

**MONITORING BOATERS' EXPERIENCES ON THE SNAKE RIVER IN
HELLS CANYON**

STUDY PLAN

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INTRODUCTION

1. Background and Need for Monitoring

This study proposes to monitor boaters' experiences on the Wild (Hells Canyon Dam to Pittsburg Landing) and Scenic (Pittsburg Landing to the northern boundary of Hells Canyon National Recreation Area) sections of the Snake River in Hells Canyon. This will be accomplished through on-site contact cards and a mail-back visitor survey addressing boaters' perceptions and experiences on the river. We will not address other forms of recreation occurring in Hells Canyon.

The Wild and Scenic Snake River Recreation Management Plan (1999; hereafter referred to as "the River Plan"), which was signed in 1994 and amended in 1999, and the Final Environmental Impact Statement for the River Plan (1994) set forth guidance for management of recreational boating in the HCNRA to fulfill certain objectives. The goals of monitoring in general, and this project in particular, are (1) to determine how well management plan objectives are being met and (2) to evaluate how management actions and policies have promoted or impeded achievement of plan objectives for experiences and social conditions. Additionally, monitoring is often performed to assess trends in conditions, and to a limited extent this will be a goal of our study.

The Snake River in Hells Canyon offers challenging whitewater opportunities in a mostly natural, remote setting for both motorized and non-motorized visitors. The River Plan specifies the desired future condition to be: "A blend of motorized and nonmotorized whitewater boating [that] provides diverse user groups a variety of opportunities in a unique setting within a major river environment." The river is used by both commercial and non-commercial parties. In past studies, it has been important to assess similarities and differences among the four primary user groups: commercial floaters, commercial power boaters, private floaters, and private power boaters. We propose to explore similarities and differences in the experiences of boaters from each of these four groups.

2. Conditions to Be Monitored

Objectives developed in the River Plan stem from several policies and laws, but are primarily developed on the basis of the Wild and Scenic Rivers Act and the Recreational Opportunity Spectrum (ROS) framework that guides Forest Service recreation management (USDA Forest Service 1982). In accordance with the Wild and Scenic Rivers Act, the Forest Service identified and described the Outstandingly Remarkable Values (ORVs) for which the river merits designation as Wild or Scenic. Management must ensure the protection and enhancement of those values. The ROS prescribes combinations of managerial, physical, and social setting attributes that are intended to provide opportunities for specific types of experiences. This framework assumes that managers can create opportunities for specific experiences (e.g., challenge) through their management of setting attributes, even though they cannot guarantee that all individuals will have those experiences (Driver et al., 1987).

A. Outstandingly Remarkable Values

The ORVs identified in the River Plan include Geology, Fisheries, Wildlife, Cultural Resources, and Recreation. Some of these are outside the purview of our study because they deal with the condition of natural resources, not recreation experiences. However, many have direct bearing on our monitoring. A careful review of all planning documents identified the following ORVs and statements of desired future conditions, which our study will assess:

Recreation:

- The river provides “a blend of motorized and nonmotorized whitewater boating” (RMP 1999, p. 2) that attracts people from outside the geographic region (FEIS 1994, p. III-10).
- There are opportunities for “diverse user groups” (RMP 1999, p. 2) and for “new boaters to learn whitewater boating skills” (FEIS 1994, p. III-10)
- There is a “wide range of available recreation activities” occurring in a “unique backcountry river setting” (FEIS 1994, p. III-10).
- The canyon is a “unique setting” with “major rapids for a premier four-season whitewater adventure” (RMP 1999, p. 2)
- “Powerboaters travel and camp in a river setting that includes major rapids for a premier four-season whitewater adventure” (RMP 1994, p. 2)

- “Hells Canyon provides one of the best whitewater floating experiences in the Pacific Northwest” (RMP 1994, p. 2)
- “a variety of trip lengths, usually one to six days in duration” (RMP 1999, p. 2)
- There are opportunities for “adventurous, physically-challenged individuals to visit remote prehistoric sites and to view wildlife and unique plant life in a natural setting” (RMP 1999, p. 2)
- “Interpretive opportunities may be exceptional” (FEIS 1994, p. III-10)

Scenery:

- “The Snake River of Hells Canyon provides for great contrasts of landform, vegetation, color, climate, and sound.” (RMP 1999, p. 3)
- “Natural sounds produced by the river” are part of the scenery ORV (FEIS 1994, p. III-9)

Fisheries and Wildlife:

- There are opportunities for “year-round fishing” for various species (RMP 1999, p. 2), with an “abundant, unique, and diverse sport fishery” (RMP 111, p. 3)
- Visitors have “unique” experiences for viewing wildlife, especially bald eagles, peregrine falcons, and bighorn sheep (RMP 1999, p. 2)
- There are “opportunities for human interaction” with “diverse wildlife species” (RMP 1999, p. 3)

Geology:

- The canyon environment provides “a diverse, appealing landscape for sightseers” due to “rugged topography, fascinating geological formations and unique geographical features” (RMP 1999, p. 2)

Historic and Prehistoric Cultural Resources:

- The rich “accumulation of riverine archaeological resources” is available for enjoyment by visitors (RMP 1999, p. 3)

B. Recreation Opportunity Spectrum Attributes

The Recreation Opportunity Spectrum typically identifies different experience “opportunities” that are to be provided on the basis of physical, social, and managerial features of the landscape. ROS generally focuses on remoteness, spatial extent of land management units, naturalness and level of development (especially roads, extractive uses, and structures), number of encounters among parties, and level and type of management. In the HCNRA, these elements have been defined as encompassing naturalness/visual quality, access, remoteness, social encounters, visitor management, visitor impact, and facilities.

ROS is typically a spatial zoning technique. In Hells Canyon, this is reflected in the different experience opportunities that are prescribed for the Wild versus the Scenic portions of the river. Additionally, the management plan specifies different attributes for a variety of land management units or zones (developed sites, scientific stations, specific historic sites along the river, and the river corridor generally). For example, on the river corridor, solitude is a goal, whereas it is not in some other zones. In our monitoring, some questions will focus on the attributes described for the “general river corridor,” while others focus on specific locations or destination sites. The management plan direction for general corridor conditions is presented in Table 1.

In addition to being used in its traditional application as a spatial zoning technique, in the HCNRA, ROS zoning has also been applied temporally. That is, there are approximately 20 weekdays (in 3-day blocks) each year during which motorized craft are prohibited on the Wild section of the river. This “non-motorized window” (NMW) creates a different social environment (and presumably different experience opportunities) during the non-motorized and motorized days. Our monitoring approach is designed to determine the nature of experience opportunities provided in the Wild and Scenic sections of river as well as to detect the nature and extent of differences between the motorized and non-motorized window on the Wild section.

Table 1. ROS Setting Descriptions for the River Corridor in the Wild and Scenic Sections of the Snake River in the HCNRA¹

	Wild River (General Corridor) ²	Scenic River (General Corridor)
Naturalness/ Visual Quality	"Largely undisturbed natural environment with little evidence of human development. Manage for preservation of visual quality. "	"Largely undisturbed natural environment with limited evidence of human development. Manage for retention of visual quality. "
Access	"Very few access sites developed along the river. Roads are to access points only and do not parallel river. Valid motorized and nonmotorized watercraft are consistent with management objectives."	"Very few access sites developed along the river. Roads are to access points only and do not parallel river. Valid motorized and nonmotorized watercraft are consistent with management objectives."
Remoteness	"Moderate expectation of solitude and some expectation of experiencing isolation from the sights and sounds of others. Sense of remoteness."	"Moderate expectation of solitude and some expectation of experiencing isolation from the sights and sounds of others. Sense of remoteness."
Social Encounters	" Few contacts with other users at rapids and access points. Little but some evidence of other users. Small party sizes are managed through limited boats per group. Upland users may frequent the corridor on established trails."	" Some contacts with other users at rapids and access points. Some evidence of other users. Small party sizes are managed through limited boats per group. Upland users may frequent the river corridor on established trails."
Visitor Management	"Self-reliance through application of outdoor skills in an environment that offers a high degree of challenge and risk. No on-site visitor management controls or regulations apparent. On nonmotorized trips, visitors participate in navigation of the river and perceive a high degree of challenge and risk "	"Self-reliance through application of outdoor skills in an environment that offers a moderate degree of challenge and risk. Only a few subtle on-site visitor management controls or regulations are apparent. Outfitter and guides are often used, but customers experience a moderate degree of challenge and risk. "
Visitor Impact	" Natural ecosystems operate freely. Human impact should not be apparent in an area greater than 750 sq. ft. at any campsite. No site hardening except to protect resources. No toilets provided."	" Natural ecosystems dominate. Human use obvious but subordinate. Sites may be hardened to accommodate use. No toilets provided."
Facilities	" No facility development for user comfort. Solid human waste carryout is required. Low impact camping practices are required. "	" Minimal facility development primarily for resource protection. Solid human waste carryout is required."

¹Different descriptors apply to historic sites and developed facilities. Descriptors in this table are for the "river corridor" only.

²Bold text indicates differences between Wild and Scenic zones.

METHODS

1. Overall Approach

This study seeks to obtain representative samples of four user groups in Hells Canyon: (1) commercial float passengers; (2) commercial motor passengers; (3) non-commercial (private) floaters; (4) non-commercial (private) motor boaters. Self-administered written survey instruments will be used to collect information on variables of interest. Boaters will be contacted at launch sites (put-in and take-out) and asked to provide a mailing address for a mail survey. This approach ensures the minimum interference with boaters' river experiences, while maintaining consistency in the way boaters are approached and guaranteeing a representative sample (assuming a high response rate). Boaters will be asked about the types of experiences they had, the quality of those experiences, and factors (social, managerial, and physical) that affected experience quality. (Specific topic areas and survey questions are presented below.)

The study must also be able to address the effectiveness of the ROS zoning of the river. That means we must be able to assess how well the Wild section provides the opportunities prescribed in the river plan and how well the Scenic section provides the opportunities it is supposed to provide. Given the temporal zoning on the Wild section during the summer months, it is also necessary to be able to describe any differences in experiences that occur on motorized versus non-motorized days.

