

**Black Canyon Hydroelectric Project  
FERC Project No. P-14110  
Recreational Resources and Whitewater Boating Study Report  
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## **1 EXECUTIVE SUMMARY**

General and flow-related recreation issues are addressed by describing recreation opportunities, identifying flow ranges for flow-related opportunities, and assessing Project effects on these opportunities. This process was accomplished by conducting “desktop” analyses, fieldwork, intercept surveys, interviews, focus groups, and surveys from experienced users. Study findings were integrated with hydrology modeling efforts to assess Project effects on flow-related opportunities.

Intercept survey results suggest that hunting, fishing, and related activities taking place either within Hancock Forest Management Timberlands or in the public Forest Service property north of the Project are the most common recreational activities in the area. These recreation users typically experience minimal crowding while driving roads and find resources and facilities marginal or adequate, with the exception of restrooms, which some found to be unacceptable. An evaluation of Project effects on general recreation found that due to limited, public access, current land use practices, and the area’s complex topography, the study area may experience less use relative to popular publicly accessible land that is managed for recreation in the vicinity. As a result, the Project will have a relatively minor impact on these non-flow dependent activities.

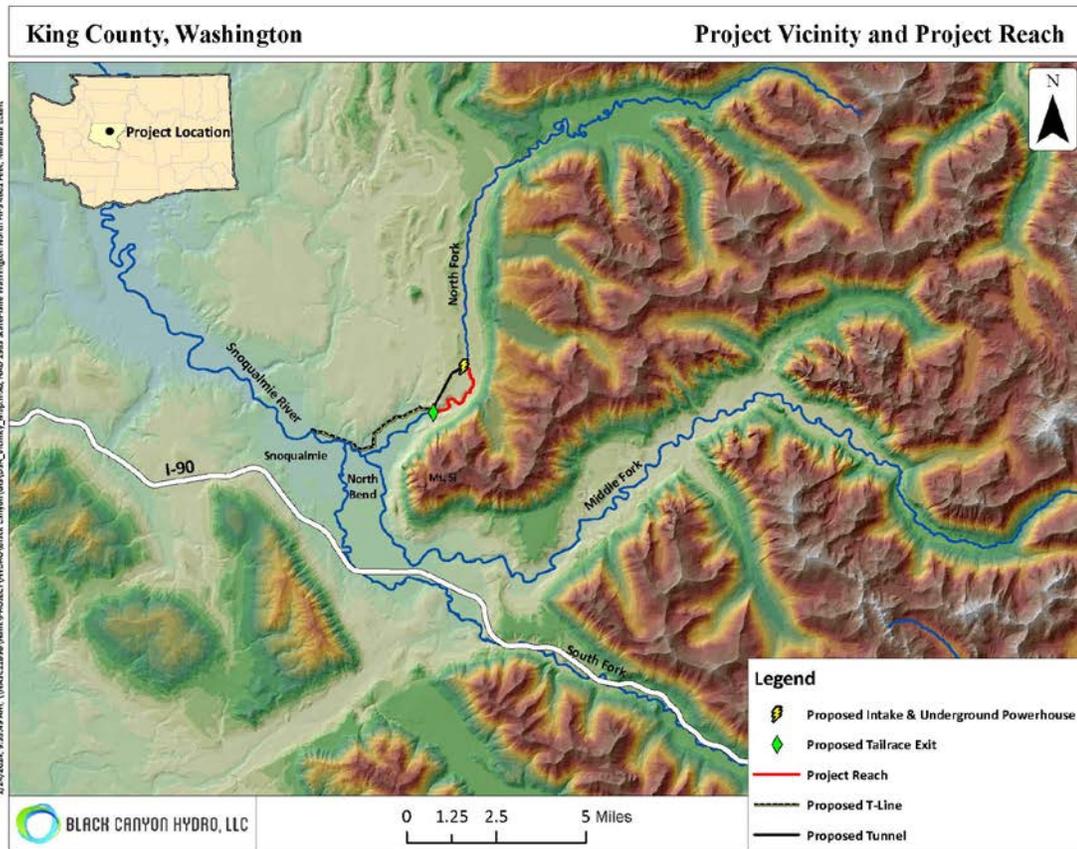
Flow-dependent activities would experience variable effects from Project operation. The number of days in the acceptable range of fishing flows would increase significantly from 164 days to 326 days, without substantially changing the number of days below the fishable range. In contrast, there would be a reduction in the availability and quality of whitewater boating days under the currently proposed Project operation. Based on annual average flow data, the proposed project operations would provide approximately 21 days in the identified boatable range. Observations of boaters by motion-activated cameras in 2013 suggest that approximately 35 to 49 days were boated in the affected segment of river, and there were many more days that provided boatable flows.

The report concludes by recommending the use of these results and further stakeholder comment to develop a detailed Recreation Management Plan (RMP) to be implemented if a license is issued.

## **2 INTRODUCTION**

Black Canyon Hydro, LLC (“BCH”) is developing an application for an original license with the Federal Energy Regulatory Commission (FERC) for a proposed 25-megawatt,

run-of-river hydroelectric facility to be located on the North Fork near North Bend, Washington. The combined maximum hydraulic capacity of the Project’s four generating turbines would be 900 cubic feet per second (cfs). Water would be diverted from an approximately 2.7-mile-section of the North Fork. The Project would affect a section of river known as Black Canyon or Ernie’s Gorge where the river is used by boaters, anglers, and other recreation users.



**Figure 1. Project Vicinity and Project Reach**

The following is a description of Project features many of which have been updated since filing of the Revised Recreational Resources and Whitewater Study Plan (“Study Plan”):

Intake

The following description of intake features reflects an evolution in project design since the filing of the Pre-Application Document (PAD) through scoping, stakeholder comment, and study results. As a result of completing relevant studies, two possible design alternatives have been developed for the intake. These Alternatives are called

Alternative C and D. Both alternatives involve bulk water screening located at approximately river mile 5.3, on the same river bend and point-bar as Alternative A. Alternative C uses a vertical plate screening system, and Alternative D uses a horizontal plate screening system.

Both alternatives would have a (1) control sill to control the normal water surface elevation and maintain a consistent river bed elevation for a side channel bulk-water intake. The control sill would consist of a concrete weir with boulders inset on the surface over top of a sheet pile cutoff wall to capture hyporheic flow. The sill would be at the newly established grade of the river bed and would allow uninterrupted flow through a natural looking re-profiled river as a roughened channel series of step pools, riffles, and boulder weirs. (2) An intake structure with a coarse trashrack, jib crane, and radial gate with sluiceway located on the east bank of the river. Diverted water would be conveyed through; (3) an open channel to a; (4) head gate control structure and into a; (5) fish and debris screening structure. (6) Fish and debris would be screened and bypassed back into the river. Screened water would then flow through a power conduit to the underground powerhouse. (7) Access to the intake site would use an existing logging road and approximately 400 feet of new roadway extending to the intake site.

#### Powerhouse

The powerhouse location would be located underground beneath the selected intake site. This would include a (1) 450-foot tall, 30-foot diameter vertical shaft to allow space for the power penstock(s), elevator, stairs, ducting, mechanical, and electrical chases. Screened water from the intake screen system would be delivered down a (2) vertical power penstock(s) to the powerhouse. The powerhouse would (3) use four Pelton Turbines each rated at 6.25-MW, as well as appurtenant facilities. The (4) powerhouse substation and (5) elevator building would be located near the intake structure.

#### Tailrace

The tailrace will be an approximately (1) 8,600 foot long 12 foot diameter tunnel, and is anticipated to be constructed primarily in bedrock. The tailrace water return to the North Fork would be located at approximately the same location as proposed in the PAD at approximately river mile 2.6.

#### Transmission

Transmission would consist of a 34.5-kilovolt underground transmission line and overhead transmission that transmits project power to the regional grid. The transmission line would be sited predominantly on an existing power line corridor. The transmission

line would originate at the powerhouse substation located at the intake site at river mile 5.3. Subsurface transmission would follow the vertical shaft to the underground powerhouse, and down the 1.6 mile long tunnel. After exiting the tunnel the transmission would travel underground 1.0 miles on new and existing roads then 4.2 miles as 34.5-kilovolt overhead transmission line predominantly following an existing power line corridor to the point of interconnection. The point of interconnection is located at an existing overhead transmission line near the intersection of 396<sup>th</sup> Drive SE and SE Reinig Road approximately 0.4 miles from the City of Snoqualmie. A new switch and substation would be added at the point of interconnection to transform voltage from 34.5-kilovolt to 115-kilovolt.

### **3 DESCRIPTION OF STUDY**

BCH is conducting studies to determine potential Project effects on environmental resources, including on general recreation opportunities, with a specific focus on flow-effects on whitewater boating and fishing. This report addresses general and flow-related recreation issues, describing recreation opportunities, identifying acceptable and optimum flow ranges for flow-related opportunities, and assessing Project effects on these recreation opportunities. The report summarizes information from several sources, including “desktop” analyses, fieldwork, interviews, focus groups, and surveys from experienced users. Study findings were integrated with hydrology information and modeling to assess Project effects on flow-related recreation and an ArcGIS analysis of viewable Project features which were developed initially in the course of completing other studies.

The objectives, as detailed in the recreation study plan (BCH, 2012), include:

- Compile an inventory of outdoor recreation resources, facilities, and activities that support commercial and non-commercial recreation and tourism in the project area;
- Quantify current recreational use, tourism, and future trends based on recent or newly conducted surveys and interviews, consultation with stakeholders, regional and statewide plans, and other available data;
- Evaluate the potential effects of project construction and operation on the resources and activities identified in the project vicinity and downstream of the project;
- Identify and evaluate new recreational opportunities that may be created by the project and effects on recreation-related spending in the project vicinity;

- Identify a range of protection, mitigation, and enhancement (PME) measures that could be applied or implemented to mitigate impacts; and
- Develop a detailed RMP to be implemented for this project if a license is issued.
- Assess potential increases to trespass and vandalism due to increased access or recreation use.

The general recreation component of the study focused on a review of existing information, interviews and an onsite or intercept survey. This survey was identified in the study plan as an acceptable alternative if a survey of Hancock Forest Management users was not possible (because a list of permittees could not be obtained).

The flow-related component of the recreation study focused on evaluating existing recreation boating and fishing activities on the North Fork Snoqualmie River and potential effects of the Project on access and experiences due to changes in flow regime and river geomorphology. More specific objectives of this component included:

- Identify recreational boating and fishing activity, including access sites, on the North Fork;
- Estimate current and future use of the river by boaters and anglers;
- Evaluate the effects of project construction and operation on boating and fishing opportunities on the North Fork;
- Determine acceptable and optimal recreation flow ranges for each relevant type of opportunity;
- Describe the effects of the proposed diversion weir and altered river flows and geomorphology on existing and potential boating and fishing activity, including access within the project area;
- Describe new boating or fishing opportunities that may be created by the project; and
- Describe possible liability issues related to providing managed boating flows.

The Project Area runs from the proposed intake and powerhouse structure to the powerhouse, including the Project bypass river reach. The study area for this report extends beyond the Project Area to include lands and waters adjacent to and within the Project area where recreation activities occur. The Study Area includes:

- The North Fork from the recreational boating access located downstream from Wagner Bridge to the take-out location at King County’s Three Forks Natural Area, at the confluence with the Middle Fork Snoqualmie River.
- Areas adjacent to the river used by recreational boaters to scout and portage along the route.
- Existing roads within the Black Canyon Hydroelectric project area that are could be used to access the river:
  - North Fork Road, National Forest Development Road 5700, from Ernie’s Grove to Spur 10 Road.
  - Lake Hancock Road / SE 88th Street from North Fork Road to Spur 10 Road.
  - Unnamed private roads near the Project Reach, particularly the existing section that would become part of the proposed intake access road.
- Proposed new or extended roads and river access points:
  - Proposed intake access road.
  - Proposed powerhouse access road.
  - Possible put-in/take-out

Study components and associated report sections were conducted by different resource specialists. Whitewater Engineering Corporation (“WEC”) collaborated with Confluence Research Consulting (“CRC”). Footnotes to each section identify lead and contributing authors where appropriate.

*Note:* This report considers potential boating, scouting, and portaging options on the North Fork based upon interviews, focus groups, on-land field reconnaissance, and surveys conducted in 2013. It does not identify or endorse specific boating, scouting, or portaging options for future boaters. All boaters need to make their own decisions about how to scout, run, and/or portage sections of the North Fork during any on-river boating activities.

## 4 METHODS

A study plan was developed in collaboration with agencies and stakeholders in summer and fall 2012, and finalized in January 2013 (BCH, 2013). The study plan links specific methods with study objectives, identifying options for collecting information when there was uncertainty about sampling or the availability of data from other organizations (e.g. Hancock Forest). Specific methods used in the study are described below; leads for the study components are identified for each.

#### **4.1 General Recreation Intercept Survey**

The intercept effort was led by WEC with consultation and review of survey instruments by CRC. Data from a sample of the population of visitors to the area was collected using an intercept survey instrument. A field research technician would introduce himself to pedestrians and drivers who stopped at the surveying station as a researcher working for the developers of a potential hydroelectric project on the North Fork. The surveying station was chosen at a pullout on a single-lane road after the final turn-off before entering the study area. Potential respondents were encouraged by the technician, wearing an orange fluorescent vest, prominently displaying signs advertising entry in a drawing for a Cabela's gift certificate to those who completed a survey. The technician would then give a brief background on the Project and provide interested respondents an informational card providing contact information and the Project's website. The field researcher would then provide the respondent with a copy of the survey and orient them using a larger, more detailed map than those attached to the survey instrument (efforts to use a detailed colored map for each individual survey was abandoned after it proved difficult for respondents to legibly indicate where they had visited due to dark background colors). Pre-addressed envelopes with postage were also provided for any respondents who were interested in completing the survey instrument and mailing it in.

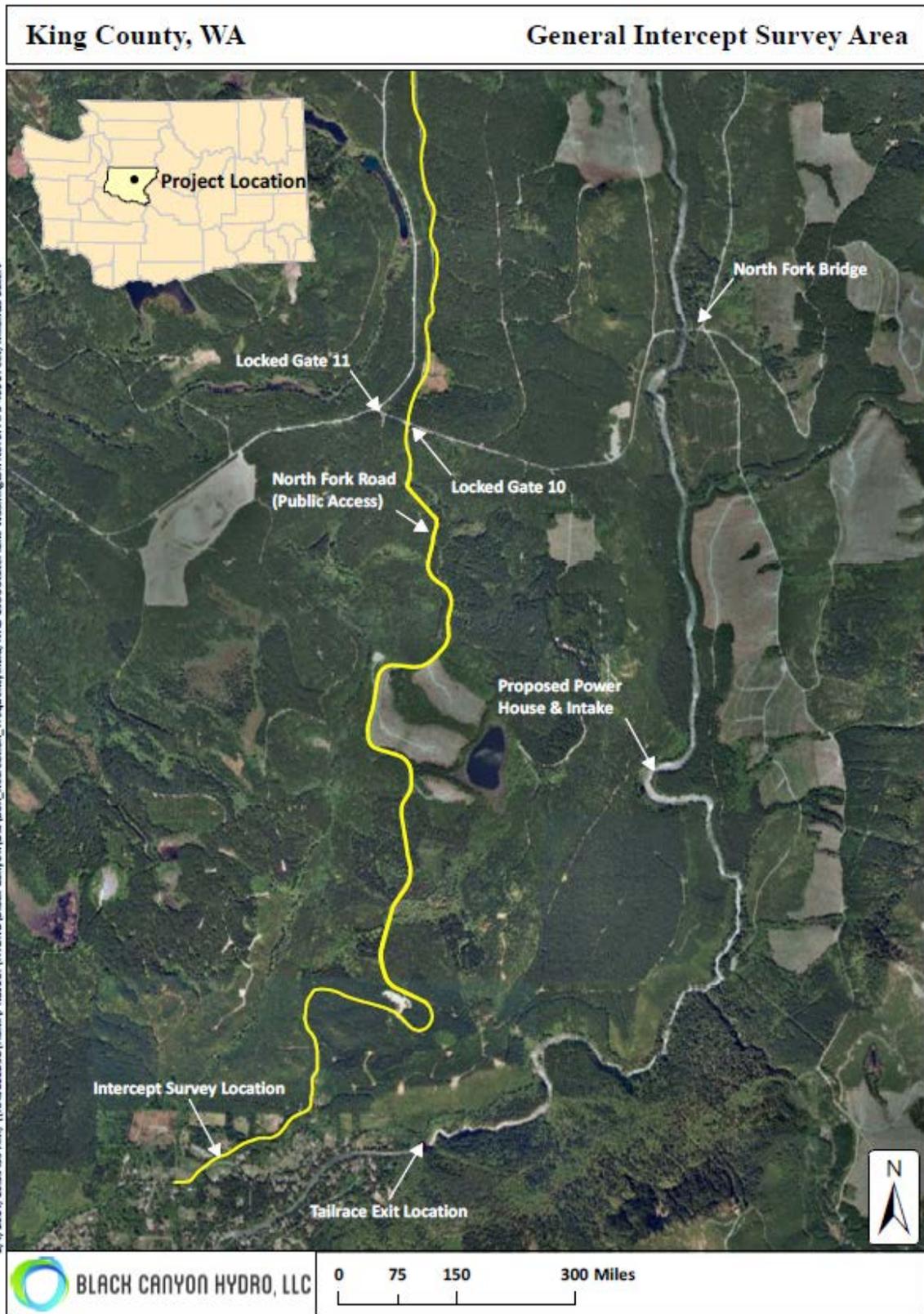
Sampling involved interviewing visitors traveling along the North Fork Road, just above the community of Ernie's Grove, downstream of the Project tailrace. The North Fork Road is the primary public, non-gated road used by the public to reach the study area. Those users trying to access either Hancock Forest Management's Snoqualmie Forest or passing through the managed forest in order to reach public lands to the north, upstream of the study area generally use this route. This route's popularity is likely due to its proximity to the cities of North Bend and Snoqualmie, Interstate 90, and its lack of locked gates. Other roads in this vicinity pass through private timberlands, which are gated, monitored at times by a security guard, and locked when logging is not actively occurring. While the stated goal of the study plan was to sample a minimum of 50 different annual pass holders and 100 different daily pass users, for a cumulative 200 total trips, these goals were qualified by a lack of available information on actual use. Only 58 respondents were ultimately willing to complete the survey instrument.

Surveys were collected on 45 days from May 26, 2013 through October 30, 2013. The technician typically arrived between 10:30 AM and 1:30 PM and remained for six hours.

**Table 1. Number of survey days per day of the week**

<b>Day of Week</b>	<b>Number of Survey Days</b>
Monday	2
Tuesday	6
Wednesday	4
Thursday	5
<i>Weekday Subtotal</i>	<i>17</i>
Friday	5
Saturday	13
Sunday	10
<i>Weekend Subtotal</i>	<i>28</i>
<b>Total</b>	<b>45</b>

The survey was one page, front and back, to minimize time and encourage participation (based on participation, these were legitimate concerns). A second page with a map was added to allow respondents to mark where they had visited in the study area over the previous 12-months. The survey assessed 1) basic recreation information (e.g., where did you go and what did you do?) and evaluations of key conditions (e.g., crowding and access). Finally, the survey asked for contact information for those people who might be willing to participate in the angler/general recreation focus group or whitewater boating-specific focus group.



