June 11, 2010

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First St. N.E.
Washington, DC 20426

Subject: **Spokane River Project, FERC Project No. 2545**
Submittal of the Lake Spokane Fishery Enhancement and Creel Survey Plan, As Required by Article 406 of the FERC License

Dear Secretary Bose:

On June 18, 2009 the Federal Energy Regulatory Commission (FERC) issued a new license for the Spokane River Hydroelectric Project, FERC Project No. 2545 (License). Article 406 of the License directs Avista to develop and implement a Lake Spokane Fishery Enhancement and Creel Survey Plan (Plan).

The License requires Avista to consult with the Washington Department of Fish and Wildlife (WDFW) during the development of the enclosed Plan. Copies of their comments and recommendations, and Avista's responses to them, are included in the Plan's Appendices.

With this, Avista is submitting the enclosed Plan to FERC for approval. Upon FERC's approval Avista will begin implementing the Plan as appropriate. Please feel free to contact me if you have any questions or wish to discuss the Plan. I can be reached at (509) 495-4998.

Sincerely,

Speed Fitzhugh

Elvin "Speed" Fitzhugh
Spokane River License Manager

Enclosure

cc: Heather Campbell, FERC
Doug Robison, WDFW

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the **Lake Spokane Fishery Enhancement and Creel Survey Plan** on Washington Department of Fish and Wildlife in compliance with Ordering Paragraph J of the Spokane River Project FERC License (P-2545).

Doug Robison
Washington Department of Fish and Wildlife
2315 N. Discovery Place
Spokane Valley, WA 99216

Dated this 4 day of June, 2010

By: _____

Cherie Hirschberger
Avista Corporation
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AVISTA CORPORATION

LAKE SPOKANE FISHERY ENHANCEMENT AND CREEL SURVEY PLAN

LICENSE ARTICLE 406

Spokane River Hydroelectric Project
FERC Project No. 2545

Prepared By:
NORMANDEAU ASSOCIATES, INC.

June 11, 2010

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1.0 Background

On June 18, 2009 the Federal Energy Regulatory Commission (FERC) issued Avista Corporation (Avista) a new license (License) for the Spokane River Hydroelectric Project, FERC Project No. 2545-091 which includes the Long Lake Hydroelectric Development (HED). The reservoir for the Long Lake HED is also called Lake Spokane. FERC staff evaluated the fishery enhancement supplementation and monitoring recommendations in its Final Environmental Impact Statement (FEIS) issued in 2007. Article 406 of the License requires Avista to enhance recreational fishing opportunities by annually stocking 155,000 catchable-sized sterile rainbow trout into Lake Spokane for five consecutive years. The Article also requires Avista to conduct creel surveys to monitor the success of the stocking program, develop specific protocols to determine whether the program is successful in creating a viable put-and-take recreational fishery for rainbow trout, document the results of the program, and include proposals for future stocking.

This Fishery Enhancement and Creel Survey Plan (Plan) provides a detailed description for implementing the new stocking and angler monitoring program. The Plan includes an implementation schedule for annually stocking sterile rainbow trout in Lake Spokane over a five year period, and a detailed description of a creel survey designed to assess the new put-and-take trout fishery as it develops over the stocking period. This Plan was developed in consultation with Washington Department of Fish and Wildlife (WDFW; see Appendix A).

2.0 Study Area

Lake Spokane is located approximately 20 miles northwest of the city of Spokane in Lincoln, Spokane and Stevens Counties, Washington (Figure 1). Lake Spokane is approximately 24 miles in length with a maximum surface area of approximately 5,060 acres and an average depth of about 45 feet. Lake Spokane is a narrow reservoir that is classified as eutrophic to mesotrophic (CH2MHill 2004), and is supplied with water from the Spokane and Little Spokane Rivers. The Little Spokane River is a tributary of the Spokane River and contributes about 10% of the inflow into Lake Spokane (Pfieffer 1985).

The upper 3 miles of Lake Spokane is riverine and has limited shoreline development (Pfieffer 1990). The next 15 miles of the reservoir transitions into more lacustrine habitat and is substantially developed with commercial and residential properties particularly on the north shoreline. This section is also characterized by having gentle, sloping shorelines and shallow bays. Heavy growths of emergent macrophytes occur in this section and comprise most of the reservoir's littoral habitat (Bennett and Hatch

