INTERIM
TECHNICAL MEMORANDUM 8-2

Recreation Flow Study

Yuba River Development Project
FERC Project No. 2246

October 2012

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EXECUTIVE SUMMARY

From 2010 through 2012, Yuba County Water Agency (YCWA or Licensee) gathered information on whitewater boating and angling in stream reaches potentially affected by YCWA's Yuba River Development Project (Project). The primary goals of the study were to: 1) determine acceptable whitewater boating opportunities consistent with demand on river reaches; 2) determine anglers' preferences (e.g., flow, location and type of fishing); and 3) be consistent with the needs of the area, the primary purposes or ability of the Project, and other resource management plans.

For the purpose of the whitewater boating and angling component of the study, the study area included three study reaches:

- The 7.5-mile long portion of the Middle Yuba River from Our House Diversion Dam downstream to the Highway 49 Bridge
- The 12.0-mile long portion of the Middle Yuba River and Yuba River from the Highway 49 Bridge downstream to the normal maximum water surface elevation of the United States Army Corps of Engineers' Englebright Reservoir
- The 4.1-mile long portion of Oregon Creek from Log Cabin Diversion Dam downstream to the confluence with the Middle Yuba River

Of the three study reaches, YCWA has completed the data collection for one of the reaches: Middle Yuba River from Our House Diversion Dam to the Highway 49 Bridge. YCWA, with agreement of Relicensing Participants, removed the reach on Oregon Creek from Log Cabin Diversion Dam to the Middle Yuba River from the study. YCWA and American Whitewater determined the reach had several key factors that resulted in the reach not being a desirable whitewater boating opportunity. These issues included:

- Relatively low reach gradient at 2.3 percent with few observable whitewater challenges/characteristics
- Restricted river channel primarily due to heavily overgrown riparian vegetation, particularly along the upper portion of the reach, particularly at the top end near Log Cabin Diversion Dam
- Flow limitations due to the drainage and existing Project operations of the reach
- Lack of demand by whitewater boaters

Due to water/flow conditions beyond YCWA's control, YCWA was not able to collect any data on the Middle Yuba River and Yuba River from Highway 49 Bridge downstream to Englebright Reservoir in 2012. These data will be collected in 2013.

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For the Middle Yuba River from Our House Diversion Dam to the Highway 49 Bridge, YCWA received 45 completed boater surveys at 12 different flow levels ranging from 350 cubic feet per second (cfs) to 2,200 cfs. Based on this data and the comparative focus group following each run, YCWA determined the general boatable flow ranges by type of watercraft ranged from 360 cfs to 3,000 cfs; whereas optimal flows ranged between 500 and 2,500 cfs. Boaters indicated a local demand for this reach, which offers high quality boating, comparatively better than the Chamberlin Falls run on the North Fork of the American River.

In addition, the North Yuba River whitewater boating reach above New Bullards Bar Reservoir from Indian Valley downstream to New Bullards Bar Reservoir was included in the study area for the sole purpose of identifying the take-out patterns, issues, and levels of use via a focus group. Note that this reach is not a Project-affected river reach as YCWA does not have any Project control over the flows in this study reach.

Based on the data gathered at the focus group on July 18, 2012, the primary boating constraint in this reach is the amount of time for a tow-out from the end of the run, which was estimated at 2 hours. Options discussed included: 1) providing low cost tow-out option for private boaters; and 2) providing road access near the inflow of the North Yuba River to New Bullards Bar Reservoir. However, even focus group participants indicated that the road option is problematic due to cost (i.e., private land ownership and steep, rugged terrain).

For the angling component of this study, YCWA conducted a large focus group on July 18, 2012 in Grass Valley, California. Angling focus group participants indicated the angling use on the study reaches was limited because of restricted public access to a few locations due to private land ownership.

The focus group expressed interest in a non-study reach: Yuba River downstream of Englebright Dam. They said this reach offers year-round angling opportunities for a variety of angling methods, has good public access, and provides an excellent fishing opportunity for drift boats to shore anglers.

The study was conducted according to Federal Energy Regulatory Commission (FERC)-approved-Study 8.2, Recreation Flow, with two variances. First, the FERC-approved study stated that YCWA would estimate the average annual number of angling usable days that occur based on With-Project and Without-Project hydrology for the study reaches with angling demand based on acceptable angling flow ranges as determined by angler focus group participants. However, the angling focus group participants were not able to provide specific acceptable flow ranges necessary for YCWA to compare flows to the hydrology. Second, the FERC-approved study required comparing “regulated” and “unimpaired” hydrology. YCWA used “With-Project” and “Without-Project” hydrology, instead, due to the influence of hydroelectric and water supply projects upstream on the North Yuba, Middle Yuba and South Yuba rivers, so that unimpaired hydrology is not the appropriate baseline for an analysis of the effects of YCWA’s Project.

This study is on schedule for completion by the end of September 2013. YCWA has the following one remaining study task to complete before all study elements are done:

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- At Our House Diversion Dam, in 2013 YCWA will mechanically operate the slide gate that controls the flows that enter the Lohman Ridge Diversion Tunnel to augment the flows below Our House Diversion Dam in order to meet the necessary target flow ranges for the Highway 49 to Englebright Reservoir study reach that were not accomplished by opportunistic flows in 2012. This option will be implemented only during the descending limb of the hydrograph in spring 2013. Mechanically operating the gate is a crude means of controlling the flow below Our House Diversion Dam (completely open or closed) and YCWA will make a good faith effort to operate the gate to aim for a target flow range.

YCWA will include the results of this effort in the final technical memorandum.

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RECREATION FLOW[1]

Yuba County Water Agency's (YCWA or Licensee) continued operation and maintenance of the Yuba River Development Project (YRDP), Federal Energy Regulatory Commission (FERC) Project Number 2246 (Project) may potentially affect whitewater boating and angling opportunities in stream reaches downstream of the Project.

1.0 Goals and Objectives

The goals of the study were to determine if Project operations can provide whitewater boating and angling opportunities consistent with: 1) the needs of the area; 2) the primary purposes and ability of the Project; and 3) applicable resource management plans.

The study objectives were to: 1) determine the acceptable flow ranges for whitewater boating using opportunistic flows; 2) determine the number of flow days by month in the acceptable flow range for whitewater boating opportunities (e.g. rafting and kayaking) under current Project operations and under With-Project and Without-Project[2] flows; 3) determine popular locations where anglers fish, the flows at which they fish, the type of fishing (e.g., wading or bank), and the number of useable days under existing Project conditions; and 4) examine the feasibility of developing real-time flow data for Project-affected stream reaches.

2.0 Methods and Analysis

The study was divided into three elements: 1) whitewater boating in the Middle Yuba River and Oregon Creek; 2) whitewater boating take-out upstream of New Bullards Bar Reservoir; and 3) angling. The methods used in each study element are discussed below.

2.1 Whitewater Boating in Middle Yuba River and Oregon Creek Element

The whitewater boating methods consisted of four steps: 1) identify study area; 2) conduct an opportunistic flow study; 3) compare regulated and unimpaired whitewater boating opportunities; and 4) describe existing or potential whitewater boating opportunities. Each of these steps is discussed below.

[1] This technical memorandum presents the results for Study 8.2, Recreation Flow, which was included in YCWA's September 8, 2011 Revised Study Plan for Relicensing of the Yuba River Development Project, and was approved by FERC in its September 30, 2011 Study Plan Determination. There were no modifications to Study 8.2 subsequent to FERC's September 30, 2011 Study Determination.

[2] Without-Project flow refers to flows that might exist without Project operations; that is, all existing water projects in the Yuba River basin operate as they currently operate, but the Yuba River Development Project facilities are not in place and the Project does not operate.

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2.1.1 Study Area

The study area (see Figure 2.1-1) for this element included three reaches:

- The 7.5-mile long portion of the Middle Yuba River from Our House Diversion Dam (River Mile, or RM, 12.0) to the Highway 49 Bridge (RM 4.5)
- The 12.0-mile long portion of the Middle Yuba River and Yuba River from the Highway 49 Bridge (RM 4.5) to the normal maximum water surface elevation (NMWSE) of the United States Army Corps of Engineers' Englebright Reservoir (RM 32.2 on the Yuba River)
- The 4.1-mile long portion of Oregon Creek from Log Cabin Diversion Dam (RM 4.1) to the confluence with the Middle Yuba River (RM 0.0)

Note: Subsequent to FERC's approval of the study, YCWA and American Whitewater (AW) determined Oregon Creek from Log Cabin Diversion Dam to the confluence with the Middle Yuba River did not have any significant whitewater boating potential. Therefore, for the purpose of the whitewater boating element of the study, this reach was eliminated from analysis. Photographs of the reach are included in Attachment 8-2B.

2.1.2 Opportunistic Flow

YCWA, in consultation with Relicensing Participants including AW, identified a core team of boaters. The core team consisted of boaters with commensurate skill levels (e.g., Class IV+ boating skill levels or greater[3]) to boat the two whitewater boating reaches and users of an appropriate distribution of craft types (e.g., hardshell kayaks, inflatable kayaks, and rafts).

YCWA then provided to the core boating team and other Relicensing Participants weekly updates on the anticipated flows for the two whitewater boating study reaches during the 2011 Spring run-off period, which began in May 2011 and continued through the descending limb of the hydrograph into June 2011. YCWA provided the updates via a weekly conference call with any interested Relicensing Participants, which normally included AW at a minimum. The updates included all real-time flow information available at the time of the call and any trend information on projected opportunistic flow levels through the upcoming weekend. The updates were focused on the Middle Yuba River upstream and downstream of Our House Diversion Dam and on the North Yuba River below New Bullards Bar Dam, which is particularly important flow information for making a decision whether the Highway 49 to Englebright Reservoir reach was boatable. In order to attract boaters for the opportunistic flows, the flow information was

[3] AW considers Class IV rapids to be suitable for advanced boaters, and characterizes the rapids as: *"Intense, powerful but predictable rapids requiring precise boat handling in turbulent water. Depending on the character of the river, it may feature large, unavoidable waves and holes or constricted passages demanding fast maneuvers under pressure. A fast, reliable eddy turn may be needed to initiate maneuvers, scout rapids, or rest. Rapids may require "must" moves above dangerous hazards. Scouting may be necessary the first time down. Risk of injury to swimmers is moderate to high, and water conditions may make self-rescue difficult. Group assistance for rescue is often essential but requires practiced skills. A strong eskimo roll is highly recommended. Rapids that are at the lower or upper end of this difficulty range are designated "Class IV-" or "Class IV+" respectively."* (from AW's *Safety Code for American Whitewater* accessed on AW's Webpage on October 20, 2012)

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communicated through AW to other interested Relicensing Participants and posted on AW's website (http://www.americanwhitewater.org).

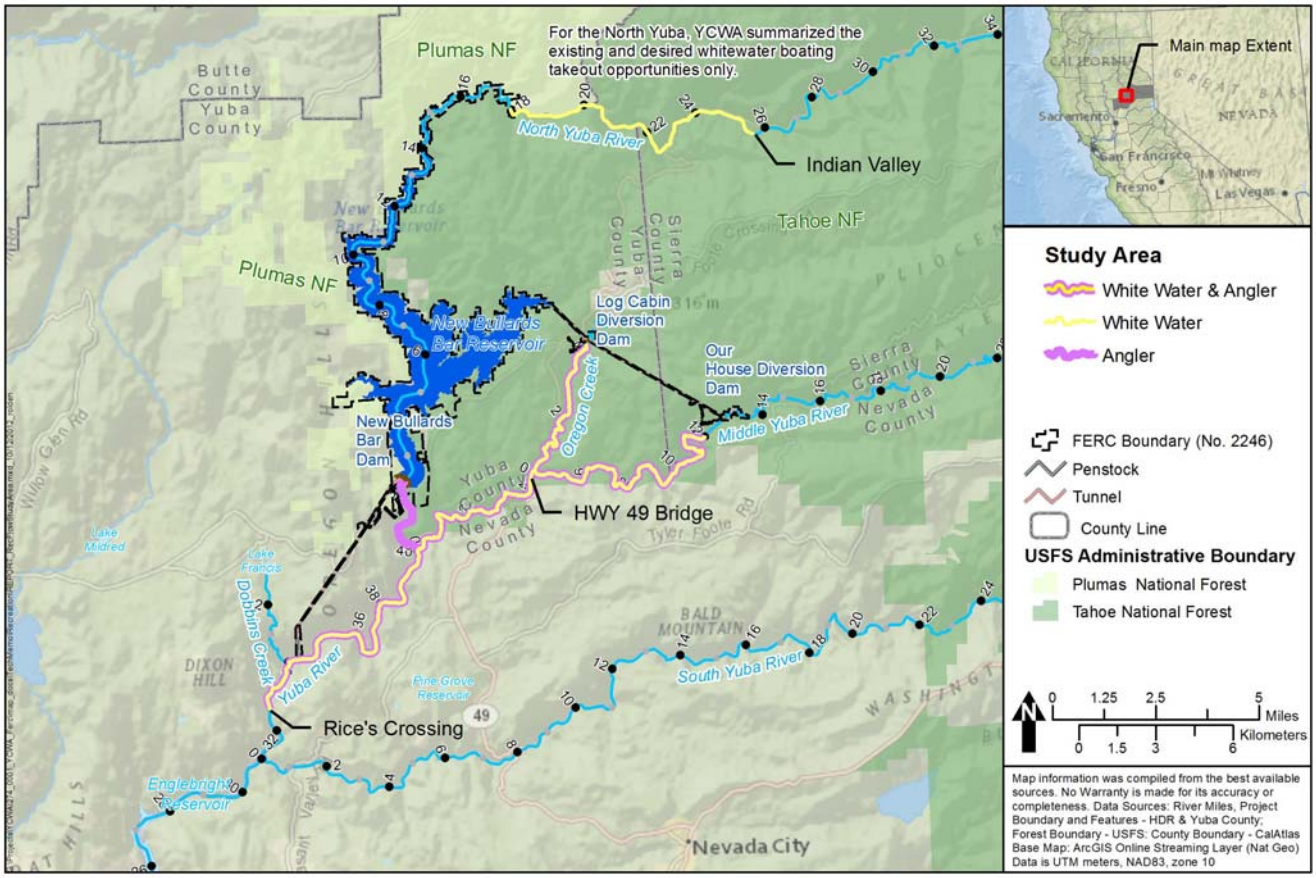

Figure 2.1-1. Recreation Flow Study area.

From May through June 2011, the core team of boaters paddled each study reach at least once in each of the target flow ranges identified in Table 2.1-1.

Table 2.1-1. Target flow ranges for each study reach.

Study Reach	Target Flow Range (cfs)			
Our House Diversion Dam to Highway 49	325 – 500	700 – 900	900 – 1,200	1,200 – 2,200
Highway 49 to Englebright Reservoir	600 – 800	800 – 1,000	1,000 – 1,200	--

The target flow ranges were developed by the interested Relicensing Participants, including AW, to span the flow ranges for each of the primary types of craft for each study reach. The flow ranges by type of craft are provided in Table 2.1-2.

Table 2.1-2. Flow ranges by primary types of craft in each study reach.

Study Reach	Flow Range (cfs) By Type of Craft		
	Inflatable Kayak/R2[1]	Hardshell Kayak	Raft (Raft>12 feet)
Our House Diversion Dam to Highway 49	325 – 500	700 – 2,200	700 – 1,200
Highway 49 to Englebright Reservoir	--	600 – 1,000	1,000 – 1,200

[1] R2 = raft < 12 ft long

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After completing a run, each member of the core team of boaters completed a single-flow boater Post-Run Evaluation Form (Attachment 8-2C). The form focused on the specific characteristics of the study reach at the single flow the boater experienced and included both survey questions and opportunities for open-ended comments regarding the reach (Attachment 8-2A).

Upon completion of at least two flows within the targeted ranges and subsequent Post-Run Evaluation forms, each member of the core team of boaters completed a Comparative Evaluation Form, which evaluated one flow over another for specific characteristics (Attachment 8-2C).

The boater evaluation forms were provided to the core team of boaters by hardcopy and online. A link to the online version was provided to the core team of boaters via Zoomerang,[4] and also posted on the AW website.

Following completion of the Post-Run and Comparative evaluation forms, YCWA conducted a focus group discussion with the core team of boaters.[5] The focus group discussion included specific questions concerning the boating experience at the different flow levels with the goal of refining the acceptable and optimal flow ranges for each craft. The ultimate goal was to identify what flows would represent the general paddling public preferences by craft type.

2.1.3 Comparison of With-Project and Without-Project Whitewater Boating Opportunities

This comparison consisted of compiling modeled hydrology by water year type and watercraft type, based on boatable flows indicated by the whitewater boater focus groups.

2.1.3.1 Hydrology

Several hydrologic data sets have been used for the evaluations in this study: 1) Historical Hydrology; 2) Without-Project hydrology; and 3) With-Project hydrology.[6] The description of each is included below.

- Historical Hydrology[7] (i.e., gaged flows). The Historical Hydrology is the measured (i.e., gaged) hydrology in the basin. This data set is composed of the measured hydrology from Water Year (WY) 1970 through WY 2010 for the geographic area from just upstream of the Project to the United States Geological Survey (USGS) Marysville streamflow gage, which is located on the Yuba River upstream of the Feather River. The

[4] Online survey software tool. www.zoomerang.com

[5] Opportunistic boaters outside the core team of boaters were included in the focus group because the opportunistic boater: 1) ran the study reach(es) in each of the target flow ranges; 2) completed all the necessary evaluation forms; and 3) were contacted for inclusion in the focus group.

[6] Each of the hydrology data sets can be found in YCWA's relicensing Technical Memorandum 2-1, Hydrologic Alteration.

[7] A significant shift in the Historical Hydrology occurred in 2006. From WY 1970 through WY 2005, the Project was operated under either the existing license minimum flow requirements or the State Water Resource Control Board's Revised Decision 1644, which are higher than the minimum flows in the existing license. Beginning in WY 2006, the Project was operated under the Yuba River Accord flow requirements, which are higher than the flow requirements in the existing license.

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Historical Hydrology data set for locations below Project facilities is representative of Project operations throughout its history.

- Without-Project Hydrology. The Without-Project Hydrology indicates the hydrology as if the Project had not been constructed (i.e., no Project facilities in place) but all other water projects in the basin are operating. This data set is comprised of measured hydrology and synthesized hydrology from WY 1970 through WY 2010 for the geographic area from just upstream of the Project to the Marysville gage. The Without-Project Hydrology for areas upstream from the Project is the measured hydrology from the Historical Hydrology data set (i.e., inflow to the Project). The Without-Project Hydrology downstream of Project facilities is synthesized hydrology that consists of calculated accretions downstream from the inflow measurement locations plus the relevant measured inflow (i.e., in the Project area and downstream).[8]
- With-Project Hydrology. The With-Project Hydrology indicates current conditions (i.e., with the Project in operation). This data set is comprised of hydrology for the geographic area from just upstream of the Project to the Marysville gage for WY 1970 through WY 2010. The measured inflows and synthesized accretions used in the Without-Project Hydrology data set are used as inputs to YCWA's Relicensing Water Balance/Operations Model. The With-Project Hydrology data set is the output from the Base Case scenario of the model.[9]

For the purposes of determining boatable flow days, YCWA used the Without-Project and With-Project hydrology data sets.

2.1.3.2 Water Year Types

While California's seasons follow a typical pattern of dry summer and fall, and wet winter and spring, there can be a substantial year-to-year variability in the quantity and timing of rainfall and snow melt runoff into its rivers. A hydrologic index is a useful tool for providing a context for the relative availability of water within a hydrologic basin. The Yuba River Index (YRI), developed by YCWA to support the California State Water Resource Control Board (SWRCB) Revised Decision 1644 (SWRCB 2000), uses seasonally-weighted unimpaired Yuba River flow at Smartsville to characterize WYs. The California Department of Water Resources (CDWR) has computed a monthly volume of unimpaired flow for the Yuba River near Smartsville for the period from October 1, 1901 through September 30, 2012 (DWR 2012); the Smartsville unimpaired flow represents the natural flow, or the flow volume that would have existed in the absence of any man-made impairments, such as diversions or storage reservoirs, within the basin.

[8] YCWA has not developed a Yuba Basin "unimpaired flow" data set for the Relicensing because it would have no meaning for the Relicensing. Other water projects, including South Feather Water and Power Agency's South Feather Power Project (FERC Project No. 2088), Nevada Irrigation District's Yuba River Development Project (FERC Project No. 2266) and Pacific Gas and Electric Company's Drum-Spaulding Project (FERC Project No. 2310) affect flow into YCWA's Yuba River Development Project. These upstream Projects are in various stages of Relicensing, but new Licenses, with new flow requirements, have not been issued. Since the new flows are unknown at this time, YCWA used the upstream historic regulated flows in its Relicensing.

[9] Refer to YCWA's Relicensing Technical Memorandum 2-3, Water Balance/Operations Model, for a detailed description of the Water Balance/Operations Model and Base Case, including the Base Case output hydrology.

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The YRI weights the flow volumes for the current WY's April through July snow melt season, the preceding WY's October through current year March rainfall season, and the previous WY's YRI value, as 50 percent, 30 percent, and 20 percent, respectively, to reflect each season's relative importance for water supply in the Yuba River watershed.

The computed YRI value can be used to classify a WY into one of five WY types. These five WY types were established assuming a log-normal distribution of historical YRI values. The YRI value thresholds for each WY type were defined to classify 30 percent of WYs as wet, 20 percent as above normal, 20 percent as below normal, 15 percent as dry, and 15 percent as critical.

For the purpose of this study, YCWA used the WY types shown in Table 2.1-3.

Table 2.1-3. Yuba River Index values and water year types.

Water Year Classification	Yuba River Index
Wet	Equal to or greater than 1,230,000 ac-ft
Above Normal	Greater than 990,000 and less than 1,230,000 ac-ft
Below Normal	Equal to or less than 990,000 and greater than 790,000 ac-ft
Dry	Equal to or less than 790,000 and greater than 630,000 ac-ft
Critical	Equal to or less than 630,000 ac-ft

2.1.4 Description of the Whitewater Boating Opportunities on the Study Reaches

YCWA summarized the whitewater boating opportunities on the Middle Yuba River from Our House to Highway 49 Bridge. The summary is based on a survey of boaters and focus groups for the reach, and includes: 1) put-in and take-out access; 2) demand for whitewater boating; 3) constraints; 4) conflicts or complementary opportunities with other recreational opportunities; 5) whitewater classification; 6) the types of craft suitable for boating the reach; 7) acceptable and optimal flows for the class of boating and type of boating that would likely occur; and 8) the annual number of usable (boatable) days that occur based on Project Base Case and No Project flows.

2.2 Whitewater Boating Take-out Upstream of New Bullards Bar Reservoir Element

The sole purpose of this study element was to identify the whitewater boating-related take-out patterns, issues, and levels of use in the run upstream of New Bullards Bar Reservoir.[10] The methods consisted of three steps: 1) identify study area; 2) conduct whitewater boating focus group; and 3) describe existing and desired take-out opportunities on the study reach.

2.2.1 Study Area

The study area for this element included:

[10] The Project does not affect flows in the North Yuba River upstream of New Bullards Bar Reservoir's normal maximum water surface elevation.

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- The approximately 3-mile section of the North Yuba River from Indian Valley downstream to the normal high water surface elevation of New Bullards Bar Reservoir

2.2.2 Whitewater Boating Focus Group

YCWA conducted a single whitewater boating focus group on July 18, 2012, consisting of a commercial outfitter, private boater, AW, and the United States Department of Agriculture Forest Service (Forest Service). YCWA made a good faith effort to reach individuals identified by Relicensing Participants via outreach at other study whitewater boating focus groups held in May 2012 and through e-mail contacts, and posting of the meeting two weeks in advance. The focus group questions specifically related to the take-out for this study reach, and included the following: 1) existing take-out locations for boaters (i.e., private and commercial); 2) access considerations for the various take-out locations, 3) how the take-out affected the overall boating experience; and 4) potential desired take-out options. The focus group topics and question are provided in Attachment 8-2D.

2.2.3 Whitewater Boating Take-out Opportunities

YCWA summarized the existing and desired whitewater boating take-out opportunities based on the information gathered in the focus group meeting.

2.3 Angling Opportunities Element

The angling opportunity methods consisted of four steps: 1) identify the study area; 2) conduct an angling focus group; 3) compare the Project Base Case and No Project angling opportunity for the study reaches; and 4) describe existing and desired angling opportunities on the study reaches. Each of these steps is discussed below.