**Figure 2. General Intercept Survey Area**



1. Trail leading to water on upstream river right side at Gate 10/11 Bridge.
2. View across river from downstream river right side at Gate 10/11 Bridge.
3. View across river from river left side near potential intake area B about RM 5.3 near beginning of the canyon.
4. View across river from river left side near potential intake area A about RM 4.8 (this camera had a poor capture rate and was only in place for a short period).
5. View across river from river right in Ernie's Grove near lower gage near proposed powerhouse site about RM 1.85 (this also had a poor capture rate and was removed).



**Figure 4. Representative photograph of kayakers**

Summarized numbers of boaters and anglers “observed” by the cameras by date and flow are available in Appendix A.

### **4.3 Future Use Trends**

WEC conducted estimates of future use trends. Although there is no long term boating or angling use information for the North Fork to identify trends, a review of national and Washington-specific trend use information can provide helpful context for likely future demand.

The Interagency Committee for Outdoor Recreation (IAC, 2003) provided estimates of future participation in major categories of recreation. The estimates are based on:

- National Survey on Recreation and the Environment (NSRE) projections for the Pacific Region, including Washington State;
- Age group participation and age trends in Washington;
- Estimates of resource and facility availability;
- User group organization and representation;
- Land use and land designations;
- “Other factors” including the economy and social pressures.

The IAC information for Washington estimates future participation as a percent change from current levels for different activities. Applied to lists of recreation activities from the intercept survey, a table in the study results shows how use might change into the future.

These “percent change” figures should be considered rough estimates because past use is not always the best or only predictor of future use. Several interviewees and researchers have suggested multiple reasons why kayaking (or other activities) may increase, remain stable, or decline at a specific location. An analysis of whitewater demand for the Clackamas River (Oregon) relicensing study (Whittaker and Shelby, 2004) examined several factors that can affect recreation demand, including: local population growth, economic changes, availability of substitute boatable rivers, changing levels of free time, diffusion of new technologies and techniques, media and marketing, instruction, indoor practice opportunities, outdoor practice opportunities, weather, and the “participation cycle.” A complete review of these issues is beyond the scope of the present document, but they have been considered in the discussion of the recreation use trend table.

### **4.4 Flow-Related Opportunities**

The instream components of the study used a phased approach common in many relicensing assessments of flow-recreation issues (Whittaker, Shelby, and Gangemi 2006); methods were also consistent with FERC study requirements under the ILP

(FERC 2004). Specific protocols followed accepted practices outlined in Whittaker et al (1993) and Whittaker et al. (2006).

#### **4.4.1 Existing information**

Existing information in agency plans, whitewater boating guides, and websites helped identify types of boating, fishing, and other recreation opportunities; typical access points; length and seasonality of trips; and general flow ranges. Most of this “Level 1” information was provided in the study plan and helped organize subsequent interview, focus group, and survey information. These Level 2 sources largely confirmed Level 1 information, but provided more quantitative and definitive descriptions.

#### **4.4.2 Field reconnaissance**

WEC and CRC performed an on-shore reconnaissance of the river in July 2013. CRC researchers (Doug Whittaker and Bo Shelby) visited access points at Gate 10/11 Bridge, near the proposed intake area (from the south or river right side), and from Ernie’s Grove upstream to the Snoqualmie water intake about RM 3.3 (from the north or river right side). Researchers also accompanied three stakeholders into the north side of Mount Si Natural Resource Conservation Area, hiking an overgrown “jeep trail” into an overlook of Racher Falls, cutting downslope to several large Douglas Fir trees, and then traveling off-trail back to Moon Valley Road (at the DNR administrative access).

#### **4.4.3 Interviews and focus groups**

CRC conducted several interviews with boaters, anglers, or others with experience on the river. Most focused on understanding access options, types of opportunities, flow ranges, and developing a list of boaters and anglers who might participate in focus groups or surveys.

Two focus groups were conducted in North Bend on July 29 and 30, 2013. The first focused on whitewater boaters and was attended by 11 boaters or agency staff (plus CRC researchers and Alex Grant from WEC). The second focused on angling and other recreation resources and was attended by 12 anglers or agency staff (plus CRC researchers and WEC staff).

The focus groups included introductions, a description of the proposed Project, and recreation study objectives. Most of the time was then spent discussing river values, trips, access, and flows.

#### **4.4.4 Post-trip surveys**

CRC developed an online survey was available to boaters from July 15, 2012 through fall 2013. The survey asked boaters to report the number of other boaters in their group, the flow, the type of boating opportunity, and their evaluation of the flow. In total, 24 boaters completed post-trip surveys between July 15, 2012 and June 29, 2013. After the long form survey became available in fall 2013, post-run surveys became redundant and were discontinued.

#### **4.4.5 Long-form surveys**

Two online “long form surveys” were developed by CRC to allow whitewater and fishing interviewees to answer questions about their experience using the North Fork, attributes of the river and its recreation opportunities, flow preferences, timing preferences for managed flow releases, and attitudes toward access options.

Twenty whitewater boaters were invited to take the boating survey, and encouraged to forward the email invitation to others who had run the river. Boaters who had not responded were emailed two reminders; 36 whitewater boaters completed the survey.

Twelve anglers were invited to take the fishing survey and encouraged to forward the invitation to other anglers who fish the river. Anglers who had not responded were emailed two reminders; 11 anglers completed the survey. Despite researcher attempts to encourage participation, discussion on an online Washington fly fishing forum suggested some respondents may not have participated because of their philosophical opposition to the Project.

### **4.5 Hydrology information and analysis**

The most relevant hydrology information for the study reach comes from the North Fork Snoqualmie near Snoqualmie Falls, WA (USGS gage 12142000), although this is supplemented by other gage information collected for the Project. The USGS gage is located at RM 9.4, just upstream from the confluence of the North Fork with Calligan Creek (about two miles above the Gate 10/11 Bridge, about four miles above the proposed intake and the top of Ernie’s Gorge). The Hydrology Study Report (BCH, 2013) contains a more detailed discussion of the area’s hydrology.

A model was developed by the Project proponent to estimate the number of days in a typical year or season within specified flow ranges both with and without the proposed Project. The present study summarizes recreation-relevant hydrology and operations

information for reader convenience. Despite occasional within-day fluctuations, mean daily flows are the most useful indicators of “usable” boating or fishing flows. Based on a review of several individual storm events in 2013, mean daily flows are representative of the flows during the typically gradual falling limb of the hydrograph that occur over days rather than hours. In contrast, hourly flows during a “flashy” storm can be substantially different from the mean daily flow, but this occurs during the steeper rising limb of the hydrograph, which typically lasts for hours rather than days. Taken together, there are typically more days with steady or falling flows than flashy or rising flows.

#### 4.6 Integration of results with other resources

Beyond hydrology and associated modeling efforts, the results of other resource studies have been integrated as necessary in this report. As an example, the Aesthetic Resources Assessment uses ArcGIS tools to evaluate whether Project features were visible from recreation points in the vicinity of the Project. These results are used in this report to assist in the evaluation of potential Project effects on recreationists participating in non-flow related activities.

## 5 RESULTS

### 5.1 General recreation intercept survey<sup>1</sup>

The following section summarizes results of the general recreation intercept survey.

Respondents were asked how many times they had visited the North Fork study area and vicinity in the past 12-months and were shown a map illustrating the study area. Of the 58 respondents, 46 (79%) had visited between 1 to 25 times in the last year. The mean, median, and mode number of visits in the last year were 27, 10, and 10 respectively.

**Table 2. Visits to study area in past 12-months**

Number of Visits	Number (n)	Percent
25 or less	46	79%
26-50	7	12%
51-75	1	2%
75 or more	4	7%

Total n = 58

<sup>1</sup> WEC performed this study component.

Of the 57 respondents, 29 (50.9%) began visiting the study area in the 2000s, 14 (24.6%) began in the last three years and the remaining visitors began visiting prior to 2000. The mean year respondents began visiting was 2001, the median was 2005, and the mode was 2013.

**Table 3. First year user began visiting study area**

<b>Year</b>	<b>Number (n)</b>	<b>Percent</b>
1950-1959	1	1.7%
1960-1969	1	1.7%
1970-1979	1	1.7%
1980-1989	8	14.0%
1990-1999	3	5.3%
2000-2009	29	50.9%
2010 and more recent	14	24.6%

Total n = 57

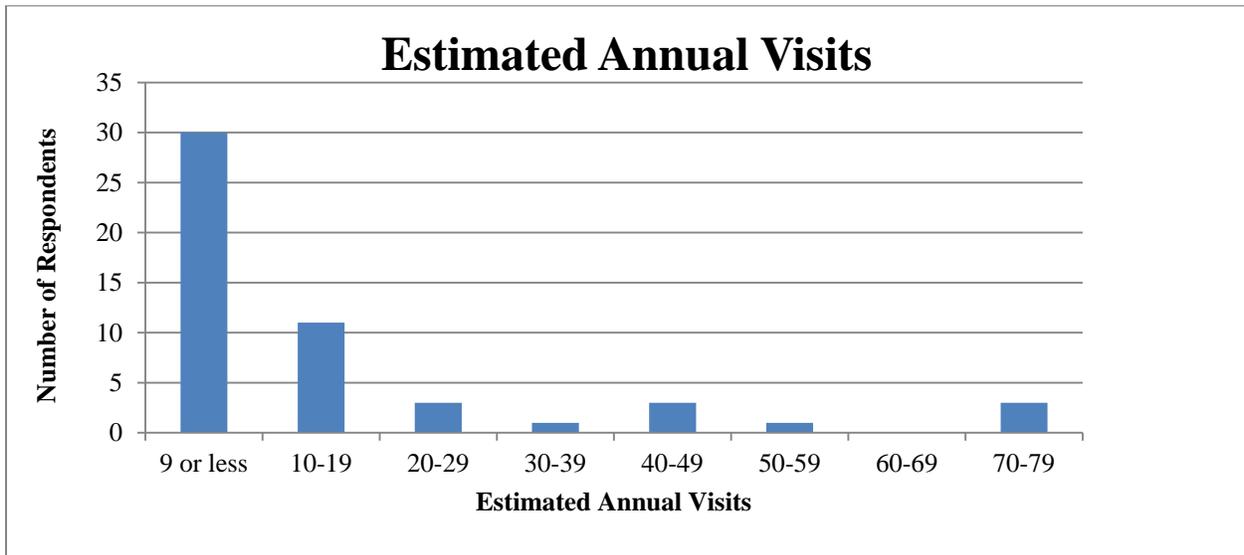
Respondents were asked to estimate the total number of visits they had made to the study area since they began visiting. Of the 53 respondents, 27 (50.9%) said they had made 99 or less visits. 13 (24.5%) of respondents had visited between 100-199 times. The mean number of visits was 157, the median reported was 72.5, and the mode was 100 visits.

**Table 4. Estimated total number of visits to study area**

<b>Total Number of Visits</b>	<b>Number (n)</b>	<b>Percent</b>
99 or less	27	50.9%
100-199	13	24.5%
200-299	4	7.5%
300-399	2	3.8%
400-499	1	1.9%
500 or more	6	11.3%

Total n = 53

Based on respondent answer to the year they first began visiting the study area and their estimated number of visits, an estimated number of annual visits was calculated. Of the 52 respondents who answered both questions, 30 (57.7%) visited the study area 9 times or less on an annual basis. 11 (21.1%) estimated between 10-19 visits per year. The mean, median, and mode number of visits were 14.5, 6.5 and 1 visit respectively.



**Figure 5. Estimated annual visits**

The vast majority of the 58 respondents visited multiple locations in the vicinity of the study area over the last 12-months. The two most common locations visited were the North Fork Snoqualmie River upstream of the study area (42 respondents or 72.4%) and Hancock Forest Management Timberlands (39 respondents or 67.2%).

**Table 5. Locations visited by users in the past 12-months**

Location	Number (n)	Percent
Snoqualmie Falls Viewpoint	27	46.6%
Three Forks Park	22	37.9%
Three Forks Natural Area	19	32.8%
HFM Timberlands	39	67.2%
Mt. Si or Little Si Trail	28	48.3%
NF Snoq. River (upstream)	42	72.4%
NF Snoq. In Study Area	32	55.2%
MF Snoqualmie River	31	53.4%
SF Snoqualmie River	27	46.6%

Total n = 58

NF = North Fork, MF = Middle Fork, and SF = SF of the Snoqualmie River

Respondents were also asked to circle their preferred location. Of the 11 respondents, 4 (36.4%) each selected Hancock Forest Management Timberlands and the North Fork Snoqualmie River upstream of the study area.

**Table 6. Locations selected as the most preferred location**

Preferred Location	Number (n)	Percent
Snoqualmie Falls Viewpoint	1	9.1%
HFM Timberlands	4	36.4
Mt. Si or Little Si Trail	1	9.1%
NF Snoq. River (upstream)	4	36.4
MF Snoqualmie River	1	9.1%

Total n = 11

Respondents indicated that they took advantage of a range of activities in the study area. The four activities that were chosen most often as activities typically participated in during a visit, were fishing (45 respondents or 74.1%), hiking (40 respondents or 69.0%), hunting (35 respondents or 60.3%), and wildlife viewing (35 respondents or 60.3%).

**Table 7. Activities typically participated in during a visit**

Activity	Number (n)	Percent
Fishing	43	74%
Hiking	40	69.%
Wildlife viewing	35	60.%
Hunting	35	60.%
Resting/relaxing	30	52%
Sightseeing	28	48%
Scouting	25	43%
Photography	20	35%
Camping	19	33%
Riding off-road vehicle	18	31%
Berry picking/Mushrooming	18	31%
Firewood cutting	17	29%
Mountain biking	14	24%
Kayaking	7	12%
Snow shoeing	6	10.%
Snowmobiling	5	9%
Whitewater boating	5	9%
Horseback riding	4	7%
Dog Training	2	3%
Gold panning	2	3%
Cross-country skiing	1	2%
Mineral collection	0	0%

Total n = 58

Other activities participated in include: partying (3), work (1)

Respondents were then asked to rank their primary activity in terms of importance to them. Hunting was overwhelming the most important activity to most users (23 respondents or 39.7%). Fishing (9 respondents or 15.5%) and hiking (7 respondents or 12.1%) were also common answers.

**Table 8. Activities chosen as primary in importance**

<b>Activity</b>	<b>Number (n)</b>	<b>Percent</b>
Hunting	23	39.7%
Fishing	9	15.5%
Hiking	7	12.1%
Riding off-road vehicle	4	6.9%
Kayaking	3	5.2%
Horseback riding	2	3.4%
Mountain biking	2	3.4%
Whitewater boating	2	3.4%
Wildlife Viewing	2	3.4%
Dog training	1	1.7%
Photography	1	1.7%
Resting/relaxing	1	1.7%
Sight seeing	1	1.7%

Total n = 58

As their second most important activity, respondents chose fishing (17 respondents or 29.8%), hunting (8 respondents or 14.0%), wildlife viewing (7 respondents or 12.3%), and scouting (6 respondents or 10.5%).

**Table 9. Activities chosen as second in importance**

Activity	Number (n)	Percent
Fishing	17	29.8%
Hunting	8	14.0%
Wildlife viewing	7	12.3%
Scouting	6	10.5%
Hiking	5	8.8%
Riding off-road vehicle	3	5.3%
Sightseeing	3	5.3%
Camping	2	5.3%
Kayaking	2	5.3%
Cross-country skiing	1	1.8%
Firewood cutting	1	1.8%
Mountain biking	1	1.8%
Resting/relaxing	1	1.8%

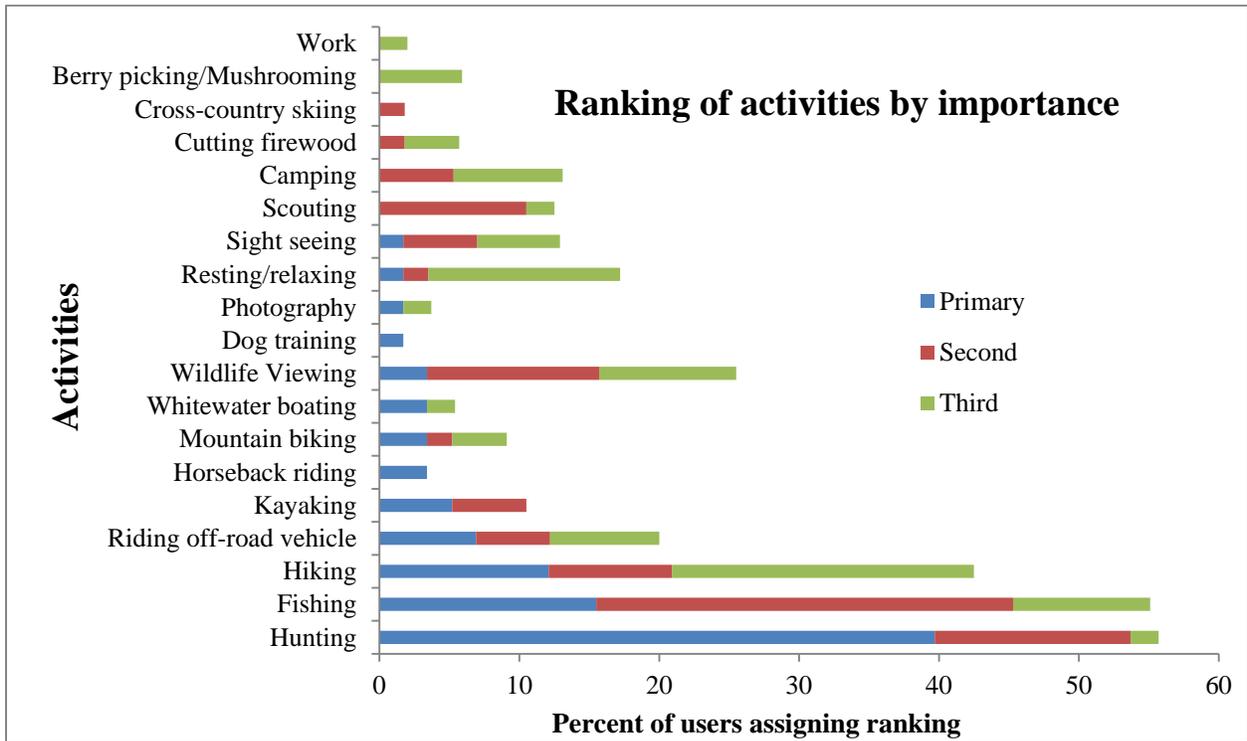
Total n = 57

Respondents selected hiking (11 respondents or 21.6%) and resting/relaxing (7 respondents or 13.7%) most often as their third most important activity.

**Table 10. Activities chosen as third in importance**

Activity	Number (n)	Percent
Hiking	11	21.6%
Resting/relaxing	7	13.7%
Fishing	5	9.8%
Wildlife viewing	5	9.8%
Camping	4	7.8%
Riding off-road vehicle	4	7.8%
Berry picking/Mushrooming	3	5.9%
Sightseeing	3	5.9%
Cutting firewood	2	3.9%
Mountain biking	2	3.9%
Hunting	1	2.0%
Photography	1	2.0%
Scouting	1	2.0%
Whitewater boating	1	2.0%
Work	1	2.0%

Total n = 51



**Figure 6. Ranking of activities by importance**

Generally, respondents rated the acceptability of recreation resources or facilities in the marginal (3) to adequate (4) range when looking at the various mean, median, and modes. The only exception being that the acceptability of restrooms was rated between unacceptable (2) and marginal (3).

