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8.8 RIPARIAN RESOURCES ENVIRONMENTAL EFFECTS

This section describes the potential impacts to riparian resources under the Proposed Action for the Middle Fork American River Project (MFP or Project). Section 4.0 – Proposed Action (including Tables 4-4, 4-5, and 4-6) provides a description of routine operation and maintenance activities to be implemented under the Proposed Action 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 enhance the protection of riparian resources.

Potential impacts to riparian resources have been identified based on changes in Project operations, changes in routine Project maintenance activities, and construction activities associated with modification of existing or construction of new Project facilities. Specifically, impacts on riparian resources include changes in the abundance or distribution of riparian species and/or communities and direct loss of individuals. The Proposed Action also incorporates measures to avoid, protect, and enhance riparian resources during Project activities. The riparian impact analyses focus on the areas where riparian vegetation 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 (direct loss) in bypass and peaking reaches and along reservoir and diversion pool shorelines resulting from:
    - Changes in routine Project maintenance activities; and
    - Modification of existing facilities or construction of new Project facilities.

The hydrology baselines and hydrology operations model runs used to quantify impacts of the Proposed Action compared to the No-Action Alternative are discussed in Section 8.1 – Analytical Approach.

Potential impacts on rare-, threatened-, or endangered-aquatic species are discussed in Section 8.5 – Fish and Aquatic Resources Affected Environment. Potential impacts to special-status riparian plants and mosses are identified in Section 8.6 – Botanical and Wildlife Resources Affected Environment.

A description of potential impacts to riparian resources resulting from implementation of the Proposed Action, considering AP and enhancement measures along the bypass and peaking reaches and reservoir and diversion pool shorelines, is provided below. An overall conclusion of impacts to riparian resources under the Proposed Action including any unavoidable adverse effects is presented at the end of the section.

8.8.1 Riparian Vegetation along Bypass and Peaking Reaches

8.8.1.1 Project Operations

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 (Section 7.7 – Geomorphology Affected Environment).

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.

The Proposed Action includes small diversion infrastructure modifications (Section 4.0 – Proposed Action, Appendix A), sediment management activities below medium dams (Sediment Management Plan [SMP] [PCWA 2011a; SD A]), and new instream flow and reservoir minimum pool requirements (Instream Flow and Reservoir Minimum Pool Measure [IFRM] [PCWA 2011b; SD A]) 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

The Proposed Action 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 the Proposed Action will provide long-term benefits for and enhance 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 8.7-1 shows an estimate of the annual amount of material, including gravels, which will be passed downstream of these facilities under the Proposed Action rather than being captured and removed from the river system (No-Action Alternative) (AQ 9 – Geomorphology Technical Study Report [TSR] [AQ 9 –TSR] [PCWA 2011c; SD B]).

Scouring Flows

The Proposed Action 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) (AQ 10 – Riparian Resources TSR [AQ 10 – TSR] [PCWA 2011d; SD B] and AQ 9 –TSR [PCWA 2011c; SD B]).

To analyze the frequency of these scouring flows, the total number of days and years that scouring flows (based on impaired five-year recurrence interval[1]) and the average number of days per event that occurred under the Proposed Action and the No-Action Alternative were compared. The total number of days and years, and average number of days per event are similar for the large bypass and peaking reaches when comparing the Proposed Action and the No-Action Alternative (Table 8.7-3a). On the small bypass streams, under the Proposed Action the frequency and total number of scouring days is similar to the No-Action Alternative (Existing License Conditions[2]); although, fewer days (1–6 fewer days) occur compared to historical conditions (impaired) (Table 8.7-3b). The Geomorphology/Riparian Monitoring Plan (GRMP) (PCWA 2011e; SD A) 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 the Proposed Action. The GRMP also includes monitoring of channel and sediment conditions, including the general channel shape, bank erosion, and fine sediment in pools in the bypass and peaking reaches under the Proposed Action. 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 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 meet to discuss the results.

Pulse Flows

The Proposed Action will maintain or enhance 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 (Section 7.8 – Riparian Resources Affected Environment).

