

8.10 Ice House Whitewater Boating Study
(Note: Above Chili Bar)

Subsequent to Plenary Group approval of this study plan on February 4, 2004, additional reconnaissance and review of the reach revealed a concern with the amount of large woody debris in the reach. This concern was discussed at the Recreation and Aesthetic TWG on April 6, 2004, and the study plan was modified. The group agreed to modify the study plan from a 3-day flow study to a one-day flow study of approximately 400 cfs on May 1, 2004. If the study team cannot adequately characterize the reach based on the information collected on the one-day flow event, a second flow event may be scheduled. The Recreation and Aesthetics TWG participants at the April 6, 2004, meeting included: ENF, BLM, American River Recreation Association/Camp Lotus, NPS, SWRCB, FWS, Chris Shackleton, Pacific Gas and Electric Company, El Dorado County Parks and Recreation, El Dorado County Water Agency, Charles Bertolette (private citizen), Gold Country Paddlers/American Whitewater and SMUD. During the April 7, 2004, Plenary Group meeting, Harry Williamson, NPS and spokesperson for the Recreation and Aesthetics TWG, informed the Plenary Group of this modification.

8.10.1 Pertinent Issue Questions

This study focuses on the Ice House Reach however there are references to the Slab Creek Reach in the study plan since the controlled flow studies on the Ice House and Slab Creek reaches were originally developed as one study plan.

The Ice House Whitewater Boating Study addresses the following recreational resource questions:

- 3a. What are the effects of potential boating flows on water levels of Project reservoirs?
6. What maximum and minimum flow regimes are required for whitewater boating in the stream reaches affected by the Project, including Upper Rubicon River
19. Can there be a flow management hydrology model (unimpaired hydrograph) built with a whitewater filter that estimates flows assuming UARP/Chili Bar presence and absence?
68. What is the need for, and feasibility of, whitewater boating in the reaches below Project dams?

Other issue questions relating to whitewater boating that were developed for the relicensing include:

- 1a. Is it possible to have consistent and regular releases that support boating in the reach between Slab Creek Dam and Chili Bar Reservoir?
2. What are the optimal and minimum boating flows between Slab Creek Dam and Chili Bar, for all crafts, and all classes of boating?

8.10.2 Background

The objectives of the Whitewater Boating Feasibility Study included:

- Identify and describe reaches where there are existing or potential whitewater opportunities
- Quantify how the Project affects these opportunities (i.e., flows, boatable days, season of use, access)
- Characterize whitewater opportunities affected by Project operations based on physical characteristics, existing information and interviews (e.g., gradient, length, access, channel characteristics, flows, reservoir storage and diversion capacity)
- Determine current and future demand for whitewater boating on Project reaches
- Develop a range of possible flows to provide other TWG's before conducting additional studies
- Describe and assess the adequacy and availability of existing flow information
- Recommend additional studies needed for whitewater resources (e.g., Single Flow Feasibility Study or Controlled Flow Study)

Reconnaissance conducted as part of the Whitewater Boating Feasibility Study was completed in 2002 and a presentation of the methods and results was made to the Recreation TWG on January 22, 2003. Subsequent

documentation of the reconnaissance was presented to the Recreation TWG on February 5, 2003. Helicopter reconnaissance of South Fork Rubicon below Robbs Forebay and Silver Creek below Junction Reservoir was conducted on June 11, 2003. Based on the presentation, documentation and field reconnaissance the Recreation TWG participants determined that additional investigation including flow studies are warranted at the Slab Creek and Ice House reaches in order to have enough information to address all of the pertinent issue questions relating to these reaches. A study plan for both of these reaches was developed and approved by the TWG February 26, 2003. The TWG subsequently asked to prepare separate study plans for each reach. The study plans were presented to the Aquatics TWG in August for review and comment. The Aquatics TWG did not have concerns with the range of flows proposed in the study plan. They also agreed that the whitewater flow study for the Slab Creek reach could be initiated as soon as November 2003.

Flows for this study will be provided to the Ice House Reach by opening the Howell-Bunger valve in the Ice House Dam. This valve is periodically tested as part of the Licensee' dam safety program. The current minimum flow requirement in the Ice House Reach is 5 cfs, year-round when the annual forecasted runoff into Folsom Reservoir is less than 1.499 million acre feet. When the forecasted runoff into Folsom Reservoir is more than 1.5 million acre-feet, the minimum instream flow requirements are: 12 cfs in October; 10/4 cfs in November; 4 cfs in December; 3 cfs in January through April; 8 cfs in May and June and 15 cfs in July, August and September.

