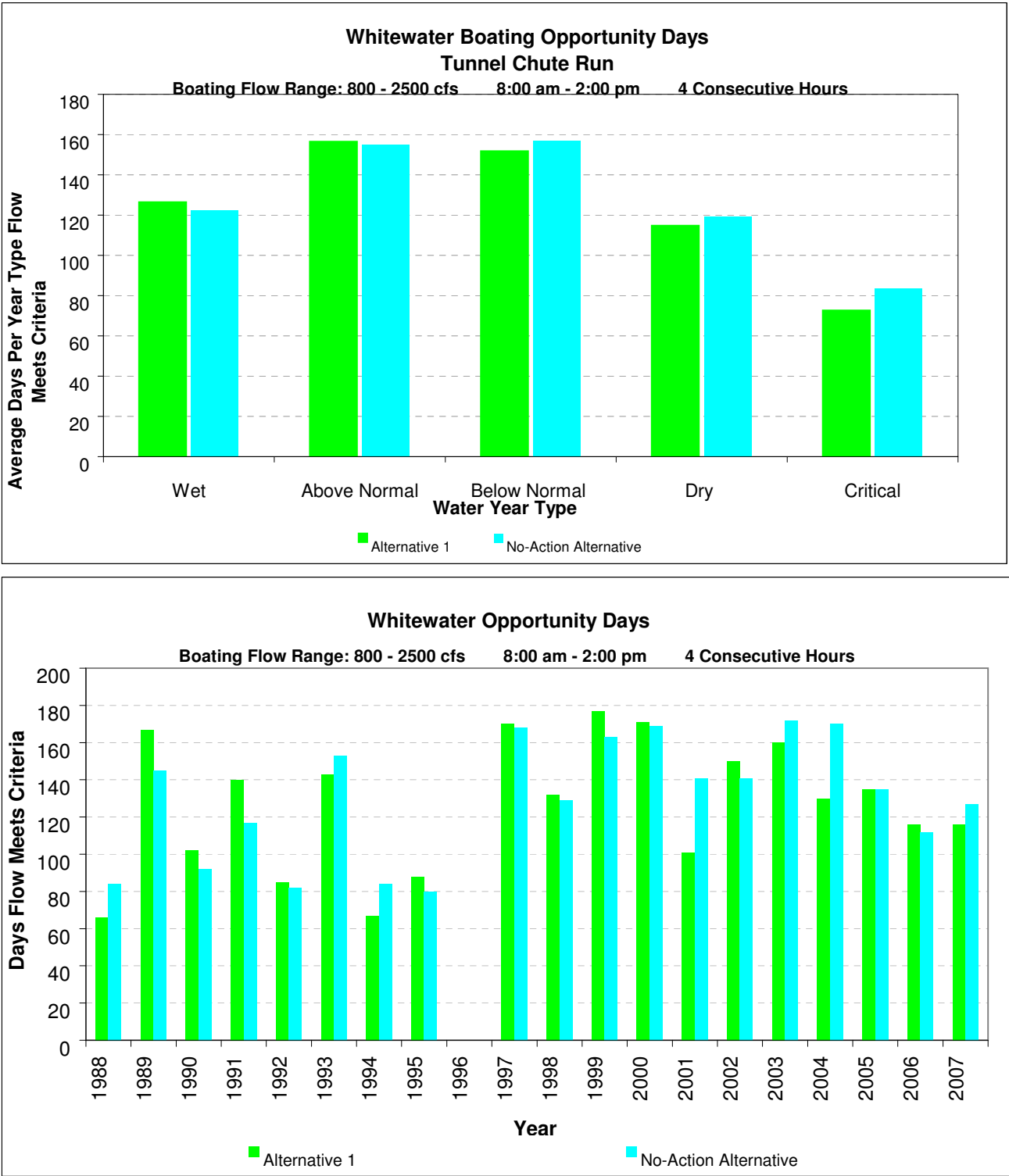
¹Opportunities = Sunrise - 11 am, 3 pm - Sunset

Figure 3.9-2b. Angling Opportunities¹ at Select Location in the Peaking Reach (300 - 600 cfs).



¹Opportunities = Sunrise - 11 am, 3 pm - Sunset

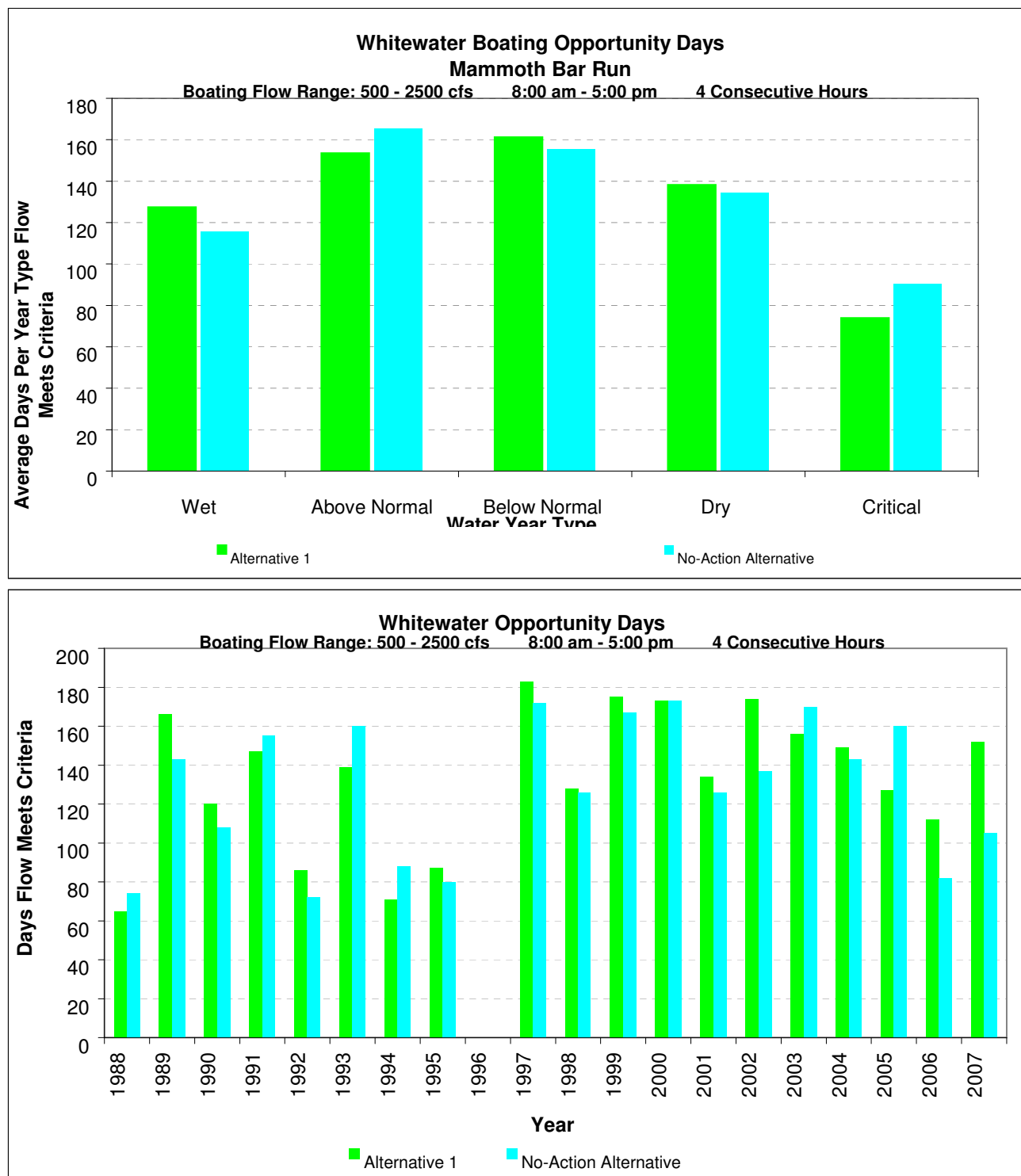
Figure 3.9-3a. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).
Tunnel Chute Run (Indian Bar Rafting Access to Ruck-a-Chucky)



Note: No data is available for 1996.

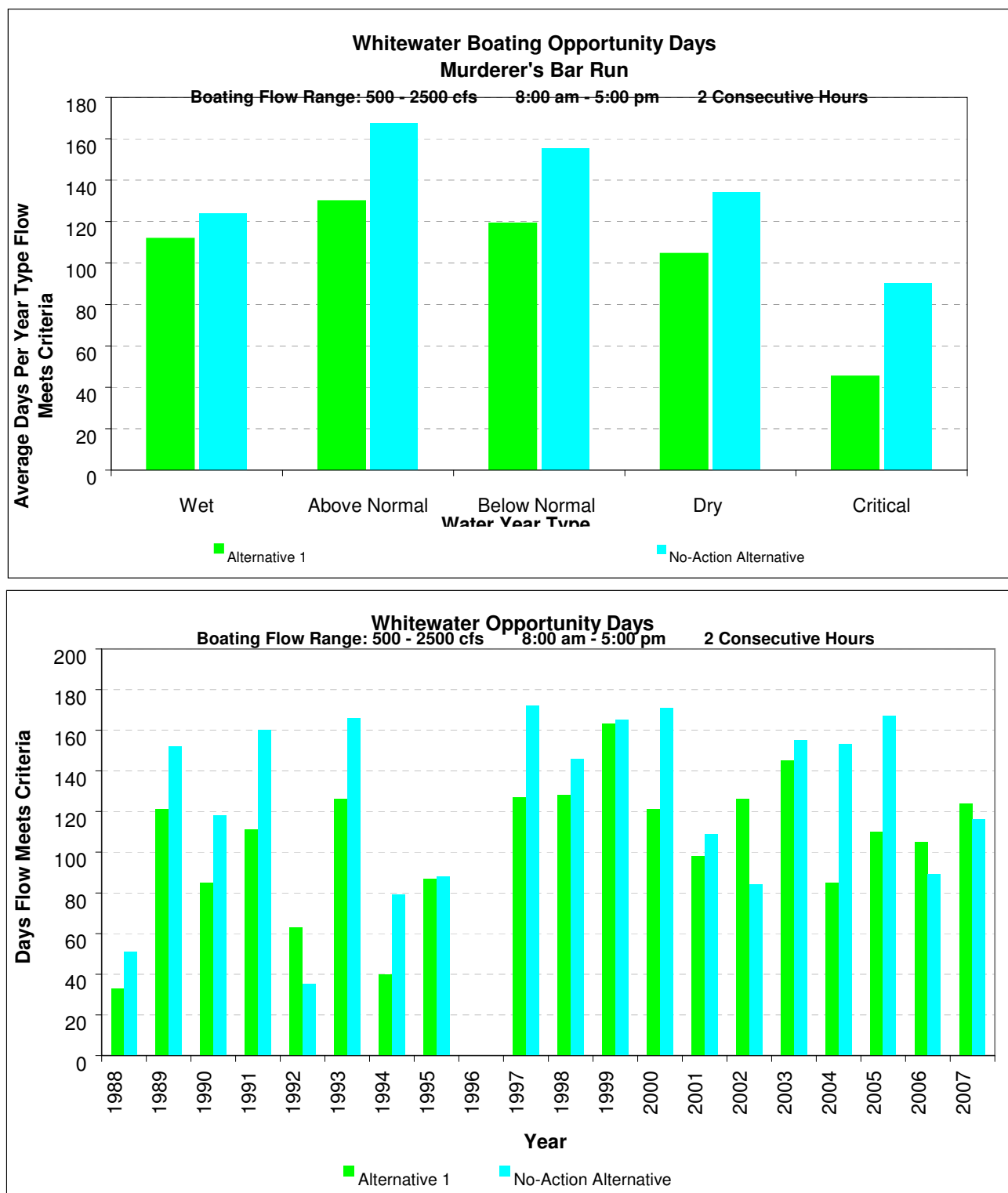
Figure 3.9-3b. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).

Mammoth Bar Run (Ruck-a-Chucky to Mammoth Bar)



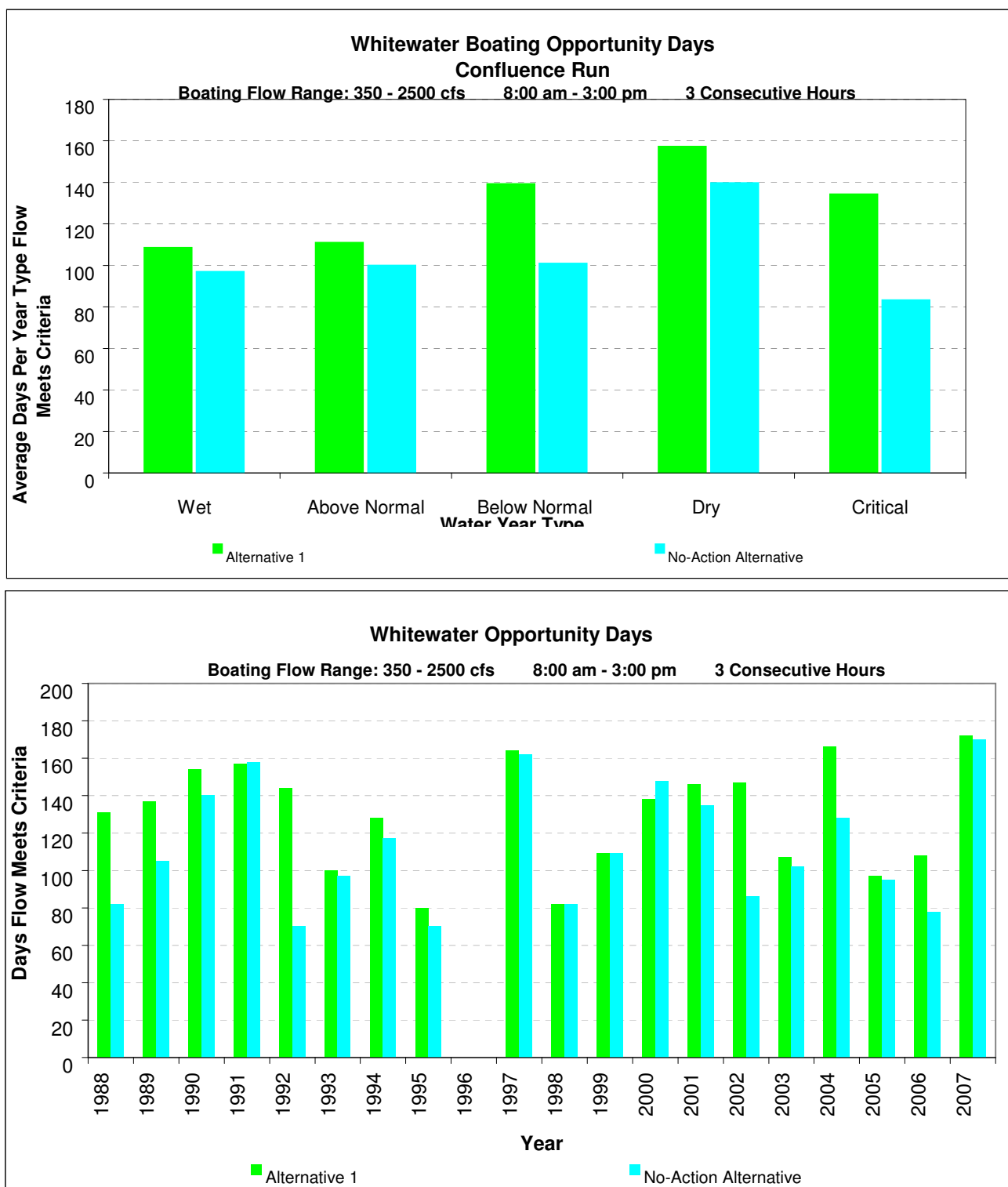
Note: No data is available for 1996.

Figure 3.9-3c. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).
Murderer's Bar Run (Mammoth Bar to Confluence)



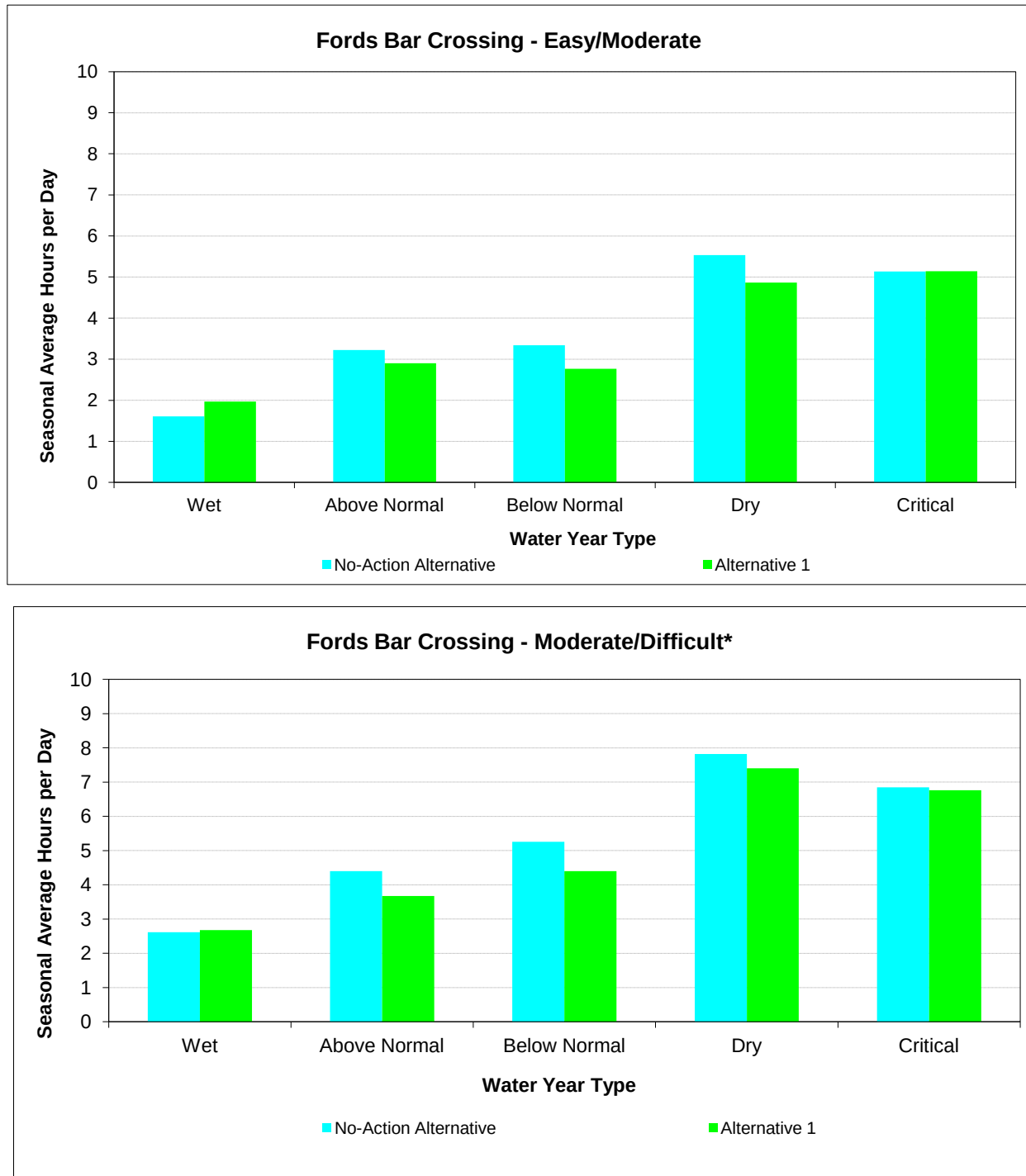
Note: No data is available for 1996.

**Figure 3.9-3d. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).
Confluence Run (Confluence to Oregon Bar)**



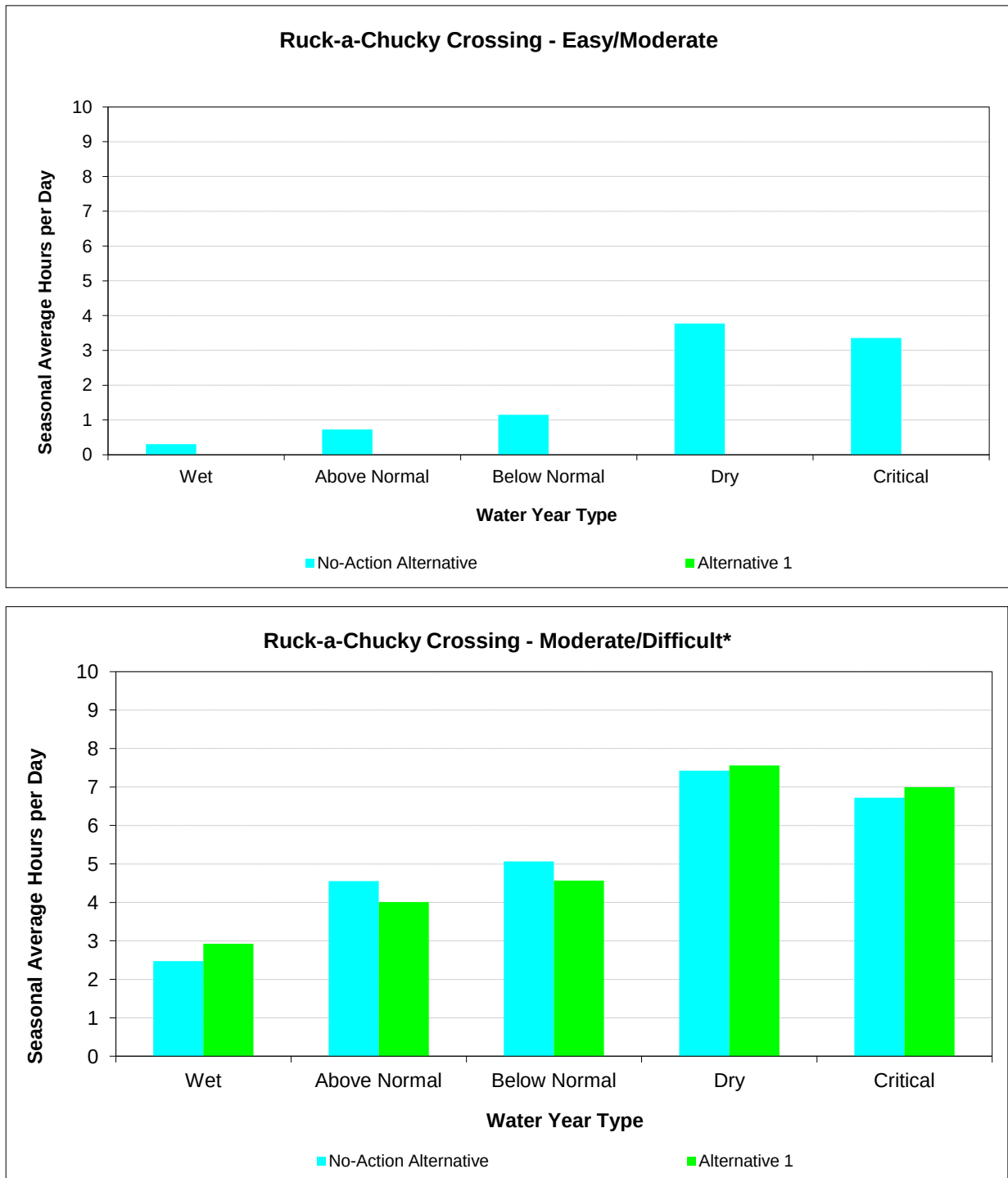
Note: No data is available for 1996.