[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 (AQ 1 – Instream Flow TSR [PCWA 2011f; SD B]; AQ 9 – TSR [PCWA 2011c; SD B]; and AQ 10 – TSR [PCWA 2011d; SD B]), 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; SD B).

[2] See Section 8.1 – Analytical Approach for an explanation of the No-Action Alternative with historical (impaired) hydrology or Existing License Conditions.

The Proposed Action specifies scheduled pulse flows in May of wet and above normal water year types in all the bypass river reaches (PCWA 2011b; SD A). These water year types constitute about 50% of the water years. The Proposed Action 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 (AQ 10 – TSR, Appendix B [PCWA 2011d; SD 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 (AQ 9 – TSR [PCWA 2011d; SD B]). The duration of the peak flows in the Proposed Action typically ranges from 1–9 days in wet water years and 2 days in above normal water years, depending on the reach (PCWA 2011b; SD A). 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 the Proposed Action and the No-Action Alternative were compared. For most bypass reaches, the Proposed Action 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 Alternative[3] (Tables 8.8-3a and 8.8-3b). The effects of the Proposed Action 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 61–66% under the Proposed Action, depending on location within the reach (37 to 89 more days). The average number of days during years with recruitment flows varies by reach increases slightly in the upper reach below French Meadows Dam (13–18%; 1–2 more days) and decreases 1-4 days below Middle Fork Interbay (5–13%) in wet water years (Table 8.8-3a). In above normal water years, recruitment flows will occur more frequently (66–100% of above normal water years under the Proposed Action compared to 17–37% under the No-Action Alternative).

- On Duncan Creek and North and South Long Canyon creeks, under the Proposed Action, the total number of recruitment flow days typically increases substantially (3.1 to 8.9 times more days depending on the reach) during the period of record compared to the No-Action Alternative (Existing License Conditions) (Table 8.8-3b). On Long Canyon Creek near the Rubicon River confluence, the total number of recruitment days increased only slightly (5 more days) compared to the No-Action Alternative (Existing License Conditions). Under the Proposed Action, there is an increase in the average number of days

[3] This analysis includes reservoir spill flows that occur in May and June.

of recruitment flows in wet water years (3–21 more days). In above normal water years, the average number of years with recruitment flows is maintained (no difference) on Long Canyon Creek, increases slightly (1–4 more days); or increases substantially (18 more days on South Fork Long Canyon Creek). For all the small bypass reaches, except North Fork Long Canyon Creek, the Proposed Action provides more recruitment flow days compared to historical conditions (impaired hydrology). The GRMP (PCWA 2011e; SD A) 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. Based on the results of the monitoring and/or comments received during the review process, PCWA and the agencies may meet to discuss the results.

- On the Rubicon River, the average number of days per year when recruitment flows occurred in above normal and wet water years typically increases under the Proposed Action (16–32% [3–6 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 (Table 8.8-3a).

The Proposed Action 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. The Proposed Action 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 (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, the Proposed Action 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 nine 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 the Proposed Action 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 relatively 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 the Proposed Action 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; SD B). Therefore, under the Proposed Action, the distribution and abundance of riparian resources will be maintained in the peaking reach.

Base Flows

Under the Proposed Action, 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.

8.8.2 Riparian Vegetation along Reservoirs and Diversion Pool Shorelines

8.8.2.1 Project Operations (Water Surface Elevations)

Under the Proposed Action, MFP operations of the 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 the Proposed Action compared to the No-Action Alternative; therefore, riparian resources will be maintained around these reservoirs (Sections 7.5 – Fish and Aquatic Resources Affected Environment and 8.5 – Fish and Aquatic Resources Environment Effects). The effects to riparian vegetation at the small diversion pools and the large reservoirs under the Proposed Action are discussed in the following sections.

Small Diversions

At the small diversions, changes in WSEs resulting from the new infrastructure modifications under the Proposed Action will maintain riparian resources. The modifications and long-term operational changes are described in detail in Appendix A. Under the Proposed Action, 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 (Figures DC 4, NF 4, and SF 4 in Appendix A). 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 the Proposed Action and No-Action Alternative.