**Table 11. Acceptability of recreation resources or facilities**

<b>Resource/Facility</b>	<b>Totally Unacceptable (1)</b>	<b>Unacceptable (2)</b>	<b>Marginal (3)</b>	<b>Acceptable (4)</b>	<b>Totally Acceptable (5)</b>
Road access to the area (n = 53)	4%	9%	30%	38%	19%
Walk-in access to the area (n = 57)	5%	4%	37%	33%	21%
Boating launch areas (n = 56)	4%	16%	54%	16%	11%
Trails to fishing areas (n = 54)	0%	9%	33%	46%	11%
Trails to scenic overlooks (n = 50)	0%	6%	38%	40%	16%
Trails to picnic or other river hang-out areas (n = 53)	2%	8%	38%	38%	15%
Restrooms (n = 54)	19%	28%	26%	13%	15%
Parking at railheads or other access areas (n = 54)	2%	22%	41%	22%	13%
Trail-less primitive areas (n = 51)	2%	8%	33%	39%	18%

**Table 12. Mean, median, and mode acceptability of recreation resource or facility**

<b>Resource/Facility</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>
Road access to the area	3.6	4	4
Walk-in access to the area	3.6	4	3
Boating launch areas	3.1	3	3
Trails to fishing areas	3.6	4	4
Trails to scenic overlooks	3.7	4	4
Trails to picnic or other river areas	3.6	4	3/4
Restrooms	2.6	3	2
Parking at railheads or other access areas	3.2	3	3
Trail-less primitive areas	3.6	4	4

**Perceived Crowding**

Most researchers recognize a difference between use density and crowding. Density is a descriptive term that refers to the number of people per unit area (and it can be determined objectively). Crowding is a negative evaluation of density; it involves a value judgment that the specified number is too many. The term perceived crowding is used to emphasize the subjective or evaluative nature of the concept. Researchers have developed a simple measure that asks how crowded they feel during their visit.

Responses are given on a 9-point scale:

1            2            3            4            5            6            7            8            9  
 Not at all                      Slightly                      Moderately                      Extremely  
 Crowded                      Crowded                      Crowded                      Crowded

Results can be analyzed in several ways. The traditional analysis collapses the scale into a dichotomous variable. This provides a conceptually meaningful break point between those who labeled the situation as “not at all crowded” (scale points 1 and 2, a positive evaluation), and those who labeled the situation as slightly, moderately, or extremely crowded (scale points 3 through 9, a negative evaluation). While other analyses of central tendency measures have been proposed, a comparison showed correlations of .90 to .95 with the traditional scale, suggesting few differences among these choices.

Since 1975, this single item indicator has been used in over 200 studies conducted across the United States (e.g., Alaska, Arizona, California, Colorado, Michigan, Minnesota, Nevada, New Hampshire, Oregon, Pennsylvania, West Virginia, Wisconsin), Canada (British Columbia, Alberta), New Zealand, Australia, and Korea resulting in crowding ratings for over 600 different settings/activities. The activities included hiking, backpacking, wildlife viewing, wildlife photography, hunting of many types, fishing of many types, rafting, canoeing, tubing, motor boating, rock climbing, sailing, and driving for pleasure. The areas represented considerable diversity, with some showing extremely high density and use impact problems, others illustrating low densities and no problems, and still others actively utilizing management strategies to control densities and use impacts.

Five “rule of thumb” categories (see Table 14) have been identified when the scale is collapsed in the manner described above.

**Table 13. Carrying capacity judgments based on levels of perceived crowding**

<b>% Feeling Crowded</b>	<b>Capacity Judgment</b>	<b>Comment</b>
0-35%	Uncrowded	Crowding usually limited by management or situational factors (remote location, difficult access), or refers to low use areas.
35-50%	Low normal	Problem situation does not exist at this time.
50-65%	High normal	Should be studied if increased use is expected, allowing management to anticipate problems.
65-80%	Over capacity	Studies & management necessary to preserve experiences.
80-100%	Greatly over capacity	Manage for high-density recreation.

The results suggest that overall crowding is at a “low normal” level and a problem situation does not exist. The only potential crowding issue was identified by users was when driving roads (and this was in the “high normal” range).

**Table 14. Percent feeling crowded by group in Project study area; mean crowding score also given**

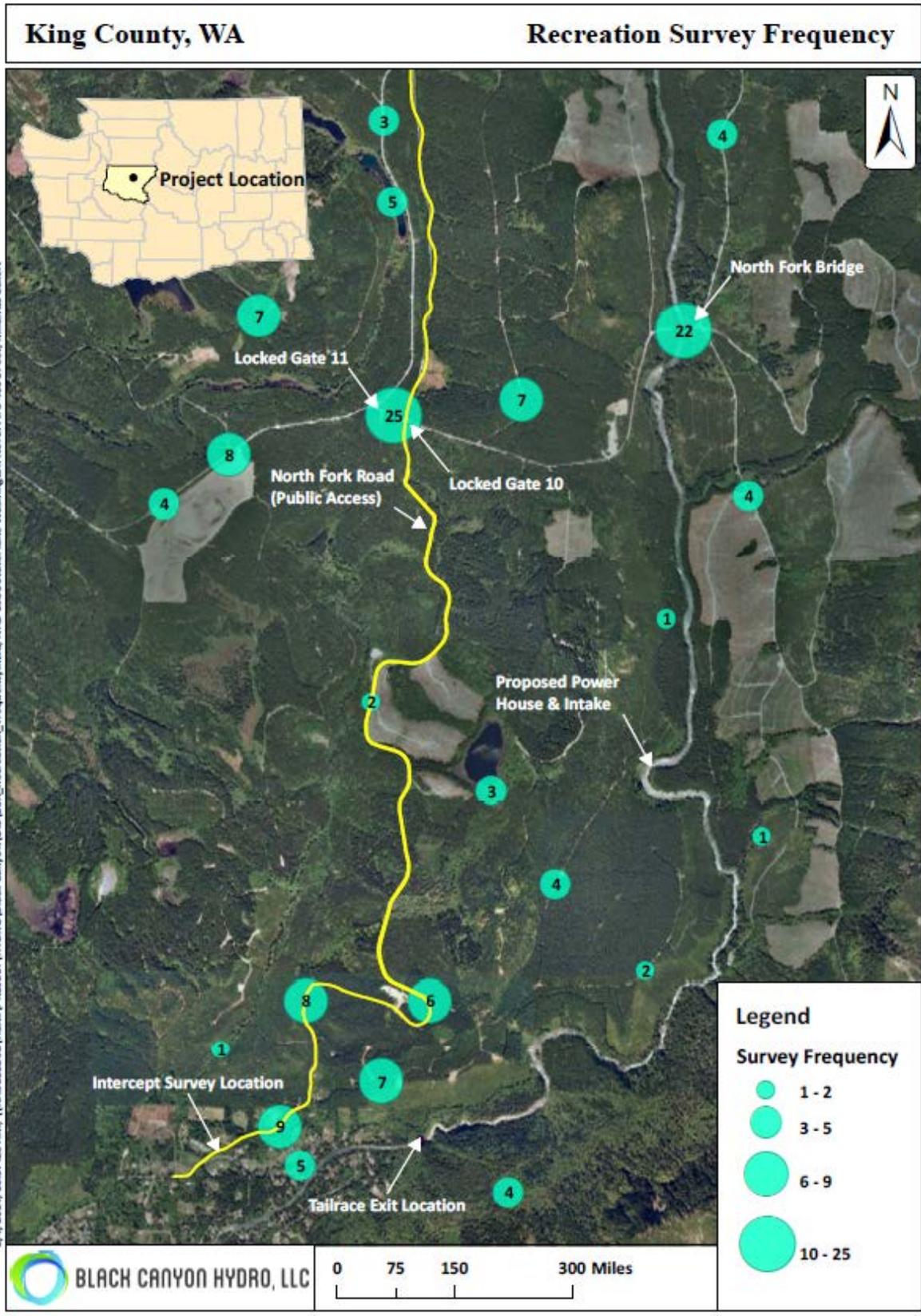
<b>Percent</b>	<b>Context</b>	<b>Mean</b>
42	While boating	2.2
39	While fishing	2.3
44	Finding parking	2.4
57	Driving roads	3.1
46	Overall	2.7

## **Frequency Map**

As respondents were first being oriented to the study area, the technician would ask the first survey question regarding visits in the last 12-months, and would also ask the respondent to indicate on the attached map, where they had visited over that time period. Respondents generally marked locations visited with either “x’s” or circles to encompass general areas.

The following map is a synthesis of these responses. Maps were collected and a final master map was created with all of the individual responses marked. Locations where “x’s” appeared repeatedly on the final master map were combined into a single point. A circle was then placed over this point, with the circle’s size being in direct proportion to the number of “x’s” the point received. Additionally, any and all points falling within a general area circled by a respondent were each assigned an additional point.

The resulting map shown on the following page depicts the locations visited most frequently in the last 12-months by the users who completed a survey instrument.



**Figure 7. Locations visited in last 12-months**

The map shows a high frequency of visits to the Spur 10/11 gates, which makes sense because this is a central area where the major public road (North Fork Road) and private gated road through Hancock Forest Management Timberland intersect. Vehicles are often seen along the road where users park before entering private land as pedestrians or bicyclists (non-motorized access permits from Hancock Forest Management cost considerably less than motorized permits).

The next highest frequency point is located at the North Fork Bridge. At this location there is room for 2-3 vehicles to park on the margins of the road, as well as an informal trail to the water. Motion-activated cameras show this trail is used often by fishermen, boaters (reported to be the primary entry point for boaters driving to the Ernie's Canyon run), and sightseers.

Another high frequency location can be identified just past the surveying point where users can park their vehicles before using informal trails to intersect the City of Snoqualmie's informal "waterline" trail (See "Aesthetic Resource Assessment"). Fishermen in particular have been observed using this location by WEC staff.

One user designated the whole river as visited, but this type of visit is likely underreported as kayakers and whitewater boaters use significant portions of the river, but are represented within the North Fork Bridge point.

Notably, only a single respondent specifically reported visiting the immediate vicinity of the Project intake and powerhouse facilities.

### **5.1.1 Summary and Future Use Trends**

Survey results indicate that the most commonly visited areas by recreationists are Hancock Forest Management Timberland or public forestland north of the study area, also reached via the North Fork Road. When a preference for areas was asked, these same two areas were selected most often as well (72.8% preferred one or the other). The vast majority of users visit the study area less than twenty times annually (78.8%), with most visiting less than ten times annually (57.7%). Only 8.6% of respondents indicated that they had visited the vicinity of the Project intake site (within ½ a mile) in the previous 12-months. However, this may not accurately capture instream users such as anglers and boaters. These users generally would select the North Fork Bridge as their visit location, as this is the location most commonly used for river access due to an informal trail to the water and a small amount of informal parking.

Fishing, hiking, hunting, and wildlife viewing were the only four activities chosen by more than 60% of respondents during a typical visit. Respondents were also asked to rank their top three “important” activities. The most common “primary activity” percentages were for hunting (39.7%), fishing (15.5%), and hiking (12.1%). The most common “secondary activity” percentages were fishing (29.8%), hunting (14.0%), wildlife viewing (12.3%), and scouting (10.5%). The most common “tertiary activity” percentages were for hiking (21.6%) and resting/relaxing (13.7%).

Survey results suggest that hunting, fishing, and related activities taking place either within Hancock Forest Management Timberlands or in the public forestland north of the study area are the most common recreational activities in the area. Also, users typically experience minimal crowding while driving roads and find resources and facilities marginal or adequate, with the exception of restrooms, which some found to be unacceptable.

The following table shows estimated changes in participation from 2013 to 2023 based on IAC projections. The estimates of future participation in outdoor recreation are shown as a percent of change in the number of people participating in the future compared to current levels.

**Table 15. Future participation estimates by relevant activities**

<b>Activity</b>	<b>Estimated change from 2013 to 2023</b>
Fishing	-5%
Hiking	+10%
Wildlife viewing*	+14%
Hunting	-6%
Resting/relaxing*	+14%
Sightseeing	+10%
Scouting*	+14%
Camping – developed (RV style)	+10%
Riding off-road vehicle	+10%
Mountain biking	+10%
Kayaking	+9%
Snow shoeing	No estimate
Snowmobiling	No estimate
Horseback riding	+3%
Cross-country skiing	No estimate

\*includes a “Nature activities” category, which has been applied to these activities.

Source: IAC, March, 2003

Almost all recreation activities are project to grow about 1 to 2 percent per year over the ten year period, with the exception of fishing and hunting, which are projected to decline by about 1 percent every two years.

Based on a review of whitewater demand conducted for the Clackamas River, Oregon (Whittaker and Shelby, 2004), whitewater kayaking demand has been growing (with the Northwest outpacing growth in other parts of the country), but it is likely to stabilize in the future. It is also unclear how overall increases in whitewater participation are related to potential changes in use on the North Fork, which has challenging Class V whitewater boatable by a relatively small proportion of all boaters.

## 5.2 Camera observations of instream users<sup>2</sup>

### 5.2.1 Boaters

Boaters were photographed running the Black Canyon on 38 different days out of 425 days monitored. The mean group size for boaters photographed was 2.1 boaters. The median group size was 2 and the mode was 2 as well. Over the 2013 calendar year, 35 days were used by boaters. The typical boater in 2013 ran Ernie’s (or Black) Canyon at flows between 365-699 cfs on the weekend, between 9:00 AM and noon, with a seasonal preference for any season, but spring.

**Table 16. Number of boaters photographed at different flows**

<b>Flow Range (cfs)</b>	<b>Number (n)</b>	<b>Percent</b>
50-364	3	3%
365-499	39	43%
500-699	45	50%
700-1,099	4	4%
Greater than 1,100	0	0

n=91

Note: The three boaters in the lowest range were recorded at 349 cfs.

<sup>2</sup> WEC performed this study component.

**Table 17. Number of boaters photographed on different days of the week**

Day of the Week	Number (n)	Percent
Monday	3	3%
Tuesday	6	7%
Wednesday	3	3%
Thursday	12	13%
Friday	9	10%
Saturday	31	34%
Sunday	27	30%

n=91

**Table 18. Boater use by season**

Season	Number (n)	Percent
Winter (Dec. - Feb.)	36	40%
Spring (Mar. - May)	7	8%
Summer (Jun. - Aug.)	20	22%
Fall (Sep. - Nov.)	28	31%

n=91

**Table 19. Boater use by time of day**

Time	Number	Percent
Before 9:00	15	17%
9:00 to 12:00	49	54%
12:00 to 15:00	14	15%
After 15:00	13	14%

n=91

### 5.2.2 Anglers

Anglers were photographed fly fishing on 12 different days out of 442 days monitored. The average group size for anglers was 1.4 anglers. Both the median and mode group size for anglers was 1.

**Table 20. Number of anglers photographed at different flows**

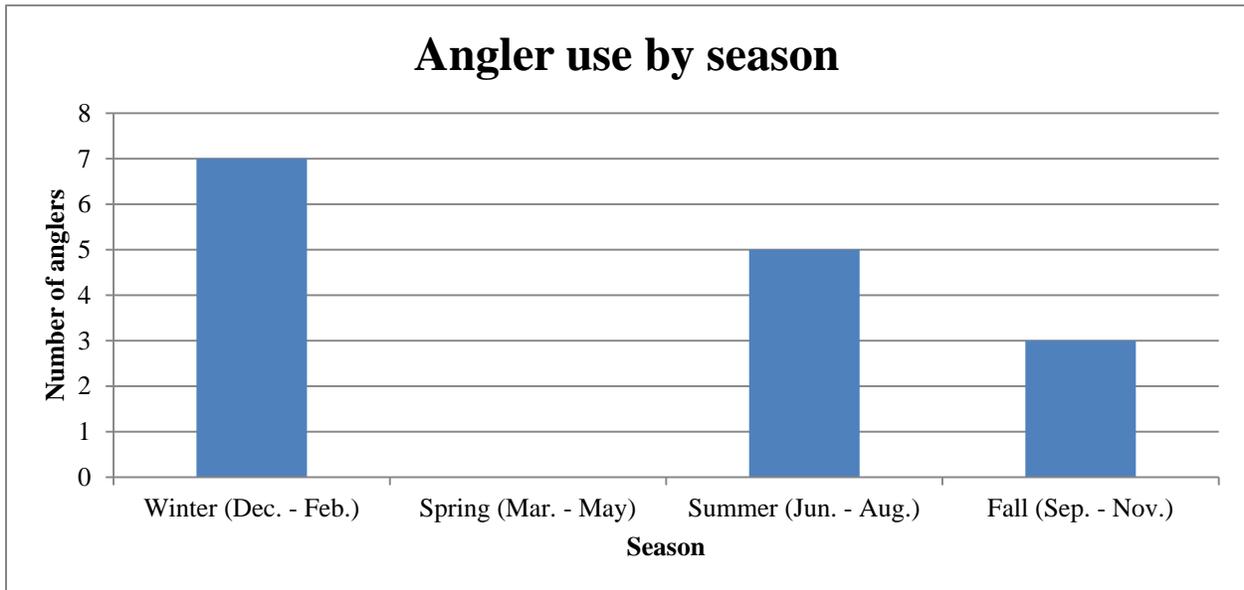
Flow Range (cfs)	Number (n)	Percent
50-364	12	71%
365-499	0	0.0%
500-699	5	29%
700-1,099	0	0.0%
Greater than 1,100	0	0.0%

n=17

**Table 21. Number of anglers photographed on different days of the week**

Day of the Week	Number (n)	Percent
Monday	6	35%
Tuesday	1	6%
Wednesday	2	12%
Thursday	0	0.0%
Friday	2	12%
Saturday	1	6%
Sunday	5	30%

n=17



**Figure 8. Angler use by season**

**Table 22. Angler use by time of day**

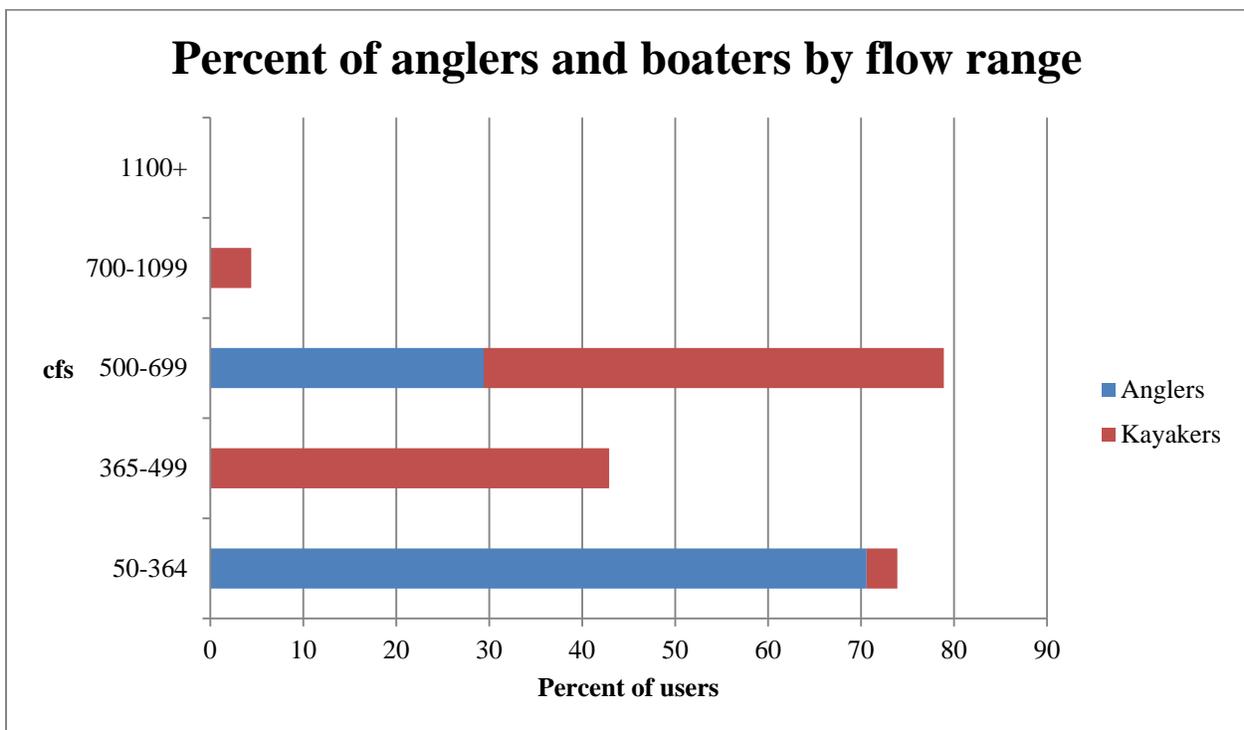
Time	Number	Percent
Before 9:00	1	6%
9:00 to 12:00	1	6%
12:00 to 15:00	5	29%
After 15:00	10	59%

n=17

The following table and figure illustrate observed use (documented by camera) across different flow ranges for both flow-dependent user groups.