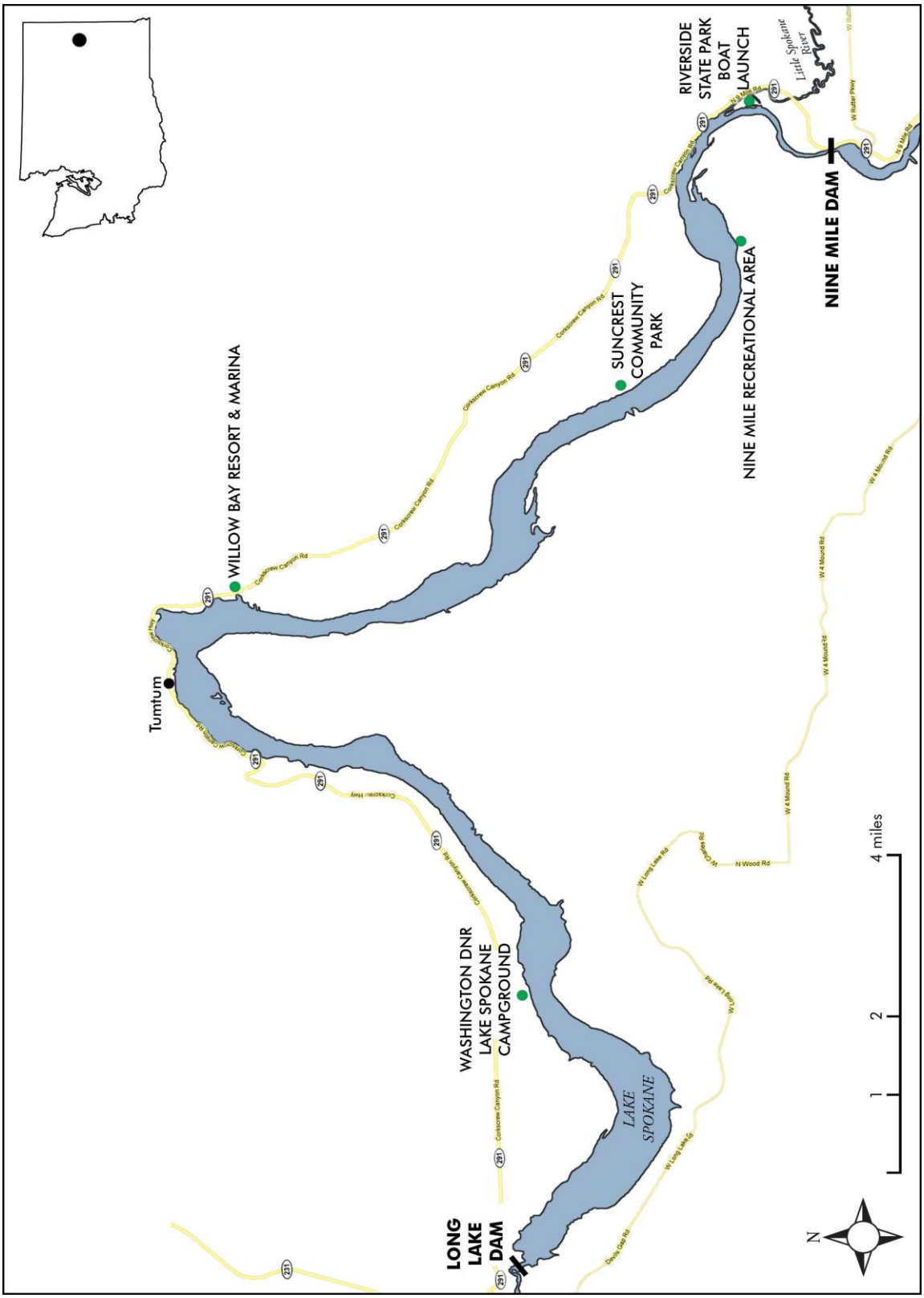

Figure 1. Map of Lake Spokane, Washington. Green dots represent public and private boat access points.

1990). The lower most 6 miles of the reservoir closest to the Long Lake Dam has limited littoral habitat, minimal shoreline development, and is characterized by steep, sandy banks and rocky shorelines. This lower section contains the reservoir's widest (3,609 ft) and deepest (180 ft) points (Pfieffer 1990). Lake Spokane stratifies thermally during the summer (Bennett and Hatch 1990).

Avista uses water stored in Lake Spokane to generate electricity at Long Lake Dam (river mile [RM] 34). The License requires Avista to limit drawdowns of Lake Spokane to no more than 14 feet except under emergency flow conditions. In recent years, depending on river flow and several other considerations, Lake Spokane has rarely been lowered more than 14 feet during the winter, and is typically held within 3 feet of full pool during most of the year. During the summer recreation season, the reservoir is typically maintained within 1 foot of the full-pool elevation (FEIS 2007, pgs 2-9 and 2-10).

Lake Spokane is a popular recreation spot with the highest use occurring during late-spring and summer (Louis Berger Group 2004). Both Riverside State Park's Nine Mile Recreation Area and Washington Department of Natural Resource's (DNR) Lake Spokane Campground have public boat launches, and provide seasonal day use as well as camping facilities. Project operations during the late-spring, summer and fall, normally do not affect access to the reservoir. The only time operations can be expected to affect access is during the winter and early-spring drawdown period, which is unpredictable and can vary in depth and duration annually. The following provides a description of the five primary access points identified in Figure 1:

Riverside State Park Boat Ramp: This access point is operated by Washington State Parks and is open to the public year round. The boat ramp is not usable when the reservoir is drawn down to 3 feet below full-pool elevation.

Nine Mile Recreational Area Boat Ramp: This access point is also operated by Washington State Parks. The boat ramp is typically open to the public seasonally from May through mid-September each year. The exact timing of when the boat ramp is opened varies from year to year depending on weather conditions and public demand. This boat launch is not usable when the reservoir is drawn down 3 feet below full-pool elevation.

Suncrest Community Park: This is a private park that has a boat ramp for community members use only. The boat ramp is typically open year round and functional when the reservoir is drawn down to 3 feet below full-pool elevation. It is unknown at what water elevation this boat ramp becomes unusable.

Willow Bay Resort & Marina: This is a private resort that has a boat ramp for its members and/or guests only. The boat ramp is typically open year round but is not usable when the reservoir is drawn down to 3 feet below full-pool elevation.

Lake Spokane Campground: This campground is operated by Washington DNR. The campground and associated boat ramp is typically open to the public seasonally from the weekend after Memorial Day through Labor Day each year. The boat ramp is still useable with a 3 foot drawdown.

3.0 Plan Overview

Avista will implement this Plan following FERC approval, which is anticipated in late 2010. Avista worked with WDFW as it developed the schedules and protocols for stocking the trout and for the creel survey identified. The initial stocking of rainbow trout will occur in 2012, instead of 2011 to allow for a baseline creel survey of the existing recreational fishery in Lake Spokane. This is one year later than FERC requested in the License, but is necessary to address the WDFW recommendations to conduct a creel survey prior to stocking trout. The first follow-up creel survey will begin in spring 2013. Annual stocking of 155,000 sterile rainbow trout and the corresponding creel survey will continue from spring 2013 through spring 2016. Following the final creel survey, Avista will conduct a comprehensive evaluation of the annual creel surveys to help determine whether a viable put-and-take trout fishery has been created. Avista will develop additional protocols for determining the success of the stocking program in consultation with WDFW. The results of this evaluation will be summarized in a final report which will be submitted to FERC in June 2017. The annual timeline and brief description of tasks to be accomplished is provided in Table 1.

4.0 Trout Stocking

As stipulated in the new license, Avista is required to stock 155,000 catchable-sized sterile rainbow trout into Lake Spokane annually for five years. The term "catchable" as defined in the license refers to trout ranging in size from 6 to 8 inches in total length.

4.1 Procurement and Criteria

Based on experience with trout vendors in the region both Avista and WDFW believe Troutlodge Inc. (Sumner, WA USA) is the preferred hatchery for acquiring sterile rainbow trout. However, due to the short timeline on which stocking can occur and limitations in hatchery production and transportation, additional trout may be produced and supplied by WDFW hatcheries. The proportion of trout that each

Table 1. Annual timeline for stocking sterile rainbow trout and creel survey in Lake Spokane, Washington.

