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8.9 RECREATION RESOURCES ENVIRONMENTAL EFFECTS

This section describes potential impacts to recreation 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 to be implemented under the Proposed Action.

Potential impacts to recreation resources were identified based on changes in routine operations and maintenance activities, implementation of non-routine recreation facility activities, and modification of existing and construction of new facilities. Impacts to recreation resources consider whether the Proposed Action will modify recreation use or opportunities. The Proposed Action includes measures that will enhance MFP recreation opportunities. Therefore, this section also describes potential benefits of the Proposed Action 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.
- 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; and
 - Sediment augmentation activities at Indian Bar and Junction Bar.
- 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.
- 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;
 - Consolidation of the McGuire Trailhead Parking Areas and associated facilities; and
 - Implementation of trail-related enhancements.
- 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;
 - Non-routine recreation facility activities; and
 - Modification of existing or construction of new Project facilities.
- 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; and
 - Enhancements to the Indian Bar Rafter Access.
- Potential impacts to Project recreation facilities associated with:
 - The removal, reduction, and consolidation of Project recreation facilities;
 - Enhancements to select Project recreation facilities; and
 - Development of a primitive use recreation site in the Duncan Creek Diversion area.
- Potential impacts to reservoir recreation access and opportunities associated with:
 - Changes in Project operations that affect reservoir WSEs;
 - Extension of French Meadows and Hell Hole boat ramps;
 - Formalization of the Ralston Afterbay Sediment Removal Access Point as a public boat ramp;
 - Dissemination of WSE Information;
 - Recreation Opportunity Marketing; and
 - Fish Stocking.
- Potential impacts to stream-based recreation opportunities along the bypass and peaking reaches from:
 - 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 Project construction activities associated with the following:
 - Implementation of the Hell Hole Reservoir Seasonal Storage Increase Improvement;
 - Modification of the Duncan Creek Diversion Dam, South Fork Long Canyon Diversion Dam, and North Fork Long Canyon Diversion Dam;
 - Modification of the outlet works at French Meadows Dam, Hell Hole Dam, and Middle Fork Interbay;
 - Removal, reduction, consolidation, conversion, and enhancement of existing Project recreation facilities; and
 - Construction of the Duncan Creek Diversion Primitive Use Site.

A description of potential impacts to recreation resources resulting from implementation of the Proposed Action, considering avoidance and protection (AP) and enhancement measures is provided below. Impact conclusions and unavoidable adverse effects are summarized at the end of this section.

8.9.1 Specially Designated Areas in the Watershed

This section describes the potential effects of the Proposed Action 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).

8.9.1.1 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 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 the Proposed Action 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”. Under the Proposed Action, changes in Project operations will affect flow on the Rubicon River. Specifically, under the Proposed Action, minimum instream flows on the Rubicon River will be the same or higher than those that will exist under the No-Action Alternative, depending upon water year type. In addition, the Proposed Action 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 the Proposed Action 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 the Proposed Action 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.

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 and sediment augmentation activities at Indian Bar and Junction Bar could affect the recreation ORV. These elements of the Proposed Action

are discussed in the following subsections, except for the WST, which is discussed in Section 8.9.1.3. 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 the Proposed Action, so these ORVs are not discussed further.

CHANGES IN PROJECT OPERATIONS THAT AFFECT FLOW

On the peaking reach, minimum instream flows under the Proposed Action will be equal to or higher than under the No-Action Alternative in all years. In addition, under the Proposed Action 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 8.5.5). Further, releases from Oxbow Powerhouse will be limited to a maximum of 900 cubic feet per second (cfs) from Memorial Day weekend to Labor Day, during the driest water year types (dry, critical, extreme critical). These flow-related measures will enhance the 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 the Proposed Action will not affect FYLF habitat in tributaries to the peaking reach.

The instream flow measures included in the Proposed Action 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 the Proposed Action, 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 stream crossing opportunities, by providing recreation visitors with data that can be used for trip planning and scheduling purposes. Therefore, implementation of the Proposed Action 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 the Proposed Action, 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 the Proposed Action 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 the Proposed Action 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.

8.9.1.2 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 (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.

Under the Proposed Action, changes in Project operations will affect flow in the Rubicon River and Long Canyon Creek, a tributary to the Rubicon River. Under the Proposed Action, 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, the Proposed Action includes:

- Environmental pulse flows on the Rubicon River and Long Canyon Creek;
- Down ramping of spills from Hell Hole Reservoir; and
- Modifications and sediment augmentation activities at North Fork Long Canyon Creek Diversion and South Fork Long Canyon Diversion, which will enhance spawning gravel (and sediment in general) supply in Long Canyon Creek.

Combined, these changes will: (1) maintain or improve the aquatic environment of the Rubicon River and Long Canyon Creek, including 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 the Proposed Action will be consistent with goals of the Rubicon River Wild Trout Management Plan. Furthermore, implementation of the Proposed Project will maintain or enhance the values for which the Rubicon River was designated as a Wild Trout Stream.

8.9.1.3 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 Section 7.9.3 – Recreation Resources Affected Environment and shown on Maps 7.9-2a and 7.9-2b.

The elements of the Proposed Action that could potentially affect the WST are:

- Changes in Project operations that affect flow in the peaking reach;
- Consolidation of the McGuire Boat Ramp Parking Areas and associated facilities; and
- Implementation of trail-related enhancements.

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 the Proposed Action, MFP operations will continue to be modified to facilitate river crossing during the Tevis Cup and Western States 100 Endurance races. However, this practice will be formalized in the Instream Flow and Reservoir Minimum Pool Measure (IFRM) (PCWA 2011a; Supporting Document [SD] A). Therefore, implementation of the Proposed Action 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 the Proposed Action on general trail crossing opportunities are discussed in Section 8.9.4.3.

Consolidation of McGuire Boat Ramp Parking Areas and Associated Facilities

Accessing Poppy Campground requires hiking along a 0.7-mile section of the WST, which is also referred to as the Poppy Trail. The Poppy Trailhead is located in the Poppy Trailhead Parking area, which is one of three parking areas associated with the McGuire Boat Ramp. Under the Proposed Action, 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. Extending the Poppy Trail will not involve relocating the WST. Accordingly, the existing trail and access to the trail will be retained. Therefore, implementation of this element of the Proposed Action will have no effect on the WST.

Implementation of Trail-Related Enhancements

Under the Proposed Action, PCWA will develop a Geographic Information System (GIS)-based map showing the locations of the primary trails in the vicinity of the MFP. The map will be laminated and posted on existing information kiosks located at the developed Project recreation facilities. In addition, PCWA will: (1) develop and install trail maps; and (2) develop, install, and maintain trailhead markers at select trailheads, including two along the WST trail. Implementation of these measures under the Proposed Action will provide recreation users with information about the WST that is not available under the No-Action Alternative. Therefore, implementation of the Proposed Action will enhance recreation opportunities associated with the WST.

8.9.1.4 Wilderness Areas (Granite Chief Wilderness Area)

None of the Project facilities are located within a designated Wilderness Area. However, as shown on Map 7.9-3, the Granite Chief Wilderness Area is located in the upper portion of the Middle Fork American River Watershed (Watershed), immediately east of the MFP. 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 the Proposed Action that could potentially affect the Granite Chief Wilderness Area is changes in Project operations that affect WSE at Hell Hole Reservoir, specifically the higher pool 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 the Proposed Action will have no effect on the Granite Chief Wilderness Area.

8.9.1.5 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 8.6). The refuge boundaries encompass French Meadows Reservoir, French Meadows Dam, a portion of the Middle Fork American River downstream of the dam, and the North Fork Long Canyon including the North Fork Long Canyon Creek Dam and pool. South Fork Long Canyon Creek forms the southwest boundary of the refuge (Map 7.9-3). None of activities under the Proposed Action will affect land use within or around the State Game Refuge, access to the refuge, or management of the refuge. Therefore, implementation of the Proposed Action will have no effect on the State Game Refuge.

8.9.1.6 Regionally or Nationally Important Recreation Areas (ASRA)

The peaking reach bisects the ASRA, and includes the North and Middle Fork American rivers (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 the Proposed Action 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; and
- Enhancements to the Indian Bar Rafter Access.

Potential impacts associated with these elements of the Proposed Action 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 the Proposed Action, flows in the peaking reach will be similar to those that will exist under the No-Action Alternative, except that minimum instream flows will generally be higher and peak flows will not exceed 900 cfs from Memorial Day weekend to Labor Day, during the driest water year types. Under the Proposed Action, PCWA will continue to schedule MFP operations to accommodate whitewater boating activities as specified in PCWA's IFRM (PCWA 2011a; SD A). Therefore, implementation of the Proposed Action will maintain commercial whitewater boating opportunities along the peaking reach and will not conflict with the goals identified in the ASRA RMP. Furthermore, implementation of the Proposed Action will maintain private boating and other recreation opportunities.

Potential impacts of the Proposed Action on stream-based recreation opportunities, including whitewater boating, are discussed in more detail in Section 8.9.4.

Installation of a New Streamflow Gage on the North Fork American River

Under the Proposed Action, 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 the Proposed Action will enhance the existing stream-based recreation experience 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 the Proposed Action, 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 pulse 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 the Proposed Action will enhance the existing stream-based recreation experience in ASRA.

Sediment Augmentation Activities at Indian Bar and Junction Bar

The Proposed Action includes changes in sediment management activities. These changes are described in detail in the Sediment Management Plan (SMP) (PCWA 2011b; SD A). Under the Proposed Action, 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 the Proposed Action. Sediment augmentation activities in this location will be the same under the Proposed Action and the No-Action Alternative. Therefore, implementation of the Proposed Action will have no effect on recreation resources compared to the No-Action Alternative.

Under the Proposed Action, 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 site 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 the Proposed Action, 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 and installing a supplemental slide ramp downstream of the existing ramp; and installing a changing pavilion.

Implementation of the Proposed Action 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.

8.9.2 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 in Table 7.9-1 by area and are shown on Map 7.9-1 (4 sheets), with respect to the primary Project facilities, land jurisdictions, and FERC Project boundary. The Project recreation facilities are discussed further in Section 7.9.4. 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; SD B).

Under the Proposed Action, 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 through the term of the new license. These commitments are formalized in the Recreation Plan and are therefore included the Proposed Action. Therefore, compared to the No-Action Alternative, implementation of the Proposed Action will enhance operation and maintenance of the Project recreation facilities.

Implementation of the Proposed Action includes non-routine recreation facility activities that could potentially affect recreation use and opportunities. These activities are described in the Recreation Plan (PCWA 2011d; SD A), and include:

- Removal of Upper Hell Hole Campground;
- Reduction of Hell Hole Campground;
- Reduction of Ralston Afterbay Picnic Area;
- Reduction of Poppy Campground;
- Consolidation of the McGuire Boat Ramp Parking Area and associated facilities;
- Conversion of McGuire Picnic Area to a Group Campground;
- Enhancements to Ahart Campground;
- Enhancements to Indian Bar Rafter Access;
- Development of a primitive use recreation site in the Duncan Creek Diversion area;
- Formalization of the Ralston Afterbay Sediment Removal Access Point as a public boat launch; and
- Extension of French Meadows and Hell Hole Boat Ramps.

In general, the non-routine recreation facility activities that will be implemented under the Proposed Action will improve the condition of existing facilities and will limit dispersed use to specific areas, thereby reducing resource impacts. In addition these 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. The non-routine recreation facility activities that will be implemented under the Proposed Action are discussed further in the following subsections, by facility. Potential construction-related effects associated with these improvements are discussed in Section 8.9.5.

8.9.2.1 Removal of Upper Hell Hole Campground

Upper Hell Hole Campground will be removed under the Proposed Action 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 the Proposed Action, 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.

8.9.2.2 Reduction of Hell Hole Campground

Hell Hole Campground will be reduced under the Proposed Action due to low use levels and to protect nearby sensitive biological and cultural resources. Reduction of the site will involve removing all tables, concrete and steel grills, fire pits, and site markers from two sites. The campsites will be allowed to naturally revegetate and a new barrier will be installed at the southeast boundary of the campground to limit recreation use to within the campground boundary. These modifications will reduce the size of Hell Hole Campground from ten sites to eight sites.

Implementation of the Proposed Action will reduce overall facility capacity by 20% compared to the No-Action Alternative. However, this reduction will have a negligible effect on recreation use and opportunities because the remaining facility capacity can more than adequately accommodate recreation use. Furthermore, the facility reduction will protect nearby sensitive resources.

8.9.2.3 Reduction of Ralston Afterbay Picnic Area

Ralston Afterbay Picnic Area will be reduced under the Proposed Action due to low use. Recreation use at Ralston Afterbay Picnic Area is relatively low. Reduction of the site will involve removing the table, pedestal grill, and signage from one site and allowing the vegetation in the vicinity of site and along the trail to site to return to natural

conditions. These modifications will reduce the size of Ralston Afterbay Picnic Area from five sites to four sites.

Implementation of the Proposed Action will reduce overall facility capacity by 20% compared to the No-Action Alternative. However, this reduction will have a negligible effect on recreation use and opportunities because the remaining facility capacity can more than adequately accommodate recreation use.

8.9.2.4 Reduction of Poppy Campground

Poppy Campground will be reduced under the Proposed Action because the site is underutilized based on use data and capacity information. Reduction of the site will involve removing all of the tables, fire rings, stoves, and user-created fire rings from four sites and allowing vegetation in the vicinity of each removed campsite and along remnant trails to return to natural conditions. These modifications will reduce the size of Poppy Campground from 12 sites to eight sites.

Implementation of the Proposed Action will reduce overall facility capacity by 33% compared to the No-Action Alternative. However, this reduction will have a negligible effect on recreation use and opportunities because the remaining facility capacity can more than adequately accommodate recreation use.

8.9.2.5 Consolidation of McGuire Boat Ramp Parking Area and Associated Facilities

Under the Proposed Action, 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; SD B). 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 the Proposed Action, 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 the Proposed Action 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.

8.9.2.6 Conversion of McGuire Picnic Area and Beach to McGuire Group Campground

Under the Proposed Action McGuire Picnic Area and Beach will be converted to the McGuire Group Campground due to low day-use levels and to provide additional group camping opportunities. The McGuire Group Campground will include two group camp sites, each sized to accommodate 25 people at one time (PAOT).

Implementation of the Proposed Action will remove day use capacity relative to the No-Action Alternative. As such, day use opportunities in this particular location will no longer be available. However, based on use studies and visitor surveys conducted in 2007 and 2008, demand for day use facilities is low (PCWA 2011c; SD B). Based on the survey results, most people who visit the French Meadows Area camp at a developed facility and then engage in day use activities from there. Therefore, conversion of the McGuire Picnic Area to a group campground will have a negligible effect on day use while providing group camping opportunities in the French Meadows Area. Converting the McGuire Picnic Area to a group campground will increase group capacity in the French Meadows Reservoir Area. Based on the use studies, there appears to be demand for group camping opportunities (PCWA 2011c; SD B). Therefore, conversion of the McGuire Picnic Area to group use will enhance MFP recreation opportunities.

8.9.2.7 Enhancements to 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 the Proposed Action, PCWA will install a groundwater well and hand pump in Ahart Campground to provide recreation visitors with a potable water source. In addition, under the Proposed Action, PCWA will pave: (1) 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) the campground loop road and spurs. Implementation of the Proposed Action 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.

8.9.2.8 Enhancements to 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 located on Forest Service land and is within the existing MFP boundary. The Indian Bar Rafter Access is not located within the ASRA boundary but California State Parks currently operates and maintains this facility.

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.

Under the Proposed Action, this facility will be improved 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 and 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.

8.9.2.9 Development of the Duncan Creek Diversion Primitive Recreation Site

There are no developed Project recreation facilities in the Duncan Creek Diversion area. However, 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 the Proposed Action, a primitive use site will be developed in the Duncan Creek Diversion Area 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; and a bear-resistant garbage container.

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 Proposed Project will enhance existing MFP recreation opportunities, while reducing resource impacts and sanitation issues.

8.9.2.10 Formalization of Ralston Afterbay Sediment Removal Access Point Boat Ramp

Under the Proposed Action, Ralston Afterbay Sediment Removal Access Point will be improved to accommodate boat launching by the public. The improvements will improve existing access conditions to Ralston Afterbay and are, therefore, discussed under Section 8.9.3, Reservoir Recreation Opportunities.

8.9.2.11 Extension of French Meadows and Hell Hole Boat Ramps

Under the Proposed Action, French Meadows and Hell Hole Boat Ramps will be extended. These enhancements relate to reservoir access and are therefore discussed below in Section 8.9.3.

8.9.3 Reservoir Recreation Opportunities

The following describes how implementation of the Proposed Action will potentially affect recreation opportunities at French Meadows Reservoir, Hell Hole Reservoir, and Ralston Afterbay. The impoundments formed behind the small diversions 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.

The Proposed Action includes changes in Project operations that could affect WSEs at French Meadows and Hell Hole reservoirs. In addition, the Proposed Action 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:

- Extension of French Meadows Boat Ramp;
- Extension of Hell Hole Boat Ramp;
- Formalization of the Ralston Afterbay Sediment Removal Access Point as a public boat ramp;
- Dissemination of WSE and other related information;
- Recreation opportunity marketing; and
- Fish stocking.

These elements are discussed in the following subsections.

8.9.3.1 Changes in Project Operations that Effect WSE

Operations model runs showing reservoir elevations for the Proposed Action (existing demand and future demand), Existing License Conditions, and historical water surface elevations (No-Action Alternative) are shown in Appendix C2c. Based on operation model runs for the period of record, implementation of the Proposed Action will result in relatively little change in the actual operational reservoir elevations/volumes compared to the No-Action Alternative - Existing License Conditions and the No-Action Alternative – Historic Impaired Hydrology. Consequently, the Proposed Action will not substantially affect reservoir surface area or water depth in French Meadows or Hell Hole reservoirs. Boat and shoreline access to the reservoirs and conditions as they relate to obstacles such as tree stumps and bedrock outcrops will be the same under the Proposed Action and No-Action Alternative.

8.9.3.2 Extension of French Meadows Boat Ramp

Under the Proposed Action, 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 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 the Proposed Action. Under the No-Action Alternative, the bottom of the boat ramp is at 5,200 feet and WSE is based on the impaired hydrology. Under the Proposed Action, the bottom of the boat ramp is at 5,175 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 8.9-1 expressed in percent of years.

The results of the boat ramp functionality analysis show that the Proposed Action 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 Proposed Action – 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 the Proposed Action, 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 the Proposed Action will improve access to French Meadows Reservoir and will enhance existing MFP reservoir recreation opportunities relative to the No-Action Alternative.

8.9.3.3 Extension of Hell Hole Boat Ramp

Under the Proposed Action, the 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.

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) an 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 the Proposed Action. Under the No-Action Alternative, the bottom of the boat ramp is at 4,530 feet and WSE is based on the impaired hydrology. Under the Proposed Action, 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 8.9-2 expressed in percent of years.

The results of the boat ramp functionality analysis show that the Proposed Action 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 the Proposed Action, the extended boat ramp will be functional for a longer period of time as compared to the No-Action Alternative. Therefore, implementation of the Proposed Action will improve access to Hell Hole Reservoir and will enhance existing MFP reservoir recreation opportunities relative to the No-Action Alternative.