Figure 3.9-4a. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type.
Fords Bar Crossing



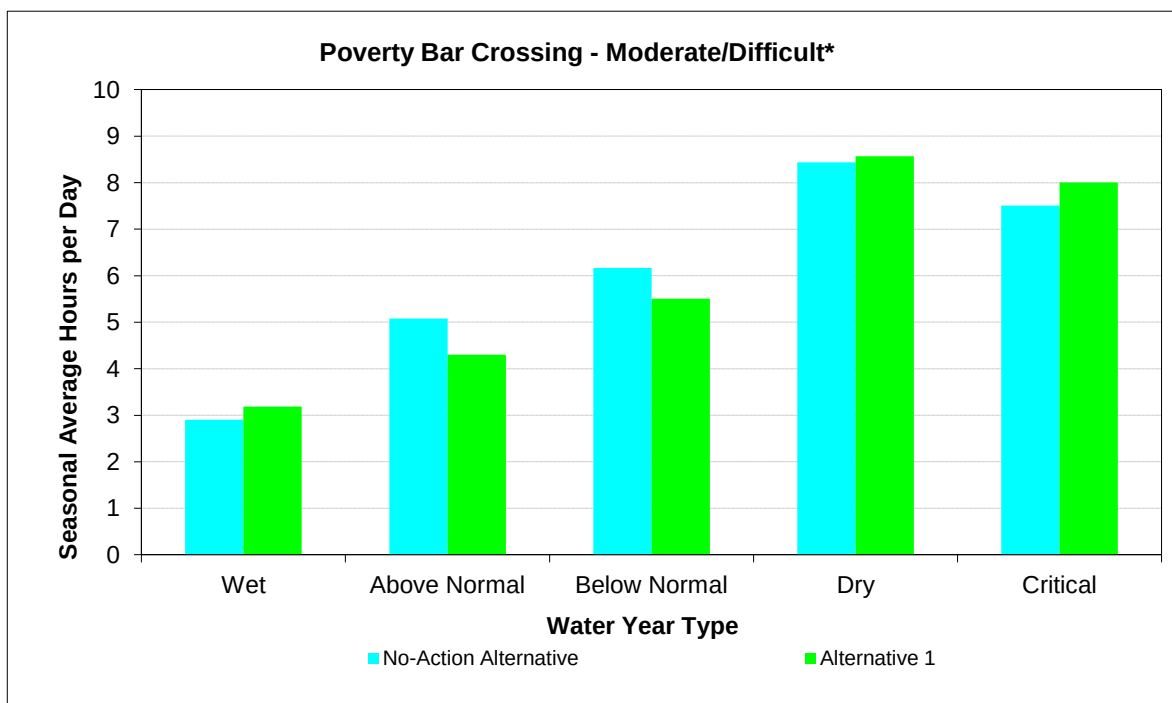
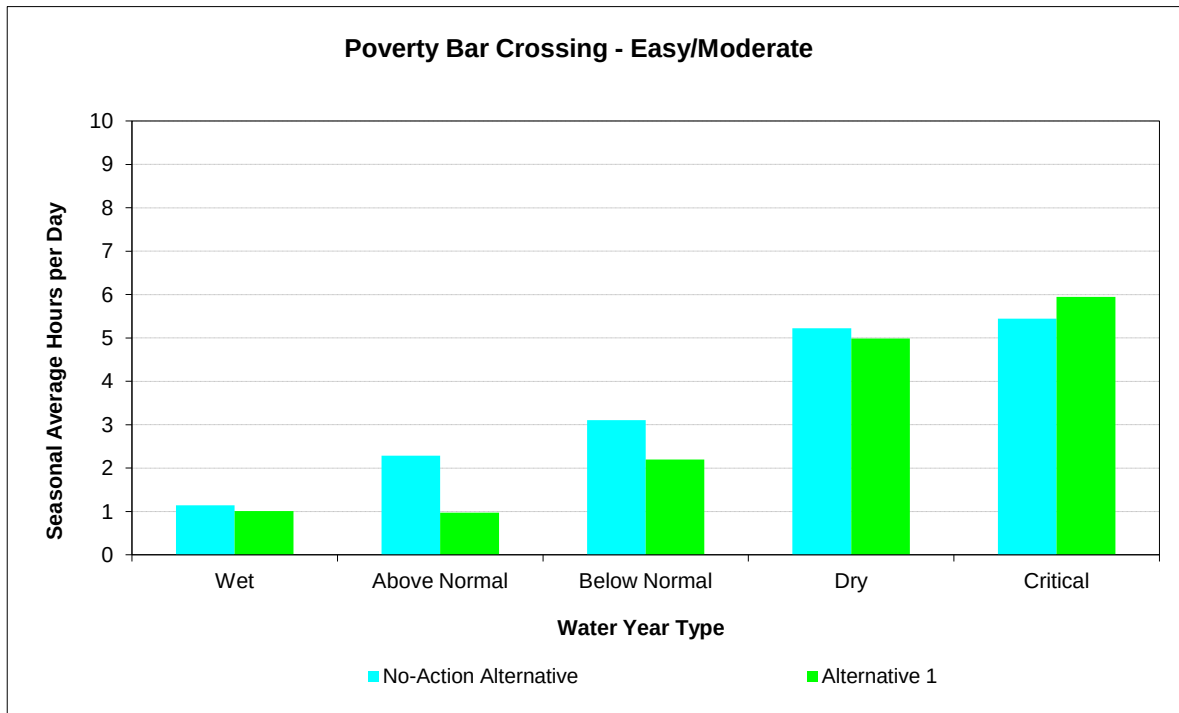
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-4b. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type.
Ruck-a-Chucky Crossing



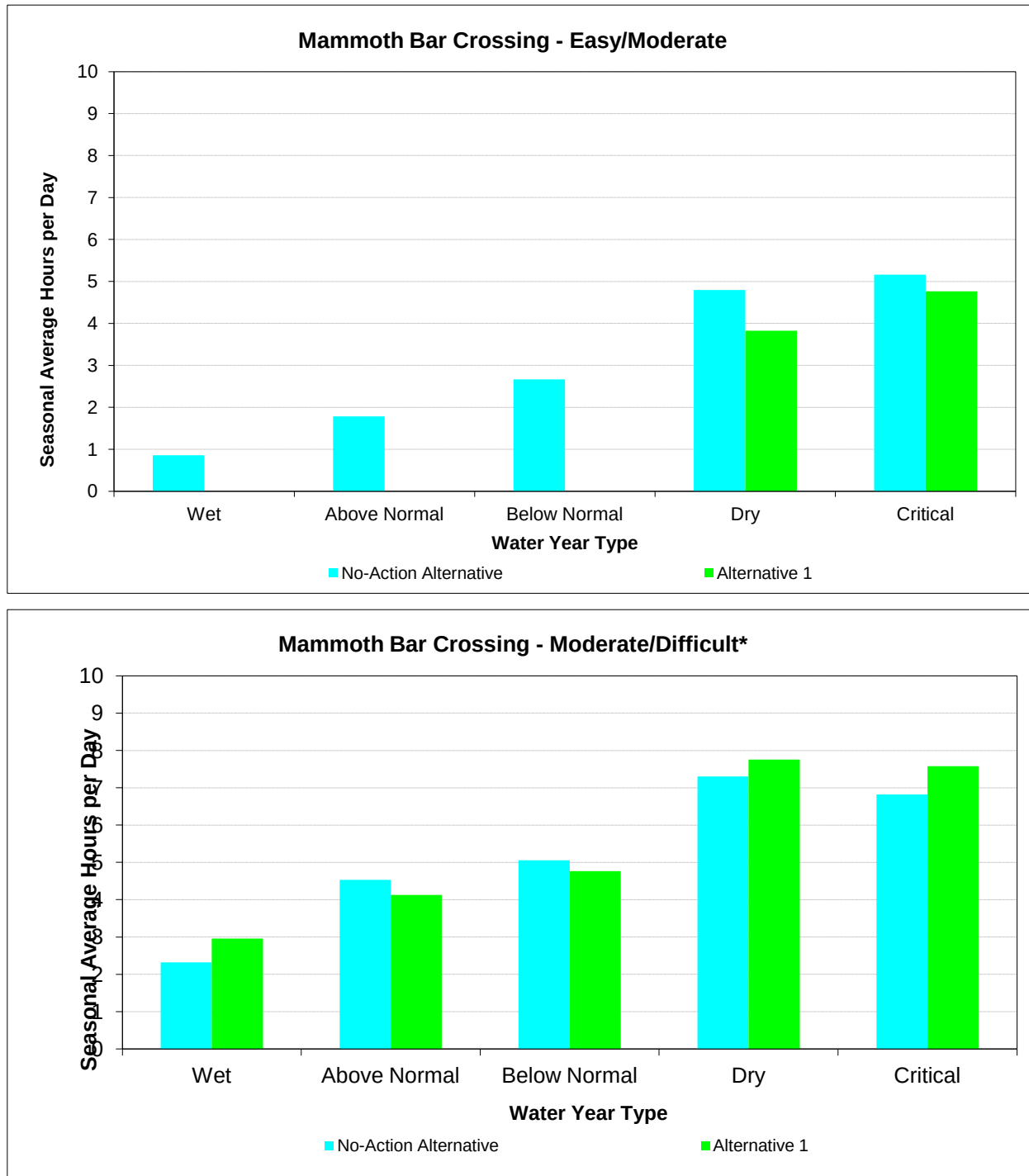
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-4c. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type.
Poverty Bar Crossing



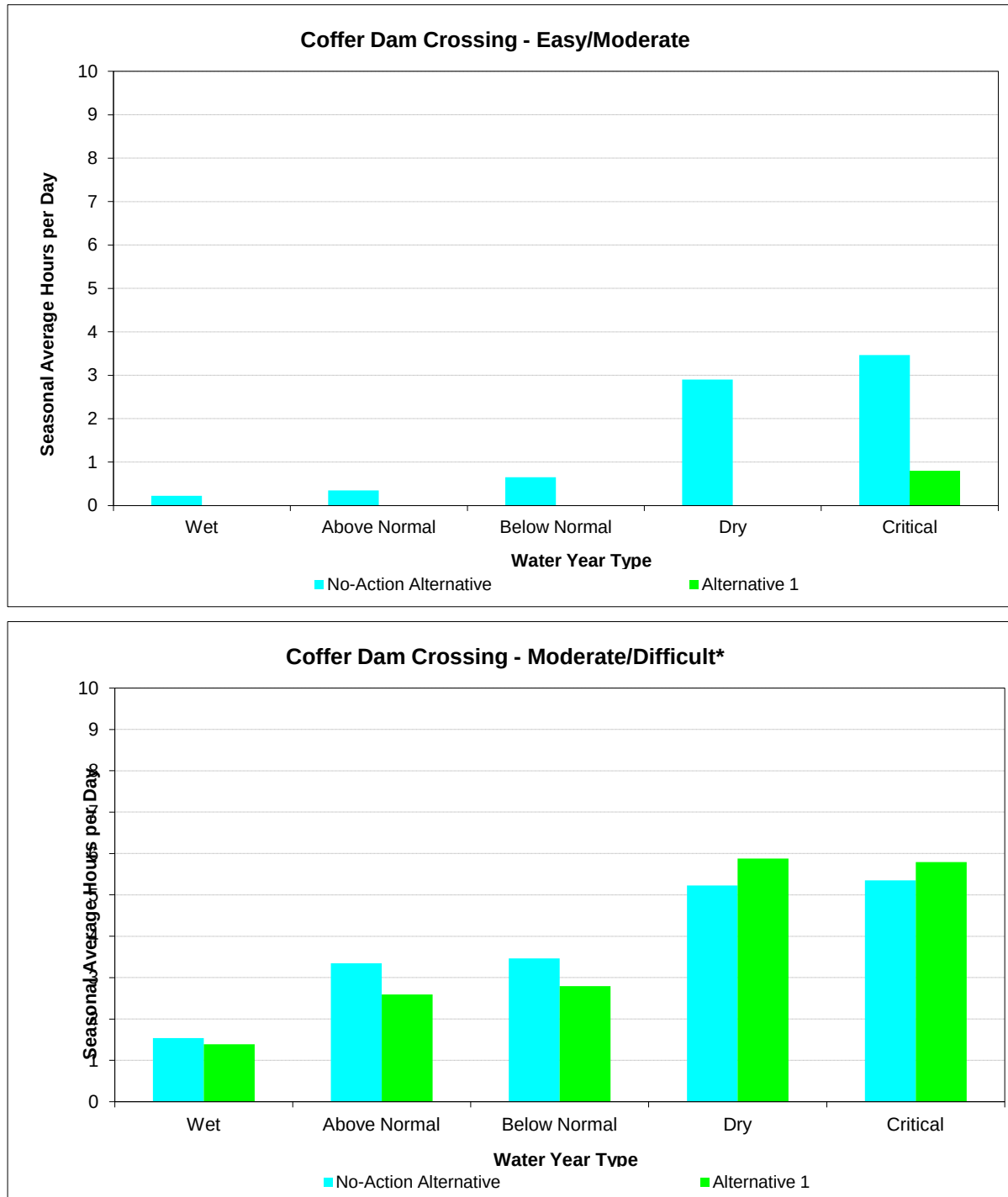
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-4d. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type.
Mammoth Bar Crossing



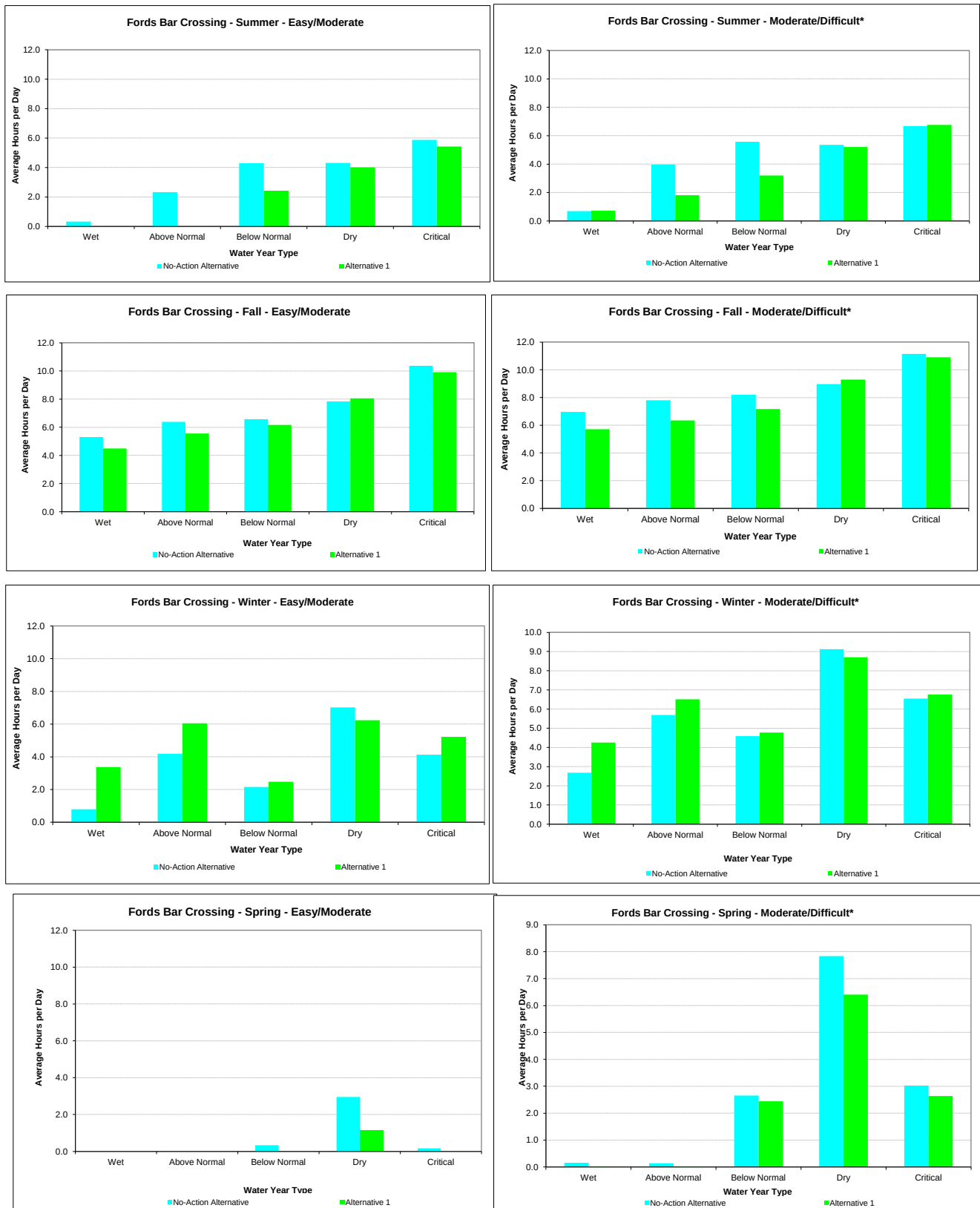
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-4e. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type.
Coffer Dam Crossing



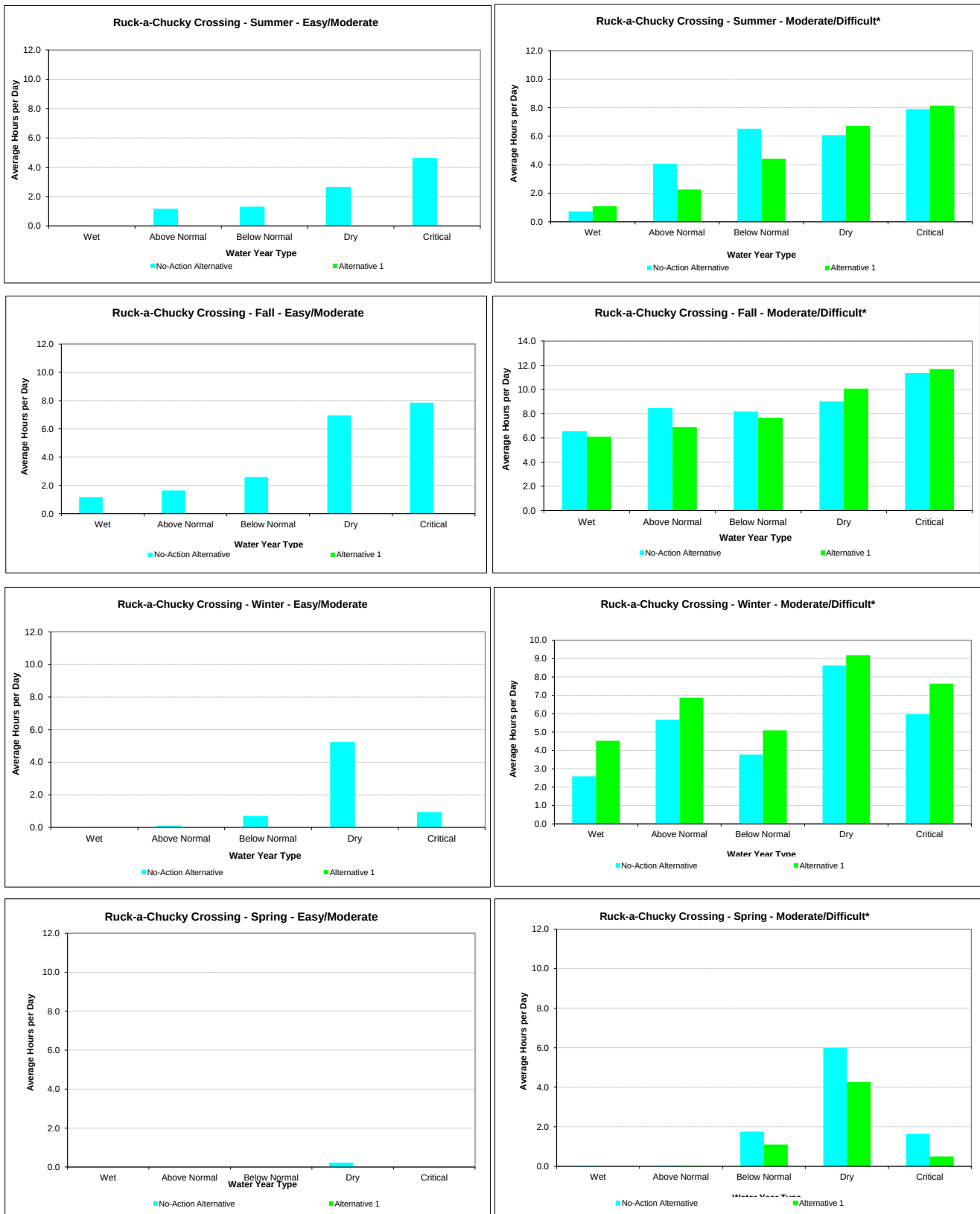
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-5a. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Fords Bar Crossing



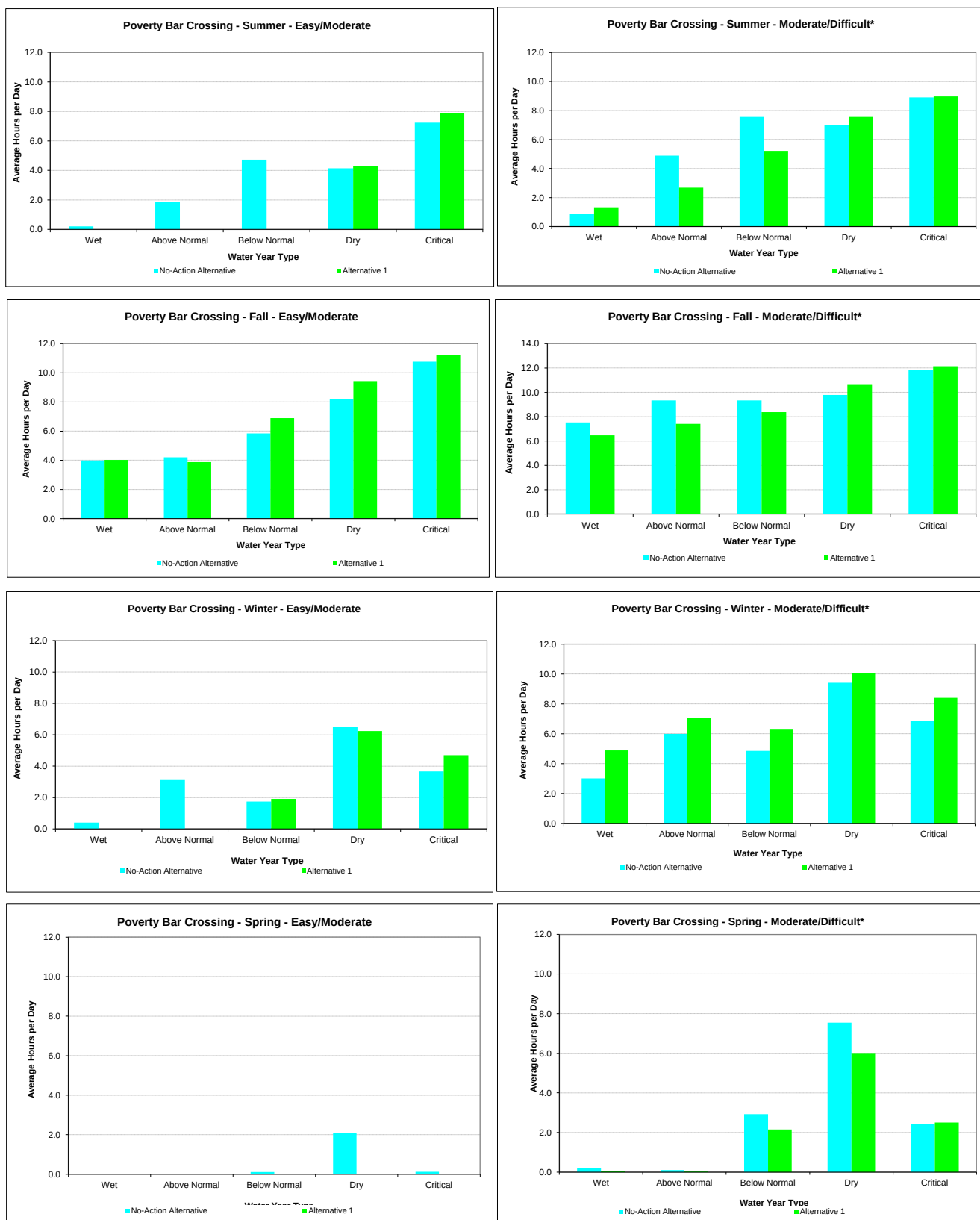
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-5b. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Ruck-a-Chucky Crossing



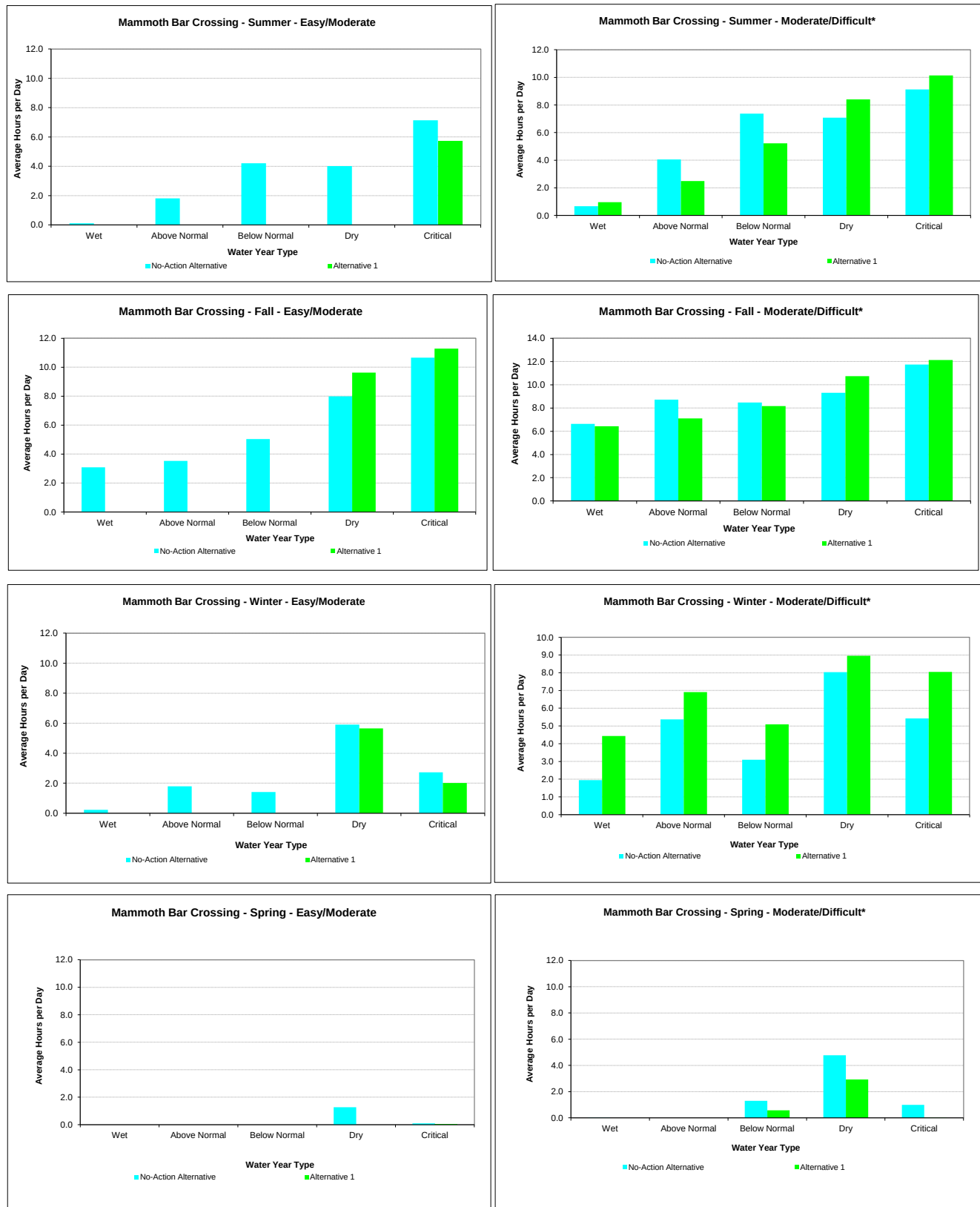
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-5c. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Poverty Bar Crossing



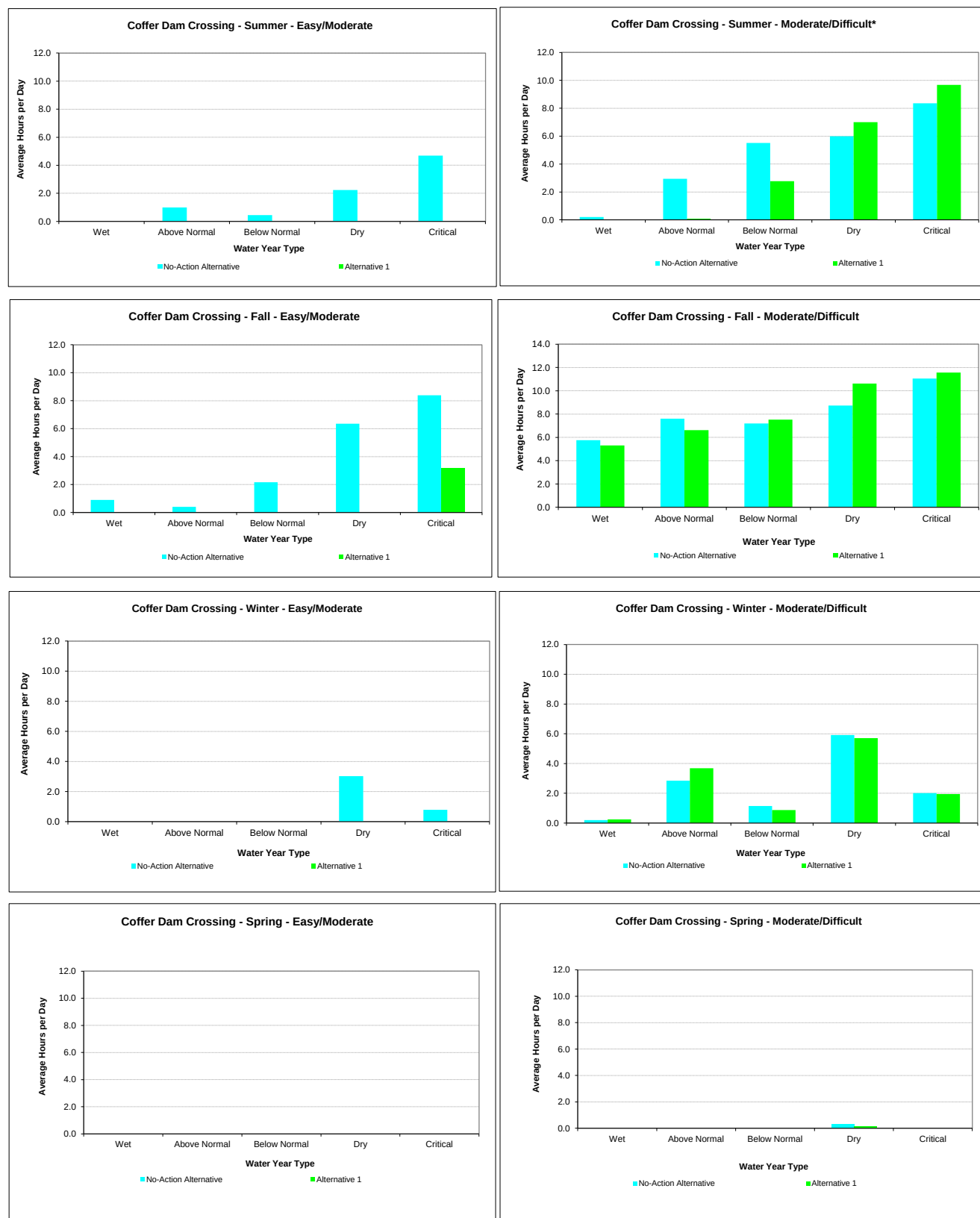
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-5d. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Mammoth Bar Crossing



*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 3.9-5e. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Coffer Dam Crossing



*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

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3.10 LAND USE ENVIRONMENTAL EFFECTS

This section describes the potential impacts to land use under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facility Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to land use under Alternative 1 are evaluated in the context of Project boundary modifications, changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing Project recreation facilities; maintenance activities at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section. Specifically, potential impacts to land use are identified if activities implemented under Alternative 1:

- Change land use designation;
- Affect existing land use;
- Change land ownership; or
- Conflict with land management plans and policies.