2.3.1 Study Area

For angling, the study area included five reaches:

- The 2.3 mile-long section of the North Yuba River from New Bullards Bar Dam (RM 2.3) downstream to the confluence with the Yuba River (RM 0.0)
- The 12.0 mile-long section of the Middle Yuba River from Our House Diversion Dam (RM 12.0) downstream to the Highway 49 Bridge (RM 4.5)
- The 4.5 mile-long section of the Middle Yuba River from the Highway 49 Bridge (RM 4.5) downstream to the Yuba River (RM 0.0)
- The 7.5 mile-long section of the Yuba River (RM 39.6) from the confluence with the North and Middle Yuba rivers downstream to Rice's Crossing (RM 32.2)
- The 4.1-mile-long section of Oregon Creek from the Log Cabin Diversion Dam (RM 4.1) downstream to the confluence with the Middle Yuba River (RM 0.0).

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2.3.2 Focus Group Interviews

YCWA conducted a focus group with anglers on July 18, 2012 in Grass Valley, California. The anglers were selected through consultation with the Relicensing Participants. Subjects for angling questions included: 1) access considerations; 2) target species; 3) types of fishing (e.g., wade/boat-based/shore-based; spin/bait/fly); 4) flow ranges for each type of opportunity by study reach; 5) angling quality relative to regional opportunities; and 6) desired angling opportunities on the study reaches.

The focus group topics and questions, which are provided in Attachment 8-2E, were designed to estimate the average annual number of usable angling days that occur based on Project Base Case and No Project flows for the reach. For the purpose of the study element, a usable day is defined as a day when a recreationist would have reasonable access to the river and the mean daily flow in the reach is within the acceptable flow range as determined through the angler focus group and using the hydrology data.

2.3.3 Comparison of Regulated and Unimpaired Angler Flows

The FERC-approved study required YCWA estimate the average annual number of angling usable days that occur based on modeled With-Project and Without-Project flows for the study reach. However, the focus group participants were not able to provide specific acceptable flow ranges necessary for YCWA to compare flows. Rather, angling focus group participants were only able to provide typical months that they fished on the study reaches.

2.3.4 Existing and Desired Angling Opportunities

YCWA documented angling opportunities on each reach, including: 1) popular angling locations; 2) access; and, 3) types of angling (e.g., species, seasonality, shore-based and wading). There was an attempt to understand what flows anglers identified as accessible, however anglers were not able to identify flows, therefore, the range of useable flows for angling on each reach and the annual number of usable days that occur based on Project Base Case and No Project flows was not developed (see study variance, Section 6.0). In addition, YCWA characterized the desired angling opportunities by reach.

3.0 Results

Results are provided below by study element.

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3.1 Whitewater Boating Element

3.1.1 Middle Yuba River from Our House Diversion Dam (RM 12.0) to Highway 49 Bridge at Oregon Creek (RM 4.5)

3.1.1.1 Opportunistic Flow Study

3.1.1.1.1 Boater Background Information

Between December 11, 2010 and August 27, 2011, YCWA received a total of 45 completed boater surveys at 12 different flow levels during opportunistic flows via coordination with YCWA on the Middle Yuba River from Our House Diversion Dam to Highway 49. The flows at which the boaters ran the river ranged from 350 cubic feet per second (cfs) to 2,200 cfs (Table 3.1-1). Seventy-three percent of the boaters identified the flow level at which they boated using the Our House Diversion Dam gage; 27 percent used other sources (not specified) to estimate the flow when they ran the river. In addition, open-ended comments are recorded in Attachment 8-2A.

Table 3.1-1. Boater response by flow levels for Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Reported Flow Level at which the Boaters Ran the River (cfs)	Number of Boaters	Percentage of All Boaters
350	3	6.7%
360	2	4.4%
380	4	8.9%
600	1	2.2%
700	5	11.1%
800	3	6.7%
850	6	13.3%
900	9	20.0%
967	2	4.4%
1,000	4	8.9%
2,000	1	2.2%
2,200	3	6.7%
Total	**45**	**100.0%**

The respondent's age ranged from 24 to 61 years of age (Table 3.1-2).

Table 3.1-2. Age of respondents Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Age	Number of Boaters	Mean Age	Minimum Age	Maximum Age
24-61 years old	32	44.2	24.0	61.0

For the study, less than half of respondents (43.8%) paddled hardshell kayaks, followed by R2 (i.e., inflatable raft less than 12 ft long paddled by two people) watercraft (40.6%) (Table 3.1-3).

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Table 3.1-3. Type of watercraft boating Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft	Number of Boaters	Percentage of Boaters Responding
Hardshell Kayak	14	43.8%
R2 (Raft <12 ft long)	13	40.6%
Inflatable Kayak	2	6.3%
Raft (Raft >12 ft long)	2	6.3%
Cataraft	1	3.1%
Total	**32**	**100.0%**

With respect to skill level, nearly 85 percent of respondents classified themselves as expert,[11] and 12.5 percent identified themselves as advanced-level boaters. The expert-level respondents had been boating for an average of 18 years, with the advanced-level respondents for 8 years. On average, the expert-level respondents boated 13 days per month, while the advanced respondents boated an average of 7 days per month during the past 3 years (Table 3.1-4).

Table 3.1-4. Number of years running rivers and number of days per year by skill level for boaters who paddled the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Boating Skill Level	Number	Percentage (%)	Years of Experience			Running Days per Month		
			Mean	Maximum	Minimum	Mean	Maximum	Minimum
Intermediate	1	3.1	6.0	6.0	6.0	3.0	3.0	3.0
Advanced	4	12.5	8.3	15.0	5.0	7.3	22.0	1.0
Expert	27	84.4	17.9	30.0	5.0	13.1	20.0	3.0

Travel time from respondent's residence to the put-in ranged from less than 15 minutes (one person) to over 60 minutes (7 persons), with 31 to 60 minutes most frequently identified (14 persons) (Table 3.1-5).

Table 3.1-5. Travel time from residence to put-in Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Travel Time	Number of Boaters	Percentage of All Boaters
Less than 15 minutes	1	3.1%
15 to 30 minutes	10	31.3%
31 to 60 minutes	14	43.8%
More than 60 minutes	7	21.9%
Total	**32**	**100.0%**

[11] AW considers an expert boater capable of running Class V and lower class rapids. AW characterizes Class V rapids as: "*Extremely long, obstructed, or very violent rapids which expose a paddler to added risk. Drops may contain** large, unavoidable waves and holes or steep, congested chutes with complex, demanding routes. Rapids may continue for long distances between pools, demanding a high level of fitness. What eddies exist may be small, turbulent, or difficult to reach. At the high end of the scale, several of these factors may be combined. Scouting is recommended but may be difficult. Swims are dangerous, and rescue is often difficult even for experts. A very reliable eskimo roll, proper equipment, extensive experience, and practiced rescue skills are essential. Because of the large range of difficulty that exists beyond Class IV, Class 5 is an open-ended, multiple-level scale designated by class 5.0, 5.1, 5.2, etc… each of these levels is an order of magnitude more difficult than the last. Example: increasing difficulty from Class 5.0 to Class 5.1 is a similar order of magnitude as increasing from Class IV to Class 5.0*" (from AW's *Safety Code for American Whitewater* accessed on AW's Webpage on October 20, 2012)

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Most respondents were residents of the towns of Washington and Nevada City (Table 3.1-6).

Table 3.1-6. Place of residence for boaters who paddled the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Place	Number of Boaters	Percentage of All Boaters
Washington	10	22.2%
Nevada City	8	17.8%
Grass Valley	3	6.7%
Penn Valley	3	6.7%
Oakland	2	4.4%
Kalispell, Mo	1	2.2%
San Mateo	1	2.2%
Berkeley	1	2.2%
Auburn	1	2.2%
Davis	1	2.2%
Colfax	1	2.2%
Total	**32**	**100.0%**

More than half of respondents (62.5%) had not participated in a flow study experience before (Table 3.1-7); and, on average, had boated 3.5 years on this reach.

Table 3.1-7. Previous boating study experience for boaters who paddled the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Previous Study Experience	Number of Boaters	Percentage of All Boaters
Yes[1]	12	37.5%
No	20	62.5%
Total	**32**	**100.0%**

[1] Study locations: Bullards Bar, Colgate, North Fork Feather, Pitt boating runs.

In the past (i.e., not specifically for the study), boaters had run the reach at flows from 300 cfs to 3,500 cfs (Table 3.1-8), with 55.6 percent in hardshell kayaks (Table 3.1-9).

Table 3.1-8. Years of boating experience on the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge reach.

Previous Boating Experience	Number	Mean of Previous Runs	Minimum of Previous Runs	Maximum of Previous Runs
Previous boating at this run	31	3.6	0	14
Experience cfs at this reach	59	1,448.3	300	3500

Table 3.1-9. Types of watercraft used in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge reach.

Watercraft Type	Number of Boaters	Percentage of All Boaters
Hardshell kayak	30	55.6%
Raft (Raft >12 ft long)	17	31.5%
Inflatable kayak	6	11.1%
R2 (Raft <12 ft long)	1	1.9%

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Boaters were asked to respond to a list of statements about their river-running preferences. Overall, the majority of respondents "agreed" that they preferred: running rivers with difficult rapids; running challenging whitewater is the most important part of their boating trips; they often boat short river segments; they boat to experience unique and interesting places; they prefer challenging rapids and whitewater play areas; are they are willing to tolerate difficult put-ins/portages to run interesting reaches; they prefer boating steep, technical rivers; and they prefer technical and big water rivers. They "did not agree" that they prefer rivers with features such as large waves and powerful hydraulics, or that play areas were more important than challenging rapids (Table 3.1-10).

Table 3.1-10. Response to river running preference statements who paddeled the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Statement	Number of Boaters	Response by Percentage				
		Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
I prefer running rivers with difficult rapids (Class IV and V).	31	0%	16.1%	0%	41.9%	41.9%
Running challenging whitewater is the most important part of my boating trips.	31	3.2%	25.8%	9.7%	25.8%	35.5%
I often boat short river segments (< 4 mi.) to take advantage of whitewater play areas.	31	3.2%	25.8%	19.4%	48.4%	3.2%
I often boat short river segments to experience a unique and interesting place.	31	0%	0%	0%	61.3%	38.7%
I often boat short river segments to run challenging rapids.	31	0%	3.2%	3.2%	58.1%	35.5%
Good whitewater play areas are more important than challenging rapids	30	10.0%	56.7%	20.0%	10.0%	3.3%
I am willing to tolerate difficult put-ins/portages to run interesting whitewater reaches.	31	0%	0%	0%	54.8%	45.2%
I prefer boating rivers that feature large waves and powerful hydraulics.	31	0%	48.4%	6.5%	38.7%	6.5%
I prefer boating steep, technical rivers.	31	0%	0%	6.5%	54.8%	38.7%
I enjoy boating both technical and big water rivers.	31	0%	0%	32.3%	45.2%	22.6%

Boaters were also asked to list the whitewater runs in California that they typically boat each year and how often they boat them on an annual basis. The majority of respondents ran the North Fork of the American River, followed by the South Yuba River runs from Edwards Crossing to Purdons Crossing and Highway 49 to Bridgeport. Respondents' said they ran these reaches from 1 to 15 or more times per year overall (Table 3.1-11).

Table 3.1-11. Experience on whitewater runs in California for boaters who paddled the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Run Name	Number of Boaters	Response by Persons			
		1-3 times	4-8 times	9-15 times	15+ times
American River	1	0	0	1	0
Chamberlain Falls, North Fork American River	5	1	0	1	3
Cherry Creek, Tuolumne River	1	1	0	0	0
Chili Bar, American River	5	1	1	2	1
Curves Creek	1	0	1	0	0
Dinkey Creek, Kings River	1	1	0	0	0
Edwards to Purdons Crossings, South Yuba River	12	0	5	1	6
Feather River	1	0	0	1	0
Giant Gap, North Fork American River	2	1	1	0	0

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Table 3.1-11. (continued)

Run Name	Number of Boaters	Response by Persons			
		1-3 times	4-8 times	9-15 times	15+ times
Highway 49 to Bridgeport, South Yuba River	12	3	0	1	8
Kewawa River	1	0	0	1	0
Maytag Reach, North Yuba River	5	0	0	1	0
Middle Fork of the Feather River	7	7	0	0	0
Middle Fork of the American River	8	2	0	0	6
North Fork of the American River	13	0	9	1	3
North Yuba	10	1	7	2	0
North Yuba Maytag	1	0	0	1	0
Paulrey Creek	3	3	0	0	0
Purdon, South Yuba River	2	2	0	0	0
Purdons to Highway 49	5	0	0	0	5
South Silver	2	2	0	0	0
South Yuba	11	2	1	2	6
South Fork of the American River	6	0	2	0	4
Tuolumne	1	1	0	0	0
Wild Plum, North Yuba River	3	3	0	0	0
Yuba	1	0	0	1	0

A majority of respondents (53.5%) used hardshell kayaks to run the study reach. The other respondents used a variety of watercraft, including inflatable kayaks, R2s, rafts (greater than 12 ft long) and C1s (canoe paddled by one person). The average length of the watercraft used to run the reach was 11.3 feet (ft) for R2s, 13.3 for rafts; and 8.0 ft for C1s (i.e., canoe paddled by one person) (Table 3.1-12).

Table 3.1-12. Type and length of watercraft by boaters who paddled the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Number of Boaters	Percentage (%)	Watercraft Length			
			Number	Mean	Minimum	Maximum
Hardshell Kayak	23	53.5%	n/a	n/a	n/a	n/a
R2 (Raft <12 ft long)	8	18.6%	7	11.3	11	12
Raft (Raft >12 ft long)	8	18.6%	7	13.3	13	14
Inflatable Kayak	3	7.0%	n/a	n/a	n/a	n/a
Other (C1)	1	2.3%	1	8.0	8	8
Total	**43**	**100.0%**	**15**	**9.13**	**7.9**	**14.0**

3.1.1.1.2 Comparative Evaluation of Flow Levels

Evaluation of Flow Levels

Boaters were asked to evaluate a range of flows boated (i.e., 400, 600, 800, 1,000, 1,200, 1,600, 1,800, 2,000, and 2,200 cfs). In evaluating flows, respondents were asked to consider all of the flow dependent characteristics that contributed to a quality river trip experience (e.g., boatability, whitewater challenge, safety, availability of surfing or other play areas, aesthetics, and rate of travel). Nearly all boaters responded that the flow level they boated was “marginal” to “totally unacceptable” with some exceptions. For example, the 1,800 cfs flow was “acceptable” to some

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hardshell kayakers; the 600 cfs flow was "acceptable" for some inflatable kayakers; and the 1,200 cfs flow was "acceptable" for some boating in R2s (Table 3.1-13).

Table 3.1-13. Evaluation of flow level by boater type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type[1]	Flow Level (cfs)	Number of Boaters	Response by Percentage					
			Cannot Estimate at This Flow	Totally Acceptable	Acceptable	Marginal	Unacceptable	Totally Unacceptable
Hardshell Kayak	400	5	60.0%	0.0%	0.0%	40.0%	0.0%	0.0%
	600	5	20.0%	0.0%	0.0%	40.0%	20.0%	20.0%
	800	12	0.0%	0.0%	0.0%	25.0%	8.3%	66.7%
	1,000	12	0.0%	0.0%	0.0%	0.0%	25.0%	75.0%
	1,200	11	0.0%	0.0%	0.0%	0.0%	27.3%	72.7%
	1,400	11	0.0%	0.0%	0.0%	0.0%	9.1%	90.9%
	1,600	11	0.0%	0.0%	0.0%	9.1%	0.0%	90.9%
	1,800	11	0.0%	0.0%	9.1%	18.2%	0.0%	72.7%
	2,000	11	18.2%	0.0%	0.0%	18.2%	0.0%	63.6%
	2,200	10	20.0%	0.0%	0.0%	20.0%	0.0%	60.0%
Inflatable-Kayak	400	4	0.0%	0.0%	0.0%	0.0%	25.0%	75.0%
	600	4	0.0%	0.0%	25.0%	0.0%	25.0%	50.0%
	800	4	50.0%	0.0%	0.0%	0.0%	0.0%	50.0%
	1,000	4	50.0%	0.0%	0.0%	0.0%	0.0%	50.0%
	1,200	4	50.0%	0.0%	0.0%	0.0%	50.0	0.0%
	1,400	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1,600	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1,800	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2,000	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2,200	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
R2	400	12	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	600	12	0.0%	0.0%	0.0%	0.0%	8.3%	91.7%
	800	12	0.0%	0.0%	0.0%	0.0%	8.3%	91.7%
	1,000	12	8.3%	0.0%	0.0%	8.3%	0.0%	83.3%
	1,200	12	8.3%	0.0%	8.3%	0.0%	83.3%	0.0%
	1,400	7	28.6%	0.0%	0.0%	0.0%	71.4%	0.0%
	1,600	7	28.6%	0.0%	0.0%	71.4%	0.0%	0.0%
	1,800	7	28.6%	0.0%	0.0%	71.4%	0.0%	0.0%
	2,000	7	28.6%	0.0%	0.0%	71.4%	0.0%	0.0%
	2,200	7	28.6%	0.0%	0.0%	71.4%	0.0%	0.0%
Raft	400	1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	600	1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	800	1	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	1,000	1	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	1,200	1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	1,400	1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	1,600	1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	1,800	1	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
	2,200	1	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%

[1] Watercraft types are types of crafts reported by respondents for each question. Note there may be differences in responses by watercraft type due to lack of response by a boater reporting on a particular watercraft type. As such, R2 refer to rafts less than 12 feet long, Raft refers to rafts greater than 12 feet long.

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Lowest, Optimal, Highest Flow Levels

Boaters were asked to respond to a list of statements concerning the lowest flow needed to get down the river, the lowest flow that provided a quality technical boating experience, the optimal flow range that provides the best whitewater characteristics, and the highest safe flow level. The preference for lowest flow to simply "get down river" included a range from 225 cfs to 800 cfs, depending on watercraft type (Table 3.1-14).

Table 3.1-14. Lowest flow (cfs) to get down the river by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Number of Boaters	Mean (cfs)	Minimum (cfs)	Maximum (cfs)
Hardshell Kayak	12	646	300	800
R2	12	307	300	380
Inflatable Kayak	4	300	225	375
Raft	1	600	600	600

With respect to the provision of a quality technical boating experience, the range was 300 cfs to 800 cfs, dependent upon watercraft type (Table 3.1-15).

Table 3.1-15. Lowest flow for a quality technical boating experience by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Number of Boaters	Mean (cfs)	Minimum (cfs)	Maximum (cfs)
Hardshell Kayak	12	733	600	800
R2	12	321	300	400
Inflatable Kayak	4	325	300	400
Raft	1	700	700	700

Also, the optimal flow range for this reach was varied and dependent on watercraft type (Table 3.1-16).

Table 3.1-16. Optimal flow range to provide the best whitewater characteristics by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Number of Boaters	Mean (cfs)	Minimum (cfs)	Maximum (cfs)
Hardshell Kayak	12	1,452	800	2,500
R2	12	738	350	1,200
Inflatable Kayak	4	719	300	1,400
Raft	1	1,100	900	1,300

Respondents felt that the highest "safe flow level" was also quite varied dependent on watercraft type (Table 3.1-17).

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Table 3.1-17. The highest safe flow by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Number of Boaters	Mean (cfs)	Minimum (cfs)	Maximum (cfs)
Hardshell Kayak	12	2,967	1,400	4,000
R2	12	1,383	1,200	1,600
Inflatable Kayak	4	813	400	1,200
Raft	1	2,000	2,000	2,000

3.1.1.1.3 Intention to Return at Optimal Range Flow Levels

Boaters were asked, based on their boating experience on this reach, if their optimal boating range were provided, how often would they return? Nearly all boaters responded they would return multiple times every year, or as often as they could, if flow levels were provided in their optimal boating range (Table 3.1-18).

Table 3.1-18. Likelihood to return at optimal flow levels by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Number of Boaters	How often would you return? (Response by Percentage)				
		Never	Once Every Year	Multiple Times Every Year	Once Every Few Years	As Often As I Could
Hardshell Kayak	12	0.0%	8.3%	66.7%	0.0%	25.0%
R2	12	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	4	0.0%	0.0%	25.0%	0.0%	75.0%
Raft	1	0.0%	0.0%	100.0%	0.0%	0.0%

3.1.1.1.4 Similar Optimal Range Flow Levels in California

Boaters were asked about comparable runs in California they felt were most similar. Respondents identified the North Fork of the American River and South Yuba River as the most similar with respect to optimal range flow levels of California rivers; and Edwards Crossing to Purdons Crossing on the South Yuba River was the most similar optimal range flow during Spring season with a range of 235 cfs to 3,300 cfs (Table 3.1-19).

Table 3.1-19. Similar optimal range flow levels in California by watercraft type as compared to the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	River Name	Run Name	Season When Used	Optimal Flow (cfs)
Hardshell Kayak	North Fork of the American River	Chamberlain Falls	Winter/Spring	1,500
		Kykang	Spring	800
		Giant Gap	Spring	1,100
	South Fork of the American River	Slab Creek	Spring	1,500
	South Yuba River	Edwards Crossing to Purdons Crossing	Spring	1,300
		Edwards Crossing to Purdons Crossing	Winter/Spring	1,800
		Poorman	Spring	2,000
		49-Bridgeport	Spring	800

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Table 3.1-19. (continued)

Watercraft Type	River Name	Run Name	Season When Used	Optimal Flow (cfs)
Inflatable Kayak	Clear Creek	Mid-Confluence	Spring	600
	North Yuba River	Sierra City	Spring	1,000
		Wild Plum	Spring	235
	North Fork of the American River	Chamberlain	Summer	700
	North Fork of the Stanislaus River	Big Trees	Spring	450
	South Yuba River	Edwards to Purdon	Spring	225
		Edwards to Purdon	Spring	400
		Edwards to Purdon	Spring	1,400
		Washington to Edwards	Spring	1,200
		Edmonds	Spring	400
		Above Washington	Spring	2,000
		Gold Quartz to Washington	Spring/Summer	360
R2	Clear Creek	Mid-Confluence	Spring	800
	North Yuba River	Sierra Creek	Spring	1,000
		Maytag	Spring	1,200
		Wild Plum	Spring	600
		Wild Plum	Spring	1,000
	South Fork of the American River	Chili Bar to Salmon Falls	Spring/Summer	5,000
	South Yuba River	Edwards Crossing to Purdons Crossing	Spring	1,000
		Edwards Crossing to Purdons Crossing	Spring	1,400
		Edwards Crossing to Purdons Crossing	Spring	2,000
		Washington	Spring	1,200
		Washington to Edwards Crossing	Spring	3,000
		Gold Quartz to Washington	Spring	1,100
		Above Washington	Spring	3,000
		Above Washington	Spring	3,300
Raft	North Fork of the American River	Chamberlin	Spring	1,300
	South Yuba River	Edwards Crossing to Purdons Crossing	Spring	1,200

3.1.1.1.5 Boating Opportunities in Optimal Boating Range

Boaters were asked to compare the reach they listed as "similar" to the current study reach, rating their boating opportunities at flows in their optimal boating range. A majority of respondents identified this reach as comparable to better, with a few exceptions (i.e., Giant Gap) (Table 3.1-20).

Table 3.1-20. Comparison with other reaches in California by watercraft type as compared to the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Reach Name	Response by Percentage				
		Much Worse	Worse	About the Same	Better	Much Better
Hardshell Kayak	Chamberlain, NF American River	0.0%	0.0%	0.0%	20.0%	80.0%
	Edwards to Purdon, South Yuba River	0.0%	0.0%	0.0%	0.0%	100.0%

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Table 3.1-20. (continued)

Watercraft Type	Reach Name	Response by Percentage				
		Much Worse	Worse	About the Same	Better	Much Better
Hardshell Kayak (continued)	Giant Gap, NF American River	0.0%	100.0%	0.0%	0.0%	0.0%
	Kykang, NF American River	0.0%	0.0%	100.0%	0.0%	0.0%
	North Fork of the American	0.0%	0.0%	0.0%	100.0%	0.0%
	Poorman	0.0%	100.0%	0.0%	0.0%	0.0%
	South Yuba River	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River, Highway 49 to Bridgeport	0.0%	100.0%	0.0%	0.0%	0.0%
	Slab Creek	0.0%	0.0%	100.0%	0.0%	0.0%
Inflatable Kayak	Clear Creek	0.0%	0.0%	0.0%	0.0%	100.0%
	North Yuba River (no reach)	0.0%	0.0%	100.0%	0.0%	0.0%
	North Yuba River, Sierra City reach	0.0%	0.0%	100.0%	0.0%	0.0%
	North Fork of the American River (no reach)	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River (no reach)	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River Above Washington	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River Edwards to Purdon	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River Washington to Edwards	0.0%	0.0%	100.0	100.0%	0.0%
R2	South Yuba River Above Washington	0.0%	0.0%	0.0%	100.0%	0.0%
	Clear Creek	0.0%	0.0%	0.0%	0.0%	100.0%
	South Yuba River, Edwards Crossing to Purdon Crossing	0.0%	0.0%	0.0%	100.0%	0.0%
	North Yuba River (no reach)	0.0%	0.0%	0.0%	100.0%	0.0%
	North Yuba River (no reach)	0.0%	0.0%	100.0%	0.0%	0.0%
	North Yuba River, Sierra City reach	0.0%	0.0%	100.0%	0.0%	0.0%
	South Fork of the American River (no reach)	0.0%	0.0%	0.0%	0.0%	100.0%
	South Yuba River (no reach)	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River, Washington	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River, Washington to Purdons Crossing	0.0%	0.0%	0.0%	100.0%	0.0%
	Wild Plum	0.0%	0.0%	100.0%	0.0%	0.0%
Raft	North Fork of the American River (no reach)	0.0%	0.0%	0.0%	100.0%	0.0%
	South Yuba River (no reach)	0.0%	0.0%	0.0%	100.0%	0.0%

3.1.1.1.6 Non-Whitewater Characteristics

Boaters were asked to respond to non-whitewater characteristics of the study reach, given their optimal flow level (i.e., length of shuttle, put-in, take-out, shuttle to boating ratio). Most respondents agreed the non-whitewater characteristics were "good" overall (Table 3.1-21).

