Lake Spokane Creel Survey, 2011
Lake Spokane Fishery Enhancement
Spokane River Hydroelectric Project
FERC Project No. 2545

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Prepared for

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INTRODUCTION

Creel surveys, or angler surveys, are frequently conducted by fisheries managers to estimate angling effort and harvest for sport fisheries (Lockwood 1999; Lockwood et al. 1999). Estimated angling effort is measured in angler hours, angler trips or angler days, and estimated harvest is measured in numbers of fish harvested and/or caught and released (Lockwood 2000). Two separate sampling components are used to estimate fishing activity and success over a given period of time at a specified location – counts of angler activity, either by boat or aircraft, and completed-trip interviews of anglers or angler parties as they exit the water at access sites (Lockwood 1999; Lockwood 2000; Lockwood and Rakoczy 2005).

This report summarizes a creel survey conducted from 1 March to 30 November, 2011 on Lake Spokane, located in Spokane, Stevens, and Lincoln Counties, Washington. The study was completed for Avista Corp (Avista) to satisfy the requirements of their hydroelectric license agreement to assess baseline angler use of Lake Spokane prior to stocking the lake with rainbow trout in 2013 or 2014.

REGULATORY 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. The reservoir for the Long Lake Hydroelectric Development 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 hatchery rainbow trout, document the results of the program, and include proposals for future stocking. Prior to implementing the stocking program, a pre-stocking creel survey was planned and carried out in 2011 to assess baseline angler use of Lake Spokane. Results of the 2011 survey, and future surveys, will help determine the future role of this program. Avista and the Washington Department of Fish and Wildlife (WDFW) have discussed various methods to define success of the stocking program and the fishery in general.

In 2010, Avista contracted Normandeau Associates, Inc. to develop a plan to carry out the stocking and survey studies. This plan, called the *Lake Spokane Fishery Enhancement and Creel Survey Plan*, was developed in consultation with WDFW. The plan was utilized as the basis for the angler study

conducted by Landau Associates and Hinson Ecological in 2011, the results of which are summarized in this report.

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 approximately 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 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 Resources' (DNR) Lake Spokane Campground have public boat launches, and provide seasonal day use as well as camping facilities. Seven or eight other community and private access sites exist on Lake Spokane. Residential ownership limits public shoreline access in the upper portion of Lake Spokane whereas some limited access is provided through public and Avista ownership on the lower portion. 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.

METHODS

The 2011 Lake Spokane creel survey was conducted to gather baseline information prior to the new rainbow trout stocking program, which is set to commence in 2013 or 2014 (Normandeau 2010). This "pre-stocking" survey was conducted to provide Avista and other fisheries managers with information about the current status of the Lake Spokane fishery and will allow for assessment of the new stocking program's effectiveness in enhancing the fishery. Two separate sampling components were used to estimate fishing activity and success at Lake Spokane in 2011 – angler counts by boat (Angler Counts), and completed-trip interviews of anglers as they exit the water at access points (Access Point Surveys). The methods employed to implement the angler counts and access point surveys, as well as computational methods utilized to analyze and summarize the survey data are described below.

SURVEY DESIGN OVERVIEW

Avista and WDFW worked together to develop the survey design appropriate for study (Normandeau 2010). Angler use in Lake Spokane was characterized through the use of a complemented survey design that incorporated both instantaneous count and access point (completed-trip) angler interviews (Normandeau 2010). Angler counts were used to determine effort (i.e., angler hours), while access point interviews obtained catch data and angler characteristics. In addition to the access point interviews, an Internet-based version of the angler survey was developed to obtain additional information on angler characteristics for home owners residing along the lake that had private fishing access. Lakeshore residents were solicited to participate in the Internet-based survey through two separate mailers during the survey period. In addition, anglers were solicited to participate in the Internet-based survey through announcements during meetings of the local Lake Spokane Association and in the Summer and Fall versions of the Spokane River Newsletter published quarterly by Avista. Results of the Internet-based survey are included as Appendix A of this report.