A description of potential effects to land use from implementation of Alternative 1 is provided below. There are no unavoidable adverse effects to land use resulting from implementation of Alternative 1 as discussed at the end of this section.”

3.10.1 Land Use Designation and Existing Land Use

The Placer County General Plan identifies five land use designations in the Middle Fork American River Watershed (Watershed) including Agriculture, Resource Protection, Rural Residential, Timberland, and Urban uses. The MFP facilities are located on lands solely designated as “Timberland.” This designation is applied to mountainous areas where the primary land uses relate to the growing and harvesting of timber and other forest products (together with limited, low-intensity public and commercial recreational uses). Necessary public utility facilities are an allowed use on lands designated as Timberland.

The North Fork American River Gage above the American River Pump Station (a new Project gage) is located several miles downstream of the Federal Energy Regulatory Commission (FERC) Project boundary, on United States Bureau of Reclamation (USBR) property with a land use designation of “Open Space”. Typical land uses

allowed within Open Space areas are limited to low-intensity agricultural and public recreational uses, with structural development being restricted to accessory structures necessary to support the primary allowed uses, and necessary public utility and safety facilities. The new Project gage will collect flow data on the North Fork American River, downstream of the Middle Fork American River confluence for real-time flow dissemination to the public. Therefore, this gage supports public recreation uses and is an allowed used.

Existing land use within the FERC Project boundary is focused on hydropower generation and recreation. Land use outside the FERC Project boundary is managed mainly for recreation, timber harvest, grazing, natural resource protection, and to a lesser extent mining. Existing land use in the vicinity of the new North Fork American River Gage above the American River Pump Station includes activities associated with operation and maintenance of the American River Pump Station facility.

The following describes potential effects to land use designation and existing land use from activities implemented under Alternative 1.

3.10.1.1 Project Boundary Modifications

As required in 18 CFR § 4.41(h)(2), the FERC Project boundary “must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources.” As such, under Alternative 1, Placer County Water Agency (PCWA) will revise the existing FERC Project boundary so that it retains all of the area that is necessary for operation and maintenance of the MFP, while releasing land that is not necessary for operation and maintenance of the MFP so that it may be utilized for other public purposes. To accomplish this, the FERC Project boundary will be modified under Alternative 1 as follows:

- Increase the boundary to include:
 - New MFP facilities and MFP recreation facilities and features constructed as part of Alternative 1;
 - Existing recreation facilities and features added to the MFP; and
 - Footprint of all existing MFP recreation facilities.
- Decrease the boundary to remove excess lands currently within the existing FERC Project boundary that are not necessary for operation and maintenance of the MFP (particularly around MFP reservoirs).

Under Alternative 1, the FERC Project boundary encompasses specific “buffer areas” around each Project facility or feature. These buffer areas were established based on a detailed review of PCWA’s operation and maintenance activities, and include all of the area necessary for operation and maintenance of the Project facilities. The FERC Project boundary will include a minimum 100-foot-buffer area around Project reservoirs, as measured from the maximum operation level inundation footprint. In all cases, including around the Project reservoirs, the FERC Project boundary will include

sufficient area to ensure public access, protect riparian and other shoreline resources, and the quality of Project waters. If Alternative 1 is incorporated by FERC into the New License Order for the MFP, PCWA will provide detailed maps of these revisions (revised Exhibit G drawings) and calculation of the acreage included within the revised FERC Project boundary. The effect of changes in the FERC Project boundary on land use designation and existing land use is described below.

Addition of Project Lands

All lands to be added to the FERC Project boundary under Alternative 1 will continue to maintain the land use designation of “Timberland” as identified in the Placer County General Plan. Adjustments to the FERC Project boundary will enhance the MFP by ensuring that those lands necessary for the safe and efficient operation and maintenance of the MFP are included within the FERC Project boundary. Land use designations will not change as a result of adding land to the FERC Project boundary nor will these changes effect existing land uses. Therefore, the addition of lands into the FERC Project boundary will not result in any impacts to land use.

Removal of Project Lands

All lands removed from the FERC Project boundary will continue to maintain the land use designation of “Timberland” as designated in the Placer County General Plan. Adjustments to the FERC Project boundary will enhance the MFP by ensuring that only those lands necessary for the safe and efficient operation and maintenance of the MFP are included within the FERC Project boundary. Land use designations will not change as a result of removing land from the FERC Project boundary, nor will these changes affect existing land use. Therefore, the removal of lands from the FERC Project boundary will not result in any impacts to land use.

3.10.1.2 Changes in Operation and Maintenance Activities

Under Alternative 1, operation and maintenance activities associated with the MFP will change compared to the No-Action Alternative. New instream flow and minimum reservoir pool conditions under Alternative 1 will result in a change in Project operations. However, these modifications to Project operations are focused on enhancing environmental resources in the bypass and peaking reaches and enhancing recreation opportunities and experience in Project reservoirs and the bypass and peaking reaches. These operational changes under Alternative 1 will not result in a change in land use designations or land uses. Further, these changes will enhance existing land use in the vicinity of the MFP.

As identified in Section 2.0 – Elements Analyzed (Tables 2-3 through 2-7) routine facility inspections, testing, and maintenance activities related to Project facilities and features, Project roads and trails, and Project recreation facilities and features are modified under Alternative 1 compared to the No-Action Alternative. These modifications include changes in the location, timing, and methods of maintenance activities. These modifications are intended to improve Project capabilities and reliability, and protect and

enhance biological, recreational, and cultural resources. Changes in maintenance activities under Alternative 1 will not result in a change in land use designation or land uses. Further, these changes will enhance existing land use in the vicinity of the MFP.

3.10.1.3 Modification of Existing Project Facilities and Construction of New Project Facilities and Project Recreation Facilities and Features

Alternative 1 includes modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features, as described in Section 2.0 – Elements Analyzed. These actions and their effects on land use designations are described below. The discussion first focuses on long-term effects on land use from modification of existing Project facilities or development of new Project facilities and Project recreation facilities and features. The section concludes with a discussion of temporary, short-term construction impacts associated with these projects.

Project Facilities

HELL HOLE RESERVOIR SEASONAL STORAGE INCREASE IMPROVEMENT

Implementation of improvements associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement will occur within the existing FERC Project boundary and will not result in a change in the land use designation for the area; therefore, there will be no impact.

The new inundation area resulting from installation of spillway crest gates will be within the existing flood pool and there are no facilities that will be impacted by the higher water surface elevation (WSE). Therefore, land use impacts related to the new inundation area associated with the higher WSE in Hell Hole Reservoir are considered negligible.

SMALL DIVERSION MODIFICATIONS

Alternative 1 includes modification of Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon diversion dams. The changes include: (1) installation of self-cleaning wedge-wire screens at the dams; (2) modification of the dams to accommodate the screens; (3) modification of the low-level outlets to release the required instream flows; and (4) modification or installation of gages. The small diversion modifications will result in diversion pools that are slightly shallower and more riverine in nature.

Modifications to the small diversions will occur within the existing FERC Project boundary and will not result in a change in the land use designation or land uses for the area; therefore, there will be no impact.

OUTLET WORKS MODIFICATIONS

Alternative 1 includes modification of outlet works at French Meadows Dam, Hell Hole Dam, and Middle Fork Interbay Dam. The purpose of these modifications is to change the outlet works to release new instream flows, and where appropriate, install new

gages to collect flow data necessary for documenting compliance under the new license.

Outlet works modifications will occur within the existing FERC Project boundary and will not result in a change in the land use designation or land uses for the area; therefore, there will be no impact.

NEW GAGES

Alternative 1 includes four new gages and associated features at North Fork Long Canyon Creek below Diversion Dam, South Fork Long Canyon Creek below Diversion Dam, Middle Fork American River below Interbay Dam, and North Fork American River above American River Pump Station. The purpose of these gages is to monitor minimum instream flows and pulse flows for compliance with the new license, and to collect real-time flow information for public dissemination.

The new gages and associated features at North Fork Long Canyon Creek below Diversion Dam, South Fork Long Canyon Creek below Diversion Dam, and Middle Fork American River below Interbay Dam will occur within the existing FERC Project boundary and will not result in a change in the land use designation or land uses for the area; therefore, there will be no impact.

The new gage and associated features at North Fork American River above American River Pump Station are several miles downstream of the FERC Project boundary, on USBR land. PCWA will work in coordination with USBR to install this gage on their property. This project will not result in a change in the land use designation or land uses for the area; therefore, there will be no impact.

NEW SEDIMENT AUGMENTATION AREAS

Under Alternative 1, sediment has routinely been excavated using heavy equipment on an as-needed basis (generally after episodic high-flow events) from the three small diversion pools (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek) and from the two medium reservoirs (Middle Fork Interbay and Ralston Afterbay). Once excavated, the sediment is hauled to approved, sediment disposal areas on United States Department of Agriculture-Forest Service (USDA-FS) land or private property.

Changes in sediment management under Alternative 1 include the use of new sediment augmentation areas associated with the medium reservoirs. These augmentation areas include: Middle Fork Interbay Augmentation Areas (new), Junction Bar Augmentation Area (new), and Indian Bar Augmentation Area (existing, added to MFP). Refer to the Sediment Management Plan (SMP) included in PCWA's Application for New License (PCWA 2011a) for a complete description of sediment augmentation activities to be implemented as part of the MFP. The location of these augmentation areas, activities that will occur at each, and their effect on land use are summarized below.

MIDDLE FORK INTERBAY

Sediment augmentation at Middle Fork Interbay will occur at two new sites downstream of the dam (each site is approximately 0.11 acre). These sites were selected because of their sediment transport potential and proximity to sediment removal activities. Use of these two augmentation areas will follow a phased approach in consultation with resource agencies. The site closest to the dam will be the primary sediment augmentation area, with the second, downstream area only used after the primary area is full and after monitoring has confirmed successful sediment recruitment.

Due to access limitations at the site, sediment augmentation will be accomplished by releasing material from Middle Fork Interbay Dam and Powerhouse Road, just downstream of the dam's north abutment, allowing it to accumulate in the river channel. During augmentation activities, measures will be implemented to protect the roadway and embankment from damage, and to protect instream flows and water quality. Following each augmentation event, all protective measures (e.g., temporary bypass pipe, silt screens) will be removed.

RALSTON AFTERBAY

Sediment augmentation at Ralston Afterbay will occur at two sites: the existing Indian Bar Sediment Augmentation Area downstream of Ralston Afterbay; and at the new Junction Bar Augmentation Area (1.77 acres). Junction Bar Augmentation Area is located just downstream of Indian Bar, on the west bank, on land managed by the Bureau of Land Management (BLM).

Junction Bar will be accessed via a temporary construction bridge that will be placed at the north end of Indian Bar and span the active channel and Willow Bar. A temporary haul road will be constructed to connect the western bridge abutment to the augmentation area. Following each augmentation event, the temporary haul road, bridge, and abutments will be removed and graded to match natural contours.

Use of Middle Fork Interbay and Ralston Afterbay sediment augmentation areas as MFP facilities will not result in a change in land use designation in the area; therefore, there will be no impact.

Land uses in the area, however, could be affected and the following effects have been identified:

- The Junction Bar area has been identified as a dispersed concentrated use area, and use of a portion of Junction Bar for sediment augmentation could potentially affect recreation use at this site; and
- Installation of facilities to accommodate augmentation activities (i.e., protective measures, temporary access road, and bridge) could result in temporary effects to land uses.

The SMP includes AP measures that address potential effects on land uses from implementation of sediment augmentation activities. Applicable measures include:

- Limiting work areas to minimize disturbance; and
- Where feasible, limiting the location of staging and access routes to developed roads and previously disturbed areas.

Implementation of the AP measures included in the SMP will minimize effects of sediment augmentation on land use over the term of the new license. Impacts related to sediment augmentation are considered negligible, because the new augmentation areas will encompass minimal acreage; facilities to accommodate augmentation activities will be temporarily installed; and use data collected by PCWA shows that dispersed recreation use at Junction Bar is low. Furthermore, the placement of sediment downstream of the dams will enhance natural sediment delivery and transport, and enhance habitat for aquatic species and riparian species. Overall, sediment augmentation is considered a beneficial impact to the environment.

Project Recreation Facilities

FRENCH MEADOWS RESERVOIR TRAIL

Alternative 1 includes development of French Meadows Reservoir Trail. The trail will be situated on the south side of French Meadows Reservoir between the reservoir and the Forest Road 96 and will be constructed connecting previously cleared and graded roadways to the extent possible. The trail will be designed, constructed, and maintained to meet USDA-FS standards for public pedestrian and bicycle use. This project will not result in a change in the land use designation or land uses for the area. The trail will accommodate and better manage existing land uses in the area. Therefore, development of the French Meadows Reservoir trail will not impact land use.

ELLICOTT BRIDGE PARKING AREA

Alternative 1 includes development of Ellicott Bridge Parking Area, a six-vehicle river access parking area along Forest Road 14N08 at the Ellicott Bridge crossing of the Rubicon River. The parking area will be located on the west side of the Rubicon River, south of Ellicott Bridge, on public land managed by the USDA-FS. The parking area will be designed, constructed, and maintained to meet USDA-FS standards for accessibility. The developed parking area will accommodate and better manage existing land uses in the area. This project will not result in a change in the land use designation or land uses for the area; therefore, there will be no impact.

CAMPGROUND WATER SUPPLIES

Alternative 1 includes replacement of the entire French Meadows South Shore Water Supply and French Meadows North Shore Water Supply infrastructure including drains, valves, pipe, and other appurtenances. All improvements will be constructed in consultation with the USDA-FS and will meet current USDA-FS and State of California

design standards for the specified use. In addition, PCWA will bring the access road up to current USDA-FS standards. The project will enhance recreational experience at the campgrounds served by the water supply. The project will not result in a change in the land use designation or land uses for the area; therefore, there will be no impact.

Temporary, Short-term Construction Impacts

Alternative 1 includes modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features, which have the potential to result in short-term effects on land use. Refer to Appendix A for detailed information on construction activities and schedule, Best Management Practices (BMPs), AP measures (as applicable), and concept design drawings for each modified/new facility.

Potential impacts could occur as a result of:

- The locations of construction work areas and staging areas for each modification/improvement; and
- Road closure or restriction during construction activities.

Each construction project includes specific AP measures and BMPs (including appropriate USDA-FS BMPs) that address potential effects from implementation of modifications to existing MFP facilities and construction of new MFP facilities on land use. The measures include:

- Limiting work areas to minimize disturbance; and
- Where feasible, limiting the location of staging and access routes to developed roads and previously disturbed areas.

Construction work areas and staging areas, and road closure or restriction during construction activities, will be developed in coordination with appropriate resource agencies, land management agencies, and public safety personnel. Construction-related impacts are considered temporary and short-term in duration. With implementation of AP measures and appropriate USDA-FS BMPs, including agency consultation, construction-related impacts on land use associated with modified/new MFP facilities are considered negligible.

3.10.2 Land Ownership

Under Alternative 1, the FERC Project boundary will be modified and several new facilities will be added to the MFP as described in Section 2.0 – Elements Analyzed, and Appendix A. The proposed boundary changes and the addition of new facilities into the MFP will not result in a change in land ownership; therefore, there will be no impact.

3.10.3 Conflicts with Land Management Plans and Policies

Operations and maintenance of the MFP is an established land use that does not conflict with any other developed or planned use. The hydroelectric facilities and the

activities included under Alternative 1 present no land use compatibility issues or policy conflicts with any applicable land management plans; therefore, there will be no impact.

3.10.4 Unavoidable Adverse Effects

There are no unavoidable adverse effects to land use under Alternative 1.

LITERATURE CITED

Placer County Water Agency (PCWA). 2011a. Application for New License. Sediment Management Plan. Volume 3, Exhibit E, Book 4, Supporting Document A. Filed with FERC February 23, 2011.

_____. 2011b. Application for New License. Section 12.5 – Consistency with Comprehensive Plans. Volume 3, Exhibit E, Book 2. Filed with FERC February 23, 2011.

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Map 3.11-1. Facilities and Features Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement.

3.11 AESTHETIC RESOURCES ENVIRONMENTAL EFFECTS

This section describes potential impacts to aesthetic resources under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facility Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to aesthetic resources were identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance at existing Project recreation facilities; maintenance at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section.

Potential impacts to aesthetic resources consider whether Alternative 1 will modify visual conditions to the extent they are incompatible with United States Department of Agriculture-Forest Service (USDA-FS) visual quality objectives (VQO) and guidelines contained in the Eldorado National Forest (ENF) Land and Resource Management Plan (LRMP) and the Tahoe National Forest (TNF) LRMP. The VQOs are goals that describe the degree of alteration measured in terms of visual contrast with the surrounding natural landscape.

Potential impacts to aesthetic resources are evaluated as follows:

- Compatibility of Project facilities and Project recreation facilities and features with USDA-FS VQOs, standards, and guidelines.
- Potential impacts to visual resources from changes in Project operations that affect reservoir water surface elevations.
- Potential impacts to visual resources from modification of maintenance activities at Project facilities including:
 - Facility painting;
 - Facility maintenance; and
 - Sediment management.
- Potential impacts to visual resources from recreation facility maintenance.
- Potential impacts to visual resources from modification of Project recreation facilities and features, including:
 - Recreation facility upgrades;

- o Recreation facility removal;
 - o Recreation facility reductions;
 - o Recreation facility conversion;
- Potential impacts to visual resources from modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features, including:
 - o Hell Hole Reservoir Seasonal Storage Increase Improvement;
 - o Small diversion modifications;
 - o Outlet works modifications;
 - o New gages; and
 - o New recreation facilities.

A description of potential impacts to aesthetic resources from implementation of Alternative 1, considering enhancement measures, is provided below. A conclusion is provided at the end of this section. There are no unavoidable adverse effects to aesthetic resources resulting from implementation of Alternative 1, as discussed at the end of this section.

3.11.1 Compatibility of Project Facilities with USDA-FS Visual Quality Objectives

Placer County Water Agency (PCWA) conducted a visual quality assessment to evaluate the visual compatibility of the existing Project facilities with the surrounding landscapes, using the USDA-FS Visual Management System (VMS). As part of the assessment, PCWA compiled VMS information relevant to the MFP. Specifically, PCWA: (1) identified the USDA-FS-managed viewsheds in the vicinity of the MFP; (2) identified USDA-FS VQOs; (3) mapped the Project facilities and viewsheds with respect to the VQOs; and (4) conducted an existing visual condition (EVC) assessment of Project facilities and features that can be seen from the managed viewsheds. The methods and results of these efforts are discussed in PCWA's Application for New License (PCWA 2011a), and more detailed information is available in the REC 5 – Visual Quality Assessment Technical Study Report (TSR) (REC 5 – TSR) (PCWA 2011b).

The information compiled through these efforts was used to determine whether the existing MFP facilities are consistent with the USDA-FS VQOs and management direction contained in the current ENF LRMP (USDA-FS ENF 1988) and TNF LRMP (USDA-FS TNF 1990). The assessment focused on the Project facilities that can be seen from each viewshed. The results of this effort are discussed in the following subsection, with respect to changes that will occur under Alternative 1.

3.11.1.1 Existing Visual Condition

The results of the EVC assessment are summarized on Table 3.11-1, organized by the specific viewsheds identified by the ENF and TNF. As indicated, the EVC of most of the MFP facilities are consistent with the VQOs. The VQO rating varies by viewshed; but, in general, the facilities and features that do not meet the VQOs are linear features such as powerlines, or large facilities such as dams and powerhouses that dominate the landscape due to their size or utilitarian form. These facilities and features are identified on Table 3.11-1, along with an explanation about why the facility or feature is inconsistent with the VQO. Under Alternative 1, the overall form and appearance of the existing Project facilities and features will generally remain unchanged relative to the No-Action Alternative.

Alternative 1 includes a Visual Resources Management Plan (VRMP) that was developed in consultation with the resources agencies (PCWA 2011c). The overall goal of the VRMP is to improve the visual conditions of select Project facilities and features so that they are more consistent with the established VQOs, standards, and guidelines contained in the ENF and TNF LRMPs. In some cases, meeting the VQO is infeasible due to the size or type of structure (i.e., dams, powerlines). The measures contained in the VRMP will improve the EVC of select Project facilities and features. Therefore, implementation of Alternative 1 will improve visual conditions as they relate to USDA-FS VQOs.

3.11.2 Project Operations

Changes in Project operations and minimum pool requirements that affect reservoir water surface elevations (WSE) are discussed in detail in Section 3.5 – Fish and Aquatic Resources. In addition, plots showing the reservoir WSE under Alternative 1 are included in Appendix D.

As shown on the WSE plots contained in Appendix D, implementation of Alternative 1 will not substantially affect WSE at any of the MFP reservoirs, particularly during the peak recreation season (Memorial Day through Labor Day) and during the fall-shoulder season (Labor Day through about November 1). During the recreation season, the minimum pool requirements at Hell Hole and French Meadows reservoirs will be the same or higher under Alternative 1 and the No-Action Alternative, depending upon water year type. The maximum flood pool will remain the same at both reservoirs under both Alternative 1 and the No-Action Alternative. Therefore, both reservoirs will be operated within their historic range with minor changes occurring on a seasonal basis, depending upon water year type. The reservoirs will not be drawn down earlier in the season under Alternative 1 when compared to the No-Action Alternative, regardless of water year type. In fact, as shown on the plots in Appendix D, WSE will generally remain higher for a longer period of time at both Hell Hole and French Meadows reservoirs. This is particularly evident during dry and critical water year types (refer to plots D1d-4, D1d-6, D1d-10, and D1d-11).

The Hell Hole Reservoir Seasonal Storage Increase Improvement will seasonally increase the WSE of Hell Hole Reservoir by 6 feet. However, the WSE will remain within the existing flood pool. A 6-foot change in WSE will not be noticeable due to the small scale of the change relative to the large size of the reservoir.

Hell Hole Reservoir and the surrounding side slopes are characterized by steep and rocky slopes, with sparse vegetation. Near Hell Hole Dam, the slopes in the immediate vicinity of the reservoir are comprised mainly of upper, montane chaparral species, huckleberry oak, and annual grasses and forbs. Riparian species (primarily willows, with a few alders and black cottonwoods) occur intermittently around the reservoir, primarily in the upper portion of the reservoir near the confluences of Five Lake Creek and the Rubicon River. As discussed in Section 3.6 – Botanical and Wildlife Resources and in Section 3.8 – Riparian Resources, a 6-foot change in WSE will not result in measurable losses of upland or riparian vegetation around the reservoir due to the timing and limited duration of inundation. Therefore, Hell Hole Reservoir will appear the same as viewed from on the reservoir or as viewed from nearby vantage points (e.g., Hell Hole Vista or Hell Hole Boat Ramp) under both Alternative 1 and the No-Action Alternative. Accordingly, visual conditions as they relate to WSE will be similar under Alternative 1 and the No-Action Alternative.

3.11.3 Operation and Maintenance of Project Facilities

Alternative 1 includes changes in routine Project maintenance activities that could affect visual quality including: (1) facility painting; (2) facility maintenance and (3) sediment management. These activities are discussed in the following subsections.

3.11.3.1 Facility Painting

PCWA will periodically paint the Project facilities as paint surfaces deteriorate. In addition, PCWA will paint the following Project facilities or features with a color that blends with the surrounding landscape, as specified in the VRMP:

- Hell Hole – Middle Fork Tunnel Gatehouse;
- Operator Cottages and Shop;
- South Fork Long Canyon Diversion Dam (yellow safety railings);
- Ralston Powerhouse (white components);
- Middle Fork – Ralston Tunnel Surge Shaft and Tank (metal components, storage building doors);
- Passive Microwave Reflector Station above Ralston Afterbay;
- Ralston Powerhouse Butterfly Valve House;
- French Meadows Powerhouse and Penstock;
- French Meadows-Hell Hole Tunnel Gatehouse;
- French Meadows Dam Generator Building; and
- Ralston Afterbay Dam Generator Building.

Under Alternative 1, PCWA will consult with the USDA-FS on the selection of appropriate colors. This consultation does not occur under the No-Action Alternative. Painting the facilities a color that blends with the surrounding landscape will improve visual conditions relative to the USDA-FS VQOs. Therefore, implementation of Alternative 1 will enhance visual quality compared to the No-Action Alternative.