Our sampling design is a two-stage cluster sample, with the first stage consisting of a random cluster sample of days/locations for collection of names and addresses, and the second stage consisting of a systematic (interval) sample with a random start of individuals from within each of the four strata. (Specific procedures are described below.)

2. Computation of Sample Sizes

To estimate required sample sizes (n 's), we need to establish four parameters: population sizes (N), the desired level of precision of estimates (called ε or B , depending on formulae), the confidence bounds, and the expected variance in the data. Some of our measures will use 7-point scales. For these measures, we seek to estimate mean responses for each of the four primary user

groups with a precision of ± 0.5 points (i.e., 14%), at the 95% confidence level. For data representing proportions (e.g., the percentage who “agree” with a statement), we seek to estimate statistics with a precision of $\pm 5\%$ at the 95% confidence level. For proportions, the most conservative estimate of variance assumes a 50-50 split in responses. (We use this to estimate sample sizes for proportions.) For continuous data, variances are typically estimated from pilot studies or prior data. Such data are unavailable for Hells Canyon. (Earlier studies, such as those by Krumpe et al. (1989) and Idaho Power (1999), either did not ask questions of the type we ask or did not have continuous response categories.) Therefore, a range of types of similar data from other recreational visitor studies was used to estimate needed samples under various possible response distributions. Appendix A presents details of computations for sample sizes.

Table 2 shows launch numbers in 2001. The population sizes (N) for the four groups of interest are quite variable (in 2001 there were 2,080 commercial floaters; 35,998 commercial power boaters; 3,010 private floaters; and 11,999 private power boaters). However, as shown in Appendix A, all population sizes are sufficiently large that the finite population correction ($N/[N-1]$) approaches unity. Because of this, the required sample sizes to estimate parameters are quite similar for all user groups.

Table 2. Use Levels (Launches) in 2001

	Primary Season				Secondary Season			
	Commercial		Private		Commercial		Private	
	Float	Power	Float	Power	Float	Power	Float	Power
Total People	2021	23026	2289	5307	59	12972	721	6692
Average People/day	18	209	21	48	0.2	51	3	26

To estimate means with 95% confidence and 14% error bounds would require relatively small sample sizes (fewer than 100 per user group). For example, using pilot data from another recreation study, data on attainment of various types of experiences (e.g., solitude, freedom, socializing) would need n 's ≈ 35 people per user group (see Appendix A). Estimating the percent of time people are in sight of others during the day would require n 's ≈ 30 . Estimating the mean evaluation of problems noticed (litter, disruptive groups, environmental conditions), would

require n 's ≈ 50 . Thus, fewer than 100 respondents from each group will be needed to estimate parameters for continuous variables.

Estimating proportions will require larger samples. For example, if we assume the most conservative outcome (50-50 split), we would need n 's between about 336 (commercial floaters) and 356 (commercial power boaters). Based on our experiences conducting other recreation studies, it is unlikely that we will find many variables that generate 50-50 splits in responses. If distributions were 70/30, the required sample sizes would drop to between 153 and 163 per user group. It seems likely that actual distributions of responses will be within this range (between 50/50 and 70/30).

Based on the need to estimate proportions, we set our target sample size for the primary season (the Friday before Memorial Day through September 10) at 300 returns per user group. According to our calculations, this is actually larger than would be needed to guarantee the desired precision for all parameter estimates. In order to obtain 300 returns from each of the four user groups, assuming a 77% response rate (the rate obtained in a study of boaters in Hells Canyon in 1988-89; Idaho Power's 1999 study reported a 70% response rate), we need to collect 390 names and addresses for each group. Assuming a 10% non-response rate during initial on-site contacts (the rate was lower than this in 1988-89, but was about 20% during Idaho Power's 1999 study), we need to contact 433 people from each group (Table 3).

Table 3. Targeted Number of Names/Addresses Per User Group and Use Season

	Primary Season			Secondary Season ¹		
	Contacts	Names	Returns	Contacts	Names	Returns
Commercial Float	433	390	300	0	0	0
Commercial Power	433	390	300	289	260	200
Private Float	433	390	300	0	0	0
Private Power	433	390	300	289	260	200

¹See text for discussion of floating use during the secondary season.

For the secondary season, Table 2 demonstrates that use by two groups (commercial floaters and private floaters) is very low. For example, the total number of private floaters launching anywhere on the river averages about three people per day. We believe this low level of use

makes on-site sampling of these users impractical. Therefore, only power boat use was used to determine sampling during the secondary season. We set our target for returned mail surveys at 200 for each of the two power boating groups. Using the same assumptions about refusals as for the primary season, we would need to obtain names from 260 boaters, and we would need to contact a total of 289 people from each group.

3. Selection of Sample Dates:

The above analysis specified the number of contacts needed to generate an adequate sample from each user group. The next step is to determine how many days of sampling are needed to generate this sample and decide where sampling should occur. Allocating sampling days across locations is somewhat challenging, because the four different boater groups use the primary access points in different proportions. Moreover, their use intensity at each launch varies by season. Because of these differences, separate sampling schedules were developed for each group for each season, to ensure that the target sample of each will be obtained. This separate sampling means that data cannot and should not be simply aggregated in presentations of results, because different proportions of each user type are being obtained.

A. Sampling during the Primary Use Season - Motorized Days

There are approximately 20 days each year when motorized boats are prohibited on the Wild section of the Snake. Sampling of these boaters will be addressed below. Sampling of boaters during the remaining motorized days in the primary use season is presented here.

Float boaters:

Commercial and private floaters will be sampled in the same way at the same locations. Their use levels almost identical in the primary season, and Forest Service records combine them in a single measure. Therefore, the same sampling approach will be used to obtain 390 names from each (commercial and private) category of floaters.

Nearly 100% of float boaters put in at Hells Canyon Creek (Table 4). About 59% take out at Pittsburg Landing (Table 5). According to Forest Service reports, 15% jet back to the dam at the end of their trip. By sampling floaters at HCC and Pittsburg, then, all float boaters will have an

opportunity to be sampled. We need an adequately large sample of days at HCC and/or Pittsburg to ensure that we can contact 433 private floaters and 433 commercial floaters (to generate 390 names for each). The smaller of the two groups is commercial floaters, who average 18 people launching per day in the primary use season. To contact 433 would therefore require approximately 24 days of sampling at HCC and/or Pittsburg. All floaters present on sample days will be contacted.

Private Power Boaters:

Private power boaters are perhaps the most diverse group in the way they use the river. Some launch at HCC, boat in the upper river, and return to the dam at the end of their trip. Others boat south from the Lewiston/Clarkston area and stay mainly in the Scenic stretch. Others boat from Pittsburg to Kirkwood or the dam and back. This diversity presents some challenges for representing private power boaters. Fortunately, however, all private power boaters from the north must stop at Cache Creek to obtain a permit, and this is a logical place to contact them. About two-thirds of weekday and 71% of weekend private power boaters pass through Cache Creek at the start of their trip (Table 4). The remaining private power boaters can be contacted at HCC or Pittsburg, where substantial proportions both launch and take out (Tables 4 and 5).

Based on the distribution of private power boaters' launch use, about 65-70% of sampling should occur at Cache Creek, 20-30% at Pittsburg, and 7-8% at HCC. We propose to every other boater for inclusion in the survey. This will ensure a greater representation of trips across the primary season and across locations. This will require approximately 24 days of sampling to generate 390 names.

Commercial Power Boaters:

Virtually all commercial power trips take out at one of six locations (Table 5): HCC (27.8%), Pittsburg (3.4%), the Quality Inn (45.2%), Hellsgate State Park (17.9%), Swallows Park (4.6%), and Heller Bar (1.1%). To obtain 390 names, we would only need a few days of sampling (the average number of commercial power boaters on the entire river per day is 209). However, we desired to have more than a few days of sampling, in order to capture the views of different clients on different trips across the primary season. (Surveying all passengers on one very large

commercial trip might not represent the views of passengers on other trips or to other locations.) Therefore, we will contact 1-in-5 commercial passengers. This will require approximately 24 days of sampling, which will be allocated proportionately across take-out locations. (Most commercial trips launch and take out at the same locations. Therefore sampling can occur at the start or the end of the trip.) For commercial power boaters, we will sample at HCC, Pittsburg, the Quality Inn, and Hellsgate State Park in the primary motorized season.

Table 4. Percent of Put-In Use by Location and User Type, Primary Use Season

	Private Power		Commercial Power		Float Boaters	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
	-----Percent-----					
Cache Creek	63	71				
Pittsburg	30	21	3	4	2	1
HCC	7	8	23	27	98	99

Table 5. Percent of Take-Out Use by Location and User Type, Primary Use Season

	Private Power		Commercial Power		Float Boaters	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
	-----Percent-----					
Heller	56.8	49.4	0.9	2.6	14.9	25.0
Pittsburg	18.7	24.9	3.2	4.4	62.4	53.1
HCC	7.7	6.4	25.0	30.0	0.0 ¹	0.0
Quality Inn	0.0	0.0	49.9	38.3	0.0	0.0
Hellsgate	6.4	4.7	16.8	18.6	0.0	0.0
Swallows	3.5	4.0	3.4	5.9	0.0	0.0
Other	6.9	10.6	0.8	0.2	22.7	21.9

¹These numbers do not include approximately 15% of floaters who jet back to the dam.

Land travel between boat launches in Hells Canyon is difficult and time consuming. For the sake of efficiency, we chose to draw a cluster sample of blocks of days. We randomly selected 15 dates during the primary season (between August 1, 2003 and September 10, 2003 and between May 28, 2004 and July 31, 2004). Sampling will occur on those 15 dates as well as the two subsequent days (i.e., sampling will occur on three consecutive days on each occasion, for a total of 45 person-days of sampling). The randomly selected dates will be randomly assigned to one of the five study launches (Pittsburg, Hells Canyon Dam, Cache Creek, the Quality Inn, and Hellsgate State Park), according to the stipulations about sampling intensity specified above. (Note that sampling at Hellsgate can occur on the same days as at the Quality Inn. However,

fewer days are required at Hellsgate, so that site will not be visited every time the Quality Inn is sampled.) In 2001, Red Wolf Crossing was not a launch point, so it did not figure into sampling protocols. However, in 2003 and 2004 it will receive substantial levels of commercial use. Therefore, it will be sampled on the days that sampling occurs at the Quality Inn.