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

- Spring: 1 March – 27 May
- Summer: 28 May – 15 September
- Fall: 16 September – 30 November

Sampling days within each seasonal stratum were randomly selected and further stratified temporally based on month, weekday and weekend days, and time-of-day. Federally designated U.S.

holidays were considered weekend days. Winter months (December through February) were excluded from the survey period due to limited angler access.

ANGLER COUNTS

Counts of fishing boats and shore anglers were made during each sampling season by a survey boat traveling from one end of the reservoir to the other. Anglers were identified by location with a handheld Global Positioning System (GPS). The starting location of each count was randomly selected between upstream (starting at Riverside State Park) and downstream (starting at Long Lake Dam) directions using the flip of a coin. Counts were scheduled to coincide with the expected period of maximum angler use based on data collected from the angler interviews. Counting anglers during times of expected maximum use resulted in angling effort 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. Angler count start times varied from early-to-mid morning to early-to-mid afternoon throughout the sampling period, depending upon expected angler use.

Stratified systematic random sampling was used to distribute angler counts throughout each season and between weekday and weekend day strata as appropriate. This approach ensured that angler count days were selected randomly, and evenly distributed across the entire seasonal strata. Weekend and weekday strata were 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 were conducted during the spring season, 14 during the summer season, and 8 during the fall season. An approximate even number of weekday and weekend days were surveyed for each season. The days alternated between randomly selected weekday and weekend days. The sampling schedule is included as a table in Appendix B.

Lake Spokane was divided into three zones to help assess the spatial orientation of anglers throughout the survey period (Figure 1). The three zones included the following:

- Upper Zone: This zone begins at the Riverside State Park boat launch and extends downstream to the Sportsman Paradise embayment.
- Middle Zone: This zone includes the Sportsman Paradise embayment and extends downstream past Tumtum to the point where Highway 291 leaves the shoreline and begins climbing the hill to the west.
- Lower Zone: This zone begins at the point where Highway 291 leaves the shoreline and begins climbing the hill to the west, and extends downstream to Long Lake Dam.

ACCESS POINT SURVEYS

Interviews of anglers exiting Lake Spokane were conducted at the primary access points along the lake during each sampling season. The following are the access points selected for angler surveys:

- Riverside State Park Boat Ramp (River Mile [RM] 57): This access point (Figure 2) 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. The boat ramp is also difficult to access when flows are high during the spring season. In 2011, flows overtopped the dock for several weeks in late May and early June.
- Nine Mile Recreational Area Boat Ramp (RM 56): This access point (Figure 2) is operated by Washington State Parks. The boat ramp is open to the public seasonally from May through mid-October 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 (RM 52): This is a private park that has a boat ramp for community member use only (Figure 3). The boat ramp is typically open and functional year round.
- Lake Spokane Campground (RM 39): This campground (Figure 4) 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. In 2011, the boat ramp was open until early September.

As with the angler counts, survey days were selected using a stratified systematic random sampling scheme to ensure that angler interviews occurred evenly across the entire season. The majority of access point surveys were 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 were also conducted during the spring and fall strata in an attempt to characterize early- and late-season angling pressure. A total of 36 access point surveys were conducted during the summer of 2011; of these, 21 occurred on weekdays and 15 occurred on weekend/holidays. An additional 7 days (4 weekday and 3 weekend days) were carried out in the spring and 5 days (3 weekday and 2 weekend days) in the fall.

Access point surveys were conducted weekly, and alternated between one or two weekdays and one weekend day randomly selected per week. The time and location of the access point interviews were selected randomly among a series of potential starting times – half-hour intervals between 0730 h and 1230 h – and the four boat launches currently identified as potential access points that could be surveyed. During each selected day, a total of three boat ramps were surveyed for a total of two hours each. Only one or two access points were surveyed during a few of the days early in the spring stratum and late in the fall due to closures and high or low water levels.