8.9.3.4 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 point consists of an unimproved ramp that is used by PCWA to access Ralston Afterbay during periodic sediment management activities. Additionally, recreation visitors utilize PCWA's Sediment Removal Access Point as an informal boat ramp to access Ralston Afterbay.

Under the Proposed Action, 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 the Proposed Action will improve access to Ralston Afterbay and will enhance existing recreational opportunities in the Ralston Afterbay area.

8.9.3.5 Dissemination of Real-time Water Surface Elevation Information

Under the Proposed Action, 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 the Proposed Action will enhance existing reservoir recreation opportunities.

8.9.3.6 Recreation Opportunity Marketing

Under the Proposed Action, 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; and (2) 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 web site 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 the Proposed Action will enhance existing reservoir recreation opportunities.

8.9.3.7 Fish Stocking

Hell Hole and French Meadows have historically been stocked with fish by CDFG to enhance angling opportunities. Under the Proposed Action, PCWA will be responsible for stocking fish in Hell Hole and French Meadows reservoirs as specified in the Recreation Plan (PCWA 2011d; SD A). Specifically, PCWA will be responsible for stocking fish in Hell Hole and French Meadows reservoirs on an annual basis during the term of the license equivalent to 50% of CDFG's annual management target or 50% of the historical average stocking into the reservoir (2001–2009), whichever is less. Accordingly, implementation of the Proposed Action will maintain reservoir angling opportunities at Hell Hole and French Meadows Reservoirs.

8.9.4 Stream-Based Recreation Opportunities

This section describes the effects of the Proposed Action on stream-based recreation opportunities relative to the No-Action Alternative, focusing on the following elements of the Proposed Action:

- Installation of new stream gages;
- Dissemination of real-time flow information; and
- Changes in Project operations that affect flow.

8.9.4.1 Installation of New Stream Gages

The Proposed Action includes the installation of eight new stream gages, four of 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 the Proposed Action 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, the implementation of the proposed action will enhance the recreation experience on the bypass and peaking reaches.

8.9.4.2 Dissemination of Real-Time Flow Information

Under the Proposed Action, 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 the Proposed Action. 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 projectable);
- 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. Real-time flow data and associated information can be used for trip planning and scheduling purposes,

which will allow recreation visitors to better utilize existing stream-based recreation opportunities.

8.9.4.3 Changes in Project Operations that Affect Flow

The Proposed Action 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

The Proposed Action 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). Spring minimum instream flows will be greatly increased. Summer instream flows will also be increased in the bypass reaches in wet and above normal water year types. Summer flows in the drier year types (critical, dry, and above normal) will be increased above or maintained at the No-Action Alternative minimum instream flows, depending on location. Winter minimum flows are either increased or maintained compared to the No-Action Alternative.

Scheduled environmental pulse flows are included in the Proposed Action in May of wet and above normal water year types in all 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 8.5-1).

Under the Proposed Action spills from Hell Hole Reservoir and French Meadows Reservoir will be down ramped when spill occurs in May–July (down ramp schedule in PCWA 2011a; SD A). In addition, spills from Hell Hole Reservoir will be extended for four days and then down ramped to provide additional benefit. Under the Proposed Action, the shape of the down ramp for both environmental pulse flows and reservoir spills provides a slowly declining hydrograph benefits other environmental/recreational 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 the Proposed Action on aquatic resources are discussed in detail in Section 8.5. In general, the increased minimum instream flows and the pulse flows will increase wetted perimeter and, therefore, enhance aquatic macroinvertebrate production (food for fish). The increased minimum instream flows greatly enhance fish spawning habitat and enhance 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. The increased gravel supply below the small stream diversions and below Middle Fork Interbay will increase the supply of spawning gravels in these stream reaches. Overall, the Proposed Action 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 (REC 4 – Stream-based Recreation Opportunities TSR [PCWA 2011e; SD B]). 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 a focus group session, through follow-up consultation, or through PCWA's whitewater boating flow studies (PCWA 2011e; SD B).

River/Stream	Reach or Segment	Boatable Flow Range (cfs)	As Measured At:
Rubicon River	Ellicott Bridge to Ralston Afterbay	400–1500 1501–3000	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 were used to evaluate boating opportunities under the No-Action Alternative – Impaired Hydrology compared to the Proposed Action – 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 the Proposed Action – Existing Demand model run. This was done because the Existing License Condition model run is the best representation of how the No-Action Alternative would be operated in the future.

In the case of the Rubicon River – Ellicott Bridge to Ralston Afterbay reach, the lower flow range was analyzed. The lower flow range represents the range of flows that both Class IV and V boaters can utilize, based on information developed through the focus group and through follow-up conversations with experienced boaters (PCWA 2011e; SD B).

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 8.9-3a–d. In addition, the results are graphically depicted on Figure 8.9-1a–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.** The Proposed Action will increase boating opportunities in the lower boating flow range (400–1,500 cfs) during above normal and wet water years (Figure 8.9-1a) compared to the No-Action Alternative. Boating opportunities are not available during the drier years under either the No-Action Alternative or the Proposed Action.
- **Long Canyon Creek.** The Proposed Action will increase boating opportunities on this reach during wet water years compared to the No-Action Alternative – Existing License Conditions run (Figure 8.9-1b).
- **Middle Fork American River – French Meadows Dam to Middle Fork Interbay.** On average, the Proposed Action will result in fewer boating opportunities on this reach during below normal and above normal water years and will maintain boating opportunities during wet water years (Figure 8.9-1c). Boating opportunities are not available in the drier years under the No-Action Alternative or the Proposed Action. This occurs because under the Proposed Action, 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.
- **Middle Fork American River – Middle Fork Interbay to Ralston Afterbay.** The Proposed Action will increase boating opportunities during above normal and wet water years (Figure 8.9-1d). Boating opportunities are not available in the drier years under the No-Action Alternative or the Proposed Action.

Other measures included in the Proposed Action will further enhance boating opportunities on the bypass reaches. Under the Proposed Action, whitewater boaters will be able to use real-time flow, pulse, 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, the Proposed Action will maintain or enhance boating opportunities on the bypass reaches compared to the No-Action Alternative.

Peaking Reach

The Proposed Action increases minimum instream flows in the peaking reach compared to the No-Action Alternative in all wet, above normal, below normal, dry, and critical water year types. The increase in minimum instream flows in the spring ranges from 50–375 cfs, in the summer from 25–225 cfs, and in the fall/winter from 0–125 cfs, depending on the water year type. In addition, the Proposed Action includes a large reduction in the ramping rate of Oxbow Powerhouse flow releases (50% reduction of up ramp rate and 41% reduction of the down ramp rate) and, during the driest water year types (dry, critical, extreme critical), a 900 cfs maximum limit on the Oxbow Powerhouse releases from Memorial Day weekend to Labor Day.

Potential effects of the Proposed Action on angling, whitewater boating, and trail crossing are discussed in the following subsections.

ANGLING

The effects of the Proposed Action on aquatic resources in the peaking reach are discussed in detail in Section 8.5. The increased minimum instream flows and the Oxbow Powerhouse release maximum limit are designed to reduce the magnitude of flow fluctuations in the peaking reach (approximately 100 cfs in the summer) and the reduction in ramping rate is designed to slow the change in flow magnitude on the up ramp and the down ramp. 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 slow the abrupt change in fish habitat during ramping and reduce the potential for stranding of fish during the down ramp. Therefore, implementation of the Proposed Action 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 2011f; SD B), and summarized with respect to current Project operations in Section 7.9.6.2.

As mentioned above, the Proposed Action includes an increase in minimum instream flows in the peaking reach and a maximum release limit from Oxbow Powerhouse. The reduction in the magnitude of flow fluctuations in the peaking reach is designed to slow the change in flow magnitude on the up ramp and the down ramp (i.e. the ramping rate). Reducing the ramping rate will enhance 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, the Proposed Action 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 2011g; SD B) combined with stream crossing criteria developed for the REC 4 – TSR PCWA 2011f; SD B). The results of this effort are discussed in Section 7.9.6.2.

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, as discussed in Section 7.9.6.2, these flows do not appear to be suitable for wading and crossing as it relates to angling. A flow range of 75 to 300 cfs provides more wading area and is more suitable for wading and crossing (Figures 7.9-2, 7.9-3, and 7.9-4).

PCWA utilized the existing impaired hydrology (No-Action Alternative) and Proposed Action hydrology to analyze angling opportunities at four angling locations in the peaking reach under the No-Action Alternative and Proposed Action, respectively. 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:

- The analysis was limited to the period of April 1 through November 30.

- The analysis was 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 period.

The hydrologic data were used to determine the percent of time angling opportunities would be available under the No-Action Alternative and the Proposed Action, given the criteria identified above. The results are tabulated on Table 8.9-4 and are graphically depicted on Figures 8.9-2a and 8.9-2b. As indicated, flows within the 300–600 cfs range (Figure 8.9-2a) are rarely available under either the No-Action or Proposed Action Alternative. 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 are within the minimum instream flow requirement range in the Proposed Action (Figure 8.9-2b). A review of the hydrologic data indicates that most of the angling opportunities under either flow range occur during the annual maintenance outage, which typically occurs in the fall.

Implementation of the Proposed Action 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 Proposed Action can be attributed comparing smooth, precise modeled hydrology data to actual measured hydrology data. Accordingly, implementation of the Proposed Action 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 No-Action Alternative – Impaired Hydrology and the Proposed Action – 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 8.9-5.
- **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 8.9-5.

The results of the boating opportunities analysis were tabulated by five water year types and by month (April–September), and are provided in Tables 8.9-6a–d. In addition, the results are graphically depicted on Figures 8.9-3a–d. Boating opportunities are expressed in the number of days that flows meet the criteria defined above.

Overall, the changes in Project operations under the Proposed Action will maintain existing commercial boating opportunities on the peaking reach (Tunnel Chute Run). The Proposed Action maintains or increases boating opportunities for private boaters on the three lower boater runs in the peaking reach (Mammoth Bar Run, Murderer's Bar Run, Confluence Run) in wet and above normal water years. Under the Proposed Action, flow will be released three hours earlier from the first Saturday proceeding Memorial Day through Labor Day in wet and above normal years, with a target flow of 800 cfs at the Confluence. Accordingly, flow will arrive at the lower runs earlier in the day, which increases whitewater boating opportunities. The flow release schedule is identified in the IFRM (PCWA 2011a; SD A).

Overall, changes in Project operations under the Proposed Action will maintain or enhance boating opportunities in the peaking reach compared to the No-Action

Alternative. Access to real-time flow and related information will allow recreation visitors to better utilize existing opportunities. Therefore, implementation of the Proposed Action 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 the Proposed Action – 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 8.9-7a-b, and graphically depicted on Figures 8.9-4a–e and 8.9-5a–e.

The Proposed Action 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 8.9-7a-b and on Figures 8.9-4a–e and 8.9-5a–e, under both the No-Action Alternative and the Proposed Action, trail crossing opportunities vary by water year, crossing location, and by season, with crossing opportunities under the Proposed Action occurring less frequently during some periods but more frequently during other periods.

**Change in Trail Crossing Opportunities
No-Action Alternative Compared to Proposed Action**
(all water years combined)

Trail Crossing	Change in Amount of Time (Average Hours/Day)	
	Easy/Moderate	Moderate/Difficult
Fords Bar	-0.54	-0.64
Ruck-a-Chucky	-0.84	-0.31
Poverty Bar	+0.05	-0.36
Mammoth Bar	-0.23	-0.05
Coffer Dam	-0.24	-0.09
Average	-0.36	-0.29

On an hourly basis, implementation of the Proposed Action will not substantially affect crossing opportunities at any of the crossing locations. Over all of the water year types, implementation of the Proposed Action will reduce easy/moderate crossing opportunities at the crossings in the peaking reach by an average of 0.36 hour per day (22 minutes/day) compared to the No-Action Alternative. Similarly, implementation of the Proposed Action will reduce moderate/difficult crossing opportunities at the crossings in the peaking reach by an average of 0.29 hour a day (17 minutes/day). These changes are considered negligible.

As indicated, the largest change in 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 the Proposed Action are sometimes higher than the crossing thresholds, depending upon water year type and month. 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 8.9-5e), when there are essentially no crossing opportunities under either the Proposed Action or No-Action Alternative.

The Proposed Action includes provisions to disseminate real-time flow information and travel time information for the peaking reach. 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 crossing opportunities that occurs when comparing the Proposed Action to the No-Action Alternative.

8.9.5 Potential Construction-Related Impacts

Under the Proposed Action, several 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 and measures. These projects are described in Section 4.0 – Proposed Action, and are identified on Table 8.9-8 along with and implementation schedule and construction window. Potential impacts to recreation users associated with the implementation of the Proposed Project are discussed in the following subsections.

Note that traffic volumes will increase during construction activities 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.

8.9.5.1 Implementation of the Hell Hole Reservoir Seasonal Storage Increase

Under the Proposed Action, 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 over a 120-day period 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 will occur in the immediate vicinity of a developed Project recreation facility. Therefore, implementation of the Hell Hole Reservoir Seasonal Storage Increase 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.

8.9.5.2 Modification of Small Diversions

Under the Proposed Action, the Duncan Creek Diversion Dam, the North Fork Diversion Dam, and the South Fork 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 will be modified two to three years after license issuance and the North and South Fork Long Canyon diversions will be modified three to four years after license issuance. In all three cases, construction will occur over a 120-day period 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. Therefore, 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 (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 the Proposed Action compared to the No-Action Alternative.

8.9.5.3 Outlet Work Modifications

The Proposed Action 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 8.9-8). The French Meadows and Middle Fork Interbay Outlet works will be modified over a 30-day period between June and December. The Hell Hole Outlet works will be modified over a 60-day period 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. Accordingly, none of the construction activities associated with the outlet work 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.

8.9.5.4 Removal, Reduction, Consolidation, Conversion, and Enhancement of Project Recreation Facilities

The Proposed Action includes the removal, reduction, consolidation, conversion, and enhancement of Project recreation facilities. In all cases, construction activities will be timed to avoid or minimize impacts to recreation users, as follows:

- To the extent practicable, construction activities will be timed to occur during the late summer or early fall, after the peak recreation season to avoid disruptions to recreation visitors.
- Construction activities will not occur simultaneously. Instead, construction activities will be staggered over a six-year period so that alternative Project recreation facilities and opportunities are always available to recreation users.
- Construction activities will occur over a relatively short period of time (e.g., less than about four weeks), which will minimize disruptions to recreation users.

With these timing considerations, recreation visitors will be negligibly affected by construction activities associated with implementation of the Proposed Action. Overall, the Proposed Action will improve the condition of recreation facilities and will enhance MFP recreation opportunities.

8.9.5.5 Development of the Duncan Creek Primitive Use Site

The Duncan Creek Primitive Use Site will be constructed immediately following the Duncan Creek Diversion modifications described above. During construction of the site, the Duncan Creek area will be temporarily closed to dispersed use. However, development of the site will occur over a relatively short period of time (e.g., less than two weeks). During this time other similar dispersed recreation opportunities will continue to be available nearby. Therefore, this closure will have a negligible effect on recreation use. Overall, construction of the Duncan Creek Primitive Use Site will enhance MFP recreation opportunities, while addressing sanitation issues and resource impacts.

8.9.6 Conclusions—Recreation Resources

The Proposed Action 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, the Proposed Action will not effect 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 eligible for the national W&SR system. Overall, implementation of the Proposed Action 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, and will maintain trail crossing opportunities. 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.

- Changes in Project operations that affect flow will enhance the fishery on the bypass and peaking reaches, which will improve fishing quality and success. Therefore, the Proposed Action will enhance the angling experience.
- Implementation of the Proposed Action will maintain angling opportunities in the 75-300 cfs and the 300–600 cfs range in the peaking reach.
- 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 will enhance Project recreation opportunities by providing additional group camping opportunities.
- Developing the Duncan Creek Primitive Use Site 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 additional and 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.
- 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.

8.9.7 Unavoidable Adverse Effects

There are no unavoidable adverse effects to recreation resources under the Proposed Action.

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TABLES

Table 8.9-1. French Meadows Boat Ramp Functionality (% of years).

Water Year Type	No-Action Alternative Existing Ramp	No-Action Alternative plus Extended Ramp	Proposed Action
	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 8.9-2. Hell Hole Boat Ramp Functionality (% of years).

Water Year Type	No-Action Alternative Existing Ramp	No-Action Alternative plus Extended Ramp	Proposed Action
	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)	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 8.9-3a. Whitewater Boating Opportunities by Year and Water Year Type - Bypass Reaches
Rubicon River: Ellicott Bridge - Ralston Afterbay

Water Year and Year Type	Flow Range	Days Flows Meet Criteria NO-ACTION ALTERNATIVE (IMPAIRED)							Days Flows Meet Criteria PROPOSED ACTION (CURRENT DEMAND)						
		Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total
		Extreme Critical													
1977	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical															
1976	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average (400 - 1500 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	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average (400 - 1500 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	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	400 - 1500 cfs	0	0	4	0	0	0	4	0	0	0	0	0	0	0
2004	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average (400 - 1500 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	400 - 1500 cfs	0	0	0	0	0	0	0	0	3	0	0	0	0	3
1978	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	400 - 1500 cfs	0	3	13	0	0	0	16	0	11	15	0	0	0	26
Average (400 - 1500 cfs)		0.0	0.5	2.2	0.0	0.0	0.0	2.7	0.0	2.3	2.5	0.0	0.0	0.0	4.8
Wet															
1980	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	400 - 1500 cfs	11	29	0	0	0	0	40	11	25	8	0	0	0	44
1983	400 - 1500 cfs	0	11	8	7	0	0	26	2	22	14	12	0	0	50
1984	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	400 - 1500 cfs	3	3	17	10	0	0	33	4	8	24	10	0	0	46
1996	400 - 1500 cfs	0	12	3	0	0	0	15	0	9	0	0	0	0	9
1997	400 - 1500 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	400 - 1500 cfs	0	0	7	8	0	0	15	0	9	0	6	0	0	15
2006	400 - 1500 cfs	28	19	10	0	0	0	57	28	28	10	0	0	0	66
Average (400 - 1500 cfs)		4.2	7.4	4.5	2.5	0.0	0.0	18.6	4.5	10.1	5.6	2.8	0.0	0.0	23.0

Table 8.9-3b. 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)							PROPOSED ACTION (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	8	0	0	0	0	13
1983	200 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	0	3	4	7	0	0	0	11
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	0	6	7	10	0	0	0	17
Average		0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.6	2.5	0.0	0.0	0.0	4.1

Table 8.9-3c. Whitewater Boating Opportunities by Year and Water Year Type - Bypass Reaches
Middle Fork American River: French Meadows Dam - Middle Fork Interbay

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							PROPOSED ACTION (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	3	0	0	0	16
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	0.5	0.0	0.0	0.0	5.3
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	6	7	0	0	0	36
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	8	0	0	0	0	8
2005	215 - 450 cfs	30	17	11	0	0	0	58	28	4	6	0	0	0	38
Average		14.7	10.8	2.8	0.0	0.0	0.0	28.3	12.2	7.0	2.2	0.0	0.0	0.0	21.3
Wet															
1980	215 - 450 cfs	5	0	0	0	0	0	5	0	7	0	0	0	0	7
1982	215 - 450 cfs	6	15	13	0	0	0	34	20	7	14	0	0	0	41
1983	215 - 450 cfs	26	20	10	0	0	0	56	22	14	7	0	0	0	43
1984	215 - 450 cfs	0	0	0	0	0	0	0	0	6	0	0	0	0	6
1986	215 - 450 cfs	6	2	2	0	0	0	10	5	8	0	0	0	0	13
1995	215 - 450 cfs	26	14	5	4	0	0	49	24	14	4	3	0	0	45
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	8	3	2	0	0	23
2006	215 - 450 cfs	0	7	4	0	0	0	11	15	8	4	0	0	0	27
Average		9.9	8.1	4.0	0.7	0.0	0.0	22.7	10.9	8.8	3.2	0.5	0.0	0.0	23.4

Table 8.9-3d. Whitewater Boating Opportunities by Year and Water Year Type - Bypass Reaches
Middle Fork American River: Middle Fork Interbay - Ralston Afterbay

Water Year and Year Type	Flow Range	Days Flows Meet Criteria													
		NO-ACTION ALTERNATIVE (IMPAIRED)							PROPOSED ACTION (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	4	0	0	0	0	4
1978	450 - 600 cfs	0	0	0	0	0	0	0	0	3	0	0	0	0	3
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	4	3	0	0	0	7
Average		0.0	0.8	0.0	0.0	0.0	0.0	0.8	0.0	1.8	0.5	0.0	0.0	0.0	2.3
Wet															
1980	450 - 600 cfs	0	0	0	0	0	0	0	0	4	0	0	0	0	4
1982	450 - 600 cfs	0	14	8	0	0	0	22	5	4	3	0	0	0	12
1983	450 - 600 cfs	16	15	7	1	0	0	39	14	0	0	0	0	0	14
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	0	6	0	0	0	0	6
1995	450 - 600 cfs	6	7	3	0	0	0	16	8	6	9	0	0	0	23
1996	450 - 600 cfs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	3	3	0	0	0	6
2006	450 - 600 cfs	0	0	3	0	0	0	3	0	3	0	0	0	0	3
Average		2.6	3.6	2.1	0.1	0.0	0.0	8.4	2.7	4.4	1.5	0.0	0.0	0.0	8.6

Table 8.9-4. Angling Opportunities¹ at Select Locations in the Peaking Reach.