Table 6 presents the sample schedule for the motorized days of the primary use season. It also includes our estimates of the number of boaters expected to be present (which is shown in parentheses). These projections are based on use data from the 2001 season. (Average numbers of launches and take-outs for each user group for each launch were computed separately for weekend days and weekdays for each month.) Numbers outside parentheses represent the expected number of contacts. (Contacts are less than the number of people present for Private Power and Commercial Power groups, due to interval sampling of these populations.) As evident in Table 6, we expect this schedule to generate at least the target number of contacts for each group.

Table 6. Sampling Schedule for the Motorized Portion of the Primary Use Season¹

Date	Days	Location	Launch/ Out	Power		Float ²	
				Pvt	Comm.	Pvt	Comm
Primary Season 2003							
8/3-8/5	S,M,T	Cache	Launch	56 (112) ³	0	0	0
8/7-8/9	H,F,S	HCC	Launch	5 (10)	18 (90)	136	
			Out	4 (7)	38(189)	20 ⁴	
8/20-8/22	W,H,F	QI/HG ⁵	Out	0	78 (389)	0	
8/29-8/31	F,S,S	Cache	Launch	77 (154)	0	0	0
9/4-9/6	H,F,S	Pitt	Launch	18 (35)	1 (7)	1	0
			Out	24 (48)	1 (5)	100	
9/9-9/11	T,W,H	Pitt	Launch	12 (25)	1 (6)	0	0
			Out	7 (14)	0 (3)	2	
Primary Season 2004							
5/31-6/2	M,T,W	Pitt	Launch	15 (32)	1 (7)	0	0
			Out	8 (16)	1 (6)6	46	
6/16-6/18	W,H,F	QI/HG ⁵	Out	2 (5)	78 (391)	0	
6/25-6/27	F,S,S	HCC	Launch	10 (20)	26 (128)	96	
			Out	11 (22)	29 (144)	14	
7/8-7/10	H,F,S	QI/HG ⁵	Out	6 (13)	85 (423)	0	0
7/3-7/5	S,M,T	Cache	Launch	61 (122)	0	0	0
7/15-7/17	H,F,S	HCC	Out	4 (9)	42 (212)	23	
			Launch	5 (10)	41 (207)	152	
7/19-7/21	M,T,W	Pitt	Launch	18 (36)	6 (34)	5	
			Out	10 (21)	5 (32)	80	
7/23-7/25	F,S,S	Cache	Launch	79 (158)	0	0	0
7/29-7/31	H,F,S	HCC	Launch	5 (10)	41 (207)	152	
			Out	5 (9)	42 (212)	23	
TOTAL				442	534	850	

¹Use estimates based on 2001 averages for same month and days of week

²Commercial and private float use is usually combined in published reports. However, their level of use is almost exactly equal, so it is reasonable to assume half of the float use is private and half is commercial.

³Number of contacts is 1-in-2 for Private Power and 1-in-5 for commercial power. Total number of people expected to be present is represented in parentheses.

⁴15% of floatboaters (commercial and private combined) jet back to the dam. Estimates for floaters taking out at HCC are based on this proportion.

⁵QI will be sampled all three days; Hellsgate will be sampled on 2 days.

B. Non-Motorized Days

One important evaluation that will be made during the monitoring process is how experiences during the non-motorized window (NMW) differ from experiences during motorized times.

Every other week during the primary use season, motor boats are prohibited on the Wild Section on Monday, Tuesday, and Wednesday. The NMW was implemented on the Wild section of the

Snake to increase the range of experiences provided, and it is essential to evaluate whether and to what extent this goal is achieved.

Therefore, we propose to conduct a separate sample of boaters on the Wild section of the Snake who boat during non-motorized days. (The two relevant contact points are HCC and Pittsburg Landing.) This sample will include float boaters (both private and commercial), as well as motorized boaters who launch from Pittsburg Landing (they are permitted to boat to Kirkwood Ranch). Given the small population size during the approximately 20 days of the NMW, we will sample on all non-motorized days from 8/11/03 to 7/28/04 (6 non-motorized periods). This intensity is required to obtain adequately large samples of boaters. Sampling will occur equally at Pittsburg and HCC. When the sampling location is Pittsburg, we will contact boaters on Tuesday, Wednesday, and Thursday (rather than on Monday, Tuesday, and Wednesday). This will capture more of the boaters who launch from HCC during the NMW, because it takes two days to reach Pittsburg from HCC. Table 7 displays the expected number of boaters present at the sampling locations for the NMW sample.

In addition to the sample of floaters (and power boaters from Pittsburg) during the NMW, we will survey power boaters at Cache Creek during the 2004 NMW as well. (Unlike the rest of the sampling, commercial power boaters will be contacted at Cache Creek during the NMW days.) This will permit assessment of power boaters' experiences and views specifically during the NMW. (Although power boaters are not permitted in the Wild section during the NMW, it is possible that power boaters on the Scenic section express different views during non-motorized times.)

It is important to note that the NMW samples are separate from the larger sample of boaters in the primary and secondary use seasons. The data for these boaters will be presented separately, not combined with the other samples. Analyses will compare responses of boaters during the NMW to those of boaters during motorized times.

Table 7. Sampling Schedule and Expected Number of Contacts During the NMW

Date	Days	Location	Float Boaters ¹	Private Power ²	Commercial Power
8/12-8/14 2003	T,W,H	Pittsburg	89	13 (27)	
8/25-8/27 2003	M,T,W	HCC	137	0	
6/8-6/10 2004	T,W,H	Pittsburg	45	8 (16)	
		Cache	0	27 (55)	82 (413)
6/21-6/23 2004	M,T,W	HCC	95	0	
		Cache	0	27 (55)	82 (413)
7/12-7/14 2004	M,T,W	HCC	146	0	
		Cache	0	43 (87)	97 (486)
7/27-7/29 2004	T,W,H	Pittsburg	95	18 (36)	6 (34)
		Cache	0	43 (87)	97 (486)
TOTAL		Cache	607	193	364

¹ Combines private and commercial floaters.

² Private Power numbers are based on the average number of daily launches from Pittsburg

Figures for HCC are based on the number of launches.

Figures for Pittsburg are based on the assumption that 65% of those launching from HCC will take out at Pittsburg.

C. Sampling During the Secondary Use Season

Use levels and distributions are different in the secondary season than in the primary season. To obtain 260 names from commercial power boaters and 260 from private power boaters will require approximately 36 days of sampling for private power boaters (assuming a sampling interval of 2) and approximately 36 days for commercial power boaters (assuming a sampling interval of 5). As shown in Table 8, private power boat use is concentrated at Cache Creek, Pittsburg, HCC, and Heller Bar during the secondary season (the precise proportions vary by day of week and month). Half of commercial use is out of the Quality Inn, with most of the rest occurring at HCC and Hellsgate.

Table 8. Distribution of Take-Out Use During the Secondary Use Season.

	Private Power	Commercial Power
	-----Percent-----	
Heller Bar	40-70	<10
Pittsburg	20	<10
HCC	6-30	20
Hellsgate	10	20
Quality Inn	0	50
Swallows Park	0	5

Table 9 displays the 20 randomly selected sample dates and sample locations for the secondary use season. (Any sample dates for HCC or Pittsburg that fell in January or February were moved to the closest weekend, because prior use data indicate that there is virtually no weekday use during those months at those sites.) The table shows the expected number of boaters present (in parentheses) and the number to be contacted (outside parentheses). This schedule will generate the desired number of names (260 from each group).

Table 9. Sample Schedule and Expected Number of Contacts for the Secondary Use Season

Date	Days	Location	Launch/ Out	Power	
				Private	Comm.
Secondary Season 2003					
9/17-9/19	W,H,F	QI/HG	Out	0 (1)	47 (235)
9/24-9/26	W,H,F	HCC	Out	5 (10)	7 (33)
			Launch	2 (5)	15 (76)
10/6-10/8	M,T,W	Pitt	Out	7 (14)	0 (3)
			Launch	5 (11)	0 (4)
10/19-10/21	S,M,T	Heller	Out	29 (58)	5 (24)
10/27-10/29	M,T,W	QI/HG	Out	0 (1)	47 (235)
11/4-11/6	T,W,H	Heller	Out	25 (50)	3 (18)
11/15-11/17	S,S,M	HCC	Out	15 (30)	3 (14)
			Launch	19 (39)	4 (20)
12/3-12/5	W,H,F	QI (no HG)	Out	0	12 (60)
12/19-12/21	F,S,S	Heller	Out	49 (99)	5 (25)
Secondary Season 2004					
1/24-1/26	S,S,M	Heller	Out	22 (44)	0
2/7-2/9	S,S,M	Heller	Out	22 (44)	0
3/5-3/7	W,H,F	Swallow	Out	0 (1)	1 (4)
3/21-3/23	S,M,T	QI/HG	Out	2 (4)	36 (180)
3/28-3/30	S,M,T	HCC	Out	2 (5)	2 (10)
			Launch	2 (5)	0 (3)
4/3-4/6	S,S,M	QI/HG	Out	5 (10)	15 (76)
4/17-4/19	S,S,M	Pitt	Out	14 (29)	0 (1)
			Launch	12 (24)	0 (3)
4/26-4/28	M,T,W	QI/HG	Out	1 (2)	26 (130)
5/6-5/8	H,F,S	Heller	Out	20 (40)	2 (10)
5/18-5/20	T,W,H	Pitt	Out	3 (7)	0 (0)
			Launch	7 (14)	2 (9)
5/23-25	S,M,T	QI/HG	Out	2 (4)	57 (289)
TOTAL				270	289

¹Use estimates based on 2001 averages for same month and days of week

²Number of contacts is 1-in-2 for Private Power and 1-in-5 for commercial power. Total number of people expected to be present is represented in parentheses.