French Meadows Reservoir

Small changes in WSEs at French Meadows Reservoir under the Proposed Action 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 the Proposed Action (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 C2c). 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 the Proposed Action, 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 the Proposed Action (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 the Proposed Action 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. 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 the Proposed Action 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 Proposed Action is provided and described in Section 8.6.1. In general, three areas were evaluated:

- **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);

- **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 the Proposed Action in some years; and

- **Area 2b** includes those portions of the riparian vegetation occurring from 4,636 feet msl under the Proposed Action to the maximum flood pool WSE at 4,640 feet msl (both the Proposed Action and No-Action Alternative).

In Area 1 (below WSE of 4,630 feet msl), approximately 2.4 acres of willows, with alders and black cottonwoods interspersed, occur along tributaries to Hell Hole Reservoir and 6 acres of willows are present along the shoreline of the reservoir. Based on reservoir modeled WSE traces, the frequency, duration, and timing of inundation of areas below 4,630 feet will be very similar under the Proposed Action (future demand) compared to the No-Action Alternative (Appendix C2c).

In Area 2a (WSE from 4,630 to 4,636 feet msl), approximately 0.14 acre of riparian vegetation will be inundated during years when additional water is captured in Hell Hole Reservoir. Under the No-Action Alternative, this water will spill (Table 8.8-1). Under existing conditions (No-Action Alternative), vegetation within Area 2a is comprised of alders, willows, and cottonwoods (young, medium-aged, and old trees and shrubs). This area will be inundated more frequently under the Proposed Action with future demand (1 more year) (Table 8.6-1 and Appendix C2c). The average duration of inundation during wet water years (7 years), however, is slightly more (3 days) under the Proposed Action (future demand) than under the No-Action Alternative (Existing License Conditions). The average duration of inundation during above normal (22 days) and below normal (1 day) water years is longer under the Proposed Action (future demand) compared to the No-Action Alternative (Existing License Conditions). Variability of the duration of inundation between years is typically greater under the No-Action Alternative compared to the Proposed Action (future demand). The timing of reservoir draw down is similar under the Proposed Action and the No-Action Alternative. Similar to the No-Action Alternative, Area 2a will not be inundated in dry or critically dry water years under the Proposed Action.

In Area 2b, 0.26 acre of woody riparian vegetation is present (primarily along Five Lake Creek) between a WSE of 4,636 feet msl and the maximum pool WSE (4,640 feet msl WSE) (Table 8.8-1). Vegetation within this area will not be inundated under the No-Action Alternative (Existing License Condition). Under the Proposed Action (future demand), vegetation within this area will be inundated during approximately 20% of the years (mostly wet water years) for approximately 20 days (and for as few as 1 day and as many as 40 days per year on average).

Riparian trees and shrubs are well adapted to surviving anoxic soil conditions that may occur with prolonged inundation. However, individuals may be susceptible to drowning if the entire tree is inundated; therefore, young sprouts established below a WSE of 4,630 feet msl and between WSEs of 4,630 and 4,636 feet msl, which might be completely inundated for long periods of time, will be susceptible to drowning. However, historically and under the No-Action Alternative, vegetation that establishes during drier years below a WSE of 4,630 feet msl WSE, when reservoir WSEs are

typically lower, will also be susceptible to drowning when the reservoir fills during wetter years. Furthermore, riparian vegetation is present at lower elevations (below a WSE of 4,630 feet msl) that are inundated under existing conditions (No-Action Alternative). Therefore, as riparian vegetation is present at elevations lower than 4,630 feet msl under the No-Action Alternative, and the timing of reservoir draw down will not change under the Proposed Action, the distribution and abundance of riparian vegetation around the reservoir under the Proposed Action will be maintained compared to the No-Action Alternative.

Reservoir WSEs under the Proposed Action 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; SD B) and not necessarily to reservoir WSEs. In addition, as described above, mature trees and shrubs are well adapted to survive anoxic conditions.