75 - 300 cfs				
Angling Location	Two Hour Window²		Three Hour Window³	
	Proposed Action	No-Action Alternative	Proposed Action	No-Action Alternative
Below Oxbow Powerhouse	17%	23%	16%	19%
Cache Rock	21%	25%	16%	24%
Ruck-a-Chucky Recreation Area (Drivers Flat)	24%	26%	23%	23%
Above NFAR/MFAR Confluence	22%	30%	22%	27%

300 - 600 cfs				
Angling Location	Two Hour Window		Three Hour Window	
	Proposed Action	No-Action Alternative	Proposed Action	No-Action Alternative
Below Oxbow Powerhouse	8%	8%	5%	6%
Cache Rock	11%	9%	5%	8%
Ruck-a-Chucky Recreation Area (Drivers Flat)	13%	8%	6%	6%
Above NFAR/MFAR Confluence	10%	11%	6%	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 8.9-5. 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 8.9-6a. 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 (IMPAIRED)							PROPOSED ACTION (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	30	31	31	22	116
1992	800 - 2500 cfs	0	9	15	25	23	10	82	0	3	30	31	31	24	119
1994	800 - 2500 cfs	0	4	27	27	23	3	84	0	1	30	31	31	27	120
Average		0	4	21	26	22	10	83	0	2	30	31	31	24	118
Dry															
1990	800 - 2500 cfs	0	2	18	28	28	16	92	0	3	30	31	31	27	122
1991	800 - 2500 cfs	14	14	24	26	27	12	117	28	0	30	31	31	26	146
2001	800 - 2500 cfs	12	22	22	28	29	28	141	8	2	30	31	31	27	129
2007	800 - 2500 cfs	5	16	20	29	31	26	127	0	2	30	31	31	28	122
Average		8	14	21	28	29	21	119	9	2	30	31	31	27	130
Below Normal															
1989	800 - 2500 cfs	25	31	27	16	31	15	145	28	26	30	30	31	28	173
2002	800 - 2500 cfs	24	28	28	28	26	7	141	30	8	30	30	31	26	155
2003	800 - 2500 cfs	28	25	28	30	31	30	172	28	22	29	30	30	28	167
2004	800 - 2500 cfs	22	29	29	30	30	30	170	19	3	29	30	31	23	135
Average		25	28	28	26	30	21	157	26	15	30	30	31	26	158
Above Normal															
1993	800 - 2500 cfs	22	30	29	30	31	11	153	7	20	30	31	31	25	144
1999	800 - 2500 cfs	25	31	29	29	30	19	163	30	31	30	31	31	25	178
2000	800 - 2500 cfs	27	31	29	31	31	20	169	30	27	28	31	31	27	174
2005	800 - 2500 cfs	30	14	26	22	17	26	135	20	3	29	31	31	23	137
Average		26	27	28	28	27	19	155	22	20	29	31	31	25	158
Wet															
1995	800 - 2500 cfs	0	0	5	30	30	15	80	0	0	2	27	31	30	90
1997	800 - 2500 cfs	30	31	29	29	31	18	168	30	28	21	30	31	23	163
1998	800 - 2500 cfs	9	15	18	31	30	26	129	12	11	30	31	31	26	141
2006	800 - 2500 cfs	0	5	30	31	29	17	112	0	1	23	31	31	30	116
Average		10	13	21	30	30	19	122	11	10	19	30	31	27	128

**Table 8.9-6b. 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 (IMPAIRED)							PROPOSED ACTION (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	1	2	30	31	31	22	117
1992	500 - 2500 cfs	6	8	22	24	17	9	86	9	3	30	31	31	22	126
1994	500 - 2500 cfs	0	9	29	25	30	9	102	4	2	30	31	31	27	125
Average		3	6	25	25	22	10	90	5	2	30	31	31	24	123
Dry															
1990	500 - 2500 cfs	12	3	23	28	29	19	114	29	6	30	31	31	27	154
1991	500 - 2500 cfs	29	31	26	28	27	18	159	30	31	30	31	31	27	180
2001	500 - 2500 cfs	19	23	24	28	29	29	152	23	16	30	31	31	27	158
2007	500 - 2500 cfs	12	2	22	28	29	19	112	26	12	30	31	31	28	158
Average		18	15	24	28	29	21	134	27	16	30	31	31	27	163
Below Normal															
1989	500 - 2500 cfs	23	31	28	18	30	16	146	27	30	30	30	31	28	176
2002	500 - 2500 cfs	30	29	30	31	30	8	158	30	30	30	30	31	28	179
2003	500 - 2500 cfs	28	23	30	31	29	30	171	26	19	29	30	30	28	162
2004	500 - 2500 cfs	23	31	28	18	30	16	146	30	14	29	30	31	23	157
Average		26	29	29	25	30	18	155	28	23	30	30	31	27	169
Above Normal															
1993	500 - 2500 cfs	19	30	30	30	31	20	160	2	18	30	31	31	25	137
1999	500 - 2500 cfs	25	31	30	31	31	19	167	29	31	30	31	31	25	177
2000	500 - 2500 cfs	30	31	30	31	31	21	174	30	31	28	31	31	27	178
2005	500 - 2500 cfs	19	31	30	30	31	20	161	30	30	29	31	31	23	174
Average		23	31	30	31	31	20	166	23	28	29	31	31	25	167
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	21	30	31	30	173
1998	500 - 2500 cfs	8	13	18	30	31	28	128	9	5	30	31	31	28	134
2006	500 - 2500 cfs	0	0	5	29	31	17	82	0	1	22	31	31	30	115
Average		10	11	14	30	31	21	116	10	9	18	30	31	30	127

**Table 8.9-6c. 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 (IMPAIRED)							PROPOSED ACTION (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	1	2	30	31	31	22	117
1992	500 - 2500 cfs	6	8	22	24	17	9	86	9	3	30	31	31	24	128
1994	500 - 2500 cfs	0	9	29	25	30	9	102	4	2	30	31	31	27	125
Average		3	6	25	25	22	10	90	5	2	30	31	31	24	123
Dry															
1990	500 - 2500 cfs	12	7	24	29	30	20	122	29	6	30	31	31	27	154
1991	500 - 2500 cfs	29	31	27	28	27	20	162	30	31	30	31	31	26	179
2001	500 - 2500 cfs	21	20	21	22	28	21	133	23	16	30	31	31	27	158
2007	500 - 2500 cfs	12	5	24	29	30	20	120	26	12	30	31	31	28	158
Average		19	16	24	27	29	20	134	27	16	30	31	31	27	162
Below Normal															
1989	500 - 2500 cfs	23	31	28	18	30	16	146	27	30	30	30	31	28	176
2002	500 - 2500 cfs	30	29	30	31	30	8	158	30	30	30	30	31	26	177
2003	500 - 2500 cfs	28	23	30	31	29	30	171	27	19	29	30	30	29	164
2004	500 - 2500 cfs	23	31	28	18	30	16	146	30	14	29	30	31	24	158
Average		26	29	29	25	30	18	155	29	23	30	30	31	27	169
Above Normal															
1993	500 - 2500 cfs	22	31	30	31	31	21	166	2	18	30	31	31	26	138
1999	500 - 2500 cfs	26	31	30	30	31	17	165	29	31	30	31	31	26	178
2000	500 - 2500 cfs	30	31	29	29	31	21	171	30	31	28	31	31	27	178
2005	500 - 2500 cfs	23	31	30	31	31	21	167	30	30	29	31	31	24	175
Average		25	31	30	30	31	20	167	23	28	29	31	31	26	167
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	21	30	31	24	167
1998	500 - 2500 cfs	16	19	23	31	31	26	146	9	5	30	31	31	29	135
2006	500 - 2500 cfs	0	0	10	31	31	17	89	0	1	22	31	31	30	115
Average		12	13	18	31	31	20	124	10	9	18	30	31	28	126

**Table 8.9-6d. 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 (IMPAIRED)							PROPOSED ACTION (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	30	16	0	3	110
1992	350 - 2500 cfs	30	22	7	2	3	3	67	30	31	24	12	0	2	99
1994	350 - 2500 cfs	30	31	21	12	4	3	101	30	31	30	14	0	1	106
Average		30	18	17	11	5	3	83	30	31	28	14	0	2	105
Dry															
1990	350 - 2500 cfs	30	1	29	29	30	21	140	30	31	29	30	5	1	126
1991	350 - 2500 cfs	26	30	30	28	26	17	157	26	30	30	31	19	6	142
2001	350 - 2500 cfs	28	31	16	5	15	1	96	27	31	30	25	1	1	115
2007	350 - 2500 cfs	30	31	28	29	30	21	169	30	31	30	31	31	8	161
Average		29	23	26	23	25	15	141	28	31	30	29	14	4	136
Below Normal															
1989	350 - 2500 cfs	4	1	29	22	31	18	105	2	22	30	30	31	28	143
2002	350 - 2500 cfs	14	31	28	0	6	4	83	9	29	27	30	31	26	152
2003	350 - 2500 cfs	12	0	21	21	12	27	93	7	0	20	29	30	30	116
2004	350 - 2500 cfs	5	24	29	22	31	17	128	27	30	30	30	31	19	167
Average		9	14	27	16	20	17	102	11	20	27	30	31	26	145
Above Normal															
1993	350 - 2500 cfs	0	0	14	31	31	21	97	0	0	9	31	31	28	99
1999	350 - 2500 cfs	6	0	22	31	31	19	109	8	0	18	31	31	28	116
2000	350 - 2500 cfs	16	17	30	18	13	5	99	5	18	30	31	31	27	142
2005	350 - 2500 cfs	0	0	12	31	31	21	95	5	7	26	31	31	26	126
Average		6	4	20	28	27	17	100	5	6	21	31	31	27	121
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	20	21	30	31	31	26	159
1998	350 - 2500 cfs	0	0	0	22	31	28	81	0	0	0	21	31	29	81
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	29	107

Table 8.9-7a. 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 8.9-7b. Average Number of Hours per Day (7:00 AM - 7:00 PM) that River Crossing was Possible at Trail Crossings in the Peaking Reach - Proposed Action.

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	0.8	5.1	5.7	3.0	3.9	0.0	0.0	8.1	2.0	10.5	2.6
Ruck-a-Chucky	0.0	1.3	0.0	6.1	0.0	4.5	0.0	0.0	0.0	0.0	11.9	3.0
Poverty Bar	0.0	1.6	5.2	6.4	3.1	4.8	0.0	0.1	8.3	2.1	12.8	3.2
Mammoth Bar	0.0	1.5	2.3	6.2	0.0	4.2	0.0	0.0	2.3	0.6	11.9	3.0
Coffer Dam	0.0	0.1	0.0	5.9	0.0	0.8	0.0	0.0	0.0	0.0	6.7	1.7

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	0.9	1.8	5.2	6.0	5.6	6.4	0.0	0.0	11.7	2.9	14.2	3.5
Ruck-a-Chucky	0.0	2.4	0.0	6.8	0.0	6.9	0.0	0.0	0.0	0.0	16.1	4.0
Poverty Bar	0.0	2.9	5.9	7.1	6.1	7.0	0.0	0.0	12.0	3.0	17.1	4.3
Mammoth Bar	0.0	2.5	4.6	6.9	5.0	6.8	0.0	0.0	9.7	2.4	16.2	4.1
Coffer Dam	0.0	0.9	0.0	6.3	0.0	5.1	0.0	0.0	0.0	0.0	12.2	3.1

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	1.9	2.8	5.6	6.7	2.5	5.0	0.0	2.8	10.0	2.5	17.3	4.3
Ruck-a-Chucky	0.0	4.5	1.4	7.4	0.0	5.5	0.0	1.3	1.4	0.4	18.8	4.7
Poverty Bar	3.3	5.1	6.3	7.9	2.0	6.6	0.0	2.5	11.6	2.9	22.0	5.5
Mammoth Bar	0.0	5.2	6.2	7.8	0.8	5.0	0.0	0.6	7.1	1.8	18.7	4.7
Coffer Dam	0.0	3.3	2.6	7.2	0.0	0.9	0.0	0.0	2.6	0.7	11.4	2.9

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	2.3	4.1	7.5	9.1	6.0	8.4	1.5	6.8	17.3	4.3	28.4	7.1
Ruck-a-Chucky	0.0	5.1	6.0	9.3	2.8	9.0	0.0	4.7	8.7	2.2	28.1	7.0
Poverty Bar	4.4	6.5	8.4	10.1	6.0	9.8	0.0	6.4	18.8	4.7	32.8	8.2
Mammoth Bar	5.0	7.1	8.9	10.2	5.4	8.7	0.0	3.3	19.2	4.8	29.3	7.3
Coffer Dam	0.0	6.6	7.8	10.1	2.2	5.5	0.0	0.2	10.0	2.5	22.4	5.6

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	3.1	5.6	9.3	10.4	5.0	6.6	0.0	2.1	17.4	4.4	24.7	6.2
Ruck-a-Chucky	1.8	5.3	7.6	10.7	0.8	7.4	0.0	0.4	10.2	2.5	23.9	6.0
Poverty Bar	4.8	7.0	9.9	11.3	4.5	8.3	0.0	2.0	19.3	4.8	28.5	7.1
Mammoth Bar	6.1	7.8	10.2	11.3	1.9	7.9	0.0	0.0	18.2	4.6	27.0	6.8
Coffer Dam	4.0	8.5	8.4	11.0	0.6	1.8	0.0	0.0	13.0	3.2	21.3	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 8.9-8. Construction Window and Duration by Project Activity.

Activity	Construction Window	Construction Duration (Days)	Actual Working Days	Implementation Schedule Year Following License Issuance
Hell Hole Reservoir Seasonal Storage Increase Improvement	July - October	120	80	3, 4, or 5
Outlet Works Modifications				
French Meadows Outlet Works Modification	June - December	30	20	1 or 2
Hell Hole Outlet Works Modification	July - November	60	40	2 or 3
Middle Fork Interbay Outlet Works Modification	June - December	30	20	1 or 2
Small Diversion Modifications				
Duncan Creek Diversion Modification	July - November	120	80	2 or 3
North Fork Long Canyon Creek Diversion Modification	July - November	120	80	3 or 4
South Fork Long Canyon Creek Diversion Modification	July - November	120	80	3 or 4
New Gage Construction				
Middle Fork American River below Interbay Dam (MFARIB)	July - October	7	7	1 or 2
North Fork Long Canyon Creek below Diversion Dam (NFLCC)	July - October	7	7	3 or 4
South Fork Long Canyon Creek below Diversion Dam (SFLCC)	July - October	7	7	3 or 4
North Fork American River above American River Pump Station (NFARPS)	October	7	7	1 or 2