4. On-Site Collection of Names and Addresses for the Mail Survey

A. Approach

On-site sampling will be used primarily to collect names and addresses for a mail survey. It will also ask a small number of questions (Appendices C-1 and C-2) that will permit analysis of non-response bias. (Those who do not respond to the mail survey will be compared to those who do, to determine whether there are any systematic differences. Idaho Power's 1999 study found few such differences.) The contact cards also obtain information about experiences and encounters that might be difficult for boaters to recall later.

B. On-Site Data Collection: Procedures

On the selected days, a researcher from the University of Idaho will begin sampling between 7:00 and 9:00 in the morning and continue for approximately 8 hours, with a one-hour break for lunch. The start times will be flexible to ensure that sampling coincides with the times of greatest use. (For example, days may begin earlier at Hells Canyon Dam, because boaters launch early in the day, but days may begin later at Heller Bar, because boaters are taking off the river later in the day.) Start and end times will be specified for each launch prior to the start of data collection, based on consultation with river rangers and others knowledgeable about boaters' use of those sites.

During surveying hours, researchers will approach all boaters sixteen years or older who are launching or taking off the river. Researchers will inform boaters that they are conducting a survey on behalf of the U.S. Forest Service through the University of Idaho that is designed to monitor the quality of boaters' experiences in Hells Canyon (see Box). If appropriate (for example, at Heller Bar), boaters will be questioned to ensure that they actually entered the HCNRA and which segment they used. They will be told that their participation is voluntary and that responses will be confidential, and they will be told that only a small number of boaters is being randomly selected to participate. They will then be invited to participate. Those agreeing will receive a contact card along with a clipboard and pencil. The contact cards differ slightly for those launching (Appendix C-1) and taking-out (Appendix C-2). They will complete the instrument on their own and return it to the researcher.

Box: Contact Script

Hi, my name is Troy. I'm a researcher with the University of Idaho, conducting a survey on boaters' Hells Canyon experiences for the US Forest Service. The Forest Service wants to understand how their management of the river and conditions boaters encounter affect boaters' experiences. We're asking a small number of randomly selected boaters to participate in this important study. Today, we're asking people to fill out a short card with a few questions about you and asking for your name and address so we can send you a mail survey. If you want to participate, your answers will be confidential, and we won't release your name or contact information to anyone. Would you be willing to help us out?

Researchers will keep a log form to document all boaters seen and contacted (Appendix D). Each day, they will note the location, weather, and start and end times for each day of contact. For each group of boaters seen, one line on the log form will be completed, indicating the type and number of craft, the status (commercial or private), group size, and any other pertinent information about each group, including the segment boated. They will indicate how many adults (at least 16 years old) were asked to participate, how many agreed, and how many refused. They will also note if they missed any boaters. Each contact card will receive a unique number linking it to the log form information.

C. Content of the Contact Card

A primary purpose of the contact card is to collect names and addresses. Another purpose is to permit us to assess non-response bias in the mail survey. We expect a high level of participation in the on-site portion of the study, but the response rate to the mail survey will be lower. By comparing on-site responses of those who later return the mail survey to those who do not, we can determine whether there are any systematic non-response biases. In 1988-89 (Krumpe et al.) and in 1999 (Idaho Power), there were very few such biases. However, should any be evident, they will be reported and discussed in the final report. In other studies, non-respondents have tended to be those with less experience on the river and members of organized groups or commercial passengers (Hall & Shelby 1996). Therefore, questions on the contact card include number of trips to Hells Canyon in the past two years (two years is the time frame presented in the 1988-89 study) and group size. (Commercial or private status and type of craft will be documented by the researcher.)

A third purpose of the on-site contact card is to collect trip-specific information that might be difficult or unreliable to obtain in a later mail survey. To do this, we have developed two versions of the card. For those launching, basic trip and visitor information will be collected, in addition to experiences sought. The items about experiences include fishing, whitewater, socializing, and other common river trip motivations. These are included to discern the extent to which boaters seek the types of experiences the Forest Service hopes to provide on the river. Those contacted as they take-out will receive a slightly longer card. In addition to the trip and visitor characteristics, the longer card asks about high and low points of the trip (open-ended), number of encounters with other boaters, and experiences obtained.

The final purpose of the on-site contact card is to collect information to allow us to determine which version of the mail survey to send to respondents. As discussed below, boaters will receive a survey pertinent to either the Wild or the Scenic section of river. (With a few minor exceptions, the questions will be the same, but the respondent will be asked to think only of one or the other segment of the river.) The contact card will document which section(s) of river boaters visited so they can be sent the appropriate survey instrument.

5. Mail Survey

A. Mail Survey Topics

The mail survey (Appendices E-1 and E-2) contains four sections: questions about the specific trip; questions about general impressions of the river; perceptions of change since 1998; and boater information.

Specific Trip. Questions are asked about the specific trip on which boaters were contacted in order to permit managers to know how many boaters perceive various conditions and the intensity of their evaluations. They also will be comparable to questions asked in earlier studies, which referred to a specific trip. These responses can be matched to the specific section of river run by each boater, to ascertain differences between the Wild and Scenic sections, as well as differences during different times of the year. Trip-specific data will permit analysis of relationships among variables, such as between the number of encounters and perceptions of crowding.

General Impressions of the River. These questions pertain to overall assessments of the ORVs of the river that are not dependent on a specific trip. For example, boaters are asked to indicate whether they believe that river management treats different users fairly. Another question asks boaters what, if anything, they would change in river management.

Perceptions of Change Since 1998. In the years since the River Plan was signed in 1994, many changes in river management have taken place. One major change was the implementation of the non-motorized window in 1999. An important goal of our study is to determine whether those management changes have improved the quality of river experiences and whether they protect opportunities for targeted experiences, specifically challenge, self-reliance, and solitude. Boaters who have been boating on Hells Canyon for more than 5 years will be asked to indicate whether various experiences have improved, deteriorated, or stayed the same. (Similar questions were asked successfully on the Owyhee River; Dickson & Hall, 2003.) Asking such questions relies on boaters' memories, which may or may not be accurate. However, during our interactions with boaters we have found that many have strong views about the nature of changes on the river and seek an opportunity to express those views.

Boater Information. Boater information questions (basic socio-demographics and past experience) are typically asked in river recreation studies. Such information allows managers to characterize how their populations of visitors differ from boaters in prior studies and on other rivers. Past experience data are also important in understanding boaters' evaluations of conditions they encounter.

B. Mail Survey Question Development

Questions were developed from several sources. One was past surveys, both in Hells Canyon and on other rivers (e.g., Dickson & Hall, 2003; Hall & Shelby, 1996; Idaho Power, 1999; Krumpke, Allen & McCoy, 1989). Such efforts have established reliable, accurate measures for many variables of interest. In addition, some commonly asked questions permit managers to assess how the Snake compares with other rivers. As an example, a 9-point "crowding" question has been asked in dozens of river surveys, and we propose to use that measure here.

Some questions were developed specifically for this study to address the ORVs and ROS setting attributes set forth in the River Plan. Specific wording was kept as close to the wording of the plan as possible, though question formats were developed to follow commonly used response categories.

An important source of question content was input from stakeholders. During three public meetings held in Lewiston, Boise, and Baker City in June 2003, boaters identified factors that they feel contribute positively to or detract from their experiences on Hells Canyon. Many of these were identified in planning documents, but additional items (e.g., concern about dogs; conflicts at boat ramps) were suggested by boaters. Where possible, existing questions addressing these topics were used. Table 10 presents the types of items described by stakeholders. Additional suggestions were provided in reviews of the draft study plan.

Table 10. Stakeholders' Identification of Factors that Contribute Positively and Negatively to Their Hells Canyon River Experiences

	Positive	Negative
Management Policies or Actions	New toilets at Pittsburg and Cache Creek	Removal of toilets at campsites
	Helpful Forest Service staff at launch/take-out sites	Non-motorized window on the wild section
		Somewhat complicated permit system
Social Conditions	Meeting interesting people on the river	Disruptive or inconsiderate boaters on the river
	Generally not crowded	Having to wait at rapids for boaters who are strung out to pass
	People who lend a helping hand	Inconsiderate use of launch (causing delays for others)
		People who litter or don't use portable toilets
Environmental Factors	Seeing wildlife (especially bighorn sheep)	Improperly disposed dog waste
	Scenic beauty, historic & natural conditions	Human waste and toilet paper
		Loss of beaches and sand at beaches

Table 11 presents the topic of each question (or battery of questions), the rationale for the question, and the source of the question.