8.8.3 Routine Maintenance

Under the Proposed Action, implementation of routine maintenance activities could potentially result in the loss of riparian vegetation. Changes in routine maintenance under the Proposed Action that could affect riparian resources include sediment management activities and vegetation and noxious weed management.

Sediment management under the Proposed Action is detailed in the SMP (PCWA 2011a; SD A). 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, Regional Water Quality Control Board (RWQCB) 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 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.

Vegetation management, including noxious weed management, under the Proposed Action is detailed in the Vegetation and Integrated Pest Management Plan (VIPMP) (PCWA 2011g; SD A). Refer to Section 4.0 – Proposed Action and Tables 4-4, 4-5, and 4-6 for routine maintenance activities and changes from the No-Action Alternative.

8.8.3.1 Contingency Sediment Management

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 the Proposed Action, riparian vegetation is not expected to establish in areas that will threaten or restrict operations of the facilities and need to be removed. Therefore, effects of contingency sediment management on riparian resources will be minimal and riparian resources will be maintained.

8.8.3.2 Sediment Management Activities and Vegetation Management

Under the Proposed Action, 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.

As described in the SMP (PCWA 2011a; SD A), 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 8.8-1 and Table 8.8-2). 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). Routine annual vegetation management at the sediment augmentation areas will prevent future establishment of riparian vegetation.

At the Junction Bar Sediment Augmentation Area, the vegetation along the channel margins that will be removed includes alders and willows (0.34 acre), as follows:

- 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 Sediment 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.

Vegetation will be prevented from becoming reestablished at the Junction Bar and Indian Bar Sediment Augmentation Areas, and at the augmentation areas below Middle

Fork Interbay through annual vegetation management activities under the Proposed Action (PCWA 2011g; SD A).

A total of approximately 0.04 acre of riparian habitat on Junction Bar (0.01 acre), Indian Bar (0.01 acre), and Willow Bar (0.02 acre) will be removed for the placement of the temporary bridge necessary to provide access to Junction Bar during sediment management activities. Vegetation will continue to be removed periodically for installation of the temporary bridge during sediment management activities.

At the sediment augmentation areas below Middle Fork Interbay, minimal riparian vegetation (herbaceous vegetation and potentially small willows) exists due to the steep side slopes, coarse substrate, and periodic high flows (spills) that scour any vegetation that may establish.

Therefore, effects of sediment management activities and vegetation management at the augmentation areas will result in a loss of riparian vegetation at Junction Bar, Indian Bar, and Willow Bar. However, implementation of the sediment augmentation management activities and new instream flow measures will provide long-term benefits to riparian and aquatic ecosystems, and riparian resources along approximately 108 107 miles of rivers and streams associated with the MFP.

8.8.3.3 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 (PCWA 2011g; SD A) under the Proposed Action will protect or enhance riparian resources occurring in or adjacent to vegetation management areas:

- Retention of a 100 foot riparian buffer with 75% ground cover around perennial streams;
- Specific fungicide application methods are required to avoid non-target species; 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, 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).

8.8.4 Existing Facility Modification and Construction of New Facilities

Modification of existing facilities and construction of new facilities, including the Hell Hole Reservoir Seasonal Storage Increase Improvement, small diversion modifications, and outlet works modifications 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 4.0 – Proposed Action and Appendix A for a description of modification and construction activities to be implemented under the Proposed Action. Riparian vegetation would only be affected at three proposed facility modifications.

Construction activities associated with the modification of existing facilities will result in a permanent loss of a total of approximately 0.28 acre of riparian at Duncan Creek Diversion Pool, South Fork Long Canyon Creek Diversion Pool, and Hell Hole Dam Outlet Works.

- At Duncan Creek Diversion Pool, approximately 0.03 acre will be permanently removed for construction of the modified dam structure (Map 8.8-2 and Table 8.8-2).

- At South Fork Long Canyon Creek Diversion Pool, approximately 0.01 acre of willows and alders will be permanently removed for construction of the modified diversion structure (Map 8.8-3 and Table 8.8-2).