**Table 23. Angler and kayaker observed use by flow range (percentages)**

Flow Range (cfs)	Angler(s)	Boater(s)
50-364	70.6%	3.3%
365-499	0.0%	42.9%
500-699	29.4%	49.5%
700-1,099	0.0%	4.4%
Greater than 1,100	0.0%	0.0%



**Figure 9. Percent of anglers and boaters by flow range**

## 5.3 Whitewater boating<sup>3</sup>

### 5.3.1 Opportunities

Whitewater boating on the North Fork is well-documented in guidebooks, boater websites and forums, but boating use is not managed by a resource agency and there are no historical use statistics. The following summarizes boating opportunities based on existing information, interviews, focus groups, and surveys. This includes access, user characteristics, attributes, and comparisons with other northwest rivers.

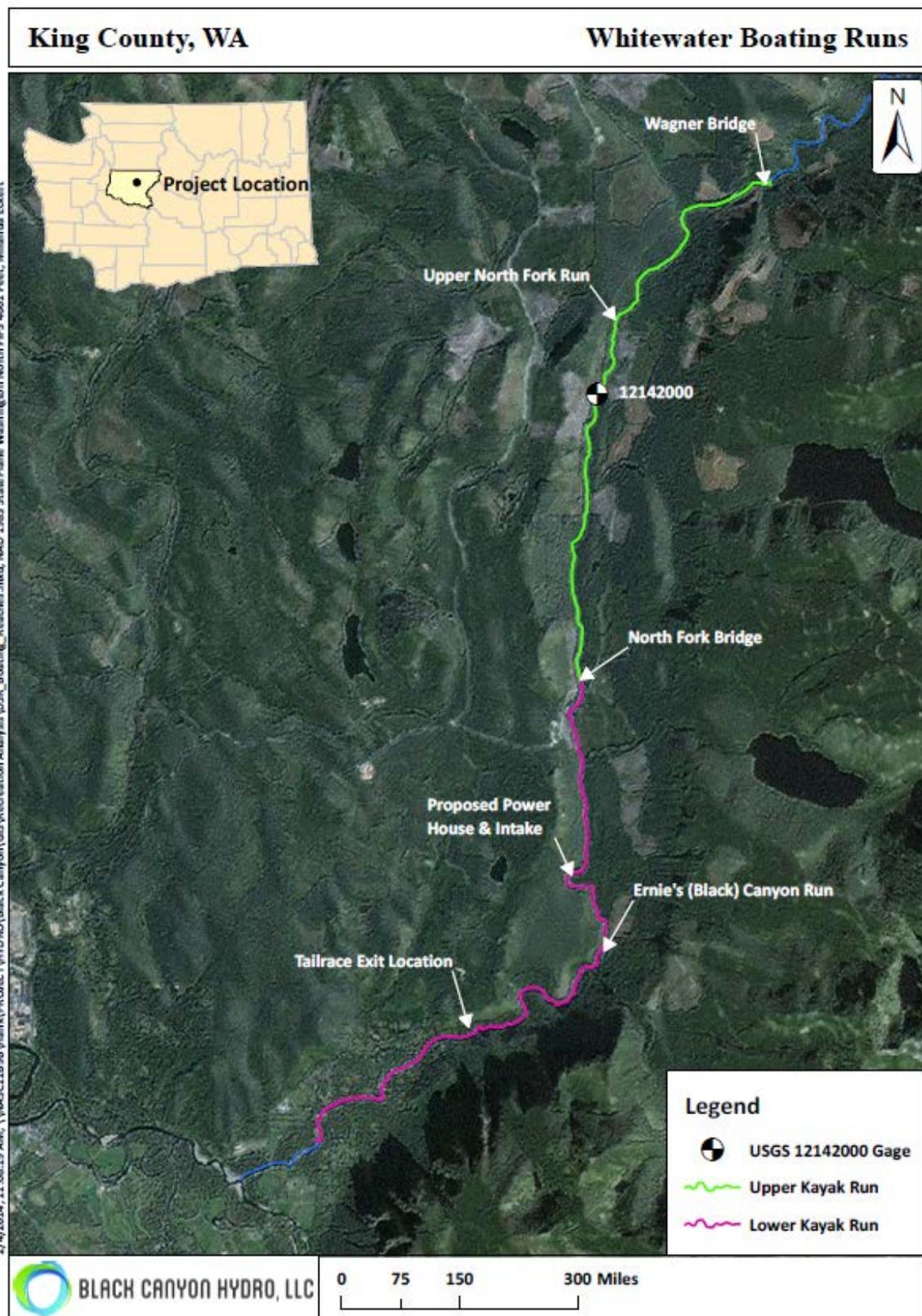
#### Overview

There are two commonly acknowledged boating segments:

- “The Upper North Fork” from Wagner Bridge in Snoqualmie National Forest to Spur 10 Bridge (6.3 miles) and
- “Ernie’s Gorge” from Gate 10/11 Bridge to Three Forks Natural Area at the confluence of the North and Middle Forks (6.5 miles). This downstream segment (most relevant for the Project) includes Ernie’s Gorge (aka Black Canyon), a 2.5 mile reach that roughly corresponds to the proposed Project bypass reach.

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<sup>3</sup> This study component completed and written by CRC.



**Figure 10. Whitewater Boating Reaches**

The Gorge has Class V/V+ rapids and is paddled regularly by skilled kayakers. It has rarely been paddled in rafts (R2) and inflatable kayaks, and it is not commercially guided. The difficulty of the Gorge limits use to a relatively small group of advanced boaters. There is at least one rapid (a roughly 25 foot falls called either “Jacuzzi” or “Fantastic Falls”) that is commonly portaged, although it has been run at favorable flows by several boaters. A second rapid (“Raft Catch”) is also frequently portaged. The Gorge is one of 24 whitewater segments reported to have “outstanding recreational and aesthetic qualities of regional and national significance” (AW, 2008, p. 8). However, this finding is from a survey of 165 self-selected respondents, of which only 12 percent (19 individuals) reported boating through Ernie’s Gorge (p. 13).

The “Upper North Fork” has Class II-III rapids, and on rare occasions (usually higher flows) boaters may combine trips on both segments. Neither segment appears to have had been adjudicated for navigability, and FERC’s criteria suggest it may be non-navigable (without commercial use or less challenging whitewater than Class IV; FERC 2004, pp. 5-6).

Boating on the reach is flow-dependent. Boaters generally rely on hydrology information from the North Fork Gage near Snoqualmie Falls (USGS gage 12142000) and weather considerations when deciding whether to boat, and what equipment to bring.

### **Access**

Recreational opportunities in study area are generally limited because private property owners control access. THR, LLC owns most of the property where the Project is proposed, and has posted “No Trespassing” signs. Other property owners in the residential neighborhood of Ernie’s Grove have indicated that public access is closed to recreational users.

Put-in access is available from a private landowner, Hancock Forest Management (HFM), by purchasing annual or daily permits, and may require a hike down Gate 10/11 Spur Road to the put-in near the Gate 10/11 Bridge. From the bridge, boaters paddle about two miles of Class II/III whitewater before the more challenging canyon. Some users have accessed the Black Canyon reach more directly by hiking along the private Lake Hancock Road, then down informal trails to the river near the proposed Project intake locations.

Take-out access is at King County's Three Forks Natural Area just above the confluence of the North and Middle Forks. This is a public park with parking and restrooms near the 428th Street Bridge.

### **User and trip characteristics**

**Type of craft.** Nearly all boaters run the North Fork in hard shell kayaks. Only one long form survey respondent had used a raft (two trips), and similarly high proportions of post trip surveys reported using hard shell kayaks (87%).

**Group sizes.** Post trip surveys indicate group sizes average about 3.3 boaters. The largest group was 6, with no solo trips. Cameras tracking use in 2012 and 2013 suggest average group sizes of 2.1 boaters and the largest trip was 4 (although cameras may miss some boaters).

**Segments used.** The typical segment boated is from Gate 10/11 Bridge to the confluence with the Middle Fork. Only one post trip survey reported a combined "Upper River" trip from Wagner Bridge (on Forest Service land about 12 miles upstream from the confluence). This trip occurred Dec 1, 2012 at a steady flow about 1,100 cfs, the highest flow boated.

**Skill levels.** Most long form survey respondents reported high skill levels, 92% Class V, and 64% Class V+. The 8% who reported Class IV skill had not taken trips in the Gorge. Several respondents were also skilled rafters (50%) and inflatable kayakers (31%).

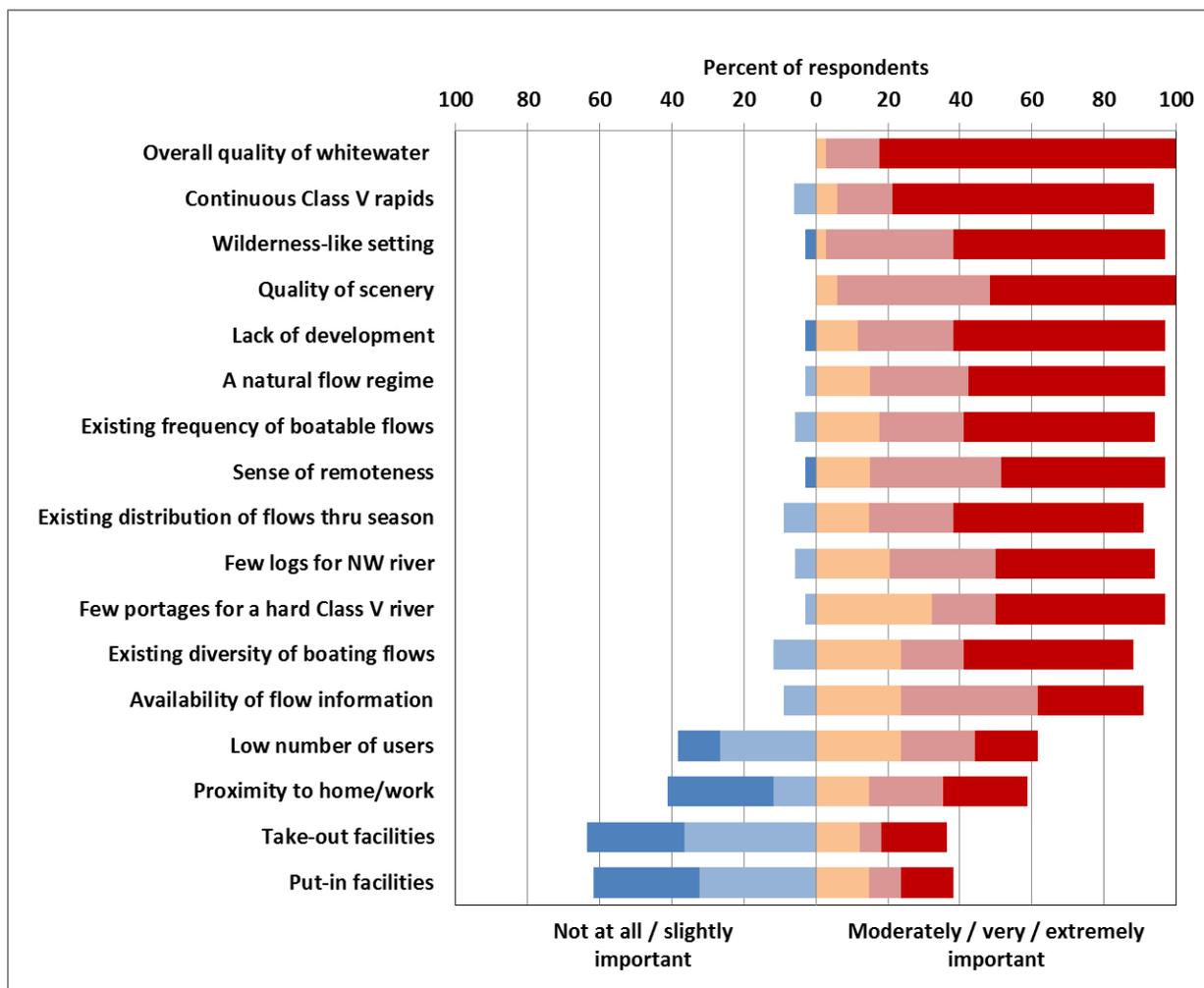
**Age.** Long form survey respondents reported a median age of 32.5. The youngest boater was 21 and the oldest was 48.

### **Experience on the North Fork**

Experience levels of long form survey respondents average 4.6 trips on the Upper North Fork and 27.7 trips in the Gorge, but these are inflated by two individuals who report 100 trips per year in the Gorge (2 boaters). The median is 1.0 on the upper river and 20 in the Gorge (the "typical" or interquartile range was from 5 to 31).

## River Attributes

Long form surveys asked respondents to rate the importance of river attributes on a five point scale from “not at all important” to “extremely important.” Figure 18 ranks them by average score and shows percentages.



**Figure 11. Important attributes of Ernie's Gorge whitewater trips**

- Whitewater quality and the availability of Class V rapids are the most important attributes of the reach.
- Boaters also value the river’s scenery, wilderness setting, lack of development, and sense of remoteness.
- The river’s natural flow regime provides frequent and diverse boatable flows through the year. The availability of real-time flow information is also important.

- Scarce logs and infrequent portages for a challenging Class V river are also important.
- Low use levels, proximity to home/work, and access facilities are relatively less important.

**Comparison to other Northwest rivers**

Boaters were asked to compare Ernie’s Gorge to other rivers (within two hours, and within the state of Washington). Responses were on a five point scale (worse than average, average, better than average, excellent, and among the very best) used in a similar study on the Sultan River. Results suggest Ernie’s Gorge is held in high regard, with 71% rating it was “among the best” within the state of Washington. By contrast, only 16% and 22% (respectively) reported the same for Segments 2 and 3 on the Sultan River. Frequency distributions are provided below.

**Table 24. Ratings of Ernie’s Gorge in comparison to other rivers (percent)**

	Within two hours	In State of Washington
<b>Worse than average</b>	0	0
<b>Average</b>	0	3
<b>Better than average</b>	3	6
<b>Excellent</b>	18	12
<b>Among the very best</b>	71	71

Boaters were also asked to name river reaches similar to Ernie’s Gorge. The list (with percent reporting each) is given below:

- Little White Salmon (42%)
- Robe Canyon on South Fork Stilligumish (36%)
- Icicle Creek (17%)
- Clear Fork of the Cowlitz (11%)
- Box Canyon of the Ashlu River in BC (11%)
- Grand Canyon of the Elwa (6%)
- Tyee River (6%)
- Upper and Middle Fork Nooksack (6%)
- Clearwater Creek near Middle Fork Nooksack (3%)
- Green Truss of the White Salmon (3%)
- Tumwater Canyon Wenatchee River (3%)
- Jefferson Creek (3%)
- West Fork Miller (3%)

### 5.3.2 Flow Evaluations

#### **General flow preferences from existing information**

As reported in the recreation study plan (BCH, 2012), several guidebooks and websites contain information about North Fork boating trips and flow preferences. Table 26 summarizes this information, which generally identifies boatable flows between 300 and 900 cfs; survey information below is more definitive.

**Table 25. Flow conditions for boating from guidebooks and websites**

Source	Minimum flow (cfs)	Maximum flow (cfs)	Season	Notes
AllAboutRivers.com 2012	300	800	November through June	
American Whitewater 2012	400	900	More often than not during the rainy fall, winter, and spring	
Professor Paddle 2012	300	750	Spring through mid-summer	
Bortelson 1974 (p. 10)	350 to 450	800		Not specific to Black Canyon – Study evaluated the less technical reach above Ernie’s Canyon (p. 28)

#### **Observed use at specific flows (from camera observations)**

As discussed earlier in this document, camera observations documented boating use at flows from 349 to 932 cfs. For the 43 trips observed, the median flow was 511 cfs. Boaters were photographed running the Black Canyon on 38 different days out of 425 days monitored (8.9% of days) and 35 or 9.6% of days in calendar year 2013. The mean group size for boaters photographed was 2.1 boaters. Direct flow evaluations from surveys (below) further define boatable flows.

#### **Use of changing flows**

Post-trip surveys suggest few boaters take trips when flows are rising, none when flows are rising fast. This supports using mean daily flows for assessing days of boatable flows; these are representative of available flows on the days boaters are interested in boating them.

- Ten percent (2 trips) of post-trip boaters reported “slowly rising” flows (430 and 740 cfs).
- Fifty-seven percent saw “steady” flows between 385 and 900 cfs.
- Twenty-eight percent saw “slowly dropping” flows between 380 and 850 cfs.

### **Trip types from post-trip surveys**

Post-trip survey boaters reported the “type of trip” they experienced using three common descriptors: technical, standard, and big water trips.

- 37% of boaters reported “technical” opportunities at flows between 380 and 500 cfs; the average flow on these trips was 427 cfs.
- 46% of boaters reported “standard” opportunities at flows between 500 and 780 cfs; the average flow on these trips was 625 cfs.
- 17% of boaters reported “big water” opportunities at flows between 710 and 1,100 cfs; the average flow on these trips was 850 cfs.

The technical/standard transition is about 500 cfs and the standard/big water transition is about 700 cfs.

### **Acceptability of flows from post-run surveys**

Post-run survey boaters rated the acceptability of flows on a five point scale (from “totally unacceptable” to “totally acceptable,” with a mid-point “marginal” response).

- 96% reported that flows were slightly or totally acceptable.
- All five “big water” trips were rated “totally acceptable.”
- Ten of twelve “standard” trips were rated “totally acceptable.” The two rated “slightly acceptable” were at 500 and 550 cfs (the lower end of the “standard” range).
- Technical trips were less likely to be rated “totally acceptable,” only two out of seven trips
- The four other “technical” trips rated “slightly acceptable” ranged from 380 to 500 cfs.

### **Comments from post-trip surveys**

Comments added to post trip surveys indicate many boaters might oppose any flow regime changes that affect boating. Similar comments at the focus group meetings led to the inclusion of some long form survey items to measure the importance of river attributes and social values-based opposition to hydropower development (see below).