3.11.3.2 Project Facility Maintenance

Over the license term, PCWA will implement a variety of measures that will improve the existing visual condition of select MFP facilities, as follows. These measures are specified in the VRMP and include:

- Replacing the Hell Hole Dormitory roof with a roof that is dark in color, to be selected in consultation with, and approved by the USDA-FS;
- Replacing the galvanized fencing that currently encloses Middle Fork – Ralston Tunnel Surge Shaft and Tank with black, plastisol fencing;
- Relocating unconsolidated items stored within the Middle Fork – Ralston Tunnel Surge Shaft and Tank fenceline in a neat manner, placed as out-of-site as possible when viewed from Forest Road 14N25; and
- Developing a Landscape Rehabilitation Plan for the French Meadows Dam Staging Area to reduce visual impacts.

In addition, PCWA will develop project-specific Visual Resource Protection Plans for any new, relocated, or significantly modified MFP facility or other Project-related disturbance that has the potential to affect visual resources on National Forest Service (NFS) land on an as-needed basis, as determined through consultation with the USDA-FS.

Implementing these measures will help ensure that the MFP facilities and features blend with the surrounding landscape to the extent possible. Furthermore, implementation of these measures will improve visual conditions of the MFP facilities relative to the USDA-FS VQOs. These measures would not be implemented under the No-Action Alternative. Therefore, implementation of Alternative 1 will enhance visual quality compared to the No-Action Alternative.

3.11.3.3 Sediment Management

Alternative 1 includes changes in sediment management activities. These changes are described in detail in the Sediment Management Plan (SMP) (PCWA 2011d). The development and use of sediment augmentation areas to facilitate natural sediment transport could potentially affect visual quality. Alternative 1 includes sediment augmentation areas, as discussed in the following.

Middle Fork Interbay Augmentation Areas

Sediment of suitable size to benefit the aquatic ecosystem will be removed during sediment management activities from Middle Fork Interbay and will be placed in two downstream augmentation areas. Sediment augmentation into the Middle Fork American River downstream of Middle Fork Interbay is extremely challenging due to the steep canyon walls and limited access. As such, sediment augmentation will be accomplished by releasing material from the Middle Fork Interbay Dam and Powerhouse Road, just downstream of the dam's north abutment, allowing it to accumulate in the river channel. The two augmentation areas are located on the north side of the river, approximately 150 feet downstream of the dam.

The augmentation areas are located in an area that is managed to meet a VQO of Modification. The Modification VQO allows for management activities that visually dominate the original characteristic landscape, provided they are compatible with the natural surroundings. The augmentation areas will not be visible from any USDA-FS managed viewshed. In addition, they will not be noticeable from Middle Fork Interbay or the adjacent road due to the steepness of the canyon. Implementation of Alternative 1 will not substantially alter the visual character of this area compared to the No-Action Alternative. The visual condition of the augmentation area will be consistent with the Modification VQO. Therefore, the desired VQO will be met under Alternative 1.

Indian Bar Augmentation Area

The Indian Bar Augmentation Area is an existing augmentation area that will be incorporated into the MFP to enhance sediment delivery and transport under Alternative 1. The augmentation area is located immediately downstream of Ralston Afterbay Dam, adjacent to the Oxbow Powerhouse. Under Alternative 1, sediment removed from Ralston Afterbay during routine sediment management activities will be placed on the existing gravel/cobble bar and then graded to the river's edge in a manner that maximizes sediment transport during high-flow events, as it is under the No-Action Alternative.

This augmentation area will be located in an area that is managed to meet a VQO of Partial Retention. The Partial Retention VQO allows for management activities that are visually subordinate to the characteristic landscape. The area will be visible from the Indian Bar Rafter Access and from the Middle Fork American River, which are USDA-FS managed viewsheds. However, the shape and general character of the augmentation area and the material placed in this augmentation area will be similar in form, color, and texture to the existing gravel/cobble bar and surrounding landscape. In addition, it will be visually subordinate to the adjacent and nearby facilities. Implementation of Alternative 1 will not substantially alter the visual character of this area compared to the No-Action Alternative. Furthermore, the visual condition of the augmentation area will be consistent with the Partial Retention VQO. Therefore, the desired VQO will be met under Alternative 1.

Junction Bar Augmentation Area

Under Alternative 1, a portion of Junction Bar will also be used for sediment augmentation associated with sediment management activities at Ralston Afterbay. Junction Bar is a large gravel/cobble bar located immediately downstream of Ralston Afterbay on the south side of the Middle Fork American River that has been previously disturbed by historical mining activities. Augmentation material will be placed close to the river's edge in a manner that will maximize sediment transport during high-flow events.

Junction Bar is located in an area with a Retention VQO, which allows for management activities that are not visually evident. The area will be visible from the Indian Bar Rafter Access and from the Middle Fork American River, which are USDA-FS managed viewsheds. However, the shape and general character of the augmentation area and the material placed in this augmentation area will be similar in form, color, and texture to the existing gravel/cobble bar and surrounding landscape. Natural erosion of the augmentation area will help shape the area to blend with the surrounding landscape. Alternative 1 will not substantially alter the visual character of this area compared to the No-Action Alternative. Furthermore, the visual condition of the augmentation area will be consistent with the Retention VQO. Therefore, the desired VQO will be met under Alternative 1.

3.11.4 Project Recreation Facility and Feature Maintenance

Alternative 1 includes routine annual and heavy maintenance at Project recreation facilities and features, existing recreation facilities and features added to the MFP, and post-construction maintenance at new Project recreation facilities, as identified in Table 2.6 and Table 2.7, respectively. Additional information about these activities is available in the Recreation Plan (USDA-FS 2011; CDFG 2011).

Routine and heavy maintenance activities at Project recreation facilities and features are ongoing and will continue under the new license. PCWA will consult with the USDA-FS on routine and heavy maintenance activities that have the potential to impact the existing VQO of a particular facility to ensure that activities are compatible with the surrounding landscape. These activities could include fuel reduction; painting buildings; replacement of barrier structures and devices; replacement of site/facility amenities; replacement of damaged signage, information boards, and fee tubes.

In addition, PCWA will develop project-specific Visual Resource Protection Plans for any new, relocated, or significantly modified Project recreation facility or features, or other Project-related disturbance that has the potential to affect visual resources on NFS land on an as-needed basis, as determined through consultation with the USDA-FS.

Implementing these measures will help ensure that the Project recreation facilities and features blend with the surrounding landscape to the extent possible. Furthermore, implementation of these measures will improve visual conditions of Project recreation

facilities and features relative to the USDA-FS VQOs. These measures would not be implemented under the No-Action Alternative. Therefore, implementation of Alternative 1 will enhance visual quality compared to the No-Action Alternative.

3.11.5 Recreation Facility Upgrades

Under Alternative 1, all of the existing Project recreation facilities and/or features will be upgraded to meet current USDA-FS design and accessibility standards. With a few exceptions, most of these upgrades would occur under both the No Action Alternative and Alternative 1. The exceptions include additional, more substantive upgrades to the following facilities that would not necessarily occur under the No Action Alternative.

- Ahart Campground
- Indian Bar Rafting Access and General Parking
- Hell Hole Boat Ramp
- French Meadows Boat Ramp
- Ralston Afterbay Sediment Removal Access Point Boat Ramp
- Duncan Creek Diversion Primitive Recreation Site

The upgrades at Ahart Campground and Indian Bar Rafter Access will occur within the existing facility footprints. The boat ramps will be extended into the reservoirs to facilitate boat launching at lower WSEs. All of the features associated with these upgrades will be designed and situated to blend with the existing facility features in terms of form, line, color, and texture. The recreation facility enhancements will meet the Partial Retention VQO assigned to recreation facilities.

3.11.5.1 Ralston Afterbay Sediment Removal Access Point Boat Launch

Under Alternative 1, the existing Ralston Afterbay Sediment Removal Access Point will be formalized as a public boat launch area. The Ralston Afterbay Sediment Removal Access Point is located within the boundaries of the ENF, along the Rubicon River arm of Ralston Afterbay, in the immediate vicinity of the Middle Fork American River confluence. The ENF manages this area to meet a VQO of Retention, which provides for management activities that are not visually evident. Currently the site is not readily noticeable from any managed viewshed due its small size and lack of improvements. Therefore, the site meets the Retention VQO.

Improving the Ralston Afterbay Sediment Removal Access Point will involve grading the existing ramp, installing barrier rock, and signage. This access point is already graded and used informally as a boat launch by the public. The improvements will not substantially alter the characteristics of the site relative to the existing condition. Furthermore, barrier rock will be selected to match the local native rock and signage will be designed and placed to blend with the natural surroundings. Therefore, the improvements will not be visually evident and will meet the Retention VQO

3.11.5.2 Duncan Creek Diversion Primitive Recreation Site

Under Alternative 1, Duncan Creek Diversion Primitive Recreation Site will be developed to address sanitation issues in the Duncan Creek Diversion area and to reduce potential resource impacts related to dispersed recreation. Development of the site will include installation of one single-unit accessible vault toilet, barrier rocks, and a bear-resistant garbage container.

The Duncan Creek Diversion lies within an area that is managed for the Modification VQO, which allows for the development of features such as the Duncan Creek Diversion Primitive Use Site. The features associated with this site will be selected and placed in consultation with USDA-FS landscape architects to ensure that the features are compatible with the surrounding landscape. The Duncan Creek Diversion Primitive Use Site will meet the more stringent VQO of partial retention assigned to recreation facilities.

3.11.5.3 Trail Improvements

Under Alternative 1, three existing trails will be added to the MFP and subsequently upgraded and maintained to meet USDA-FS design standards: Poppy Trail, Hell Hole Reservoir Trail; and Middle Fork American River Upstream of Ralston Afterbay Trail. These three trails are existing trails but are not currently maintained by PCWA. Under Alternative 1, these trails will be upgraded and maintained by PCWA to facilitate recreation access. These trails will be upgraded using native materials and will not require structures such as foot bridges. The overall appearance of these trails will be similar under both the No-Action Alternative and Alternative 1 and upgrading these trails will have no effect on visual quality.

3.11.6 Recreation Facility Removal

Under the Alternative 1, Upper Hell Hole Campground will be removed due to low use and to protect nearby sensitive biological and cultural resources. As a recreation facility, Upper Hell Hole Campground is managed to meet the Partial Retention VQO. The surrounding landscape is managed to meet a more stringent VQO of Retention. Under the Alternative 1, all of the amenities at Upper Hell Hole Campground will be removed and previously disturbed areas will be allowed to revegetate. Removal of this facility will eliminate features that are visually evident relative to the surrounding landscape. After removal, the area will meet the more stringent VQO of Retention.

3.11.7 Recreation Facility Reductions

Under Alternative 1, the following Project recreation facilities will be reduced in size due to low use levels and/or to protect nearby sensitive resources:

- Ahart Campground
- Poppy Campground
- French Meadows Campground

- Lewis Campground
- French Meadows Picnic Area
- Hell Hole Campground (potentially reduce)
- Ralston Picnic Area

Facility reductions will be achieved by: (1) removing select camp sites or picnic sites; or (2) consolidating or reconfiguring one or more campsites to create larger sites. Specific information about the number of sites to be removed at each Project recreation facility and an implementation schedule is available in the Recreation Plan.

These facilities are managed to meet the Partial Retention VQO and will continue to meet this VQO after they are reduced in size. However, reduction of these facilities will reduce the overall size and scale of these facilities, making them more compatible with the characteristics of the surrounding landscape. Revegetation of previously disturbed areas will further improve visual quality. Under Alternative 1, these facilities will continue to meet the Partial Retention VQO assigned to recreation facilities.

3.11.8 Recreation Facility Conversions

Under the Alternative 1, McGuire Picnic Area will be converted to a group campground. The existing picnic tables and associated features will be removed and the area will be reconfigured to support group camping opportunities. As a recreation facility, McGuire Picnic Area is managed to meet a VQO of Partial Retention. When converted to a group campground, the facility will continue to meet the Partial Retention VQO.

French Meadows Reservoir and the area surrounding French Meadows Reservoir are managed to meet a VQO of Retention, which provides for management activities that are not visually evident. The existing picnic area is not noticeable from the reservoir due the small size of facility and the presence of trees and other understory vegetation. Therefore, the existing picnic area meets the desired VQO of Retention as viewed from the reservoir. If improperly designed, the group campground may be more noticeable from the reservoir than the existing picnic area. Accordingly, the group campground will be designed in consultation with USDA-FS landscape architects to ensure that views from the reservoir continue to meet the Retention VQO. Removal of trees and other vegetation will be minimized to ensure that the presence of a group campground is not visually evident from the reservoir.

3.11.9 Modification of Existing Project Facilities and Construction of New Project Facilities and Project Recreation Facilities and Features

Under Alternative 1, modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features will be implemented to improve operations and maintenance of the MFP, enhance environmental resources, and/or meet the requirements specified in new environmental programs and measures. These projects are described in Section 2.0 – Elements Analyzed and Appendix A, and include:

- Hell Hole Reservoir Seasonal Storage Increase Improvement;
- Small Diversion Modifications;
- Outlet Works Modifications;
- New Gages; and
- New Project Recreation Facilities.

These elements of Alternative 1 are discussed in the following subsections with respect to visual quality.

Note that Alternative 1 also includes modification of existing gages and installation of new gages to monitor flows for compliance with the new license and collect flow data for real-time flow dissemination to the public. Modifications to existing gages will occur at existing Project facilities (i.e., dam outlet works, spillways, diversion tunnels, and penstocks) and will not alter the physical or visual character of these features. Modifications to the existing gages will meet the requirements of the VRMP.

3.11.9.1 Hell Hole Reservoir Seasonal Storage Increase Improvement

Alternative 1 includes construction of the Hell Hole Reservoir Seasonal Storage Increase Improvement. The purpose of this improvement is to seasonally increase the storage capacity of Hell Hole Reservoir by approximately 7,600 acre-feet. The improvement will utilize a portion of the existing flood pool, above the present normal maximum operating water level, to store additional water during the spring and summer after the peak of the runoff period. This increase will be achieved by installing 6-foot-high crest gates on the existing dam spillway. Operation of the crest gates will seasonally increase the reservoir's inundation area, within the existing flood pool, by approximately 36 acres.

This improvement requires construction of three new Project facilities in addition to the 6-foot-high crest gates including:

- Hell Hole Dam Spillway Crest Gates Control Building—a small control building and perimeter fence adjacent to the spillway to house equipment to power the new spillway crest gates;
- Hell Hole Dam Spillway Crest Gates Control Building Powerline—a short spur line (approximately 525 feet) from the control building to an existing Project powerline to provide power to the control building for operation of the spillway crest gates; and
- Hell Hole Dam Spillway Gates Road—a road providing access to the new spillway gates.

In addition, implementation of this improvement will require the construction of temporary staging areas and work areas in the vicinity of Hell Hole Dam.

The locations of these components are shown on Map 3.11-1 with respect to the existing Project facilities and VQOs. As indicated, the components associated with this improvement are located in the immediate vicinity of Hell Hole Dam, in previously disturbed areas. These components are discussed further in the following subsections with respect to visual resources.

Hell Hole Dam Spillway Crest Gates

PCWA prepared photo simulations showing the Hell Hole Dam and Spillway area under the No-Action Alternative (Figure 3.11-1) and Alternative 1 (Figure 3.11-2), as viewed from one Key Observation Point (KOP) selected in consultation with an ENF landscape architect. This KOP is located at the Hell Hole Vista, from which most of the reservoir, the dam, and spillway are visible. Figure 3.11-1 shows the existing structures with the current maximum normal operating WSE as viewed from Hell Hole Vista (No-Action Alternative). Figure 3.11-2 shows the existing structures with a 6-foot raise in the maximum normal operating WSE, plus the new spillway gates, the new control building, and the new powerline (Alternative 1).

As shown in Figure 3.11-2, the crest gates would not be noticeable from Hell Hole Vista (or anywhere on the reservoir) when in operation because they would be covered or nearly covered by water. The gates would be lowered when the reservoir level recedes and would lay flat (horizontal) on the spillway when not in use. Similarly, the gates would not be visible from Hell Hole Reservoir, or from the Hell Hole Boat Ramp and associated parking, both USDA-FS managed viewsheds. Therefore, installation of the Hell Hole Dam Spillway Crest Gates would not change the existing visual conditions relative to the No-Action Alternative.

Hell Hole Dam Spillway Crest Gates Control Building and Powerline

As shown on Map 3.11-1, the Hell Hole Dam Spillway Crest Gates Control Building will be situated on a bedrock outcrop that separates Hell Hole Dam and the spillway. The powerline will extend from the west end of the spillway, southwest up a bedrock embankment to an existing powerline.

The new control building and powerline are shown on Figure 3.11-2. As indicated, the control building will be visible from Hell Hole Vista, but will not be noticeable due to the viewing distance and due to the small size of the feature relative to the dam and spillway. The powerline will traverse relatively barren bedrock and will not be noticeable from Hell Hole Vista due to the distance between the vista and powerline, and because the powerline will be obscured by bedrock outcrops and shadows.

The control building and powerline will be more evident when viewed from closer distances. Specifically, the building and the powerline will be visible from some locations on Hell Hole Reservoir, and potentially from the Hell Hole Boat Ramp access road and parking area. However, neither feature will dominate the landscape relative to the surrounding features, which include Hell Hole Dam and spillway.

Hell Hole Dam and spillway are located in an area that is managed by the USDA-FS to meet a VQO of Retention. The Retention VQO provides for management activities that are not visually evident. As indicated on Table 3.11-1, neither Hell Hole Dam nor the spillway meet the VQO of Retention from any of the managed viewsheds due to their size and form. The new control building and powerline will be situated in areas that are already substantially disturbed and do not meet the USDA-FS VQO. Therefore, implementation of Alternative 1 will not substantially change visual conditions relative to the No-Action Alternative.

To minimize visual impacts, the new control building will be painted a color that is compatible with the surrounding landscape. The exact color will be determined in consultation with the USDA-FS, as specified in the VRMP. Visual impacts of the powerline will be minimized by utilizing non-specular materials that blend with the surrounding environment when possible, and by minimizing vegetation clearing.

Hell Hole Dam Spillway Gates Road

Implementation of this improvement will require construction of a new road referred to as the Hell Hole Dam Spillway Gates Road. This road will provide access to the spillway area during and after construction. The location of this road is shown on Map 3.11-1. As indicated, the road will be constructed in a previously disturbed area, in the immediate vicinity of the dam and spillway. Accordingly, the road will be visually subordinate to the surrounding features and will not be noticeable from the Hell Hole Vista or from any USDA-FS managed viewshed. Therefore, implementation of Alternative 1 will not substantially change visual conditions relative to the No-Action Alternative.

Temporary Features

Implementation of this improvement will require construction of the following temporary features:

- Hell Hole Dam Spillway Crest Gates Construction Work Area;
- Hell Hole Dam Spillway Crest Gates and Control Building Construction Staging Area; and
- Hell Hole Dam Spillway Crest Gates Control Building Powerline Construction Staging Area.

The locations of these features are shown on Map 3.11.1. As indicated, these features will be situated in barren or sparsely vegetated, previously disturbed areas, in the immediate vicinity of the dam and spillway. Accordingly, these features will be visually subordinate to the surrounding structures and will not be noticeable. Furthermore, these features are temporary. Upon completion of construction activities, these areas will be returned to their original condition. Therefore, implementation of Alternative 1 will not change visual conditions relative to the No-Action Alternative.

3.11.9.2 Small Diversion Modifications

Under Alternative 1, the Duncan Creek, North Fork and South Fork diversion dams will be modified to allow for more natural transport of sediment past the diversion structures, and to reduce the need for future sediment removal activities. Modifying the small diversions will include installation of self-cleaning wedge-wire screens at the dams; modification of the low-level outlets to release the required instream flows; and modification or installation of gages.

The modifications will result in diversion pools that are slightly shallower and more riverine in nature, consistent with the adjacent landscape. Otherwise, none of the modifications to the small diversions will substantially alter the physical or visual character of the dams or ancillary structures. Accordingly, the visual condition of the diversion dams will be similar under the No-Action Alternative and Alternative 1. The Duncan Creek Diversion Dam will continue to meet the Modification VQO and the North and South Fork diversions will continue to meet the Partial Retention VQOs.

3.11.9.3 Outlet Works Modifications

Alternative 1 includes modification of the outlet works at French Meadows Dam, Hell Hole Dam, and Middle Fork Interbay Dam. The purpose of these modifications is to enhance the ability of the outlet works to release new instream flow requirements, and, where appropriate, install new gages to collect flow data necessary for documenting compliance under the new license. French Meadows Dam and Hell Hole Dam are located in areas managed to meet a VQO of Retention. As indicated on Table 3.11-1, these features can be seen from various USDA-FS managed viewsheds and do not meet the desired VQO of Retention due to their large size and form. Middle Fork Interbay Dam spans the ENF and the TNF boundary. On the TNF side, the area is managed to meet a VQO of Modification. On the ENF side, the area is managed to meet a VQO of Partial Retention. Middle Fork Interbay Dam cannot be seen from any USDA-FS managed viewshed and meets the desired VQOs.

None of the outlet works modifications will alter the physical or visual character of the dams or ancillary structures. In addition, the new gages associated with these modifications will be contained within the outlet works. Therefore, implementation of Alternative 1 will not change existing visual conditions relative to the No-Action Alternative. Furthermore, implementation of Alternative 1 will not change visual conditions relative to the USDA-FS VQOs.

3.11.9.4 New Gages

Alternative 1 includes four new gages and associated access trails, photovoltaic poles and powerlines, and cableways at North Fork Long Canyon Creek below Diversion Dam, South Fork Long Canyon Creek below Diversion Dam, Middle Fork American River below Interbay Dam, and North Fork American River above American River Pump Station. The purpose of these gages is to monitor minimum instream flows and pulse flows for compliance with the new license, and to collect real-time flow information for

public dissemination. These new gages are discussed further in the following subsections with respect to visual resources.

North Fork Long Canyon Creek Gage below Diversion Dam

Alternative 1 includes installing a new gage, cableway, access trail, photovoltaic pole, and powerline about 200 feet downstream of the North Fork Long Canyon Diversion Dam (Appendix A, Figure NFLCC-1). The ENF manages this area to meet a VQO of Partial Retention, which allows for management activities that are visually subordinate to the characteristic landscape. The new gage, cableway, access trail, photovoltaic pole, and powerline will be constructed in an area with similar or larger scale features (e.g. a diversion dam and appurtenant structures). Therefore, installation of a new gage, cableway, trail, photovoltaic pole, and powerline will not substantially alter the character of the area relative to existing conditions. Furthermore, construction materials and finishes will be selected in consultation with the USDA-FS to ensure that the gage and associated features are designed to blend with the surrounding environment to the extent possible. The new gage and associated features will be visually subordinate to the characteristic landscape, and will therefore meet the Partial Retention VQO.

South Fork Long Canyon Creek Gage below Diversion Dam

Alternative 1 includes installing a new gage, cableway, access trail, photovoltaic pole, and powerline about 150 feet downstream of the South Fork Long Canyon Diversion Dam (Appendix A, Figure SFLCC-1). The ENF manages this area to meet a VQO of Partial Retention. The new gage, cableway, access trail and photovoltaic pole will be constructed in a previously disturbed area with similar or larger scale features, including project roads, a diversion dam, and ancillary facilities. Therefore, installation of a new gage, cableway, trail, photovoltaic pole, and powerline will not substantially alter the character of the area relative to existing conditions. Furthermore, construction materials and finishes will be selected in consultation with the USDA-FS to ensure that the gage and associated features are designed to blend with the surrounding environment to the extent possible. The new gage and associated features will be visually subordinate to the characteristic landscape, and will therefore meet the Partial Retention VQO.

Middle Fork American River Gage below Middle Fork Interbay

Alternative 1 includes installing a new gage, cableway, photovoltaic pole, powerline, and trail downstream of Middle Fork Interbay Dam (Appendix A, Figure MFARIB-1). These features will be placed on the east side of the Middle Fork American River, which is under TNF jurisdiction. The TNF manages this area to meet a VQO of Modification, which provides for management activities that may visually dominate the original characteristic landscape while remaining compatible with natural surroundings. The cableway, photovoltaic pole and associated powerline will be visible from Middle Fork Interbay Road, but this road is not a USDA-FS managed viewshed. The gage will be placed near the river, in an area that is obscured from view by steep terrain and bedrock outcrops. The new gage, cableway, photovoltaic pole, powerline, and trail will be constructed in the immediate vicinity of Middle Fork Interbay Dam, and visually

subordinate to the dam and associated features. Therefore, installation of a new gage, cableway, photovoltaic pole, and trail will not substantially alter the character of the area relative to existing conditions. The new gage and associated features will not visually dominate the characteristic landscape and will be compatible with the surrounding environment. Therefore, the gage, cableway, powerpole, powerline, and trail will meet the Modification VQO.

North Fork American River Gage above American River Pump Station

Alternative 1 includes installing a new gage, photovoltaic pole, powerline, and trail on the North Fork of the American River, just upstream of the American River Pump Station, on land managed by the Bureau of Reclamation (BOR) (Appendix A, Figure NFARPS-1). This area has been substantially disturbed by previous land use activities, including dam and road building activities that are not associated with the MFP. Installation of a new gage, photovoltaic pole, powerline, and trail in this location will be visually compatible with the surrounding landscape and will not substantially alter the character of the area relative to existing conditions.

3.11.9.5 New Recreation Facilities

The following new recreation facilities will be constructed under Alternative 1 and are discussed in the following subsections with respect to visual quality.

French Meadows Reservoir Trail

Alternative 1 includes development of French Meadows Reservoir Trail. The trail will be situated on the south side of French Meadows Reservoir between the reservoir and the Forest Road (FR)-96 and will be constructed connecting previously cleared and graded roadways to the extent possible (Appendix A, Figure FMRT-1). The trail will be designed, constructed, and maintained to meet USDA-FS standards for public pedestrian and bicycle use.

The trail will be constructed in an area managed by the TNF to meet a VQO of Retention, which provides for management activities which are not visually evident. The adjacent reservoir and road (FR-96) are Sensitivity Level 1 managed viewsheds, meaning they are primary recreation areas and/or travel routes where visitors are anticipated to have a high concern for visual quality. However, the trail will not be visible from either the reservoir or FR-96 due to the relatively steep slope between the road and the reservoir and the presence of dense vegetation consisting primarily of coniferous forest with interspersed white fir and huckleberry oak. Since the trail will not be visually evident, it will meet the Retention VQO.

Ellicott Bridge Parking Area

Alternative 1 includes development of Ellicott Bridge Parking Area, a six-vehicle river access parking area along Forest Road 14N08 at the Ellicott Bridge crossing of the Rubicon River. The parking area will be located on the west side of the Rubicon River, south of Ellicott Bridge, on public land managed by the USDA-FS (Appendix A,

Figure EBPA-1). The parking area will be designed, constructed, and maintained to meet USDA-FS standards for accessibility.