Table 3.1-21. Non-whitewater characteristics by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Statement	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	Length of shuttle is not a problem.	12	0.0%	0.0%	0.0%	8.3%	91.7%
	The put-in for this run is good.	12	0.0%	0.0%	0.0%	25.0%	75.0%
	The take-out for this run is good.	12	0.0%	0.0%	0.0%	0.0%	100.0%

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Table 3.1-21. (continued)

Watercraft Type	Statement	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak (continued)	The total shuttle-to-boating ratio on this run is good.	12	0.0%	0.0%	0.0%	16.7%	83.3%
Inflatable Kayak	Length of shuttle is not a problem.	4	0.0%	0.0%	0.0%	0.0%	100.0%
	The put-in for this run is good.	4	0.0%	25.0%	0.0%	0.0%	75.0%
	The take-out for this run is good.	4	0.0%	0.0%	0.0%	0.0%	75.0%
	The total shuttle-to-boating ratio on this run is good.	4	0.0%	0.0%	0.0%	25.0%	83.3%
R2	Length of shuttle is not a problem.	5	0.0%	0.0%	0.0%	41.7%	58.3%
	The put-in for this run is good.	5	0.0%	0.0%	0.0%	41.7%	58.3%
	The take-out for this run is good.	5	0.0%	0.0%	0.0%	41.7%	58.3%
	The total shuttle-to-boating ratio on this run is good.	5	0.0%	0.0%	0.0%	41.7%	58.3%
Raft	Length of shuttle is not a problem.	2	0.0%	0.0%	0.0%	50.0%	50.0%
	The put-in for this run is good.	2	0.0%	25.0%	0.0%	50.0%	50.0%
	The take-out for this run is good.	2	0.0%	0.0%	0.0%	50.0%	50.0%
	The total shuttle-to-boating ratio on this run is good.	2	0.0%	0.0%	0.0%	50.0%	50.0%

3.1.1.1.7 Overall Evaluation of the Reach

All respondents identified the put-in location as Our House Diversion Dam and take-out as Highway 49.

Run Time

Respondents were asked to respond to the estimated time taken to boat this reach. Responses were analyzed by flow level and type of boater. Table 3.1-22 displays the amount of time it took boaters to run the Middle Yuba at various flow levels. On average, it took respondents anywhere from 2 to 4.5 hours to run this reach depending on flow level.

Table 3.1-22. Running hours to run reach by flow level in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Flow Level (cfs)	Number of Boaters	Running Hours		
		Mean	Minimum	Maximum
350	3	4.5	4.5	4.5
360	2	4.5	4.5	4.5
380	4	4.5	4.5	4.5
600	1	4.0	4.0	4.0
700	4	4.0	4.0	4.0
800	3	4.0	4.0	4.0
850	6	2.92	1.5	4.3
900	9	3.28	1.5	5.5
967	2	2.7	2.5	3.0
1,000	2	3.5	3.0	4.0
2,000	1	3.0	3.0	3.0
2,200	3	2.17	1.5	3.0

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Whitewater Difficulty

All respondents classified the reach as Class IV to Class VI[12] (Table 3.1-23).

Table 3.1-23. Whitewater difficulty by flow level & watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage		
			Class IV	Class V	Class VI
Hardshell Kayak	850	5	80.0%	0.0%	20.0%
	900	8	75.0%	0.0%	25.0%
	967	2	50.0%	0.0%	50.0%
	1,000	4	75.0%	0.0%	25.0%
	2,000	1	0.0%	0.0%	100.0%
	2,200	3	66.7%	0.0%	33.3%
Inflatable Kayak	350	1	100.0%	0.0%	0.0%
	360	2	50.0%	0.0%	50.0%
R2	350	2	100.0%	0.0%	0.0%
	380	4	25.0%	25.0%	50.0%
	800	1	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	100.0%
Raft	600	1	100.0%	0.0%	0.0%
	700	5	40.0%	40.0%	20.0%
	800	2	50.0%	50.0%	0.0%
Other (C1)	900	1	0.0%	0.0%	100.0%

Intention to Return at Study Flow Ranges

Respondents were asked to indicate their intention to return based on the flow level. Responses were analyzed by flow level and type of boater. All boaters responded that they would return to boat the reach, based on various flow levels described overall (Table 3.1-24).

Table 3.1-24. Future intention to return by flow level & watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage			
			Definitely No	Possibly	Probably	Definitely Yes
Hardshell Kayak	850	5	0.0%	0.0%	0.0%	100.0%
	900	8	0.0%	0.0%	12.5%	87.5%
	967	2	0.0%	0.0%	0.0%	100.0%
	1,000	4	0.0%	0.0%	0.0%	100.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%
	2,200	3	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	100.0%
	360	2	0.0%	0.0%	0.0%	100.0%

[12] AW considers Class VI rapids to be "*extreme and exploratory rapids*," and characterizes the rapids as: "*These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability and danger. The consequences of errors are very severe and rescue may be impossible. For teams of experts only, at favorable water levels, after close personal inspection and taking all precautions. After a Class VI rapids has been run many times, its rating may be changed to an appropriate Class 5.x rating.*" (from AW's *Safety Code for American Whitewater* accessed on AW's Webpage on October 20, 2012)

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Table 3.1-24. (continued)

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage			
			Definitely No	Possibly	Probably	Definitely Yes
R2	350	2	0.0%	0.0%	0.0%	100.0%
	380	4	0.0%	0.0%	0.0%	100.0%
	800	1	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	100.0%
Raft	600	1	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	100.0%
	800	2	0.0%	0.0%	0.0%	100.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	100.0%

Preferred Flow Level

Respondents were asked to evaluate relative flow levels by watercraft type. Specifically, they were asked 'relative to today's flow, would you prefer a flow that was higher or lower or was this optimal flow? Responses were analyzed by flow levels and type of boater. The majority of hardshell kayakers preferred higher flows from 1,000 cfs and lower. However, some of them felt the flows could be lower. All inflatable kayakers, R2s, rafters, and C1 responded preferred flow levels higher than what they boated overall (Table 3.1-25).

Table 3.1-25. Preferred flow level by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage				
			Much Lower	Lower	Higher	Much Higher	Optimal
Hardshell Kayak	850	5	0.0%	20.0%	20.0%	20.0%	40.0%
	900	8	0.0%	0.0%	87.5%	0.0%	12.5%
	967	2	0.0%	0.0%	100.0%	0.0%	0.0%
	1,000	4	0.0%	0.0%	100.0%	0.0%	0.0%
	2,000	1	0.0%	100.0%	0.0%	0.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	100.0%	0.0%	0.0%
	360	2	0.0%	0.0%	100.0%	0.0%	0.0%
R2	350	2	0.0%	0.0%	100.0%	0.0%	100.0%
	380	4	0.0%	0.0%	25.0%	25.0%	50.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%
Raft	600	1	0.0%	0.0%	100.0%	0.0%	0.0%
	700	5	0.0%	0.0%	100.0%	0.0%	0.0%
	800	2	0.0%	0.0%	50.0%	0.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

3.1.1.1.8 Characteristics of the Reach

Respondents were asked to respond the characteristics of this reach at the flow they boated (e.g., boatable, challenging, features, play spot, overall, safe, aesthetic, length, portage, places of a break or lunch) they experienced during their run. Responses were analyzed by flow levels and type of boater.

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Boatable for Different Type of Watercraft

Table 3.1-26 displays respondents' opinion on the boatability of the reach for different types of watercraft. Boaters were asked to rate all watercraft, including what they were boating in at the time. Most boaters agreed that the reach is boatable for all types of watercraft identified below.

Table 3.1-26. Boatable for flow level by type of watercraft in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	0.0%	0.0%	20.0%	80.0%
	900	8	0.0%	0.0%	0.0%	12.5%	87.5%
	967	2	0.0%	0.0%	0.0%	0.0%	100.0%
	1,000	4	0.0%	0.0%	0.0%	0.0%	100.0%
	2,000	1	0.0%	0.0%	0.0%	0.0%	100.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	2	0.0%	0.0%	0.0%	100.0%	0.0%
	380	4	0.0%	0.0%	0.0%	75.0%	25.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%
Raft	600	1	0.0%	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	60.0%	40.0%
	800	2	0.0%	0.0%	0.0%	50.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of Challenging and Technical Boating by Type of Watercraft

Table 3.1-27 displays respondents' opinion on the challenging and technical boating characteristics by different types of watercraft. Again, boaters were asked to rate all types of watercraft, including what they were boating in at the time. Most boaters agreed that the reach offers challenging and technical boating for all types of watercraft.

Table 3.1-27. Challenging and technical aspects of flow levels by watercraft in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	0.0%	0.0%	80.0%	20.0%
	900	8	0.0%	0.0%	0.0%	37.5%	62.5%
	967	2	0.0%	0.0%	0.0%	100.0%	0.0%
	1,000	4	0.0%	0.0%	0.0%	50.0%	50.0%
	2,000	1	0.0%	0.0%	0.0%	0.0%	100.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	2	0.0%	0.0%	0.0%	100.0%	0.0%
	380	4	0.0%	0.0%	0.0%	25.0%	75.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%

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Table 3.1-27. (continued)

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Raft	600	1	0.0%	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	60.0%	40.0%
	800	2	0.0%	0.0%	0.0%	50.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of Water Features by Type of Watercraft

Table 3.1-28 displays respondents' opinions on the statement "this reach has nice water features such as waves and holes" by different types of watercraft for this reach. Boaters were asked to rate all types of watercraft, including what they were boating in at the time. Most boaters agreed that the reach has nice water features such as waves and holes for all watercraft.

Table 3.1-28. Water features at flow level by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	20.0%	0.0%	40.0%	40.0%
	900	8	0.0%	0.0%	0.0%	12.5%	87.5%
	967	2	0.0%	0.0%	0.0%	0.0%	100.0%
	1,000	4	0.0%	0.0%	0.0%	50.0%	50.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	2	0.0%	0.0%	0.0%	50.0%	50.0%
	380	4	0.0%	0.0%	0.0%	25.0%	75.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%
Raft	600	1	0.0%	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	60.0%	40.0%
	800	2	0.0%	0.0%	0.0%	50.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of Play Spots by Type of Watercraft

Table 3.1-29 displays the respondents' opinions on good play spots by different types of watercraft for this reach. Boaters were asked to rate all types of watercraft, including what they were boating in at the time. Boaters were split as to whether the reach had good play spots for all types of watercraft.

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Table 3.1-29. Evaluation of play spots by type of watercraft in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	20.0%	80.0%	0.0%	0.0%
	900	8	0.0%	0.0%	0.0%	12.5%	87.5%
	967	2	0.0%	0.0%	0.0%	0.0%	100.0%
	1,000	4	0.0%	0.0%	25.0%	50.0%	25.0%
	2,000	1	0.0%	100.0%	0.0%	0.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	360	2	0.0%	0.0%	50.0%	50.0%	0.0%
R2	350	2	0.0%	100.0%	0.0%	0.0%	0.0%
	380	4	0.0%	0.0%	0.0%	75.0%	25.0%
	800	1	0.0%	0.0%	0.0%	100.0%	0.0%
	850	1	0.0%	100.0	0.0%	0.0%	0.0%
Raft	600	1	0.0%	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	60.0%	40.0%
	800	2	0.0%	0.0%	0.0%	50.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of Overall Whitewater Challenge for Different Type of Watercraft

Table 3.1-30 displays the respondents' opinions on the level of whitewater challenge by different types of watercraft. Boaters were asked to rate all types of watercraft, including what they were boating in at the time. Most boaters agreed that the run offers good overall whitewater challenge for all watercraft types.

Table 3.1-30. Overall challenge by type of watercraft in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	20.0%	0.0%	20.0%	80.0%
	900	8	0.0%	0.0%	12.5%	12.5%	75.0%
	967	2	0.0%	0.0%	0.0%	0.0%	100.0%
	1,000	4	0.0%	0.0%	0.0%	25.0%	75.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	0.0%	100.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	2	0.0%	0.0%	0.0%	50.0%	50.0%
	380	4	0.0%	0.0%	0.0%	50.0%	50.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	100.0%	0.0%
Raft	600	1	0.0%	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	60.0%	40.0%
	800	2	0.0%	0.0%	0.0%	50.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

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Perception of Safety of the Reach by Type of Watercraft

Table 3.1-31 displays the respondents' perception of safety of the run for different types of watercraft. Boaters were asked to rate all types of watercraft, including what they were boating in at the time. Most boaters perceived the run as a "safe run" for a variety of watercraft types.

Table 3.1-31. Safety of run by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage to Safety of the Run by Watercraft type				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	0.0%	20.0%	60.0%	20.0%
	900	8	0.0%	0.0%	12.5%	0.0%	87.5%
	967	2	0.0%	0.0%	0.0%	50.0%	50.0%
	1,000	4	0.0%	0.0%	25.0%	25.0%	50.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	2	0.0%	0.0%	0.0%	100.0%	0.0%
	380	4	0.0%	0.0%	0.0%	50.0%	50.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%
Raft	600	1	0.0%	0.0%	0.0%	100.0%	0.0%
	700	5	0.0%	0.0%	0.0%	100.0%	0.0%
	800	2	0.0%	0.0%	0.0%	100.0%	0.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of the Aesthetics of the Reach by Watercraft Type

Table 3.1-32 displays the respondents' opinions on the aesthetically pleasing aspects of this reach. Boaters were asked to rate all types of watercraft, including what they were boating in at the time. Most boaters agreed that the reach is an aesthetically pleasing run for all watercraft.

Table 3.1-32. Aesthetically pleasing run by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage to the Aesthetics of the Run by Watercraft type				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	0.0%	0.0%	40.0%	60.0%
	900	8	0.0%	0.0%	0.0%	25.0%	75.0%
	967	2	0.0%	0.0%	0.0%	50.0%	50.0%
	1,000	4	0.0%	0.0%	0.0%	50.0%	50.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	0.0%	100.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	2	0.0%	0.0%	0.0%	50.0%	50.0%
	380	4	0.0%	0.0%	0.0%	25.0%	25.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%

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Table 3.1-32. (continued)

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage to the Aesthetics of the Run by Watercraft type				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Raft	600	1	0.0%	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	20.0	80.0%
	800	2	0.0%	0.0%	0.0%	50.0	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of the Length by Watercraft Type and Flow

Table 3.1-33 displays the respondents' opinion on the length of run by watercraft and flow. Boaters were asked to rate all types of watercraft, including what they were boating in at the time. Most boaters agreed that the reach had a good length for all watercraft types and the range of flows experienced.

Table 3.1-33. Length by Flow and Watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage to Length of the Run by Flow Level and Watercraft type				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	20.0%	0.0%	40.0%	60.0%
	900	8	0.0%	0.0%	0.0%	12.5%	87.5%
	967	2	0.0%	0.0%	0.0%	50.0%	50.0%
	1,000	4	0.0%	0.0%	0.0%	25.0%	75.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	0.0%	100.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	2	0.0%	0.0%	0.0%	50.0%	50.0%
	380	4	0.0%	0.0%	0.0%	25.0%	75.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%
Raft	600	1	0.0%	0.0%	0.0%	0.0%	100.0%
	700	5	0.0%	0.0%	0.0%	60.0%	40.0%
	800	2	0.0%	0.0%	0.0%	50.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of Portages by Watercraft Type and Flow

Table 3.1-34 displays the respondents' opinions of the portages on this reach, which overall were not a problem. Boaters were asked to rate all types of watercraft, including what they were boating in at the time.

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Table 3.1-34. Evaluation of acceptability of portages in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage to Evaluation of Portage Problem				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	20.0%	40.0%	20.0%	40.0%
	900	8	0.0%	0.0%	0.0%	0.0%	100.0%
	967	2	0.0%	0.0%	0.0%	0.0%	100.0%
	1,000	4	0.0%	25.0	25.0%	0.0%	50.0%
	2,000	1	0.0%	0.0%	0.0%	100.0%	0.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	0	n/a	n/a	n/a	n/a	n/a
	360	2	0.0%	0.0%	50.0%	50.0%	0.0%
R2	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	380	3	0.0%	0.0%	66.7%	33.3%	0.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%
Raft	600	0	n/a	n/a	n/a	n/a	n/a
	700	4	0.0%	0.0%	0.0%	100.0%	0.0%
	800	1	0.0%	0.0%	0.0%	100.0%	0.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

Evaluation of Places to Take Break or Have Lunch by Watercraft and Flow

Table 3.1-35 displays the respondents' opinions on whether the reach has enough places to take a break or have lunch. Boaters were asked to rate all types of watercraft, including what they were boating in at the time. Most boaters agreed that the reach has enough places to take a break or have lunch on this run for all types of watercraft and flow levels.

Table 3.1-35. Availability of break or lunch area by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage on Enough Break/Lunch Areas by Watercraft				
			Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Hardshell Kayak	850	5	0.0%	0.0%	0.0%	40.0%	60.0%
	900	8	0.0%	0.0%	0.0%	12.5%	87.5%
	967	2	0.0%	0.0%	0.0%	0.0%	100.0%
	1,000	4	0.0%	0.0%	0.0%	25.0%	75.0%
	2,000	1	0.0%	0.0%	0.0%	0.0%	100.0%
	2,200	3	0.0%	0.0%	0.0%	0.0%	100.0%
Inflatable Kayak	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	360	2	0.0%	0.0%	0.0%	50.0%	50.0%
R2	350	1	0.0%	0.0%	0.0%	100.0%	0.0%
	380	3	0.0%	0.0%	0.0%	75.0%	25.0%
	800	1	0.0%	0.0%	0.0%	0.0%	100.0%
	850	1	0.0%	0.0%	0.0%	0.0%	100.0%
Raft	600	1	0.0%	0.0%	0.0%	100.0%	0.0%
	700	5	0.0%	0.0%	0.0%	80.0%	20.0%
	800	2	0.0%	0.0%	0.0%	50.0%	50.0%
Other (C1)	900	1	0.0%	0.0%	0.0%	0.0%	100.0%

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Evaluation of Hits, Stops, Boat Drags, and Portages

Respondents were asked to recall incidents (e.g., hits, stops, boat drags, and portages) they experienced during their run. Responses were analyzed by type of boater and flow level.

At each flow level, most of the inflatable kayakers, R2s, and rafters had one to five hits, C1s had six to 10 hits, and hardshell kayaker had a variety of hits, from no hits to more than 20 hits. Based on the results, a clear relationship between flow levels and hits is not evident (Table 3.1-36).

Table 3.1-36. Number of hit counts by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage					
			0 times	1-5 times	6-10 times	11-15 times	16-20 times	More than 20 times
Hardshell Kayak	850	5	20.0%	20.0%	20.0%	0.0%	0.0%	40.0%
	900	8	0.0%	62.5%	12.5%	0.0%	12.5%	12.5%
	967	2	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	1,000	3	0.0%	50.0%	0.0%	25.0%	0.0%	25.0%
	2,000	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	2,200	3	66.7	0.0%	33.3%	0.0%	100.0	0.0%
Inflatable Kayak	350	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	360	2	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
R2	350	2	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	380	4	0.0%	75.0%	25.0%	0.0%	0.0%	0.0%
	800	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	850	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Raft	600	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	700	5	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	800	2	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Other (C1)	900	1	0.0%	0.0%	100.0	0.0%	0.0%	0.0%

At each flow level, most of the boaters had no stops to five stops. Based on the results, there does not appear to be a relationship between flow level and numbers of stops (Table 3.1-37).

Table 3.1-37. Number of stop counts by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage					
			0 times	1-5 times	6-10 times	11-15 times	16-20 times	More than 20 times
Hardshell Kayak	850	5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	900	8	62.5%	37.5%	0.0%	0.0%	0.0%	0.0%
	967	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1,000	4	75.0%	25.0%	0.0%	0.0%	0.0%	0.0%
	2,000	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2,200	3	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Inflatable Kayak	350	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	360	2	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%

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Table 3.1-37. (continued)

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage					
			0 times	1-5 times	6-10 times	11-15 times	16-20 times	More than 20 times
R2	350	2	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%
	380	4	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	800	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	850	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Raft	600	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	700	5	80.0%	20.0%	0.0%	0.0%	0.0%	0.0%
	800	2	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Other (C1)	900	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%

At each flow level, most of the boaters had no drags. Based on the results, a relationship is not evident between flow levels and the number of drags (Table 3.1-38).

Table 3.1-38. Number of drags or pulls of boat counts by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage					
			0 times	1-5 times	6-10 times	11-15 times	16-20 times	More than 20 times
Hardshell Kayak	850	5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	900	8	87.5%	12.5%	0.0%	0.0%	0.0%	0.0%
	967	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1,000	4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2,000	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2,200	3	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Inflatable Kayak	350	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	360	2	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%
R2	350	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	380	4	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%
	800	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	850	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Raft	600	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	700	5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	800	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other (C1)	900	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%

At each flow level, most of the boaters had no portages to five portages. Based on the results, a relationship is not evident between flow level and numbers of portages (Table 3.1-39).

Table 3.1-39. Number of portage counts by watercraft type in the Middle Yuba River from Our House Diversion Dam to Highway 49 Bridge.

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage					
			0 times	1-5 times	6-10 times	11-15 times	16-20 times	More than 20 times
Hardshell Kayak	850	5	40.0%	60.0%	0.0%	0.0%	0.0%	0.0%
	900	8	87.5%	12.5%	0.0%	0.0%	0.0%	0.0%
	967	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1,000	4	75.0%	25.0%	0.0%	0.0%	0.0%	0.0%
	2,000	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2,200	3	66.7%	33.3%	0.0%	0.0%	0.0%	0.0%

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Table 3.1-39. (continued)

Watercraft Type	Flow Level (cfs)	Number of Boaters	Response by Percentage					
			0 times	1-5 times	6-10 times	11-15 times	16-20 times	More than 20 times
Inflatable Kayak	350	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	360	2	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%
R2	350	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	380	4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	800	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	850	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Raft	600	1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	700	5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	800	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other (C1)	900	1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%

3.1.1.1.9 Whitewater Boating Focus Group

In general, 15 boaters participated in the focus group and had similar information and conclusions about the boatability of the reach from Our House Diversion Dam to Highway 49 Bridge. All participants emphasized a strong desirability for this reach, especially by the local boating community (i.e., Nevada City and surrounding area). Table 3.1-40 summarizes the boaters' experiences and key reach characteristics for the reach from Our House Diversion Dam to Highway 49 Bridge.

Table 3.1-40. Whitewater boating focus group responses and channel characteristics regarding Middle Yuba River Reach from Our House Diversion Dam to Highway 49 Bridge.

PHYSICAL REACH DESCRIPTION (derived from maps)
Length of Reach: 7.5 mi
Elevation Range: 2,049 ft to 1,500 ft
Average Gradient: 65 feet per mile.
ACCESS CONSIDERATIONS
Put-In: There is vehicle access beyond the gate at Our House Diversion Dam, with gate closed, it is several hundred yards to the river.
Take-out: Take-out road is paved access at Oregon Creek; restrooms are often closed until May, so very inconvenient. It would be helpful to have a toilet open in early Spring or boating season.
Overall Quality of Access: Acceptable, put-in could be more accessible, user-friendly.
KEY REACH CHARACTERISTICS
Difficulty: Class III-VI depending on range.
Boatable Flow Range: 500 to 3,000 cfs for hardshell kayaks; 360 to 800 cfs for inflatable kayaks; 360 to 2,000 cfs for rafts <12 ft; 600 to 3,000 cfs for rafts 12 ft +.
Optimum Flow: 800 to 2,500 cfs for hardshell kayaks; 500 to 700 cfs for inflatable kayaks; 400 to 1,400 cfs for rafts greater than 12 ft; 900 to 1,800 cfs for rafts 12 ft or more.
Portages: Low head diversion dam below Our House Diversion Dam is a dangerous run at any flow and should be portaged.
Watercraft: hardshell and inflatable kayaks; rafts.
Estimated Run Time: 2-4.5 hours by all types of watercraft.
Runnable Months: April and May.
FLOW INFORMATION
Is It Readily Available? Yes, but not reliable or predictable. Flows vary within 24 hours, and are a central issue for boatability of the reach.
Where/How? Our House Diversion Dam flow gage. This gage requires some guesswork (need to add in some flow from upstream tributaries).[1]
OTHER INFORMATION & COMMENTS
This reach compares to or is slightly better than North Fork of the American River, Chamberlain Falls Run, which is an extremely popular run amongst the local boating community.