### **Specified flow ranges from long form survey**

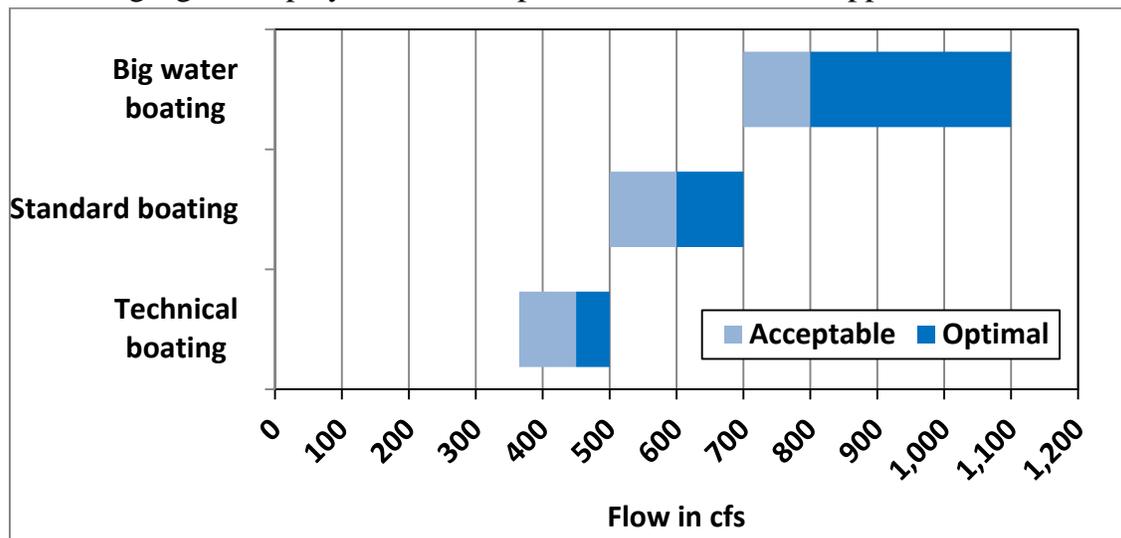
A series of “specified flow” questions on the long form survey asked boaters to identify flows that provide different boating opportunities. Specific questions are provided in the appendices. The table below shows means, medians, minimum, maximum, and the “typical range” (the 25th and 75th percentile responses). Medians are the most useful

measures of “central tendency,” while inter-quartile ranges help show the level of agreement.

**Table 26. Specified flows for Ernie’s Gorge**

	Mean	Median	Minimum	Maximum	Typical range	
					25%	75%
<b>Lowest flow ever</b>	433	374	300	1,000	350	450
<b>Highest flow ever</b>	856	800	450	2,000	630	1,000
<b>Start of acceptable technical trips</b>	384	<b>365</b>	250	600	350	413
<b>Start of optimal technical trips</b>	463	<b>450</b>	300	900	400	500
<b>Start of acceptable standard trips</b>	517	<b>500</b>	350	750	450	550
<b>Start of optimal standard trips</b>	620	<b>600</b>	400	900	550	650
<b>Start of acceptable big water trips</b>	735	<b>700</b>	500	1,000	700	800
<b>Start of optimal big water trips</b>	846	<b>800</b>	700	1,200	750	888
<b>Highest safe flow</b>	1,162	<b>1,100</b>	750	1,500	1,000	1,350

The following figure displays median responses to characterize opportunities:



**Figure 12. Specified flow ranges for three major boating opportunities**

- Boaters have taken trips as low as 300 cfs, but this low quality.
- Flows about 365 cfs are required for acceptable technical trips, but 450 cfs is needed for optimal technical trips.
- Boaters recognize differences between “technical” and “standard” trips, with flows about 500 cfs defining the transition.
- Optimal quality standard trips start about 600 cfs.
- Boaters recognize differences between “standard” and “big water” trips, with flows about 700 cfs defining the transition.
- Higher quality big water trips occur about 800 cfs.
- Taken together (as shown in Figure 20):
  - Technical opportunities occur from 365 to 500 cfs, and are optimal from 450 to 500 cfs.
  - Standard opportunities occur from 500 to 700 cfs, and are optimal from 600 to 700 cfs.
  - Big water opportunities occur from 700 to 1,100 cfs, and are optimal from 800 to 1,100 cfs.

### **Overall flow evaluation from long form survey**

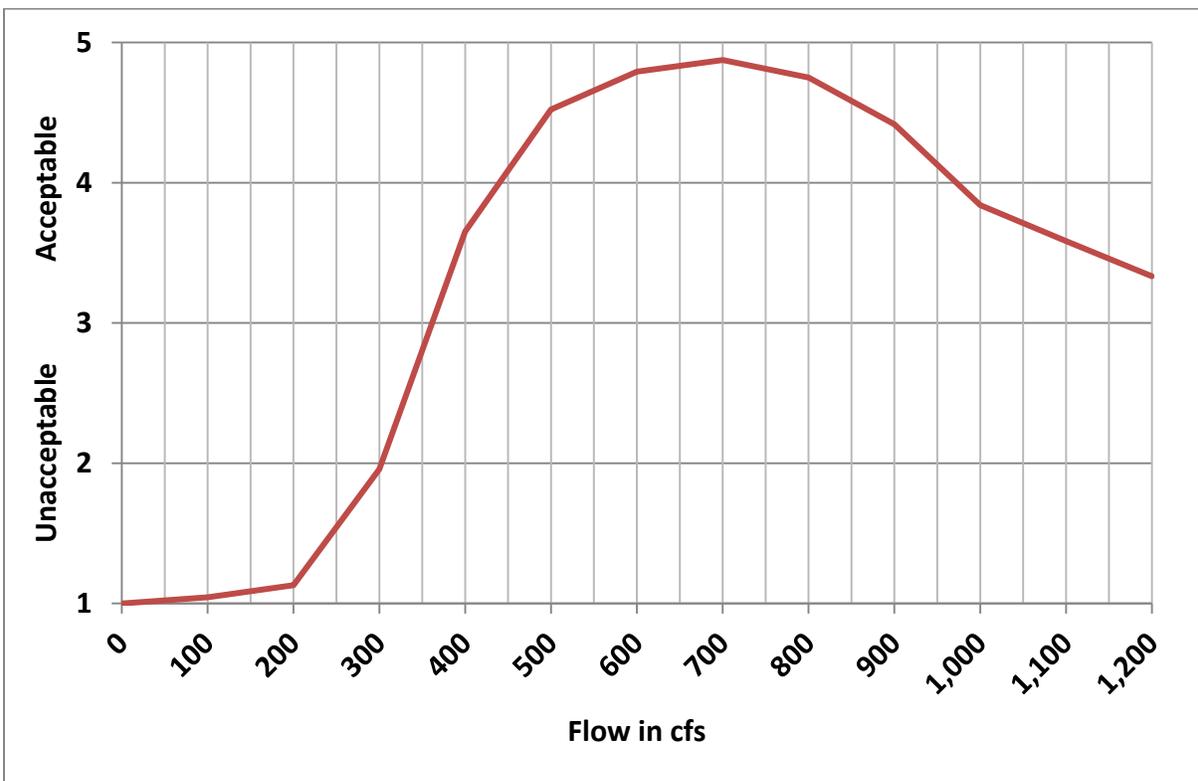
Boaters rated twelve flows from 100 to 1,200 cfs using a five-point acceptability scale (1=totally unacceptable, 3=marginal, and 5=totally acceptable). The following figure shows flow along the horizontal axis and average acceptability evaluations along the vertical axis; the curve describes the relationship between flows and overall boating quality.

In general, the overall evaluation curve rises steeply at lower flows, reflecting the substantial improvement in quality as flows increase. The curve peaks at optimal evaluations, then declines. This shape fits with findings from previous studies (Whittaker & Shelby, 2002).

The curve crosses the marginal line about 360 cfs, which is about the start of acceptable technical trips. Higher ratings (over 4 on the scale) occur from about 450 cfs to 975 cfs, which includes optimal technical trips, the entire standard range, and most of the big water range.

The highest ratings are for 700 cfs, the high end of the optimal range for standard boating and the transition between standard and big water boating. Ratings decline above this

flow because less skilled boaters may not be as interested in big water opportunities. Flows remain acceptable through 1,200 cfs (the highest flow included in the question).



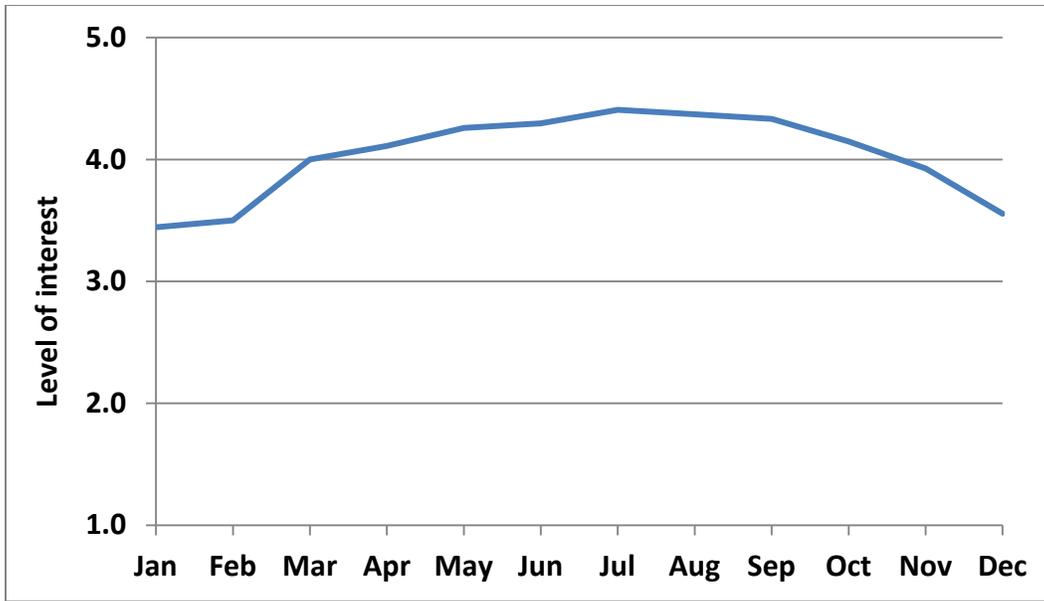
**Figure 13. Overall flow evaluation curve based on average acceptability ratings**

### 5.3.3 Preferences for managed flow regimes

The following section reviews boater preferences for potential managed flow regimes if the Project was licensed and built (and included managed flows for boating on some days as part of mitigation). Specific managed boating flows are not being proposed in this study, but may be considered in discussion with stakeholders as the licensing process continues. Information in this section was designed to help with potential negotiations.

#### **Preferred months for managed boating flows**

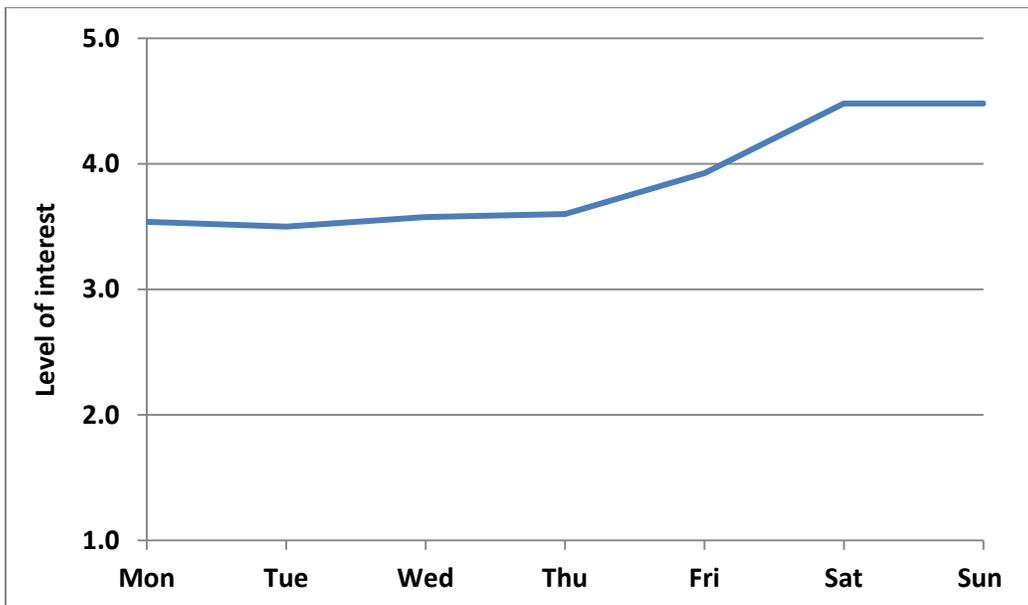
Boaters were asked to report their level of interest (on a five point scale from “not at all” to “extremely interested”) for managed boating flows in different months; averages are shown Figure 21. Boaters are interested in flows throughout the year, but there is greater interest in warmer and longer-daylight months (March through October). Boaters would appreciate flows (and use is likely to be higher) in these warmer months.



**Figure 14. Level of interest in managed boating flows by month**

**Preferred days for managed boating flows**

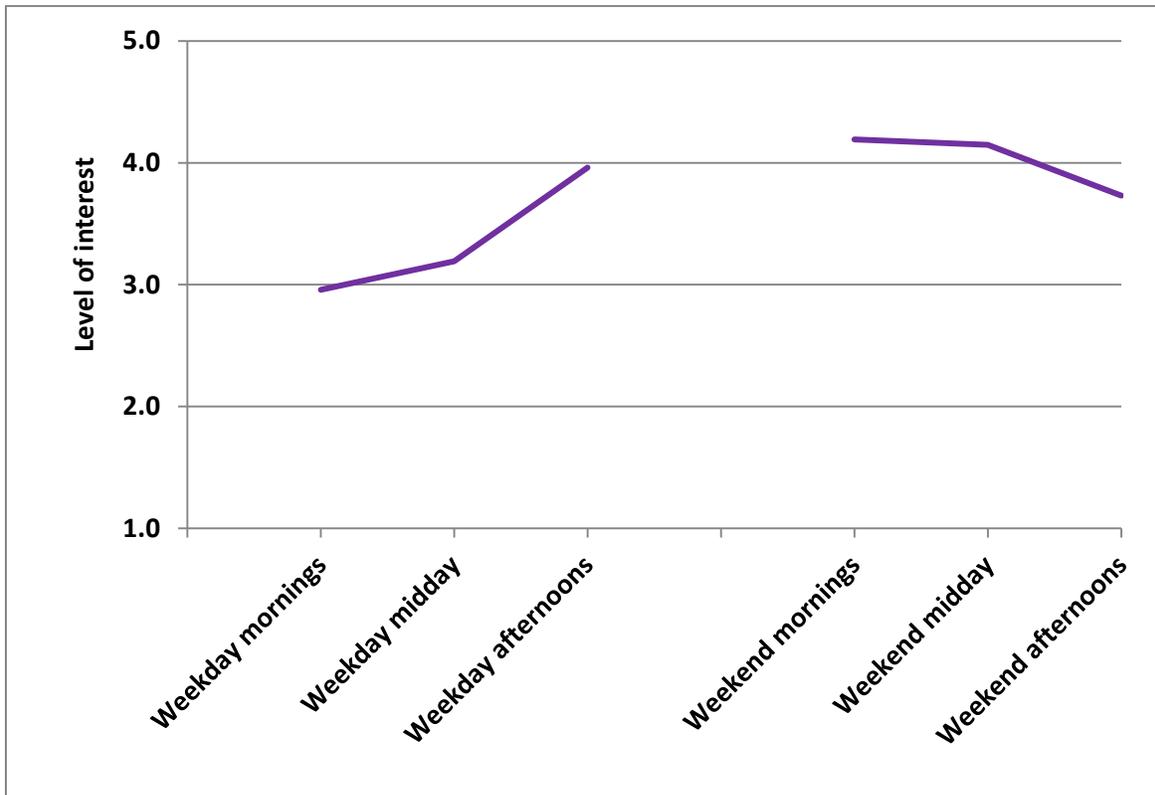
Boaters were asked to report their level of interest (on a five point scale from “not at all” to “extremely interested”) for managed boating flows on different days of the week; averages are shown in the following figure. Boaters are interested in flows throughout the week, but there is greater interest in Fridays and weekends. Boaters would appreciate flows more (and use is likely to be higher) on these days.



**Figure 15. Level of interest in managed boating flows by day of week**

### Preferred times on weekends and weekdays

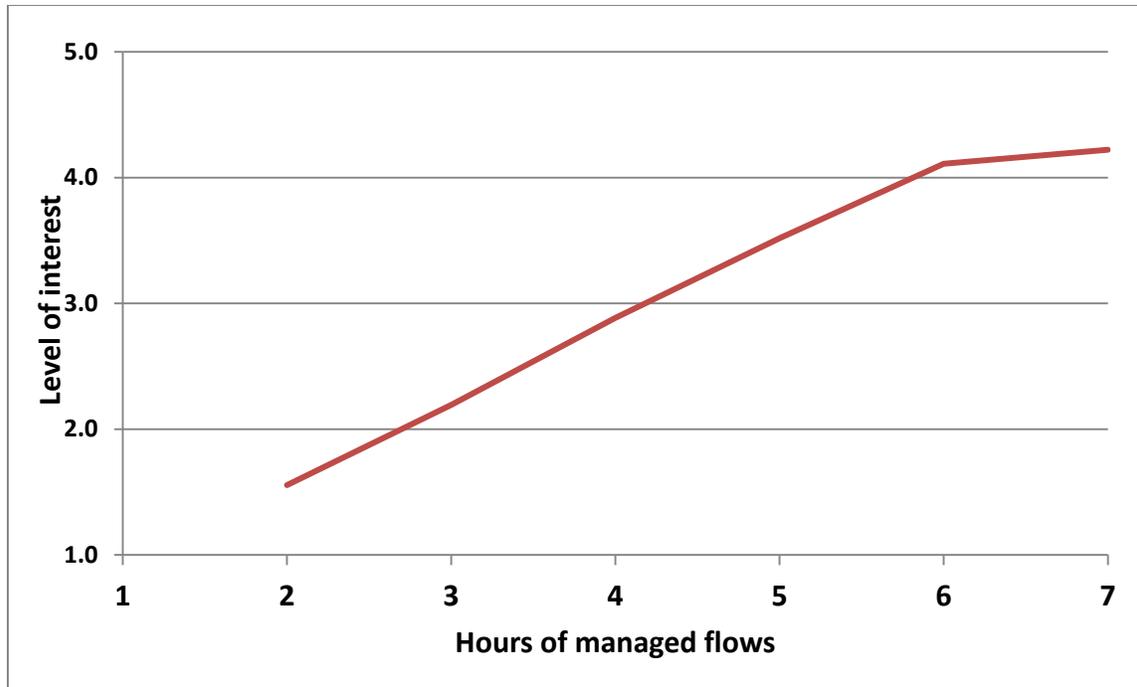
Boaters were asked to report their level of interest (on a five point scale from “not at all” to “extremely interested”) for managed boating flows at different times of day; averages are shown in the following figure. Boaters are more interested in afternoon flows on weekdays and morning or midday flows on weekends. Boaters would appreciate flows more (and use is likely to be higher) at these times.



**Figure 16. Level of interest in managed boating flows by weekday/weekend time of day**

### Preferred duration of managed boating flows

Boaters were asked to report their interest in different durations of flows. There was greatest interest in releases that last 6 to 7 hours. Although some at the focus group indicated they could complete a run through the Gorge in less than two hours, there was general agreement that less skilled or experienced boaters would need longer releases to allow time for scouting and portaging.



**Figure 17. Level of interest in durations of managed boating flows**

**Tradeoff of different managed flow options**

Any development that removes flows may decrease the quality of boating or the number of days when those are available. If the Project were operated to minimize some of these effects, there are questions about whether boaters would prefer more days of boating vs. better flows. Boaters were asked a series of tradeoff questions that assess these preferences directly. Results are provided and discussed below.