The parking area will be located near the Rubicon River, which is eligible for inclusion in the National Wild and Scenic River System. The ENF manages the Rubicon River, and the area within 0.25 mile of the river to maintain this status. According to the ENF Land and Resource Management Plan (USDA-FS 1988), the desired VQO for the Rubicon River is Retention, meaning management activities should not be visually evident. Developed recreation facilities should be 100 feet from the river's edge and buildings, improvements should be screened, and designs should harmonize with the environment (USDA-FS 1990). Accordingly, this facility will be designed and constructed in consultation with the USDA-FS to ensure that it meets these management objectives. Specifically, the facility will be sited more than 100 feet from the river. In addition, it will be designed and constructed with materials and finishes that blend with the existing environment. Removal of trees and other vegetative screening will be minimized to ensure that the facility is not readily visible from the Rubicon River and views from FR-2 (Eleven Pines Road) are obscured. With these provisions, construction of the Ellicott Bridge Parking Area will meet the desired VQO of Retention and will not conflict with the management direction, standards and guidelines contained in the LRMP for the Rubicon River.

Recreation Facility Water Supply Replacement

Alternative 1 includes replacement of the entire French Meadows South Shore Water Supply and French Meadows North Shore Water Supply infrastructure including drains, valves, pipe, and other appurtenances. All improvements will be constructed in consultation with the USDA-FS and will meet current USDA-FS and State of California design standards for the specified use. In addition, PCWA will bring the access road up to current USDA-FS standards.

Both of these water supplies are located in the vicinity of French Meadows Reservoir in an area managed by the TNF to meet a VQO of Retention, which provides for management activities that are not visually evident. The existing water supply systems consist of above ground storage tanks and water supply lines, most of which are underground. The underground lines are not visible. Therefore, replacement of the water supply lines will have no effect on visual resources. The water storage tanks are located in densely forested, unimproved areas and, as such are not readily visible. Therefore, replacement of the water tanks (if needed) will not be visually evident and will meet the VQO of Retention.

3.11.10 Conclusions—Aesthetic Resources

Implementation of Alternative 1 will not adversely affect aesthetic resources. Alternative 1 includes a VRMP that specifies a variety of measures that will improve the overall visual condition of select Project facilities and features relative to USDA-FS objectives, standards, and guidelines. In addition, the VRMP includes a provision that requires PCWA to consult and coordinate with the USDA-FS when implementing future projects

that have the potential to affect visual resources on NFS lands, including modification of existing MFP facilities or the construction of new MFP facilities. Compared to the No-Action Alternative, the measures included in the VRMP will improve the visual conditions of select Project facilities and features so that they are more consistent with the established VQOs. The measures contained in the VRMP would not be implemented under the No-Action Alternative. Therefore, Alternative 1 will enhance visual quality relative to the No-Action Alternative.

3.11.11 Unavoidable Adverse Effects

There are no unavoidable adverse effects to aesthetic resources under Alternative 1.

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TABLES

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives.

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
TNF Managed Viewsheds							
Mosquito Ridge Road Viewshed (FR 96)							
French Meadows Reservoir Area	French Meadows Dam and Outlet Works	Large Dam	IV	R	Seen	No	FR 96 crosses top of dam. Travelers experience immediate foreground views of downstream dam face for a short distance (less than 0.5 mi) when approaching dam from the west. Outlet works are not seen due to view angle and intervening terrain. Dam appears as major disturbance seen in foreground distance zone.
	French Meadows Reservoir & Shoreline	Large Reservoir	II-IV	R	Seen	Dependent on water surface elevation	Reservoir and shoreline are not seen until FR 96 nears the spillway structure. Views are of short duration while crossing the spillway area and dam. Expansive panoramic views of the reservoir and shoreline are experienced when crossing the dam. There are limited, filtered views of the reservoir and shoreline through trees when traveling east along the reservoir. Reservoir appears near-natural at full pool, and visual quality declines with reservoir surface elevation and increased exposure of shoreline. Very low pool elevations dominate visual experience.
	French Meadows Reservoir Staff Gage	Reservoir Gage	II	R	Not noticed	Yes	Not noticed from FR 96 due to small scale of gage, speed of travel on road and location of gage near north shoreline.
	French Meadows Reservoir Gage (USGS Gage No. 11427400)	Reservoir Gage	II	R	Not noticed	Yes	
	French Meadows Dam Leakage Weirs Nos. 1-6	Leakage Weir	II	R	Not noticed	Yes	
	French Meadows Dam Generator Building	Ancillary Facility	IV	R	Seen	No	Seen in immediate foreground, foreground and middleground from FR 96. Industrial appearance of structure in combination with spillway facilities and chain link fencing dominate view when seen in immediate foreground. Small scale and light color of building result in facilities being not readily noticed when seen in the middleground distance zone.
	French Meadows Dam Staging Area	Ancillary Facility	III-IV	R	Seen	No	Seen in immediate foreground and middleground from FR 96. The moderate scale, and spoil-pile-character of staging area is seen in the immediate foreground when entering the reservoir viewshed. The staging area contrasts in form and texture with the surrounding characteristic landscape.
	French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline	Powerline	III	R	Seen	No	Poles seen in immediate foreground from segment of FR 96 near spillway area. Small scale features add incrementally to industrial character of area.
	French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline	Powerline	III	R	Seen	No	Poles seen in immediate foreground from segment of FR 96 near spillway area. Small scale features add incrementally to industrial character of area.
	Duncan Creek – Middle Fork Tunnel Portal Road	Project Road	II-III	R	Seen	No	Horizontal line created by road alignment is visible from Westbound FR 96 when crossing dam. Bed of road not seen. Note that this road was improved in 2010 in association with the French Meadows Dam Spillway widening project.
	French Meadows – Hell Hole Tunnel Gatehouse Road	Project Road	II-III	R	Not noticed	Yes	Brief view of entrance while traveling FR 96 eastbound.
	French Meadows Dam Outlet Works and South Leakage Weir Road	Project Road	II-III	R	Not noticed	Yes	Road is not readily noticeable due to low color contrasts and partial screening from vegetation.
	French Meadows Dam Staging Area and Spillway West Access Road	Project Road	II	R	Not noticed	Yes	Entrance seen from road. Not readily noticed.
	French Meadows Spillway East Access Road	Project Road	II	R	Not noticed	Yes	Area is disturbed and road is not readily noticeable.
	French Meadows Dam North Leakage Weir Road	Project Road	II	R	Not noticed	Yes	Area is disturbed and road is not readily noticeable.
Middle Fork Interbay Area	Middle Fork Powerhouse Penstock and Butterfly Valve House Road	Project Road	II	R	Not noticed	Yes	
	Middle Fork Powerhouse Penstock and Butterfly Valve House	Water Conveyance	IV	PR	Seen	No/Yes	Exposed soil associated with penstock is noticeable in background from FR 96. Butterfly valve house not seen.
	Middle Fork Powerhouse Butterfly Valve House Road	Project Road	IV	PR	Seen	Yes	Road alignment not readily seen due to vegetative screening. However exposed soils associated with road cut can be seen from FR 96 (in background distance zone of road).
	Middle Fork Powerhouse to Middle Fork Powerhouse Butterfly Valve House Communication Line/Powerline	Communication and Powerline	II-III	PR/M	Seen/Not noticed	Yes	Exposed soil associated with ROW creates contrasts in color with surrounding landscape. Exposed soil seen from Mosquito Ridge Road near Dutch Flat. Visibility of actual powerline from FR 96 is not readily noticed.
Ralston Afterbay Area	Ralston Afterbay Dam and Outlet Works	Medium Dam	III	R/PR	Seen	No/Yes	Views of the dam are limited from the road due to rugged terrain and vegetative screening. Angular form and light color of dam contrasts with surrounding vegetation and water.
	Ralston Afterbay	Medium Reservoir	II-III	R/PR	Seen	Yes	Views of the reservoir are limited due to rugged terrain and vegetative screening. Reservoir is moderate in scale and blends with the surrounding characteristic landscape and therefore meets the Retention VQO.
	Middle Fork – Ralston Tunnel Surge Shaft and Tank	Water Conveyance	II	R	Not noticed	Yes	Middleground views from above Ralston Afterbay and near intersection with 14N25. Tank is not noticeable due earth color, nearby vegetation, and viewing distance from road (in background distance zone of road).
	Ralston Afterbay Dam Generator Building	Ancillary Facility	III	PR	Seen	Yes	Limited views of area from road due to terrain and vegetative screening. Small scale of building minimizes visual effects. Light color of building blends with exposed soil of roads and dam. Angular form of building blends with form of dam.
	Storage Building at Middle Fork – Ralston Tunnel Surge Shaft and Tank	Ancillary Facility	II	R	Not noticed	Yes	Middleground views from above Ralston Afterbay and near intersection with 14N25. Due to small scale of building and distance it is not readily noticeable. Light white color of building does increase visibility since it contrasts with surrounding vegetation.
	Oxbow Powerhouse and Switchyard	Powerhouse/ Switchyard	III	PR	Seen	Yes	Opening in vegetation above powerhouse and dam area provides a near view of Ralston Afterbay Area. Exposed soil areas associated with roads is and the dam dominate the view. The powerhouse and switchyard are tucked into the hillside and partially screened by vegetation. The small scale of the powerhouse and neutral to dark colors reduce the contrasts of the building with the surrounding landscape.
	Ralston Powerhouse and Switchyard	Powerhouse/ Switchyard	II-III	R	Seen	No	Brief view rounding bend at junction with Blacksmith Flat Road (14N25). Facilities not readily noticed due to distance (0.5.mi) and relatively small scale of facilities as seen in context of Rubicon River corridor.

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
TNF Managed Viewsheds (continued)							
Mosquito Ridge Road Viewshed (FR 96) (continued)							
Ralston Afterbay Area (continued)	Passive Microwave Reflector Station above Ralston Afterbay	Microwave Reflector	II	R	Not noticed	Yes	Brief view up Rubicon canyon near intersection with 14N25. Due to distance and small scale of facility relative to view of canyon, the reflector would not be noticed to most travelers on FR 96. May be more noticeable at certain times of day due to reflection. Contrast in color with surrounding vegetation enhances visibility.
	Photovoltaic Pole and Powerline at Rubicon River Gage above Ralston Powerhouse	Photovoltaic Pole and Powerline	II	R	Not noticed	Yes	Not visually evident.
	Rubicon River above Ralston Powerhouse (RRRP)	Stream Gage	II	R	Not noticed	Yes	Not visually evident.
	Rubicon River Gage above Ralston Powerhouse Trail	Project Trail	II	R	Not noticed	Yes	Narrow, unimproved access trail blends with surrounding environment. Not visually evident.
	Ralston Ridge Sediment Disposal Area	Disposal Area	IV	R	Seen	No	Limited middleground views across river canyons to Ralston Ridge. Exposed soils and moderately large spoil area combine with exposed soil from roads and cleared transmission line corridor to create a disturbed appearance not characteristic to the surrounding landscape. Spoil pile creates contrasts primarily in color with surrounding landscape.
	Ralston Afterbay Dam Access Road	Project Road	II-III	PR	Seen	Yes	
	Ralston Powerhouse Butterfly Valve House Road	Project Road	IV	R	Seen	No	Brief view of exposed soil associated with road alignment when rounding bend near road intersection with 14N25. Exposed light soil contrasts with surrounding dark green vegetation.
	Oxbow Powerhouse Road	Project Road	II-III	PR	Seen	Yes	Exposed soil associated with road surface and nearby features (parking areas) attracts attention and is in contrast to the dark color of the surrounding vegetation.
	Indian Bar Access Road	Project Road	II-III	PR	Seen	Yes	
	Indian Bar Augmentation Area	Augmentation Area	II	PR	Not noticed	Yes	Existing gravel bar with intermittent vegetation. Blends with surrounding environment and is therefore seen but not noticeable.
	Ralston Afterbay Dam and Access Point Road	Project Road	II-III	R	Not noticed	Yes	Brief, near view of Ralston Area from above. Road is not readily noticed since it is well integrated into the dam structure, and there are no expansive areas of exposed soil associated with it.
Soda Springs-Riverton Road Viewshed (FR 22)							
French Meadows Reservoir Area	French Meadows Dam and Outlet Works	Large Dam	IV	R	Seen	No	FR 22 intersects with FR 96 on south side of dam. Travelers experience immediate foreground views of dam near intersection with FR 96. Outlet works are not seen from FR 22.
	French Meadows Reservoir & Shoreline	Large Reservoir	II-IV	R	Seen	Dependent on water surface elevation	Reservoir and shoreline are not seen until near the intersection of FR 22 with FR 96. Immediate foreground views are of the access road to the dam base, downstream dam face, FR 96 road across dam and reservoir and shoreline. More distant foreground views (about 1 mile) are of the spillway, staging area and gatehouse structures which are not readily noticed due to the moderate scale of the features, similar colors to the surrounding characteristic landscape, and the partial screening provided by trees. Reservoir appears near-natural at full pool, and visual quality declines with reservoir surface elevation and increased exposure of shoreline. Very low pool elevations dominate visual experience.
	French Meadows Dam Leakage Weirs Nos. 1-6	Leakage Weir	II	R	Not noticed	Yes	
	French Meadows Dam Generator Building	Ancillary Facility	II	R	Not noticed	Yes	Building is generally not noticeable due to small scale and low height of building, and because light color of building is similar to surrounding exposed rock.
	French Meadows Dam Staging Area	Ancillary Facility	II	R	Not noticed	Yes	Seen in middleground from FR 22 at the intersection with FR 96. Due to viewing distance and relatively small size of staging area, it appears integrated into the characteristic landscape due to the similar colors as the surrounding granite rock.
	Duncan Creek – Middle Fork Tunnel Portal Road	Project Road	II-III	R	Not noticed	Yes	Horizontal line created by road alignment not readily noticed due to middleground viewing distance and trees near rock outcropping breaking up horizontal line.
	French Meadows Dam Outlet Works and South Leakage Weir Road	Project Road	III	R	Seen	No	Road is seen in vicinity of intersection with FR 96. Road is not readily noticed due to low contrasts in color and partial screening from vegetation.
Western States Trail Viewshed							
French Meadows Reservoir Area	French Meadows Dam and Outlet Works	Large Dam	IV	R	Seen	No	Most likely filtered views periodically. Dam ranges from immediate foreground to foreground.
	French Meadows Reservoir & Shoreline	Large Reservoir	II - IV	R	Seen	Dependent on water surface elevation	Reservoir appears near-natural at full pool and visual quality declines with reservoir surface elevation and increased exposure of shoreline. Very low pool elevations dominate visual experience.
	French Meadows-Hell Hole Tunnel Gatehouse	Water Conveyance	III	R	Seen	No	Gatehouse may be seen in middleground, across reservoir depending on screening from vegetation between trail and reservoir and screening from trees at gatehouse area.
	Middle Fork American River at French Meadows (USGS Gage No. 11427500)	Stream Gage and Weir	II	R	Not noticed	Yes	
	French Meadows Reservoir Staff Gage	Reservoir Gage	II	R	Not noticed	Yes	
	French Meadows Reservoir (USGS Gage No. 11427400)	Reservoir Gage	II	R	Not noticed	Yes	
	French Meadows Dam Generator Building	Ancillary Facility	III	R	Seen	No	May be seen in immediate foreground of trail, although most views from trail appear partially screened by vegetation.
	French Meadows Dam Staging Area	Ancillary Facility	II-III	R	Seen	No	May be seen in immediate foreground of trail, although most views from trail appear to be partially screened by vegetation.
	French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline	Powerline	III	R	Seen	No	May be seen in immediate foreground of trail, although most views from trail appear to be partially screened by vegetation.
	French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline	Powerline	III	R	Seen	No	May be seen in foreground of trail, although most views from trail appear to be partially screened by vegetation.

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
TNF Managed Viewsheds (continued)							
Western States Trail Viewshed (continued)							
French Meadows Reservoir Area (continued)	Radio Communications Tower near French Meadows – Hell Hole Tunnel Gatehouse	Radio Tower	II	R	Not noticed	Yes	Seen in middleground, across reservoir. Screening between trail and shoreline and near radio tower may result in tower being not noticed.
	Duncan Creek – Middle Fork Tunnel Portal Road	Project Road	III	R	Seen	No	May be seen in immediate foreground of trail due to close proximity of road to trail.
	French Meadows Dam Outlet Works and South Leakage Weir Road	Project Road	III	R	Seen	No	May be seen in foreground of trail, although most views from trail appear to be partially screened by vegetation.
	French Meadows Dam Staging Area and Spillway West Access Road	Project Road	III	R	Seen	No	May be seen in immediate foreground of trail, although most views from trail appear to be partially screened by vegetation.
	French Meadows Spillway East Access Road	Project Road	II	R	Not noticed	Yes	Road is not visually evident relative to the surrounding features.
	French Meadows Dam North Leakage Weir Road	Project Road	II	R	Not noticed	Yes	Road is not visually evident relative to the surrounding features.
Tevis Cup Trail Viewshed							
French Meadows Reservoir Area	French Meadows Dam and Outlet Works	Large Dam	IV	R	Seen	No	Assume dam is seen in middleground from Red Star Ridge above north side of reservoir. From middleground dam is visually evident, but does not dominate due to similarity to exposed shoreline.
	French Meadows Reservoir & Shoreline	Large Reservoir	II-III	R	Seen	Dependent on water surface elevation	Assume reservoir appears near-natural from middleground views of trail. Reservoir would appear near-natural at full pool. Visual quality would decline with reservoir surface elevation and increased exposure of shoreline. Very low pool elevations would be visually evident but not dominate the visual experience from the middleground distance zone.
	French Meadows-Hell Hole Tunnel Gatehouse	Water Conveyance	III	R	Seen	No	Assume gatehouse can be seen in middleground. Due to small scale of feature, assume area appears as a minor disturbance.
	French Meadows Dam Staging Area	Ancillary Facility	II	R	Not noticed	Yes	Assume feature blends in with characteristic landscape as seen from middleground.
	French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline	Powerline	II	R	Not noticed	Yes	
	French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline	Powerline	II	R	Not noticed	Yes	
	Photovoltaic Pole and Powerline at Middle Fork American River Gage at French Meadows	Photovoltaic Pole and Powerline	II	R	Not noticed	Yes	
	Radio Communications Tower near French Meadows – Hell Hole Tunnel Gatehouse	Radio Tower	II	R	Not noticed	Yes	
	French Meadows Dam Outlet Works and South Leakage Weir Road	Project Road	II-III	R	Not noticed	Yes	Road segment near FR 22 is screened from view by vegetation. The remainder of the road is at the base of FM dam and would not visible from the Tevis trail due to the distance between the trail and the road and viewing angle.
French Meadows Reservoir Viewshed							
French Meadows Reservoir Area	French Meadows Dam and Outlet Works	Large Dam	III-IV	R	Seen	No	Long duration views of dam due to recreational activities. Views range from immediate foreground to middleground views for water-based recreation and middleground views for land-based recreation. The dam creates contrasts in form, line and texture that vary in strength depending on water surface elevation and the degree of exposure of the dam. Outlet works are not seen.
	French Meadows Reservoir & Shoreline	Large Reservoir	II - IV	R	Seen	Dependent on water surface elevation	
	French Meadows-Hell Hole Tunnel Gatehouse	Water Conveyance	III-IV	R	Seen	No	Area is set back from reservoir shoreline. Area seen primarily from nearby reservoir. Views include abandoned rusting equipment and other project related materials scattered about site.
	Duncan Creek – Middle Fork Tunnel Portal	Water Conveyance	II	R	Not noticed	Yes	
	French Meadows Dam Generator Building	Ancillary Facility	III	R	Seen	No	Seen in foreground and middleground from reservoir. Small scale and light color of building and fencing result in facilities not dominating the view especially when seen in context with the dam face.
	French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline	Powerline	II	R	Not noticed	Yes	Not noticed or seen from most of the reservoir, except immediate foreground views.
	Radio Communications Tower near French Meadows – Hell Hole Tunnel Gatehouse	Radio Tower	III	R	Seen	No	Small scale feature seen from reservoir area near gate house area.
	French Meadows – Hell Hole Tunnel Gatehouse Road	Project Road	II	R	Not noticed	Yes	Views of road obscured by vegetation
	Duncan Creek – Middle Fork Tunnel Portal Road	Project Road	II-III	R	Seen	No	Horizontal line created by road alignment is visible from reservoir locations within the immediate foreground of the dam, but is not readily noticeable from more distant locations.

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
TNF Managed Viewsheds (continued)							
Middle Fork American River Viewsheds							
French Meadows Reservoir Area	French Meadows Dam and Outlet Works	Large Dam	IV	R	Seen	No	Immediate foreground views of dam and outlet works due to location next to river. Dam dominates view due to large scale and engineered form.
	Middle Fork American River at French Meadows (USGS Gage No. 11427500)	Stream Gage and Weir	II-III	R	Seen	No	Immediate foreground view from the river. Small scale feature would not readily detract from the surrounding landscape character.
	French Meadows Dam Leakage Weirs Nos. 1-6	Leakage Weir	II-III	R	Not noticed	Yes	Small features that are located in the immediate vicinity of the dam and outlet works.
	French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline	Powerline	III	R	Seen	No	Seen in immediate foreground. Multicolor line enhances visibility. Small scale feature seen against backdrop of dam adds visual clutter to area.
	Photovoltaic Pole and Powerline at Middle Fork American River Gage at French Meadows Dam	Photovoltaic Pole and Powerline	III	R	Seen	No	Small scale feature seen in immediate foreground of river.
	French Meadows Dam Outlet Works and South Leakage Weir Road	Project Road	III	R	Seen	No	Road seen in immediate vicinity of dam. Road is not readily noticed due to low contrasts in color and partial screening from vegetation.
French Meadows Reservoir Developed Recreation Sites Viewsheds (Ahart, French Meadows, Lewis, and Poppy CGs, Gates and Coyote Group CGs, French Meadows RV Dump Station, Poppy Trail, French Meadows Picnic Area and Boat							
French Meadows Reservoir Area	French Meadows Dam and Outlet Works	Large Dam	III-IV	R	Seen	No	Long duration, middleground views of the dam face are experienced by visitors to French Meadows Picnic Area, French Meadows Boat Ramp and French Meadows Campground. Outlet works are not seen. Dam blends well in color and texture with surrounding exposed shoreline and is not readily distinguishable from the shoreline as seen in middleground.
	French Meadows Reservoir & Shoreline	Large Reservoir	II-III	R	Seen	Dependent on water surface elevation	Reservoir and shoreline seen from French Meadows Picnic Area, Boat Ramp and Campground, McGuire Boat Ramp, Poppy Campground and Poppy Trail. Views from boat ramps are open and expansive. Views from campgrounds and picnic areas are partially to completely screened depending on the camp or picnic site.
	French Meadows-Hell Hole Tunnel Gatehouse	Water Conveyance	III	R	Seen	No	Not seen from developed recreation sites except Poppy Campground and from Poppy Trail. Views from Poppy Campground are middleground and partially screened by vegetation. Area is not readily noticed from campground or trail.
Ralston Afterbay Developed Recreation Sites Viewsheds (Ralston Picnic Area, Middle Fork American River above Ralston Afterbay Access Trail, and Indian Bar Rafting Access)							
Ralston Afterbay Area	Oxbow Powerhouse and Switchyard	Powerhouse/ Switchyard	IV	PR	Seen	No	Indian Bar Rafting Access and General Parking Recreation Site - near views of moderate duration during raft staging & loading activities. Powerhouse is of moderate scale and nestled into canyon wall. Switchyard, powerhouse and associated landform alterations introduce angular forms and textures in contrast to the characteristic landscape. Powerhouse colors are somewhat similar to surrounding landscape.
	Oxbow Powerhouse (USGS Gage No. 11433212)	Powerhouse Gage	II-III	PR	Seen	Yes	Indian Bar Rafting Access and General Parking Recreation Site - minor structure not readily noticed compared to powerhouse and switchyard, but contributes to visual contrasts associated with the powerhouse.
	Oxbow Powerhouse Slope Fence	Fence	II-III	PR	Seen	Yes	Indian Bar Rafting Access and General Parking Recreation Site. Fencing is discernable on hillsides under some lighting conditions. Metallic color contrasts with native rock enhancing visibility of the fencing.
	Indian Bar Augmentation Area	Augmentation Area	II	PR	Not noticed	Yes	Not visible from picnic area or trail. Indian Bar Rafter Access is located on a portion of the augmentation area. Augmentation area is an existing gravel bar with intermittent vegetation. Blends with surrounding environment and is therefore seen but not noticeable.
	Oxbow Powerhouse Road	Project Road	III	PR	Seen	No	Indian Bar Rafting Access and General Parking Recreation Site – immediate foreground views of road experienced by rafters to access the rafting access site.
	Indian Bar Access Road	Project Road	II-III	PR	Seen	Yes	Road provides access to recreation facility.
	Oxbow Powerhouse to Ralston Afterbay Dam Generator Building Communication Line/Powerline	Project Communication Line	II-III	PR	Not noticed	Yes	Indian Bar Rafting Access and General Parking Recreation Site. Line is discernable in hillsides. Metallic color contrasts with native rock enhancing visibility of the line.
	Ralston Afterbay	Medium Reservoir	II	PR/R	Seen	Yes	Middle Fork American River arm of reservoir is visible from picnic area, but not from trail or Indian Bar rafting access. Views of afterbay from picnic area vary depending upon water level. View of afterbay from picnic area is consistent with characteristic landscape and therefore meets VQO of retention.
ENF Managed Viewsheds							
Eleven Pines Road Viewshed (Forest Road 14N08)							
No Project facilities or features are visible from this viewshed.							
Old Icehouse Road Viewshed (Forest Road 17N02) - Extends from Eleven Pines Road (14N08) Northwest to ENF/TNF Boundary							
No Project facilities or features are visible from this viewshed.							
Old Icehouse Road Viewshed (Forest Road 17N02) - Extends from Eleven Pines Road (14N08) East to Hell Hole Dam							
North Fork Long Canyon	North Fork Long Canyon Diversion Drop Inlet Road	Project Road	II	PR	Not noticed	Yes	Road crosses FR 2 nearly perpendicular to it. Not readily noticed due to road alignment and forested setting.
	North Fork Long Canyon Diversion Drop Inlet Road	Project Road	II	PR	Not noticed	Yes	Road crosses FR 2 nearly perpendicular to it. Not readily noticed due to road alignment and forested setting.
South Fork Long Canyon Diversion Area	South Fork Long Canyon Diversion Dam and Pool	Small Diversion Dam and Pool	III	PR	Seen	Yes	Brief views of yellow railings when traveling on FR 2.
	South Fork Long Canyon Diversion and Drop Inlet Road	Project Road	III	PR	Seen	Yes	Brief view of road, entrance sign and cleared area. Road segment down to drop inlet not seen.
	South Fork Long Canyon Diversion and Drop Inlet Cutoff Road	Project Road	II	PR	Not noticed	Yes	