- At Hell Hole Dam Outlet Works, re-contouring of the Rubicon River channel in close proximity (assuming 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 8.8-4 and Table 8.8-2).

Although approximately 0.28 acre of riparian vegetation will be permanently removed by construction activities associated with modifications of MFP facilities, the Proposed Action results in a more natural hydrologic regime and improved sediment supply and transport downstream of MFP facilities. These improvements will provide long-term benefits to maintain or enhance riparian and aquatic resources in approximately 26.4 miles of river within the small bypass streams, and approximately 30.5 miles of river along the Rubicon River through the term of the new license that will not occur under the No-Action Alternative. In addition, 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 (Section 4.0 – Proposed Action, Appendix A).

Section 4.0 – Proposed Action and 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 4.0 – Proposed Action 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 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, RWQCB 401 Certification, 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.

8.8.5 Conclusion—Riparian Resources

Although the Proposed Action will result in loss of 1.19 acres of riparian habitat from Project construction and routine maintenance activities, overall the Proposed Action will enhance riparian habitat along approximately 108 miles of rivers and streams associated with the MFP. The GRMP (PCWA 2011e; SD A) includes periodic monitoring of riparian vegetation (composition, age class structure, relative cover, community structure, position along the stream channel, and health) in the bypass and peaking reaches and agency consultation over the term of the new license. In addition, the Proposed Action includes re-planting riparian vegetation following completion of the re-contoured Rubicon River reach. The enhancement of riparian resources along the bypass and peaking reaches will more than adequately mitigate for the loss of riparian habitat and, therefore, will result in an overall enhancement of riparian resources (including distribution, abundance, and recruitment processes).

8.8.6 Unavoidable Adverse Effects

No unavoidable adverse effects to riparian resources have been identified under the Proposed Action.

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TABLES

Table 8.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement[1].

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 8.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement[1] (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 8.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement[1] (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 8.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement[1] (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 8.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement[1] (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 8.8-1. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Improvement[1] (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**

[1]Refer to AQ 10 - TSR (PCWA 2011d; SD B) for additional information.

[2]Map polygon numbers refer to the polygons labeled on maps in Appendices H and I in AQ 10 - TSR (PCWA 2011d; SD B) .

Table 8.8.2. Potential Loss of Individuals from Existing Facility Modification and Construction of New Facilities and Sediment Management Activities.

Location	Species	Potential Loss (Acres)
Facility Modification and Construction of New Facilities		
South Fork Long Canyon Diversion Pool	Willow and Alder	0.01
Duncan Creek Diversion Pool	Willow and Alder	0.03
Hell Hole Dam Outlet Works	Alder	0.24
Sub-Total		**0.28**
Sediment Management Activities[1]		
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 Areas[2]		
Junction Bar	Willow and Alder	0.34
Indian Bar	Willow	0.53
Sub-Total		**0.87**
TOTAL		**1.19**

[1] Riparian vegetation that may develop within small diversion pools will be removed, as part of Contingency Sediment Management activities.

[2] Riparian 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 8.8-3a. 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	Proposed Action				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	129	13	13	10 / 10	77	8	11	7 / 10
		Abv Normal	31	5	5	6 / 6	24	4	12	2 / 6
		Blw Normal	7	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	**167**	**---**	**---**	**18 / 33**	**101**	**---**	**---**	**9 / 33**
MF36.2	702	Wet	70	7	10	7 / 10	53	5	9	6 / 10
		Abv Normal	22	4	6	4 / 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	**93**	**---**	**---**	**12 / 33**	**56**	**---**	**---**	**7 / 33**
Middle Fork American River below Middle Fork Interbay Dam										
MF35.5	322	Wet	244	24	24	10 / 10	197	20	28	7 / 10
		Abv Normal	53	9	9	6 / 6	17	3	17	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	**303**	**---**	**---**	**18 / 33**	**214**	**---**	**---**	**8 / 33**
MF26.2	532	Wet	179	18	20	9 / 10	125	13	21	6 / 10
		Abv Normal	30	5	8	4 / 6	7	1	7	1 / 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	**213**	**---**	**---**	**15 / 33**	**132**	**---**	**---**	**7 / 33**