[1] Respondents referred to the Our House Diversion Dam flow gage; however, this gage provides substantially incomplete information from which to deduce upstream flows due to the ability of YCWA to divert up to 800 cfs at Our House Diversion Dam to its Lohman Ridge Tunnel.

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3.1.1.2 Comparison of Project Base Case and No Project Whitewater Boating Opportunities

This section provides a comparison of whitewater boating days by watercraft under With-Project flows and Without-Project flows for the period of record. The focus group identified the following four watercraft types to be included in an analysis of flow levels and boatable ranges: 1) hardshell kayaks; 2) inflatable kayaks; 3) rafts less than 12 feet long; and 4) rafts greater than 12 feet long. For this analysis, YCWA compared the boatable flow ranges determined by the focus group rather than ranges from the core boating team. YCWA compared the boatable opportunities (e.g., average number of boatable days per year over the period of analysis) and the average number of boatable days by water year type (critical, dry, below normal, above normal and wet water years) under With-Project and Without-Project flows. Each of the figures below provides a graphical representation of the boatable day distribution by study reach under each water year type.

3.1.1.2.1 Middle Yuba River

Middle Yuba River – YCWA's Our House Diversion Dam to the Highway 49 Bridge

Hardshell Kayaks

The focus group determined the boatable flow range for hardshell kayaks in this reach is 500 to 3,000 cfs (Table 3.1-40). As reference, the core team of boaters indicated the lowest and highest flows for a quality boating experience using a hardshell kayak were 600 cfs and 4,000 cfs, respectively (Tables 3.1-15 and 3.1-17), and the optimal boatable flow range was 800 to 2,500 cfs (Table 3.1-16).

The number of days with flows in the boatable flow[13] range (i.e., 500 to 3,000 cfs) was greater under Without-Project hydrology (an average of 80 days per year) compared to With-Project hydrology (an average of 14 days per year) for the period of record across all water year types (Figure 3.1-1). Under the Without-Project hydrology, most of the days with boatable flows occur in Dry, Below Normal, Above Normal and Wet WYs typically during the months of February through April. Under the With-Project hydrology, most of the days with boatable flows occur in Below Normal WYs in March; Above Normal during January through March; and Wet WYs typically during December through May.

[13] For this analysis, days with boatable flows were counted regardless of when they occurred during the year. Access conditions during some periods may preclude boating on some of these days with boatable flows.

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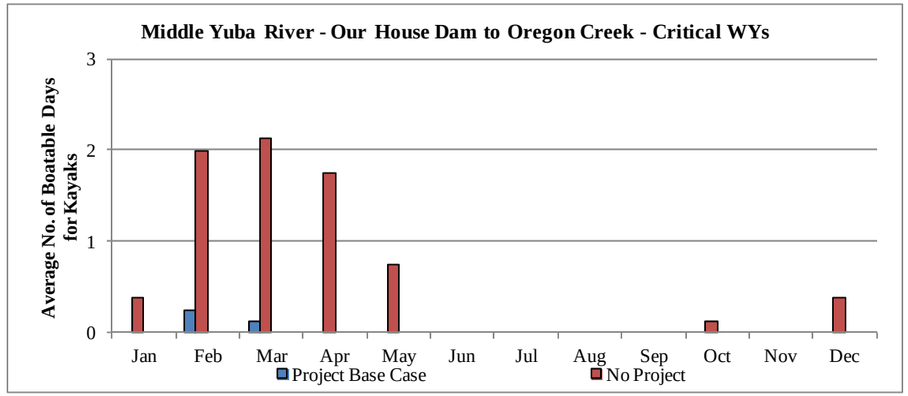

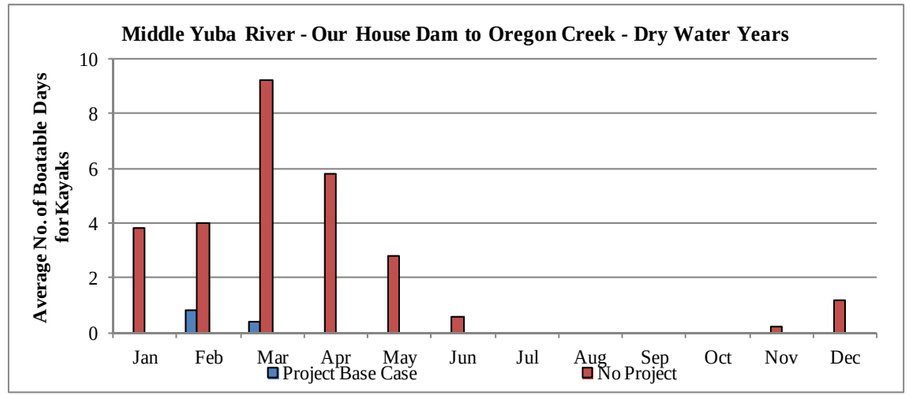

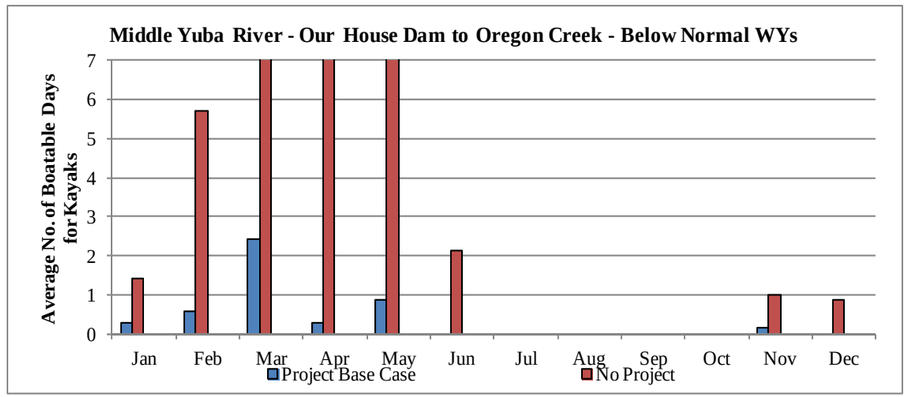

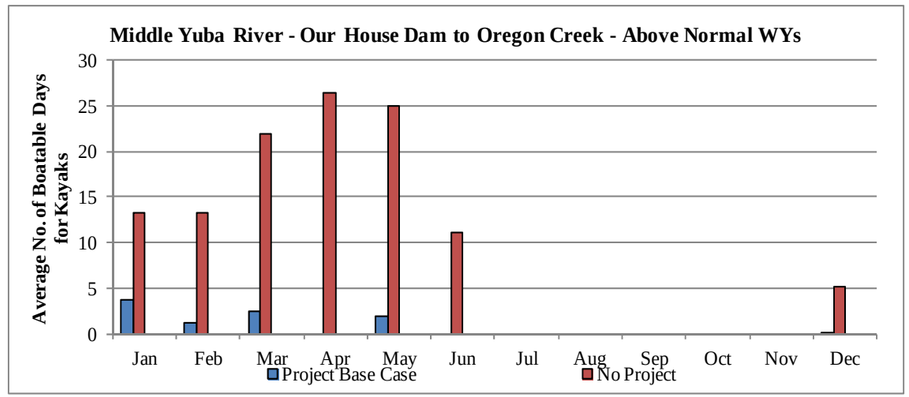

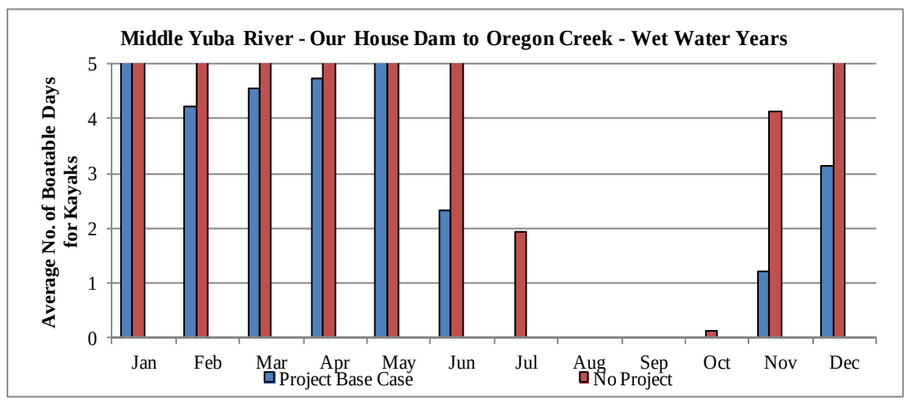

Figure 3.1-1. Number of boatable days (500-3,000 cfs) for hardshell kayaks on the Middle Yuba River from Our House Diversion Dam to Highway 49 at Oregon Creek under With-Project and Without-Project hydrology in Critical, Dry, Below Normal, Above Normal and Wet WYs from WY 1970 through WY 2010.

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Inflatable Kayaks

The focus group determined the boatable flow range for inflatable kayaks in this reach is 360 to 800 cfs (Table 3.1-40). As reference, the core team of boaters indicated the lowest and highest flows for a quality boating experience using an inflatable kayak were 300 cfs and 1,200 cfs, respectively (Tables 3.1-15 and 3.1-17), and the optimal boatable flow range was 300 to 1,400 cfs (Table 3.1-16).

The number of days with boatable flows was greater under Without-Project hydrology (an average of 71 days per year) compared to With-Project hydrology (an average of 8 days per year) for the period of record across all water year types (Figure 3.1-2). Under the Without-Project hydrology, most of the days with boatable flows occur during all types of WYs, typically during the months of March through May for Critical WYs; February through May for Dry WYs; February through May, with some days in June, for Below Normal WYs; January through June for Above Normal WYs; and December through June for Wet WYs. Under the With-Project hydrology, most of the days with boatable flows occur in Wet WYs, typically during March and May, with 2 or slightly more boatable days in each month of February, April, and June.

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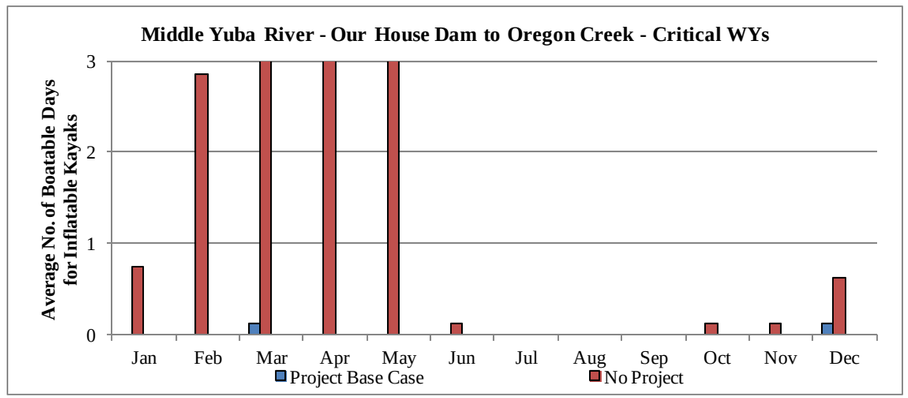

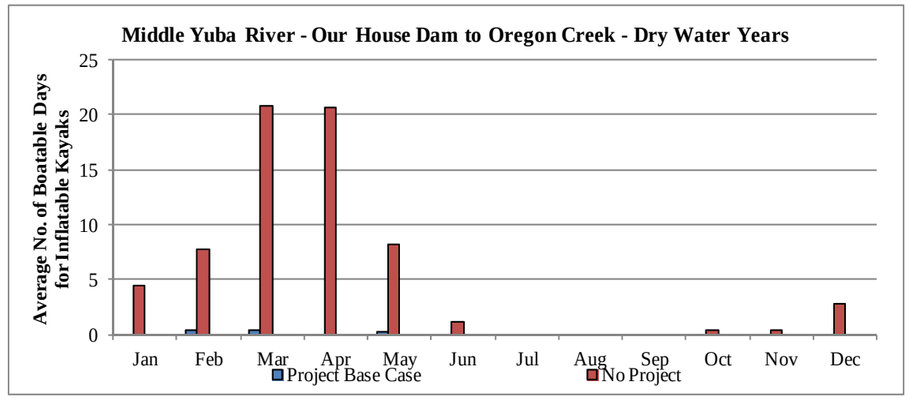

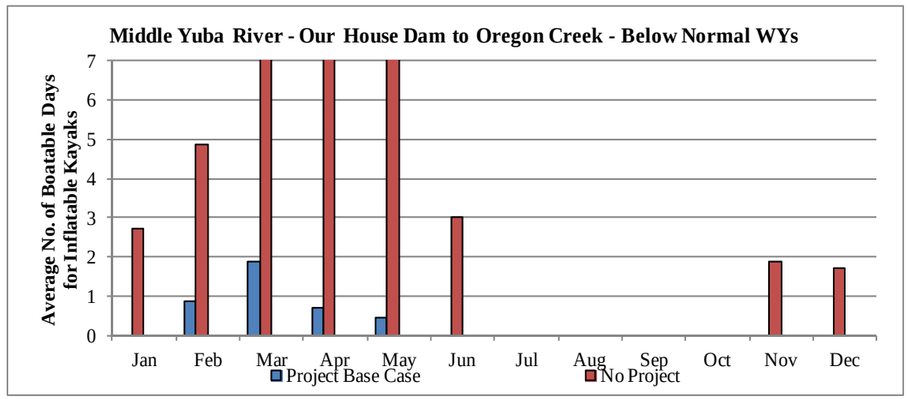

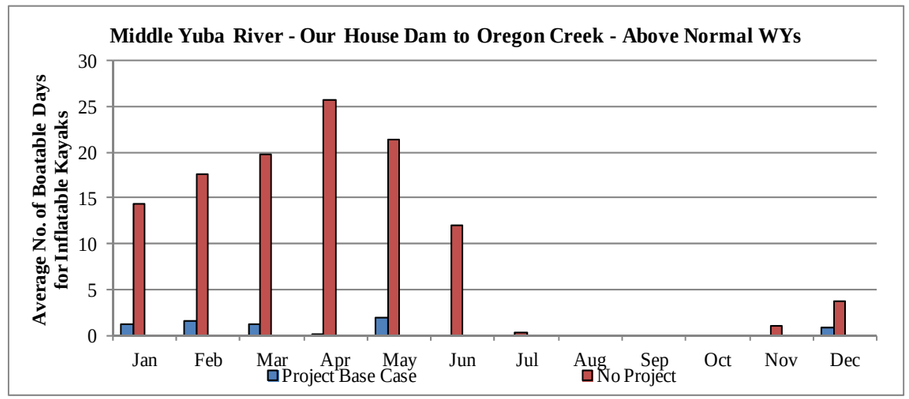

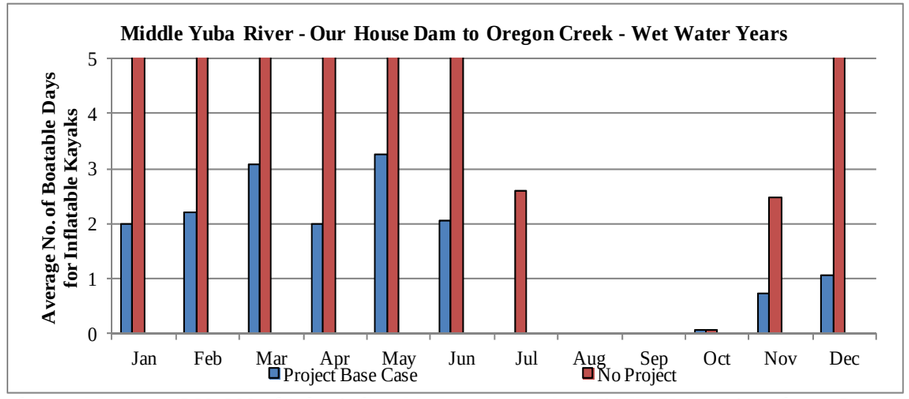

Figure 3.1-2. Number of boatable days (360-800 cfs) for inflatable kayaks on the Middle Yuba River from Our House Diversion Dam to Highway 49 at Oregon Creek under With-Project and Without-Project hydrology in Critical, Dry, Below Normal, Above Normal and Wet WYs from WY 1970 through WY 2010.

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Whitewater Rafts (Up to 12 feet long)

The focus group determined the boatable flow range for whitewater rafts less than 12 feet long in this reach is 360 to 2,000 cfs (Table 3.1-40). As reference, the core team of boaters indicated the lowest and highest flows for a quality boating experience using a whitewater raft less than 12 feet long were 300 cfs and 1,600 cfs, respectively (Tables 3.1-15 and 3.1-17), and the optimal boatable flow range was 350 to 1,200 cfs (Table 3.1-16).

The number of days with boatable flows was greater under Without-Project hydrology (an average of 89 days per year) compared to With-Project hydrology (an average of 13 days per year) for the period of record across all water year types (Figure 3.1-3). Under the Without-Project hydrology, boatable flows occur in all types of WYs typically during the months of March and April in Critical WYs; February through May in Dry WYs; February through May in Below Normal WYs; January through June in Above Normal and Wet WYs. Under the With-Project hydrology, most of the days with boatable flows occur in Wet WYs typically during the months of January through May.

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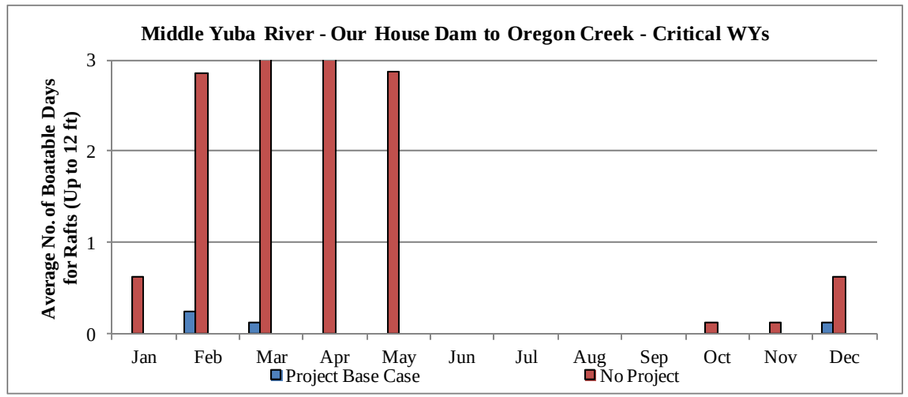

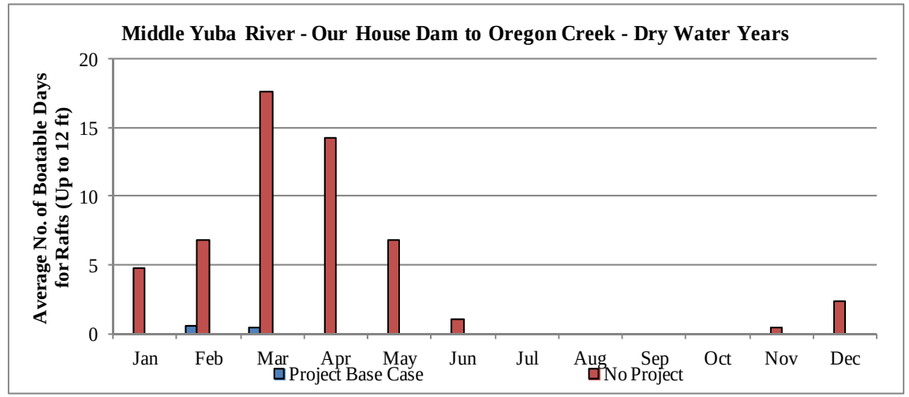

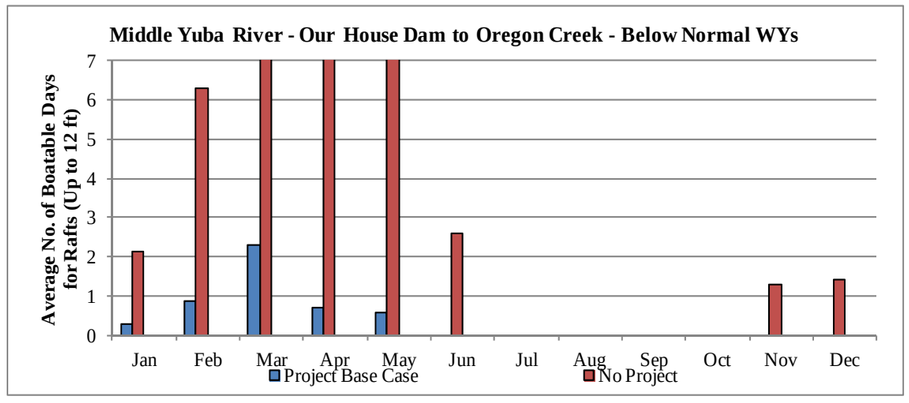

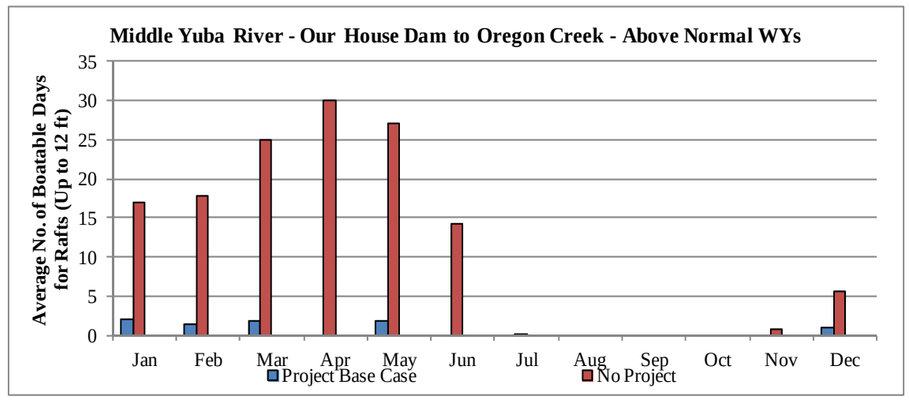

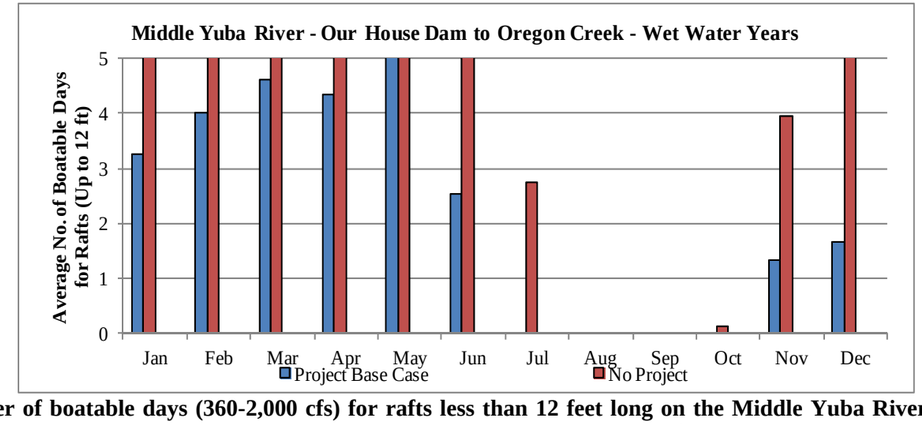

Figure 3.1-3. Number of boatable days (360-2,000 cfs) for rafts less than 12 feet long on the Middle Yuba River from Our House Diversion Dam to Highway 49 at Oregon Creek under With-Project and Without-Project hydrology in Critical, Dry, Below Normal, Above Normal and Wet WYs from WY 1970 through WY 2010.

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Whitewater Rafts (Over 12 feet long)

The focus group determined the boatable flow range for whitewater rafts more than 12 feet long in this reach is 360 to 2,000 cfs (Table 3.1-40). As reference, the core team of boaters indicated the lowest and highest flows for a quality boating experience using a whitewater raft less more 12 feet long were 700 cfs and 2,000 cfs, respectively (Tables 3.1-15 and 3.1-17), and the optimal boatable flow range was 900 to 1,300 cfs (Table 3.1-16).