Table 11. Survey Topics, Rationales, and Sources

Question	Rationale	Source
Section 1: This trip		
Comparison of conditions with expectations	Fulfillment of expectations often explains satisfaction or dissatisfaction with a trip. Managers may desire to know whether visitors have accurate expectations. Items address ORVs and ROS attributes: social conditions, wildlife and fishing, whitewater, and wild character of the river	Asked in many surveys on rivers & wilderness; Shelby et al. 1983
Comparison of encounters to expectations	Addresses expectations for encounters with floaters and power boaters. Encounters are presumed to have a substantial impact on experiences, especially solitude.	Asked in 1988-89
Did actions of anyone else affect you?	Open-ended question designed to understand how aspects of encounters other than crowding affect experiences. Past research has shown that behavior of others is often more important than the number of encounters.	Modified from 1988-89 to allow for both “positive” and “negative” interactions
Crowding – open-ended	Crowding is a major concern on popular rivers, and use limits on the Snake were designed in part to alleviate crowding	Asked in 1988-89
Crowding – closed-ended	Asks boaters to evaluate how crowded they felt on the river, using a 9-point scale	Many river studies; Idaho Power 1999; Shelby et al. 1989
Perception and evaluation of facilities	Items ask whether boaters noticed facilities (e.g., toilets, navigational markers, picnic tables, buildings, historic sites); if so, they evaluate the extent to which those facilities added to or detracted from their experience. Many are elements targeted by management actions.	Many items from 1988-89 (responses altered slightly). Commonly asked in recreation studies (Hall & Shelby 1998; Hall et al. 1997)
Perception and evaluation of environmental conditions	Items ask whether boaters noticed conditions such as water levels, cultural sites, recreational impacts, wildlife, stock impacts, and weeds. Boaters who noticed evaluate the extent to which those facilities added to or detracted from their experience.	Many items from 1988-89; several items suggested by stakeholders

Perception and evaluation of social conditions	Items ask whether boaters noticed conditions such as noisy groups, FS rangers, campsite competition, waiting at rapids, and firearm use. If so, boaters evaluate extent to which conditions added to detracted from their experience.	Many items from 1988-89 and Idaho Power 1999; several items suggested by stakeholders
Effect of management actions on self-reliance, challenge, solitude	Items ask how specific management actions (e.g., removal of tables, toilets, and navigational markers) affected boaters' attainment of specific types of experiences proscribed in the river plan	Items developed for this study. Similar items asked by Hall & Cole 2002
Satisfaction with experiences	Items ask boaters to indicate whether they were seeking each of several types of experience and the extent to which they attained those experiences. The format is a typical "importance/performance" type of question.	Guadagnolo 1985; Hammitt et al. 1996
Section 2: Overall Perceptions		
Adequacy of facility provision	Items ask boaters to indicate whether they feel there are too many or too few facilities such as toilets, parking, and tables. This question is intended to assess visitor preferences. An earlier question asked how these facilities affect types of experiences.	Asked in 1988-89; Idaho Power 1999
Provision of ORVs	Questions ask boaters whether (and how strongly) they agree or disagree that the river provides the types of values proscribed in the River Plan.	Items developed from the Plan; standard Likert-type format
Changes to management	An open-ended question asks boaters what, if anything, they would change about river management	Item developed in response to stakeholder reviews
Perception of the NMW	A question asks boaters if they are aware that a NMW exists. If so, they are asked to describe (open-ended question) how this has affected their boating experiences	Item developed in response to stakeholder reviews
Section 3: Perceptions of Change		
Use history	Asks boaters whether they had experience on the Snake before 1998. This will filter out boaters who are capable of commenting on change	Asked in several river studies
Perceptions of change	Boaters indicate whether specific attributes based on ORVs (cultural resources, scenery, recreation, facilities, wildlife, solitude, naturalness, management, and campsite conditions) have improved, deteriorated, or stayed the same	Asked in several studies; some items suggested by stakeholders

Section 4: Boater Characteristics		
River experience	Items ask about specific experience in HCNRA as well as on other rivers	Asked in 1988-89; slightly modified
Season of use in Hells Canyon	Items ask about which seasons boaters have floated Hells Canyon. Will permit comparison of those floating in the secondary and primary seasons. Boaters are also asked why they choose to boat in the secondary use season.	New for this study
Overall evaluation of river	Asks boaters whether the Snake is among their favorite rivers	Asked in 1988-89; Idaho Power 1999
Skill levels	Ask boaters about their whitewater skill levels	Standard skill questions; Idaho Power 1999
Age	Basic demographic information	Standard question; Idaho Power 1999
Gender	Basic demographic information	Standard question; Idaho Power 1999
Education	Basic demographic information. Sometimes relates to perceptions of conditions and views on management	Standard survey question

C. Mail Survey – Procedures

As names and addresses are collected in the field, they will be entered into a spreadsheet to generate mailing labels. Answers to questions on the contact card will be entered into a spreadsheet. Mail survey administration will generally follow the Dillman Total Design Method (Dillman, 1978; Salant & Dillman, 1994) with three waves of mailings.

Mailings will be done in bulk lots for the sake of efficiency and ease of tracking. Boaters will be sent the version that corresponds to their trip (Wild vs. Scenic). Boaters who passed through both sections will be randomly assigned to one or the other version. Approximately two weeks after the first collection of names and addresses (and once a month thereafter), the boaters sampled from the on-site contact list will be sent a cover letter (see Appendix F) along with a survey booklet (See Appendix E-1 and E-2) and a postage-paid return envelope. Record will be kept of the date that the first mailing was sent.

As surveys are returned, they will be logged into the mailing data base, and names and addresses of those who returned surveys will be deleted. Survey data will be entered into the spreadsheet containing information from the contact cards. After three weeks from the date of the first mailing, postcards (see Appendix G) will be sent to all remaining individuals on the mailing list. The postcards will thank those who returned their surveys and gently remind those who did not that their participation is valued. Two weeks later, another copy of the survey itself with a new cover letter (See Appendix H) will be sent to all non-respondents. This will be the final effort to solicit participation.

Random checks of the spreadsheet will be performed regularly to ensure quality of data entry. Once a week, six random surveys will be selected and the spreadsheet will be inspected to ensure that there are no errors in data entry.

6. Analysis and Presentation of Data

Several analyses are important to this effort. One important question concerns potential non-response bias. Although we expect over 70% of mail surveys to be returned, there is the possibility that those who did not return surveys were in some way systematically different from those who did. Therefore, responses to the questions on the contact card will be used to perform a non-response bias check. Responses of those who returned the mail survey will be compared to responses of those who did not. Any significant differences that appear will be documented and discussed.

Data from all questions will be summarized by reporting frequencies and central tendency measures. Analysis of closed-ended questions will be performed using SPSS. Frequency data will be presented graphically where practical. Basic descriptive statistics will be presented for every question asked in the study. Because the mail survey will not be administered proportionately to use levels for the four groups of boaters, data will not be aggregated in any presentations. That is, the views of each of the four subgroups will be presented separately for each question.

Data will be presented for the primary use season vs. the secondary season, as well as for the Wild sections vs. the Scenic section. Additionally, analysis of “this trip” information will be performed for those boating during the non-motorized window on the Wild section compared to (1) boaters using the Wild section during the motorized days of the primary use season and (2) boaters on the Scenic section during the non-motorized days on the Wild section. Comparisons will be made between experienced and novice boaters. Additional multivariate analyses will be performed as requested by the Forest Service.

Interpretation of the data will be limited to the content and context of the questions.

Interpretation of the monitoring objectives and goals remains the responsibility of the US Forest Service.

TIMELINE

June, 2003	Public meeting with stakeholders
June, 2003	Development of study plan
July, 2003	Peer review and public comment on study plan
August, 2003	Begin on-site data collection
January, 2004	Analysis of initial data
February, 2004	Review and validation of survey questions and approaches
August 1, 2004	Cease on-site data collection
October 31, 2004	Submit draft report to USFS
December 31, 2004	Submit final report to USFS

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APPENDIX A: SAMPLE SIZE COMPUTATIONS

APPENDIX A: COMPUTATION OF SAMPLE SIZES

Our approach is a two-stage cluster sample, with the first stage consisting of separate cluster samples of days during the primary and secondary use seasons. A simple one-stage cluster sample: “involves taking a simple random sample of clusters and then sampling every enumeration or listing unit within each sample cluster. In some situations one would achieve greater efficiency if the sampling were performed in more than one stage. ...it is often better to take a sample of listing units within selected clusters” (Levy & Lemeshow 1991, p. 212). In our case, the clusters would be blocks of days and the listing units would be people present. In the second stage, a systematic (interval) sample will be taken from the list of names and addresses generated during the first stage. (See text of proposal for details of procedures.)

To estimate the number of respondents from each group required to generate estimates with specified error bounds and a given level of precision requires some assumptions about response distributions and knowledge of population sizes. Population sizes are displayed in the Table below. We adopt 95% confidence limits for all our estimates.

	Primary Season				Secondary Season			
	Commercial		Private		Commercial		Private	
	Float	power	float	power	Float	power	float	power
People	2021	23026	2289	5307	59	12972	721	6692

For **estimation of means**, two similar formulae are available:

For a systematic sample, the sample size (n) required to estimate μ with a bound B on the error of estimation (Scheaffer et al. 1996, p. 265):

$$(eq1) \quad n = \frac{N\sigma^2}{(N-1)D + \sigma^2}$$

$$\text{Where } D = B^2/4$$

From Levy & Lemeshow 1991:

$$(eq2) \quad n = \frac{z^2 V^2}{\epsilon^2}$$

$$\text{Where } V^2 = \frac{[(N-1)/N]s^2}{\chi^2}$$

Example Calculations, assuming a question using 7-point scales related to experiences, with mean of 5.2, $sd = 1.50$, $s^2 = 2.25$, $\epsilon = .10$, and $N=2080$. From Eq 2:

$$V^2 = [(2079)/(2080)](2.25)/5.2^2 = .08317$$

$$n = (1.96^2)(.08317)/(.10^2) = 32$$

if $\epsilon = .05$, then $n = 128$

Or using Eq 1, where B is set at 0.5

$$n=35$$

Using data collected in various recreation studies of hikers, float boaters, and power boaters, we computed several projections for sample sizes, as displayed in the table below.