Once arriving at the boat launch, the creel clerk proceeded to interview all departing anglers to gather information including, but not limited to: angler party size; target species; number of fish caught

by species; number of hour's fished; and residential zip code (Appendix C). Additional questions were asked during the interview to obtain more specific information on angler trip satisfaction.

Additional angler interviews were conducted in conjunction with angler count surveys during the spring and fall strata when public access to the reservoir was limited and angler use was presumed to be low and less concentrated. These interviews were conducted during the return trip down the reservoir once the angler count survey was completed. Attempts were made to contact all boat and shoreline anglers observed to gather angler use and trip information. Anglers contacted during these events were also invited to participate in the Internet version of the survey when they returned home to obtain their completed trip information. For the 2011 survey, ten boat roving surveys were conducted in the spring strata and eight in the fall.

COMPUTATIONAL METHODOLOGY

Data collected from access point surveys and angler counts were used to calculate descriptive statistics in an effort to characterize angler use. Statistics calculated include angler hours, species composition, angling location, angling method, angling frequency, angler satisfaction, and angler demographics (e.g., age, residential zip code, etc.).

ANGLER EFFORT

Angling effort during the sampling period (March – November 2011) was measured in angler hours. The proportional probability methodology described by Lockwood et al 1999 was proposed for use in this study (Normandeau 2010); however, the proportional probability methodology was not utilized to calculate angler effort due to limited angler response at access points that prevented the development of angler frequency distributions. Instead, angler effort was calculated according to slightly modified methodology developed by WDFW (Hahn et al 2000). This methodology uses average day length to expand instantaneous counts of anglers collected during angler counts. This methodology assumes equal probability of angler presence throughout the day. Estimates of angler effort were calculated for weekdays and weekends in each seasonal stratum and summed to estimate total angler effort on Lake Spokane during the sampling period.

Daily effort in hours was calculated for each sampling day in which angler counts occurred as:

$$DE = (AC \times DH) / N \quad (1)$$

Where:

DE = daily effort in hours;
AC = number of anglers counted during the day;
DH= number of fishable daylight hours available (Hahn et al 2000);
N = number of hours sampled.

Total effort in hours for weekends and weekdays (referred to as *day type*) was then calculated for each seasonal stratum by multiplying the mean daily effort for each season and day type by the total number of days in each season and day type. Total effort in hours for each seasonal stratum was then calculated by summing the effort calculated for each day type. Total effort in hours for all seasons combined was calculated by summing the effort calculated for each seasonal stratum. Variances were calculated for daily, seasonal, and total effort by day type and were used to calculate standard errors, coefficients of variation, and confidence intervals for the effort totals (Hahn et al 2000).

SPECIES COMPOSITION

Data collected during access point surveys included fish species targeted by anglers and fish species caught by anglers. This information was summarized and expressed as percent fish species targeted and caught.

RESULTS

This section summarizes results of the angler counts and access point surveys conducted on Lake Spokane in the March to November, 2011 sampling period.

ANGLER COUNTS

A total of 362 anglers were counted during boat surveys on Lake Spokane in the March to November, 2011 sampling period (Table 1). Of these, 258 were boat anglers and 104 were shoreline anglers. A total of 91, 141, and 130 anglers were counted in the Upper, Middle, and Lower zones of Lake Spokane, respectively (Figures 2, 3, and 4). The greatest proportion of boat anglers was counted in the Lower lake zone (38%); whereas the greatest proportion of shoreline anglers was counted in the Middle lake zone (48%).

Table 1. Boat and Shoreline Anglers Counted on Lake Spokane March – November 2011.

Zone	Boat Anglers Counted	Shoreline Anglers Counted	Total Anglers Counted
1 Upper	68	23	91
2 Middle	91	50	141
3 Lower	99	31	130
TOTALS	258	104	362

ACCESS POINT SURVEYS

A total of 31 anglers were interviewed during the access point surveys on Lake Spokane in the March – November sampling period. The anglers interviewed were instructed to provide information about all the anglers in their angling party. As such, angler survey information was collected on a total of 56 anglers. None of the interviewed anglers indicated that they had been interviewed more than once during the sampling period. Anglers interviewed ranged in age from six to 58, with the greatest proportion of interviewed anglers ranging between the ages of 41 and 50 (32%) (Table 2).