The number of days with boatable flows was greater under Without-Project hydrology (an average of 64 days per year) compared to With-Project hydrology (an average of 12 days per year) for the period of record across all water year types (Figure 3.1-4). Under Without-Project hydrology, most of the days with boatable flows occurring in Dry WYs happen during the months of February through May; in Below Normal WYs during February through May; in Above Normal during January through June; and in Wet WYs typically during the months of November through June. Under With-Project hydrology, most of the days with boatable flows occur in Wet WYs typically during the months of January through May.

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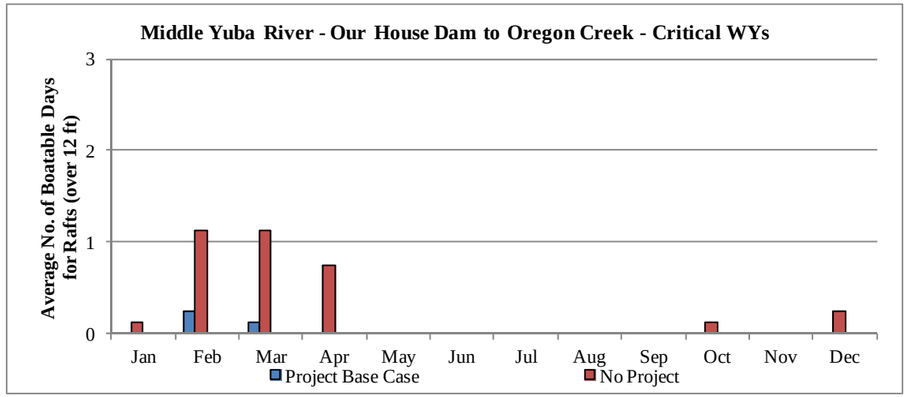

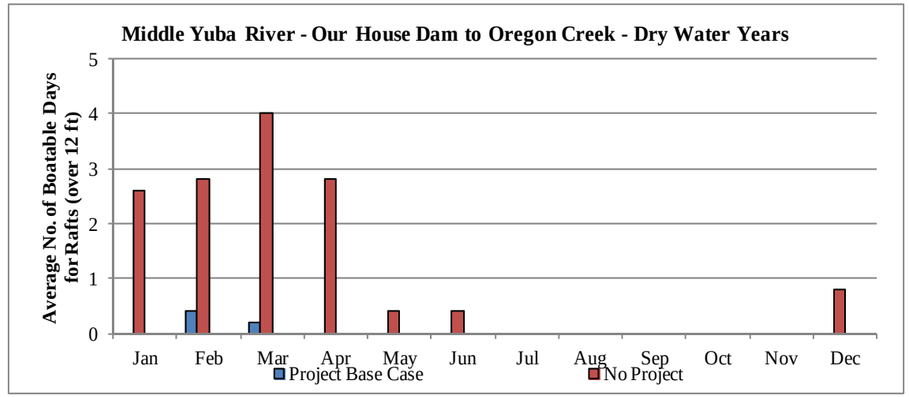

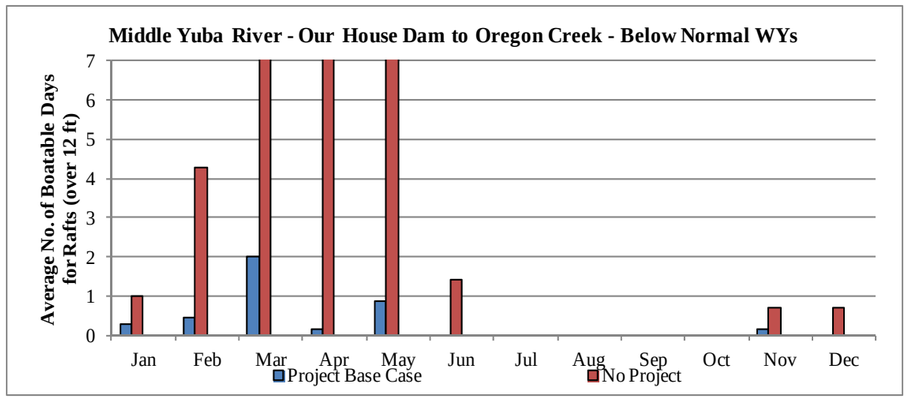

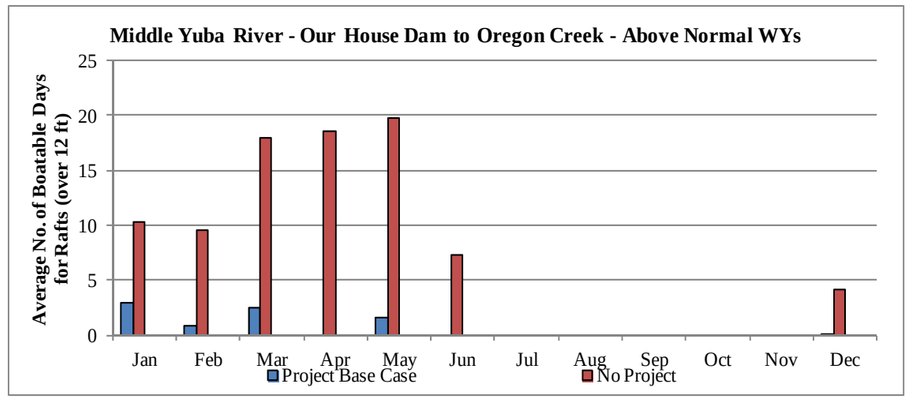

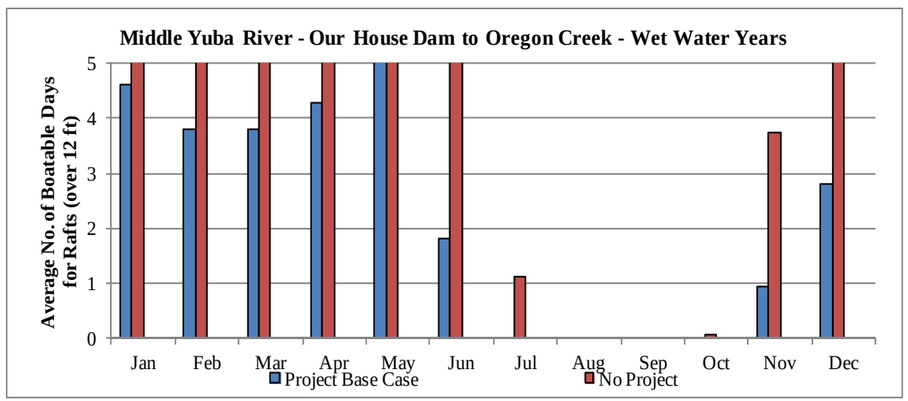

Figure 3.1-4. Number of boatable days (360-800 cfs) for rafts over 12 feet on the Middle Yuba River from Our House Diversion Dam to Highway 49 at Oregon Creek under With-Project hydrology and Without-Project hydrology in Critical, Dry, Below Normal, Above Normal and Wet WYs from WY 1970 through WY 2010.

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3.1.1.3 Description of Whitewater Boating Opportunities

Middle Yuba River – YCWA's Our House Diversion Dam (RM 12.0) to the Highway 49 Bridge (RM 4.5)

This 7.5-mile long run descends from an elevation of 2,049 ft to 1,500 ft (gradient of 65 feet per mile), varies from Class III to Class VI depending on flows, and has challenging whitewater. The estimated run time is 2 to 4.5 hours. Boaters identified this reach as slightly better than the North Fork of the American River and the Chamberlain Falls runs and, therefore, appears to have considerable demand. The reach was reported to be popular with the local boating community. The primary constraint noted by boaters was identifying accurate flows on the reach, as it must be estimated from one gage at Our House Diversion Dam, which does not account for contributing flows from other tributaries. This is typically a spring-flow run, with a majority of flows occurring between January and April during Wet WYs with an estimated 8 and 12 boatable days per season under the With-Project hydrology. Boaters reported they normally make the run in April and May.

Access considerations reported by the boater focus group included:

- Put-In: Vehicle access beyond the gate at Our House Diversion Dam; when the gate is closed, it is several hundred yards to the river.
  - The road is paved, but steep and narrow in sections. Parking is available at the end of the road in a large dirt and gravel parking area.
- Take-out: The take-out road is a paved access at Oregon Creek. Restrooms are often closed by the Forest Service until May. Parking is available at Oregon Creek Day Use area.
- Shuttle: Approximately 10 miles or 20-25 minutes via Pike City Road and Highway 49.
- Overall Quality of Access: Acceptable, however could be more user-friendly, including opening the restroom earlier in the season to serve boaters.

3.1.2 Middle Yuba River and Yuba River – Highway 49 Bridge (RM 4.7) to the normal maximum water surface elevation (NMWSE) of the United States Army Corps of Engineers' (USACE's) Englebright Reservoir (RM 32.5 on the Yuba River) – River mile 32.5 is Rice's Crossing.

[Relicensing Participants – This section will be completed after 2013 data are collected. YCWA]

3.2 Whitewater Boating Upstream of New Bullards Bar Reservoir Element

The North Yuba River whitewater boating reach above New Bullards Bar Reservoir from Indian Valley to New Bullards Bar Reservoir was included in the study area for the sole purpose of identifying the take-out patterns, issues, and levels of use via a focus group.

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A focus group was convened on July 18, 2012 and included five participants who represented commercial rafting, private boating, public land managers, and American Whitewater.

3.2.1 Reach Information

The North Fork Yuba River is boated typically during the months of April through July. There are currently three commercial outfitters who operate trips on this reach. Commercially, the number of trips per year depends greatly on flow levels. For example, during a low water year, each outfitter may book five trips per year, whereas during a high water year, each may book up to 35 trips per year. The cost of a trip ranges from $128 to $418 per day depending on the section and the number of days (i.e., 1-2).

Each commercial outfitter has a use allotment of 1,600 user days, or for example, 16 people for 100 days; however, commercial outfitters are able to use their allocation in whatever combination they chose (e.g., 2-day-long trips or 3-day-long trips). Use estimates provided by the Forest Service, which permits commercial boating on this reach, are shown in Table 3.2-1.

Table 3.2-1. Commercial boating annual use estimates from 2009 through 2011.

Year	Total Estimated Commercial Boats	Estimated Annual Passenger Numbers (6 per boat)	Estimated Annual Passenger Numbers (4 per boat)
2009	30-46	180-276	120-184
2010	74-110	444-660	296-440
2011	102-153	612-918	408-612
Annual Average	**69-103**	**412-618**	**275-412**

Based on average commercial use during dry years (median cost per passenger of $273 per person for five, five-person trips), a low-end estimated commercial use is approximately $6,825 per outfitter, or $20,475 for all three outfitters combined. A high-end estimated use (e.g., $273 per person for 35 five-person trips) is approximately $47,775 per outfitter, or $143,325 for all three outfitters combined.

3.2.2 Logistics and Take-out Preferences

3.2.2.2 Take-out

Participants identified the take-out location as either a tow-out to Dark Day Boat Ramp or Cottage Creek. Cottage Creek is not as desirable, as it adds 2 miles to the reach. Both tow-out options are on New Bullards Reservoir. The tow-out takes 2 hours, and while participants noted it was easy, it does take longer. If the take-out situation was improved (i.e., reduced the effort and time), participants felt a reasonable fee (i.e., $5 per boater) could be charged. The participants did not agree that this would necessarily increase the frequency of boating by non-commercial users due to the tow-out that does not really exist on other comparable reaches.

With respect to identifying potential options to improve the existing take-out situation, the primary option, as identified by focus group participants, was to provide a reliable, and lower cost/cost-effective scheduled tow-out option. This scenario would likely result in an increased

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demand including kayakers and not just rafters, but would still be a reach for a limited boating population since a long, slow tow-out is not a particularly desirable way to end a boating run. For commercial use, the flows are the driving force behind demand.

A secondary option to improve the take-out was to evaluate potential road access near the inflow of the North Yuba River to New Bullards Bar Reservoir to eliminate the need for a tow-out and extended time for boaters in a flat-water experience. However, the focus group participants indicated that options may be very limited for public road access due largely to widespread private land ownership and steep, rugged terrain along the river canyon and at the upstream end of New Bullards Bar Reservoir. The option appeared unlikely, as evaluated by focus group participants.

3.2.2.3 Boating

The primary type of whitewater boating on this reach is rafting with flows estimated to support various raft sizes at 1,000 cfs or higher for 14-foot rafts and 700 to 1,000 cfs for 12 foot rafts. Kayaking is rare relative to rafting due to the long paddle out and the cost of getting a boat tow-out, particularly when kayakers are typically in smaller group sizes compared to private and commercial rafters.

3.2.2.4 Constraints

There were a couple of constraints to current logistics with respect to the tow-out/take-out. First, log jams at the upstream end of New Bullards Bar Reservoir can constrain use because a boat tow-out may not be able to reach the boaters/rafters through the debris. Second, due to logistical issues (boat tow-out), outfitters often charge more, but not enough to cover the full cost of the boat tow-out.

3.3 Angling Element

3.3.1 Focus Group

YCWA held the angler focus group on July 18, 2012 in Grass Valley, California. Eighteen anglers participated in the focus group, and appeared to be in general consensus on experience on various reaches, interest in various reaches, and geographic and logistical considerations. Overall, participants had an extensive amount of angling experience in the region and elsewhere; however, most participants had limited experience on the study reaches, particularly compared to a non-study reach immediately downstream of the study reaches – Yuba River below Englebright Dam. The focus group participants' primary data were related to this non-study reach. YCWA has included the data gathered during the focus group for this non-study reach following any data and discussion related to the study reaches.

Overall, public fishing access locations on the study reaches were limited to major highways or road intersections such as the Highway 49 Bridge which provides access to both the Middle Yuba River and lower end of Oregon Creek.

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Once downstream of the Highway 49 Bridge, public access is severely limited due to private land ownership and participants indicated the next popular angling location was at the downstream end of the study reaches at Rice's Crossing and New Colgate Powerhouse on the Yuba River below the confluence of the North Yuba and Middle Yuba rivers.

In comparison, the non-study reach on the Yuba River below Englebright Dam has significantly more public angling locations. Table 3.3-1 summarizes the results of the angler focus group discussion concerning fishing experience and locations on the study reaches.

Table 3.3-1. Angling locations of focus group participants on study reaches.

Reach	Locations
North Yuba River below Bullards Bar Dam	No fishing experience on this reach
Middle Yuba River, Our House Diversion Dam to Highway 49	Oregon Creek Day Use Area: rainbow trout, fly fishing. According to respondents, the fishing quality and success is better upstream of Our House Diversion Dam than below Our House Diversion Dam.
Middle Yuba River, Highway 49 to North Yuba River Confluence	Mushroom Rock area (private access only)
Yuba River from Middle Yuba River-North Yuba River Confluence to Englebright Reservoir	Rice's Crossing, Colgate Powerhouse
Oregon Creek	Oregon Creek Day Use Area, Highway 49 roadside
Yuba River below Englebright Reservoir	Parks Bar, Sycamore Park, Hammon Grove Park, Hammon-Smartsville Road, Western Aggregate.

For each study reach, participants provided when they typically fished (Table 3.3-2); any constraints on the reaches (Table 3.3-3); and the overall access rating for the study reaches (Table 3.3-4).

Table 3.3-2. Anglers typical timing and seasonality on the study reaches.

Reach	Season	Time of Day
North Yuba River below New Bullards Bar Dam	NA	Varied (all times)
Middle Yuba River Our House Diversion Dam to Highway 49	• April-May mostly; occasionally in Summer but much lower flows	Varied (all times)
Middle Yuba River Highway 49 to North Yuba River Confluence	• April to close (for trout)	Varied (all times)
Yuba River from Middle Yuba River-North Yuba River Confluence to Englebright Reservoir	• April-May	Varied (all times)
Yuba River below Englebright Dam	• Year-round, but peak September-December (steelhead/trout); January-March (still good fishing from 500 - 2,500 cfs for drift boat fishing; 2,000-3,000 cfs optimal) • Destination fishing location (Bay Area) with 1-7 boats/day during peak season. • Typical peak season use levels: 5-40 anglers	Varied (all times)

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Table 3.3-3. Constraints to angling by reach.

Reach	Constraint	Solution?
North Yuba River below New Bullards Bar Dam	NA	NA
Middle Yuba River Our House Diversion Dam to Highway 49	• Fishable flows only during late April-May then flows drop off and water temps get too warm	• Increase flows in reach
Yuba River from Middle Yuba River-North Yuba River Confluence to Englebright Reservoir	• Good fishing, but high flow fluctuations make fishing this reach very difficult and dangerous, particularly for wading. Shore fishing is more successful because less impact from flows. • River right/north side is all private so you have virtually no access.	• Need consistent flows; less fluctuation • Need for more public access
Oregon Creek	• Low flows limit fishing use/success • Very brushy/overgrown with vegetation	• Increase fish flows
Yuba River below Englebright Dam	• A lot of private lands along reach (river right); boat fishing is easier than shore fishing due to limited access locations. • When wading, as long as you stay within high water mark you are permitted, but higher flows often constrain where you can fish without trespassing.	• Identify private land, increase public access points

Table 3.3-4. Anglers overall access rating by reach.

Reach	Rating
North Yuba River below Bullards Bar Dam	No experience
Middle Yuba River Our House Diversion Dam to Highway 49	Slightly Acceptable
Middle Yuba River Highway 49 to North Yuba River Confluence	Slightly Acceptable
Yuba River from Middle Yuba River-North Yuba River Confluence to Englebright Reservoir	Marginal
Oregon Creek	Slightly Acceptable
Yuba River below Englebright Dam	Totally Acceptable

YCWA asked focus group participants to identify the type and quality of their fishing opportunities on the study reaches (Table 3.3-5).

Table 3.3-5. Anglers type and quality of fishing opportunity by study reach.

Reach	Target Species	Flow Range	Flow Information	Fish Per Hour	Size	Season	Time of Day
North Yuba River below Bullards Bar Dam	NA	NA	NA	NA	NA	NA	NA
Middle Yuba River, Our House Diversion Dam-Highway 49	Trout	April-May flows	CDEC[1]	<1	varied	April-May	all
Middle Yuba River, 49-North Yuba River	Trout	April-May flows	CDEC	<1	varied	April-May	all
Mainstem, Middle Yuba River-North Yuba River Confluence to Englebright Reservoir	Trout	April-May flows	CDEC	1	varied	April-May	all
Oregon Creek	Trout	April-May flows	CDEC	<1	varied	April-May	all

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Table 3.3-5. (continued)

Reach	Target Species	Flow Range	Flow Information	Fish Per Hour	Size	Season	Time of Day
Yuba River below Englebright Dam	Trout, steelhead	Boat: 500-4,000 Wade: 500-1500 optimal) Shore: 500-4,000	CDEC (real-time). There is a need for public flow projection dissemination for safety and angling.	1	16 inches	Year-round Peak (September-March)	all

[1] CDEC = California Data Exchange Center

YCWA asked participants to list reaches on rivers within 4 hours of the Project and discuss any similarities and differences compared to the study reaches (i.e., worse, similar or better). Participants did not provide any similar reaches to the study reaches. However, participants did provide similar reaches and a comparison to the non-study reach of the Yuba River below Englebright Reservoir. Within 2 hours of the Project, participants identified the Feather River below Lake Oroville and Truckee River from Lake Tahoe to Pyramid Lake; and rated these reaches better than the non-study reach of the Yuba River below Englebright Reservoir. Within 4 hours of the Project, participants identified the Lower Sacramento River and Lower American River below Folsom Lake; and rated these reaches as similar to the Yuba River below Englebright Reservoir (non-study reach).

Participants indicated that the local angling community was less than 100 anglers, primarily fly fishing, and mostly from the shoreline and wading for all three study reaches. Of note, for the non-study reach on the Yuba River below Englebright Reservoir, the angling community was estimated at more than 500 anglers; fly and bait type angling; and a wide variety of modes of angling (e.g., boat, shore, wading and tubes).

Participants were asked to provide their impressions of various management issues (crowding) and facility needs that may exist in areas where they spent time angling. However, participants did not indicate any management issues or facility needs related to the study reaches. In comparison, on the Yuba River below Englebright Reservoir, participants identified crowding at Parks Bar, primarily on weekends from September through December; facility improvements at the Highway 20 put-in on river right at the bridge; and safety issues due to unknown ramping of flows in the river.

4.0 Discussion

4.1 Whitewater Boating Element

The study area began with three whitewater study reaches on two different rivers affected by the Projects - the Middle Yuba River, Yuba River, and Oregon Creek. Based on the data collected in Phases 1, 2 and 3, only two reaches have existing or potential whitewater boating opportunities: the Middle Yuba River from Our House Dam to Highway 49 Bridge and Highway 49 Bridge to Englebright.

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In addition, YCWA conducted a flow study on November 8 and 9, 2008 to estimate the minimum and optimum whitewater boating flows and other whitewater boating characteristics of the North Yuba River and Yuba River from New Bullards Bar Dam to Rice's Crossing. The following discussion provides an overall appraisal of the viability of these reaches based on the boatable flow ranges, operational constraints and access considerations.

4.1.1 Middle Yuba River

The two Middle Yuba River study reaches considered in this study were YCWA's Our House Diversion Dam to Highway 49, and Highway 49 to Englebright Reservoir. In addition, YCWA conducted a flow study from New Bullards Bar Dam to Rice's Crossing to estimate the minimum and optimum whitewater boating flows and other whitewater boating characteristics.

To date, YCWA received whitewater boater surveys from boaters on the Our House Diversion Dam to Highway 49 reach. Due to a low water year in 2012, there was limited capability for opportunistic flows on the Highway 49 to Englebright Reservoir reach. The study plan allowed for a contingency, which will address this reach in particular in 2013. However, an expert/elite boating team that ran the New Bullards Bar Dam to Rice's and New Colgate take-out locations in 2008 and these results are included below. Overall, members of the boating focus group noted four primary types of boaters on the Middle Yuba River: 1) hardshell kayakers; 2) inflatable kayakers; 3) rafts under 12 feet in length; and 4) rafts over 12 feet in length.

4.1.1.1 Our House Diversion Dam to the Highway 49 Bridge

For the Our House Dam to Highway 49 reach, boaters identified the boatable range as 500 to 3,000 cfs. The number of boatable days for hardshell kayakers was greater under the Without-Project hydrology (an average of 80 days per year) compared to the With-Project hydrology (an average of 14 days per year) for the period of record across all water year types. Under the With-Project hydrology, most of the days with boatable flows occur in Below Normal WYs in March; Above Normal during January through March; and Wet WYs typically during December through May.

For inflatable kayakers, boaters identified 360 to 800 cfs as a boatable flow range. The number of days with boatable flows was greater under the Without-Project hydrology (an average of 71 days per year) compared to the With-Project hydrology (an average of 8 days per year) for the period of record across all water year types. Boatable flows for this range occur typically in Wet Water Years under the With-Project hydrology during March and May.

For rafts under 12 feet in length, boaters identified a flow range of 360 to 2,000 cfs. The number of days with boatable flows was greater under the Without-Project hydrology (an average of 89 days per year) compared to With-Project hydrology (an average of 13 days per year) for the period of record across all water year types. Under the With-Project hydrology, most of the days with boatable flows occur in Wet WYs typically during the months of January through May.

Boaters identified the boatable flow range for whitewater rafts over 12 feet long as 360 to 2,000 cfs. The number of days with boatable flows was greater under the Without-Project hydrology

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(an average of 64 days per year) compared to the With-Project hydrology (an average of 12 days per year) for the period of record across all water year types. Under the With-Project hydrology, most of the days with boatable flows occur in Wet WYs typically during the months of January through May.

The reach is desirable when compared to other like-reaches in the region. Boaters noted as a Class III to VI reach, it compares to or is slightly better than the North Fork of the American River and Chamberlain Falls runs, and is popular locally.

There were a couple of issues identified by boaters relative to running the reach. First, there is one portage at the low-head diversion dam below Our House Diversion Dam. Second, the Our House Diversion Dam gage requires some guess work due to the upstream tributaries flows, and, flows vary within 24 hours, hence is seen as a central issue for boaters. The gage provides substantially incomplete information from which to deduce upstream flows due to the ability of YCWA to divert up to 800 cfs at Our House Diversion Dam to its Lohman Ridge Tunnel. Last, the take-out at the Forest Service's Oregon Creek Day Use Area is convenient, yet boaters would like to see the restrooms opened earlier in the season, which would make the take-out more accessible and functional for their use.