Sample Sizes Needed to Estimate Means, Given Projected Response Distributions

Question type	Mean	SD	Error bound ¹	N	n
Experiences attained (e.g., solitude, challenge) (7-point scales)	5.2	1.50	$\epsilon = .10$	2080	32
Percent of time in sight of other boaters	26	28	$B = 10$	2080	31
Evaluation of number of kayakers seen on the Owyhee River (“too many” to “too few”) (private boaters)	2.94	0.55	$\epsilon = .05$	2080	53
Evaluation of number of kayakers seen on the Owyhee River (“too many” to “too few”) (commercial boaters)	2.97	0.64	$\epsilon = .05$	2080	71
Evaluation of number of kayakers seen on the Owyhee River (“too many” to “too few”)	2.94	0.55	$\epsilon = .05$	35998	54
Evaluation of number of rafters seen on the Owyhee River (“too many” to “too few”) (private boaters)	3.26	0.65	$\epsilon = .05$	2080	61
Evaluation of number of rafters seen on the Owyhee River (“too many” to “too few”) (commercial boaters)	3.28	0.62	$\epsilon = .05$	2080	55
Comparison of “challenging whitewater” with expectations (private boaters)	3.09	0.90	$\epsilon = .05$	2080	130
Comparison of “number of groups seen” with expectations (private boaters)	3.24	0.96	$\epsilon = .05$	2080	135
Comparison of “challenging whitewater” with expectations (commercial boaters)	3.20	0.89	$\epsilon = .05$	2080	119
Comparison of “challenging whitewater” with expectations (commercial boaters)	3.01	0.96	$\epsilon = .05$	2080	156
Crowding on the Owyhee (9-point scale), commercial boaters	2.72	1.66	$B = .5$ pt	35998	21
Problems noticed (7-point scale)	2.5	1.8	$B = 0.5$	2080	51

¹In each case, seeking to estimate means with 95% confidence

For **estimation of proportions**, the sample size required to estimate p with a bound of B on the error of estimation:

Scheaffer et al. 1996:

$$(eq3) \quad n = \frac{Npq}{(N-1)D + pq}$$

From Levy and Lemshow (p. 62):

$$(eq4) \quad n \geq \frac{z^2 NP_y(1-P_y)}{(N-1)\epsilon^2 P_y^2 + z^2 P_y(1-P_y)}$$

Where ϵ is the error bound, expressed as a proportion of the true population parameter

Using Eq 4, and assuming 50-50 splits in proportion data ($P_y = 0.5$); desiring to be within $\pm 5\%$ of the true proportion with 95% confidence ($z=1.96$), needed sample sizes are:

	Commercial		Private	
	Float	power	float	power
N (2001)	2080	35998	3010	11999
n (50/50 split)	324	379	340	372
n (70/30 split)	152	163	156	162

Example calculations:

n (commercial floaters, assuming **50/50 split**)

$$= (1.96^2)(2080)(0.5)(0.5)/[(2079)(0.1^2)(0.5^2) + (1.96^2)(0.5)(0.5)] = 324$$

n (commercial floaters, assuming **70/30 split**)

$$= (1.96^2)(2080)(0.7)(0.3)/[(2079)(0.1^2)(0.7^2) + (1.96^2)(0.7)(0.3)] = 152$$

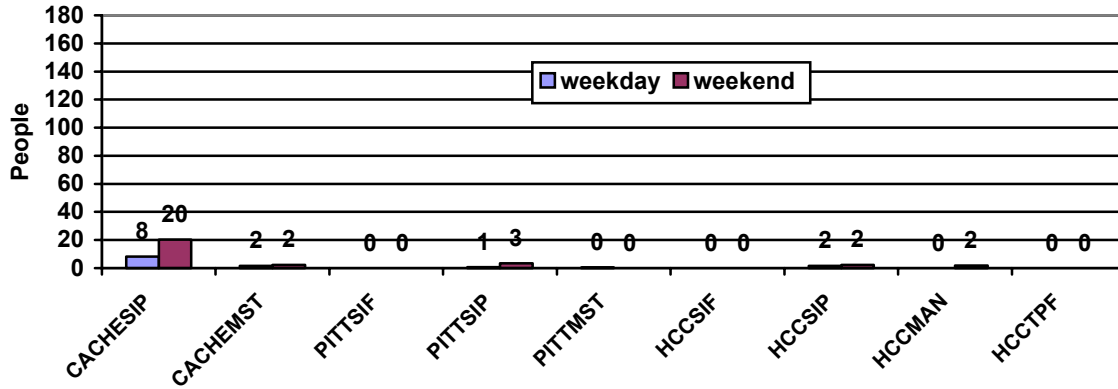
APPENDIX B: USE LEVELS IN 2001
Average Number of People Launching Per Day

Note: the following codes are used by the Forest Service in all figures presented in Appendix B:

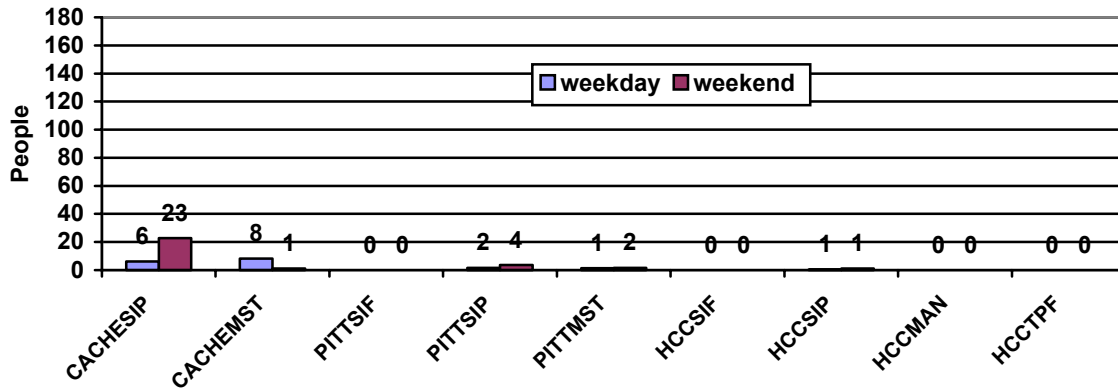
CACHESIP = Self issue private power boat from Cache Creek
CACHEMST = Commercial power manifest from Cache Creek
PITTSIF = Self-issue private float permit from Pittsburg
PITTSIP = Self-issue private power boat permit from Pittsburg
HCCSIF = Self-issue private float permit from Hells Canyon Creek
HCCSIP = Self-issue private power boat permit from Hells Canyon Creek
HCCMAN = Commercial power manifests from Hells Canyon Creek
HCCMTPF = Commercial and private trip permits from Hells Canyon Creek (primary season)