**Table 27. Boater opinions toward tradeoffs about the amount, duration, or days of flows**

<b>Optimal / acceptable vs. number of days</b>	Optimal flows on fewer days	Acceptable (but not optimal) flows on more days	I oppose managed boating flows on principle
	33%	33%	33%
<b>Optimal / acceptable vs. duration of flows</b>	Optimal flows with shorter durations (at least two hours).	Acceptable (but not optimal) flows for longer durations (at least four hours).	I oppose managed boating flows on principle
	41%	28%	31%
<b>Number of days vs. duration of flows</b>	More days with shorter durations (at least two hours).	Fewer days for longer durations (at least four hours).	I oppose managed boating flows on principle
	41%	28%	31%

About one third of the respondents oppose managed flows in principle, which suggests a social values-based attitude opposing the Project regardless of its effects on boating.

Among those rating specific tradeoffs:

- Boaters are evenly split over the quality of flows (optimal/acceptable) vs. the number of days.
- Slightly more boaters prefer shorter releases at optimal flows rather than longer durations at acceptable levels (41% to 28%).
- Slightly more boaters prefer more days of shorter durations rather than fewer days of longer durations.

### **Advance planning**

Long form survey boaters were asked to describe their “planning horizons” for Ernie’s Gorge in terms of hours, days, or weeks.

- Only 14% answered in terms of hours. Of these, the median was 48 hours, with a “typical range” of 30 to 48 hours. In focus group discussions, several local boaters reported trips on short notice when preferred flows coincide with fine weather.
- Most boaters (42%) answered in terms of days. Of these, the median was 3 days, with a typical range of 2 to 7 days. Focus group discussion suggested most trips develop with a few days’ notice based on flows and weather forecasts.
- A few boaters answered in terms of weeks (39%). Of these, the median was 1 week, with a typical range of 1 to 2 weeks. When boatable flows are stable and consistently available (e.g., winter and spring), boaters may plan trips further in advance.

### **Potential social values conflict**

Focus group discussions and comments on some post-trip surveys suggested that some boaters may be opposed to hydropower development on the North Fork independent of potential effects on boating. Researchers developed two survey items to assess this potential “social values conflict,” where people are concerned about adverse impacts even if they personally may not encounter them (Vaske et al, 1995; Vaske et al, 2007). Results are given in Table 5, and they provide evidence of social values opposition to hydropower development on the North Fork. Having noted this, focus group discussions indicate that boaters are interested in negotiating for managed boating flows if development is licensed.

**Table 28. Percent agree/disagree with “social values” items about hydropower development**

	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
Even if a new flow regime provides an equivalent number of boatable days each year, I prefer a natural flow regime in the North Fork.	0	0	3	10	86
Even if the proposed hydroelectric Project provided boating flows, I prefer a natural flow regime in the North Fork.	0	0	7	10	83

### 5.3.4 Access issues

The Project could affect boating access into the area. If a road is developed into the diversion/intake, for example, boaters could access the top of the Gorge to start their trips. The long form survey asked about boaters’ current access and preferences for other options.

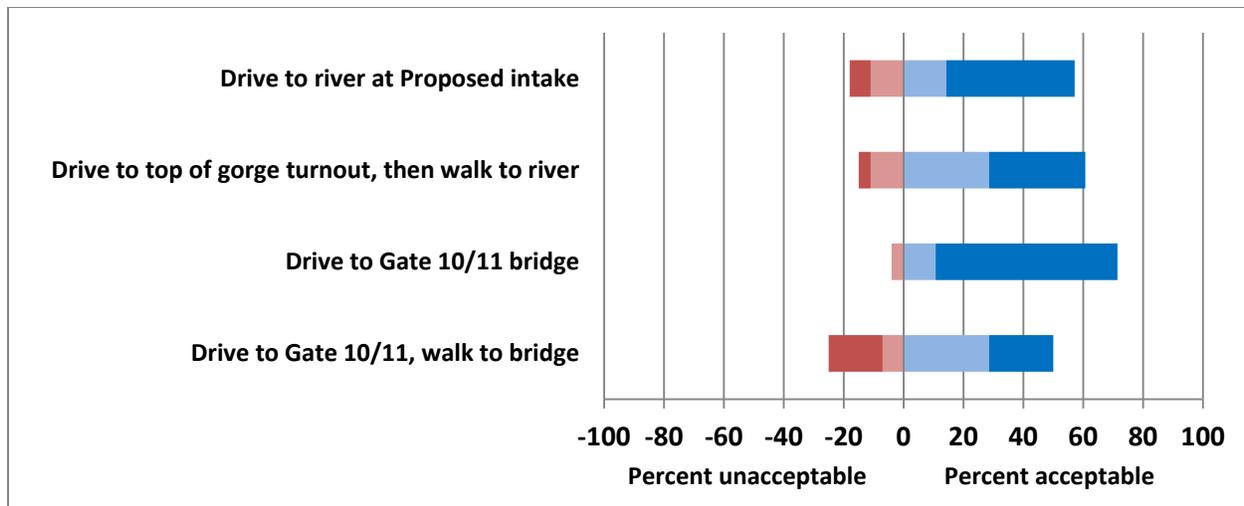
#### Hancock Forest Management permit purchases

Over half (58%) of survey respondents did not buy an access permit to the Hancock Forest in 2013, while 14% bought an annual drive-in pass, 11% bought an annual non-motorized use pass, and 17% bought a daily non-motorized pass on one or more occasions. About 20% report buying an annual permit at some time in the past. Walk-in permits were not required before 2009.

#### Preferences for potential access options

Respondents were asked to rate the acceptability of different access options on a five point acceptability scale (1=totally unacceptable, 3=neutral, 5= totally acceptable). Results are given in Figure 25. However, findings suggest that boaters would rank order the options (from most to least preferred) as follows:

1. Drive to the Gate 10/11 bridge
2. Drive to river at proposed intake
3. Drive to top of Gorge turnout, then walk to river
4. Drive to Gate 10/11, then walk to the bridge



**Figure 18. Acceptability of different access options into the North Fork**

**Boater assessments of “reasonable fees” for access to the North Fork**

Access permits through Hancock Forest have fluctuated over the years and vary for motorized and non-motorized use. Boaters were asked to assess “reasonable fees” for access in the future. Results show that boaters are willing to pay daily fees from 1 to 5 dollars and annual fees of 15 to 50 dollars, while recognizing that walk-in access should be less expensive than drive-in access. Drive-in daily access is not available at this time, and drive-in annual access will cost 250.00 dollars in 2014 (limited to 1,000 permits).

**Table 29. Boater assessments of reasonable fees for North Fork boating access**

	Dollars per trip for drive-in access	Dollars per trip for walk-in access	Dollars for an annual drive-in pass	Dollars for an annual walk-in pass
<b>Mean</b>	4.80	1.40	53.60	15.90
<b>Median</b>	5.00	1.00	50.00	15.00
<b>Typical range</b>	4.50 to 5.00	0 to 2.50	28.80 to 95.00	25.00 to 50.00

## 5.4 Fishing<sup>4</sup>

### 5.4.1 Opportunities

#### Overview

Fishing on the North Fork Snoqualmie is documented in guidebooks and angler websites, but use information is sparse and sometimes imprecise about locations. Focus group information suggests that fishing use on the river is low compared to the Middle Fork and South Fork. Of the use that does occur, most is focused on Forest Service lands upstream of Wagner Bridge (about RM 12) or near the confluence with the Middle Fork at Three Forks Natural Area. Fewer anglers purchase annual or daily permits to access the river from Hancock Forest property; most appear to concentrate their use near the Gate 10/11 Bridge. A few anglers travel Hancock logging roads and bushwack into the river from the river left side. Focus group discussion suggests some anglers access Black Canyon from other private lands on the river, sometimes utilizing the Snoqualmie Water Utility right-of-way upstream from Ernie's Grove.

The target species appears to be cutthroat trout or hybrid "cutbow" trout, although brook trout are occasionally caught. The fishery is open year round to catch and release fishing, and up to 2 fish per day may be kept from June 1st to October 31st. Anglers appear to prefer lower late summer flows and dry fly fishing (see further discussion below). Fish appear to average 8 to 9 inches, although larger fish (over 16 inches) are sometimes caught; most anglers appear to practice catch and release fishing, even when regulations allow harvest.

#### Fishing experience

Anglers were asked to report their fishing experience.

- Anglers have considerable fishing experience. Median fly fishing experience was 20 years and the median number of days fishing on any river (all types of gear combined) is 60.
- Three anglers spent 15, 15, and 27 days per year fishing the North Fork, but the other nine averaged just 3.8 days per year.
- Black Canyon was the least likely North Fork segment to be fished (1.5 days vs. 3.5 or more on other segments). Only 5 of the 11 anglers reported any days fishing in Black Canyon. Focus group discussion noted the challenging access (few trails on the Hancock property and private land around Ernie's Grove and Moon Valley) and difficult fishing (steep banks, gradients, and large boulders).

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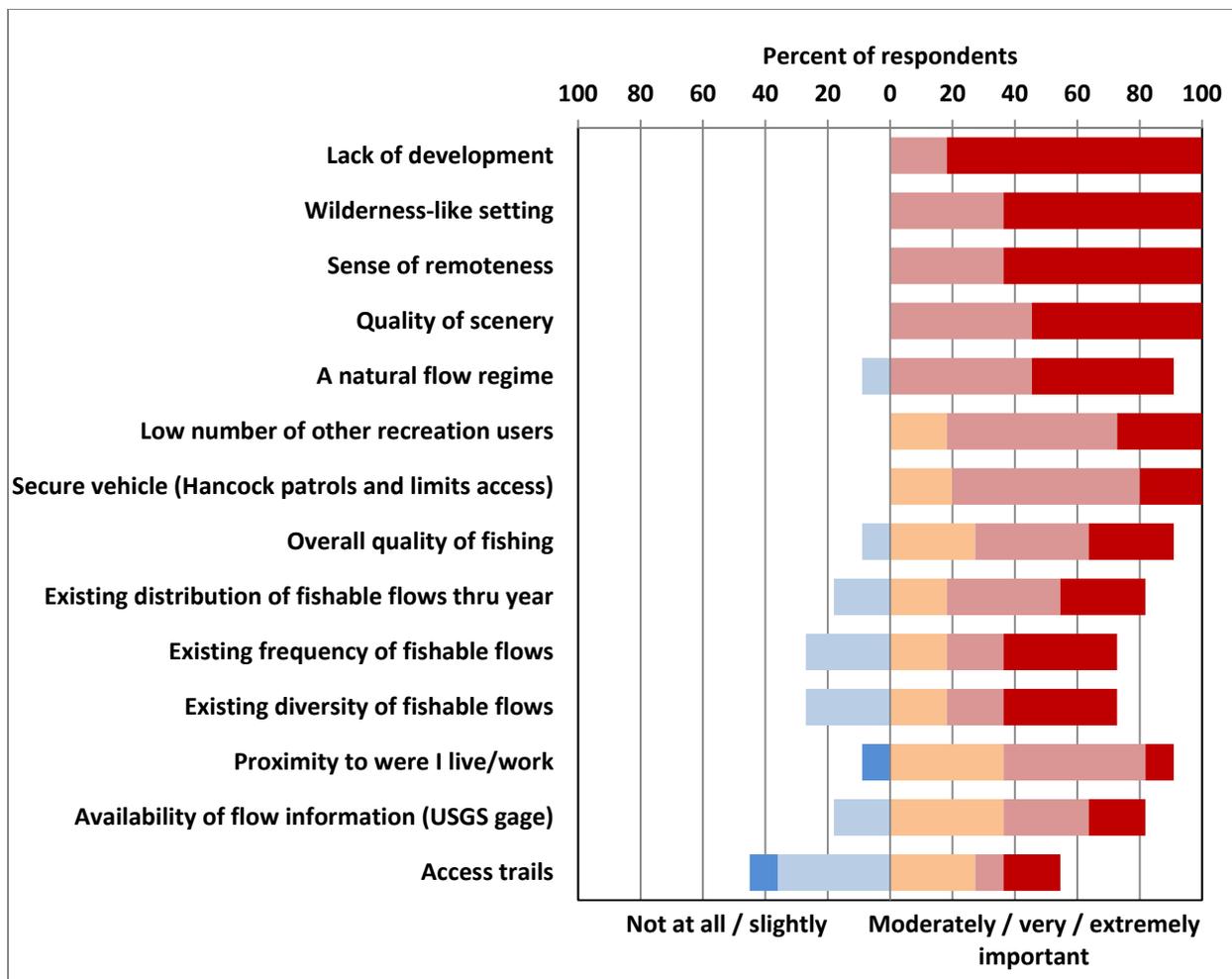
<sup>4</sup> This study component completed and written by CRC.

**Table 30. Angler experience with different types of fishing (years and days per year), and on different segments of the Snoqualmie River (days per year)**

	Average	Median	25%	75%	n
<b>Years fishing</b>					
Bait fishing rivers	19.1	10.0	2	30	7
Spin fishing rivers	18.2	9.5	1	38	6
Fly fishing rivers	24.5	20.0	14.5	38	11
Lake fishing	31.2	35.0	20	43	11
Salt water fishing	30.4	35.0	19	44	10
<b>Days per year fishing</b>					
Bait fishing rivers	15.2	5.5	0.3	18	6
Spin fishing rivers	14.3	3.0	0.3	16	6
Fly fishing rivers	56.5	40.0	21	68	11
Lake fishing	11.6	10.0	8	15	11
Salt water fishing	11.0	10.0	5	14	10
<b>Days per year on Snoqualmie River segments</b>					
Upper NF (FS land above Wagner Bridge)	4.6	3.5	2	5	10
Gate 10/11 Bridge area	4.6	4.0	0.5	6	7
Ernie's Gorge / Black Canyon	2.5	1.5	0	3	8
Ernie's Grove	3.5	3.5	1	5	8
South Fork	5.5	5.0	1.5	7.5	11
Middle Fork	6.5	5.0	2	7.5	11
Main Stem below Snoqualmie Falls	7.2	5.0	3	6	9

### **River attributes**

Long form surveys asked respondents to rate the importance of river attributes on a five point scale from “not at all important” to “extremely important.” The following figure ranks them by average score and shows percentages.



**Figure 19. Important attributes of the North Fork Snoqualmie River**

- Anglers appreciate the river’s remote, undeveloped, wilderness-like, and scenic qualities even more than the quality of fishing.
- Anglers rated the river’s existing natural flow regime higher than the specific frequency, distribution, or diversity of fishable flows. This may suggest greater concern about the river’s biological/ecological values (e.g., flows for fish habitat) than it’s angling values (e.g., flows for “angler habitat”). The availability of real-time flow information was also relatively less important.
- Low use levels and security provided by limited access and Hancock Forest patrols were relatively important to anglers. As discussed in the focus group meeting and in several interviews, many anglers use the Hancock Forest because the limited access provides an uncrowded and secure setting close to Seattle.
- Access trails were the least important attribute for anglers, indicating less interest in increasing access development.

### **Comparisons to other Northwest rivers**

Anglers were asked to compare the North Fork to other rivers (within two hours, and within the state of Washington). Responses were on a five point scale (worse than average, average, better than average, excellent, and among the very best).

Results suggest the North Fork is generally considered “better than average” (mean scores on the scale were 3.3), but only one respondent felt it was “among the very best.” This contrasts with the boaters, of whom 71% reported it was “among the very best” in Washington. Frequency distributions for the question are provided below.

**Table 31. Rating the North Fork in comparison to other rivers (percent)**

	Within two hours	In State of Washington
<b>Worse than average</b>	0	0
<b>Average</b>	22	33
<b>Better than average</b>	33	22
<b>Excellent</b>	33	22
<b>Among the very best</b>	11	11

Anglers were also asked to name river reaches similar to the North Fork. The list (with the percent mentioning each) is given below:

- Upper MF of Snoqualmie / Middle Fork Snoqualmie (27%)
- South Fork Snoqualmie / SF Snoqualmie near Mt Si Golf Course (27%)
- Upper Yakima / Yakima River (18%)
- Cle Elum River (9%)
- North Fork Tolt River (9%)
- Nisqually River (9%)
- Puyallup River (9%)
- Skate Creek (9%)
- Sunset and Canyon Falls Area, South Fork Skykomish (9%)
- Teanaway River (9%)

### **5.4.2 Flow evaluations and managed flow regimes**

#### **Observed use at specific flows (from camera observations)**

As discussed earlier in this document, camera observations documented angling use at flows from 51 to 629 cfs. For the 13 trips and 17 anglers observed, the median flow was 202 cfs. Anglers were photographed on the river on 12 different days out of 425 days

monitored (3% of days) and 11 or 3% of days in calendar year 2013, but anglers may have used other parts of the river that were not covered by cameras. The mean group size for anglers was 1.3 people. Direct flow evaluations from focus groups and surveys (below) further define fishable flows.

### **Calibration to USGS gage**

Of the 11 long form survey respondents, only three reported being “calibrated to numeric flows from the USGS gage for the river;” of those, two answered only some “specified flow” questions. Because statistics for small samples are less useful, survey responses have been integrated with focus group and interview findings and preferred flows are summarized as a whole.

### **Specified flow ranges**

***Highest flows.*** Most anglers report high flows can be challenging to fish, especially in the steeper gradient parts of Black Canyon/Ernie’s Gorge. The highest flow that any angler reported fishing in the Gorge was 500 cfs, although focus group discussion suggested flows less than 400 cfs were better, with shallower depths and low velocities that increase wadeable and fishable water.

Anglers appear able to fish higher flows downstream of the Gorge from Ernie’s Grove to the confluence. Anglers at the focus group reported fishing flows between 600 and 800 cfs (typically during March or April) in this reach.

Focus group discussion noted that the “color” of the river (turbidity) was an important variable for deciding when to fish. Higher levels are better for fishing if the flows have been dropping and turbidity is low.

***Lowest flows.*** Anglers generally prefer lower flows on the North Fork. One angler reported fishing in the Gate 10/11 Bridge area at flows as low as 35 cfs, and cameras at the bridge recorded anglers at flows between 51 and 90 cfs, while other anglers reported fishing flows of 100 to 150 cfs in Black Canyon and Ernie’s Grove to the mouth. During focus group discussion, anglers noted that it was common to fish late summer low flows, which often drop below 100 cfs (early September median daily flows are 80 to 90 cfs). However, several anglers raised questions of whether there were biological concerns at these flows. These biological concerns are addressed in other studies designed to provide more definitive information about minimum flow needs for fish.

**Preferred flows.** Focus group discussion suggested that the preferred fishing flows occur from mid-July through September, and median flows in this period tend to drop steadily from about 250 cfs to just under 100 cfs. Based on survey responses, optimal flows generally ranged from 100 to 325 cfs on different segments. However, one angler reported optimal fishing as high as 700 cfs for Ernie’s Grove to the confluence, and cameras recorded anglers at the Gate 10/11 bridge at flows as high as 629 cfs. The angler with the most Black Canyon experience (highest days per year) identified an optimal range of 200 to 325 cfs.

**Fishing ranges for different segments.** Taken together, we have defined acceptable and optimal flows for the three fishing segments below. The ranges are based on integrated information from camera observations, the focus group meeting, interviews, the long form survey, and hydrology information about median flows in different times of the year. In general, they suggest slightly higher ranges for the lower gradient reaches near the Gate 10/11 bridge and from Ernie’s Grove to the confluence, compared to the steeper segment in Black Canyon.

The low end of the acceptable range for all three segments was defined at 50 cfs, recognizing that even if anglers can fish some areas at even lower flows, these lower flows may reduce fishing success.