4.1.1.2 Middle Yuba River and Yuba River from the Highway 49 Bridge to Englebright Reservoir

[Relicensing Participants – This section will be completed after 2013 data are collected. YCWA]

4.1.2 North Yuba River

4.1.2.1 New Bullards Bar Dam to Colgate and Rice's Crossing

YCWA conducted a whitwater boating flow study on the New Bullards Bar Dam Reach on November 8 and 9, 2008. The results of this study are located in Attachment 8-2F. The major findings of this study indicated that this reach is best suited for hardshell kayaks, however rafting could be possible with a team of elite rafters. The boaters also did not recommend this reach for commercial rafting due to the severe consequences and technical portaging and maneuvering around boulders and rapids required of most, if not all, rafters involved.

The whitewater difficulty is Class V to V+, with an overall boatable range of 500 to 1,000 cfs. The reach consists of endless Class IV/V rapids and roughly a dozen Class V to V+ rapids with three major portages and one very difficult portage below the confluence with the Middle Yuba River (at the "S-Turn" rapid). The preferred put-in location is below New Bullards Bar Dam with the preferred take-out location at New Colgate Powerhouse, resulting in an 8.1-mile-long reach.

Boaters noted that due to very different gradients and variation in flows, there are sub-reaches that exist, primarily from New Bullards Bar Dam to Highway 49 Bridge, and from Highway 49 Bridge to the take-out.

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Boaters noted that vehicle access to the river at the put-in would be the ideal, but hiking down the access road was manageable and greatly preferred over hiking/scrambling down the canyon walls to the river.

Currently, flow information on the reach is primarily based on guessing or driving out the dam to see what the flows are and extrapolating what the Middle Yuba River is flowing, to determine what the combined flows will be for the lower part of the run, and results in a reach that is primarily boatable for a very local population. In addition, boaters noted that the reach is similar to some other Northern California whitewater runs such as the South Yuba River from Highway 49 to Bridgeport and Purdons to Highway 49; Cherry Creek, South Fork Merced and the Clavey River.

4.2 Whitewater Boating Take-out Upstream of New Bullards Bar Reservoir Element

YCWA studied the North Yuba take-out patterns, issues, and levels of use via a focus group. Based on the data gathered at the focus group on July 18, 2012, the primary boating constraint was the amount of time for a tow-out from the end of the run at the inflow to New Bullards Bar Reservoir, which was estimated at 2 hours. The tow-out option is primarily used by commercial rafting who can pass some of the cost of the tow-out service onto customers (i.e., large, reserved groups). Currently, the tow-out option is not viable for private boaters, who typically run the reach in smaller numbers and thus, the cost for a tow-out is considered too high. The primary option, as identified by focus group participants, was to provide a reliable, and lower cost/cost-effective tow-out option through a private concessionaire at New Bullards Bar reservoir. The boaters opined this scenario would result in an increased demand by kayakers, but the reach would still be used by a limited boating population since a long, slow tow-out is not a particularly desirable way to end a boating run. For commercial use, the flows are the driving force behind demand.

A secondary option to improve the take-out was to evaluate potential road access near the inflow of the North Yuba River to New Bullards Bar Reservoir to eliminate the need for a tow-out and extended time for boaters in a flat-water experience. However, even focus group participants indicated that options may be very limited for public road access due largely to widespread private land ownership and since YCWA's operations do not affect conditions over the length of this run except for the current tow-out options, since it is upstream of all Project facilities.

4.3 Angling Element

For the angling component of this study, focus group participants indicated the angling use on the study reaches was limited generally to the Middle Yuba River from Our House Diversion Dam to Highway 49, and Highway 49 to the North Yuba River confluence; the North Yuba River Confluence to Englebright; and Oregon Creek. However, public access to angling opportunities on these reaches was often limited to a few locations and then hiking upstream and/or downstream for quality angling experiences. Anglers were not familiar with various flow levels, and as such, a comparison of hydrology was not made.

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The focus group noted fishing in the Yuba River downstream of Englebright Reservoir is a year-round angling opportunity for a variety of angling methods (e.g., shoreline, wading and boat). They opined this reach has the better public access and provides an excellent fishing opportunity for drift boats to shore anglers.

5.0 Study-Specific Consultation

The FERC-approved study included study-specific consultations, each of which is discussed below.

5.1 Identify Core Team of Boaters

The FERC-approved study states:

> YCWA, in consultation with Relicensing Participants, will identify the team of boaters to opportunistically run the Middle Yuba River study reaches (and the Oregon Creek study reach if an opportunistic flow study is conducted on the reach).

YCWA consulted with Relicensing Participants, including AW to identify the core team of boaters.

5.2 Determine if Oregon Creek Has Potential for Whitewater Boating

The FERC approved study states:

> YCWA, in consultation with Relicensing Participants, determine whether or not Oregon Creek had potential for whitewater boating.

YCWA consulted with Relicensing Participants, including AW, regarding whether or not Oregon Creek had potential for whitewater boating. YCWA and Relicensing Participants collaboratively agreed that a reasonable whitewater boating opportunity did not exist on Oregon Creek.

5.3 Select Participants for North Yuba River Focus Group

The FERC-approved study states:

> YCWA, in consultation with Relicensing Participants, will identify whitewater boaters to participate in the whitewater boating focus group on the North Yuba River study reach from Indian Valley to New Bullards Bar Reservoir.

YCWA consulted with Relicensing Participants regarding whitewater boaters to participate in the whitewater boating focus group on the North Yuba River study reach. Participants in the focus group included the Forest Service, a commercial boating company, private boaters and AW.

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5.4 Contingency Option for Middle Yuba River

The FERC-approved study states:

> YCWA, in consultation with Relicensing Participants, will determine if contingency option 2 on the Middle Yuba River whitewater boating component is feasible. If YCWA and Relicensing Participants collaboratively agree that this option is feasible to complete the study, then YCWA will implement this option.

This option has been collaboratively agreed to, and YCWA will implement it in 2013.

5.5 Select Angler Focus Group Participants

The FERC-approved study states:

> YCWA, in consultation with Relicensing Participants, will identify anglers to participate in focus groups.

YCWA consulted with Relicensing Participants to identify 18 focus group participants, who attended the meeting on July 18, 2012.

6.0 Variances from FERC-Approved Study

The study was conducted according to Study 8.2, Recreation Flow, with two variances. First, the FERC-approved study stated that YCWA would estimate the average annual number of angling usable days that occur based on Project Base Case and No Project hydrology for the study reaches with angling demand based on acceptable angling flow ranges as determined by angler focus group participants. However, the focus group participants were not able to provide specific acceptable flow ranges necessary for YCWA to compare flows to the hydrology and thus complete Step 2 of the angling component. Rather, angling focus group participants were only able to provide typical months that they fished on the study reaches.

Second, the FERC-approved study required comparing "regulated" and "unimpaired" hydrology. YCWA used "With-Project" and Without-Project" hydrology.

7.0 Attachments to This Interim Technical Memorandum

This interim technical memorandum includes six attachments:

- Attachment 8-2A Whitewater Boater Open-ended Responses [1 Adobe PDF file: 40 kB; 4 pages formatted to print double-sided on 8 ½ x 11 paper]
- Attachment 8-2B Oregon Creek Photographic Summary [1 Adobe PDF file: 1MB; 4 pages formatted to print double-sided on 8 ½ x 11 paper]

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- Attachment 8-2C Comparative Evaluation Form [1 Adobe PDF file: 730 kB; 6 pages formatted to print double-sided on 8 ½ x 11 paper]
- Attachment 8-2D North Yuba River Whitewater Boating Take-out Focus Group Questions [1 Adobe PDF file: 42 kB; 4 pages formatted to print double-sided on 8 ½ x 11 paper]
- Attachment 8-2E Angler Focus Group Questions [1 Adobe PDF file: 44 kB; 4 pages formatted to print double-sided on 8 ½ x 11 paper]
- Attachment 8-2F 2008 New Bullards Bar Dam Whitewater Study Results [1 Adobe PDF file: 374 kB; 22 pages formatted to print double-sided on 8 ½ x 11 paper]

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Interim Technical Memorandum 8-2

Recreation Flow Study

Attachment 8-2A

Whitewater Boater Open-ended Responses

Yuba River Development Project
FERC Project No. 2246

October 2012

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ATTACHMENT A
Open-Ended Responses

Question: If you have any suggestions for improving the access or shuttle for this run please describe these improvements below.

Hardshell Kayakers
- Reliable flow, Predictable flow.

Inflatable Kayakers
- A ramp at put in below dam would be nice.
- Bathroom & trash can at put in.

R2ers
- Put in sign on main road.

Rafters
- Sign at our house dam road.

Question: Please provide any comments about your overall boating experience on study reach below.

Hardshell Kayakers
- Fun sector with good access.
- This is a great run for fun, widely, challenging rapids, but not too scary.
- This is a great run with really pleasure it would get a lot of paddles throughout winter & spring.

Inflatable Kayakers
- Amazing section of river.
- Sign to our house dam on road. A potty at our house dam.

R2ers
- Flipped and wrapped, was testing a prototype boat.
- Provide seasonal on camping toilet at put in and trash receptacle.
- Provide seasonal toilet at put-in and trash can.

Rafters
- Bathroom at put in.
- Beautiful run. Great. Classic, safe, and fun for whitewater.

Question: Did you observe or experience any significant safety issues on this run at the flow you are evaluating – such as swims, pins, wrapped boats, man-made or natural river features, etc.? Please explain below.

Hardshell Kayakers

- All good. Great stretch of river.
- Great run.
- It was brushed due to consistent low flows. Higher flows would need this.
- Just a bit rocky in a few places, a little bit move water would clear things up nicely at 1200 plus cfs.
- None.
- The low head dam feature early on in the run was easily run at this flow.
- The portage at the mile 7 long rapid is tough for old guys.
- There would be fewer issues with shallow rocks especially in the last 1/3 of the run if the flow was a hit higher. There are some brush issues that would be cleared up with more comfortable flows.
- Willows growing in the river

Inflatable Kayakers

- A few rapids need a slat on prior knowledge to run safety
- Clean rim swim at the bottom hole of a rapid. It was awesome.

R2ers

- 1 IK swim.
- Flipped once, easy swim, wrapped once. Shifty boat it was a prototype
- Flipped once, had a great swim into a mellow pool.
- None
- R2 flipped & wrapped prototype lousy boat seasoned paddles.

Rafters

- 1 quick run.
- A guy had a quick in & out swim.
- I took a dump truck in and out.
- One boat hipped at the bottom of a class IV rapid.
- Quite trip

C1er

- Low head down right below put in is kind a sketchy.

Interim Technical Memorandum 8-2

Recreation Flow Study

Attachment 8-2B

Oregon Creek Photographic Summary

Yuba River Development Project
FERC Project No. 2246

October 2012

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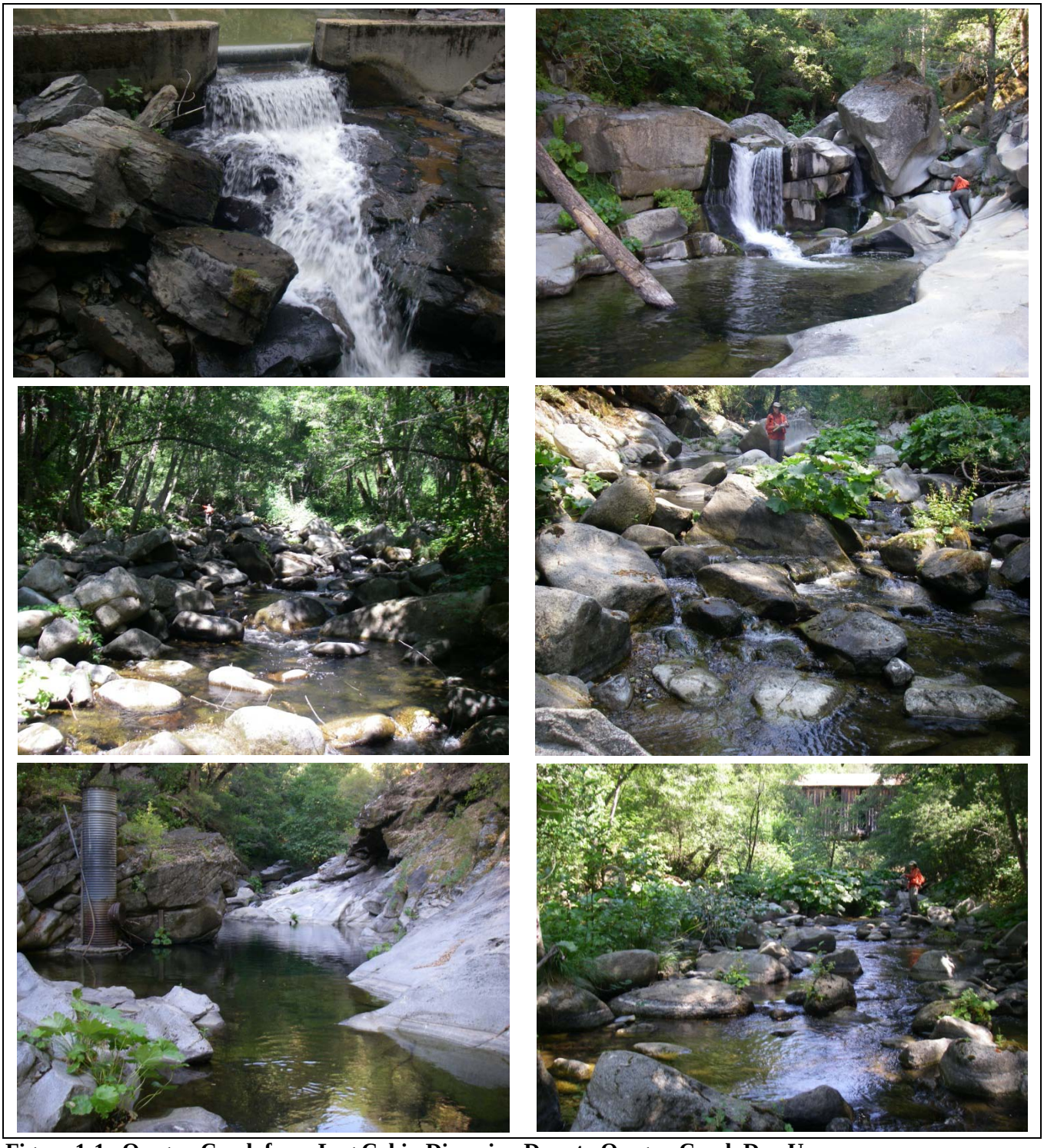

Figure 1-1. Oregon Creek from Log Cabin Diversion Dam to Oregon Creek Day Use.

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Interim Technical Memorandum 8-2

Recreation Flow Study

Attachment 8-2C

Comparative Evaluation Form

Yuba River Development Project
FERC Project No. 2246

October 2012

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Middle Yuba River Whitewater Boating Flow Study
Comparative Evaluation Form

Section 1 - Boater Background Information (1 page)

1. Name: _____
2. Email: _____
3. Zip Code: _____
4. Age: _____
5. How long does it take you to get to the Middle Yuba River Study Reach from your home? (circle one)
   a. Less than 15 minutes b. 15 to 30 minutes c. 31 to 60 minutes d. More than 60 minutes
6. What is your preferred craft? (circle one)
   a. Hardshell kayak b. Inflatable kayak c. Cataraft d. R2 e. Raft f. Other (specify): _____
7. Please indicate your current boating skill level. a. Novice b. Intermediate c. Advanced d. Expert e. Elite
8. How many years have you been boating at this level? _____ years
9. In the past 3 years, how many days a month do you boat? _____/month
10. a. Have you ever participated in a hydro relicensing whitewater boating study before? a. Yes b. No

b. If yes, what year and for which hydro project? *(List up to 2 projects)*	Year	Name of Hydro Project
i.	_____	_____
ii.	_____	_____

11. a. How many times have you boated this run before this study? _____ / year
    b. If you have boated this reach before this study what were the flows and type of craft you used?
    i. Flow: _____ ▶ Craft: _____
    ii. Flow: _____ ▶ Craft: _____
    iii. Flow: _____ ▶ Craft: _____
12. Please respond to each of the following statements about your river-running preferences. (circle one response per row)

Statement	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
I prefer running rivers with difficult rapids (Class IV and V).	1	2	3	4	5
Running challenging whitewater is the most important part of my boating trips.	1	2	3	4	5
I often boat short river segments (<4 mi.) to take advantage of whitewater play areas.	1	2	3	4	5
I often boat short river segments to experience a unique and interesting place.	1	2	3	4	5
I often boat short river segments to run challenging rapids.	1	2	3	4	5
Good whitewater play areas are more important than challenging rapids.	1	2	3	4	5
I am willing to tolerate difficult put-ins/portages to run interesting whitewater reaches.	1	2	3	4	5
I prefer boating rivers that feature large waves and powerful hydraulics.	1	2	3	4	5
I prefer boating steep, technical rivers.	1	2	3	4	5
I enjoy boating both technical and big water rivers.	1	2	3	4	5

13. Please list some of the whitewater runs in California you typically boat each year; and how often you boat these runs.
    a. Reach Name: _____ ▶ Trips per year on this reach: 0-3 4-8 9-15 15+
    b. Reach Name: _____ ▶ Trips per year on this reach: 0-3 4-8 9-15 15+
    c. Reach Name: _____ ▶ Trips per year on this reach: 0-3 4-8 9-15 15+
    d. Reach Name: _____ ▶ Trips per year on this reach: 0-3 4-8 9-15 15+

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Comparative Evaluation Form (continued)

Section 2 – Comparative Evaluation of Flow Levels (2 pages)

1. Which Study Reach are you evaluating? (circle one) a. Our House Div. Dam to Hwy 49 b. Hwy 49 to Englebright

2. What craft type are you evaluating the flows for? (circle one)

   a. Hardshell Kayak b. Inflatable Kayak c. Cataraft d. R2 e. Raft f. Other (specify): _____

3. Please evaluate the following flows for Your Craft and Skill Level. In making your evaluations, please consider all the flow-dependent characteristics that contribute to a high quality trip (e.g., boatability, whitewater challenge, safety, availability of surfing or other play areas, aesthetics, and rate of travel). IMPORTANT: If there is a flow level that you do not feel comfortable making this evaluation for, then check the box in the First Row.

Complete for EACH column	Flow Level (cfs)									
	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200
Cannot Estimate At This Flow	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Totally Acceptable	5	5	5	5	5	5	5	5	5	5
Acceptable	4	4	4	4	4	4	4	4	4	4
Marginal	3	3	3	3	3	3	3	3	3	3
Unacceptable	2	2	2	2	2	2	2	2	2	2
Totally Unacceptable	1	1	1	1	1	1	1	1	1	1

4. Based on your boating trips on this reach, please answer the following questions by providing a flow for each.
   (Note: you can specify flows that you have not seen, but which you would predict based on your experience.)

   a. What is the lowest flow you need to simply get down the river in your craft? _____ *cfs*
   b. What is the lowest flow that provides a quality technical boating experience for this reach? _____ *cfs*
   c. What is the optimal flow range that provides the best whitewater characteristics for this run? _____ to _____ *cfs*
   d. What do you feel the highest safe flow for your craft and skill level? _____ *cfs*

5. Based on your boating trips on this reach, if the flows in your optimal boating range (Question 4, Row C) were provided, then how often you would return to this run. (circle one)

   a. Never b. Once Every Year c. Multiple Times Every Year d. Once Every Few Years e. As Often As I Could

6. Based on your boating trips on this reach and at flows in your optimal boating range (Question 4, Row C), to which established boating runs in California do you feel the Study Reach is most similar?

	River Name	Run	Season	Optimal Flow (cfs)
a.				
b.				
c.				
d.				

7. Compared to the runs you listed above, how would you rate boating opportunities on this Study Reach at the flows in your optimal boating range (Question 4, Row C). *(circle one number for each; if you are unsure, leave that item blank).*

Other Reach Name:	Compared to the reach at left, the Study Reach is…				
	…Much Worse	…Worse	…About the Same	…Better	…Much Better
a.	1	2	3	4	5
b.	1	2	3	4	5
c.	1	2	3	4	5
d.	1	2	3	4	5

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Comparative Evaluation Form (continued)

8. Please respond to the following statements about the non-whitewater characteristics of the Study Reach at the flows in your optimal boating range (Question 4, row C).

Statement	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a. Length of Shuttle is not a problem.	1	2	3	4	5
b. The put-in for this run is good.	1	2	3	4	5
c. The take-out for this run is good.	1	2	3	4	5
d. The total shuttle to boating ratio on this run is good.	1	2	3	4	5

9. If you have any suggestions for improving the access or shuttle for this run please describe these improvements below.

a. _____

b. _____

c. _____

d. _____

e. _____

10. Please provide any comments about your overall boating experience on Study Reach below.

_____

_____

_____

_____

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Thank You For Taking the Time to Complete this Form.

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Interim Technical Memorandum 8-2

Recreation Flow Study

Attachment 8-2D

North Yuba River Whitewater Boating Takeout Focus Group Questions

Yuba River Development Project

FERC Project No. 2246

October 2012

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North Yuba River Whitewater Boating Takeout Focus Group
Topics and Questions

Experience / Background Information

1. Do you boat the North Yuba River reach as a private boater, commercial outfitter, or commercial client?
2. How many years have you been boating?
   - Overall?
   - On the North Yuba River reach?
3. What type of boats do you commonly use?
   - Overall
   - On the North Yuba River reach?
4. How would you rate your skill level with each type of craft?
5. In general, estimate the number of days per year you spend boating?
6. Estimate the number of times you have boated the North Yuba River from Indian Valley to NBBR?
   - Total
   - Times per year
7. What months is the North Yuba River reach typically boatable?
8. How would you classify the existing boating demand for the North Yuba River reach?
   - Less than 10 groups per weekend day
   - Between 10 and 20 groups per weekend day
   - 20 or more groups per weekend day

Questions Specific to the Takeout

Note: in general, the answers will be categorized by private vs. commercial boaters

9. Where do you typically takeout on this reach?
   - Specific river mile/location (identify on a map)
   - On river right or left?
10. Please explain the following for each different takeout location/option.
    - Physical logistics
    - How long does it take (in minutes)?
    - Rate the level of effort/difficulty of the takeout using a scale from 1 to 5 (1=Easy; 5=Difficult)
    - How does the takeout experience affect your overall boating experience?
      - 1-Very much; 2-Somewhat; 3-Not at all
    - How does the takeout situation contribute to your decision to boat this reach?
      - 1-Very important; 2-Important; 3-Average; 4-Somewhat important; 5-Not important
    - If the takeout situation was improved (reduces the effort and time), would you boat the reach more often?
      - 1-Strongly disagree; 2-Disagree; 3-Neither agree nor disagree; 4-Agree; 5-Strongly disagree
11. If you had your choice, what would be the ideal takeout location/scenario?

Questions Specific to the Takeout. (continued)

Note: in general, the answers will be categorized by private vs. commercial boaters

12. Would you be willing to pay a reasonable user fee (e.g., per boater, per vehicle, per group, etc.) for an improved takeout location or scenario?
    If so, would a user fee affect the demand for boating on this reach? How so?

Interim Technical Memorandum 8-2

Recreation Flow Study

Attachment 8-2E

Draft Angler Focus Group Questions

Yuba River Development Project
FERC Project No. 2246

October 2012

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Angling Focus Group
DRAFT Topics and Questions

Experience

[Option: provide participants with a form with these questions to complete prior to starting the group discussions.]

1. Total years fishing
2. Fishing within the study reaches
   - Total years fishing
   - Typical days per year
3. Types of fishing (spin, bait, fly)
4. Modes of fishing (shoreline, wading, tubing, boat)

Access and Use Areas

5. Identify existing access locations, how they work, and what fishing areas they provide access to. [Identify these areas on a map, particularly high use areas.]
6. Identify if visitors typically use public vs. private access? Is this legal private access?
7. Identify typical use levels by season and time of day.
8. Identify any constraints to angling and any potential solutions to these constraints?
9. Rate overall access quality (1=totally unacceptable, 2=slightly unacceptable, 3=marginal, 4=slightly acceptable, 5=totally acceptable).

Type and Quality of Fishing Opportunity

10. Target species
11. Types of fishing (wade/boat/tube/shore; spin/bait/fly)
    - Likely flow ranges for each type of opportunity.
    - Rough estimate of angling success (fish per hour of effort; size, etc.)
    - Seasonality and time of day considerations on fishing success

Regional Assessment Issues

12. List similar reaches on nearby rivers and discuss similarities/differences
13. Rating (1=worse than others, 3=similar to others, 5=better than others)
    - Within 2 hours
    - Within Northern California (4 hours)
14. Estimate size of local angling community in the region
    - Less than 100 anglers / 100 to 500 anglers / Greater than 500 anglers
15. Discuss of proportion of anglers who do different types of fishing (fly/spin/bait)
16. Discuss of proportion of anglers who use different modes of fishing (shore/wade/tube/boat)

Potential Management Issues

17. Do you experience crowding? If so, what locations? And, what times of year?
18. What, if any, facilities would you like to see on the stream reach?
19. Do you experience any safety/liability issues?
20. Have you experienced any conflicts with others (anglers, river users, residents, etc.)