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
ENF Managed Viewsheds (continued)							
Old Icehouse Road Viewshed (Forest Road 17N02) - Extends from Eleven Pines Road (14N08) East to Hell Hole Dam (continued)							
Hell Hole Reservoir Area	Hell Hole Dam and Outlet Works	Large Dam	IV	R	Seen	No	Foreground views of upstream end of dam seen from southern terminus of road. Large scale feature dominates the view and contrasts in form and texture with the surrounding landscape.
	Hell Hole Reservoir & Shoreline	Large Reservoir	II-III	R	Seen	Dependent on water surface elevation	Short term expansive views from above Hell Hole Boat Ramp, and brief view from along ¼ mile section of road that is north of the Dormitory and Cottage Water Supply Tank. EVC rating moves from II to III as water surface elevation lowers and more shoreline
	Hell Hole – Middle Fork Tunnel Gatehouse	Water Conveyance	III-IV	R	Seen	No	Foreground views of gatehouse f. Moderately small, light colored structure is highly noticed due to color contrasts with surrounding cut slopes that are moderately dark in color.
	French Meadows Powerhouse Penstock and Butterfly Valve House	Water Conveyance	II	R	Not noticed	Yes	Penstock not noticed from road due to dark color that blends with surrounding landscape. Butterfly Valve House is not noticed due to the small scale and light color that blends in with the surrounding landscape.
	French Meadows Powerhouse and Switchyard	Powerhouse/ Switchyard	III-IV	R	Seen	No	Powerhouse seen from road segment above boat ramp. Not seen from other road locations. Powerhouse is in middle-ground distance zone from road. Exposed soil adjacent to the powerhouse and switchyard attracts attention to the powerhouse.
	Dormitory and Cottages Water Supply Tank	Ancillary Facility	II-III	R	Seen	No	Minor facilities located adjacent to road. Seen in immediate foreground for a brief duration. Dark siding on tank blends well with surrounding landscape. Roof of structure contrasts due to light reflective color/material.
	French Meadows Powerhouse and Switchyard to Hell Hole — Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator's Cottages, and Hell Hole Powerhouse Communication Line/Powerline	Communication and Powerline	II-III	R	Seen	No	Power lines and poles are in the immediate foreground of the road near the cottage and dormitory. In combination with the roads and other features they are somewhat noticed. The powerline is not seen from other road locations.
	Operator Cottages and Shop	Ancillary Facility	II-III	R	Not noticed	Yes	Brief foreground views of cottage and workshop from road above boat ramp. Light tan color of buildings contrasts with surrounding forested landscape. Road entrance and gate are more noticeable than structures.
	French Meadows-Hell Hole Tunnel Portal Road	Project Road	II	R	Not noticed	Yes	Seen in middle-ground. Blends well with surrounding landscape.
	French Meadows Powerhouse Road	Project Road	II-III	R	Not noticed	Yes	Road blends well with surrounding landscape due to narrow road width, minor road cuts, and highly textured landscape surrounding the road.
	Hell Hole-Middle Fork Tunnel Gatehouse Road	Project Road	II	R	Not noticed	Yes	Road blends well with surrounding landscape due to narrow road width, minor road cuts, and highly textured landscape surrounding the road.
	Dormitory Facility Road	Project Road	II-III	R	Seen	No	Road entrance seen. Narrow road bed with vegetation close to road bed reduces visual effect of road.
	Operator Cottages and Shop Road	Project Road	II	R	Not noticed	Yes	Brief view of road when in the immediate vicinity of road.
	Spur on North Side of Operator Cottage	Project Road	II	R	Not noticed	Yes	Brief view of road when in the immediate vicinity of road.
	Spur on South Side of Operator Cottage	Project Road	II	R	Not noticed	Yes	Brief view of road when in the immediate vicinity of road.
	Hell Hole Dam Spillway Northern Access Point Road	Project Road	II	R	Not noticed	Yes	Blends in well with surrounding landscape.
Blacksmith Flat Road Viewshed (14N25, also referred to as FR 23)							
Ralston Afterbay Area	Ralston Afterbay and Shoreline	Medium Reservoir	III	R/PR	Seen	Yes	Open, near views Ralston Afterbay upper reaches on Middle Fork and Rubicon rivers. Afterbay blend with natural environment and therefore meets Retention VQO.
	Ralston Afterbay Dam Access Road	Project Road	III	PR	Seen	Yes	
	Ralston Afterbay Sediment Removal Access Point	Ancillary Facility	II	R	Not noticed	Yes	Small feature, not readily noticeable.
	Ralston-Oxbow Tunnel Intake to Ralston Powerhouse Communication Line	Project Communication Line	III	R/PR	Seen	No	Seen in immediate foreground of road for a moderate duration of time. Seen from Middle Fork American River to Ralston Powerhouse. Cleared area of ROW increases visual contrasts associated with the power line.
	Ralston Powerhouse and Switchyard	Powerhouse and Switchyard	IV	R	Seen	No	Facilities seen in foreground and immediate foreground where road parallels Rubicon River. Views are short to moderate in duration. Exposed views, no screening. Facilities dominate and contrast strongly with surrounding landscape due to large scale.
	Photovoltaic Pole and Powerline at Rubicon River Gage above Ralston Powerhouse	Photovoltaic Pole and Powerline	II	R	Not noticed	Yes	Not visually evident from road.
	Rubicon River above Ralston Powerhouse (RRRP)	Stream Gage	II	R	Not noticed	Yes	Not visually evident from road.
	Rubicon River Gage above Ralston Powerhouse Trail	Project Trail	II	R	Not noticed	Yes	Narrow, unimproved access trail blends with surrounding environment. Not visually evident from road.
	Passive Microwave Reflector Station above Ralston Afterbay	Microwave Reflector	III	R	Seen	No	Station is visible from the road under certain lighting conditions. Trail not noticeable from the road.
	Ralston Powerhouse Butterfly Valve House Road	Project Road	II	R	Not noticed	Yes	Road appears as part of Ralston Afterbay Ridge Sediment Disposal Area and is not readily noticeable from 14N25.
	Ralston Powerhouse to Ralston Powerhouse Butterfly Valve House Communication Line/Powerline	Project Communication Line	III	R	Seen	No	Seen for a short duration from road along Rubicon River. Highly textured hillside reduces visual contrast of power line. Exposed soil of ROW increases visual contrasts associated with the power line.
	Ralston Powerhouse Slope Fence	Project Fence	II	R	Not noticed	Yes	Not noticeable from road.
	Ralston Powerhouse Penstock and Butterfly Valve House Slope Fences	Project Fence	II-III	R	Seen	No	Moderate scale feature noticeable due to immediate foreground views from the road and visual contrasts in color and texture.
	Ralston Powerhouse Penstock and Butterfly Valve House	Water Conveyance	III	R	Seen	No	Open view of lower portion of penstock seen in immediate foreground of road along river near Ralston Powerhouse. Dark color of penstock reduces contrasts with surrounding landscape.
	Storage Building at Middle Fork - Ralston Tunnel Surge Shaft and Tank	Ancillary Facility	III	R	Seen	No	Small feature seen as part of Surge Shaft and Tank. Immediate foreground views of storage facility from road for a short duration of time.
	Middle Fork - Ralston Tunnel Surge Shaft and Tank	Water Conveyance	IV	R	Seen	No	Immediate foreground view for short duration of large scale feature.
	Ralston Ridge Sediment Disposal Area	Disposal Area	IV	R	Seen	No	Large scale feature dominates view from the road for a short duration. Foreground views of open, exposed soil areas with engineered land contours.

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
ENF Managed Viewsheds (continued)							
Chipmunk Ridge Road Viewshed (14N09, also referred to as FR 24)							
No Project facilities or features are visible from this viewshed.							
Hunters Trail Viewshed (trail near spur trail from FR 96 visited only)							
No Project facilities or features are visible from this viewshed.							
Hell Hole Reservoir Viewshed							
Hell Hole Reservoir Area	Hell Hole Dam and Outlet Works	Large Dam	IV	R	Seen	No	Foreground and middleground views of dam from most reservoir locations, except boat ramp area and upper reservoir area. Large scale feature creates contrasts in form, line and texture depending on the extent of exposure (water surface elevation). Outlet works not seen because they are located on downstream side of dam.
	Hell Hole Reservoir & Shoreline	Large Reservoir	II-IV	R	Seen	Dependent on water surface elevation	Meets retention at full pool/ partial retention at moderate drawdown. Modification at low reservoir elevations due to dominance of exposed shoreline and color contrasts with surrounding forested landscape.
	Hell Hole – Middle Fork Tunnel Gatehouse	Water Conveyance	III-IV	R	Seen	No	Foreground and middleground views of gatehouse from most reservoir locations, except upper reservoir area. Moderately small, light colored structure is highly noticed due to color contrasts with surrounding moderately dark rock walls.
	French Meadows Powerhouse Penstock and Butterfly Valve House	Water Conveyance	III	R	Seen	No	Penstock readily noticed from foreground distance zone of reservoir, but not readily noticed from middleground viewing locations. Dark colored penstock blends well with surrounding terrain. Butterfly house may be noticed in foreground but not readily noticed from middleground due to small scale and light color of building which blends well with surrounding rock walls. Tunnel muck next to the penstock and powerhouse dominates views of the area. Area seen from foreground and middleground reservoir locations. The large area covered by the muck, and form and texture of the material create a strong contrast to the surrounding characteristic landscape.
	French Meadows Powerhouse and Switchyard	Powerhouse/ Switchyard	IV	R	Seen	No	Powerhouse and switchyard noticed in the foreground and middleground distance zones. Color of powerhouse and switchyard similar to surrounding terrain, reducing color contrasts. Moderate contrasts in form and texture. Tunnel muck next to the powerhouse dominates views of the area. Area seen from foreground and middleground reservoir locations. The large area covered by the muck, and form and texture of the material create a strong contrast to the surrounding characteristic landscape.
	French Meadows Powerhouse (USGS Gage No. 11427200)	Powerhouse Gage	II	R	Not noticed	Yes	Small scale feature not seen from the reservoir except in the immediate foreground of the gage.
	Hell Hole Reservoir Staff Gage	Reservoir Gage	II	R	Not noticed	Yes	Small scale feature not seen except in the immediate foreground of the gage.
	French Meadows Powerhouse to French Meadows Powerhouse Penstock and Butterfly Valve House Communication Line/Powerline	Communication and Powerline	II-III	R	Not noticed	Yes	Upper portion of poles and some line segments can be seen from foreground locations. However, feature is not readily noticeable from most locations due to small scale of feature and screening of the feature by topography and vegetation.
	French Meadows Powerhouse and Switchyard to Hell Hole — Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator’s Cottages, and Hell Hole Powerhouse Communication Line/Powerline	Communication and Powerline	II-III	R	Seen	No	Seen in foreground from western half of reservoir. Powerline is not readily noticeable in most locations due to vegetative screening.
	Hell Hole Substation	Substation	II-III	R	Not noticed	Yes	Substation is screened by vegetation and is not readily noticeable as seen from the south shore of the reservoir.
	Dormitory Facility	Ancillary Facility	II-III	R	Seen	No	Visible from some areas of reservoir but not readily noticeable.
	French Meadows Powerhouse Penstock Rock Fence	Fence	II	R	Not noticed	Yes	
	French Meadows Powerhouse Slope Fence	Fence	II-III	R	Not noticed	Yes	Small scale feature seen only from immediate foreground of powerhouse area. Not discernable from most other reservoir locations.
	French Meadows-Hell Hole Tunnel Portal Road	Project Road	II-III	R	Not noticed	Yes	Cut slope associated with road seen in foreground and middleground. Road cut is not visually evident because feature blends in with the surrounding rock reducing color contrasts.
	French Meadows Powerhouse Road	Project Road	II-III	R	Not noticed	Yes	Road seen in foreground, creates a line on hillside. However, it is not visually evident due to a lack of road cuts, good vegetative screening and the highly textured character of the surrounding landscape.
	Hell Hole-Middle Fork Tunnel Gatehouse Road	Project Road	II-III	R	Not noticed	Yes	Road can be seen in foreground from the west end of the reservoir. However, minimal road cuts and partial vegetative screening results in road being not readily noticeable.
	Hell Hole Dam and Powerhouse Road	Project Road	IV	R	Seen	No	Upper portion road can be seen from most reservoir locations. Road is integrated part of dam and spillway.
	Hell Hole Dam Spillway Northern Access Point Road	Project Road	II-III	R	Not noticed	Yes	Upper portion road can be seen from most reservoir locations. However, road is integrated part of dam and spillway so it is not noticeable.

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
ENF Managed Viewsheds (continued)							
Middle Fork American River Viewshed							
Ralston Afterbay Area	Ralston Afterbay Dam and Outlet Works	Medium Dam	IV	R/PR	Seen	No	Due to immediate foreground views from river, dam would dominate the characteristic landscape due to contrasts in form, and color.
	Oxbow Powerhouse and Switchyard	Powerhouse/ Switchyard	IV	PR	Seen	No	Short term viewing by whitewater boaters putting in at Indian Bar Rafting Access, and by other visitors using this access point.
	Middle Fork American River near Foresthill (USGS Gage No. 11433300)	Stream Gage	III	PR	Seen	Yes	Short term viewing by rafters or anglers. Staff plate and pipe is adjacent to river and visible from river. Metal stairs are mounted on bedrock above the river. Small scale object, visually unobtrusive.
	Oxbow Powerhouse (USGS Gage No. 11433212)	Powerhouse Gage	II	PR	Not noticed	Yes	
	Photovoltaic Pole and Powerline at Middle Fork American River Gage near Foresthill	Photovoltaic Pole and Powerline	II	PR	Not noticed	Yes	Short term viewing of isolated gage in river by rafters. Due to the small scale of the object, it is visually unobtrusive.
	Oxbow Powerhouse Slope Fence	Fence	II	PR	Not noticed	Yes	Slope fence is visible in certain lighting conditions but otherwise not noticeable due to color and texture of adjacent bedrock.
	Indian Bar Augmentation Area	Augmentation Area	II	PR	Not noticed	Yes	Augmentation area is an existing gravel bar with intermittent vegetation. Blends with surrounding environment and is therefore seen but not noticeable.
Rubicon River Wild and Scenic River Viewshed							
Hell Hole Reservoir Area	Hell Hole Dam and Outlet Works	Large Dam	IV	R	Seen	No	Foreground views of dam from river downstream of dam. Views of the dam dominate. Dam contrasts in scale, form, and texture with the characteristic landscape.
	Hell Hole Powerhouse	Powerhouse	III	R	Seen	No	Seen in immediate foreground at base of dam. Small scale structure blends in color with surrounding characteristic landscape, low contrasts in form, line and texture.
	Rubicon River below Hell Hole Dam (USGS Gage No. 11428800)	Stream Gage and Weir	II-III	R	Seen	No	
	Hell Hole Dam Leakage Weir	Leakage Weir	II-III	R	Not noticed	Yes	Not distinguishable from dam.
	French Meadows Powerhouse and Switchyard to Hell Hole — Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator's Cottages, and Hell Hole Powerhouse Communication Line/Powerline	Communication and Powerline	III	R	Seen	No	Poles and lines seen in immediate foreground of the river, and ascending the north slope of the canyon. Features contribute to existing visual disturbance.
	Hell Hole Powerhouse to Rubicon River Gage below Hell Hole Dam Communication Line/Powerline	Communication and Powerline	III	R	Seen	No	Foreground views of line and poles at river and ascending open rock slope. Poles and line are visually evident due to no vegetative screening and contribute to visually cluttered appearance of area below dam.
	Hell Hole Dam Leakage Weir Road	Project Road	III	R	Seen	No	In foreground of river, in immediate vicinity of dam.
	Hell Hole Dam and Powerhouse Road	Project Road	IV	R	Seen	No	Road seen in immediate foreground from river below dam. Road contributes to the disturbed character of the area.
	Rubicon River Gage below Hell Hole Dam Road	Project Road	III	R	Seen	No	Road seen in immediate foreground from river below dam. Lack of road cuts minimizes visual effects but contributes to disturbed character of the area.
	Hell Hole Dam Spillway Discharge Channel Road	Project Road	IV	R	Seen	No	Road seen in immediate foreground from river below dam. Road contributes to the disturbed character of the area.
Ralston Afterbay Area	Ralston Afterbay	Medium Reservoir	II-III	R/PR	Seen	Yes	Upper end of reservoir is visible from Rubicon River but meets Retention VQO.
	Ralston Powerhouse Penstock and Butterfly Valve House	Water Conveyance	IV	R	Seen	No	Penstock creates solid line on hillside in contrast to highly textured hillside. Appurtenant facilities at base add visual clutter. Penstock color blends well with surrounding characteristic landscape.
	Ralston Powerhouse and Switchyard	Powerhouse/ Switchyard	IV	R	Seen	No	Near views of moderate duration while traveling along Rubicon river. Facilities dominate and contrast strongly with surrounding landscape character due to large scale, angular forms and smooth man-made textures created by building and switchyard facilities.
	Ralston Powerhouse (USGS Gage No. 11427765)	Powerhouse Gage	III	R	Seen	No	Minor structure not readily noticed compared to powerhouse and switchyard, but contributing to visual contrasts associated with the powerhouse.
	Ralston Powerhouse to Ralston Powerhouse Butterfly Valve House Communication Line/Powerline	Communication and Powerline	III	R	Seen	No	Powerline is not readily discernable. Visibility of exposed soils associated with the penstock dominates.
	Ralston-Oxbow Tunnel Intake to Ralston Powerhouse Communication Line	Communication Line	III	R/PR	Seen	No/Yes	Powerline seen from Rubicon River along 14N25.
	Photovoltaic Pole and Powerline at Rubicon River Gage above Ralston Powerhouse	Photovoltaic Pole and Powerline	II/III	R	Seen	No	Visible from river.
	Rubicon River above Ralston Powerhouse (RRRP)	Stream Gage	II/III	R	Seen	No	Visible from river.
	Rubicon River Gage above Ralston Powerhouse Trail	Project Trail	II	R	Not noticed	Yes	Narrow, unimproved access trail blends with surrounding environment. Not visually evident from river.
	Passive Microwave Reflector Station above Ralston Afterbay	Microwave Reflector	II-III	R	Not noticed	Yes	This feature could be seen by river users, although it may not be readily noticeable depending upon the viewing angle and time of day.
	Ralston Powerhouse Penstock and Butterfly Valve House Slope Fences	Fence	II	R	Not noticed	Yes	
	Ralston Powerhouse Slope Fence	Fence	III	R	Seen	No	Fencing is discernable on hillsides. Metallic color contrasts with native rock enhancing visibility of the fencing.
	Ralston Afterbay Sediment Removal Access Point	Ancillary Facility	II-III	R	Seen	No	Area can be seen from the river when entering the upstream tail of Ralston Afterbay. Access point appears as a put-in or ramp area and is not visually obtrusive.
South Fork Long Canyon Creek Viewshed							
South Fork Long Canyon Diversion Area	South Fork Long Canyon Diversion Dam and Pool	Small Diversion Dam and Pool	IV	PR	Seen	No	Project features dominate Immediate foreground views from stream locations immediately upstream and downstream of the diversion. Built features contrast in form, line, colors and textures with the characteristic landscape. Due to the relatively small scale of the features they are not readily seen beyond the immediate foreground.
	South Fork Long Canyon Diversion Pipe and Drop Inlet	Water Conveyance	III	PR	Seen	Yes	Project feature seen in immediate foreground view of stream. Due to the relatively small scale of the features they are not readily seen beyond the immediate foreground.

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
ENF Managed Viewsheds (continued)							
South Fork Long Canyon Creek Viewshed (continued)							
South Fork Long Canyon Diversion Area (continued)	South Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433065)	Stream Gage/Weir	III	PR	Seen	Yes	Gage and weir seen in immediate foreground of stream below diversion.
	South Fork Long Canyon Creek Diversion Tunnel (USGS Gage No. 11433060)	Diversion Gage	III	PR	Seen	Yes	Gage seen in immediate foreground of stream upstream of the diversion.
	Photovoltaic Pole and Powerline at South Fork Long Canyon Creek Gage below Diversion Dam	Photovoltaic Pole and Powerline	III	PR	Seen	Yes	Seen from immediate foreground of stream upstream of the diversion.
	South Fork Long Canyon Diversion and Drop Inlet Road	Project Road	III	PR	Not noticed	Yes	Features seen in immediate foreground of stream downstream of the diversion only.
	South Fork Long Canyon Diversion and Drop Inlet Cutoff Road	Project Road	II	PR	Not noticed	Yes	
	South Fork Long Canyon Diversion Drop Inlet Access Road	Project Road	II	PR	Not noticed	Yes	
North Fork Long Canyon Diversion Area	North Fork Long Canyon Diversion Pipe and Drop Inlet	Water Conveyance	III	PR	Seen	Yes	Seen in immediate foreground of stream bed, otherwise not seen.
	North Fork Long Canyon Diversion Drop Inlet Road	Project Road	III	PR	Seen	Yes	May be seen, area not visited.
Hell Hole Reservoir Developed Recreation Sites Viewsheds (Big Meadows CG, Hell Hole CG, Hell Hole Boat Ramp and Parking Area, Hell Hole General Parking Area, Hell Hole Vista, Hell Hole Reservoir Trail, and Upper Hell Hole CG)							
Hell Hole Reservoir Area	Hell Hole Dam and Outlet Works	Large Dam	III-IV	R	Seen	Dependent on water surface elevation	A portion of the dam is seen in foreground from the Hell Hole General Parking area and in middleground from Hell Hole Vista and some sites from Hell Hole Campground. Foreground, middleground and background views from Hell Hole Reservoir Trail.
	Hell Hole Reservoir & Shoreline	Large Reservoir	II - III	R	Seen	Dependent on water surface elevation	Reservoir seen from Hell Hole Reservoir Trail, Hell Hole Boat Ramp, parking area, general parking area, Hell Hole Vista, and campsites nearest the reservoir at Hell Hole Campground and from Upper Hell Hole Campground.
	Hell Hole – Middle Fork Tunnel Gatehouse	Water Conveyance	III	R	Seen	No	Foreground views of gatehouse from Hell Hole Reservoir Trail, Hell Hole Boat Ramp, parking area and general parking area. Moderately small, light colored structure is highly noticed due to color contrasts with surrounding moderately dark rock walls.
	French Meadows Powerhouse Penstock and Butterfly Valve House	Water Conveyance	II - III	R	Seen	No	Seen in foreground, at an oblique angle from Hell Hole Vista. Seen in middleground from Hell Hole Boat Ramp, parking area and general parking area. Can be seen from Hell Hole Reservoir Trail, depending upon location. Penstock and butterfly valve house are not readily noticed due to visual dominance of tunnel muck from all locations.
	French Meadows Powerhouse and Switchyard	Powerhouse/ Switchyard	III	R	Seen	No	Seen in foreground, at an oblique angle from Hell Hole Vista. Seen in middleground from Hell Hole Boat Ramp, parking area and general parking area. Seen from Hell Hole Reservoir Trail, depending upon location. Powerhouse and switchyard are visually evident, but do not dominate the view as does the tunnel muck.
	French Meadows Powerhouse to French Meadows Powerhouse Penstock and Butterfly Valve House Communication Line/Powerline	Communication and Powerline	II - III	R	Seen	No	Seen in foreground from Hell Hole Vista and foreground and middleground from Hell Hole Boat Ramp area. Distant views from Hell Hole Reservoir Trail. However, poles and line are not readily noticeable.
	French Meadows Powerhouse and Switchyard to Hell Hole — Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator's Cottages, and Hell Hole Powerhouse Communication Line/Powerline	Communication and Powerline	II - III	R	Seen	No	Foreground views from above of some of the line from Hell Hole Vista. Foreground and middleground views from Hell Hole Boat Ramp, Parking Area, and General Parking Area of the powerline are not readily noticeable due to vegetative screening.
	Hell Hole Substation	Substation	II - III	R	Not noticed	Yes	
	French Meadows Powerhouse Penstock Rock Fence	Fence	II	R	Not noticed	Yes	
	French Meadows Powerhouse Slope Fence	Fence	II	R	Not noticed	Yes	
	French Meadows-Hell Hole Tunnel Portal Road	Project Road	II - III	R	Not noticed	Yes	Road cut in hillside seen, but not readily noticeable. Road blends well in color and texture with surrounding characteristic landscape. Road not noticeable from Boat Ramp, Parking, General Parking areas, and Hell Hole Reservoir Trail, and not seen from other recreation sites.
	French Meadows Powerhouse Road	Project Road	II - III	R	Not noticed	Yes	Road seen in foreground, creates a line on hillside. Otherwise, is not visually evident due to a lack of road cuts, good vegetative screening and the highly textured character of the surrounding landscape.
	Hell Hole-Middle Fork Tunnel Gatehouse Road	Project Road	II - III	R	Not noticed	Yes	Road seen in foreground from the Boat Ramp, Parking Area, and General Parking Area. Minimal road cuts and partial vegetative screening results in road being not readily noticeable.
	Hell Hole Dam and Powerhouse Road	Project Road	IV	R	Seen	No	Southern access road is visible in background from Hell Hole Vista but is not readily noticeable due to the viewing distance and due to the presence of the dam and associated structures.
	Hell Hole Dam Spillway Northern Access Point Road	Project Road	II - III	R	Not noticed	Yes	Northern access road is not noticeable from any recreation facility.
Middle Meadows Group Campground Viewshed							
No Project facilities or features are visible from this viewshed.							

Table 3.11-1. Existing Visual Condition of the Existing MFP Facilities and Consistency with USDA-FS Visual Quality Objectives (continued).

Project Area	Middle Fork Project Facilities	Project Facility Type	EVC Viewshed Rating*	Forest Plan VQOs	Visibility from Viewshed	Consistent with Forest Plan	Discussion/Explanation
ENF Managed Viewsheds (continued)							
Big Crater Special Interest Area Viewshed (area not visited, information based on consultation with USDA-FS landscape architect)							
Middle Fork Interbay Area	Passive Microwave Reflector Station above Middle Fork Interbay	Microwave Reflector	III	PR	Seen	Yes	Likely view across canyon from rim of Big Crater. Small scale object, light color contrasts with surrounding vegetation.
	Middle Fork Powerhouse Penstock and Butterfly Valve House Road	Project Road	III	PR	Seen	Yes	Possible views of exposed slopes and road bed due to viewing angle and foreground viewing distance.
	Middle Fork Powerhouse Butterfly Valve House Road	Project Road	III	PR	Seen	Yes	Possible views of exposed slopes and road bed due to viewing angle and foreground viewing distance.
	Middle Fork Interbay Dam Road	Project Road	III	R/PR/M	Seen	Yes	Most likely road is fairly well screened due to heavily vegetated slope, middleground distance, and viewing angle.
Little Crater Interest Area Viewshed (area not visited, information based on consultation with USDA-FS landscape architect)							
No Project facilities or features are visible from this viewshed.							