It should be noted that this reach was burned in the Cleveland fire. Field reconnaissance revealed that there appears to be a notable amount of large woody debris in the reach.

8.10.3 Study Objectives

The objectives of this study include:

- Identify current and potential boating opportunities on the Ice House reach. Opportunities may vary by craft, skill level, or preferences for different types of whitewater conditions.
- Identify flow-related attributes for each of those opportunities, including a description and classification of key rapids.
- Develop relationships between flow levels and quality of whitewater experience for the Ice House Reach. Resulting "flow evaluation curves" will identify minimum and maximum acceptable flows and optimum flow ranges for each reach for a variety of watercraft.
- Determine the whitewater difficulty using the International Scale of Whitewater Difficulty (American Whitewater 1963) for the reach within the range of test flows.
- Determine what types of watercraft are suited for the reach within the range of test flows.
- Characterize the whitewater resource in the reach in terms of quality of the opportunity and suitability for whitewater boating.
- Determine what operational challenges may exist in providing flows in the boatable range.
- Quantify how the Project has affected the frequency and timing of boatable days available in this reach.

8.10.4 Study Area and Sampling Locations

The study area is defined as the Project reach directly downstream of Ice House Dam (between Ice House Dam and Junction Reservoir).

8.10.5 Information Needed From and Coordination with Other Studies

Hydrology data to determine the annual number of days and timing of boatable flows that occur under regulated and unimpaired conditions in this reach. Channel morphology and habitat mapping information may be useful to review in the analysis.

Provide timing, duration and magnitude of test flows as soon as practical to other TWG's. The Aquatics TWG will develop a set of concurrent studies that will focus on aquatic resources that could potentially be affected by the study flows.

8.10.6 Study Methods And Schedule

The Ice House Whitewater Boating Study requires that a team of boaters paddle a given stream reach multiple times in succession while the independent variable, flow, is changed. The objective is to record how changes in flow alter the quality of the experience for individual participants and the group. The group of participants paddle each pre-selected flow then individually complete a single flow survey questionnaire querying them on a number of whitewater characteristics specific to that flow. Upon completion of all the test flows participants complete the comparative survey form enabling them to evaluate one flow over another for specific characteristics. Focus group discussions structured with specific questions are conducted at the conclusion of each single flow and upon completion of the comparative evaluations.

The methodology to complete the Ice House Whitewater Boating Study will include an organized boating trip on the Project reach. Boating teams of between six to 12 kayaks and other crafts suitable for small creek type of boating on the Ice House reach will be organized to make runs of the reach at the following target flows:

Ice House Reach: 200, 300 and 500 cfs

The actual flows may be adjusted, within this range, while the study is in progress based on results of single flow responses and focus group discussions.

The existing information about the whitewater resource on the Ice House Reach indicates that current boating opportunities are constrained by the Project diversions around the reach. The target flows for this run are selected to gain information about the entire range of boatable flows.

The boating team members will have the skills necessary to boat the reach and will commit to participate in the entire test flow series. Boating participants will be selected by interested TWG participants. Each boater will sign a waiver of liability prior to participating in the study. The primary data for this study will consist of the boaters' responses to questionnaires that they will complete at the conclusion of each run. The questionnaire will include a section to gather data for a comparative flow evaluation for each reach. A draft of the questionnaire has been prepared and is attached to this study plan (***The questionnaire was distributed at the 2/26/03 Recreation TWG meeting***). Comments and changes to the questionnaire will be incorporated prior to initiating the study. The type of data to be collected include: 1) boatability, 2) quality of the reach, 3) suitability of the run for different crafts and boater skill levels, 3) quality of the put-in/take-out 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, 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.

If practical, the locations of any significant boating hazards or log jams in the reach will be made using GPS equipment during the study flows.