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Interim Technical Memorandum 8-2

Recreation Flow Study

Attachment 8-2F

2008 New Bullards Bar Dam Whitewater Study Results

Yuba River Development Project

FERC Project No. 2246

October 2012

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NEW BULLARDS BAR DAM WHITEWATER BOATING STUDY

December 19, 2008

1.0 Introduction

The Yuba County Water Agency (YCWA) intends to apply to the Federal Energy Regulatory Commission (FERC) for a new license for the Yuba River Development Project (Project), FERC Project No. 2246, by April 30, 2014. At the current time, YCWA intends to relicense the Project using FERC's Integrated Licensing Process (ILP), which requires YCWA file with FERC a Pre-Application Document (PAD), which would include existing, relevant and reasonably available information regarding resources that could potentially be affected by continued operation of the Project, sometime between five and five and one-half years before the existing license expires on April 30, 2016.

YCWA determined that it had an opportunity in fall 2008 during scheduled higher flow releases from New Bullards Bar Dam to gather additional information regarding the potential whitewater boating characteristics of North Yuba River and Yuba Rivers from New Bullards Bar Dam to Rices Crossing. To facilitate this data gathering, YCWA consulted with American Whitewater (AW) and performed the study described below. YCWA and AW agreed that performance of this study did not presuppose the outcome of the Relicensing with regards to whitewater boating.

YCWA Unequivocally States Whitewater Boating Is An Inherently Dangerous Activity That Could Result In Serious Injury Or Death For Participants. YCWA Does Not Promote Whitewater Boating In Any Way And Specifically Not In The North Yuba River and Yuba Rivers From New Bullards Bar Dam To Rices Crossing.

2.0 Study Goals and Objectives

The goal of the study is, based on the responses of boaters who participate in the study, to estimate the minimum and optimum whitewater boating flows and other whitewater boating characteristics of the North Yuba River and Yuba River from New Bullards Bar Dam to Rices Crossing.

3.0 Existing Information

Table 3.0-1 provides some existing (pre-study) information regarding key aspects of the potential whitewater boating opportunity on the North Yuba River and Yuba River from New Bullards Bar Dam to Rices Crossing. The information is based on existing (pre-study) information in whitewater boating guidebooks and other boater sources of information (*e.g.*, Internet and personal accounts/knowledge of whitewater boaters who were contacted by YCWA). YCWA will gather additional information as it may become available.

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Table 3.0-1. Existing Information on New Bullards Bar Dam to Rices Crossing Run.

Put In: Base of New Bullards Bar Dam. Access to the put-in occurs from the Town of Nevada City via Highway 49, Moonshine Road and Marysville Road, which are all paved. Access continues by crossing the dam road and taking the first left and driving to the gated dam access road. The 0.75-mile-long, paved, private, gated road (posted "No Trespassing") accesses the base of New Bullards Bar Dam.
Take-out(s): Two options – Rices Crossing and Colgate Powerhouse. Option 1: Rices Crossing (near Bridgeport State Park) - Access to the takeout at Rices Crossing occurs from the Bridgeport State Park via a dirt road leading roughly 2 miles north. The turnoff is approximately .3miles east of the bridge over the South Fork Yuba River. Rices Crossing is the more straightforward takeout access of the two options from the Grass Valley/Nevada City area. It may also be easier to find due to the proximity to the popular South Yuba River takeout at Bridgeport. Option 2 - Colgate Powerhouse - Access to Colgate Powerhouse from the Town of Dobbins occurs via Lake Francis Road. This access is entirely paved.
Shuttle: The shuttle is roughly 21 miles (45 minutes) from the takeout at Rices Crossing to the put-in at New Bullards Bar Dam. The route starts by traveling south from Rices Crossing (1.5 mi.); taking a left on Pleasant Valley Rd. (6.5 mi.); left onto Hwy 49 (5.2 mi.); left on Moonshine Rd. (4.9 mi.); left on Marysville Rd. across New Bullards Bar Dam (2.0 mi.); after dam head south on Marysville Rd. (0.75 mi.) to gated access road on left. One gate (locked) occurs along the shuttle route at the put-in road that leads to the base of New Bullards Bar Dam.
Difficulty: Class V
Portages: There are four rapids that are considered mandatory portages, and three others for which portages are flow dependent.
Estimated Boatable Flow Range: 600 – 1,500 cubic feet per second (cfs)
Estimated Optimum Flow: 1,000 cfs
Length of Reach: 9.8 river miles (total) if the Put-in is at New Bullards Bar Dam and the Takeout is at Rices Crossing. In general, the reach may be split into three distinct segments from upstream to downstream as follows: 1) New Bullards Bar Dam to Middle Yuba River confluence (2.3 miles); 2) Yuba River from the Middle Yuba River confluence to Colgate Powerhouse (5.8 miles); and 3) Yuba River from Colgate Powerhouse to Rices Crossing (1.7 miles).
Elevation Range: 925 vertical feet. The reach ranges in elevation from 1,450 feet at New Bullards Bar Dam on the North Yuba River to elevation 525 feet at Rices Crossing on the Yuba River.
Gradient: 97 feet per mile (1.8%). Smaller scale changes in gradient occur throughout the 3 sub-reaches detailed above. The estimated gradient by sub-reach is as follows: 1) New Bullards Bar Dam to Middle Yuba River confluence sub-reach is about 135 feet per mile); 2) Middle Yuba River confluence to Colgate Powerhouse sub-reach is 101 feet per mile; and 3) Colgate Powerhouse to Rices Crossing sub-reach is 12 feet per mile.
Watercraft: Best suited for kayaks.
Streamflow Gages: USGS gage (Station ID NYR) at 1,350 ft. elevation. Latitude: 39.3910^{o}N, Longitude: 121.1430^{o}W. Note: real-time data no longer available on CDEC.
Maps: USGS 1:24,000 topographic quadrangles: Challenge and French Corral
Run Time (est.): Kayaks: 4 to 6 hours, depending on put-in, takeout and portages.
Land Ownership: Most of the run occurs on land in private ownership. Land downstream of New Bullards Bar Dam and near Colgate Powerhouse is owned by YCWA (posted "No Trespassing" due to safety constraints). Small portions of the run on Yuba River are on public land administered by the United States Department of Interior, Bureau of Land Management (BLM). Rices Crossing is at the upstream end of the United States Army Corps of Engineer's (COE) Englebright Reservoir and may be on public land administered by COE.
Other Information: This is an advanced stretch of river with many technical Class V rapids. There are 4-7 rapids that must be portaged by advanced kayakers; rafts may consider several portages. Hazards common to Class V whitewater are present, including vertical drops, sieves, holes and potential pin spots. There are no current data regarding impassible obstacles. Access is limited at the put-in and has historically involved a 1-mile walk to the river. Better access exists for taking off the river at Rices Crossing, because it is a common launch for flat-water kayakers at the head of Englebright Reservoir.

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4.0 Study Methods and Analysis

4.1 Study Area

For the purpose of this study, the study area included the portion of the North Yuba River from New Bullards Bar Dam to the confluence with the Middle Yuba River; and the portion of the Yuba River from the confluence to Rices Crossing at the upstream end of Englebright Reservoir.

4.2 Study Methods

The study will be completed in five steps, each of which is described below. In general, two target flows will be tested in the following order: 500 cfs and 1,000 cfs. YCWA will make a good faith effort to provide the target flows. YCWA will advise BLM of the study prior to implementation.

Step 1 - Select Whitewater Boating Teams. AW, in consultation with YCWA, will select a Study Boating Team comprised of a kayak and raft team to participate in the study. The Kayak Team will include five to six kayakers; and the Raft Team will include two rafts (and two safety kayakers). Each of the members of the selected Kayak Team must commit to participating in both days of the study; whereas the Raft Team will only boat at the second days' flow (1,000 cfs). However, the Raft Team will conduct land-based reconnaissance during the first day's flow to confirm that 500 cfs is much too low for rafting the reach. Due to the difficulty of the run, only boaters with advanced to expert kayaking and rafting capabilities will be selected to participate in the study. Each boater must review this study proposal and sign the attached waiver of liability (Attachment 1) before participating in the study.

YCWA understands that other members of the public may boat the North Yuba River and Yuba River prior to, during and after the boating study test flows. Due to Project safety considerations, those boaters must gain ingress and egress to the river, including across private property, using their own devices: YCWA intends that only the Study Boating Teams will be permitted access to YCWA-owned land beyond the closed, gated portion of the road to New Bullards Bar Dam.

Step 2 – Day One Controlled Flow. On Saturday, November 8, 2008, the Kayak Team members will stage from Rices Crossing. At 7:30 a.m., YCWA will coordinate a review of the study and reach, including viewing of topographic maps and aerial photographs, if available. General logistics, expectations and safety will be reviewed. At 8:00 a.m., the Kayak Team will transport their kayaks and gear to the put-in at the closed, gated access road leading to New Bullards Bar Dam. Once at the closed, gated road, YCWA will escort all Study Boating Team members beyond the closed, gated portion of the road to New Bullards Bar Dam. YCWA will provide at least one radio tuned to YCWA's frequency; however, contact may be limited due to steep canyon walls. The Kayak Team will begin the run no later than 9:30 a.m. since the run is expected to take about 5-6 hours. Take-out is expected by about 2:00 p.m. to 3:00 p.m for the Kayak Team. The target flow in the river will be 500 cfs when the Kayak Team begins the run. Individual Kayak Team members are responsible to provide their own equipment, food,

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beverages and safety equipment during the run. YCWA will provide snacks and refreshments at the takeout before the boating team shuttles to the put-in and after taking out of the river. The Study Boating Team members is also responsible to provide one individual in charge of safety who will not boat the run. That individual will coordinate any off-the-river activities as needed.

In addition, at 8:30 a.m., the Raft Team (or at least the Raft Team leaders) will meet YCWA at the closed, gated access road at Marysville Road. The Raft Team will conduct land-based reconnaissance near the put-in while YCWA staff are present. Once the reconnaissance is completed (likely by 9:30 a.m.), YCWA staff will escort the Raft Team beyond the locked gate and the Raft Team will then conduct reconnaissance of the remaining reach (as feasible).

YCWA will meet the Kayak Team at the takeout at Rices Crossing (expected to be between 2:00 p.m and 3:00 p.m.). Individual Kayak Team members will complete the Boating Questionnaire (Attachment 2) at the takeout upon completion of the run, and hold a short de-briefing focus group meeting, which will be moderated by YCWA and videotaped. The purpose of the de-briefing focus group meeting is to obtain the Kayak Team member's individual and group perceptions of the day's run.

The Boating Questionnaire addresses the boater's perception of items regarding: 1) boatability; 2) quality of the run; 3) suitability of the run for different crafts and boater skill levels; 3) quality of the put-in/takeout locations; 4) boater's opinion of the class of difficulty of the run; 5) comparison of each run at its different flows; 6) quality and length of the shuttle based on general knowledge since the boaters will not have made the shuttle; 7) any safety concerns or hazards; 8) scenic quality; 9) number and difficulty of portages; 10) availability of play areas; and 11) boater's opinion of the flows that would represent the general paddling public preference.

Step 3 – Day Two Controlled Flow. The first day of study (Step 2) will be repeated in entirety on the second day of the study for the Kayak Team, with the exception that the target flow in the river during the run will be 1,000 cfs.

The Raft Team will also boat the reach. At 7:00 a.m., the Raft Team will meet YCWA staff at the put-in at the closed, gated access road to New Bullards Bar Dam. YCWA will coordinate a review of the study and reach, including viewing of topographic maps and aerial photographs, if available. General logistics, expectations and safety will also be reviewed. The Raft Team will begin the run no later than 8:00 a.m. The second day of the study will be Sunday, November 9, 2008.

The Raft and Kayak Teams will follow the same process after the run as described for the first day of the study at the takeout; however, the Kayak Team's discussion will also include a comparison of the two runs (*i.e.*, 500 cfs and 1,000 cfs).

Step 4 – Day Three Controlled Flow (if needed). If YCWA and the Study Boating Team members agree a third day of study is needed, the logistics of that study day will be discussed, including target flow. If needed, the Day Three flow will be on November 15, 2008.

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Step 5 - Prepare Report. YCWA will compile the information from the study and other information, such as hydrology and information from other boaters that provide information to YCWA, into a brief report. The report will include: 1) Study Goals and Objectives; 2) Methods; 3) Results; and 4) Conclusions. The report will include copies of the completed Boater Questionnaires, as well as summaries, and a draft will be discussed with AW. YCWA will include the report in its PAD when issued to document existing, relevant and reasonably available information.

4.4 Schedule

The schedule for the study is as follows:

Step 1-Assemble Whitewater Boating Team.....October 19–October 31, 2008
Step 2-Day One Controlled Flow .....November 8, 2008
Step 3-Day Two Controlled Flow.....November 9, 2008
Step 4-Day Three Controlled Flow (if necessary) .....November 15, 2008
Step 5- Summary Report..... February 15, 2009

4.5 Variances from the Study Plan

As detailed in the study plan, YCWA would make minor modifications to the study in the field to accommodate actual field conditions and unforeseen problems. As such, YCWA had several variances from the study plan, which are described below. In all cases, YCWA consulted with AW immediately to discuss the changes. One variance occurred prior to field-based study work and three variances occurred while in the field conducting the test flows. These variances from the study plan are detailed below.

4.5.1 Variances Prior to Field-Based Study Work

- YCWA reduced the second day's flow level to 800 cfs from 1,000 cfs due to operational constraints on the low level output valve. In this instance, YCWA informed AW and the boating teams on Thursday, November 6, 2008.

4.5.2 Variances During the Field-Based Study Work

- The Raft Team lead decided to eliminate the rafting team from the 800 cfs flow based on the information she received from the study kayakers following their run at the 500 cfs flow. As a result, the Raft Team did not participate in the study.
- The Kayak Team changed the takeout location for the second day of flows to Colgate Powerhouse. The group arrived at this decision due to nature of the river below the powerhouse (flatwater with little interest for Class IV/V whitewater boaters). This decision also enabled the boaters to evaluate the secondary (and likely preferred) takeout location and associated shuttle route/logistics.

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- The final variance was minor. The Kayak Team agreed to stage at the put-in access road to the dam for the second day of flows rather than at the original takeout location on the first day of flows at Rices Crossing. This change was made to allow additional time on the river with day light if needed since the first day was rather close to the end of daylight hours.

5.0 Study Results

5.1 Summary of Flow Study Events

5.1.1 Day One, 500 CFS (Saturday, November 8, 2008)

Seven boaters met YCWA at the takeout at Rices Crossing at 7:00 a.m., where all seven completed the liability waivers, ran through the purpose, logistics and safety details for the day. YCWA and the boating team shuttled to the put-in, where we YCWA provided the boating team vehicle access to the river at 8:30 a.m. The boaters put on the river at 9:30 a.m. In the first rapid, one of the boaters injured himself (aggravated an old injury) and decided it was not in his nor the boating team's best interest for him to continue. YCWA assisted his exit from the river and returned him to his vehicle in Nevada City, California. The remaining six boaters were on their way by 10:00 a.m. and all the vehicles exited the put-in access road and were shuttled to the takeout immediately by YCWA. The kayakers arrived at Rices Crossing at 3:15 p.m. where all six completed the surveys and took part in a post-run focus group debriefing. Following the debriefing, the kayak team, in consultation with YCWA and AW, decided to make the following changes to the schedule and logistics for the second day of flows: a) start the run earlier on at 7:00 a.m.; b) meet/stage at the put-in (rather than the takeout); and c) takeout at Colgate Powerhouse rather than Rices Crossing as most of the run below Colgate Powerhouse is flat-water and of little interest to Class IV/V kayakers.

5.1.2 Day Two, 800 CFS (Sunday, November 9, 2008)

Four boaters met at the put-in at the parking area on Marysville Road at the closed, gated access road to the dam at 7:00 a.m., where YCWA provided access to the river below the dam. The fifth kayaker from the previous day determined he could not physically complete the second day. Again, YCWA and the boating team ran through the purpose, logistics and safety details for the day. All four boaters put on the river at 8:00 a.m. after which all the vehicles exited the put-in access road and were shuttled down to the takeout immediately by YCWA. The kayakers arrived at Colgate Powerhouse at 11:15 a.m., where they completed the surveys and took part in a post-run focus group debriefing. As noted earlier, one of the boaters from Saturday was unable to participate on Sunday at the 800 cfs flow; however, he had recently run the same study reach the previous week, so he completed the survey based on that experience.

Of note, on Saturday night, the raft team leader spoke with several of the study kayakers who ran the reach at 500 cfs that day. After those discussions, the raft team leader determined that the

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North Yuba River section of the run was not advisable for rafting. Thus, the raft team did not participate in the flow study on Sunday at the 800 cfs flow level.

5.2 Boating Team Background and Experience

As discussed above, seven whitewater kayakers (boaters) arrived on Saturday, November 8, 2008 to participate in the New Bullards Bar Dam Reach Whitewater Boating Flow Study; though, only four of the seven boaters completed both days of the study flows (Saturday and Sunday). However, the study results utilized a core sample size of five kayakers after YCWA, in consultation with AW, decided to include a fifth boater who completed the first day of flows at 500 cfs, and recently boated the exact same reach the previous week at 800 cfs (the scheduled flow for the second day of the flow study). Thus, the final study sample size is five kayakers that completed all components of the study survey.

The remaining two boaters were not considered part of the final boating team because they did not complete the two days of flows (as required by the study plan). One boater injured himself in the first rapid and decided to withdraw from the study at that point; and the other boater completed the first day of flows and determined he could not physically complete the second day. As a result, the following study results are based on the five boater sample that completed the surveys for both flows.

The five boaters ranged in age from 19 to 53 years, and classified themselves as either expert or elite level whitewater boaters, and all identified the hard-shelled kayak as their preferred craft. The boating team had a combined 70 years of boating experience at these current whitewater skill levels; and boat an average of 11 days per month throughout the year. Travel time to this reach from boater's residences averaged 67 minutes ranging from only 30 minutes to 150 minutes. Three of the five boaters are local residents in the Nevada City/Grass Valley, California area (30 to 35 minutes away), while the remaining two boaters were currently residing in Truckee, California (90 minutes) and Reno, Nevada (150 minutes). Prior to this flow study, three of the participants kayaked the New Bullards Bar Dam Reach (once each). One boater ran the reach at only 650 cfs and two boaters ran the reach at 800 cfs. Two of the boaters had participated in whitewater boating studies on other hydropower relicensings.

Each of the five boaters was asked to respond to a list of statements about their river-running preferences. Overall, the boaters were consistently in agreement or disagreement regarding their river-running preferences. The two exceptions were: 1) "running challenging whitewater is the most important part of my boating trips" where 20 percent of the boaters "disagreed" compared to 60 percent who either "agreed" or "strongly agreed"; and 2) "I often boat short river segments (under 4 miles) to take advantage of whitewater play areas", where 20 percent "agreed" or "strongly agreed" compared to 40 percent who "disagreed". The results are displayed in Table 5.2-1.

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Table 5.2-1. Boater responses to the following river-running statements (n=5).

Statement	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
I prefer running rivers with difficult rapids (Class IV and V).	1	0	0	0	4
Running challenging whitewater is the most important part of my boating trips.	1	0	1	0	3
I often boat short river segments (under 4 miles) to take advantage of whitewater play areas.	0	2	0	0	3
I often boat short river segments to experience a unique and interesting place.	0	1	0	2	2
I often boat short river segments to run challenging rapids.	0	0	0	0	5
Good whitewater play areas are more important than challenging rapids.	3	1	1	0	0
I am willing to tolerate difficult put-ins and portages in order to run interesting reaches of whitewater.	0	0	0	1	4
I prefer boating rivers that feature large waves and powerful hydraulics.	0	1	0	2	2
I prefer boating steep, technical rivers.	0	0	0	1	4
I enjoy boating both technical and big water rivers.	0	0	0	1	4

In addition, boaters were asked what other runs in California that they boat in a typical year. The following list of whitewater reaches were listed by the boaters (with incidence in parantheses):

- South Yuba River (5) – includes Summit Run (1), Purdons to Highway 49 (1) and Highway 49 to Bridgeport (3)
- Upper Cherry Creek (3)
- North Fork of the American River (2)
- South Fork of the American River (2)
- Middle Fork of the Feather River (2)
- Dinkey Creek (2)
- South Fork of the Feather River (1)
- West Branch of the Feather River, Kimshew Run (1)
- Upper Tuolumne River (1)
- Cal Salmon River (1)
- Kaweah River (1)
- North Yuba River (1)

5.3 Daily Flow Evaluations

5.3.1 Reach Length and Whitewater Difficulty

Both the 500 and 800 cfs flow level results are based on a put-in location at New Bullards Bar Dam. However, to be clear, the study results are based on a takeout at Rices Crossing (9.8 miles) at the 500 cfs flow level; and a takeout location at Colgate Powerhouse (8.1 miles) at the 800 cfs flow level. Despite this difference in length on the two flow days, the affect on the results is

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likely non-existent since the remaining 1.7 miles of the reach below Colgate Powerhouse is virtually all flat-water paddling (Class II whitewater). Two notable exceptions to this rule exist. First, the shuttle route from Rices Crossing and Colgate Powerhouse is significantly different (and is discussed below in the non-whitewater characteristics section of this report). Second, the overall paddle time was higher at the 500 cfs flow level due to the additional 1.7 miles of float time (Table 5.3-1). However, based on the radio communications between the boaters and YCWA, it is estimated that the travel time from Colgate Powerhouse to Rices Crossing was no more than 30 minutes. When taking this correction into consideration, the average paddling time was roughly 30 minutes shorter at the 800 cfs flow level. The boaters indicated little difference in the overall whitewater difficulty of the reach from 500 cfs to 800 cfs with a range from Class V to V/V+ for both flow levels (Table 5.3-1).

Table 5.3-1. Length of run by flow and type of run (n=5).

Reach			Flow Level (cfs)	Average Time	Whitewater Class	
Put-In	Takeout	Length			Minimum	Maximum
New Bullards Bar Dam	Rices Crossing	9.8 miles	500	5 hrs	V	V/V+
New Bullards Bar Dam	Colgate Powerhouse	8.1 miles	800	3 hrs, 24mins	V	V/V+

5.3.2 Number of Breaks, Scouts, Portages, Etc.

As would be expected, the number of breaks, scouts and portages (and the associated time for each) all decreased with the increased flow (more water) on the second day (Table 5.3-3). While technically the average number of breaks decreased at the higher flow, in general the difference was minimal. In contrast, the number and time of scouts and portages decreased significantly (roughly 30 percent) at the higher flow from 44 minutes to 32 minutes on average. Notably, the maximum time spent scouting/portaging for both flow levels was 120 minutes (at 500 cfs). It is important to also note that at the 800 cfs flow level the reach was 1.7 miles shorter; however, virtually all of that length is flat-water paddling (Class II), so the number of breaks and scouts/portages is not affected by the omission of this final 1.7 miles at the 800 cfs flow level.

Table 5.3-2. Number and length of breaks and scouts/portages at 500 and 800 cfs flow levels (n=5).

Flow Level (cfs)	Stat	No. of breaks	Total time for breaks (minutes)	No. of scouts/ portages	Total time for scouts/portages (minutes)
500	Avg.	1.4	5.4	16.0	44.0
	Min	1	5	10	10
	Max	2	6	20	120
800	Avg.	1.2	4.6	11.0	32.0
	Min	1	2	10	20
	Max	2	12	15	45

As would be expected, the number of hits, stops, and drags (and the associated time for each) all decreased with the increased flow (more water) on the second day (Table 5.3-3). The number of

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portages remained consistent at both flow levels. Again, at the 800 cfs flow level, the reach was 1.7 miles shorter; however, virtually all of that length is flat-water paddling (Class II), so the number of hits, stops, drags and portages is not affected by the omission of this final 1.7 miles at the 800 cfs flow level.

Table 5.3-3. Number of hits, stops, drags and portages at 500 and 800 cfs flow levels (n=5).

Flow Level (cfs)	Statistic	No. of hits	No. of stops	No. of drags	No. of portages
500	Avg	64.0	3.4	.0	1.8
	Min	20	0	0	0
	Max	100	10	0	3
800	Avg	46.0	3.0	.4	1.8
	Min	30	0	0	0
	Max	50	10	1	3

Boaters were asked about their likelihood to return for future boating at each day's flow level (Table 5.3-6). All the boaters would return at both flows; although at the 500 cfs flow level with four boaters responded "definitely yes" and one boater respondedg "probably". All five boaters responded "definitely yes" at the 800 cfs flow level. With regards to the boaters' preferences for higher or lower flows after each days run (Table 5.3-7), there was consensus at the 500 cfs flow level with all boaters preferring a "higher" flow level. At the 800 cfs flow level, four boaters stated the flow was "optimal", while the remaining boater preferred a "lower" flow level.