Year	Tasks to be accomplished
2011	Initiate creel survey to determine the existing angler use prior to stocking sterile rainbow trout.
2012	Initial stocking of 155,000 sterile rainbow trout. No creel survey conducted.
2013	Stock 155,000 sterile rainbow trout and continue annual creel survey.
2014	Stock 155,000 sterile rainbow trout and continue annual creel survey.
2015	Stock 155,000 sterile rainbow trout and continue annual creel survey.
2016	Stock 155,000 sterile rainbow trout and complete creel survey.
2017	Prepare comprehensive report describing the trout stocking program and whether it was successful at creating a viable put-and-take trout fishery. The final report describing the new put-and-take recreational trout fishery will be prepared in consultation with WDFW and submitted to FERC no later than June 2017.

supplier contributes to the overall annual production may vary among years. In the instance that neither Troutlodge Inc. nor WDFW can provide the necessary number of rainbow trout, Avista will pursue acquiring trout from other fish hatcheries.

The following criteria will be specified for the trout stocked in Lake Spokane:

- Sterile or "triploid" rainbow trout must have a triploidy rate of 98 percent (±2 percent) or greater.
- Greater than 95 percent of the stocked trout must be female to reduce the risk of potential spawning habitat competition with native rainbow trout present in the system..
- Stocked trout must meet a coefficient of variation of 6 to 8 percent or less from that designated as "catchable" (i.e., 6 to 8 percent variation in size of the released population).
- Stocked trout must be of coastal origin, which possess diet preferences that are skewed more towards being insectivore/zooplanktivore.
- Adipose fins of stocked trout must be clipped for external identification and to support the current monitoring program downstream in Lake Roosevelt in the event that fish are entrained and survive passage through Long Lake Dam.

4.2 Stocking Schedule and Location

Annual stocking of sterile rainbow trout will occur in the spring, and will coincide with periods of descending river in-flow (i.e., longer water retention), cool surface water temperature, and adequate primary and secondary food production. Stocking under these conditions will be done to promote long-term survival and hold-over in Lake Spokane. The target date for having the trout stocked into Lake Spokane is during the first two weeks of June.

The trout will be released in the lower, more pelagic segment of the reservoir extending from the Washington DNR's Lake Spokane Campground (RM 39) upstream to the Highway 291 pullouts near the town of Tumtum, Washington (RM 46). Approximately fifty percent of the fish will be stocked near each access point; however, during high flow years, a higher portion of fish may be released at the Highway 291 pullouts to minimize potential entrainment through Long Lake Dam. [The stocking schedule and locations may be re-evaluated depending on annual conditions, fish supply, creel survey results or other factors, and implemented as agreed to by WDFW and Avista].

5.0 Creel Survey

To assess the effectiveness of the new stocking program, a creel survey that monitors overall angler use will be implemented to assess the put-and-take recreational trout fishery as it develops. The survey will ensure that the overall recreational fishery in Lake Spokane is monitored and that any changes resulting from the trout stocking program can be characterized. The survey design may be adapted following information gained from previous years and implemented as agreed to by WDFW and Avista.

5.1 Survey Design Overview

A complemented survey design that incorporates both instantaneous count and access point angler interviews will be used to characterize angler use in Lake Spokane (Malvestuto 1996). Angler counts will be used to determine effort (i.e., angler hours), while access point interviews will obtain catch data and angler characteristics. In addition to the access point surveys, an Internet-based version of the angler survey will also be developed to obtain additional information on angler characteristics for home owners residing along the lake that have private fishing access. The overall creel survey design will be conceptually similar to traditional methods used by WDFW (Hahn et al. 2000).

Angler use will be monitored over an eight-month timeframe, which will be stratified into three seasons that reflect seasonal changes in angler accessibility and use patterns at Lake Spokane.
The seasonal strata will be defined as follows in 2011:

- Spring: 1 March – 27 May

- Summer: 28 May – 15 September
- Fall: 16 September – 30 November

Sampling days within each season will be randomly selected and further stratified temporally within each season based on month, weekday and weekend days, and time-of-day. Federally designated U.S. holidays will be considered weekend days.

Winter months (December through February) will be excluded from the survey period on account of limited angler access. During these months the public boat launches are closed and access to the reservoir is limited. In addition, most of the landowners that have private access to the reservoir (i.e., personal docks) remove their boats from the water due to winter drawdowns and freezing conditions. [Although Lake Spokane does occasionally freeze, it does not typically freeze enough to support ice fishing opportunities].

5.2 Angler Counts

Counts of fishing boats and shore anglers will be made during each sampling season by a survey boat traveling from one end of the reservoir to the other similar to the methods described by Pfeiffer (1990). Anglers will be identified by location, activity, and visible fishing gear. The starting location of each count will be randomly selected between upstream (starting at Riverside State Park) and downstream (starting at Lake Spokane Campground) directions using a flip of a coin. Angler counts are anticipated to be completed in about 75 to 90 minutes. If boating conditions are limited by inclement weather or other factors, counts may be made from the shore from a vehicle instead.

Stratified systematic random sampling will be used to distribute angler counts throughout each season and between weekday and weekend day strata as appropriate. This approach will ensure that angler count days are selected randomly, but are evenly distributed across the entire seasonal strata. Weekend and weekday strata will be used to reduce variability associated with typically higher and more consistent angler use occurring on the weekends and lower and less consistent angler use on the weekdays.

For the initial survey conducted in 2011, a total of 10 angler counts will be conducted during the spring season, 14 during the summer season, and 8 during the fall season (Table 2). During the initial survey year, an approximate even number of weekday and weekend days will be surveyed for each season. The days will alternate between randomly selected weekday and weekend days. The number of angler counts

conducted during subsequent years will be determined based on the pervious year's results and agreed to by WDFW and Avista.

Counts will be scheduled to coincide with the expected period of maximum angler use based on data collected from the angler interviews. The rationale for non-random scheduling of count times is provided principally in Lockwood et al. (2001), but also in Dauk and Schwarz (2001). Counting anglers during times of expected maximum use results in fishing pressure estimates based on the maximum amount of data and the minimum amount of data expansion to represent effort for the respective stratum, while reducing variability associated with count expansion.