**Table 32. Acceptable and optimal fishing flows for different North Fork segments**

	Acceptable range	Optimal range
<b>Gate 10/11 Bridge</b>	50 to 500 cfs	250 to 350 cfs
<b>Black Canyon</b>	50 to 400 cfs	200 to 300 cfs
<b>Ernie’s Grove – confluence</b>	50 to 800 cfs	200 to 400 cfs

**Tradeoffs between fishing and biological conditions**

Any development that changes flows may affect ecological conditions (e.g., fish habitat) as well as fishability conditions (e.g. “angler habitat”), not always negatively. In spite of this, focus group discussions showed considerable opposition to hydropower development on the North Fork regardless of potential benefits for fish or fishing. This is similar to the “social values conflict” idea (Vaske et al, 1995; Vaske et al, 2007) that was also found among boaters.

Two questions were developed to directly assess anglers’ opinions about preferences for a natural flow regime, even if hydropower development and operations could maintain or improve the fishery or fishing conditions. The questions are given below; response options were on a 5-point scale from strongly disagrees to strongly agree.

If the proposed Black Canyon Hydroelectric Project was licensed and built, it would affect flows in the 2.7 mile Black Canyon reach. The flow effects will depend on base flows required by the license, but the project would generally reduce flows in the Black Canyon reach by several hundred cfs during high flow periods, and the Project might not operate at all during low flow periods. Please tell us if you agree or disagree with the following statements about potential new flow regimes.

Even if the Project’s flow regime helps improve the biological fishery, I prefer a natural flow regime in the North Fork.

Even if the Project’s flow regime provided better fishing flows in the fishing season, I prefer a natural flow regime in the North Fork.

Results are given below. They provide evidence of a “social values” basis for opposition to hydropower development on the North Fork. Having noted this, focus group discussions also suggest that anglers are interested in negotiating flows that would maintain the fishery and provide good fishing conditions if development is licensed.

**Table 33. Percent agree/disagree with “social values” items about hydropower development**

	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
Even if a new flow regime provides an equivalent number of boatable days each year, I prefer a natural flow regime in the North Fork.	10	0	10	0	80
Even if the proposed hydroelectric Project provided boating flows, I prefer a natural flow regime in the North Fork.	10	0	0	0	90

Anglers were also asked about potential tradeoffs between better flows for fish habitat vs. better flows for fishing:

If water from the Project was limited and you had to choose, would you prefer...  
 ...a flow regime that is optimal for the biological fishery.

- ...a flow regime that is optimal for fishing conditions during the fishing season.
- I oppose managed flows in the Black Canyon on principle.

Results show that anglers were evenly split (50% each) in supporting flows optimal for the biological fishery, or opposing any managed flows in Black Canyon on principle. No anglers thought good fishing flows should be the priority. This is further support for a “social values conflict” where anglers oppose any change in the natural values and flow regime.

### **5.4.3 Access issues**

The Project could affect angling access into the area. For example, if a road is developed into the diversion/intake, it is possible that anglers could access the lower gradient reach near the top of the Gorge without a Hancock permit. To assess how this might affect angling use, the long form survey asked anglers the same set of questions about access described earlier for boaters.

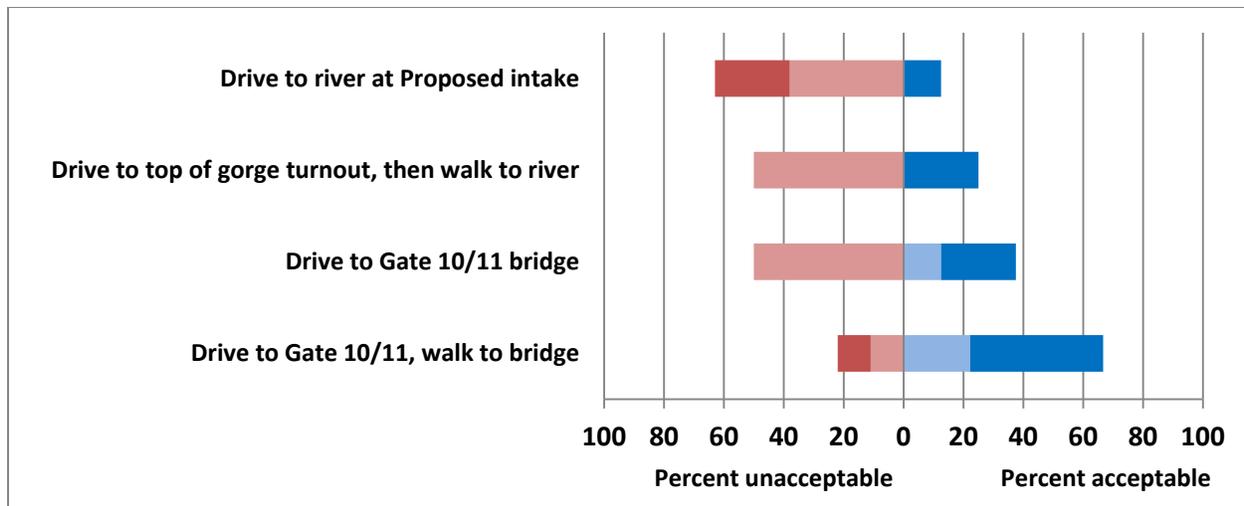
#### **Hancock Forest Management permit purchases**

Of the ten respondents who answered this question, 30% had bought an annual non-motorized permit in 2013, and the remaining 70% had not. None had bought an annual or daily walk-in permit. About 60% had bought a Hancock permit in the past.

#### **Preferences for access options**

Respondents were asked to rate the acceptability of different access options on a five point acceptability scale (1=totally unacceptable, 3=neutral, 5= totally acceptable). Results are given in the following figure. Findings suggest that most prefer to drive to Gate 10/11, then walk to the bridge (rather than drive directly to the bridge). Most consider driving to the river at a new access to the proposed intake unacceptable, and half consider a “top of gorge” access turnout unacceptable.

Some of these responses may reflect discomfort with adding access to a place that permit holders enjoy in part because of its low use and challenging access for other anglers. It may also reflect general opposition to hydropower development and increasing road access in the natural area (even if it improves access for anglers).



**Figure 20. Acceptability of different access options into the North Fork among anglers**

**Angler assessments of “reasonable fees” for access**

Prices for access permits in Hancock Forest have fluctuated over the years and vary for motorized and non-motorized use. Anglers were asked to assess “reasonable fees” for access to the North Fork in the future. Results show that most are willing to pay daily fees of 5 to 20 dollars and annual fees of 20 to 100 dollars, while recognizing that walk-in access should be less expensive than drive-in access. These are notably higher (especially the daily fees) than boater estimates. Drive-in daily access is not available at this time, and drive in annual access will cost 250 dollars in 2014.

**Table 34. Angler assessments of reasonable fees for North Fork fishing access**

	Dollars per trip for drive-in access	Dollars per trip for walk-in access	Dollars for an annual drive-in pass	Dollars for an annual walk-in pass
<b>Mean</b>	44.20	5.00	83.30	74.00
<b>Median</b>	15.00	11.00	75.00	50.00
<b>Typical range</b>	10.00 to 23.80	5.00 to 20.00	50.00 to 100.00	20.00 to 100.00

**5.5 Other recreation**

Other recreation is available within the study area, including hiking, biking, hunting, relaxing along the river, and swimming. Much of this use occurs on Hancock Forest lands, but permit access is required. Residents in Ernie’s Grove appear to use the Snoqualmie informal “waterline “ trail that leads upstream into Black Canyon, with two notable spurs reaching an overlook of Fantastic Falls and a gravel beach that could offer opportunities for swimming or picnicking.

Ambitious backcountry hikers can also bushwhack along the river left side of the canyon through Mount Si Natural Resource Area. Although DNR has administrative access off Moon Valley Road, there is no obvious public access there. Hikers who do get into the area can follow the overgrown “Jeep Trail” on public land to Rachor Creek, and travel across trail-less areas to old Douglas Firs and overlooks of Rachor Falls.

### **Trespass and Vandalism**<sup>5</sup>

Trespass and vandalism has been observed in the study area. However, the Project itself is not expected to increase either because the Project will not provide additional access. Existing restrictions on private property in the area that limit access will remain and the Project design will use mostly existing, active roads.



**Figure 21. Dumping in the study area**

### **Liability Issues**<sup>5</sup>

Whitewater boating is an inherently dangerous sport, especially on a Class V/V+ run like Ernie’s (Black) Canyon. Beyond the challenges presented by a Class V/V+ run, the steep canyon walls and limited access to the river make rescue difficult. However, safety and liability concerns have not prevented FERC from requiring whitewater access and flow

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<sup>5</sup> WEC authored these sections.

releases on past projects. Recent examples of storage projects where managed flows have been provided for whitewater boating in Washington include both the Lake Chelan and Henry M. Jackson hydroelectric projects. In these instances, possible liability for accidents was an issue parties attempted to address in settlement agreements. Specifically, liability insurance and waivers were used to try and minimize liability to the licensees.

This Project would be different than the two projects discussed above. First, those were storage projects that had a much greater ability than this Project would to release specific flows at a specific time and date. Technically, the Project would be capable of diverting less than 900 cfs and leaving more water in the North Fork so that flow would stay within a desired range. However, that ability would be heavily dependent on weather, and the flashy nature of the North Fork, making advanced planning difficult. As a run-of-river facility without a significant volume of water storage, the Project would not be able to provide flow releases in the same manner or as effectively as a storage project. Second, whitewater boating releases were required at these projects as part of a re-licensing process on much larger, existing storage projects. This Project is a smaller run-of-river facility with a minor impact on area recreation, including on a limited number of users capable of using a Class V/V+ run. As a result, it may not warrant the same type of requirements.

Regardless, the Project proponent would be concerned about potential liability arising from any license articles or settlement agreement that might imply any responsibility for the safety of whitewater boaters. Any mitigation efforts identified in the development of an RMP would need to be coupled with appropriate liability reduction measures.

## **6 DISCUSSION<sup>6</sup>**

This section discusses how the Project's operation would affect different types of recreation assuming an operating plan where 900 cfs is diverted from the North Fork with a 50 cfs instream flow requirement.

### **6.1 General recreation**

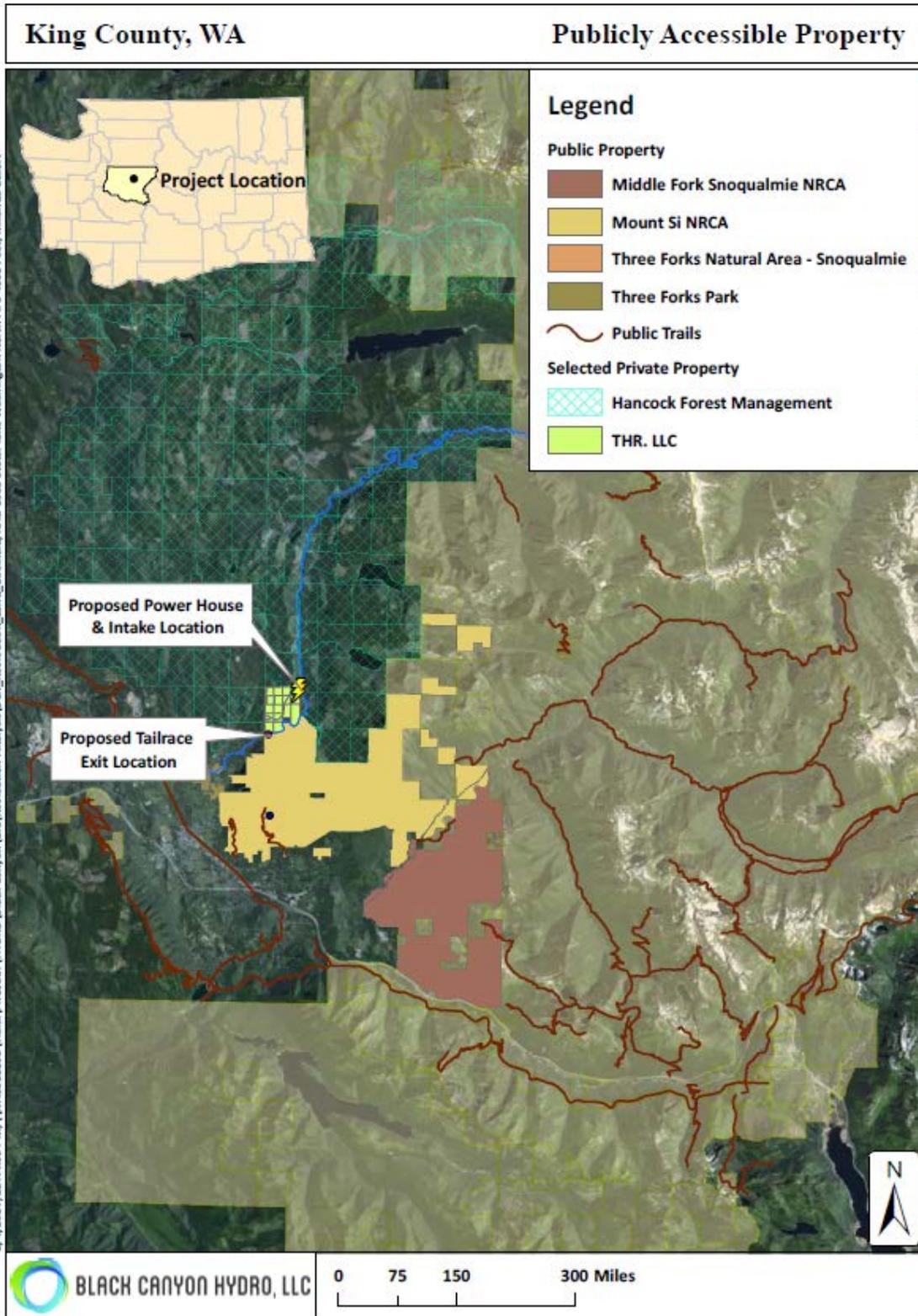
The permanent footprint of the Project within the recreation study area is approximately 2-acres within HFM's 90,000-acre tree farm. This is a minimal displacement of potential recreationists relative to the amount of available area on HFM property and considering

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<sup>6</sup> WEC was the lead author on this section. CRC contributed analysis and discussion of the whitewater boating and fishing sub-sections.

the limited number of access permits sold (1,000 for motorized access). Current land use practices, primarily commercial forestry, have also made the existing landscape highly disturbed and altered from its primitive state. The area of Project land that would be disturbed is extremely minor relative to the high volume of land being actively altered and disturbed through logging activities in the Project's immediate vicinity.

Additionally, there are significant other recreation opportunities in the larger area. For example, the public can access both the Mount Si NRCA immediately to the south and east of the Project and Forest Service property immediately to the north. Additionally, beyond fishing and boating, none of the recreation opportunities identified appear to be flow-dependent, with the exception of swimming, which is probably best at lower flows during the summer. At summer low flows, water temperatures are warmer, pools remain deep, but cascades or runs are less dangerous. At this time, the Project would generally not be operating due to insufficient minimum operating flows.



**Figure 22. Publicly Accessible Property in Area**

These non-flow dependent activities are generally hunting related or general nature activities like hiking. With the Project's small terrestrial footprint limiting displacement of use, a potential issue would be visual (addressed in detail in the Aesthetic Resource Assessment). However, due to limited aesthetic resources, public access, current land use practices, and the area's complex topography, the Project will have a relatively minor impact on aesthetic resources. Limited public access prevents significant numbers of people from accessing location where Project features will be visible. Non-flow dependent activities will also be screened from the North Fork, and any changes to flow patterns in the river within the Project Reach, by the required logging buffers.

## **6.2 Flow-Related Opportunities**

Project effects on flow-dependent activities occurring in the Project Reach have been analyzed assuming a diversion of 900 cfs and an instream flow requirement of 50 cfs as detailed in the Environmental Flows Study Report. The analysis was based on a hydrology model of the existing flow regime (daily flows over a 22-year period of record from 1991 to 2012) that characterizes the number of days in a year or season when certain opportunities or flow ranges are currently available and how those opportunities would change if the Project were operating. Under this analysis, the Project would not be providing specific managed flows for boating on any days; the only boatable days would occur when instream flow requirements plus the amount of un-diverted flows are in the boatable ranges.

### **6.2.1 Whitewater boaters**

Days of boatable flows in different ranges for different seasons under the current regime and the post-Project regime are given in Tables 35 and 36. A direct comparison for the entire year is given in Table 37.

- Boatable flows from 365 to 1,100 cfs are currently available about 47% of the days in the year (with about 70% of spring days boatable, 49% of winter days, and 29-30% of summer and fall days).
- Boatable flows from 349 to 932 cfs (as defined by documented use in 2013 from cameras) are available about 42% of the year (with about 65% of spring days being boatable, 47% of winter days, and 29% of summer days and 29% of fall days).
- Cameras documented use on 35 days or about 21% of the available days in 2013 (as defined boatable by the survey). Assuming this accounted for about 61% of the days that had actual use (based on the rate at which cameras photographed

boaters who also completed a post-trip survey), boaters run Ernie’s Gorge about 49 days (30% of total days in 2013) in a given year, assuming 2013 was representative of use.

- Standard boating opportunities are currently available about 58 days or 16% of the year (with about 27% in spring, 17% in winter, and 10% in summer and 10% in fall).
- Only about 12% of days in a year are higher than the “highest safe flow” of 1,100 cfs, and 41% are below 365 cfs and do not provide “acceptable” quality boating.

**Table 35. Estimate of boatable under the existing regime**

Opportunity	Flow range		Days per year		Winter (Dec-Feb)		Spring (Mar-May)		Summer (Jun-Aug)		Fall (Sep-Nov)	
	Low	High	n	%	n	%	n	%	n	%	n	%
<b>Boatable range (from survey)</b>	365	1,100	164	45	44	49	64	70	28	30	27	29
<b>Observed boating range (2013 by camera)</b>	349	932	154	42	42	47	60	65	27	29	26	29
<b>Technical kayaking</b>	365	499	52	14	16	18	18	20	9	10	9	10
<b>Standard kayaking</b>	500	699	58	16	15	17	25	27	9	10	9	10
<b>Big water kayaking</b>	700	1,099	53	14	13	14	21	23	10	11	9	10
<b>Above boatable range</b>	>1,100		42	12	15	17	11	12	6	7	10	11
<b>Below boatable range</b>	< 365		149	41	30	33	16	17	55	60	48	52

Based on 22 years of record – 1991-2012.

After applying operating conditions, the following number of days would be available in a typical year, and by season.

**Table 36. Estimate of boatable under the proposed regime**

Opportunity	Flow range		Days per year		Winter (Dec-Feb)		Spring (Mar-May)		Summer (Jun-Aug)		Fall (Sep-Nov)	
	Low	High	n	%	n	%	n	%	n	%	n	%
Boatable range (from survey)	365	1,100	22	6	7	8	6	7	3	3	6	7
Observed boating range (from cameras)	349	932	19	5	6	7	5	5	3	3	4	4
Technical kayaking	365	499	7	2	2	2	2	2	1	1	2	2
Standard kayaking	500	699	7	2	2	2	2	2	1	1	2	2
Big water kayaking	700	1,099	8	2	3	3	2	2	1	1	2	2
Above boatable range		>1,100	11	3	6	7	2	2	0	0	3	3
Below boatable range	< 365		324	89	78	87	84	91	85	92	77	85

Based on 22 years of record – 1991-2012.

**Table 37. Comparison of available boatable days under existing and post-project conditions**

Flow Range (cfs)	Existing Conditions	Post-project Conditions
365-499 (Technical)	53	6
500-699 (Standard)	58	7
700-1,099 (Big water)	53	8
All boatable days (350-1,100)	164	21

This analysis shows there would be a substantial reduction in boatable days under post-Project conditions; the existing flow regime provides 164 boatable days per year, compared to 21 for the post-Project regime. In addition, not all days may be sufficiently predictable or usable by boaters. Some of these higher flows occur during “flashy” periods, when flows are particularly difficult to predict from gage information and weather forecasts, and the chance of rising flows is greater. Boaters prefer stable or slightly declining flows so they can avoid being caught in the canyon at hazardous high flows.