Table 5.3-6. Number of responses about returning to boat the reach at each flow level (n=5).

Flow Level (cfs)	Definitely No	Possibly	Probably	Definitely Yes
500	0	0	1	4
800	0	0	0	5

Table 5.3-7. Number of responses regarding higher or lower flow preferences (n=5).

Flow Level (cfs)	Lower	Optimum	Higher	Much Higher
500	0	0	5	0
800	1	4	0	0

5.3.3 Overall Reach Characteristics

When asked about the reach's characteristics after each flow level, there was a consensus among the boaters (who offered an opinion) on six of the ten reach characteristics (Table 5.3-8). On the six characteristics with consensus, the boaters agreed that the five characteristics were present on this reach at each flow:

- This reach is boatable at these flows
- This reach offers challenging and technical boating

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- This run offers good overall whitewater challenge
- This is an aesthetically pleasing run
- This run is a good length

The one consensus characteristic that the boaters (who offered an opinion) agreed did not exist on this run was that "this reach has good play spots".

Table 5.3-8. Boater responses to characteristics of the run at 500 cfs and 800 cfs flow levels (n=5).

Statement	Flow (cfs)	Strongly Disagree	Disagree	Agree	Strongly Agree	No Opinion
This reach is boatable at these flows.	500	0	0	1	4	0
	800	0	0	0	5	0
This reach offers challenging and technical boating.	500	0	0	1	4	0
	800	0	0	0	5	0
This reach has nice water features such as waves and holes.	500	0	2	0	2	1
	800	0	0	1	3	1
This reach has good play spots.	500	0	2	0	0	3
	800	0	1	0	0	4
This run offers good overall whitewater challenge	500	0	0	3	2	0
	800	0	0	0	5	0
This is a safe run.	500	0	2	1	0	2
	800	0	3	0	0	2
This is an aesthetically pleasing run	500	0	0	0	5	0
	800	0	0	0	5	0
This run is a good length	500	0	0	3	2	0
	800	0	0	1	4	0
The portages on this run are not a problem	500	1	0	1	2	1
	800	0	0	2	3	0
There are enough places to take a break or have lunch on this run.	500	1	0	1	3	0
	800	1	0	0	4	0

Three characteristics with some divergence in responses were related to the: 1) presence of nice water features (i.e. waves and holes); 2) the safety of the run; 3) the portages are not a problem; and 4) that there enough places to take a break or have lunch on this reach (Table 5.3-8).

5.3.4 Boatability for Different Types of Craft

Overall, for those boaters who offered an opinion, a consensus view emerged that this reach at these flow levels would work well at for hard-shell kayaks. In contrast, the boaters had a consensus opinion that this run at these flows would not work well for rafts or catarafts. The boaters were split in their responses for open canoes and inflatable kayaks on this reach, although more boaters responded that they would not work well (Table 5.3-9).

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Table 5.3-9. Boaters' opinion of the boatability of the run at each flow for different types of craft (complete run).

This run at this flow would work well for:	Flow (cfs)	Strongly Disagree	Disagree	Agree	Strongly Agree	No Opinion
Hard shell kayaks	500	0	0	1	4	0
	800	0	0	1	4	0
Rafts	500	0	3	0	0	2
	800	1	1	0	0	3
Catarafts	500	0	3	0	0	2
	800	1	1	0	0	3
Open Canoes	500	2	1	1	0	1
	800	1	3	1	0	1
Inflatable Kayaks	500	1	2	1	0	1
	800	0	3	1	0	1

5.3.5 Challenging Rapids and Portages

Each of the boaters was asked to identify challenging rapids they encountered at each of the flow levels and whether they portaged the rapid. Without widespread information available for this run, the boaters were certainly challenged to accurately identify each rapid, however, after running the reach on two consecutive days, the boaters identified five of the most challenging rapids (Table 5.3-10).

Table 5.3-10. Whitewater classification (range) and number of boaters who portaged the major rapids (n=5).

Rapid Name	Flow Level (cfs)	Portaged	Classification Range
"S-Turn" Rapid	500	2	Class V to V+
	800	2	Class V to V+
"Sieve" Rapid	500	1	Class V to V+
	800	0	Class V to V+
"Baby Dream Gap" Rapid	500	2	Class V to V+
	800	2	Class V+ to VI-
"Confluence" Rapid	500	0	Class V to V+
	800	0	Class V to V+
"Big Portage" Rapid	500	0	Class IV+
	800	1	Class V to V+

In general for all five of these rapids, the whitewater difficulty remained generally the same at both flows and was rated by the boaters in the Class V to V+ at both flows with two exceptions. The first exception was the "Baby Dream Gap" rapid, which was rated a Class V to V+ at 500 cfs, but increased to a Class V+ to VI- rapid at the 800 cfs flow level. The second exception was the "Big Portage" rapid, which was rated a Class IV+ rapid at the 500 cfs flow level and increased to Class V to V+ at 800 cfs. During the post-run focus group debriefing following the 800 cfs flow level, the boaters noted that aside from these major challenging rapids, the reach was full of solid Class IV rapids throughout during the 500 cfs flow, and that some of these Class IV rapids jumped to solid Class V rapids at 800 cfs. Furthermore, the majority of the Class IV

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rapids at 500 cfs may have remained Class IV but increased in intensity at the 800 cfs flow making for regular challenging rapids throughout the reach (particularly on the North Yuba River section of the reach).

The boaters also identified three portages on the reach (Table 5.3-11). Not all of the boaters portaged all three of them, but all portaged at least one. In the post-run focus group debriefing, the boaters noted that more often than not, all but the elite Class V boaters would have to portage most if not all of the three portages, especially on a boaters' first descent of the reach. The "S-Turn" portage was rated the most difficult of the three, and was the only portage that boaters responded was either "moderately difficult" or "extremely difficult" due to the large boulders that needed to be traversed with fall potential on one or both sides of the boulders during the portage. The "Big Portage" portage was rated "easy" to "slightly difficult", whereas the "Baby Dream Gap" portage was unanimously rated "easy" by the boaters that portaged the rapid.

Table 5.3-11. Difficulty of the portages as identified by boaters in number of responses .

Portage	Flow (cfs)	Easy	Slightly difficult	Moderately difficult	Extremely difficult
"S-Turn"	500	0	0	1	1
	800	0	0	3	0
"Big Portage"	500	0	1	0	0
	800	3	0	0	0
"Baby Dream Gap"	500	1	0	0	0
	800	5	0	0	0

5.4 Comparative Evaluations

5.4.1 Flow Range Evaluations

The boaters (n=5) were asked to evaluate a range of flow levels for their craft (hard-shell kayaks) and skill level (expert/elite) from 150 cfs to 1,000 cfs according to a five-point scale of acceptability – totally unacceptable (1), unacceptable (2), marginal (3), acceptable (4), and totally acceptable (5). The range of acceptable flows (average rating of 3.5 or higher) for hard-shell kayaks was 500 to 1,000 cfs (Table 5.4-1). At the lower end of the flow range from 150 cfs to 350 cfs, the boaters (who were comfortable estimating at that flow) all rated the flows as "totally unacceptable"; the 400 cfs flow level was still rated as "unacceptable"; and the 450 cfs flow was rated "marginal". The boater responses display a clear trend that shows this reach is not boatable for hard-shell kayaks at or below 400 cfs.

Table 5.4-1. Boaters' evaluation of flow levels for hard-shell kayaks at the expert/elite skill level.

Statistic	Flow Level (cfs)									
	150	200	250	300	350	400	450	500	750	1,000
Average	1.0	1.0	1.0	1.0	1.0	1.8	2.8	4.6	5.0	3.5
Minimum	1	1	1	1	1	1	2	4	5	3
Maximum	1	1	1	1	1	3	3	5	5	4
Boaters who Responded "Cannot Estimate At This Flow"	2	2	1	1	1	1	0	0	0	3

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5.4.2 Specific Boatable Flow Levels

Furthermore, the boaters were asked to identify specific flow levels for different kinds of boating scenarios as identified in Table 5.4-2. On average, the lowest flow needed to simply get down the river was 460 cfs; the lowest flow that would provide a quality technical boating experience was 500 cfs; the optimal ranged that provided the best whitewater characteristics was 520 to 790 cfs; and the highest safe flow was 1,060 cfs, on average. The boater responses on the lower end and optimal range for flows are all in a tight cluster, but at the upper end (highest safe flow to get down the river) the variation is much greater, as is typical at this skill level, where an extreme boater can often push the limits of what is runnable even for the average expert/elite Class V boater. And, in fact, only one boater identified any flow higher than 1,000 cfs (1,600 cfs) for the highest safe flow for hard-shell kayaks for an expert/elite Class V boater - the other four boaters indicated the highest safe flow was between 800 and 1,000 cfs.

Table 5.4-2. Average Flow Level Responses by Skill Level to Various Flow Scenarios (n=5).

Flow Scenarios	Average	Minimum	Maximum
What is the lowest flow you need to simply get down the river in your kayak?	460	450	500
What is the lowest flow that provides a quality technical boating experience for this reach?	500	500	500
What is the optimal range of flows that provides the best whitewater characteristics for this run?	520 - 790	500	800
What do you feel the highest safe flow for your craft and skill level?	1,060	800	1600

When asked if they would return if the flows were in their respective optimal range, three of the five boaters responded “multiple times every year”, whereas the remaining two responded “as often as I could”. None of the boaters responded that they would “never” return.

The boaters identified a set of similar whitewater reaches to the New Bullards Bar Dam Reach in California. Reaches along the lower South Yuba River had the highest response (7 responses), particularly the Highway 49 to Bridgeport and Purdons to Highway 49 reaches. The other similar reaches identified were the South Fork of the Merced River (4), Clavey River (2), Cherry Creek (1), Middle Fork of the Feather River (1) and the Loves Falls run on the North Yuba River (1). Only one boater indicated that he would not favor the New Bullards Bar Dam run over the others that he makes now (South Yuba River reaches below Purdons, South Fork of the Merced and the Clavey River). The remaining four boaters indicated they would favor the New Bullards Bar Dam Reach over at least one of the other similar runs they listed. In addition, the boaters identified how these established California runs similar to the New Bullards Bar Dam run compared to New Bullards Bar Dam Reach (Table 5.4-3). In most cases, the boaters indicated that the similar runs were “about the same” as the New Bullards Bar Dam Reach; in two instances the New Bullards Bar Dam Reach was rated “better” than

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Table 5.4-3. How New Bullards Bar Dam Run compares to similar established whitewater runs in California.

Whitewater Reach	Total Responses	No. of Responses		
		New Bullards Bar Dam Reach is…		
		Worse	*…About the same*	*…Better*
South Yuba River, Purdons to Highway 49	3	0	3	0
South Yuba River, Highway 49 to Bridgeport	4	1	2	1
South Fork of the Merced River	4	0	4	0
Clavey River	2	0	2	0
North Yuba River, Loves Falls	1	0	1	0
Cherry Creek	1	0	0	1
Middle Fork of the Feather River	1	0	1	0

5.4.3 Non-whitewater Characteristics of the New Bullards Bar Dam Reach

The boaters (who offered an opinion) unanimously agreed that the put-in and overall shuttle to boating ratio were good for the New Bullards Bar Dam Reach; and the majority of the boaters agreed that the length of the shuttle was not a problem and the takeout for the run is good (Table 5.4-4).

Table 5.4-4. Percent responses to non-whitewater characteristic statements at the optimum boating range flows on New Bullards Bar Dam Reach (n=10).

Statement	Number of Boaters Who Offered an Opinion				No. of Boaters who Offered "No Opinion"
	Strongly Disagree	Disagree	Agree	Strongly Agree	
Length of shuttle is not a problem	0	1	1	3	0
Put-in for this run is good	0	0	1	4	0
Take-out for this run is good	0	1	2	2	0
Total shuttle to boating ratio on this run is good	0	0	1	3	1

Furthermore, the boaters had several suggestions for improving the access or shuttle for the New Bullards Bar Dam Reach. The categorized suggestions (with the incidence for each in parentheses) was: allowing/providing boaters to access the dam to put-in (3); installing bathrooms at put-in and/or takeout (2); improving/continuing to allow access and parking at Colgate Powerhouse (2); and clearing vegetation at put-in for better access to the river (1).

5.5 Post-Run Focus Group Summaries

Following each of the boaters' runs, the boating team took part in a brief post-run focus group to discuss the primary characteristics and impressions of the day's run in a group environment. The next two sections summarize the highlights from each of the post-run focus group discussions.

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5.5.1 500 CFS Focus Group Summaries

- Solid Class V reach that offers high quality, technical boating with abundant Class IV and IV+ rapids; and as many as twelve, solid Class V rapids. Primarily a run for solid Class V boater, but could be run by solid Class IV boater who runs some Class V rapids.
- The run is a continuous, pool-drop nature with many linked rapids followed by pools before the next rapid or set of rapids; ample eddies were available between rapids or sets of rapids to allow time for scouting of upcoming rapids/river.
- Similar character on North Yuba and Middle Yuba except for the following distinctions: a) the North Yuba River sub-reach is tighter/narrower and requires more technical boating skills to navigate the rapids (often multiple moves required in a rapid); and b) the Middle Yuba section was wider and providing more lines/options in each rapid with bigger pools following the rapids.
- Only one portage on the North Yuba River section, and up to two portages on the Middle Yuba River section with the most difficult portage several miles downstream of the Middle Yuba River confluence.
- Any flows below 500 cfs would make a lot of rapids difficult to get through and likely increase to as many as six portages.
- The preferred put-in location is at the base of New Bullards Bar Dam and most boaters would be fine walking their boats down the gated access road to the put-in. One kayaker had scrambled down the canyon wall below the gated access road and stated he would never access the river by that means again due to the steep terrain, thick vegetation and amount of time it takes to get down to the river.
- The preferred takeout location is Colgate Powerhouse. If taking out at Rices Crossing, the reach is a long run (5+ hours and nearly 10 miles) from New Bullards Bar Dam. The river characteristics below Colgate Powerhouse to Rices Crossing (1.7 miles) are of little interest to Class IV/V whitewater kayakers; as a result, the boaters concluded that most, if not all would prefer to takeout at Colgate Powerhouse to shorten the run and shuttle, and focus their paddling on solid Class IV and V rapids located above Colgate Powerhouse and along the North Yuba River section of the reach.
- Currently, flow information on the reach is primarily based on guessing or driving out the dam to see what the flows are and extrapolating what the Middle Yuba River gage reads. The result is that the reach primarily boatable for a very local population.
- The reach would have a higher demand in the summer and fall, but it provides enough quality Class IV and V whitewater that it would have some demand in the spring. This reach would be in the mix with other local runs such as the South Yuba River (Highway 49 to Bridgeport and Purdons to Highway 49). This reach feels more remote than similar South Yuba River runs in the area.
- Regarding rafting on this reach, the kayakers believed rafting would be marginal on this reach due to the tight rapids that at many times were wide enough for a kayak to get through

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but not wide enough for rafts. The amount of time out of the water would be significantly higher for rafts compared to kayaks for portaging.

5.5.2 800 CFS Focus Group Summaries

- The reach becomes a solid, Class V to V+ run at 800 cfs; the river becomes "pushy" and loses the technical boating aspects found at the 500 cfs flow level; very little woody debris, but the reach does have plenty of sieves. Not a run recommended run for Class IV/V boater at 800 cfs flow. The rapids tend to require very technical moves or even multiple moves in the rapid, which is not recommended for Class IV/V kayakers.
- The 800 cfs flow level places a premium on fast decision-making with fewer locations to eddy out, scout the rapids and pick safe, clean lines through the rapids.
- Another consequence of the higher flow level is the difficulty of the rapids was increased substantially. The abundant Class IV rapids found at 500cfs became solid Class V rapids in most cases; as a result, the intensity of the reach is raised and the blend of Class IV and Class V rapids is almost entirely diminished.
- The Class V rapids at 500cfs remained substantially Class V rapids with a few exceptions where the difficulty was increased to Class V+;
- With more water in the river, on the North Yuba River the lines and options in the Class V and V+ rapids stayed the same but improved with more water on the North Yuba River section. On the Middle Yuba River, the increased water had more options and lines in most of the rapids, but the holes got bigger and "punchier".
- Again, one portage on the North Yuba River section, and up to two portages on the Middle Yuba River section with the most difficult portage several miles downstream of the Middle Yuba River confluence. Boaters noted that the two Middle Yuba River rapids that are usually portaged, were slightly more runnable at the 800 cfs flow level.
- At 800 cfs, the reach is a much quicker run with the increased water in the reach, especially when combined with a shorter distance to cover by taking out at Colgate Powerhouse (3+ hours).
- The kayakers unanimously believed that this run at 800cfs would not be a good flow for a boaters' first time on this reach – the river is too "pushy" and borders on big water river conditions requiring very quick decision-making as you enter Class V rapids throughout; the "pushy" nature of the river does not allow for adequate scouting for a first descent.
- One kayaker noted that they might enjoy the challenge of running the reach above 1,000 cfs (maybe even 1,600 cfs), but such a flow level would not be recommended for all but elite Class V kayakers; he believed that at that flow level (1,000+ cfs), the reach would become a big water river with constant, serious consequences.
- Another kayaker said he was likely at the limit of his Class V abilities at the 800 cfs flow level and would not be boat the reach at flow levels higher than 800 cfs.

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- The reach would have a higher demand in the summer and fall, but it provides enough quality Class IV and V whitewater that it would have some demand in the spring. The difficulty is on par with other area reaches, but it has a more remote, wilderness feel.
- Another advantage to the takeout at Colgate Powerhouse (a shorter run) makes it more feasible and appealing in the fall/winter months when colder temperatures are a limiting factor in how long you want to be on the river. If you had to go all the way to Rices Crossing, then it would not be very appealing in the fall/winter months. In contrast, if boating this reach in the summer, you would have the option to take your time and spend the whole day exploring the river due to warmer temperatures and longer days. The reach has a lot of flexibility to run it as a fast-paced run or a relaxed, slower run.
- Overall, the boaters believed the acceptable boatable range is 500 to 800 cfs for most solid, Class V kayakers; and that it is likely boatable at or above 1,000 cfs, but only for a very small, elite level Class V/V+ kayaker.
- The optimal boatable range would be in the 650 to 750 cfs flow range, which would keep some of the technical boating characteristics of the 500 cfs flow, but provide a bit more "padding" (more water) in the rapids; and provide more options for lines (especially cleaner lines) through most rapids, and still keep a blend of Class IV and Class V rapids throughout.
- Regarding rafting, the kayakers believed it would be very questionable. It is raftable, but it would need to be an elite team of rafters and not for commercial rafting. It is very likely that it would take two full days to get down the reach. A lot of time would be spend out of the water pulling the rafts through rapids that rafts wouldn't fit through. The kayakers said it was comparable to rafting for Cherry Creek, but more difficult.

5.6 Summary of Key Reach Study Results

Based on the study results, the whitewater and non-whitewater characteristics for the New Bullards Bar Dam Reach are summarized in Table 5.6-1. The major findings for this study reach were:

1) The reach is best suited for hard-shell kayaks; rafting may be possible but likely only for a team of elite rafters; not recommended for commercial rafting due to the severe consequences and technical portaging and maneuvering around boulders, rapids, etc.
2) The whitewater difficulty is Class V to V+;
3) The overall boatable range is 500 cfs to 1,000 cfs;
4) The optimal boatable range is 520 to 790 cfs;
5) The reach consists of endless Class IV/V rapids and roughly a dozen Class V to V+ rapids with three major portages with one very difficult portage below the confluence with the Middle Yuba River (at the "S-Turn" rapid)
6) The preferred put-in location is below New Bullards Bar Dam with the preferred takeout location at Colgate Powerhouse resulting in an 8.1-mile reach;
7) Vehicle access to the river at the put-in would be the ideal, but hiking down the access road was manageable and greatly preferred over hiking/scrambling down the canyon walls to the river; and

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8) The study reach is similar to some other Northern California whitewater runs such as the South Yuba River from Highway 49 to Bridgeport and Purdons to Highway 49; Cherry Creek, South Fork Merced and the Clavey River.

Table 5.6-1. Summary of Existing and Study Information on the New Bullards Bar Dam Reach.

Put In: Base of New Bullards Bar Dam. Access to the put-in occurs from the Town of Nevada City via Highway 49, Moonshine Road and Marysville Road, which are all paved. Access continues by crossing the dam road and taking the first left and driving to the gated dam access road. The 0.75-mile-long, paved, private, gated road (posted "No Trespassing") accesses the base of New Bullards Bar Dam.
Take-out(s): Two options – Rices Crossing and Colgate Powerhouse. Preferred Option - Colgate Powerhouse - Access to Colgate Powerhouse from the Town of Dobbins occurs via Lake Francis Road. This access is entirely paved. Alternate: Rices Crossing (near Bridgeport State Park) - Access to the takeout at Rices Crossing occurs from the Bridgeport State Park via a dirt road leading roughly 2 miles north. The turnoff is approximately .3miles east of the bridge over the South Fork Yuba River. Rices Crossing is the more straightforward takeout access of the two options from the Grass Valley/Nevada City area. It may also be easier to find due to the proximity to the popular South Yuba River takeout at Bridgeport.
Shuttle: Two options based upon the takeout location (Rices Crossing or Colgate Powerhouse) Preferred Shuttle (from Colgate Powerhouse): Approximately 10 miles (20 minutes) from to New Bullards Bar Dam. The route starts by traveling north on Lake Francis Road (4.1 mi.) into Dobbins, CA; taking a right onto Old Dobbins Road (0.2 mi.); turn right onto Marysville Road (5.7 mi.) to the gravel parking area near the gated access road to New Bullards Bar Dam. Alternate Shuttle (from Rices Crossing): The shuttle is roughly 21 miles (45 minutes) to New Bullards Bar Dam. The route starts by traveling south from Rices Crossing (1.5 mi.); taking a left on Pleasant Valley Rd. (6.5 mi.); left onto Hwy 49 (5.2 mi.); left on Moonshine Rd. (4.9 mi.); left on Marysville Rd. across New Bullards Bar Dam (2.0 mi.); after dam head south on Marysville Rd. (0.75 mi.) to gated access road on left. One gate (locked) occurs along the shuttle route at the put-in road that leads to the base of New Bullards Bar Dam.
Difficulty: Class V to V+ (solid Class V at 500 cfs; Class V+ at 800 cfs)
Watercraft: Best suited for hard-shell kayaks; rafting may be possible but likely only for a team of elite rafters; not recommended for commercial rafting due to the severe consequences and technical portaging and maneuvering around boulders and rapids required of most if not all rafters involved.
Portages: Three – one on the North Yuba River and two on the Middle Yuba River (including the most difficult)
Estimated Boatable Flow Range: 500 – 1,000 cubic feet per second (cfs)
Estimated Optimum Flow: 520 - 790 cfs
Length of Reach: Preferred Run (takeout at Colgate Powerhouse): 8.1 miles. Put-in is at New Bullards Bar Dam and the Takeout is at Rices Crossing. In general, the reach may be split into three distinct segments from upstream to downstream as follows: 1) New Bullards Bar Dam to Middle Yuba River confluence (2.3 miles); 2) Yuba River from the Middle Yuba River confluence to Colgate Powerhouse (5.8 miles) Alternate Run (takeout at Rices Crossing): 9.8 miles – by adding 1.7 miles below Colgate Powerhouse.
Run Time (est.): For hard-shell kayaks: a) 3 hours to Colgate Powerhouse; b) 5+ hours to Rices Crossing.
Elevation Range: 925 vertical feet. The reach ranges in elevation from 1,450 feet at New Bullards Bar Dam on the North Yuba River to elevation 525 feet at Rices Crossing on the Yuba River.
Gradient: 94 feet per mile. Smaller scale changes in gradient occur throughout the 3 sub-reaches detailed above. The estimated gradient by sub-reach is as follows: 1) New Bullards Bar Dam to Middle Yuba River confluence sub-reach is about 135 feet per mile); 2) Middle Yuba River confluence to Colgate Powerhouse sub-reach is 101 feet per mile; and 3) Colgate Powerhouse to Rices Crossing sub-reach is 12 feet per mile.
Streamflow Gages: Currently, a streamflow gage with realtime flow information does not exist on the North Yuba River below New Bullards Bar Dam. Boaters drive to the dam to see if it is a boatable flow.
Maps: USGS 1:24,000 topographic quadrangles: Challenge and French Corral

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