The study methods will include videotaped recordings and/or photographs taken at key locations on the run. The post-run discussion among the boaters (after the team has completed the questionnaires) will also be recorded on videotape. The post run group discussions, will include identifying suitable locations in the reach for lunch or break stops, possible overnight use locations, access and potential for commercial boating use in the reach as well as discussing other general aspects of the reach. The questions for the focus group discussion will be developed with interested TWG participants during the process of reviewing and finalizing the questionnaires that will be used in the study.

The schedule for conducting the Ice House Whitewater Boating Study will depend on the type of water year and the timing of snowmelt. The schedule will need to be flexible to respond to these climatic conditions however for planning purposes, the estimated schedule for conducting the flow study for the reach is listed below:

Ice House Reach: April 30 to May 30, 2004
(Tentative dates are April 30, May 1, and 2 with alternate dates of May 7, 8 and 9)

This is an approximate schedule that will be revisited and updated based on hydrologic events in the coming months. Although the Licensee has every intention of completing this study by 2004, this study plan needs to include a contingency for the occurrence of a dry water year, unforeseen power generation needs or because of biological concerns raised by the Aquatics TWG. The Licensee would like to accomplish the work associated with this study plan late spring during a period of the year when the flows necessary for the study would occur within the natural hydrograph.

8.10.7 Analysis

The information developed in this study will be used to describe the whitewater boating opportunities on this reach, quality of the run, ease of the shuttle (in terms of time, distance, quality of route), access at both put-ins and take-outs, scenic quality, class of difficulty and boatability. The data collected will be summarized and analyzed for frequencies of responses and general trends that may exist in the data. The questionnaire responses will be used to estimate by watercraft type, the minimum and maximum acceptable boating flows and optimum boating flow for the reach that is within the normal peaks of the natural hydrograph. These definitions (Whittaker et al. 1993) are:

Minimum Acceptable Flow: the lowest flow at which 50% of the survey respondents will return to paddle.

Maximum Acceptable Flow: the highest flow at which 50% of the survey respondents will return to paddle.

Optimum Flow: The flow level that provides the best combination of flow conditions for a whitewater opportunity. The optimum flow is the peak of the flow preference curve.

Flow Preference Curve: the graphic relationship between flow (horizontal axis) and survey responses (vertical axis).

Hydrology data for the period of record (1975 to 2001) will be analyzed to display how often boatable flows, as identified by the boaters, including optimum flows, have occurred under unimpaired and regulated conditions. The analysis will also identify when these flows have occurred over the period of record (number of days with boatable days per month and water year type) under unimpaired and regulated conditions. Hourly data will be used, where available or where it can be synthesized.

Other hydrologic factors that may affect boating opportunities will also be analyzed. These will include how quickly typical spill flows move through the boatable range and whether there other flow fluctuations that make it difficult to boat this reach under current operations.

8.10.8 Study Output

A written report will be prepared to include documentation of survey findings with presentation in graphical and discussion format in a manner which appropriately answers issue questions. The study output will include a USGS quad map showing basic information about the runs including the location of the put-ins and take-outs, potential break or lunch stop locations, portages, locations of barriers/log jams, areas with safety concerns, shuttle route, and locations of photographs or videotape recordings taken during the study. If areas of concern or interest present themselves at different flows, this will be noted on the maps (i.e. a log was portaged at 200 cfs but the log was not a barrier at the 500 cfs flow). The study output will also include the summarized responses to the questionnaires, flow preference curves, photographs showing portions of the runs, put-ins and take-outs, and edited videotape of the run and post-run group discussion. The edited video will capture watercraft at each pre-selected rapid for each test flow. The output will also include graphical and tabular data to compare the number and timing of boatable days that occur under unimpaired and regulated conditions in this reach. Operational aspects of the Project such as the Howell-Bunger valve and the minimum instream flow requirements will be presented in the report.

8.10.9 TWG and Plenary Group Endorsement

This study plan was approved on January 28, 2004 by the following entities of the TWG: ENF, BLM, American River Recreation Association/Camp Lotus, NPS, SWRCB, CDFG, Chris Shackleton, Chris Shutes and SMUD. The Plenary Group approved this plan on February 4, 2004. The participants at the meeting who said they could “live with” the plan were Taxpayers Association of El Dorado County, Friends of El Dorado County, USFS, American River Recreation Association & Camp Lotus, El Dorado County Water Agency, Pacific Gas & Electric Company, SMUD, El Dorado County, El Dorado Irrigation District, NPS, SWRCB, USBLM, City of Sacramento, CDFG, and FOR. None of the participants at the meeting said they could not “live with” this study plan.