5.3 Access Point Surveys

Since public shoreline access is limited at Lake Spokane, it is anticipated that the majority of fishing pressure will occur by boat anglers or by shore anglers utilizing designated access points. The majority of access point surveys will be conducted from Memorial Day weekend to just after Labor Day weekend (i.e., summer strata) to coincide with when most public boat launches and primary access points are opened. Some access point surveys may be scheduled during the spring and fall strata depending on the timing of when primary access points are opened and on angler use.

Survey days will be selected using a stratified systematic random sampling scheme to ensure that angler interviews occur evenly across the entire season as appropriate. Access point surveys will be conducted weekly, and will alternate between one or two weekdays and one weekend day randomly selected per week. For the initial creel survey in 2011, a total of 36 access point surveys will be scheduled during the summer; of these, 21 will occur on weekdays and 15 will occur on weekend/holidays (Table 2). An additional 7 days (4 weekday and 3 weekend days) will be scheduled in spring and 5 days (3 weekday and 2 weekend days) will be scheduled in the fall, 2011. The number of days surveyed in subsequent years will be determined based on the pervious year's results and agreed to by WDFW and Avista.

The time and location of the access point interviews will be selected randomly among a series of potential starting times (e.g., half-hour intervals between 0730 h – 1230 h) that may be adjusted to account for day length, and the five boat ramps currently identified as potential access points that could be surveyed (Figure 1; Table 3). During each selected day, a total of three boat ramps will be surveyed for a total of two hours. For instance, a creel clerk would arrive at a predetermined access point at a selected time of 0900 h, and then depart that access point at 1100 h. From there the creel clerk would then travel to the next predetermined access point and remain at that location for the next two hours interviewing all

returning anglers. Once the two hour time interval expired, the creel clerk would then travel to the final predetermined access point and remain at that location for the next two hours interviewing all returning anglers. A time of approximately one half-hour will be estimated for travel times between locations.

Table 2. Schedule for instantaneous angler counts and access point surveys conducted during the initial angler survey in 2011.

		Angler Counts			Access Point Surveys			
		Weekday	Weekend		Weekday		Weekend	
Seasonal Strata	Month	Days of the Month	Days of the Month	Days Surveyed	Days of the Month	Days Surveyed	Days of the Month	Days Surveyed
Spring	March	8, 31	5, 20	4	9	1	27	1
	April	13	10, 30	3	27	1	16	1
	May	13, 23	21	3	6, 26	2	22	1
Summer	May	-	30	1	-		29	1
	June	1, 23	18	3	3, 8, 9, 13 14, 22, 30	7	5, 11, 19, 25	4
	July	8, 19	3, 17	4	7, 12,13,18 28,29	6	4, 9, 16 23, 31	5
	Aug.	9, 25	7, 20	4	4, 8, 16, 17 24, 26	6	6, 14, 21, 28	4
	Sept.	7	3	2	2, 6	2	4	1
Fall	Sept.	19	-	1	23	1	-	-
	Oct.	6, 26	1, 15	4	18	1	9	1
	Nov.	17	12, 25	3	3	1	26	1

Table 3. List of developed public and private access points located at Lake Spokane, Washington.

Access Point	Accessibility	RM
Washington DNR Lake Spokane Campground	Public	39
Willow Bay Resort and Marina	Private	46
Suncrest Community Park and Boat Launch	Private	52
Nine Mile Recreational Area	Public	56
Riverside State Park Boat Launch	Public	57

Individual survey locations will be selected and assigned to each survey period randomly. However, as additional information becomes available on the distribution of angler use at each access point, survey locations may be selected based on proportional use rather than a simple random distribution. One creel clerk will be used to cover the reservoir, and all data will be recorded on a standard data form (Appendix B).

Once arriving at the boat launch, the creel clerk will interview all departing anglers to gather information including: angler party size; target species; number of fish caught (released and harvested) by species; number of fish kept (harvested) by species; number of hours fished; and residence (zip code; Appendix B). Additional questions to obtain more specific information on angler trip satisfaction will be asked during the interview. If multiple anglers are present, one angler will be randomly selected (e.g., angler with the most recent birthday) to participate in the additional survey. Length and weight data from harvested trout will be obtained when possible by creel clerks. The number of anglers that refused to be interviewed will be recorded.

While it is anticipated that the majority of public fishing pressure will be encountered at the designated access points, it is common however for shoreline anglers to establish high use areas in response to changes in the fishery such as seasonal differences in fish behavior. These areas will be identified from angler count surveys and would be included in the monthly survey schedule to collect additional angler information.

Additional angler interviews will be conducted in conjunction with angler count surveys during the spring and fall strata when public access to the reservoir is limited and angler use is presumed to be low and less concentrated. These interviews will be conducted during the return trip down the reservoir once the angler count survey is completed. Attempts will be made to contact all boat and shoreline anglers observed to gather angler use and trip information. Anglers contacted during these events may also be

invited to participate in an Internet version of the survey when they return home to obtain their completed trip information. In 2011, 10 boat roving surveys will be conducted in the spring and 8 in the fall strata.

5.4 Internet Questionnaire

An Internet version of the survey form will be developed similar to the methods deployed in the Spokane River Project Recreation Monitoring Survey (REC Resources 2010 *in review*). The reason for developing an Internet survey is to acquire creel information from private landowners residing along the reservoir. While local residents fishing or launching their fishing boats from private docks will be included into estimates of angler effort, information regarding their fishing trip will be difficult to collect from the access point surveys. To account for these anglers, local residents will receive a notification in the mail informing them of the recreational fishing survey and asking for their participation. Information gathered from the questionnaire will be similar to that obtained from the access point surveys regarding angler trip characteristics and perspective. Data collected from the Internet surveys will be analyzed independently of data collected from on-site interviews.

5.5 Computational Methods

Data collected from angler interviews and instantaneous counts will be used to calculate descriptive statistics that will characterize angler use across years. The focus of the analysis will be on evaluating changes in angler characteristics towards the new recreational trout fishery and whether the goals set in the new License regarding this fishery have been met.