### 6.2.2 Fishing

Only three respondents were “calibrated” to the USGS gage and only two answered “flow specific” questions. Because statistics for small samples are less useful, survey responses have been integrated with focus group, interview, and camera findings, and

preferred flows are summarized as a whole. Analysis focuses on the proposed bypass reach in Black Canyon.

- Acceptable fishing flows from 50 to 400 cfs are available about 45% of the days in the year (with about 62% of the days in summer, 56% in fall, and 40% in winter, but only 22% in spring).
- Optimal flows from 200 to 300 cfs are available less frequently, about 12% of the year (with about 12% in summer, 11% in fall, 25% in winter, and 9% in spring).
- Cameras documented use on 10 separate days in a full year from 2012-2013. Assuming this accounted for 50% of the days anglers fish the river, anglers are probably present about 20 days in any given year.

**Table 38. Estimate of fishable days under the existing regime**

Opportunity	Flow range		Days per year		Winter (Dec-Feb)		Spring (Mar-May)		Summer (Jun-Aug)		Fall (Sep-Nov)	
	Low	High	n	%	n	%	n	%	n	%	n	%
Acceptable fishing	50	400	164	45	36	40	20	22	57	62	51	56
Optimal fishing	200	300	45	12	15	25	8	9	11	12	10	11
Below fishable range	< 50		8	2	0	0	0	0	3	3	5	6
Above fishable range	>400		192	53	54	60	72	78	31	34	35	38

After applying operating conditions, the following number of days that would be available in a typical year, and by season.

**Table 39. Estimate of boatable under the proposed regime**

Opportunity	Flow range		Days per year		Winter (Dec-Feb)		Spring (Mar-May)		Summer (Jun-Aug)		Fall (Sep-Nov)	
	Low	High	n	%	n	%	n	%	n	%	n	%
Acceptable fishing	50	400	326	89	78	87	85	92	86	93	78	86
Optimal fishing	200	300	7	2	2	2	2	2	1	1	1	1
Below fishable range	< 50		8	2	0	0	0	0	3	3	5	5
Above fishable range	>400		30	11	12		8		3		8	

There will be a substantial increase in fishable days under post-Project conditions. The existing flow regime provides 164 days in the acceptable fishing range (with 45 days in the optimal range), while the post-Project regime would provide 326 days in the acceptable range and 7 days in the optimal range. Project operation would not appreciably change the number of days below the fishable range.

## **7 RECOMMENDATIONS**

- Use results of this study and stakeholder comment to develop a detailed Recreation Management Plan (RMP) to be implemented for the Project if a license is issued.

## 8 REFERENCES

- AllAboutRivers.com. 2012. "North Fork Snoqualmie – Ernie’s Canyon Whitewater Kayaking Trip on the Snoqualmie River." Quicksilver Interactive Media, Inc. <http://www.allaboutrivers.com/rivers-in-washington/north-fork-snoqualmie---ernies-canyon-RUN1104.html>. Accessed July 30, 2012.
- American Whitewater. 2008. "Whitewater Paddling in the North Cascades." <http://www.americanwhitewater.org/content/Document/view/documentid/554>. Accessed August 2, 2012.
- . 2012. "Snoqualmie, N. Fork – 2. Spur 10 Bridge to 428th Street Bridge (Ernie’s Gorge)." <http://www.americanwhitewater.org/content/River/detail/id/2223/>. Accessed July 30, 2012.
- Bortleson, Gilbert C. 1974. "Whitewater Stream Inventory and Streamflow Suitability for Whitewater Canoeing and Kayaking." Washington State Department of Ecology. <https://fortress.wa.gov/ecy/publications/SummaryPages/7411002.html>. January 1974. Accessed July 31, 2012.
- Ecology (Washington State Department of Ecology). 1979. "Snohomish River Basin Instream Resources Protection Program Including Proposed Administrative Rules, and Supplemental Environmental Impact Statement (Water Resource Inventory Area 7)." Olympia, Washington. August 28, 1979. <https://fortress.wa.gov/ecy/publications/SummaryPages/79IRPP7.html>. Accessed July 31, 2012.
- Federal Energy Regulatory Commission, 2012. Letter to Chris Spens with request for studies, additional information, and study requests in response to the Notice of Intent to File, Pre-Application Document (PAD) and Scoping Document. July 24, 2012. Federal Energy Regulatory Commission. Washington, D.C.
- FERC. 2004. "Order on Rehearing and Dismissing Petition as Moot." 109 FERC ¶61,039, Docket No. JR02-1-001. October 8, 2004.
- Heberlein, T. A., & Vaske, J. J. 1977. Crowding and visitor conflict on the Bois Brule River. Technical completion report. Project report No. OWRT A-066-WAS. Water Resources Center. The University of Wisconsin--Madison. 109 pp.

HFM (Hancock Forest Management). 2012. “Snoqualmie.” <http://hancockrecreationnw.com/snoqualmie/about/about-snoqualmie>. Accessed August 2, 2012.

IAC (Interagency Committee for Outdoor Recreation). 2002. “An Assessment of Outdoor Recreation in Washington State: A State Comprehensive Outdoor Recreation Planning Document (SCORP) 2002-2007.” October 2002. [http://www.rco.wa.gov/doc\\_pages/other\\_pubs.shtml](http://www.rco.wa.gov/doc_pages/other_pubs.shtml). Accessed July 31, 2012.

Kurl, M. Boating footage of Ernie’s Gorge. Feb. 2013. <http://www.youtube.com/watch?v=VVjbDP8tprI>

King County Department of Natural Resources and Parks. 2009. “Recreational Use of King County’s River System.” June 30, 2009.

NPS (National Park Service). 1993. “Nationwide Rivers Inventory.” US Department of the Interior. <http://www.nps.gov/ncrc/programs/rtca/nri/>. Accessed August 1, 2012.

———. 2012. Letter from Michael Linde, National Park Service, to Kimberly D. Bose, Secretary, FERC, Re: Black Canyon Hydroelectric Project (P-14119), North Fork Snoqualmie River, King County, Washington. July 17, 2012. FERC eLibrary Accession Number 20120719-5037.

Patrinellis, D. Boating footage of Ernie’s Gorge (several different trips):

<http://www.youtube.com/watch?v=O48oCrZCdUU>

<http://www.youtube.com/watch?v=WnJ5EpzMatU>

<http://www.youtube.com/watch?v=L48gc4gvVpY>

<http://www.youtube.com/watch?v=8CePnJNRCTQ&list=UUCk29qXy4rW2mgU0IC1P8wA>

Professor Paddle. 2012. “Snoqualmie, N. Fork – 2. Spur 10 Bridge to 428th Street Bridge (Ernie’s Canyon).” <http://www.professorpaddle.com/rivers/riverdetails.asp?riverid=602>. Accessed July 30, 2012.

Snohomish PUD (Public Utility District No. 1 of Snohomish County). 2006. "Revised Study Plans and Studies Not Proposed: Henry M. Jackson Hydroelectric Project, FERC No. 2157." FERC eLibrary Accession Number 200609125117.

USFS (US Forest Service). 1990. "Mt. Baker-Snoqualmie National Forest land and resource management plan." Department of Agriculture, Seattle, Washington. June 1990. pp. E 217 223.

USGS (US Geological Survey). 2012. "USGS Current Conditions for USGS 12142000 NF Snoqualmie River near Snoqualmie Falls, WA."

[http://waterdata.usgs.gov/wa/nwis/uv/?site\\_no=12142000](http://waterdata.usgs.gov/wa/nwis/uv/?site_no=12142000). Accessed August 2, 2012.

Thorpe, T. Boating footage of Upper North Fork at 1,000 cfs. June 1, 2011.

<http://www.youtube.com/watch?v=Bh2gG0n2g8g>

Shelby, B., Vaske, Jerry J., Heberlein, T. A. 1989. Comparative analysis of crowding in multiple locations: results from fifteen years of research. *Leisure Sciences*. 11: 269–291.

Vaske, J. J. 2008. *Survey research and analysis: Applications in parks, recreation, and human dimensions*. Venture Publishing. State College, PA.

Vaske, J. J., & Shelby, L. B. 2008. Crowding as a descriptive indicator and an evaluative standard: Results from 30 years of research. *Leisure Sciences*, 30, 111-126.

Vaske, J. J., Donnelly, M. P., Wittmann, K., & Laidlaw, S. (1995). Interpersonal versus social values conflict. *Leisure Sciences*, 17, 205-222.

Vaske, J. J., Needham, M. D. & Cline, R. C. (2007). Clarifying interpersonal versus social values conflict among recreationists. *Journal of Leisure Research*, 39(1), 182-195.

Whittaker, D. and Shelby, B. 2004. Clackamas River Hydroelectric Project Regional Demand for Whitewater Kayaking. Report prepared for Portland General Electric. September.

Whittaker, Doug, Bo Shelby, and John Gangemi. 2005. "Flows and Recreation: A guide to studies for river professionals." Hydropower Reform Coalition and National Park Service. October 2005. <http://www.nps.gov/hydro/flowrec.htm>. Accessed August 2, 2012.

## 9 APPENDIX A: Camera Observation Summary

Boaters counted by motion-activated camera(s) between 11/3/2012 and 01/01/2014.

Date	Day	Time	Photographed Users*	cfs	Location Photographed
11/3/2012	SAT	10:23	4	655	3
11/26/2012	MON	9:43	2	619	5
12/15/2012	SAT	12:56	3	349	3
1/26/2013	SAT	7:49	2	511	2, 3
1/26/2013	SAT	9:31	2	506	1, 2, 3
2/2/2013	SAT	10:34	1	767	2
2/3/2013	SUN	7:49	2	686	1, 2
2/9/2013	SAT	10:31	3	385	1
2/16/2013	SAT	11:45	2	435	1
3/28/2013	THUR	16:03	2	381	1, 2
3/30/2013	SAT	9:34	2	547	1, 2
3/30/2013	SAT	15:33	2	520	1, 2
5/23/2013	THUR	17:48	1	665	1
6/13/2013	THUR	16:30	3	455	1, 2
6/15/2013	SAT	6:31	1	415	2
6/18/2013	THUR	13:30	3	538	3
6/19/2013	FRI	17:12	1	480	1, 2, 3
6/22/2013	SAT	10:41	2	745	2, 3
6/23/2014	SUN	9:19	1	680	1, 3
6/26/2013	WED	18:28	2	624	3
6/30/2013	SUN	9:52	3	634	2
7/2/2013	TUE	18:26	2	538	Staff Observe
7/3/2013	WED	11:29	1	480	2
7/4/2013	THUR	7:46	1	435	2
10/4/2013	FRI	7:52	4	629	1
10/4/2013	FRI	9:44	1	614	3
10/5/2013	SAT	7:55	2	476	2
11/3/2013	SUN	9:11	5	435	1,2
11/10/2013	SUN	8:00	2	571	1,2
11/12/2013	TUE	12:56	2	468	1
11/17/2013	SUN	10:35	3	547	1
11/24/2013	SUN	11:08	3	366	1,2,3
12/14/2013	SAT	9:57	2	561	1,2
12/15/2013	SUN	11:24	5	419	2,3
12/21/2013	SAT	8:57	1	502	1
12/21/2013	SAT	13:36	2	497	2,3
12/22/2013	SUN	12:57	1	932	1
12/26/2013	THUR	10:09	2	590	1,3
12/27/2013	FRI	9:21	2	515	1,2
12/29/2013	FRI	10:27	1	489	1

12/29/2013	SUN	11:20	2	484	2,3
12/30/2013	MON	13:00	1	407	3
12/31/2013	TUE	12:52	2	419	1

Total number (n) photographed = 91

Anglers counted by motion activated camera(s) between 8/6/2012 and 10/22/2013.

Date	Day	Time	Photographed Users*	cfs	Location Photographed
8/6/2012	MON	13:30	1	145	4
9/2/2012	SUN	15:43	1	51	3
2/10/2013	WED	14:37	2	328	1
2/17/2013	SUN	15:30	3	502	1
2/25/2013	MON	17:03	2	315	1
6/28/2013	FRI	17:04	1	629	2
6/30/2013	SUN	12:05	1	599	2
7/6/2013	SAT	16:05	1	286	2
7/12/2013	FRI	16:26	1	202	2
7/15/2013	MON	15:42	1	167	2
7/30/13	TUE	8:20	1	77	1
9/16/2013	MON	11:30	1	89	2
9/16/2013	MON	13:00	1	90	2

Total number (n) photographed = 17

## 10 APPENDIX B: Verbatim comments from surveys

### Post trip boating surveys

- 380 cfs I don't like the run much lower than this.
- 380 cfs Flow of 380 is on the lower end of good for me personally.
- 384 cfs Holes seemed more powerful, less maneuverable. Sieves were more exposed. Overall, though, it ran very well and similar to the creek when it has more water in it.
- 385 cfs Low end of flows.
- 430 cfs Low, not my preferred flow, but still fun
- 430 cfs Consider flow of 430 to be a good but low flow.
- 500 cfs Okay flow, getting a bit low.
- 500 cfs We came all the way from Canada. This is a resource not to be lost!
- 520 cfs Hancock's Management Policy is an inconvenience.
- 550 cfs Good medium flow

550 cfs I'm all for lowering emissions but messing with the amazing eco system there, will do more harm than good.

550 cfs This is a good mid-range flow; I think the river becomes slightly higher in quality in the 650-800 cfs range

650 cfs Good medium flow

650 cfs Great flow

700 cfs Considered the flow of 700 to be a high-medium or low-high for me personally

710 cfs Somewhat pushier than expected- fabulous.

780 cfs Good solid medium flow

850 cfs This is an outstanding medium water level.

900 cfs Still a reasonable, fun flow

1,100 cfs This is the highest I've gotten on the river. We had a successful run and all said that we would return at the same flow or higher.

## Long form surveys – Boaters

Please keep the river free flowing. This is one of the most remarkable watersheds I've had the pleasure of paddling in my entire life of exploring the world in search of whitewater.

Please do not dam this section of river. Thanks, name and xxx – xxx – xxxx

Thanks for letting us be represented. Fully realize that we are a small special interest but we are extremely passionate and this run is a gem.

The Little White is awesome, but overcrowded. Robe is awesome, and even though is remote, doesn't feel as remote as Ernie's is, even though it is farther from Seattle. I get on a plane and fly to Seattle to boat Ernie's at least one time per year. It is special. LEAVE IT ALONE!

Ernie's Gorge is an incredible and unique river; it is by far the most spectacular run available for before/after-work whitewater kayaking in the Seattle area, and a big part of the reason I chose to go to medical school here at the University of Washington (and a big part of the reason I'm strongly considering practicing in the Snoqualmie Pass area when I'm done with school). Having lived/paddled in many kayaking destinations both in the US and abroad, I can confidently say Ernie's is without a doubt one of the best after-work runs in the world, both in terms of quality of whitewater and number of boatable days per year, and any damage/alteration to it would be a significant loss for the American whitewater community.

Ernie's Canyon is one of the best difficult class V kayaking runs in the Pacific Northwest. It combines challenging creek style drops with water volumes more often seen in larger riverbeds. The result is a challenging mix of pushy water, vertical drops, and paradise for the class V kayaker. For this reason I am completely opposed to any hydroelectric construction or alteration of the flows in the river. I have traveled from my home state of Colorado on 5 occasions in the last two years with a specific eye to run Ernie's Canyon. I frequently travel with a group of 4 other kayakers from CO. and we always fly into SeaTac, rent a car, eat meals in restaurants and often stay in area hotels. If the experience on Ernie's were to be diminished I would travel to alternate states/areas to paddle whitewater.

I just bought a house in Snoqualmie because of the proximity to Ernie's. This is the most prized and challenging section of whitewater in the state. This section defines kayaking in Washington and it would be a tragedy to dewater it.

This river is a valuable recreational resource and should be protected and preserved as such. If the proposed hydroelectric project goes through, there should be many concessions for recreational use, and portions of the resulting revenue from power generation should go directly

toward a no-fee model for recreational access through Hancock land as well as further preservation efforts.

I strongly oppose this ill-considered project.

Have been out of state for past few years. Miss Ernie's dearly. Truly a magical place and gem for the region. Please make responsible choices regarding this resource.

Black Canyon is a wild and scenic area very close to a major city, this is a fantastic world class kayak run that people from all over the country and the world come to kayak. Any kind of development in this beautiful area is totally unacceptable. The small amount of power for the nation compared to the destruction of this paradise would be deemed a crime if it was not sanctioned by a governing authority. I came to live in the Pacific Northwest from New Zealand because of the mountains and rivers. Amazing, virtually year round kayaking. (primarily Black Canyon which is only 45 mins from my home in Kirkland), and because of the conservation minded, outdoors loving people. Please do not destroy this amazing resource.

Upper limit of the "big water" flow is hard to nail down as the sport progresses which allows kayakers to safely boat at levels that would have been previously considered above a boatable flow. The experience provided by a natural variation in flow level is irreplaceable. It causes us to boat at lower levels than optimum as well as higher levels than we would perhaps choose. The "take what the river gives us" is a valuable and unique experience which at times may push out of our comfort level but also forces us to gain new experiences. This could potentially be taken from us if flows were regulated and dictated to fall into a range of specified flows. I believe that a natural flow regime is best. Thanks

Recreation mitigation is a nice gesture, but [I'm] still **STRONGLY OPPOSED** to hydropower development of this resource. We are not facing a power shortage, this only represents an opportunity for a private developer to make a buck off what should remain a public resource. throughout the rest of the state/region, hydropower dams are being decommissioned, & here we are talking about creating substantial environmental impact that would not benefit the community, only the developer & seller of electricity. Thumbs down.

One of the best parts of the natural flow regime is that we can go at any time if the river is at the correct flow. A good number of my runs are "dawn patrol", where we are putting on the river before 8 am. Or late afternoon in the spring/summer, when we can put in at 5 or 6 pm. This makes it possible to work a full day and still be able to get a run in.

I am against the dam one hundred percent. Any answers to the survey that may seem to reflect a positive interest in the dam should be disregarded.

## Long form surveys – Anglers

Question 22 is confusing as it does not identify public access or permitted access. In closing I appreciate the information gathering and due diligence put into the project. I do not feel that we need more electricity in WA that is not wind or solar, and our focus should be in that direction, However, if the project moves forward and the input is considered in the build out of the project I would be much more open to accepting it as long as the foot print and overall resort on the river below would not be harmful....such as temperature change to the river. Please contact me with any questions you may have. xxx-xxx-xxxx

Looking for cheap power at the cost of ruining a natural flowing river is something that will prove to be a mistake our kids and grand kids will have to endure. Don't make the mistake.

I catch my biggest fish of the year, every year, in the "middle flows" of spring, between ~350 cfs and ~900 cfs (on the North Fork Snoqualmie) around April, May, June, and sometimes into July, before lots of people start thinking of fishing the Snoqualmie Forks. I would be really sad to see these flows go away at this time of year. They are likely very important to the fishery. Don't build the goddam thing! [Angler reported fishing from Grove to confluence, with a highest flow of 800 cfs].

Good folk -- I have limited experience in the area below the proposed hydro project. Historically, the vast majority of my fishing has been done above the Gate 10 access point.

I believe gauge is spelled gauge, not gage.

The main concern is removing cold water from the river have it run through channel and returned back to the river warmer than the temperature it left the river at.

Please don't let this happen! Thanks