8.10.10 Literature Cited

American Whitewater, 1963. International Scale of Whitewater Difficulty.

Whittaker et al. 1993. Instream Flows for Recreation: A Handbook on Concepts and Research Methods. U.S. Department of the Interior.

**Ice House Run
(Ice House Dam to Junction Reservoir)
WHITEWATER BOATING FLOW STUDY, 2004**

BOATER EVALUATION FORM

This questionnaire is organized in three sections. **Section 1**—Contact information and characterization of your boating skills/experience. (You will need to complete this section only once during the study.) **Section 2**—Questions regarding your experience on today’s run. **Section 3**—A comparative evaluation of different flows (To be completed after completing all test flows).

SECTION 1--BOATER BACKGROUND INFORMATION--(COMPLETE THIS SECTION ONLY ONCE)

1. Name _____
2. Affiliation _____
3. Home Address _____
4. Telephone _____
5. E-Mail Address _____
6. Preferred Craft _____
7. What is your age? _____ years
8. Gender (*circle one*): Male Female
9. Please indicate your current boating skill level below. (*Circle one*)
 - a) Novice
 - b) Intermediate
 - c) Advanced
 - d) Expert
 - e) Elite
10. How many years have you been boating at this level? _____
11. In the past 3 years, how many days a month do you boat? _____
12. Have you ever participated in a hydro relicensing whitewater boating study before? _____
If yes, how many, when and for which hydro projects? _____
13. How many times have you boated this run before today? ____/year
If you have boated this run before (*Leave blank if you have not boated the run before today.*):
what were the flows? _____ cfs
what type of craft(s) did you use? _____
14. How long does it take you to get to this reach from your home? _____ hrs _____ min

15. Please respond to each of the following statements about your river-running preferences.

Statement	Strongly Disagree	Disagree	Neutral	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 (under 4 miles) 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 and portages in order to run interesting reaches of whitewater.	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

SECTION 2-- BOATER POST-RUN EVALUATION FORM

Date of run: ____ / ____ / 2004

Reach: **Ice House**

1. What was the target flow on this run? _____ cfs as measured at _____.
2. What type of craft did you use for this run (*Circle one*)?

1. Hard shell kayak	5. Cataract (please indicate length: _____)
2. Inflatable kayak	6. Raft (please indicate length: _____)
3. Closed deck canoe	7. No craft: I road/trail-scouted this run
4. Open canoe with floatation	8. Other: (please explain) _____
3. Please identify the put-in and take-out locations you used and estimate the time you put-in and took out on this run.
 Put-in location: _____ Time: _____
 Take-out location: _____ Time: _____
4. About how many times did you stop and get out of your boat for breaks, or for scouting and portaging?
 About _____ times for breaks.
 About _____ times for scouting or portaging.
5. Please estimate the total amount of time you spent out of your boat for breaks, or for scouting and portaging.
 About _____ minutes for breaks.
 About _____ minutes for scouting or portaging.
6. *In general, how would you rate the whitewater difficulty on this reach at this flow? (Use the International Whitewater Scale that ranges from Class I to Class VI).* _____
7. Are you likely to return for future boating if today's flow were to be provided? (*circle one*)
 a) *Definitely No* b) *Possibly* c) *Probably* d) *Definitely Yes*
8. Relative to today's flow would you prefer a flow that was higher or lower or was this optimum flow?
 a) Much Lower b) Lower c) Higher d) Much Higher e) Optimum
9. Please respond to each of the following statements about the characteristics of this run at today's flow.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This reach is boatable at these flows.	1	2	3	4	5
This reach offers challenging and technical boating.	1	2	3	4	5
This reach has nice water features such as waves and holes.	1	2	3	4	5
This reach has good play spots.	1	2	3	4	5
This run offers good overall whitewater challenge.	1	2	3	4	5
This is a safe run.	1	2	3	4	5
This is an aesthetically pleasing run.	1	2	3	4	5
This run is a good length.	1	2	3	4	5
The portages on this run are not a problem.	1	2	3	4	5
There are enough places to take a break or have lunch on this run.	1	2	3	4	5

10. If you feel qualified to offer an opinion of the boatability of this run at today's flow using different types of crafts, please respond to the following statements. Leave blank if you do not have experience with a particular type of craft. (Circle one number for each type of craft)

This run at this flow would work well for:	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Kayaks	1	2	3	4	5
Rafts	1	2	3	4	5
Cataracts	1	2	3	4	5
Open Canoes	1	2	3	4	5
Inflatable Kayaks	1	2	3	4	5

11. Please estimate the number of **hits**, **stops**, **boat drags**, and **portages** you had on this run.

I **hit** rocks or other obstacles (but did not stop) about ____ times.