5.5.1 Estimating Angler Effort

Effort estimates for boat and shore anglers will be calculated following the proportional method for estimating angler hours described by McNeish and Trial (1991) and more recently by Lockwood et al. (2001). This methodology will provide a similar estimate of angler effort as more traditional methods described by Hahn et al. (2000), but is more efficient for surveys that occur over multiple years. The proportional method uses information collected from completed trip angler interviews to construct a distribution of angling activity or "angler use profile" over a designated time period (i.e., seasonal stratum). This distribution of angler activity is then used to expand instantaneous counts of anglers taken when angling effort is the greatest to estimate total angler effort during a given time period. The factors e_{pt} for expanding counts for i = 1-24 hours are defined as:

(1) $$e_{pt} = \frac{1}{b_{pt}} \sum_{i=1}^{24} b_{pi}$$

where:

e_{pt} = count expanding factor;

b_{pi} = the number of fishing boats or shore anglers each hour of the day during the period;

b_{pt} = the total number of fishing boats or shore anglers during the period.

Each individual count (B_{pt}) can then be expanded by e_{pt} and the number of days in the period (D_p) to estimate effort (E_{pt}) by:

(2) $$E_{pt} = B_{pt} \cdot D_p \cdot e_{pt}$$

Mean effort ($\overline{E}_p$) for each period can then be estimated by averaging over *n* counts in the period.

Estimated variance for $\overline{E}_p$ can be calculated as:

(3) $$\hat{Var}(\overline{E}_p) = 1 - \frac{n_p}{D_p}\left(\frac{\sum_{i=1}^{n_p} (\overline{E}_p - E_{pi})^2}{n_p(n_p - 1)} \right)$$

To estimate boat angler hours ($\hat{E}_{ap}$) for each period, the mean number of anglers per boat (A_p) derived from access point interviews will be multiplied by $\overline{E}_p$. Variance of the estimated boat angler hours will be calculated as:

(4) $$\hat{Var}(\overline{E}_{ap}) = \overline{E}_p{}^2 \, \hat{\text{var}}(A_p) + A_p{}^2 \, \hat{\text{var}}(\overline{E}_p) - \hat{\text{var}}(A_p)\,\hat{\text{var}}(\overline{E}_p)$$

Effort in angler trips will be estimated based on methods described by Malvestuto (1996), where the estimate of angler effort in angler hours for each stratum is divided by the mean length of completed fishing trips in each stratum. Total angler trips will be the aggregate of individual stratum.

Estimates of angler hours and trips will be calculated overall and for those anglers targeting rainbow trout. The proportions of estimated total angler effort and of anglers specifically targeting trout will be compared across years. This comparison will provide an index of rainbow trout angler use as it relates to overall angler use in Lake Spokane, and assist in determining whether the trout stocking program has been successful at creating a viable fishery.

5.6.2 Catch and Harvest Rates

Catch and harvest rates will be developed for rainbow trout using completed trip interviews. A ratio-of-means estimator (Jones et al. 1995; Lockwood 1997; Pollock et al. 1997) will be used to calculate catch and harvest rates for boat and shore anglers in each stratum separately. All rates will be expressed as fish per angler-hour. The ratio-of-means estimator is calculated by dividing the total catch or harvest by the total effort of all interviewed anglers with the stratum. The estimator is defined as:

(5)
$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{\sum_{i=1}^{n} c_i}$$

where:

$\bar{x}$ = mean catch rate or harvest rate from the stratum;

n = the number of party interviews in the stratum;

x_i = the catch or harvest of the ith party i=1,….n;

c_i = the total angler hours expended by the ith party.

The estimate of variance of the mean catch or harvest rates will be calculated using a single cluster sampling with replacement formula described by Jones et al. (1995):

(6)
$$\hat{Var}(x) = \frac{1}{N(\bar{x})^2}\left(\frac{\sum_{i=1}^{n}(x_i - \bar{x}c_i)^2}{n}\right)$$

where:

$\hat{Var}(x)$ = estimated variance of the mean catch rate or harvest rate;

$\bar{x}$ = mean catch rate or harvest rate from the stratum;

n = the number of party interviews in the stratum;

x_i = the catch or harvest of the ith party i=1,….n;

c_i = the total angler hours expended by the ith party.

Catch and harvest rates will be combined with estimates of total angler effort to derive estimates of total catch and harvest similar to methods described by Pollock et al. (1994). Estimates of total catch and harvest for rainbow trout will be used to estimate return rates on trout stocking and calculate catch and harvest per angler visit (trip).

Information on catch and harvest data will be also used to help evaluate the size structure of trout caught across years to determine whether hold-over is occurring, and provide an additional measure of quality for the fishery.

5.6 Angler Perspective

In addition to angler effort and harvest metrics, changes in angler perspective regarding the recreational fishery in Lake Spokane over the five year stocking period will also be evaluated and reported in the final evaluation.

6.0 Reporting Timeline

Following completion of the final survey in spring 2016, a draft final report will be submitted to WDFW no later than March 2017 for the required 30-day review period. The final report describing the new put-and-take recreational trout fishery as it developed over the designated stocking period will be submitted to FERC in June 2017, at the beginning of 8th year post-license issuance.

7.0 References

Bennett, D.H., and D.R. Hatch. 1991. Factors limiting the fish community with emphasis on largemouth bass in Long Lake, Spokane County, Washington. Doc. No. 1991-0361. Washington Water Power Company, Spokane, Washington.

CH2MHill. 2004. Spokane River and Long Lake Reservoir Use Attainability Analysis. Prepared for Spokane River UAA Sponsoring Committee.

Dauk, P.C., and C.J. Schwarz. 2001. Catch estimates with restricted randomization in the effort survey. Biometrics 57:461-468.

Final Environmental Impact Statement (FEIS). 2007. Spokane River and Post Falls Hydroelectric Projects. Prepared by Federal Energy Regulatory Commission. Office of Energy Projects, July 2007. FERC/FEIS – 0204F.

Hahn, P., S. Zeylmaker, and S. Bonar. 2000. Washington Department of Fish and Wildlife Methods Manual: Creel information from sport fisheries. Technical Report 93-18. Published by Washington Department of Fish and Wildlife.

Jones, C.M., D.S. Robson, H.D. Lakkis, and J.Kressel. 1995. Properties of catch rates used in analysis of anger surveys. Transactions of the American Fisheries Society 124:911-928.

Lockwood, R.N., J. Peck, and J. Oelfke. 2001. Survey of angling in Lake Superior Waters at Isle Royale National Park, 1998. North American Journal of Fisheries Management 21:471-481.

Louis Berger Group. 2004. Recreational facility inventory and user surveys report Spokane River Project, FERC Project 2545. Prepared for Avista Corporation Recreation, Land Use and Aesthetics Work Group.