2001 Hells Canyon Use Data Average Number of People Launching Per Day

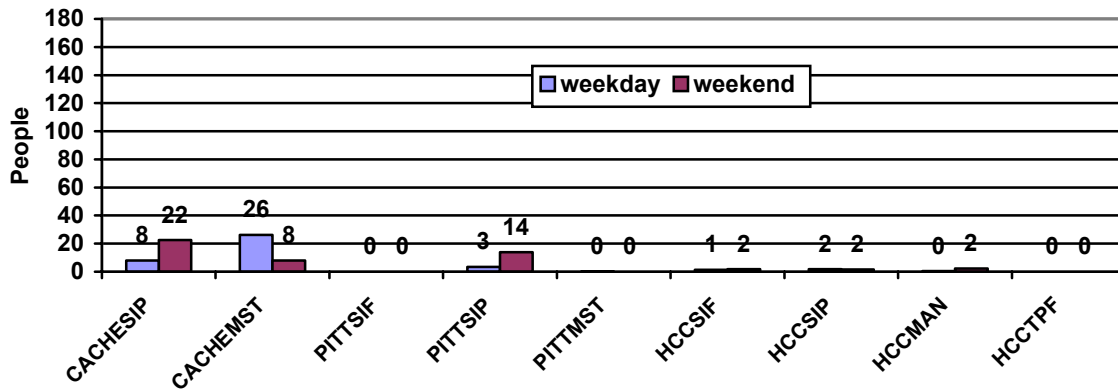
January



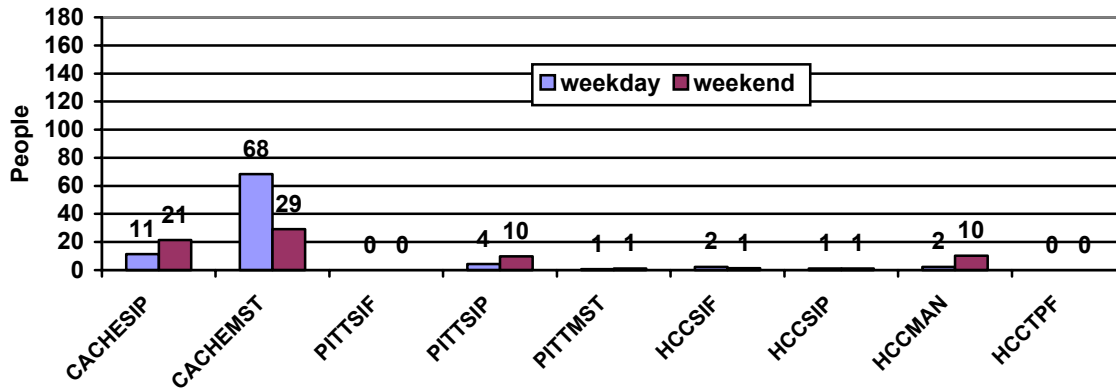
February



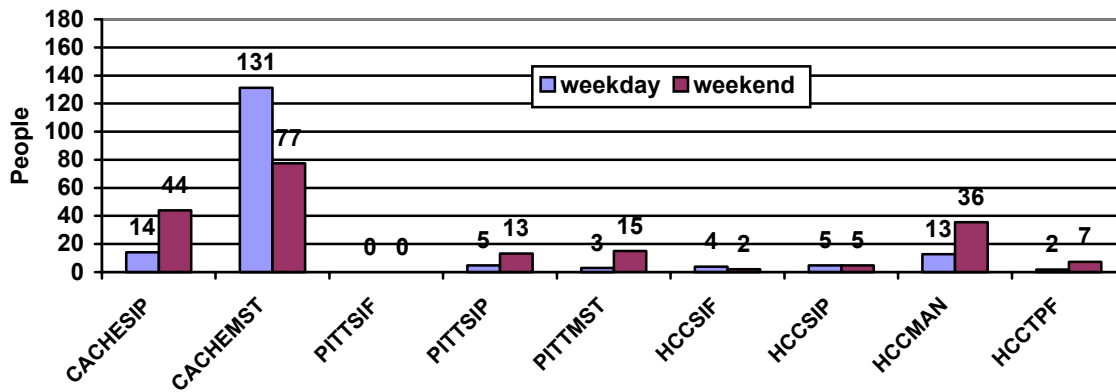
March



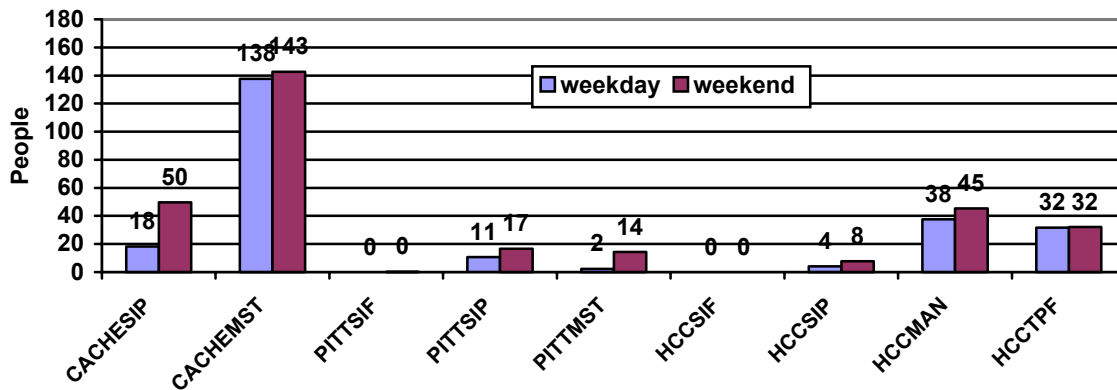
April



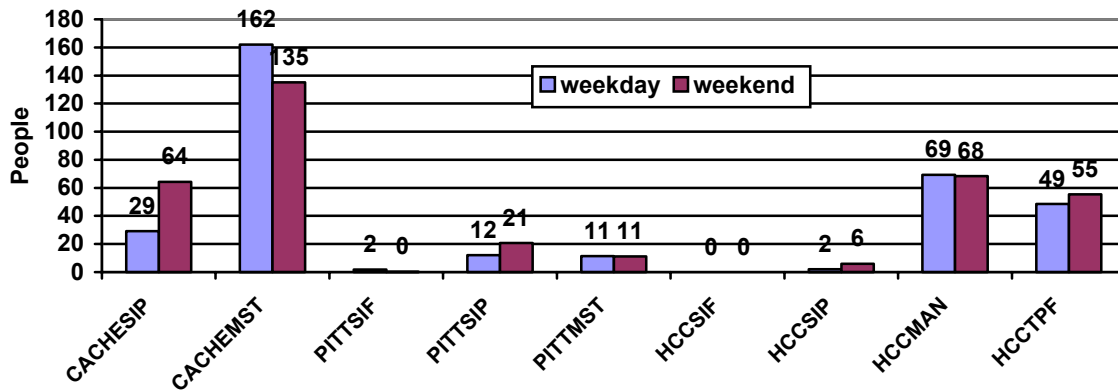
May



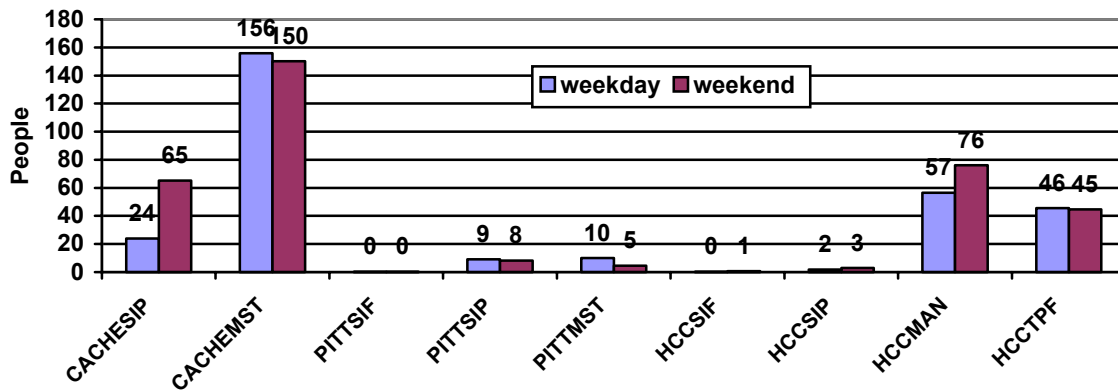
June



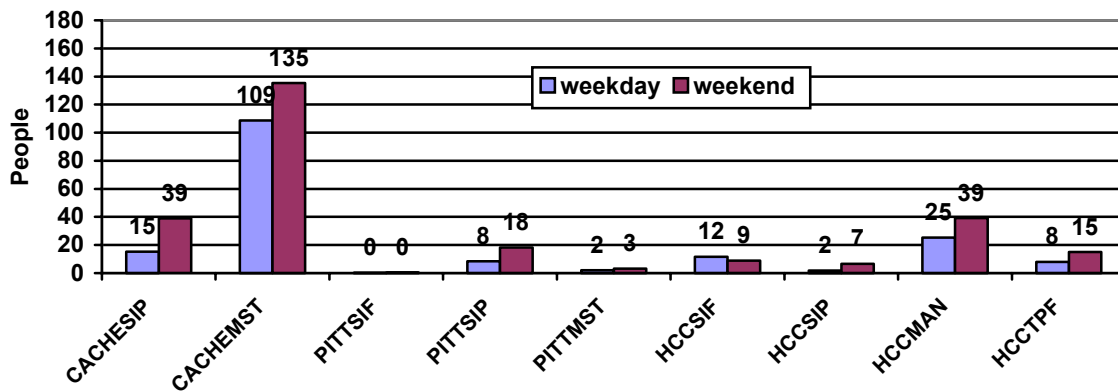
July



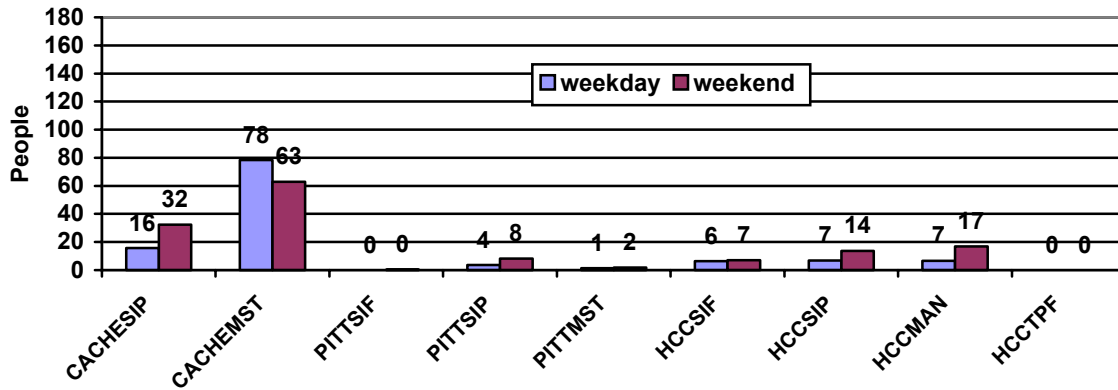
August



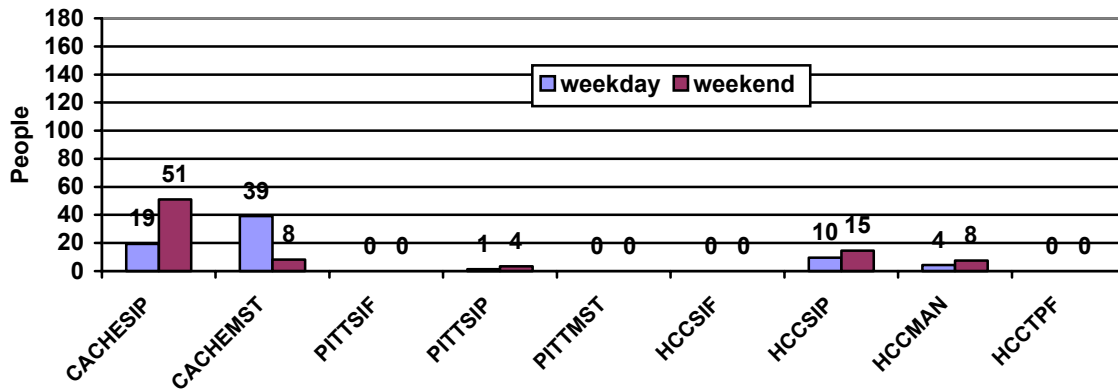
September



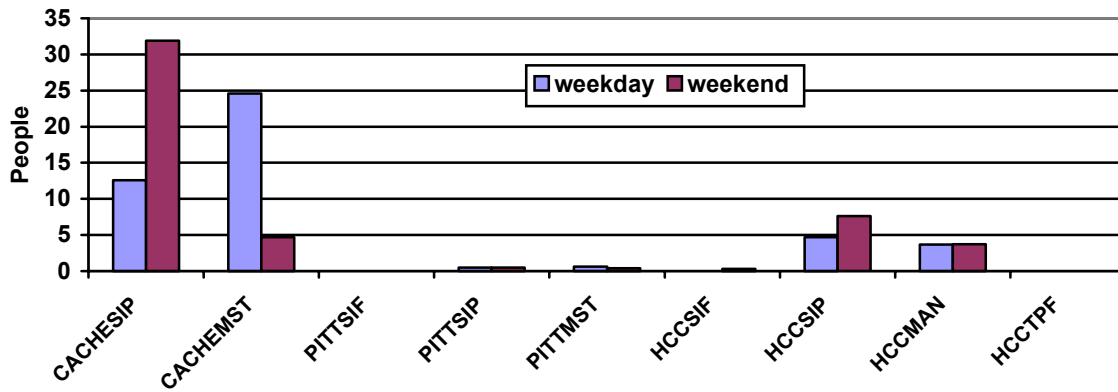
October



November



December



APPENDIX C1: CONTACT CARD FOR THOSE LAUNCHING

Note: The University of Idaho Human Assurances Committee has granted approval for this project.