FIGURES

Figure 8.9-1a. 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

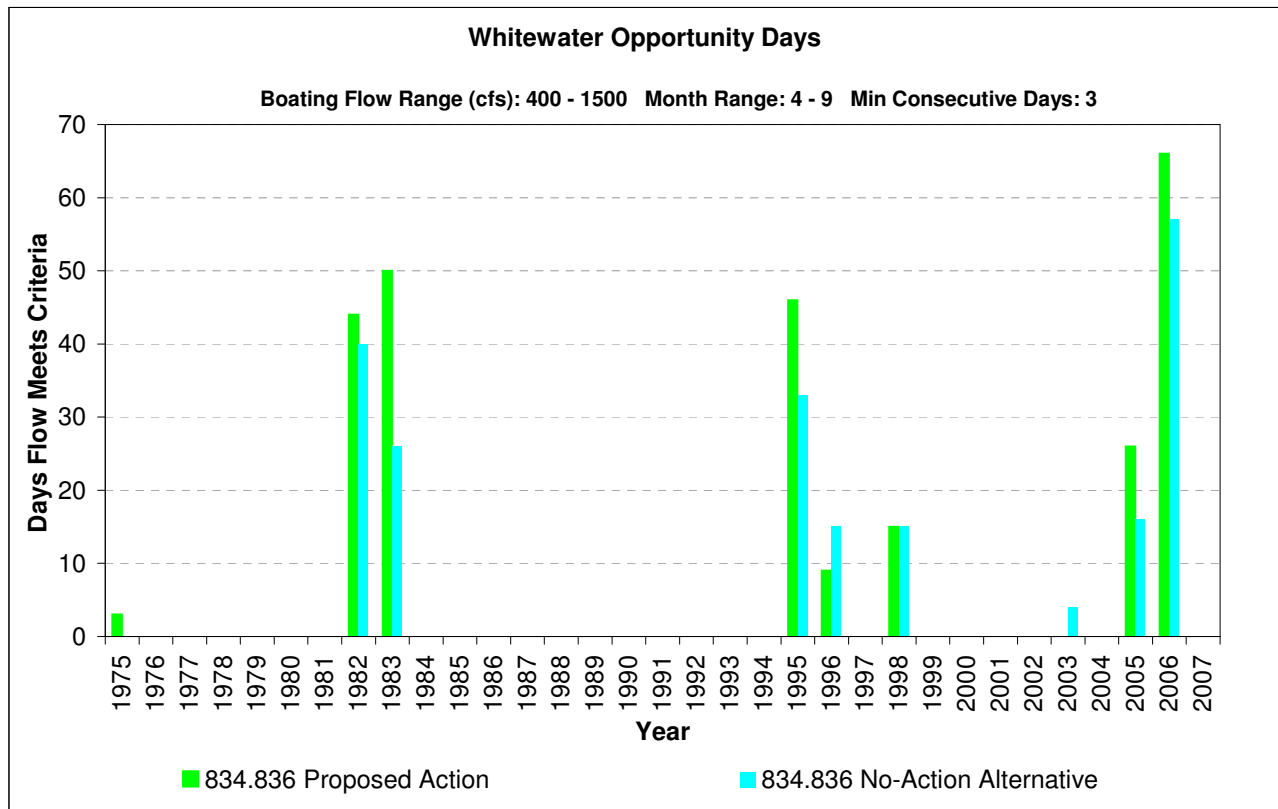
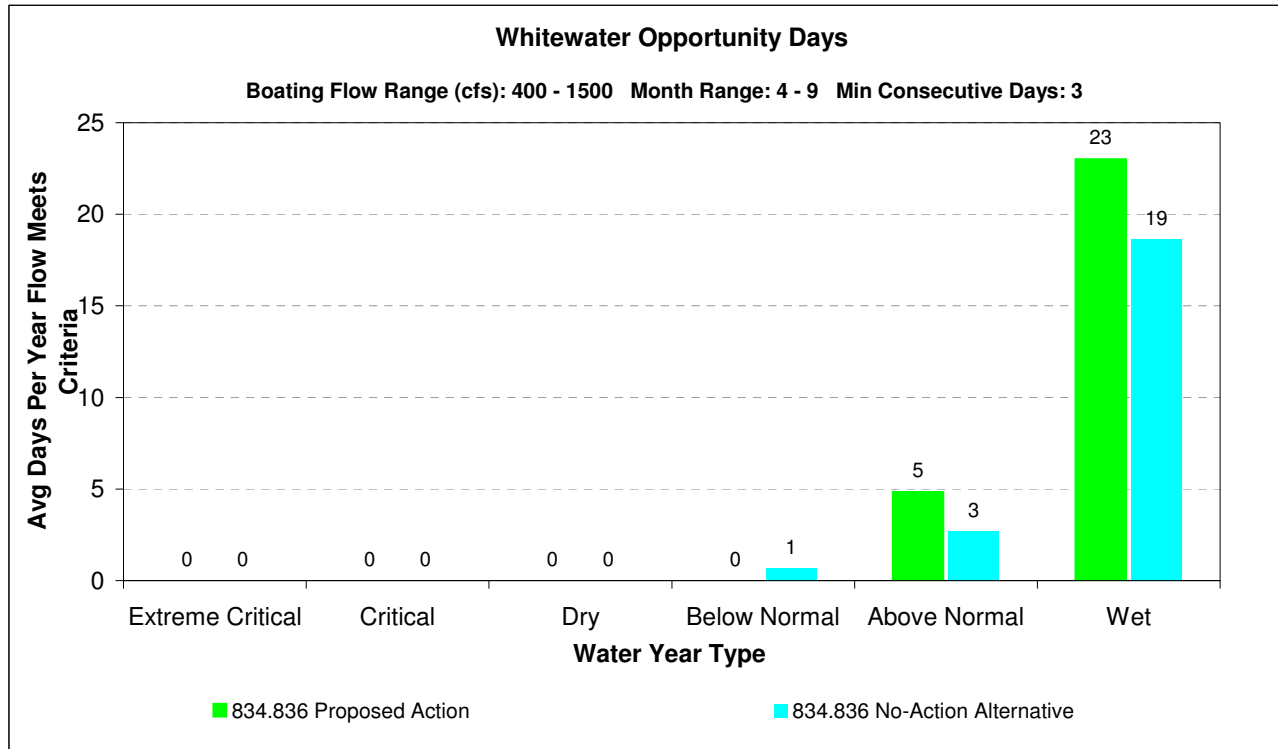


Figure 8.9-1b. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Day by Year (bottom). Long Canyon Creek

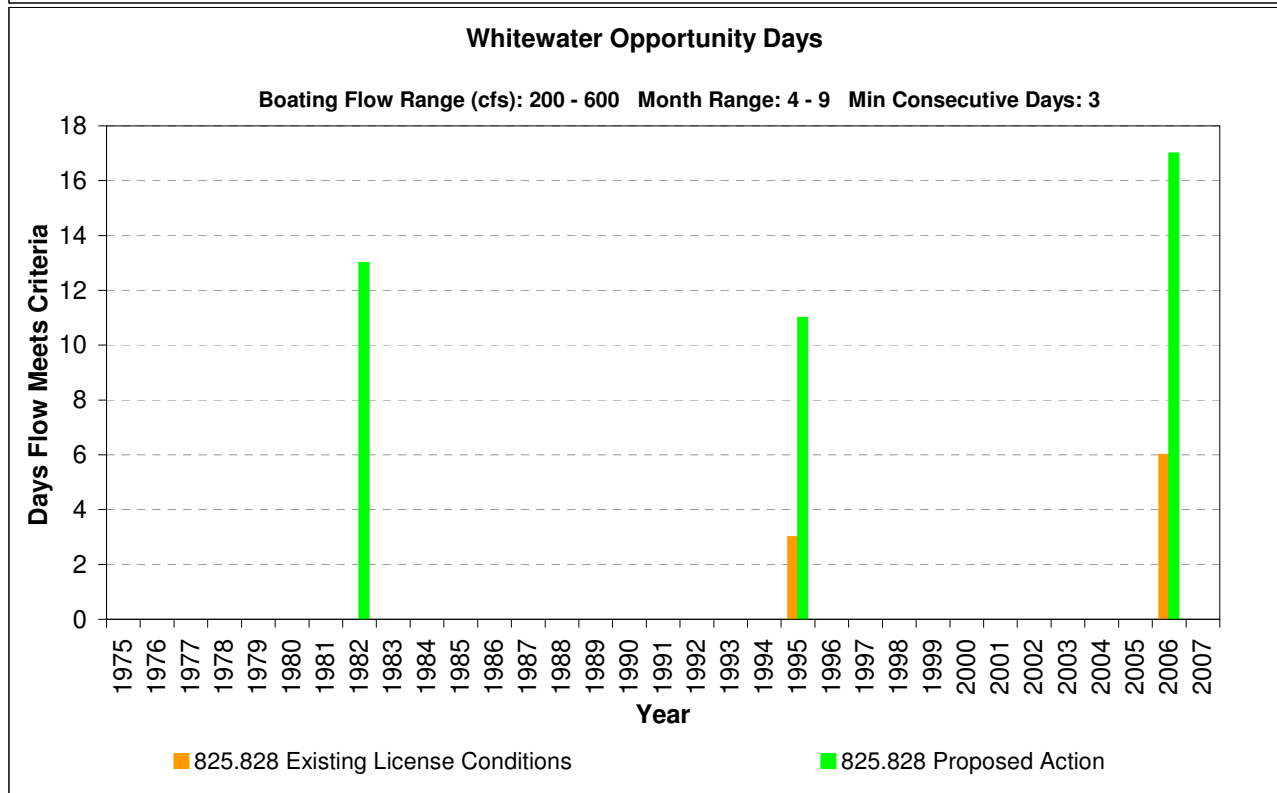
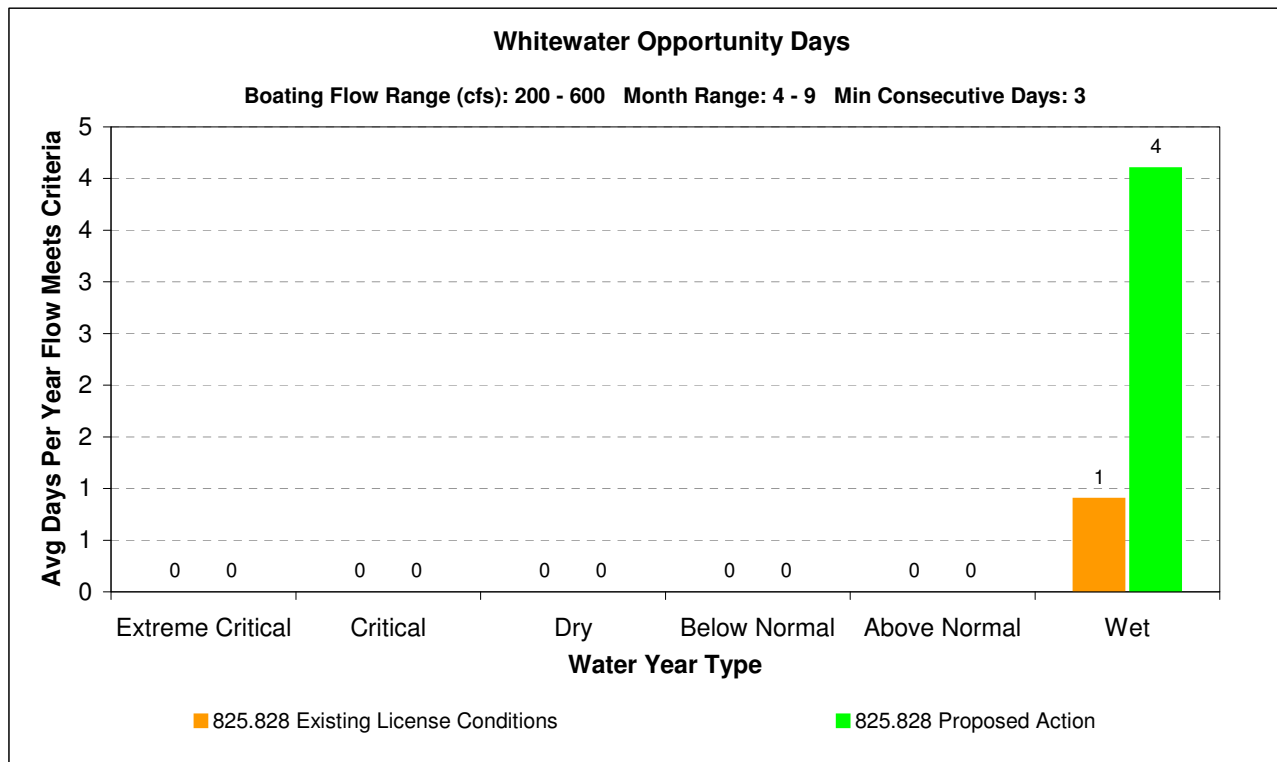


Figure 8.9-1c. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).

Middle Fork American River: French Meadows Dam - Middle Fork Interbay

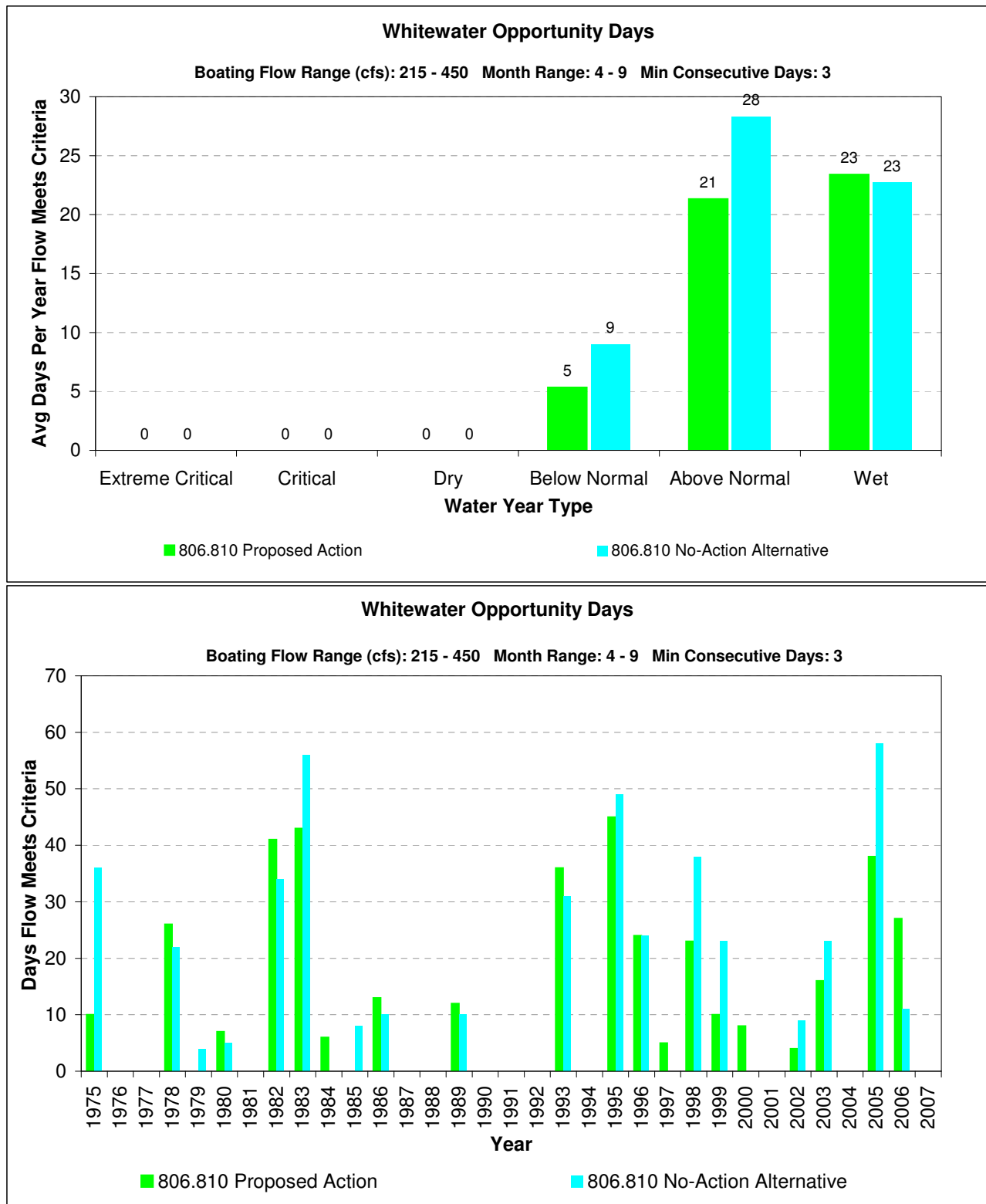


Figure 8.9-1d. Average Number of Boating Opportunity Days by Water Year Type (top) and Total Number of Boating Opportunity Days by Year (bottom).