Malvestuto, S.P. 1996. Sampling the recreational creel. Pages 591-650 *in* B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

McNeish J.D., and J.G. Trial. 1991. A cost-effective method for estimating angler effort from interval counts. American Fisheries Society Symposium 12:123-138.

Osborne, R.S., M.J. Divens, and C.Baldwin. 2003. 2001 Warmwater fisheries survey of Lake Spokane, Spokane and Stevens Counties, Washington. Washington Department of Fish and Wildlife.

Pfeiffer, D.E. 1985. A general assessment of aquatic resources in the lower Spokane River reservoirs. Report to the Washington Water Power Company, Spokane.

Pfeiffer, D.E. 1990. Long Lake Reservior angler and boater user survey. Report to the Washington Water Power Company, Spokane.

Pollock, K.H., C.M. Jones, and T.L. Brown. 1994. Angler survey methods and their application to Fisheries Management: American Fisheries Society Special Publication 25. American Fisheries Society, Bethesda, Maryland.

Pollock, K.H., J.M. Hoeing, C.M. Jones, D.S. Robson, and C.J. Greene. 1997. Catch rate estimation for roving and access point surveys. North American Journal of Fisheries Management 17:11-19.

Schaeffer, R.L., W. Mendenhall, and R.L. Ott. 1996. Elementary Survey Sampling. Fifth edition. Wadsworth Publishing Co., Belmont, California.

Appendix A

Record of Consultation and Agency Recommendations and Avista's Responses

April 28, 2010

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2315 N Discovery Place
Spokane Valley, WA 99216-1566

RE: Federal Energy Regulatory Commission's Spokane River Project, (FERC Project No. 2545) License Article 406, Review Draft Lake Spokane Fishery Enhancement and Creel Survey Plan

Dear Mr. Robison:

On June 18, 2009 the Federal Energy Regulatory Commission (FERC) issued a new license for the Spokane River Hydroelectric Project, FERC Project No. 2545 (License). Article 406 of the License directs Avista to develop and implement a Lake Spokane Fishery Enhancement and Creel Survey Plan (Plan).

The License requires Avista to consult with the Washington Department of Fish and Wildlife (WDFW) during the development of the enclosed Plan. With this, we request your comments and/or your approval on the Plan by May 28, 2010. If you have any questions regarding the Plan, feel free to call me at (509) 495-4998 or in my absence please contact Tim Vore at (509) 495-8612.

Sincerely,

Speed Fitzhugh

Elvin "Speed" Fitzhugh
Spokane River License Manager

Enclosure

c: Tim Vore - Avista

Washington Department of FISH and WILDLIFE

Region 1 Office: 2315 North Discovery Place, Spokane Valley, WA 99216-1566
(509) 892-1001

May 27, 2010

Mr. Elvin "Speed" Fitzhugh
Spokane River License Manager
Avista Corporation
1411 E. Mission Ave
Spokane, WA 99220-3727

RE: FERC Project No. 2545, Spokane River Project, License Article 406
Lake Spokane Fishery Enhancement and Creel Survey Plan

Dear Mr. Fitzhugh,

This letter comprises the Washington Department of Fish and Wildlife's (WDFW) response to your April 28th, 2010, letter and attached Lake Spokane Fishery Enhancement and Creel Survey Plan (Plan). We have reviewed the draft Plan and offer the following comments. Article 406 of the FERC license requires consultation with WDFW for development of the Plan. The WDFW appreciates Avista's consultation effort and we feel the Plan has improved as a result; however, we are providing additional comments and recommendations for preparation of the final Plan.

1. Section 1.0, Page 1, Background: It is stated that "*The Article also requires Avista to monitor angler use by implementing a series of creel surveys to determine whether the stocking program has been successful at creating a viable put-and-take recreational trout fishery.*" For clarification and accuracy, we recommend that you modify this sentence in the following manner. "*The Article requires Avista to conduct creel surveys to monitor the success of the stocking program, develop specific protocols to determine whether the program is successful in creating a viable put-and-take recreational fishery for rainbow trout, document the results of the program and include proposals for future stocking.*"

2. Section 2.0, Page 1, Study Area: We recommend including information relative to the creel effort, such as how operations in some years can affect access points, fishing effort and success. Please include a description of timing and frequency of lake level operations in relation to boat ramp access and docks. It would be helpful to know how the typical 3-foot drawdown, and larger drawdowns, affects boater access at each of the boat ramp locations. On page 2, please clarify that the locations listed are where boat ramps are located.

3. Section 3.0, Page 3, Plan Overview: It is stated that "*Following the final creel survey, Avista will conduct a comprehensive evaluation of the stocking program in consultation with WDFW using data collected from each annual creel survey to determine whether a viable put-and-take trout fishery has been created.*" We agree that this evaluation should be conducted in consultation with WDFW. It should be noted in the Plan that development of specific protocols for determining the program's success are required as part of this evaluation. These protocols are not in this draft Plan. We request that these specific protocols also be developed in consultation with WDFW.

4. Section 5.1, Page 6, Survey Design Overview: It is stated that "*In addition to the access point surveys, an internet based version of the angler survey will also be developed to obtain additional information on angler characteristics particularly for home owners residing along the lake that have private fishing access*." The Plan should make clear that all data collected from internet surveys will be analyzed as a separate data set from personal interviews with anglers. Data collected from internet surveys cannot be validated; therefore, this data cannot be established with the same confidence as personal creel interviews.

5. Section 5.3, Page 7, Access Point Surveys: It is stated that "*Access point surveys will be conducted from Memorial Day weekend to just after Labor Day weekend (i.e., summer strata) to coincide with when public boat launches and primary access points are opened.*" Some public boat launches and other primary access points are open beyond this time period. The Plan currently has only 1 day in Spring and 3 days in the Fall for creel interviews. This limited effort will lead to poor precision in the creel. We request the Plan include additional access point survey effort: For the spring, please survey 7 days, and for the fall, please survey 5 days. The Plans should reflect these changes in Table 2.

6. Section 5.4, Page 10, Internet Questionnaire: Please see comment #4. The Plan should make clear that all data collected from internet surveys will be analyzed as a separate data set from personal interviews with anglers. Data collected from internet surveys cannot be validated; therefore, this data cannot be established with the same confidence as personal creel interviews.