FIGURES

Hell Hole Dam and Spillway Area as seen from Hell Hole Vista



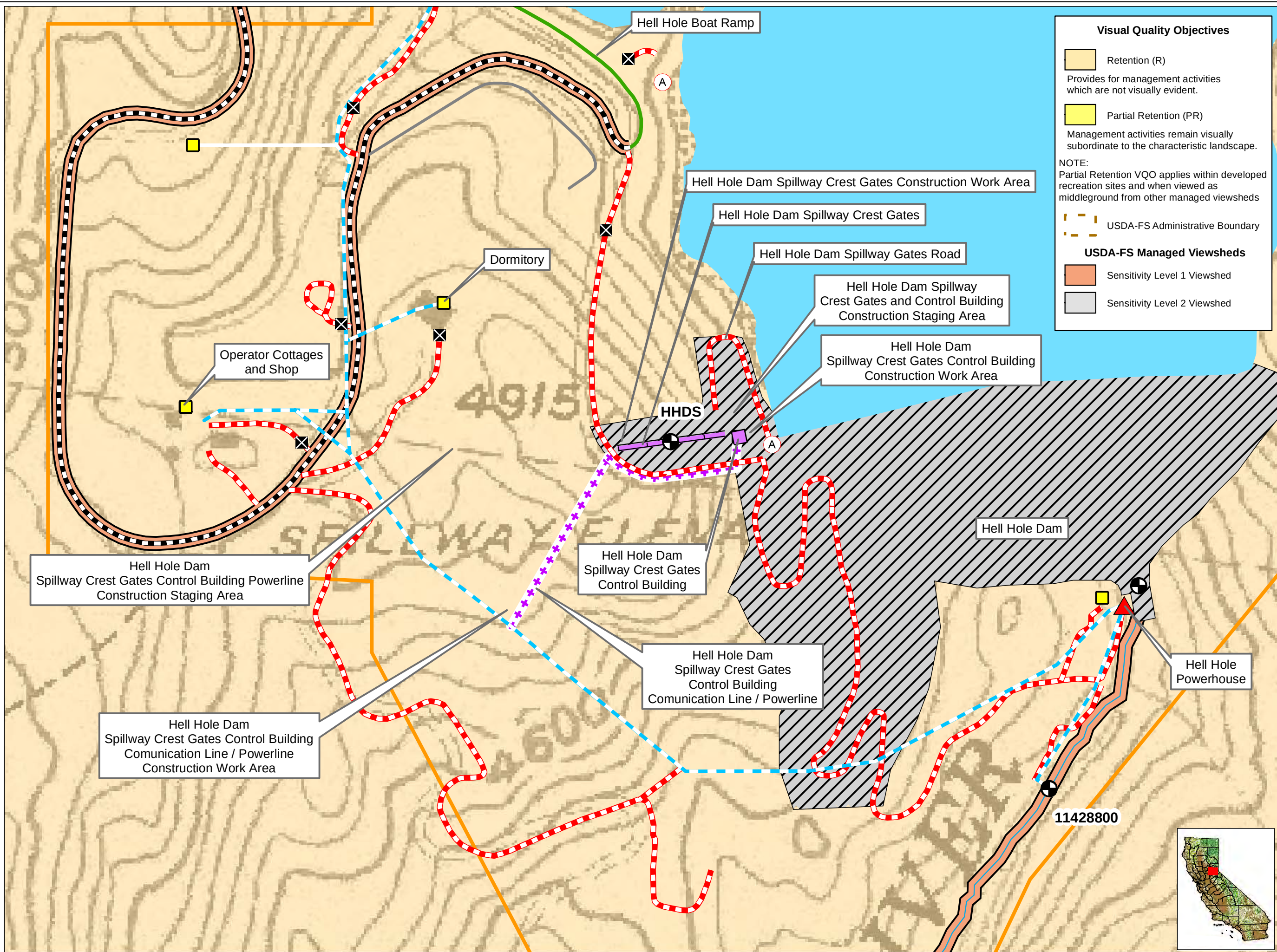
Figure 3.11-1. Existing dam and spillway with current maximum normal operating WSE (No-Action Alternative).



Figure 3.11-2. Existing dam and spillway with 6-foot raise in current maximum normal operating WSE, plus new spillway gates, gatehouse and powerlines (Alternative 1).

Note that the existing power lines are not discernable under the No-Action Alternative. Similarly, neither the existing nor the new power lines are discernable under Alternative 1.

MAPS



Visual Quality Objectives

Retention (R)
Provides for management activities which are not visually evident.

Partial Retention (PR)
Management activities remain visually subordinate to the characteristic landscape.

NOTE:
Partial Retention VQO applies within developed recreation sites and when viewed as middleground from other managed viewsheds

USDA-FS Administrative Boundary

USDA-FS Managed Viewsheds

Sensitivity Level 1 Viewshed

Sensitivity Level 2 Viewshed

PCWA Facilities and Features

Dam Footprint

Ancillary and Other Facilities

Powerhouse

Gage

Penstock

Tunnel

Gate

Access Point

Public Safety Fence

FERC Boundary

Project Power and Communication Lines:

Communication

Power

Power (underground)

Communication/Power

Communication/Power (underground)

Transportation

Project Road

Project Trail

Recreation Access Road

Other road

Project Recreation Facilities

Boat Ramp

Scenic Viewpoint

Developed Campground

Other Facilities

PG & E Transmission Lines:

230 kV

60 kV

Potential Project Betterments

Control Building

Powerline

Crest Gates

Construction Staging and/or Work Area

PCWA

Placer County Water Agency
Middle Fork American River Project

Map 3.11-1

Facilities and Features Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement

0 100 200 Feet

Projection: Ca. Stateplane, Zone 2
Datum: NAD 83

Date: 10/17/11

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3.12 CULTURAL RESOURCES ENVIRONMENTAL EFFECTS

This section describes the potential impacts to cultural resources under Alternative 1 for the Middle Fork American River Project (MFP or Project). Cultural resources include any prehistoric or historic object, site, district, structure, or building created or modified by human activity. Potential impacts to tribal resources are addressed in Section 3.13 – Tribal Resources. Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facilities Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Placer County Water Agency (PCWA) delineated the Area of Potential Effects (APE) in consultation with the resource agencies, Native American Tribes, and the State Historic Preservation Officer (SHPO). During the relicensing studies, PCWA identified four properties (sites) located within the APE that are eligible for inclusion on the National Register of Historic Places (NRHP). These four sites are located within or near Project recreation facilities. In addition, one site is also located within the inundation area of a Project reservoir. Information that identifies the specific location of these sites is considered privileged information (confidential) and, therefore, is not provided in this section. Privileged information, including site-specific descriptions and environmental measures for the cultural resources in the vicinity of the MFP can be found in PCWA's Application for New License (PCWA 2011a), and the Cultural Resources Supplemental Technical Study Report and the Draft Final Historic Properties Management Plan (HPMP) (Volume 3). These supporting documents will not be made available to the public or posted on the internet.

This section describes how the following activities could potentially affect the NRHP-eligible sites that were identified during the relicensing studies:

- Recreation use;
- Project recreation facility maintenance;
- Project operations that effect water surface elevations (WSE); and
- Modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features.

For the purposes of this discussion, effects that alter the characteristics of a site are considered to be "adverse." "Adverse Effects" as defined in 36 Code of Federal Regulation (CFR) Part 800.5 include physical destruction or damage to an historic property; change of the character of the historic property's use or its physical features; introduction of visual elements that diminish the integrity of a historic property's significant features; and/or neglect of a historic property, which causes its deterioration.

Under Alternative 1, PCWA will implement a HPMP, which provides management measures for NRHP-eligible sites within the MFP APE. The HPMP reflects PCWA's consultation with the SHPO, Native American Tribes, United States Department of Agriculture-Forest Service (USDA-FS), and other relicensing participants throughout the relicensing process regarding the identification and resolution of impacts to cultural resources for the MFP. The goal of the HPMP is to manage Project-related activities to protect NRHP-eligible resources from any effects that could alter the characteristics that make them eligible for inclusion on the NRHP. The HPMP provides specific measures that will be implemented under Alternative 1 to avoid damage or disturbance to the four NRHP-eligible sites. In addition, the HPMP includes measures to protect one site located near a Project road identified by the Colfax Todd Valley Consolidated Tribe (CTVCT). At the request of the USDA-FS, measures to manage vegetation and pest management activities in the vicinity of potential traditional cultural properties are included in the revised Vegetation and Integrated Pest Management Plan (VIPMP) (Attachment 1A).

3.12.1 Recreation Use

The four NRHP-eligible sites are located within or near Project recreation facilities. Recreation use of the Project recreation facilities is generally low (Volume 3) and is not expected to substantially change under Alternative 1. However, recreation use could potentially affect the NRHP-eligible sites. Typical recreation-related effects may include:

- Inadvertent trampling or damage of the resource by recreation visitors;
- Intentional vandalism of cultural site features by recreation visitors; or
- Removal of artifacts by recreation visitors.

Alternative 1 includes specific actions that will be implemented to help protect the NRHP-eligible sites from potential impacts associated with recreation use, as follows:

- One campground will be removed due to low-use levels and to protect nearby environmental and cultural resources.
- Another campground may be reduced in size due to low-use levels and to protect nearby environmental and cultural resources, pending the results of visitor surveys and subsequent consultation with the USDA-FS. Barrier fencing will be installed to limit use to an area where cultural resources are not present.

Alternative 1 also includes a public education component, which is described in the HPMP. Under Alternative 1, PCWA will develop information posters that will be placed at existing information boards at Project-related facilities. These posters will focus on educating recreation users about the laws and regulations pertaining to the protection of cultural resources. Therefore, the measures specified in the HPMP and included in Alternative 1 will help reduce potential impacts associated with recreation use.

3.12.2 Project Recreation Facility Maintenance

Cultural resources located within the boundaries of developed Project recreation facilities could potentially be affected by activities related to operation and maintenance of those facilities.

Operation and maintenance activities include “annual” maintenance and “heavy maintenance.” Annual maintenance typically includes activities such as patrol, clean up, signing, toilet pumping, and water testing. These activities do not involve ground-disturbing activities, will not affect cultural resources and are, therefore, not discussed further. Heavy maintenance includes anything beyond normal, annual maintenance and may include:

- Reconstruction, replacement and/or repair of facilities and infrastructure including but not limited to Project recreation facility access roads and interior loop roads, site spurs, facility pathways and trails, water supply and distribution systems, sanitation systems, buildings, and boat ramps,
- Improvements to individual camp sites and picnic sites including grading, obstacle removal, and site expansion or reconfiguration;
- Removal, conversion, consolidation, and/or reduction of campgrounds or picnic areas; and
- Enhancement or reconstruction of existing Project trails.

These activities sometimes involve ground disturbance. Potential effects related to heavy maintenance of developed Project recreation facilities may include:

- Inadvertent trampling of cultural site features or artifacts by construction workers and equipment;
- Removal of artifacts by construction personnel;
- Inadvertent damage or removal of cultural site features or artifacts during construction activity; and/or
- Disturbance of previously unidentified subsurface features or artifacts.

Alternative 1 includes specific measures to help protect the NRHP-eligible sites from potential impacts associated with the heavy maintenance activities at the Project recreation facilities identified above. These measures are specified in the HPMP and include:

- **Consultation.** PCWA will consult with the USDA-FS prior to implementing any ground disturbing activities at the recreation facilities that overlay NRHP-eligible sites. The purpose of this consultation is to: (1) determine whether additional cultural resource surveys or studies are required before proceeding; (2) discuss and identify potential impacts based on detailed design plans; and 3) develop Project-specific design and avoidance measures that consider the proximity of known

cultural resources and the potential for encountering currently unidentified subsurface cultural resources.

- **Additional Studies.** PCWA may conduct additional cultural resource studies prior to implementing ground disturbing activities at the campgrounds that overlay the four NRHP-eligible sites if the USDA-FS determines that additional information is needed for design and planning purposes. The location and extent of these studies will be determined on a case-by-case basis in consultation with the USDA-FS.
- **Design.** Heavy maintenance activities that involve ground disturbing activities will be designed in consultation with the USDA-FS to avoid NRHP-eligible cultural resources
- **Buffers.** Prior to any construction and/or ground-disturbing activities, a buffer of at least 30 feet (approximately 10 meters) will be established around the features associated with NRHP-eligible sites. The buffer will protect the site from direct or indirect Project-related activities.
- **Monitoring.** PCWA will notify each of the Tribes prior to conducting any construction or ground-distributing activities at or near the four NRHP-eligible sites. The purpose of this notification is to allow a Tribal representative to be present and monitor site conditions during ground disturbing activities. If a previously unknown cultural resource is uncovered during ground disturbing activities, or if ground disturbing activities result in an adverse impact to a known NRHP-eligible resource, PCWA will immediately cease work in the area and will notify the USDA-FS. Ground disturbing activities will not be resumed until appropriate protection and avoidance measures are identified in consultation with the USDA-FS, SHPO, and the Native American Tribes.

The measures specified in the HPMP and included in Alternative 1 will help reduce potential impacts to NRHP-eligible sties associated with Project recreation facility maintenance or construction activities. Additional measures will be implemented to protect all cultural resources located within the MFP APE, regardless of NRHP-eligibility status. These measures are not exclusive to Project recreation facilities and are therefore discussed under Section 3.12.5.

3.12.3 Project Operations (Water Surface Elevations)

One NRHP-eligible site is located within the inundation zone of a Project reservoir. The site could be affected by:

- Wave action (erosion);
- Deterioration as the site is exposed and submerged; or
- Vandalism or damage by recreational boaters when exposed, particularly when water levels are near or just below the elevation of the site.

This reservoir will be operated similar under Alternative 1 and the No-Action Alternative, with minor changes in WSE occurring on a seasonal basis depending upon water year

type. Therefore, implementation of Alternative 1 will have no effect on this resource compared to the No-Action Alternative. However, Alternative 1 includes the following measures that will be implemented at this reservoir:

- **Site Condition Surveys.** PCWA will revisit the NRHP-eligible site that is located within the inundation zone of this reservoir once every five years to monitor the condition of the site over time. Native American Tribes will be notified and invited to participate in site monitoring activities. If adverse impacts are identified through these monitoring efforts, PCWA will consult with the USDA-FS, SHPO, and Native American Tribes, as appropriate, to identify and design measures that address the specific nature of the effect.

In addition, PCWA will implement the following measures that may yield additional information relevant to this site:

- An additional survey (once over the term of the next license) will be conducted within the inundation area of the Project reservoir when WSE reaches a specified level to determine whether additional cultural resources are present. Native Americans will be invited to participate in the survey.
- In the unlikely event that the reservoir is drawn down below the minimum pool elevation, PCWA will survey the areas of the bottom of the reservoir that have not been previously surveyed for cultural resources.

The purpose of these surveys is to determine whether additional cultural resources are present in areas of the reservoir that are usually submerged. The survey will provide data related to the prehistoric and historic use of the area around the reservoir, and may provide additional insight regarding the NRHP-eligible site.

3.12.4 Existing Facility Modification and Construction of New Facilities

As discussed in Section 2.0, Alternative 1 includes modification of existing Project facilities and construction of new Project facilities and Project recreation facilities and features, including:

- Hell Hole Reservoir Seasonal Storage Increase Improvements;
- Small Diversion Modifications;
- Outlet Works Modifications;
- Construction of New Gages;
- Construction of a new Project recreation facility at Ellicott Bridge;
- Construction of new trail in the French Meadows Reservoir area; and
- Reconstruction of two water supplies in the French Meadows Reservoir area.

There are no NRHP-eligible sites located in areas where construction activity is proposed. Therefore, the modification of existing Project facilities and the construction

of new Project facilities and Project recreation facilities will have no effect on NRHP-eligible sites.

3.12.5 Additional Measures to Protect Cultural Resources

In addition to the measures described above, Alternative 1 includes specific measures to help protect cultural resources located within the MFP APE from potential impacts, regardless of their NRHP-eligibility status. These measures are specified in the HPMP and include:

- **Training.** PCWA will implement an Employee Resource Awareness Training Program including: (1) annual training; (2) informational materials; and (3) field meetings.
- **Site Condition Monitoring.** PCWA will revisit all of the cultural resource sites located within the MFP APE once every five years to monitor the condition of the sites over time. Native American Tribes will be notified and invited to participate in site monitoring activities. If adverse impacts are identified through these monitoring efforts, PCWA will consult with the USDA-FS, SHPO, and Native American Tribes, as appropriate, to identify and design measures that address the specific nature of the effect.
- **Identification of Site Damage.** The USDA-FS will be immediately notified if damage to a site is identified during site-condition monitoring or during routine Project operation and maintenance activities. Site damage will be assessed using Archeological Resources Protection Act of 1979 (ARPA) guidelines. Appropriate management measures will be identified in consultation with the USDA-FS and Native American Tribes.

The HPMP also includes management measures that are designed to identify and protect currently unknown cultural resources that may be present in the vicinity of the MFP. These management measures include:

- Implementation of procedures for addressing new projects that were not part of the MFP as described under Section 2.0.
- Treatment of human remains uncovered during Project-related activities will be addressed following the Native American Graves Protection and Repatriation Act (NAGPRA) guidelines, Eldorado National Forest (ENF) and Tahoe National Forest (TNF) NAGPRA plans, and California Health and Safety Code (CHSC) Section 7050.5(b).
- Procedures for inadvertent discoveries include notifying cultural resources staff of the ENF or TNF, and implementation of management measures that all parties deem feasible and appropriate such as: avoidance, preservation in place, excavation, documentation, curation, data recovery, or other appropriate measures.
- Procedures for addressing discoveries of paleontological resources in the unlikely event that they are encountered in the MFP APE.

- Requirements that future project activity, not included under Alternative 1 and evaluated in Federal Energy Regulatory Commission's (FERC) National Environmental Policy Act (NEPA) document for the MFP, will require separate environmental review.

3.12.6 Conclusions—Cultural Resources

Four NRHP-eligible properties are located within the APE of the MFP. These properties have high cultural and research values and could be affected by recreation use, Project recreation facility maintenance, and Project operations. However, Alternative 1 includes a HPMP that contains management measures that will be implemented to protect NRHP-eligible resources from any effects that could alter the characteristics that make them eligible for inclusion on the NRHP. These measures include:

- Implementation of an Employee Resource Awareness Training Program;
- Implementation of a public education program;
- Implementation of design and planning measures, including additional consultation with the USDA-FS and conducting additional studies, if warranted;
- Avoidance measures, including design measures and the establishment of buffers during ground-disturbing activities;
- Resource condition monitoring and specific provisions that will be implemented if damage to an NRHP-eligible site is identified;
- Additional surveys;
- Increased involvement by Native American Tribes; and
- Contingency measures and procedures that will be implemented in the event a currently unknown cultural resource is identified.

In addition, the HPMP includes measures to protect all cultural resources located within the MFP APE, regardless of their NRHP-eligibility status. These measures include:

- Implementation of a public education program;
- Implementation of an Employee Resource Awareness Training Program;
- Resource condition monitoring and specific provisions that will be implemented if damage is identified.

Implementation of these measures will enhance management of cultural resources in the MFP APE compared to the No Action Alternative.

3.12.7 Unavoidable Adverse Effects

Alternative 1 includes an HPMP, which includes a variety of measures that were explicitly developed to avoid adverse impacts to the four NRHP-eligible resources located within the MFP APE. Therefore, unavoidable adverse impacts to the four

NRHP-eligible sites in the APE are not expected. However, PCWA recognizes that MFP operation and maintenance activities could potentially impact cultural resources, features and/or artifacts located within the MFP APE that are currently unidentified. Therefore, the HPMP includes additional measures to ensure that currently unknown cultural resources are not adversely affected by MFP operation and maintenance activities.

In addition, the HPMP includes specific measures that will be implemented in the event that adverse impacts to an NRHP-eligible site are identified through: (1) site monitoring activities during ground disturbing activities; or (2) periodic site condition monitoring. As specified in the HPMP, the USDA-FS will immediately be notified if damage to a site is identified during routine Project operation and maintenance activities or during site condition monitoring. Site damage will be assessed using ARPA guidelines and site documentation will be provided to the USDA-FS and SHPO. Appropriate management measures will be identified in consultation with the USDA-FS and Native American Tribes. Therefore, implementation the HPMP over the term of the license will avoid adverse impacts to cultural resources from activities identified under Alternative 1.

LITERATURE CITED

Placer County Water Agency (PCWA). 2011a. Application for New License. Filed with FERC February 23, 2011.

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3.13 TRIBAL RESOURCES ENVIRONMENTAL EFFECTS

This section describes potential impacts to tribal resources under Alternative 1 for the Middle Fork American River Project (MFP or Project). The information presented in this section is based on extensive consultation with appropriate federal and state agencies, Native American Tribes and individuals, and members of the public regarding relicensing of the MFP and its associated tribal resources. The discussion is organized as follows:

- Tribal Lands;
- Tribal Agreements;
- Tribal Concerns; and
- Traditional Cultural Properties.

A description of potential impacts to cultural resources associated with operation and maintenance of the MFP under Alternative 1 is presented in Section 3.12 – Cultural Resources. Section 3.12 also describes the environmental programs and measures that will be implemented under Alternative 1 for managing activities in the vicinity of cultural resources located within the MFP Area of Potential Effects (APE).

3.13.1 Tribal Lands

No federally recognized tribal lands are located within or near the existing Federal Energy Regulatory Commission (FERC or Commission) Project boundary or within the Proposed FERC Project boundary. Therefore, implementation of Alternative 1 will not impact any tribal lands.

3.13.2 Tribal Agreements

There are no known agreements between federally recognized tribes or other entities that have a connection to the operation and maintenance of the MFP apart from the trust responsibilities accorded to tribes acknowledged by agencies of the United States. Therefore, implementation of Alternative 1 will not affect tribal agreements.

3.13.3 Tribal Concerns

Tribal concerns identified during consultation for the relicensing of the MFP are described in Placer County Water Agency's (PCWA) Application for New License (PCWA 2011a). In addition, tribal concerns were identified by the United Auburn Indian Community of the Auburn Rancheria (UAIC) in a letter dated July 6, 2011. The UAIC comments were filed with FERC in response to issuance of the "Notice of Application Accepted for Filing, Soliciting Motions to Intervene and Protests, Ready for Environmental Analysis, and Soliciting Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Fishway Prescriptions" on June 7, 2011. The concerns expressed by the Native American Tribes are addressed in the Draft Final

Historic Properties Management Plan (HPMP) (Volume 3), as summarized in the following:

- PCWA will notify each of the Tribes prior to conducting any construction or ground-disturbing activities at or near one of the four NRHP-eligible sites to allow a Tribal representative to be present.
- Any human remains uncovered during Project-related activities will be treated in accordance with Native American Graves Protection and Repatriation Act (NAGPRA) guidelines, Eldorado National Forest (ENF) and Tahoe National Forest (TNF) NAGPRA plans, and California Health and Safety Code Section 7050.5(b).
- PCWA will review the HPMP every five years and provide the FERC, ENF, TNF, other pertinent land managers, and the Native American community an opportunity to comment on the HPMP.
- PCWA will implement management measures included in the HPMP to protect NRHP-eligible sites from adverse effect, including: employee and public education, avoidance (design and buffers), monitoring, and additional surveys.

As required, the HPMP focuses on the four sites that are eligible for listing on the NRHP. However, PCWA will work with the United States Department of Agriculture-Forest Service (USDA-FS) and Native American Tribes to protect the cultural values of all cultural resources located within the APE, consistent with PCWA's existing cultural resources management policy. This commitment is included in the HPMP.

The measures contained in the HPMP address the concerns raised by the Native American Tribes during the relicensing process regarding operation and maintenance of the MFP.

3.13.4 Traditional Cultural Properties

There are no known ethnographic villages in the vicinity of the MFP. Further, no fishing grounds or areas that contribute to cultural patrimony were identified in areas affected by operation and maintenance of the MFP. Therefore, these resources will not be impacted by implementation of Alternative 1.

By letter dated July 2, 2010, the Colfax Todds Valley Consolidated Tribe (CTVCT) identified a site located along a creek near a Project road that is currently used and may have historically been used by Native Americans. PCWA subsequently conducted a site visit on September 9, 2010, to identify the exact location of the site and to discuss the concerns and suggestions identified in the CTVCT's July 2, 2010 letter. Three primary concerns were expressed by the CTVCT and discussed at the meeting, as follows:

- Road maintenance activities, specifically the side casting of slide material, may degrade the site;

- Recreation visitors and other types of users may damage the site; and
- Hazard tree removal could damage the site.

Based on the information identified during the site visit, PCWA developed the following measures to protect the site from potential damage. These measures were discussed during the September 9, 2010 site visit and are included in PCWA's HPMP.

- PCWA will remove slide material from the Project road and will not push slide material off of the adjacent slope;
- PCWA will monitor the area during routine operation and maintenance activities and report improper recreation use of the site to the TNF; and
- PCWA will consult with the TNF prior to removing hazard trees in the vicinity of the site.

3.13.4.1 Traditional Gathering Areas

PCWA has conducted extensive consultation with the Native American Tribes and the USDA-FS in association with the MFP relicensing. To date, neither the Tribes nor the USDA-FS have identified any specific traditional gathering areas in the vicinity of the MFP. However, in a letter dated December 17, 2010, the resource agencies expressed an interest in protecting traditional gathering areas, should they be identified in the vicinity of the MFP in the future. In addition, the USDA-FS identified specific concerns regarding potential traditional gathering areas in a comment letter provided to PCWA by e-mail on October 24, 2011. Specifically, the USDA-FS indicated that management measures related to traditional gathering areas, particularly as they relate to the application of herbicides and pesticides, should be addressed in the revised Vegetation and Integrated Pest Management Plan (VIPMP) (Attachment 1A) and not in the HPMP. The USDA-FS comments were subsequently discussed at a meeting held on October 26, 2011. PCWA's vegetation and integrated pest management activities and measures to protect traditional gathering areas are discussed in the following subsection.

VEGETATION AND INTEGRATED PEST MANAGEMENT

Routine Project vegetation and integrated pest management includes the trimming of vegetation and application of herbicides, pesticides, and rodenticides within and around the MFP facilities and recreation facilities. These activities are described in detail in the VIPMP. Vegetation and integrated pest management activities have the potential to adversely affect traditional gathering areas. Accordingly, the VIPMP includes measures that will be implemented to manage Project activities that may impact traditional gathering areas that are yet to be identified by the Native American Tribes or USDA-FS.