Middle Fork American River: Middle Fork Interbay - Ralston Afterbay

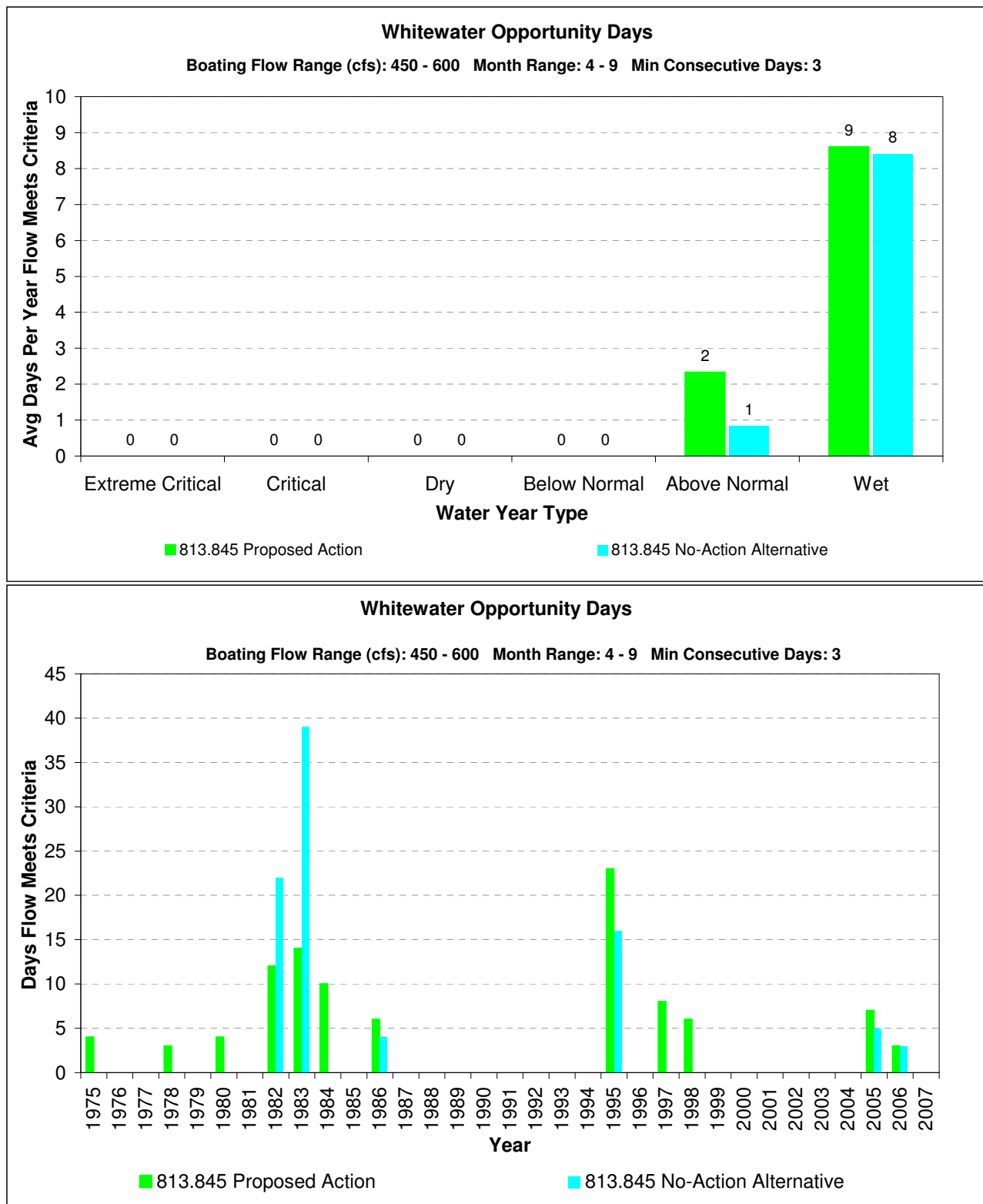
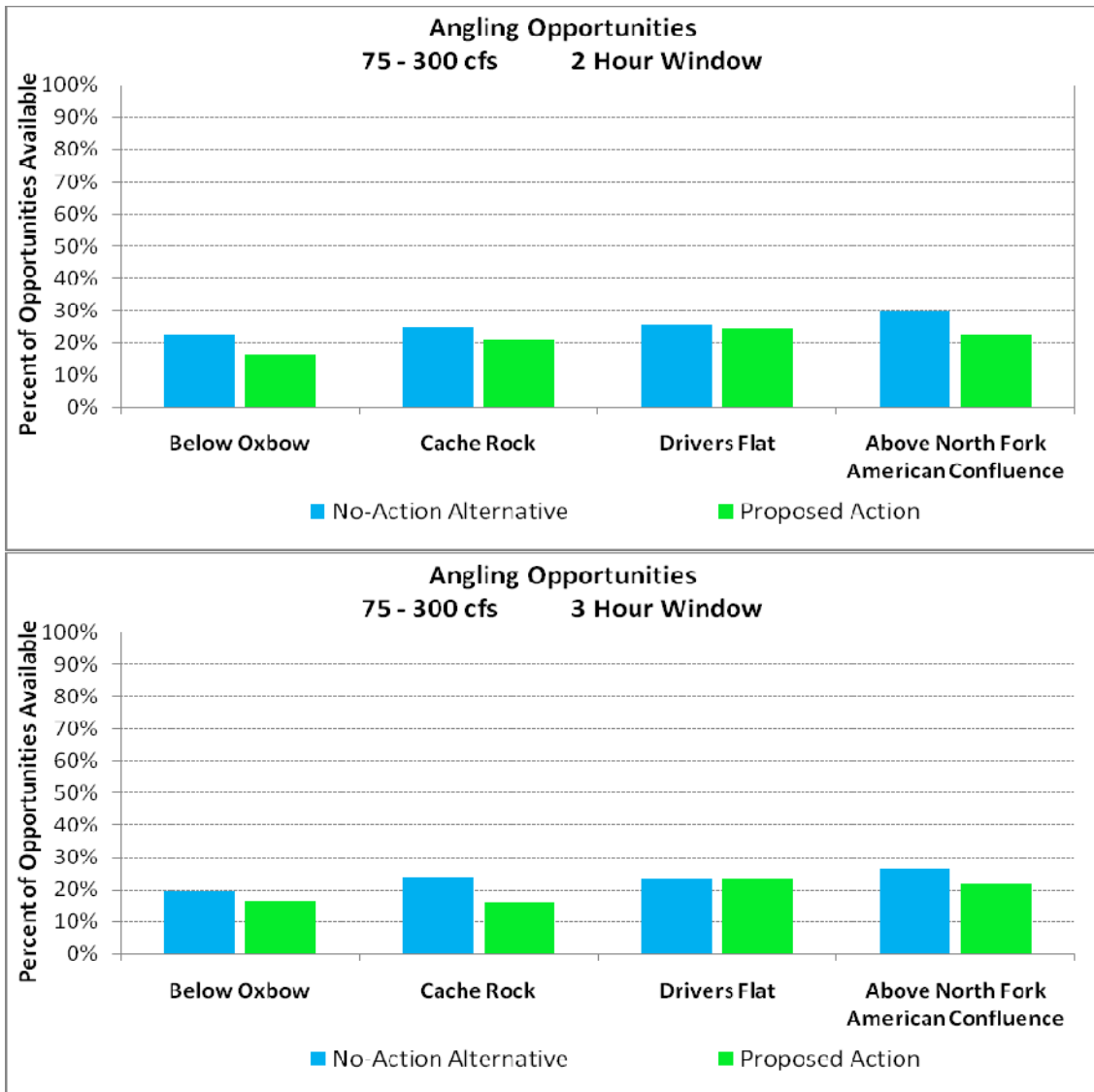
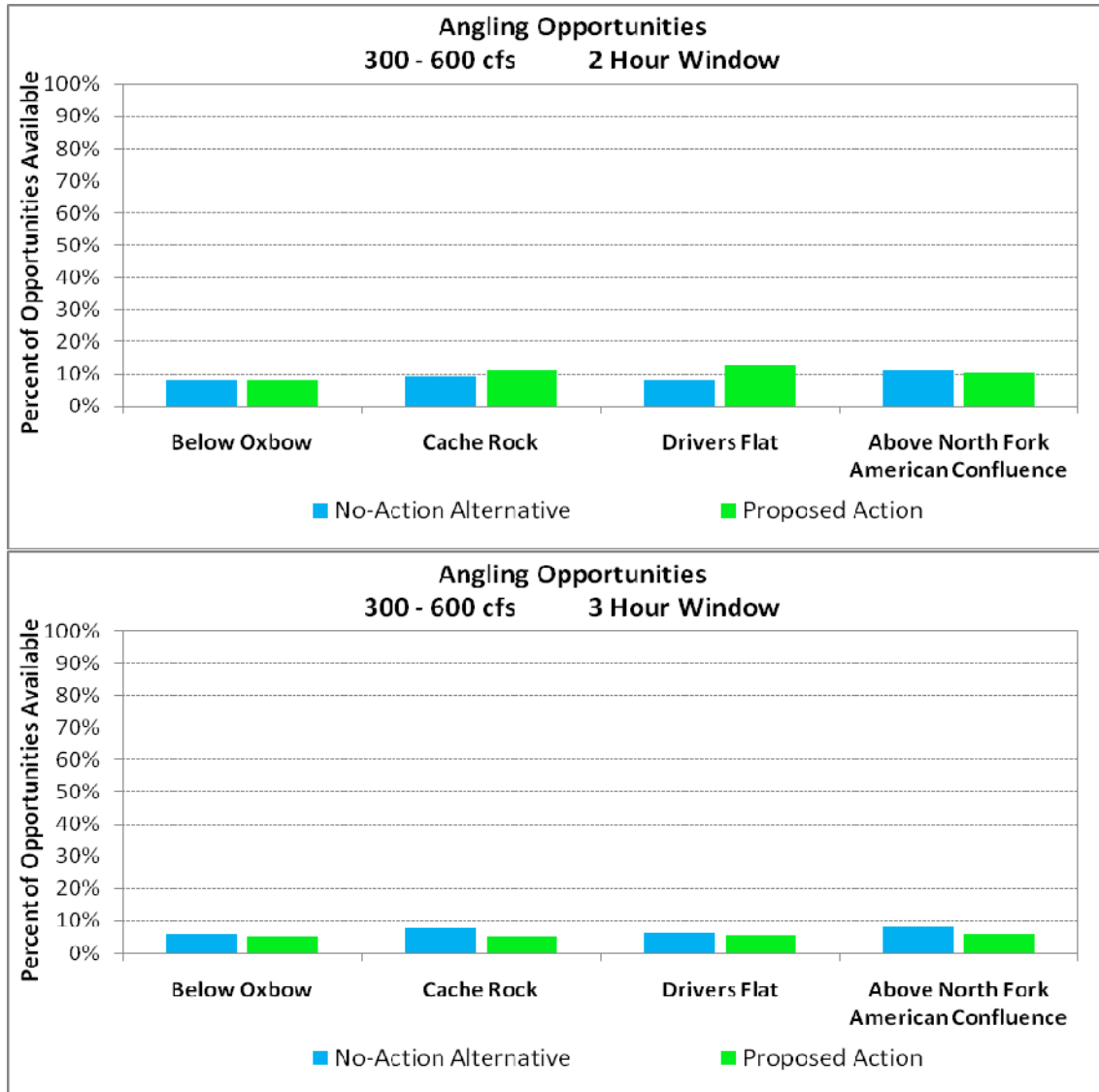


Figure 8.9-2a. Angling Opportunities¹ at Select Locations in the Peaking Reach (300–600 cfs).



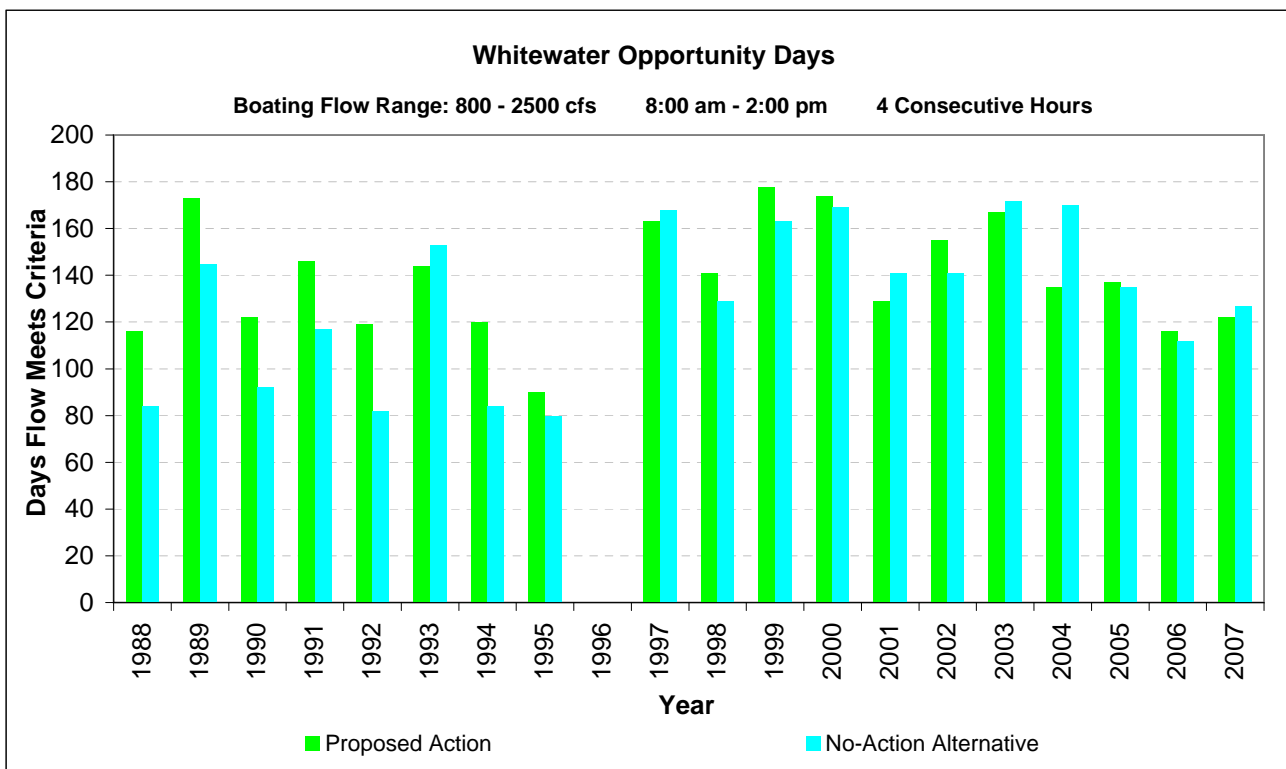
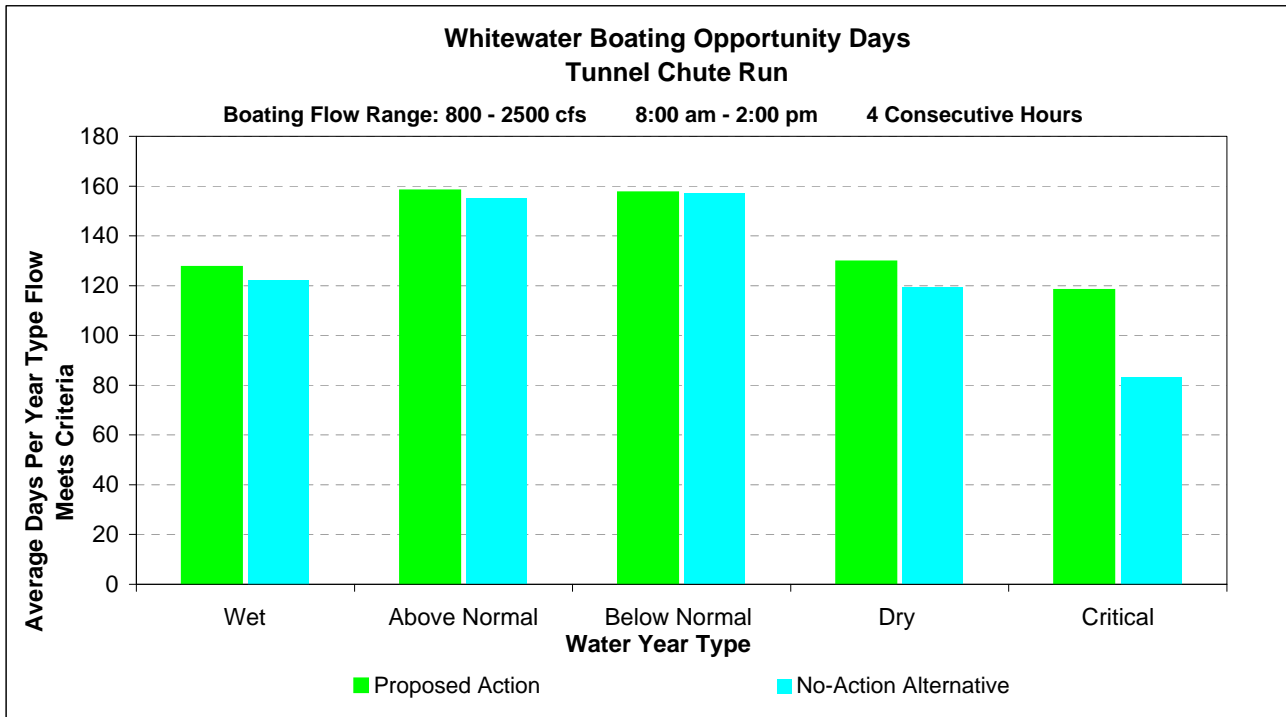
¹Time Period for analysis = Sunrise - 11 AM and 3 PM - Sunset, adjusted as appropriate by month.

Figure 8.9-2b. Angling Opportunities¹ at Select Locations in the Peaking Reach (75–300 cfs).



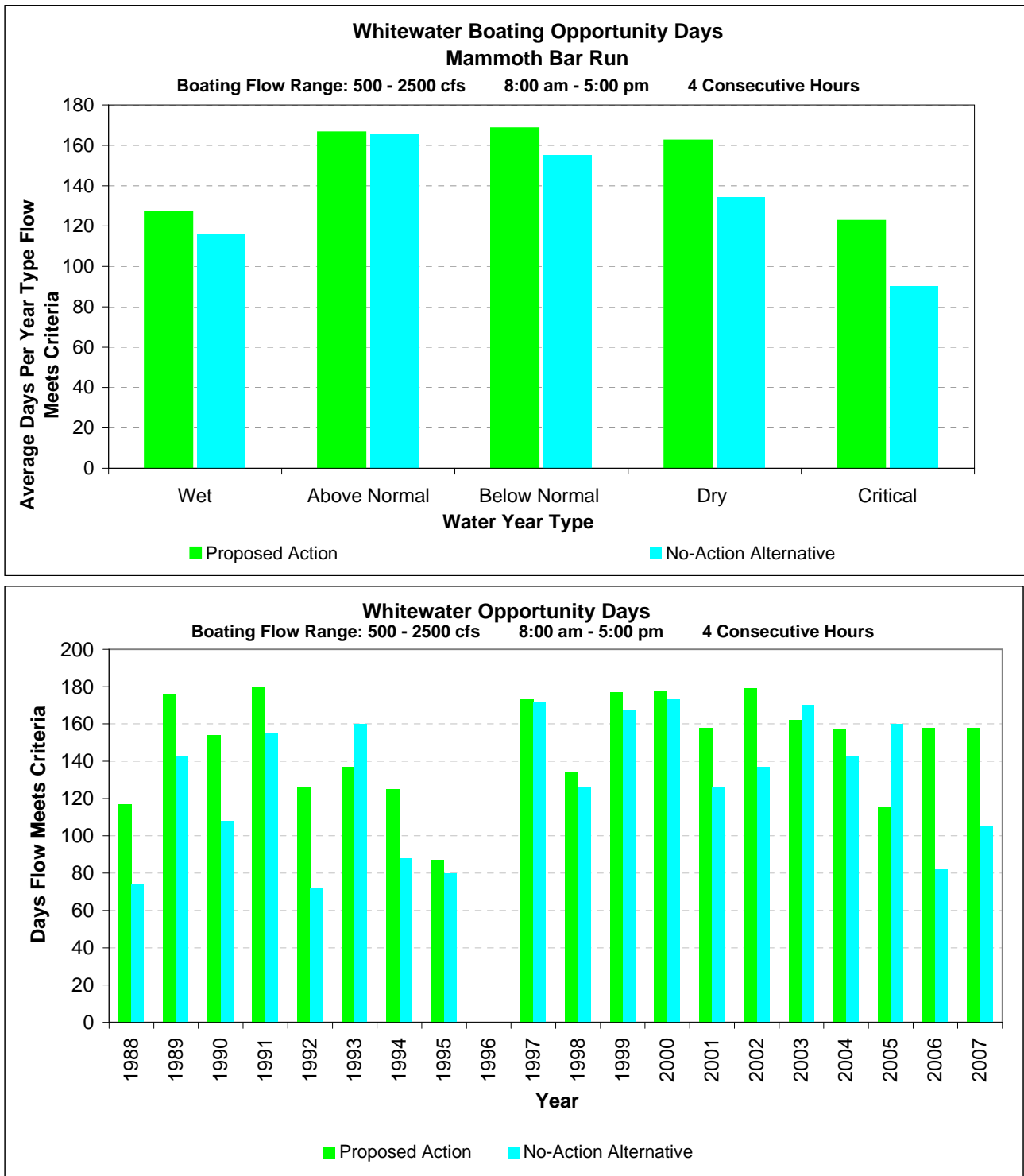
¹Opportunities = Sunrise - 11 am, 3 pm - Sunset

Figure 8.9-3a. 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)