Thank you for the opportunity to provide comments and recommendations on the Lake Spokane Fishery Enhancement and Creel Survey Plan. We look forward to working with your staff to implement the Plan over the term of the license. If you have any questions or want to discuss our comments, I can be reached at (509) 892-1001 x322

Sincerely,

Doug Robison

Doug Robison
Hydropower Mitigation Coordinator

Avista Responses to WDFW Comments:

Comment number 1:

For clarification and accuracy, we recommend that you modify this sentence in the following manner. "*The Article requires Avista to conduct creel surveys to monitor the success of the stocking program, develop specific protocols to determine whether the program is successful in creating a viable put-and-take recreational fishery for rainbow trout, document the results of the program and include proposals for future stocking."*

Avista Response:

The Plan has been revised in Section 1.0 as suggested.

Comment number 2:

We recommend including information relative to the creel effort, such as how operations in some years can affect access points, fishing effort and success. Please include a description of timing and frequency of lake level operations in relation to boat ramp access and docks. It would be helpful to know how the typical 3-foot drawdown, and larger drawdowns, affects boater access at each of the boat ramp locations. On page 2, please clarify that the locations listed are where boat ramps are located.

Avista Response:

The Plan has been revised in Section 2.0 to address how Project operations generally affect access to the reservoir. Also added to Section 2.0 is a detailed description of how a typical 3-foot drawdown affects each of the five primary boat ramps identified in Table 3. The locations of these five primary boat ramps are shown in Figure 1 on page 2. For completeness, the detailed description of each access point added to Section 2.0 is provided below:

<u>Riverside State Park Boat Ramp</u>: This access point is operated by Washington State Parks and is open to the public year round. The boat ramp is not usable when the reservoir is drawn down to 3 feet below full-pool elevation.

<u>Nine Mile Recreational Area Boat Ramp</u>: This access point is also operated by Washington State Parks. The boat ramp is typically open to the public seasonally from May through mid-September each year. The exact timing of when the boat ramp is opened varies from year to year depending on weather conditions and public demand. This boat launch is not usable when the reservoir is drawn down 3 feet below full-pool elevation.

Suncrest Community Park: This is a private park that has a boat ramp for community members use only. The boat ramp is typically open year round and functional when the reservoir is drawn down to 3 feet below full-pool elevation. It is unknown at what water elevation this boat ramp becomes unusable.

Willow Bay Resort & Marina: This is a private resort that has a boat ramp for its members and/or guests only. The boat ramp is typically open year round but is not usable when the reservoir is drawn down to 3 feet below full-pool elevation.

Lake Spokane Campground: This campground is operated by Washington Department of Natural Resources. The campground and associated boat ramp is typically open to the public seasonally from the weekend after Memorial Day through Labor Day each year. The boat ramp is still useable with a 3 foot drawdown.

It is important to note that even though a couple of the boat ramps remain functional at a 3-foot drawdown, it does not necessarily mean the public has access to them. Restricted access to the ramps can also be caused by snow and ice, or ramp closures. The seasonal nature of boating restricts access more that Project operations does in most instances. Anglers need to call the state and private managers to get the current and up-to-date information on when the boat ramps are open. Also, it is unknown how a 3-foot drawdown affects the various private docks around Lake Spokane. Most docks are fixed from shore so a 3-foot drawdown would presumably affect access from these docks.

Comment number 3:

It should be noted in the Plan that development of specific protocols for determining the program's success are required as part of this evaluation. These protocols are not in this draft Plan. We request that these specific protocols also be developed in consultation with WDFW.

Avista Response:

The Plan has been revised in section 3.0 to now read: "Following the final creel survey, Avista will conduct a comprehensive evaluation of the annual creel surveys to help determine whether a viable put-and-take trout fishery has been created. Avista will develop additional protocols for determining the success of the stocking program in consultation with WDFW."

Comment number 4:

The Plan should make clear that all data collected from internet surveys will be analyzed as a separate data set from personal interviews with anglers. Data collected from internet surveys

cannot be validated; therefore, this data cannot be established with the same confidence as personal creel interviews.

Avista Response:

Avista understands the concern WDFW has with data being collected from the Internet-based surveys, and agrees that certain components of the survey can not be validated (i.e., accurate identification of fish species caught and measurements of size). For this reason, data collected from the Internet surveys will be analyzed separately from data collected during on-site interviews. However, it may be necessary to incorporate some data collected from the Internet-based surveys once protocols for determining the success of the stocking program have been developed. Avista will work with WDFW on this throughout the process.

The following sentence has been added to section 5.4 of the Plan: "Data collected from the Internet surveys will be analyzed independently of data collected from on-site interviews."

Comment number 5:

We request the Plan include additional access point survey effort: For the spring, please survey 7 days, and for the fall, please survey 5 days. The Plans should reflect these changes in Table 2.

Avista Response:

Avista agrees with WDFW that some additional access point surveys should be scheduled when the access points open early or remain open later in the year.

Avista is already planning to conduct angler interviews during the spring and fall in conjunction with angler count surveys (see section 5.3 last paragraph). In 2011, 10 boat roving surveys will be conducted in the spring and 8 in the fall when angler use may be low and less concentrated. Under these conditions, a roving type survey is typically more efficient than an access point survey, because of the potential to contact more anglers over a given time period. The boat roving surveys will be conducted during the return trip on the reservoir once the angler count survey is completed. Creel clerks will attempt to contact all boat and shoreline anglers observed while traveling by boat to gather angler use and trip information.

Since it is unknown as to the amount of angler effort that will occur at Lake Spokane during off-peak use periods, Avista agrees to add 7 days of effort in the spring and 5 days of effort in the fall to conduct access point surveys in 2011 in addition to the boat roving surveys. The extent to which access point surveys are conducted during subsequent years in the spring and fall will be determined based on the

number of angler interviews obtained from access point surveys during these periods and on when the access points are open.

The spring and fall access point surveys will be conducted predominately at the Riverside State Park public boat ramp, which is the only access point that is open year round. Beginning in 2010, Washington State Parks opened the Nine Mile Recreational Area boat ramp early to include the month of May. If a similar schedule is followed in 2011, it will also be included as an access point during the spring schedule. As discussed in our response to Comment 2, DNR's Lake Spokane Campground (including the boat launch) is closed during the fall, winter and spring seasons. Therefore, spring and fall access point surveys will not be scheduled to occur at this site in 2011. Avista will make every effort to collect the suggested access point information at the two private access points (Suncrest Community Park and Willow Bay Marina). Table 2 has been revised according to these changes.