I was **stopped** after hitting rocks or other obstacles about ____ times (but did not have to get out of my boat to continue downstream).

I had to get out to **drag or pull my boat** off rocks or other obstacles about ____ times.

I had to **portage** around logs about _____ times.

I had to **portage** around unrunnable rapids, or other sections about ____ times.

12. Please identify particularly challenging rapids or sections and rate their difficulty at this flow (using the International Whitewater Scale). Also note if you portaged any of these rapids.

Location (Name or site)	Rating (Whitewater Scale of Difficulty)	Portage? (Yes or No)

13. If you portaged any portion of the run, please identify rapids or sections you chose to portage and rate the **difficulty of those portages** (using your type of craft at this flow level).

Location	Not at all difficult	Slightly difficult	Moderately difficult	Extremely difficult
	1	2	3	4
	1	2	3	4
	1	2	3	4
	1	2	3	4
	1	2	3	4
	1	2	3	4

14. *Did you observe or experience any significant safety issues on your run today (swims, pins, wrapped boats, man-made or natural river features etc...)? Please explain.*

15. Please use the space below to provide any comments about your boating experience today on the Ice House run.

SECTION 3—Comparative Evaluation Form—(COMPLETE AFTER THE LAST TEST FLOW EVENT)

Name _____ Date ____ / ____ / 2004

1. Please evaluate the following flows for your craft and skill level (please circle one in each column). 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).

Ice House	150 cfs	200 cfs	250 cfs	300 cfs	350 cfs	400 cfs	450 cfs	500 cfs	550 cfs	600 cfs	650 cfs	700 cfs
Totally acceptable	5	5	5	5	5	5	5	5	5	5	5	5
Acceptable	4	4	4	4	4	4	4	4	4	4	4	4
Marginal	3	3	3	3	3	3	3	3	3	3	3	3
Unacceptable	2	2	2	2	2	2	2	2	2	2	2	2
Totally Unacceptable	1	1	1	1	1	1	1	1	1	1	1	1

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

Flow in cfs

What is the lowest flow you need to simply get down the river in your craft? _____

What is the lowest flow that provides a quality technical boating experience for this reach? _____

What is the optimal range of flows that provides the best whitewater characteristics for this run? _____ to _____

What do you feel the highest safe flow for your craft and skill level? _____

3. In your experience, what whitewater runs in California do you believe offer a whitewater experience similar to this one at the optimum flow for this reach? Also list how often you boat these reaches and how long it takes you to travel the run from your home.

a) _____

Trips per year on this reach (circle one) 0-3 4-8 9-15 15+

Travel Time: _____ hours What months do you usually boat this run? _____

b) _____

Trips per year on this reach (circle one) 0-3 4-8 9-15 15+

Travel Time: _____ hours What months do you usually boat this run? _____

c) _____

Trips per year on this reach (circle one) 0-3 4-8 9-15 15+

Travel Time: _____ hours What months do you usually boat this run? _____

d) _____

Trips per year on this reach (circle one) 0-3 4-8 9-15 15+

Travel Time: _____ hours What months do you usually boat this run? _____

4. Compared to the runs you listed above, how would you rate boating opportunities on the Ice House Reach. *(Circle one number for each; if you are unsure about a comparison, leave that item blank).*

Compared to:	Much Worse	Worse	About the Same	Better	Much Better
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

5. Please respond to the following statements about the non-whitewater characteristics of this run

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Length of Shuttle is not a problem.	1	2	3	4	5
The put -in for this run is good.	1	2	3	4	5
The take-out for this run is good.	1	2	3	4	5
The total shuttle to boating ratio on this run is good.	1	2	3	4	5

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

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

7. Please use the space below to provide any comments about your overall boating experience on the Ice House run.