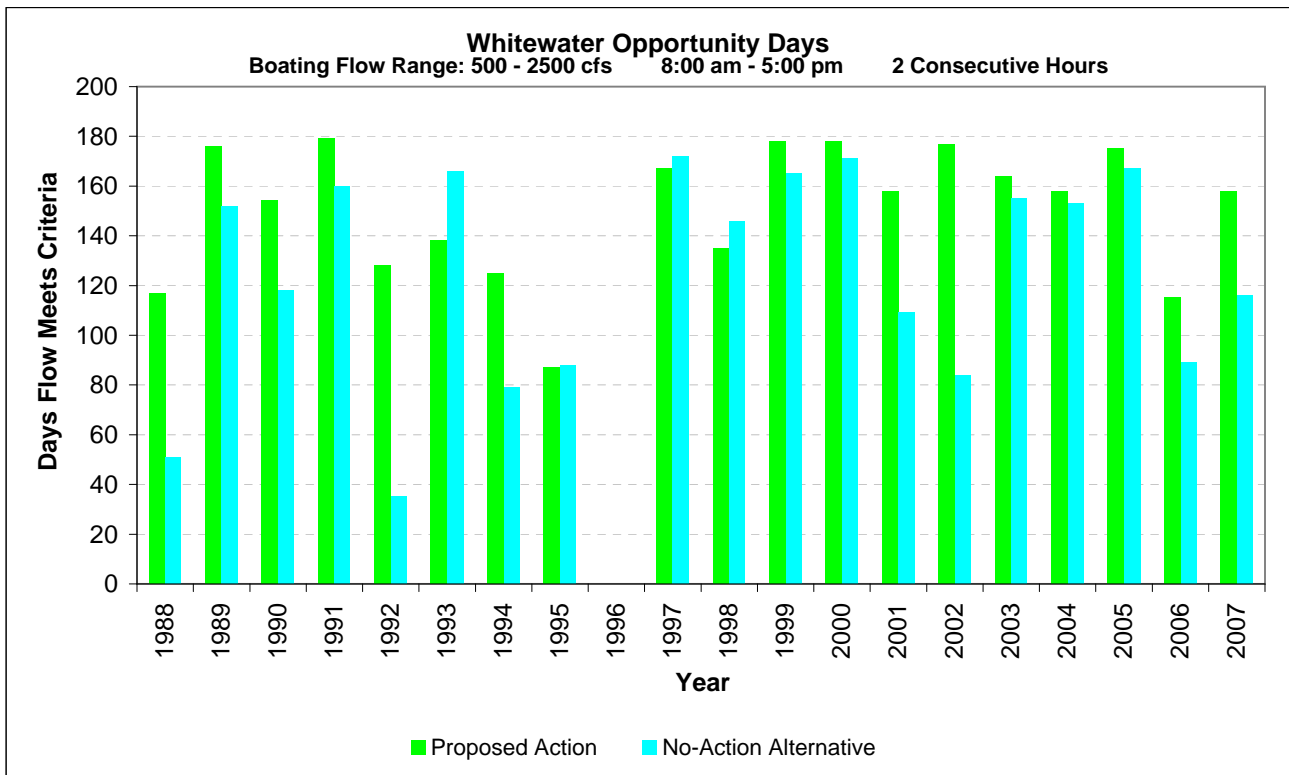
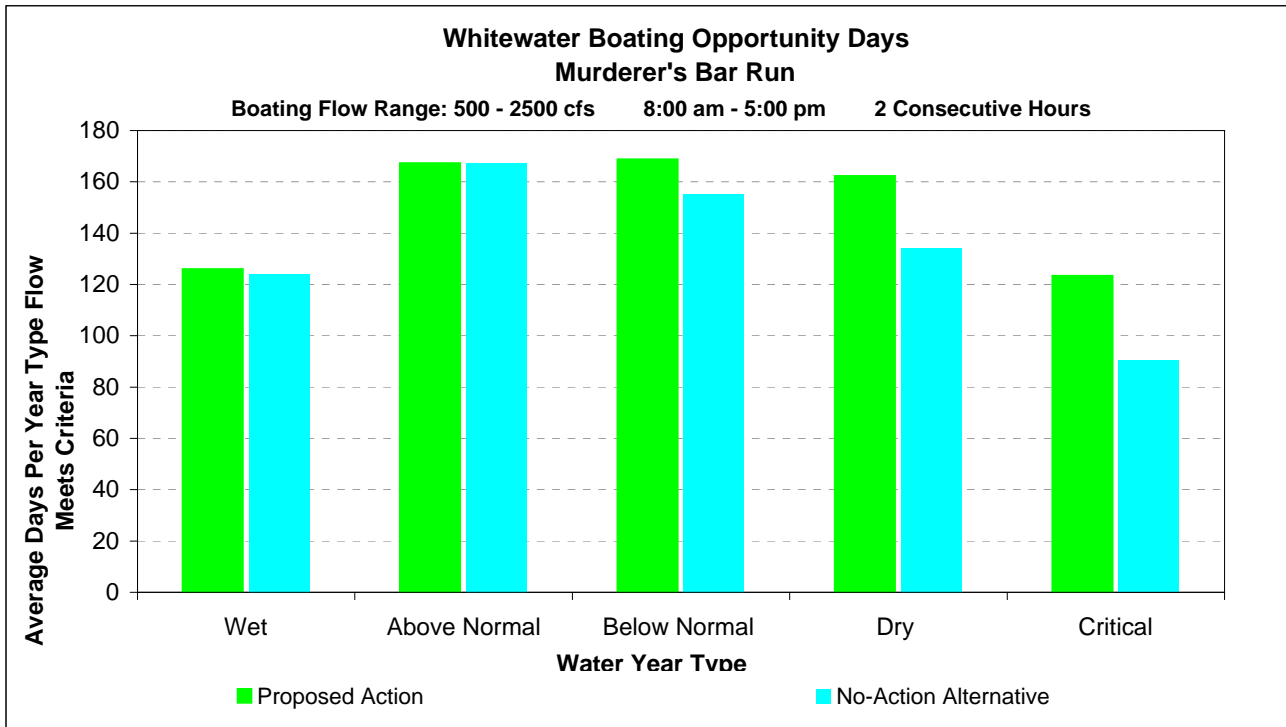
Note: No data is available for 1996.

Figure 8.9-3b. 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)



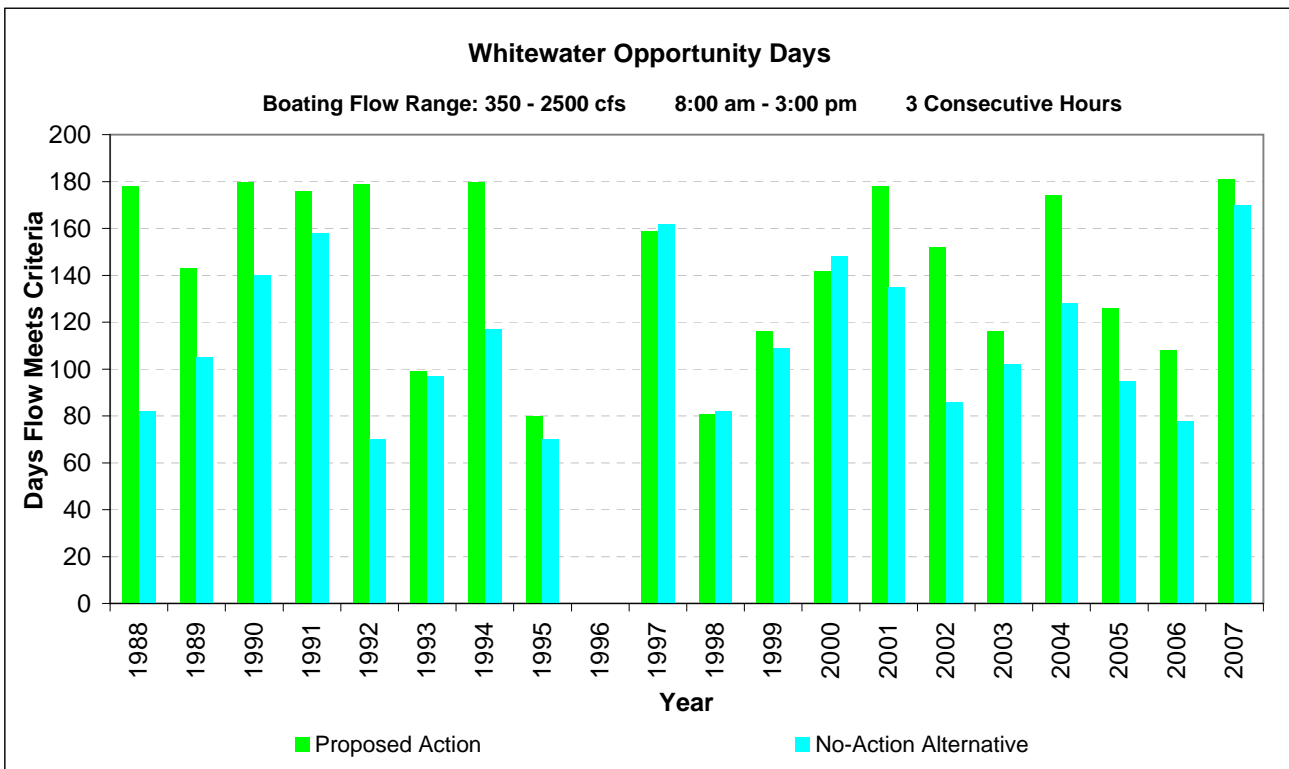
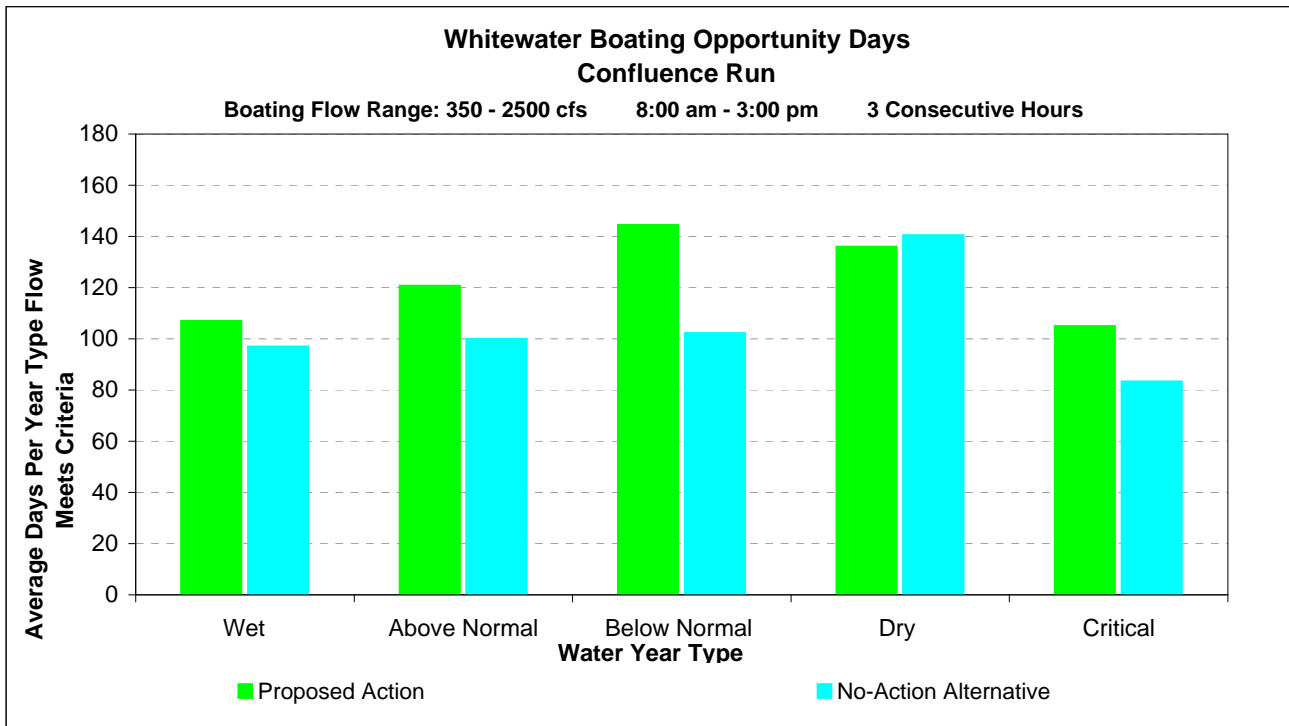
Note: No data is available for 1996.

**Figure 8.9-3c. 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)**



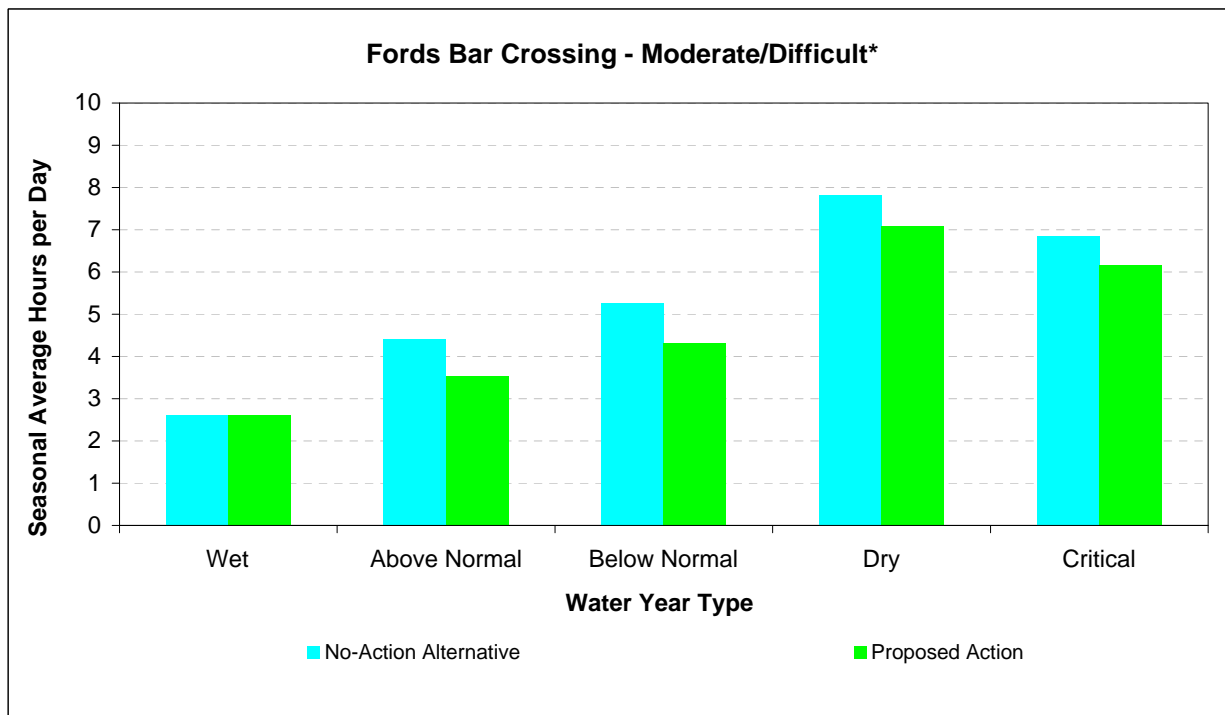
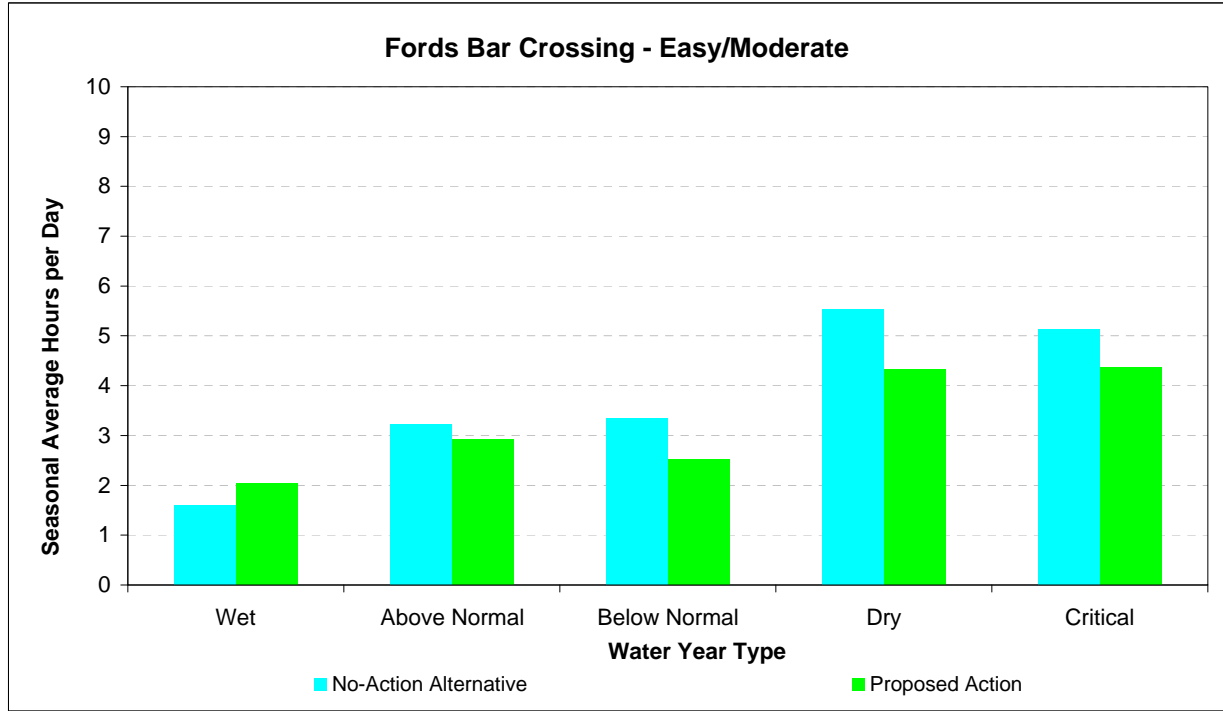
Note: No data is available for 1996.

**Figure 8.9-3d. 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)**



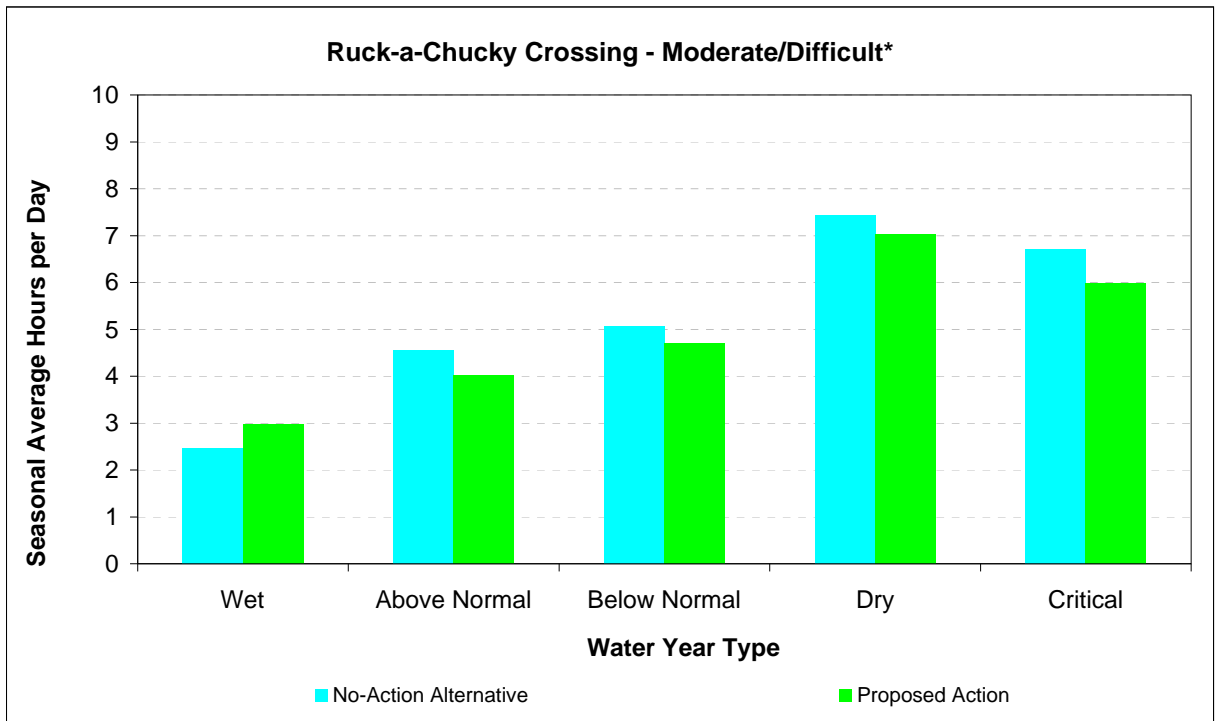
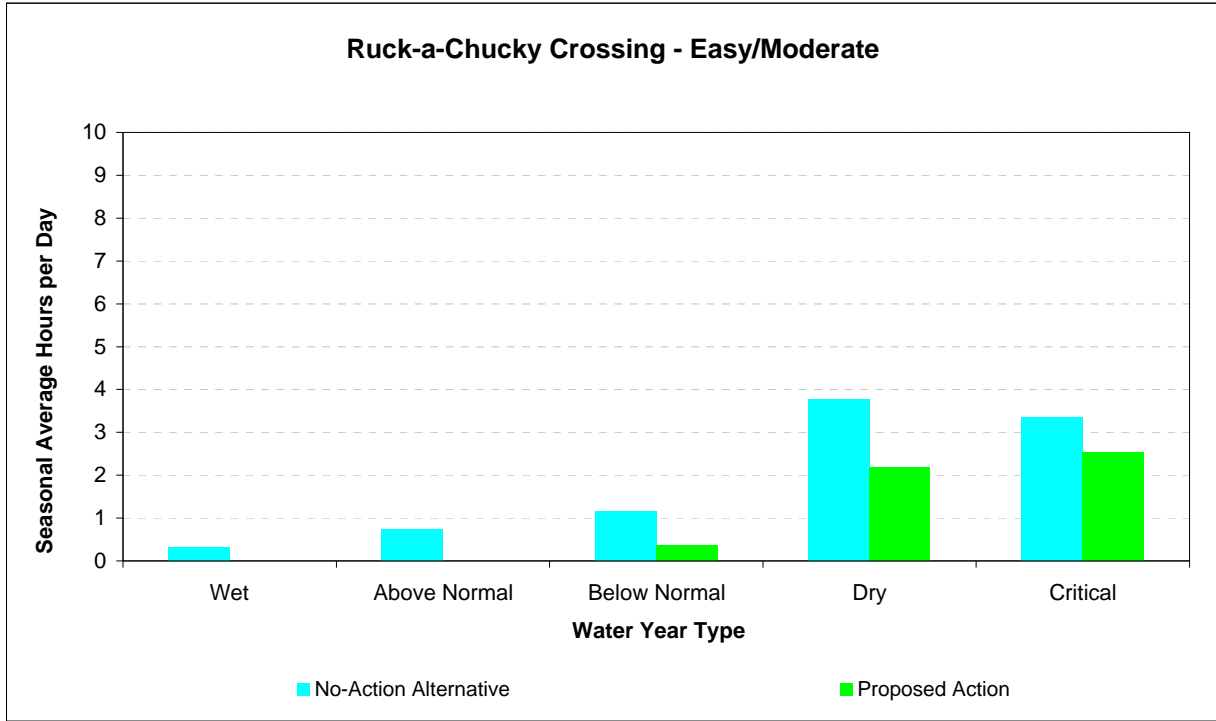
Note: No data is available for 1996.