Comment number 6:

> The Plan should make clear that all data collected from internet surveys will be analyzed as a separate data set from personal interviews with anglers. Data collected from internet surveys cannot be validated; therefore, this data cannot be established with the same confidence as personal creel interviews.

Avista Response:

Please see response to comment number 4.

Appendix B

Sample Creel Survey Form

Appendix B:

The following information will be included on the questionnaire administered to anglers by creel clerks during access point surveys and will also be included on the Internet-based survey. Wording may be slightly modified between access point and Internet-based versions to refer to the site visit in past or present tense. Some questions may also only occur on the access point surveys (e.g., the size of the angler's harvested fish), and some may only occur on the Internet-based survey (e.g., Where did you launch your boat today?).

1. Survey location: _____
    a. *See list of access points below.*

2. Interview date/start time: _____

3. Weather conditions: _____
    a. Clear
    b. Partly cloudy
    c. Overcast
    d. Raining
    e. Windy
    f. Foggy
    g. Snow

4. Fishing mode: _____
    a. Boat
    b. Shore

5. Fishing method: _____ (mark all that apply)
    a. Bait
    b. Artificial lure
    c. Fly
    d. Other

6. a. How many people are in your group today? _____
    b. How many people are fishing in your group today? _____

7. a. What is your zip code? _____
    What is the zip code(s) of the other people fishing today?

    b. Zip code #1:_____ number of anglers_____

    c. Zip code #2:_____ number of anglers_____

    d. Zip code #3:_____ number of anglers_____

8. What time did you start fishing today? _____

9. Is your fishing trip completed today?

    a. Yes: _____ Fishing stop time:_____

    b. No: _____

10. What kind of fish were you trying to catch today? _____
    a. *See species codes below*

11. Were you participating in a fishing tournament?

    a. Yes: _____

    b. No: _____

    c. Practicing: _____

12. Did you catch or harvest any fish today?

    a. _____ Yes, go to 13.

    b. _____No, go to 14.

13. The following information will be recorded on angler's catch/harvest:

Species Name[a]	Species Code[a]	Released Count	Harvested Count	Measured Count[b]		Length (inches)	Weight (oz)		Remarks Code[c]

[a] See common species list and codes below.

[b] Length and weight data will only be collected for rainbow trout that were harvested; for all other species, only the number released and harvested will be recorded.

[c] Remarks codes: (A) adipose clipped rainbow trout; (B) no catch or harvest information, reluctant angler; (C) tagged fish; (D) fish with physical deformities

Following the general creel survey questions above, a series of additional questions will be asked to obtain more specific information on angler trip satisfaction. If multiple anglers are present, one angler will be randomly selected (e.g., angler with the most recent birthday), and asked the following questions:

14. What was the primary purpose for visiting Lake Spokane today? _____
    a. Fishing
    b. Recreational boating
    c. Picnicking
    d. Camping
    e. Swimming
    f. Walking/hiking
    g. Viewing wildlife
    h. Special event
    i. Other (specify):_____

15. Is this your first fishing trip to Lake Spokane?

    a. Yes: _____

    b. No: _____, continue below:

        i. Have you completed a creel survey at Lake Spokane this year?

            1. Yes: _____, continue below:

                a. Approximately how many surveys have you completed? _____

            2. No: _____

        ii. On average, how many days per year do you fish at Lake Spokane? _____

                a. < 5 days/year

                b. 5 – 20 days/year

                c. > 20 days/year

        iii. How many days do you typically fish at Lake Spokane between the first of December and the end of February? _____

16. *If fishing from a boat:* Where did you launch your boat today?

    a. Public boat launch: _____, if so, which one? _____

    b. Private or community owned boat launch: _____, if so, which one? _____

    c. Private dock: _____

17. Where on Lake Spokane did you fish today: _____ *see map for reference*[1].
    a. Zone 1
    b. Zone 2
    c. Zone 3 *etc.*

[1] A map that divides the reservoir into specific zones (e.g., upper, middle, and lower) will be developed and provided as reference to the anglers.

18. How satisfied were you with your fishing experience today? _____, if "d" or "e", continue below
    a. Very satisfied
    b. Satisfied
    c. Neutral
    d. Dissatisfied
    e. Very dissatisfied.

        i. Why were you dissatisfied? (Please specify reason): _____

19. How would rate your fishing success today? _____
    a. Excellent
    b. Good
    c. Fair
    d. Poor

20. *If fishing for rainbow trout:* Based on your fishing success today for rainbow trout will you likely return to Lake Spokane to fish for trout?

    a. Yes: _____

    b. No: _____

21. Interviewer notes gender: _____

22. What is your age? _____

23. Thank you very much for your time. Do you have any additional comments that you would like to make about the Lake Spokane recreational fishery?

List of access points

Access Code	Location
101	Washington DNR Lake Spokane Campground
102	Willow Bay Resort and Marina
103	Suncrest Community Park
104	Nine Mile Recreation Area
105	Riverside State Park Boat Launch

Common fish species collected in Lake Spokane (from Osborne et al. 2003)

Species Code	Common Name	Scientific Name
000	No species caught	
480	Anything	
472	Mountain whitefish	*Prosopium williamsoni*
031	Rainbow trout	*Oncorhynchusmykiss*
451	Chinook salmon	*Oncorhynchus tshawytscha*
324	Kokanee	*Oncorhynchus nerka*
032	Brown trout	*Salmo trutta*
129	Black crappie	*Pomoxis nigromaculattus*
094	Channel catfish	*Ictalurus punctata*
090	Bullhead catfish	*Ictalurus species*
054	Carp	*Cyprinus carpio*
492	Tench	*Tinca tinca*
473	Chiselmouth	*Acrocheilus alutaceus*
475	Northern pikeminnow	*Mylocheliyus caurinus*
080	Suckers	*Catostomus species*
127	Largemouth bass	*Micropterus salmoides*
126	Smallmouth bass	*Micropterus dolomieui*
124	Pumpkinseed	*Lepoomis gibbosus*
142	Yellow perch	*Perca flavescens*