Table 8.8-3a. 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	Proposed Action				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	113	11	23	5 / 10	120	12	17	7 / 10
		Abv Normal	17	3	17	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	**130**	**---**	**---**	**6 / 33**	**136**	**---**	**---**	**9 / 33**
R20.9	678	Wet	120	12	24	5 / 10	124	12	21	6 / 10
		Abv Normal	17	3	17	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	**137**	**---**	**---**	**6 / 33**	**138**	**---**	**---**	**8 / 33**
R3.5	2,198	Wet	33	3	7	5 / 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	**36**	**---**	**---**	**6 / 33**	**40**	**---**	**---**	**6 / 33**

Table 8.8-3a. 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	Proposed Action				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	10	1	3	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	**11**	**---**	**---**	**4 / 33**	**8**	**---**	**---**	**4 / 33**
MF14.1	6,674	Wet	10	1	3	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	**11**	**---**	**---**	**4 / 33**	**8**	**---**	**---**	**4 / 33**
MF4.8	6,797	Wet	10	1	3	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	**11**	**---**	**---**	**4 / 33**	**8**	**---**	**---**	**4 / 33**

[1]For 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 (AQ 9 – TSR [PCWA 2011c; SD B]) and approximately the flow at which increases in the width and depth of inundation with increased flow changed very little (Appendix B, AQ 10 – TSR [PCWA 2011d; SD B]).

[2]No-Action Alternative = Historical hydrology (1975–2007).

[3]Total number of event days / number of years in water year type.

[4]Total number of event days / number of years with events in water year type.

[5]Number of years with events / total number of years in water year type.

Table 8.8-3b. 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	Proposed Action				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	54	5	8	7 / 10	42	4	7	6 / 10	4	0	2	2 / 10
		Abv Normal	24	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	**78**	**---**	**---**	**12 / 33**	**54**	**---**	**---**	**8 / 33**	**7**	**---**	**---**	**3 / 33**
Duncan D0.0	383	Wet	25	3	5	5 / 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	**28**	**---**	**---**	**7 / 33**	**17**	**---**	**---**	**5 / 33**	**5**	**---**	**---**	**3 / 33**
North Fork Long Canyon Creek	29	Wet	57	6	11	5 / 10	91	9	18	5 / 10	2	0	2	1 / 10
		Abv Normal	25	4	4	6 / 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	**82**	**---**	**---**	**11 / 33**	**91**	**---**	**---**	**5 / 33**	**2**	**---**	**---**	**1 / 33**
South Fork Long Canyon Creek	40	Wet	159	16	23	7 / 10	112	11	22	5 / 10	2	0	2	1 / 10
		Abv Normal	91	15	18	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	**250**	**---**	**---**	**12 / 33**	**112**	**---**	**---**	**5 / 33**	**2**	**---**	**---**	**1 / 33**

Table 8.8-3b. 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	Proposed Action				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	33	3	6	6 / 10	38	4	8	5 / 10	3	0	2	2 / 10
		Abv Normal	6	1	6	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	**39**	**---**	**---**	**7 / 33**	**42**	**---**	**---**	**6 / 33**	**6**	**---**	**---**	**3 / 33**
Long Canyon LC0.0	652	Wet	9	1	5	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	**11**	**---**	**---**	**3 / 33**	**11**	**---**	**---**	**3 / 33**	**6**	**---**	**---**	**3 / 33**

[1]For 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 (AQ 9 – TSR [PCWA 2011d; SD B]) and approximately the flow at which increases in the width and depth of inundation with increased flow changed very little (Appendix B, AQ 10 – TSR [PCWA 2011c; SD B]).

[2]No-Action Alternative = Historical hydrology (1975–2007).

[3]Existing License Conditions = Operations model run using existing FERC license conditions and current demand.

[4]Total number of event days / number of years in water year type.

[5]Total number of event days / number of years with events in water year type.

[6]Number of years with events / total number of years in water year type.

MAPS