Figure 8.9-4a. 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

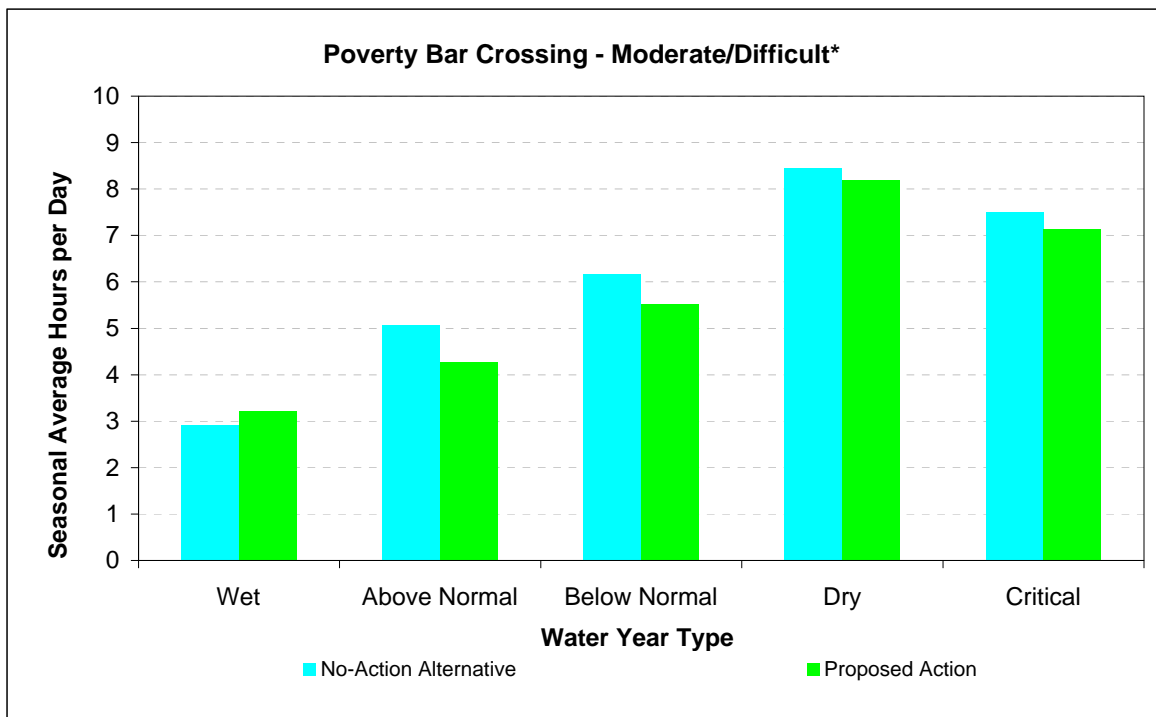
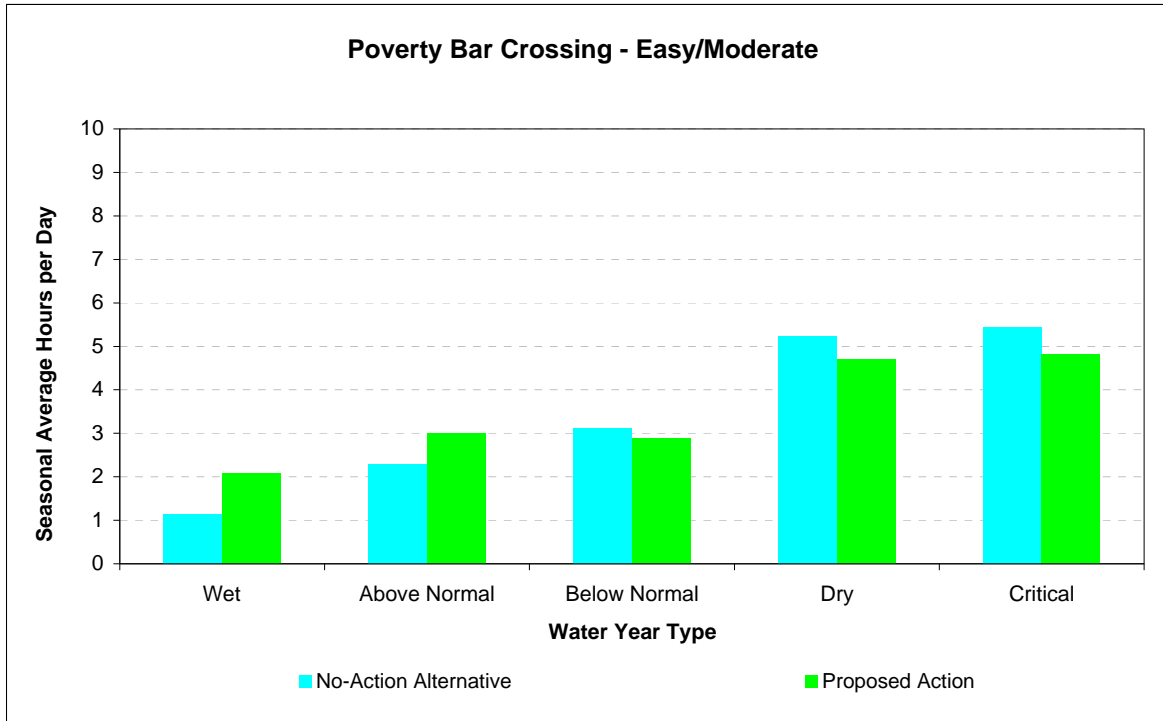
Figure 8.9-4b. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type. Ruck-a-Chucky Crossing



*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

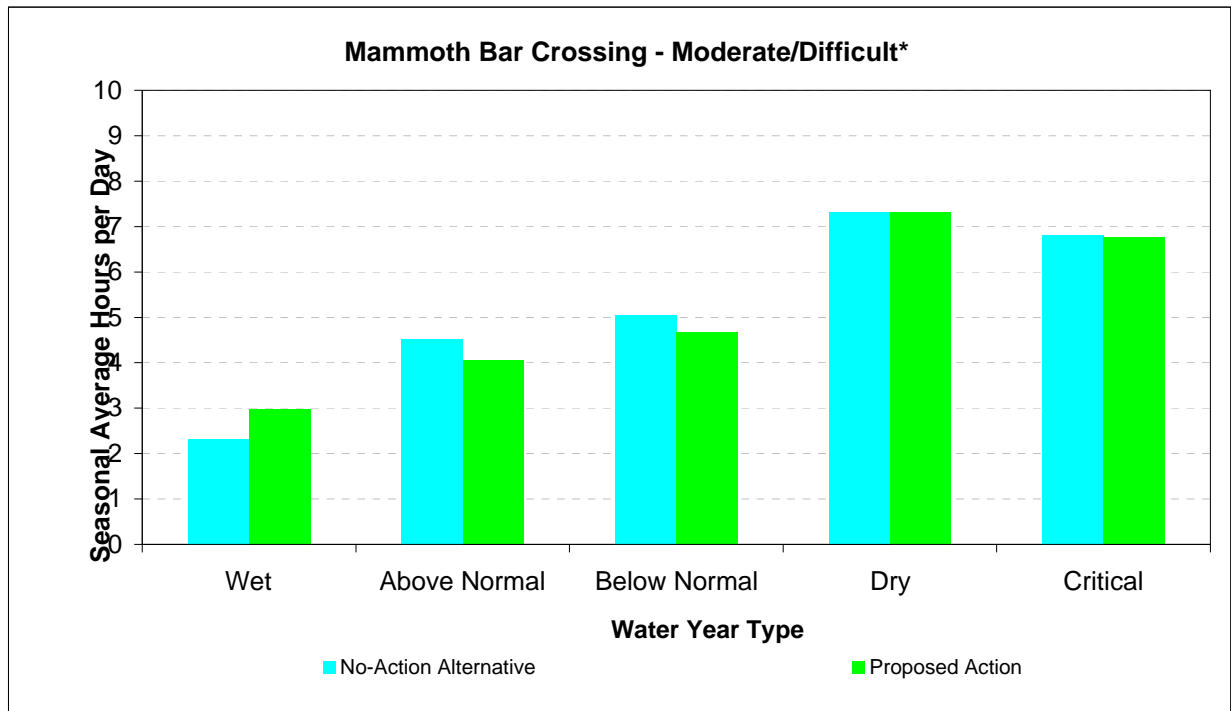
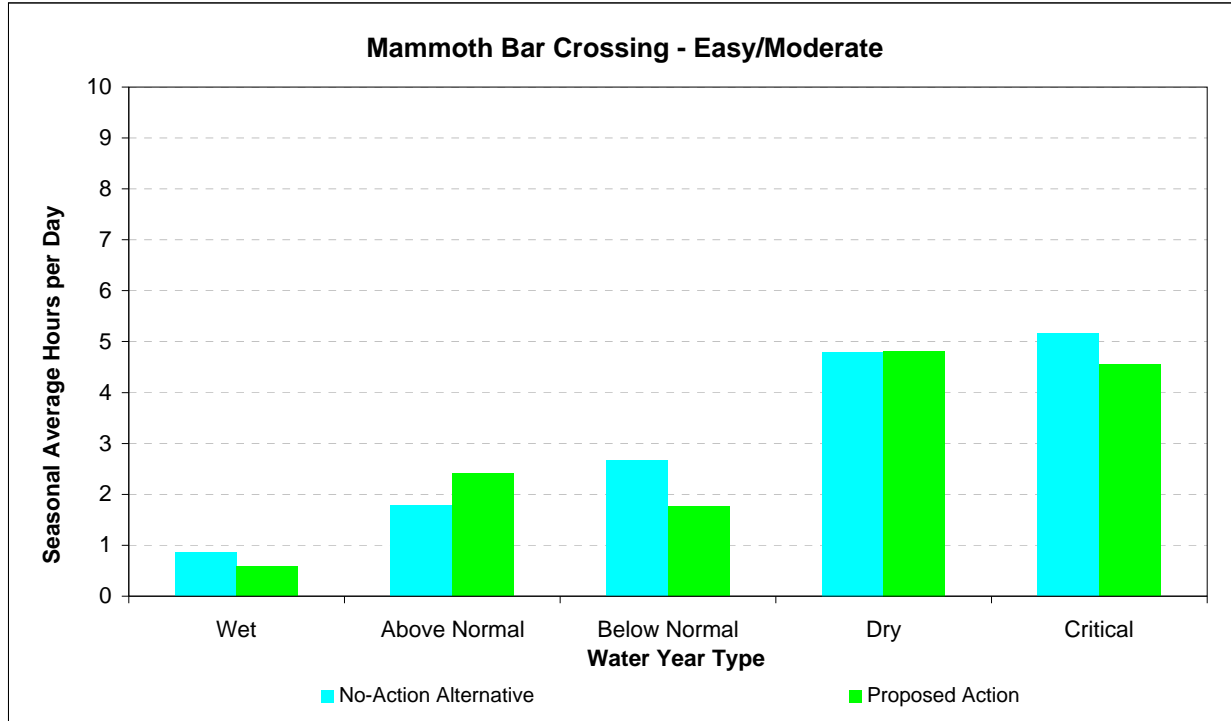
Figure 8.9-4c. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type.

Poverty Bar Crossing



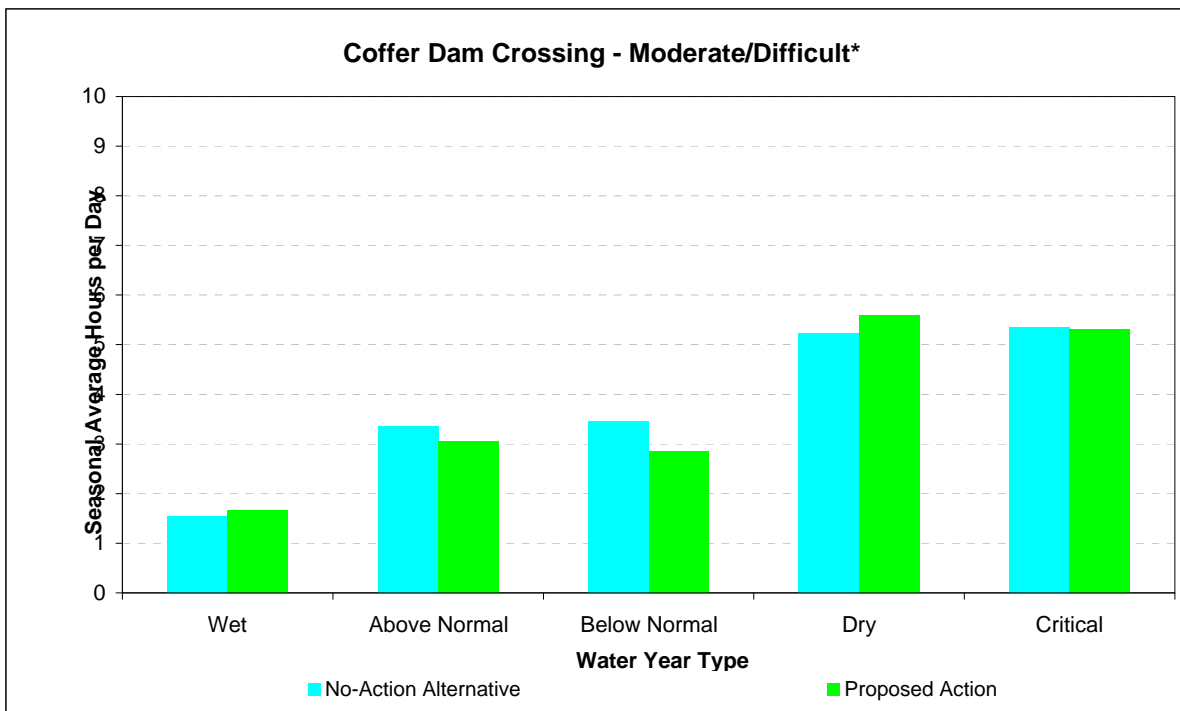
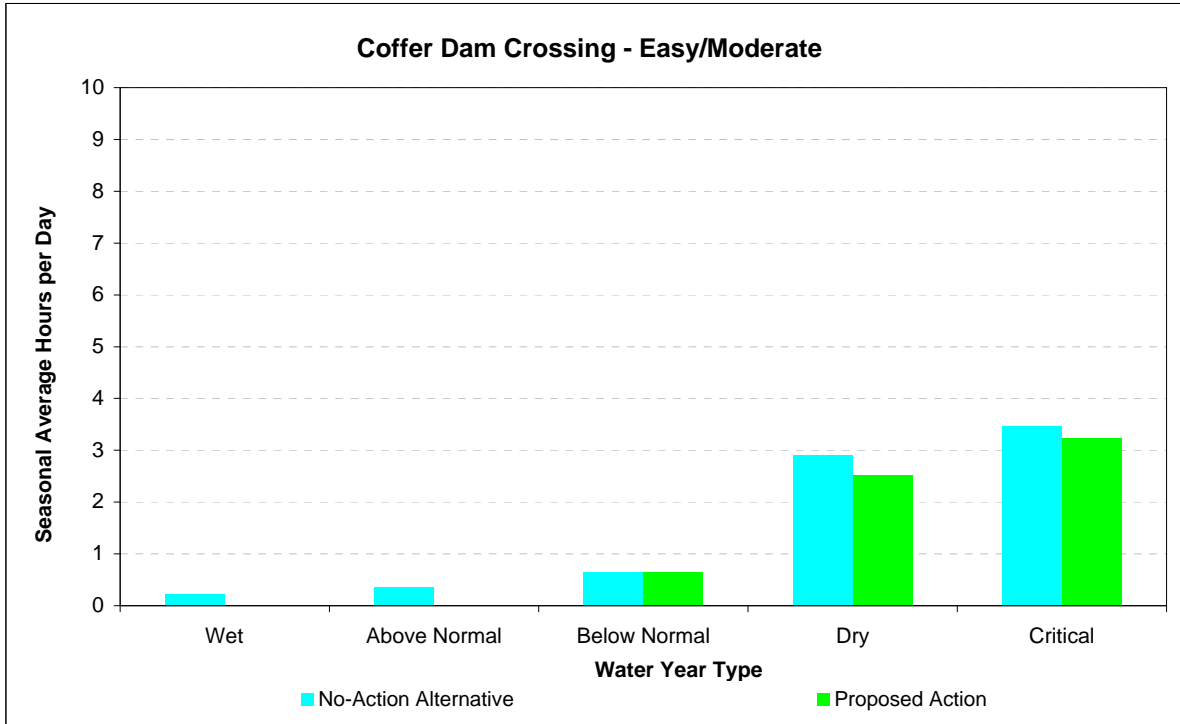
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 8.9-4d. 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