Table 2. Age of Anglers Surveyed on Lake Spokane March – November 2011.

Age	Number of Anglers	Percent of Anglers
< 20	4	13
20-30	4	13
31-40	8	26
41-50	10	32
> 50	5	16
TOTALS	31	100

Lake Spokane anglers originate from a wide range of local areas. Eighteen different residential zip codes were reported among the 31 angling parties. Of the 31 angling parties interviewed, ninety percent originated from Spokane County, with the other ten percent originating from Kootenai and Lincoln counties (Table 3). The majority of anglers interviewed used artificial lures only (89%), while the remaining anglers used either bait or a combination of artificial lures and bait. Ninety-one percent of anglers visit Lake Spokane less than 20 times per year, with the majority of anglers indicating they fish Lake Spokane between five and 20 times per year. Forty-eight percent of anglers indicated that they were *satisfied* with their angling experience, while twenty-one percent were *very satisfied*.

Table 3. Town of Origin of Anglers Surveyed on Lake Spokane March – November 2011.

Angler Town/City Origin	Angler County	Number of Anglers	Percent of Anglers
Spokane	Spokane	27	48
Nine Mile Falls	Spokane	7	13
Greenacres	Spokane	5	9
Cheney	Spokane	3	5
Veradale	Spokane	3	5
Post Falls	Kootenai	2	4
Rathdrum	Kootenai	2	4
Elk	Spokane	2	4
Davenport	Lincoln	2	4
Colbert	Spokane	1	2
Deer Park	Spokane	1	2
Otis Orchards	Spokane	1	2
TOTALS	N/A	56	100

ANGLER EFFORT

It is estimated that total fishing pressure exerted on Lake Spokane during the 1 March – 30 November, 2011 sampling period, based upon equation 1, was 21,566 angler hours (+/- 39,731 h) (Table 4). Angler hour estimates were slightly higher on weekends (11,387 h +/- 19,647 h) than on weekdays (10,180 h +/- 20,084 h) during the sampling period. Estimates of angler hours were highest in the summer sampling strata (13,820 h +/- 18,544 h) and lowest in the fall sampling strata (124 h +/- 415 h).

Table 4. Angler Effort on Lake Spokane March – November 2011.

Month	Stratum	Angler Hours	95% CI (+/-)
Spring	Weekend	3,023	7,418
	Weekday	4,600	10,353
	TOTAL	7,623	14,283
Summer	Weekend	8,364	12,229
	Weekday	5,456	9,301
	TOTAL	13,820	18,544
Fall	Weekend	0	0
	Weekday	124	430
	TOTAL	124	415
TOTALS	**Weekend**	**11,387**	**19,647**
	Weekday	**10,180**	**20,084**
	GRAND TOTAL	**21,566**	**39,731**

SPECIES COMPOSITION

Based upon access point interviews, the 56 anglers surveyed caught 262 total fish (Table 5). Fish species caught included smallmouth bass *Micropterus dolomieu* (83%), northern pikeminnow *Ptychocheilus oregonensis* (11%), largemouth bass *Micropterus salmoides* (2%), yellow perch *Perca flavescens* (2%), crappie *Pomoxis* spp. (2%), and mountain whitefish *Prosopium williamsoni* (< 1%).

Table 5. Fish Species Caught by Surveyed Anglers on Lake Spokane March – November 2011.

Species	Number Caught	Percent Caught	Mean Fish/Angler
Smallmouth Bass	217	83	3.88
Northern Pikeminnow	29	11	0.52
Yellow Perch	6	2	0.11
Largemouth Bass	5	2	0.09
Crappie	4	2	0.07
Mountain Whitefish	1	0	0.02
TOTALS	262	100	4.68

Fifty-nine (59) percent of anglers indicated that they targeted smallmouth bass and largemouth bass, 23 percent targeted smallmouth bass only, 16 percent targeted any species, and two (2) percent targeted carp *Cyprinus carpio* (Table 6).