2003 Hells Canyon Boater Survey

The University of Idaho is studying visitors to Hells Canyon to help the U.S. Forest Service evaluate its management of the river. We'd like to ask you a few questions about your experiences here. We ask for your name and address so we can send some visitors a survey asking a few more questions. This information is completely confidential and your name will not be released to anyone.

1. Before this trip, how many times have you boated (float or powerboat) in Hells Canyon in the last **two years**?

_____ Boating trips

2. Which sections of the Snake River have you boated (float or power) in Hells Canyon in the last **two years**? Mark the box if you have boated on any part of that section. (*Check all that apply.*)

- Hells Canyon Dam to Rush Creek
- Rush Creek to Pittsburg Landing
- Pittsburg Landing to the Salmon River confluence
- Salmon River confluence to Cache Creek (boundary of the Hells Canyon Recreation Area).

3. Where will you take out of the river on this trip? _____

4. How many days will you spend on the river during this trip? _____ days

5. How many people (including yourself) are in your group on this trip? (*Check one answer*)

- 1-5
- 11-15
- 21-25
- 6-10
- 16-20
- More than 25

6. The following are experiences people sometimes seek on boating trips in Hells Canyon. For each, circle a number to indicate how much you hope to have the experience on this trip.

	How much are you <i>seeking</i> it?						
	Not at all						
	1	2	3	4	5	6	7
Learning about historic or cultural sites	1	2	3	4	5	6	7
Solitude	1	2	3	4	5	6	7
Feeling of remoteness	1	2	3	4	5	6	7
Closeness to nature	1	2	3	4	5	6	7
Mental relaxation	1	2	3	4	5	6	7
Peace and quiet	1	2	3	4	5	6	7
Outstanding fishing opportunities	1	2	3	4	5	6	7
Sense of challenge	1	2	3	4	5	6	7
Time with friends or family	1	2	3	4	5	6	7
Being in a natural environment	1	2	3	4	5	6	7
Seeing unique geological formations	1	2	3	4	5	6	7

7. We'd like to send you a survey after your trip asking about your perceptions and experiences.

Name: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

Thanks for your help!

Public reporting burden for this collection of information is estimated to average 2 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Agriculture, Clearance Officer, OIRM, Room 404-W, Washington, DC 20250; and to the Office of Management and Budget, Paperwork Reduction Project (OMB #0596-0108), Washington, DC 20503.

APPENDIX C-2: CONTACT CARD FOR THOSE TAKING OUT

2003 Hells Canyon Boater Survey

The University of Idaho is studying visitors to Hells Canyon to help the U.S. Forest Service evaluate its management of the river. We'd like to ask you a few questions about your experiences here. We ask for your name and address so we can send some visitors a survey asking a few more questions. This information is completely confidential and your name will not be released to anyone.

1. Where did you launch on this trip? _____
2. How many days did you spend on the river during this trip? _____ days
3. How many people (including yourself) are in your group on this trip?
 1-5 11-15 21-25
 6-10 16-20 More than 25
4. What were the high points – the best parts – of your river trip?

What was the high point? What made it so good?

5. What were the low points – the worst parts – of your river trip?

What was the low point? What made it so bad?

6. On a **typical** day during your trip, about how many boats from other parties did you see?
(Circle a number for each type of boat.)

Float boats: 0--2--4--6--8--10--12--14--16--18--20--22--24--26--28--30--32--34--36--38--40-->40

Power boats: 0--2--4--6--8--10--12--14--16--18--20--22--24--26--28--30--32--34--36--38--40-->40

7. The following are feelings or experiences that people sometimes seek on river trips. For each, please indicate how much you actually experienced it on this trip. (Circle a number for each item.)

	How much did you <i>experience</i> it?						
	Not at all						Very much
Learning about historic or cultural sites	1	2	3	4	5	6	7
Solitude	1	2	3	4	5	6	7
Feeling of remoteness	1	2	3	4	5	6	7
Closeness to nature	1	2	3	4	5	6	7
Mental relaxation	1	2	3	4	5	6	7
Peace and quiet	1	2	3	4	5	6	7
Outstanding fishing opportunities	1	2	3	4	5	6	7
Sense of challenge	1	2	3	4	5	6	7
Time with friends or family	1	2	3	4	5	6	7
Being in a natural environment	1	2	3	4	5	6	7
Seeing unique geological formations	1	2	3	4	5	6	7

8. Before this trip, how many times have you boated (float or powerboat) in Hells Canyon in the last **two years**?

_____ Boating trips

9. Which sections of the Snake River have you boated (float or powerboat) in Hells Canyon in the last **two years**? Mark the box if you have boated on any part of that section (Check all that apply.)

- Hells Canyon Dam to Rush Creek
- Rush Creek to Pittsburg Landing
- Pittsburg Landing to the Salmon River confluence
- Salmon River confluence to Cache Creek (boundary of the Hells Canyon Recreation Area)

We'd like to send you a survey asking about your perceptions and experiences.

Name: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

Thank You!
Drs. Troy Hall and Ed Krumpe
University of Idaho

Public reporting burden for this collection of information is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Agriculture, Clearance Office, DTR 003 on 404-W, Washington, DC 20250; and to the Office of Management and Budget, Paperwork Reduction Project (OMB #0596-0108), Washington, DC 20503.

APPENDIX D: ON-SITE CONTACT LOG FORM

APPENDIX D: EXAMPLE OF ON-SITE LOG FORM

Name: Troy Hall
 Date: July 4, 2003
 Time begin: 8:45 am

Location: Pittsburg
 Weather: sunny and hot
 Time end: 5:15 pm

Group #	Time	Put in/ Take out	Status	#/Type craft	Kids	Total adults	# asked	# refuse	Survey #s	Comments
1	9:12	Take out	<input checked="" type="checkbox"/> Pvt <input type="checkbox"/> Comm	<u>2</u> raft <u>2</u> kayak <input type="checkbox"/> jet <input type="checkbox"/> power	0	8	6	1	#1-5	2 boaters missed - left while talking to others
2	9:29	Take out	<input type="checkbox"/> Pvt <input checked="" type="checkbox"/> Comm	<input type="checkbox"/> raft <input type="checkbox"/> kayak <u>1</u> jet <input type="checkbox"/> power	7	8	8	0	#6-13	Wild River Adventures
3	10:15	Put in	<input checked="" type="checkbox"/> Pvt <input type="checkbox"/> Comm	<u>2</u> raft <input type="checkbox"/> kayak <input type="checkbox"/> jet <input type="checkbox"/> power	0	6	6	2	#14-17	

APPENDIX E-1: MAIL SURVEY for WILD SECTION

This mail survey will be sent to a sample of those who indicated that they have boated the wild section.

APPENDIX E-2: MAIL SURVEY for SCENIC SECTION

This survey will be sent to a sample of those who indicated that they have boated the scenic section

APPENDIX F: COVER LETTER FOR MAIL SURVEY (ROUND 1)

August, 2003

Dear Hells Canyon Visitor:

Recently we talked to you during your trip to Hells Canyon and asked if you would be willing to participate in a study of boaters' experiences on the Snake River. Now we're writing to learn more about your trip and other experiences in Hells Canyon.

The information you provide will be given to the Forest Service managers of Hells Canyon so they are aware of the types of experiences people have and any problems they might encounter.

Because we are contacting only a small number of Hells Canyon visitors, it is important that we hear from you so the results will accurately represent the views of all river users. Please give us your views even if this was your first visit to Hells Canyon.

The questionnaire should take about 15 minutes to complete, and we've included a stamped, addressed return envelope for your convenience. Your identity will be kept confidential and your name will never be associated with your responses. Once we are done with this study, we will destroy the list of names and addresses, and they will never be given to anyone outside of this study.

Thank you for your help. As an added incentive to answer and return the survey, we'll enter your name into a drawing to win one of several gift certificates to REI, LL Bean, or Northwest River Supply.

If you have any questions, please contact me at 208 885-9455. Or you can email me at troyh@uidaho.edu.

Sincerely,

Troy Hall
Study Director

APPENDIX G: POSTCARD REMINDER

Dear Hells Canyon Visitor:

Last week I sent you a questionnaire asking about your recent visit to the Snake River in Hells Canyon. This information will be used by the Forest Service to understand the types of experiences boaters have on the river and to ensure that management actions are maintaining high quality river trips.

If you have already completed and returned the survey, then thank you for your help! Your name has been entered into our drawing for gift certificates to REI and LL Bean. If you haven't returned your survey yet, could you please do so today? Because we sent out questionnaires to just a small random sample of Hells Canyon visitors, we need to hear from everyone to make sure all river users' opinions are accurately represented.

If you did not receive the questionnaire or it got misplaced, please call me (208 885-9455) or email me (troyh@uidaho.edu) right away and I'll send another copy. Once again, thanks for your help.

Sincerely,

Troy Hall,
Study Director

APPENDIX H: MAIL SURVEY COVER LETTER (ROUND 2)

Dear Hells Canyon Visitor:

About three weeks ago, I wrote asking about your experiences on the Snake River in Hells Canyon. As of today, we have not received your completed questionnaire.

We're asking for your help to better understand river use in Hells Canyon. This information will be used by the Forest Service to ensure that their management on the river provides the highest quality trips for boaters. We believe that river users like yourself are the best source of information about recreation in Hells Canyon.

I'm writing again because it's important that all questionnaires be returned. You are one of a small group of boaters randomly selected to receive the survey. For our results to be accurate and represent all boaters, we need to hear back from everyone. Even if you visit Hells Canyon rarely it is important that we hear from you.

I'm enclosing another copy of the questionnaire, in case the original one has been misplaced. We hope you'll enjoy giving us your views on what the river has to offer. It should take only about 15 minutes to complete the survey, and we've included a stamped, addressed return envelope. Your identity will remain confidential and your name will not be associated with your responses.

Thanks for your help. Once you send back the survey you'll be entered into a drawing to receive one of several gift certificates to REI or LL Bean.

If you have any questions, please call me at 208 885-9455, or you can email me at troyh@uidaho.edu.

Sincerely,

Troy Hall
Study Director