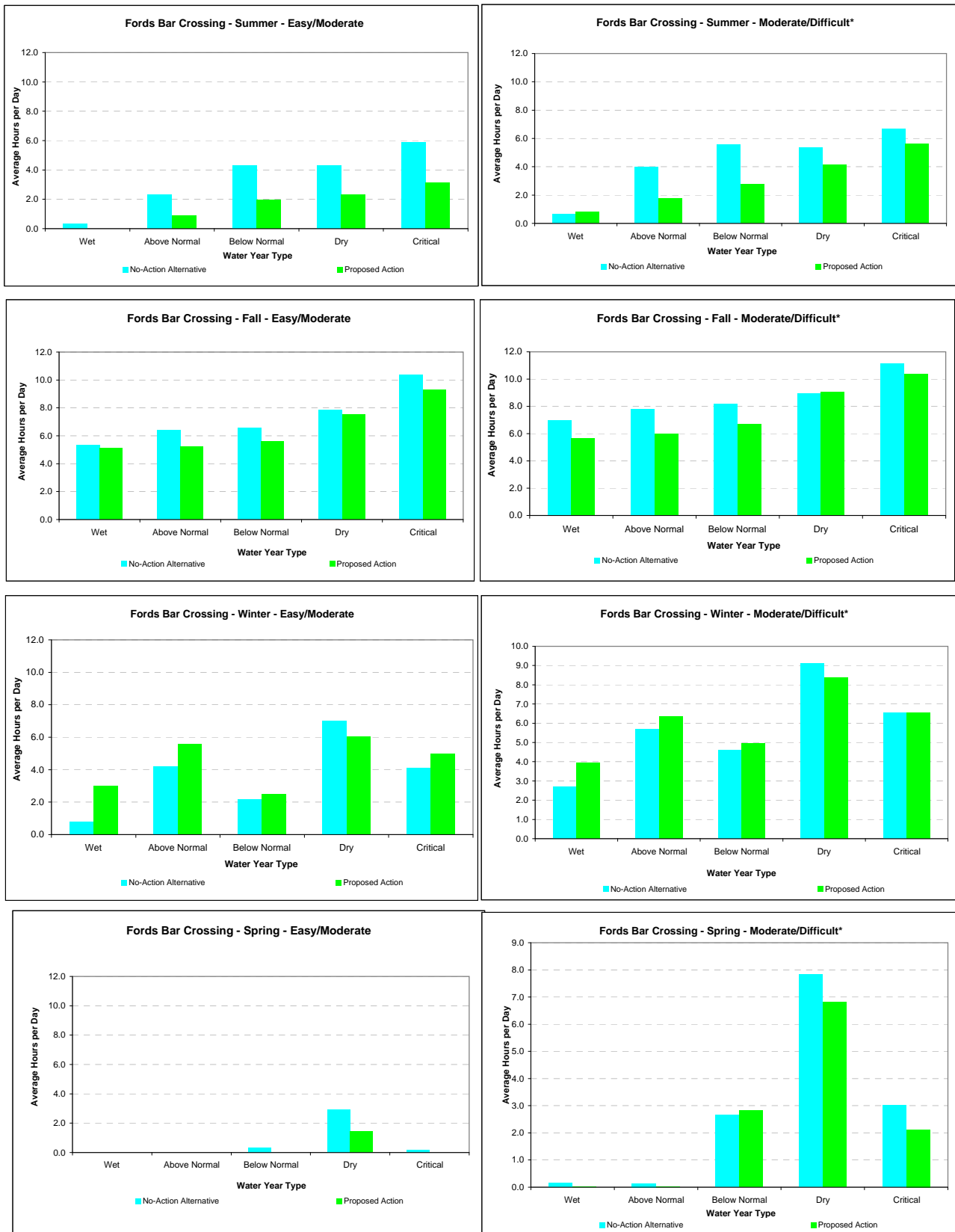
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 8.9-4e. Average Number of Easy/Moderate Trail Crossing Opportunities (top) and Moderate/Difficult Trail Crossing Opportunities (bottom) per Year by Water Year Type. Coffe Dam Crossing



*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 8.9-5a. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Fords Bar Crossing



*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 8.9-5b. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Ruck-a-Chucky Crossing

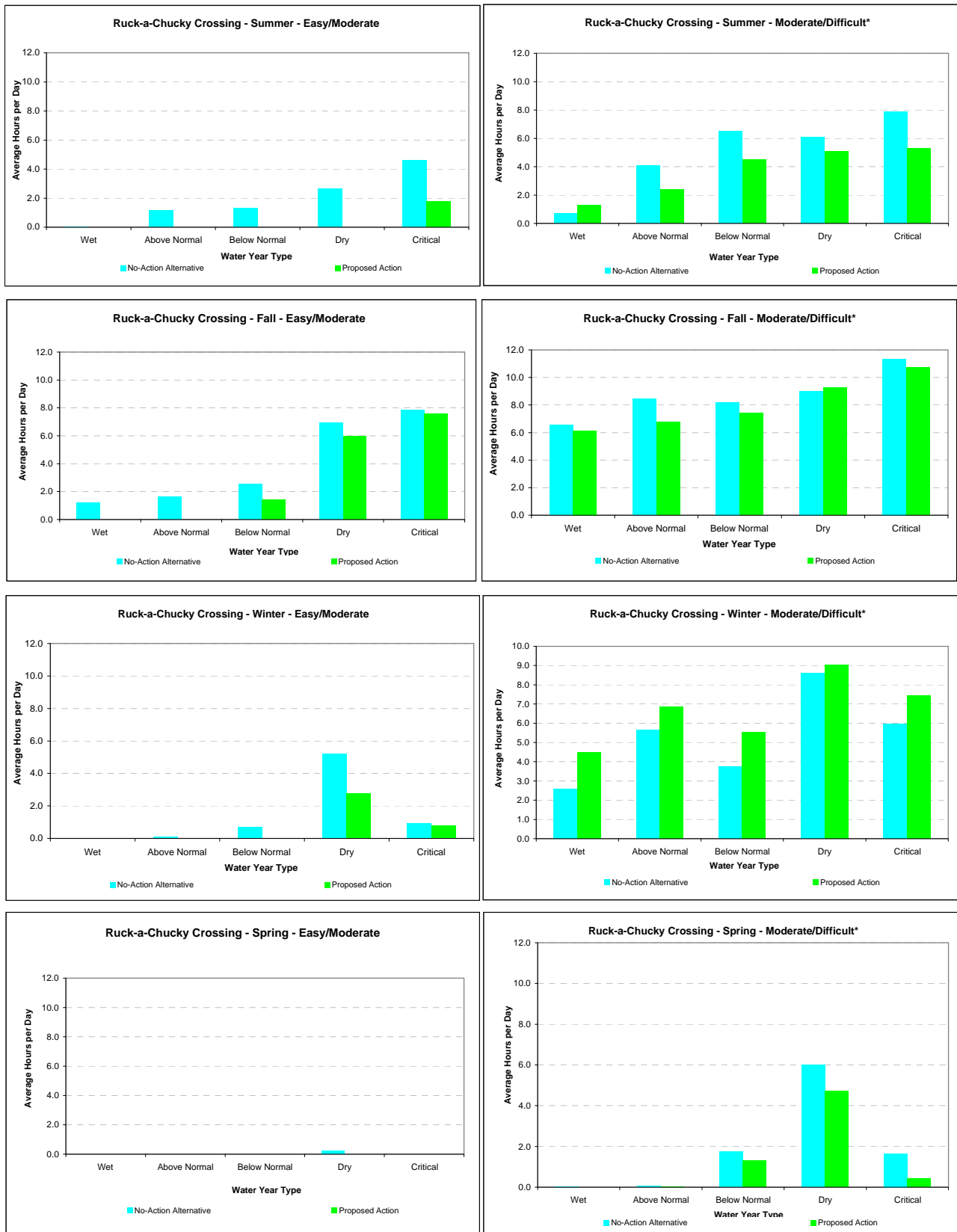
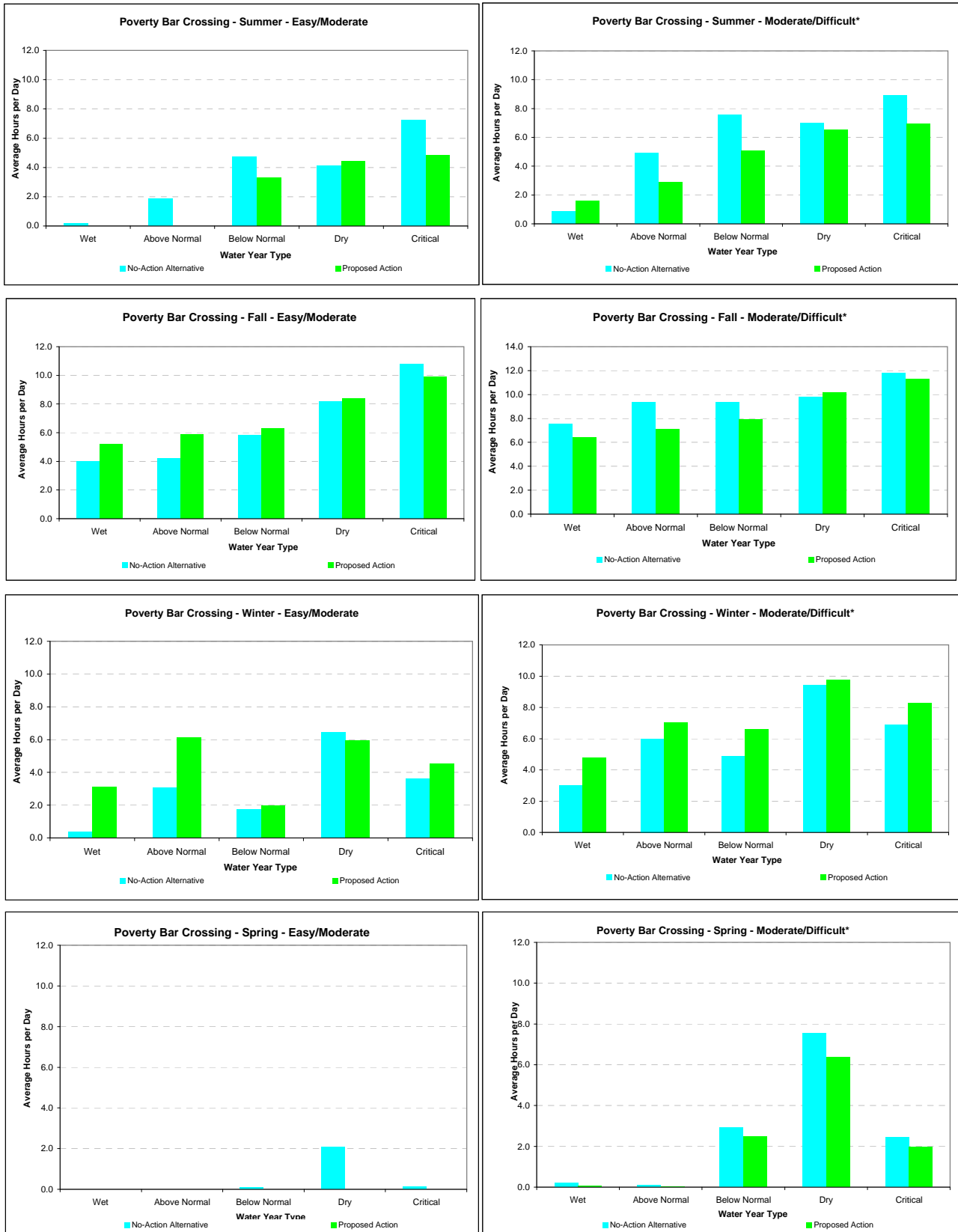
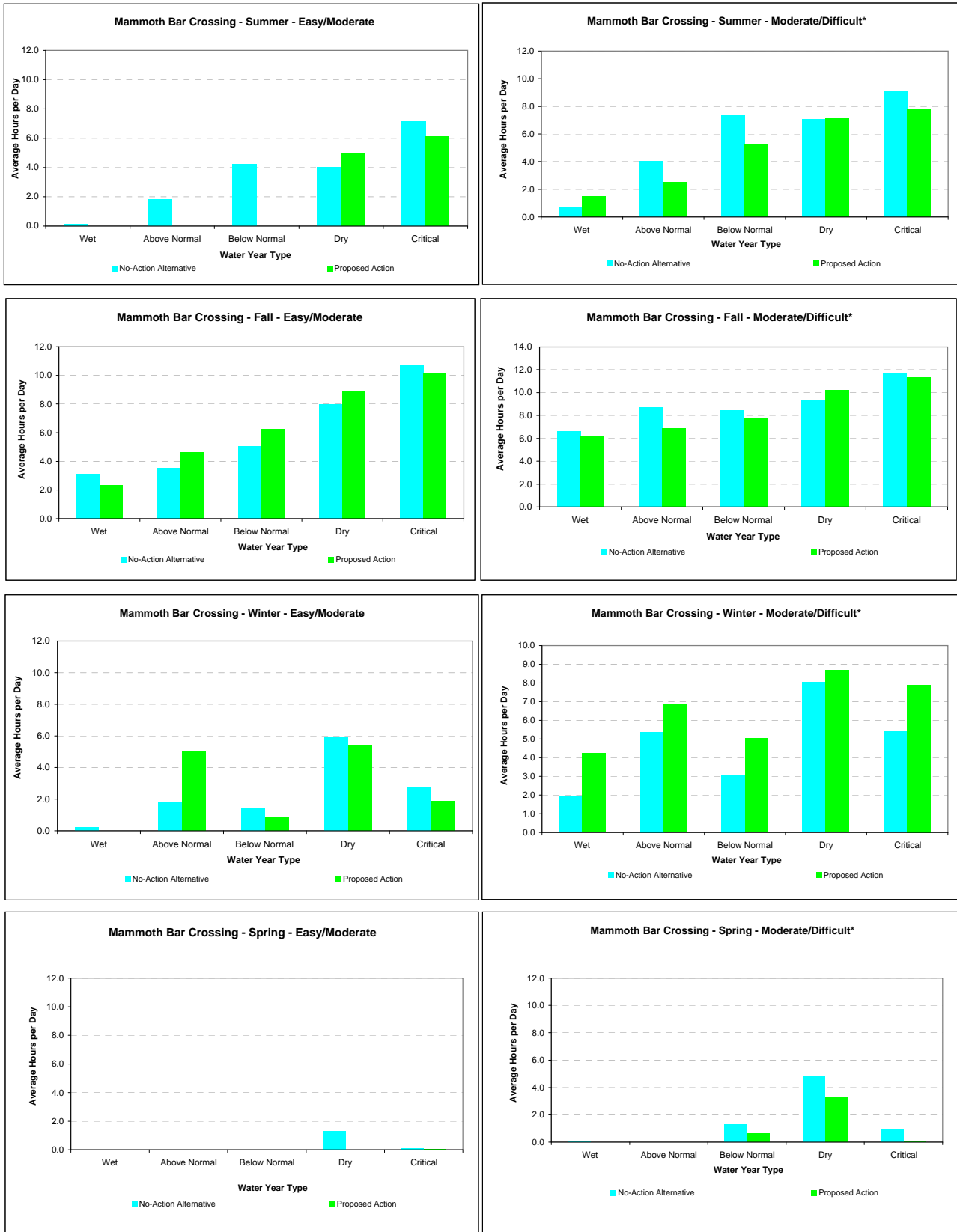


Figure 8.9-5c. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Poverty Bar Crossing



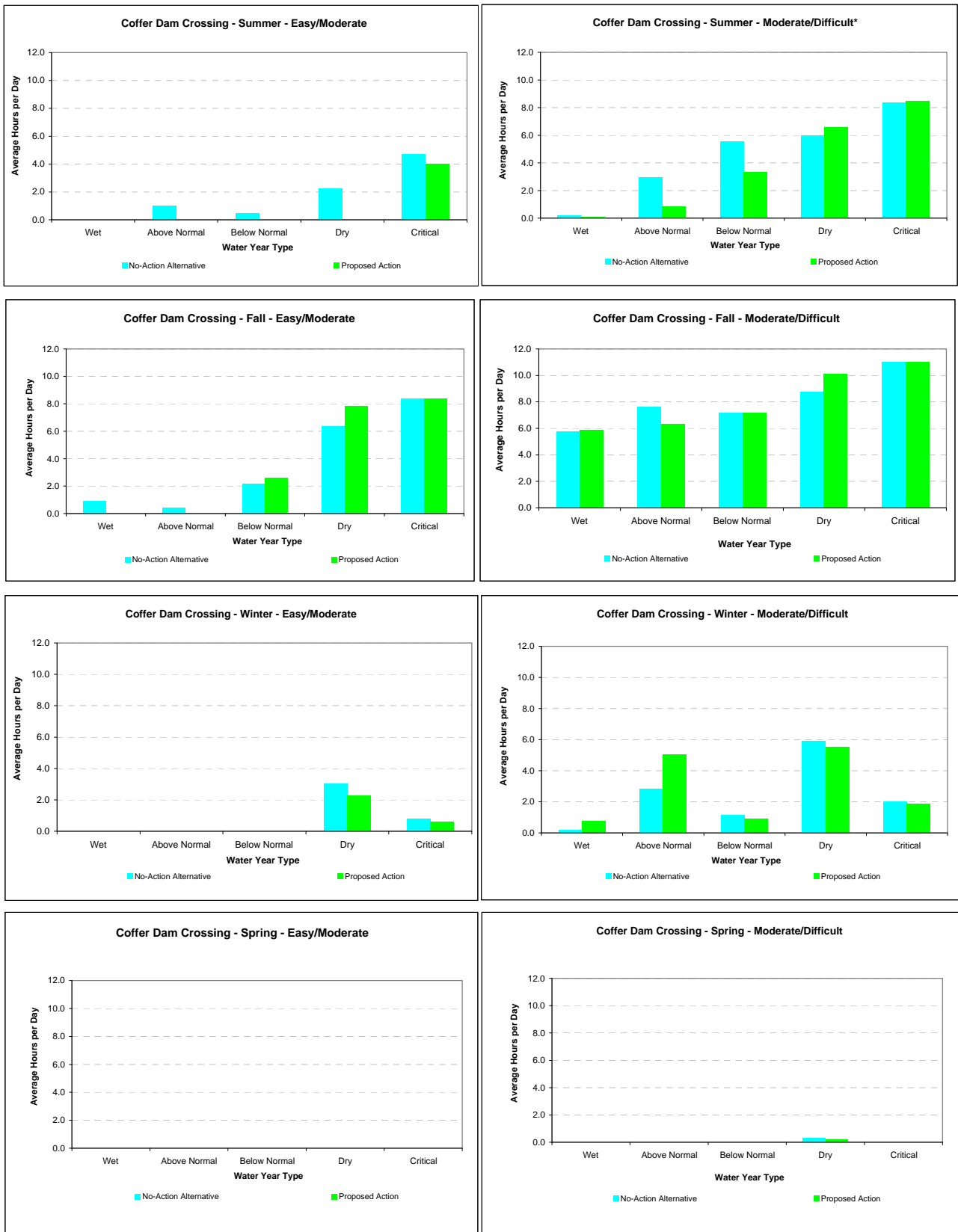
*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 8.9-5d. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Mammoth Bar Crossing



*Moderate/Difficult includes Easy/Moderate Crossing Opportunities

Figure 8.9-5e. Average Number of Trail Crossing Opportunities by Water Year Type and Season.
Coffer Dam Crossing



*Moderate/Difficult includes Easy/Moderate Crossing Opportunities