As outlined in the VIPMP, PCWA will conduct an annual consultation meeting with the USDA-FS to discuss vegetation and pest management activities for the upcoming year, including the specific areas to be treated. After identifying the specific areas to be

treated, PCWA will implement the following measures to manage Project activities at potential traditional gathering areas, as specified in the VIPMP:

- PCWA will notify the Native American Tribes within two weeks after completion of the annual consultation meeting with USDA-FS to identify areas proposed for vegetation and integrated pest management (including vegetation removal and application of pesticides, herbicides, or rodenticides). The notification will be provided in writing and will include activity and location-specific information. A copy of the notification will be provided to the USDA-FS. The purpose of this notification is to allow the Native American Tribes to contact PCWA if the Project activities could potentially impact a previously unidentified traditional gathering area. If a traditional gathering area is identified through this process, PCWA will consult with the USDA-FS and Native American Tribes to document the location of the gathering area and to identify additional measures to manage Project activities at that location.
- In addition, all areas that are being treated with pesticides, herbicides, or rodenticides will be identified with clearly visible signs along likely access points. The signs will indicate the type of treatment, treatment date, and the name and phone number of a contact person. The signs will remain posted for three weeks following application of any chemicals.

With these measures, implementation of Alternative 1 will protect traditional gathering areas over the term of the new license.

3.13.5 Unavoidable Adverse Effects

There are no unavoidable adverse effects to tribal resources under Alternative 1.

LITERATURE CITED

Placer County Water Agency (PCWA). 2011a. Application for New License. Section 7.13 – Tribal Resources Affected Environment. Volume 3, Exhibit E, Book 2. Filed with FERC February 23, 2011.

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Table 3.14-1. Number of Construction Personnel by Project Activity.

3.14 SOCIOECONOMICS ENVIRONMENTAL EFFECTS

This section describes potential impacts to socioeconomics under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facilities Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to socioeconomics have been identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing Project recreation facilities; maintenance activities at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section. Impacts to socioeconomics are evaluated as follows:

- Changes in temporary and long-term workforce;
- Changes in housing demand and real estate/property tax base;
- Demand for public services;
- Effects on local and regional economy and local and state tax revenue;
- Displacement of residences/business establishments and effects on property value; and
- Environmental justice effects.

A description of potential impacts to socioeconomics from implementation of Alternative 1 is provided below. There are no unavoidable adverse effects to socioeconomics resulting from implementation of Alternative 1 as discussed at the end of this section.

3.14.1 Changes in Temporary and Long-term Workforce

The total Placer County workforce consisted of approximately 137,700 individuals in 2008 (PCWA 2011). Under Alternative 1, the workforce associated with the MFP will increase on a temporary basis to complete the required construction and modification of Project facilities, Project recreation facilities, and Project roads. These activities are concentrated during the first fourteen years following license issuance and result in a very modest increase of approximately 66–142 temporary workers (total for all project activities spread over the fourteen-year period). In addition, the project activities only occur between the months of June through December in each year (Table 3.14-1). To the extent practical, local workforce and resources will be utilized during these activities.

Placer County Water Agency's (PCWA) workforce will increase by three full-time employees (from 179 to 182) to implement Alternative 1 over the term of the new license. These employees will work out of offices in either Auburn or Foresthill, California.

Overall, the increase in the temporary and full-time workforce necessary to implement Alternative 1 will have a negligible impact on employment in Placer County.

3.14.2 Changes in Housing Demand and Real Estate/Property Tax Base

The workforce necessary to complete the construction and modification projects under Alternative 1 will be comprised of local residents and/or temporary workers. Depending on the specific project, the temporary workers will be housed in commercial lodging in Auburn and Foresthill or at the MFP Dormitory Facility. Due to the temporary and seasonal nature of the work and the use of existing commercial lodging, housing demand in the area will be unaffected by the construction and modification projects. Similarly, the addition of three full-time workers to PCWA's workforce (currently 179) over the term of the new license will have a negligible effect on housing demand. In both cases, the real estate/property tax base in the local communities will remain unchanged under Alternative 1.

3.14.3 Demand for Public Services

The demand for public services including law enforcement and public safety; fire protection; emergency services/response; road maintenance and repairs; and educational facilities does not measurably increase under Alternative 1. The minor increase in demand for public services from the temporary workforce necessary to complete the construction and modification projects during the first fourteen years following license issuance is negligible. Similarly, the addition of three full-time workers to PCWA's workforce over the term of the new license will have a negligible effect on the demand for public services.

3.14.4 Effects on Local and Regional Economy and Local and State Tax Revenue

The local and regional economy will benefit under Alternative 1. The total average annual income of the temporary employees generated from construction and modification projects during the first fourteen years following license issuance will be approximately \$228,400 (range \$145,400–\$311,400) (Table 3.14-1). A portion of temporary worker earnings will be spent in local area generating both revenue for businesses and sales tax for state and local government. Similarly, a portion of the annual income of the three additional PCWA employees (\$375,000 annually over the term of the new license [2010 dollars]) will generate revenue for businesses and sales tax proceeds for state and local governments. State income tax revenue will also increase based on taxes on temporary and full-time worker earnings under Alternative 1.

Although benefits to the local and regional economy will occur under Alternative 1, these benefits are relatively small in comparison to the overall economy of Placer County. In 2008, the most recent year data is available, total personal income in Placer County was approximately \$16 billion.

Net revenue produced from the sales of MFP electricity generated after April 30, 2013 will contribute to the local and regional economy. Currently, the generation output of the MFP is contractually obligated to Pacific Gas & Electric Company (PG&E) pursuant to the Middle Fork Project Power Purchase Contract, dated April 30, 1963. PCWA does not receive any net revenue from MFP generation provided to PG&E in accordance with the current contract. The contract expires on April 30, 2013. After that time, net revenue from MFP power sales will be split equally (50/50) by PCWA and Placer County. These revenues will be used by PCWA and Placer County during the term of the new license to fund local projects to benefit the people of Placer County.

Under Alternative 1, implementation of resource agencies instream flow and reservoir minimum pool elevation conditions (USDA-FS 2011; CDFG 2011; DOI) reduces average annual generation by approximately 5.12% and results in a reduction in gross annual benefit from the No-Action Alternative of \$2,021,630 (Section 5.0 – Economic Analysis). Similarly, implementation of new environmental measures, programs, and facilities under Alternative 1 further reduce net revenue by a total annualized cost of \$1,843,410 (Section 5.0 – Economic Analysis). The overall reduction in net annual benefits of Alternative 1 compared to the No-Action Alternative is \$4,396,240. These reductions in net revenue result in a corresponding decrease in the funding of local projects by PCWA and Placer County. The combined annual budgets of the County of Placer and PCWA for the 2010 fiscal year was \$872 million. Therefore, the overall reduction to the local economy from implementation of Alternative 1 is considered negligible.

However, Alternative 1 enhances recreation resources in the vicinity of the MFP. As described Section 3.9 – Recreation Resources, benefits to recreation resources include:

- Increased recreational boating opportunities in the bypass and peaking reaches;
- Improved stream-based angling opportunities and experience;
- Greater access to Project reservoirs and bypass and peaking reaches;
- Facilitates trip planning by providing publicly available real-time flow and reservoir water surface elevation information, and brochures and maps;
- Enhanced recreation opportunities by providing additional group camping;
- Relieves congestion and improves recreational experience at Indian Bar Rafter Access; and
- Improves dispersed recreation opportunities.

Implementation of Alternative 1 enhances recreation use of the vicinity of the MFP and continues to benefit the economy of local communities.

3.14.5 Displacement of Residences/Business Establishments and Effects on Property Value

The MFP is located in a heavily forested, rural in nature, and sparsely populated area. The Project facilities are situated on public land managed by the Eldorado National Forest (ENF) and Tahoe National Forest (TNF) or private property owned by PCWA. There are no residential or commercial developments in the immediate vicinity of the Project. The nearest population center is Foresthill (population 1,791) located approximately four miles west-northwest of Ralston Afterbay. The construction and modification projects will occur at or in the immediately vicinity of existing Project facilities and Project recreation facilities. As such, no residences or business establishments will be affected by Alternative 1. Property values will be unaffected by implementation of Alternative 1.

3.14.6 Environmental Justice Effects

Environmental justice effects occur if low-income or minority populations incur a disproportionately high share of adverse socioeconomic effects caused by implementation of an action. There are no adverse socioeconomic effects incurred by Alternative 1. Therefore, there are no impacts related to environmental justice.

3.14.7 Unavoidable Adverse Effects

There are no unavoidable adverse socioeconomic effects under Alternative 1.

LITERATURE CITED

California Department of Fish and Game (CDFG). 2011. Response to Notice of Ready for Environmental Analysis, Federal Power Act Section 10(j) and 10(a) Recommendations, Middle Fork American River Project (FERC Project No. 2079-069). Filed with FERC August 5, 2011.

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TABLES

Table 3.14-1. Number of Construction Personnel by Project Activity.

Activity	Construction Window	Actual Working Days	Implementation Schedule Year Following License Issuance	Total Workforce Over 14-Year Period		Total Number of Person-days Over 14-year Period		Total Wages Over 14-Year Period ^{1, 2}	
				Min	Max	Min	Max	Min	Max
Hell Hole Reservoir Seasonal Storage Increase Improvement	July–October	80	3, 4, or 5	10	20	800	1600	\$560,000	\$1,120,000
Small Diversion Modifications									
Duncan Creek Diversion Modification	July–November	80	2 or 3	6	15	480	1200	\$336,000	\$840,000
North Fork Long Canyon Creek Diversion Modification	July–November	80	3 or 4	6	10	480	800	\$336,000	\$560,000
South Fork Long Canyon Creek Diversion Modification	July–November	80	3 or 4	6	10	480	800	\$336,000	\$560,000
Outlet Works Modifications									
French Meadows Outlet Works Modification	June–December	20	1 or 2	2	10	40	200	\$28,000	\$140,000
Hell Hole Outlet Works Modification	July–November	40	2 or 3	6	20	240	800	\$168,000	\$560,000
Middle Fork Interbay Outlet Works Modification	June–December	20	1 or 2	2	15	40	300	\$28,000	\$210,000
Gages									
North Fork Long Canyon Creek Gage below Diversion Dam (NFLCC)	July–October	7	3 or 4	3	4	21	28	\$14,700	\$19,600
South Fork Long Canyon Creek Gage below Diversion Dam (SFLCC)	July–October	7	3 or 4	3	4	21	28	\$14,700	\$19,600
Middle Fork American River Gage below Interbay Dam (MFARIB)	July–October	7	1 or 2	3	4	21	28	\$14,700	\$19,600
North Fork American River Gage above American River Pump Station (NFARPS)	October	7	1 or 2	3	4	21	28	\$14,700	\$19,600
Recreation Facilities									
Ellicott Bridge Parking Area	July–November	10	Within 14 years of license issuance	4	8	40	80	\$28,000	\$56,000
French Meadows Reservoir Trail	July–November	14	Within 14 years of license issuance	4	6	56	84	\$39,200	\$58,800
Water Supply Replacements									
French Meadows North Shore Water Supply (Dolly Creek Water Supply)	June–October	21	Within 9 years of license issuance	4	6	84	126	\$58,800	\$88,200
French Meadows South Shore Water Supply (French Meadows Water Supply)	June–October	21	Within 5 years of license issuance	4	6	84	126	\$58,800	\$88,200
Total				66	142	2908	6228	\$2,035,600	\$4,359,600
Annual Average								\$145,400	\$311,400

¹Assumes 10-hour workday.

²Average hourly wage is \$70.

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Table 3.15-3.	Estimated Annual Construction Emissions.
Table 3.15-4.	Estimated Annual Construction Greenhouse Gas Emissions.

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Appendix E.	Construction Air Quality Emissions Model.

3.15 AIR QUALITY ENVIRONMENTAL EFFECTS

This section describes potential impacts to air quality under Alternative 1 for the Middle Fork American River Project (MFP or Project). Section 2.0 – Elements Analyzed provides a description of changes in Project facilities and features, Project recreation facilities and features, and routine operation and maintenance activities to be implemented under Alternative 1 compared to the No-Action Alternative. Appendix A – Modified or New Facilities Construction Activities and Concept Designs includes a description of facility modification and construction activities, as well as avoidance and protection (AP) measures to be implemented under Alternative 1.

Potential impacts to air quality have been identified based on changes in operation and maintenance activities, modification of existing Project facilities, and construction of new Project facilities and Project recreation facilities and features. Project maintenance activities include routine maintenance activities at existing Project facilities; routine and heavy maintenance activities at existing Project recreation facilities; maintenance activities at existing recreation facilities and trails added to the MFP; and post-construction maintenance activities at new Project facilities and Project recreation facilities and features. These Project maintenance activities are collectively analyzed in this section. Specifically, impacts to air quality include:

- Short-term impacts associated with emissions produced during construction; and
- Long-term impacts associated with emissions produced during routine operation and maintenance of the Project over the term of the new license.

Changes in Project operations under Alternative 1 and related greenhouse gas (GHG) emissions impacts are discussed in Section 4.0 – Cumulative Effects Analysis.

A description of potential impacts to air quality from implementation of Alternative 1 is provided below. There are no unavoidable adverse effects to air quality resulting from implementation of Alternative 1 as discussed at the end of this section.

3.15.1 Approach

The following section describes the approach used to determine air quality impacts associated with emissions from construction activities and routine operations and maintenance.

3.15.1.1 Construction Emissions

Under Alternative 1, several construction projects will be implemented to improve operations and maintenance of the MFP, enhance environmental resources, and/or meet the requirements specified in new environmental programs and measures. The construction projects include modifications to existing Project facilities and construction of new Project facilities and new Project recreation facilities and features. Construction projects analyzed in this section are described in Appendix A – Modified or New Facilities Construction Activities and Concept Designs and include:

- Hell Hole Reservoir Seasonal Storage Increase Improvement;
- Small Diversion Modifications;
- Outlet Works Modifications;
- New Gages;
- New Recreation Facilities; and
- Recreation Facility Water Supply Replacements.

Construction emissions were estimated for the individual projects identified on Table 3.15-1. Information developed as part of Alternative 1 was used to identify equipment and vehicles proposed for use during construction activities. Information in Appendix E – Construction Air Quality Emissions Model presents, for each project, the estimated construction schedule, the proposed type of construction equipment needed, estimated construction-use hours or miles per day, and the number of days of anticipated use. To further refine the analysis, all engines were categorized into on-road and off-road applications. Off-road equipment was further defined by engine brake horsepower rating and on-road vehicles defined by light duty (LD), medium duty (MD), and heavy, heavy duty (HHD) weight class. Equipment manufacturers' databases and marketing websites were used to identify the engine size for each piece of equipment.

Using this information, Project-specific emissions were calculated using the California Air Resources Board's (CARB) Emissions Factors (EMFAC) model and OFFROAD model, based on 40 CFR 86 et seq. and 40 CFR 89, respectively, as preprocessed by the South Coast Air Quality Management District (SCAQMD). The SCAQMD emission factors were used for this assessment because: (1) the Placer County Air Pollution Control District (PCAPCD) does not publish their own emission factors; (2) the SCAQMD emission factors are widely used for both federal and state projects; and (3) these factors represent the most conservative (worst-case) conditions for emission estimates.

The emission estimations incorporate other conservative assumptions to evaluate a reasonable worst-case scenario, including the following:

- Where equipment model numbers are not specific, the largest machine for the class was selected.
- Where a specific engine size for a particular machine could not be determined due to various options, the largest engine size available was selected.
- Because the timing of construction is not specific as to the exact year (Table 3.15-1), the estimations assumed a likely worst-case timing that would produce the maximum annual emissions. This results in a conservative assumption that six projects will be constructed in Year 2 following license issuance, five projects in Year 3, one project in Year 5, one project in Year 9, and two projects in Year 14.

To evaluate the impact of Alternative 1 on air quality, estimated emissions were compared to significance thresholds (federal and local) identified in Table 3.15-2.

Annual construction emissions (tons per year) were estimated for the following criteria pollutants (Table 3.15-3):

- Volatile Organic Compounds (VOC as CH₄);
- Carbon Monoxide (CO);
- Oxides of Nitrogen (NO_x as NO₂);
- Sulfur Dioxide (SO_x as SO₂);
- Combustion Particulates (C-PM₁₀);
- Combustion Particulates (C-PM_{2.5});
- Fugitive Dust (F-PM₁₀); and
- Fugitive Dust (F-PM_{2.5}).

In addition, annual construction emissions (metric tons or tonnes per year) were estimated for the following GHG (Table 3.15-4):

- Carbon Dioxide (GHG – CO₂);
- Methane (GHG – CH₄);
- Nitrous Oxide (GHG – N₂O); and
- Carbon Dioxide Equivalent (CO₂ eqv).

Operational impacts of Alternative 1 on greenhouse gas emissions are discussed in Section 4.0 – Cumulative Effects Analysis.

3.15.1.2 Operation and Maintenance Emissions

To determine the impact to air quality from operation and maintenance activities, Placer County Water Agency (PCWA): (1) identified additional staff necessary to implement Alternative 1; and (2) assessed the annual emissions associated with the additional staff.

3.15.2 Short-term Impacts – Construction

Project construction has the potential to temporarily affect air quality. Impacts to air quality will result from engine exhaust and fugitive dust emissions caused by operation of off-road construction equipment and on-road vehicles. A summary of construction equipment, construction duration, and emission calculations for each construction project is provided in Appendix E – Construction Air Quality Emissions Model. In addition to criteria pollutants, emissions of greenhouse gases are also estimated.

Table 3.15-3 summarizes the estimated annual construction emissions for criteria pollutants and fugitive dust, as well as, provides the corresponding federal and local thresholds. The estimates assume a worst-case timing that would produce the maximum annual emissions. As depicted, annual construction emissions under Alternative 1 are well below all established thresholds for criteria pollutants.

Table 3.15-4 summarizes the estimated annual GHG emissions as a result of construction activities. There are no established thresholds for GHGs. As a benchmark, California's CO₂ eqv emissions from fuel combustion activities in 2008 were estimated at 408,000,000 metric tons (CARB 2010). Short-term construction activities associated with Alternative 1 will minimally contribute to this state total by adding 717 metric tons for all 15 construction projects combined (0.00018% of the state's 2008 estimated CO₂ eqv emissions).

Construction emissions will be temporary and intermittent, and will cease upon completion of work. Emissions will also be dispersed over a large area that is sparsely populated. PCWA will comply with all applicable PCAPCD rules and regulations regarding construction emissions, including permitting of portable engines greater than 50 horsepower, and compliance with District Rule 228 for fugitive dust and Rule 202 for diesel smoke from engines. In addition, standard construction air quality control measures are included in each Project construction plan (refer to Appendix A – Modified or New Facilities Construction Activities and Concept Designs). Therefore, the environmental effects on air quality associated with construction activities implemented under Alternative 1 are considered negligible.

3.15.3 Long-term Impacts – Operation and Maintenance

Existing operation and maintenance activities of the MFP result in emissions associated with worker-commuting traffic to and from the facility; worker traffic associated with annual scheduled outage maintenance and repairs; temporary generator use; and off-road maintenance equipment including graders and backhoes.

As of October 2009, PCWA had 179 full-time employees, of which 18 are assigned to the Power Division in support of the MFP administration, engineering, operations, and maintenance. Of the 18, 16 work out of PCWA's Foresthill office while two reside year-round at the operator cottages located near Hell Hole Reservoir.

PCWA's workforce will increase by three full-time employees to implement Alternative 1 over the term of the new license. These employees will work out of offices in either Auburn or Foresthill. Traffic trips and emissions associated with this additional workforce will result in an increase in emissions; however, this incremental increase is considered negligible.

3.15.4 Unavoidable Adverse Effects

There are no unavoidable adverse effects to air quality under Alternative 1.

LITERATURE CITED

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TABLES

Table 3.15-1. Project Construction Timing and Modeling Assumptions.

Construction Project	Construction Schedule	Conservative Model Assumptions
Hell Hole Reservoir Seasonal Storage Increase Improvement		
Hell Hole Reservoir Seasonal Storage Increase Improvement	Year 3, 4, or 5	Year 3
Small Diversion Modifications		
Duncan Creek Diversion Dam Modification	Year 2 or 3	Year 2
North Fork Long Canyon Diversion Dam Modification	Year 3 or 4	Year 3
South Fork Long Canyon Diversion Dam Modification	Year 3 or 4	Year 3
Outlet Works Modifications		
French Meadows Dam Outlet Works Modification	Year 1 or 2	Year 2
Hell Hole Dam Outlet Works Modification	Year 2 or 3	Year 2
Middle Fork Interbay Dam Outlet Works Modification	Year 1 or 2	Year 2
New Gages		
North Fork Long Canyon Creek Gage Below Diversion Dam	Year 3 or 4	Year 3
South Fork Long Canyon Creek Gage Below Diversion Dam	Year 3 or 4	Year 3
Middle Fork American River Gage Below Interbay Dam	Year 1 or 2	Year 2
North Fork American River Gage Above American River Pump Station	Year 1 or 2	Year 2
New Recreation Facilities		
Ellicott Bridge Parking Area	Within 14 years of license issuance	Year 14
French Meadows Reservoir Trail	Within 14 years of license issuance	Year 14
Water Supply Replacement		
French Meadows North Shore Water Supply (Dolly Creek Water Supply)	Within 9 years of license issuance	Year 9
French Meadows South Shore Water Supply (French Meadows Campground Water Supply)	Within 5 years of license issuance	Year 5

Table 3.15-2. Emissions Significance Thresholds.

Criteria Pollutant	Federal Thresholds	Placer County APCD Thresholds	
	tons/yr ^{a,b}	tons/yr ^c	lbs/day ^c
Ozone (O ₃) 8-hour (as VOC or NO _x)	25 ^a	40	10
Carbon Monoxide (CO)	100 ^b	100	550
Oxides of Nitrogen (NO _x as NO ₂)	25 ^a	40	10
Sulfur Dioxide (SO _x as SO ₂)	40 ^b	40	80
Particulates (PM ₁₀)	15 ^b	15	80
Particulates (PM _{2.5})	10 ^b	10	80

Sources and Notes:

Assumes all 15 project sites are located in Mountain Counties Air Basin

^aGeneral Conformity (40 CFR 51.853)

^bPrevention of Significant Deterioration (40 CFR 51.166)

^cPlacer County Air Pollution Control District (PCAPCD):

tons/yr: Definition of significant from Rule 502 New Source Review (as amended 2/11/10)

lbs/day: Project-level CEQA thresholds for short-term construction emissions; PM₁₀ from fuel combustion only (excludes fugitive dust) per Rule 502

Table 3.15-3. Estimated Annual Construction Emissions.

Criteria Pollutant	Year 2	Year 3	Year 5	Year 9	Year 14	Highest Year	Project Total	Federal Thresholds		Placer County APCD Thresholds	
	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons	tons/yr	Significant	tons/yr	Significant
Volatile Organic Compounds (VOC as CH ₄)	0.25	0.39	0.04	0.04	0.07	0.39	0.79	25	No	40	No
Carbon Monoxide (CO)	1.40	2.22	0.20	0.20	0.33	2.22	4.34	100	No	100	No
Oxides of Nitrogen (NO _x as NO ₂)	1.32	1.93	0.23	0.23	0.42	1.93	4.13	25	No	40	No
Sulfur Dioxide (SO _x as SO ₂)	0.003	0.004	0.000	0.000	0.001	0.004	0.008	40	No	40	No
Combustion Particulates (C-PM ₁₀)	0.09	0.13	0.02	0.02	0.03	0.13	0.28	15	No	15	No
Combustion Particulates (C-PM _{2.5})	0.08	0.11	0.01	0.01	0.02	0.11	0.25	10	No	10	No
Fugitive Dust (F-PM ₁₀)	0.90	1.39	0.10	0.10	0.20	1.39	2.69	n/a	n/a	n/a	n/a
Fugitive Dust (F-PM _{2.5})	0.17	0.25	0.03	0.03	0.04	0.25	0.51	n/a	n/a	n/a	n/a

Sources:

SCAQMD 2008, EPA 2011

Notes:

Year X (tons/yr) is the estimated annual emissions for applicable projects

Highest Year (tons/yr) is the highest estimated annual emissions for applicable projects

Project Total (tons/yr) is the estimated emissions for all projects combined (worst case)

Fugitive dust and combustion particulates determined separately (thresholds do not apply to fugitive dust)

Projects by year:

Year 2: Six Projects: Duncan Creek Diversion Dam Modification, French Meadows Outlet Works Modification, Hell Hole Dam Outlet Works Modification, Middle Fork Interbay Dam Outlet Works Modification, Middle Fork American River Gage Below Interbay Dam, North Fork American River Gage Above American River Pump Station

Year 3: Five Projects: Hell Hole Reservoir Seasonal Storage Increase Improvement, North Fork Long Canyon Diversion Dam Modification, South Fork Long Canyon Diversion Dam Modification, North Fork Long Canyon Creek Gage Below Diversion Dam, South Fork Long Canyon Creek Gage Below Diversion Dam

Year 5: One Project: French Meadows South Shore Water Supply (French Meadows Campground Water Supply)

Year 9: One Project: French Meadows North Shore Water Supply (Dolly Creek Water Supply)

Year 14: Two Projects: Ellicott Bridge Parking Area, French Meadows Reservoir Trail

Table 3.15-4. Estimated Annual Construction Greenhouse Gas Emissions.

Greenhouse Gas	Year 2	Year 3	Year 5	Year 9	Year 14	Highest Year	Project Total
	tonnes/yr	tonnes/yr	tonnes/yr	tonnes/yr	tonnes/yr	tonnes/yr	tonnes
Carbon Dioxide (GHG – CO ₂)	231	358	31	31	56	358	707
Methane (GHG – CH ₄)	0.02	0.03	0.00	0.00	0.00	0.03	0.06
Nitrous Oxide (GHG – N ₂ O)	0.01	0.02	0.00	0.00	0.00	0.02	0.03
Carbon Dioxide Equivalents (CO ₂ eqv)	234	363	31	31	57	363	717

Sources:

SCAQMD 2008, EPA 2011

Notes:

Units are metric tons or tonnes (1,000 kilograms or 2,204.6 pounds)

Year X (tonnes/yr) is the estimated annual emissions for applicable projects

Highest Year (tonnes/yr) is the highest estimated annual emissions for applicable projects

Project Total (tonnes/yr) is the estimated emissions for all projects combined (worst case)

Projects by year:

Year 2: Six Projects: Duncan Creek Diversion Dam Modification, French Meadows Outlet Works Modification, Hell Hole Dam Outlet Works Modification, Middle Fork Interbay Dam Outlet Works Modification, Middle Fork American River Gage Below Interbay Dam, North Fork American River Gage Above American River Pump Station

Year 3: Five Projects: Hell Hole Reservoir Seasonal Storage Increase Improvement, North Fork Long Canyon Diversion Dam Modification, South Fork Long Canyon Diversion Dam Modification, North Fork Long Canyon Creek Gage Below Diversion Dam, South Fork Long Canyon Creek Gage Below Diversion Dam

Year 5: One Project: French Meadows South Shore Water Supply (French Meadows Campground Water Supply)

Year 9: One Project: French Meadows North Shore Water Supply (Dolly Creek Water Supply)

Year 14: Two Projects: Ellicott Bridge Parking Area, French Meadows Reservoir Trail