Table 6. Fish Species Targeted by Surveyed Anglers on Lake Spokane March – November 2011.

Species Targeted	# Anglers Targeting	Percent Targeted
Bass (Smallmouth & Largemouth)	33	59
Smallmouth Bass	13	23
Any Species	9	16
Carp	1	2
TOTALS	56	100

DISCUSSION

Angler survey data collected in 2011 indicate that Lake Spokane is a popular bass fishery and that the majority of anglers currently targeting Lake Spokane for angling opportunities are satisfied. No anglers interviewed were targeting trout. The 2011 angler survey was successful in gathering pre-stocking angler information, which helped characterize angler use of Lake Spokane. In a general sense, we believe that angler data collected in the 2011 survey is representative of angler characteristics on Lake Spokane. From the days spent counting anglers on the water and interviewing anglers at the access points, it was evident that most boat anglers were targeting bass along shorelines, docks, and rocky points. Shoreline anglers were generally concentrated at the pullouts along the highway near Tumtum and on docks at private residences. Weekdays on Lake Spokane are typically quiet with few boats and anglers seen. Weekend days were very busy on Lake Spokane during the summer, and consisted of both recreationalists and anglers spending several hours at a time on Lake Spokane. Angler effort during the fall period was noticeably lower than the other two seasons.

A total of 31 anglers were interviewed during this survey, which is low. Angler counts were also low, which may indicate low angler effort on Lake Spokane compared to other local lakes. Due to the lower effort encountered during the 2011 survey, future surveys may try to maximize survey information collected from anglers by increasing the amount of time spent at access points on any given day. Instead of remaining at access points for two hours at a time, the creel clerks could remain for at least three hours at a time to be more effective at gathering completed-trip data from anglers exiting the lake. Another consideration may be to modify the survey day during the summer period to try and capture more interviews from anglers returning to the access points in the evening hours.

As mentioned earlier in this report, methods developed by WDFW (Hahn et al 2000) were utilized to calculate angler effort rather than methods by Lockwood et al 1999. In order to use the methods developed by Lockwood et al 1999, an angler probability distribution needed to be created based upon angler exit data gathered at access points. The limited number of angler interviews gathered at access points in 2011 prevented enough completed trip angler information from being collected, which in turn prevented the development of an angler probability distribution. From the information gained in 2011, future survey methods may be adapted to increase angler interviews at each access point during each portion of the day (sunrise to sunset) such that an angler probability distribution can be created. This probability distribution will allow angler effort estimates to be fine-tuned based upon probability estimates of angler use of Lake Spokane.

Considering the size of Lake Spokane and its proximity to a large population center, angler effort for the survey period seems fairly low. Creel surveys on Coeur d'Alene Lake in 1995-96 (Fredericks et al

1997) and 2009 (Maiolie et al 2010) resulted in estimates of 250,371 and 95,300 angler hours, respectively. When these estimates are scaled-down to the smaller size of Lake Spokane and the shorter survey period (March – November), they total 38,810 and 14,546 angler hours, respectively. The Lake Spokane estimate of 21,566 falls between these two Coeur d'Alene Lake estimates. Effort on Lake Roosevelt in 1998 totaled 1,003,551 angler hours (Spotts et al 1998). When scaled-down to adjust for the smaller size of Lake Spokane and the shorter survey period, the Lake Roosevelt estimate totals 54,848 angler hours. Overall, the Lake Spokane angler effort estimate is a believable figure and may be on the lower side.

The internet portion of the survey was voluntary and may be biased toward successful anglers and people comfortable using computer communications. The effort involved in the internet version of the survey may be better applied to the access point surveys and return trip boat interviews.

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.

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

Fredericks, J., J. Davis, N. Horner and C. Corsi. 1997. Regional Fisheries Management Investigation Panhandle Region. Federal Aid in Fish Restoration – 1996 Job Performance Report. Program F-71-R-21.

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. Washington Department of Fish and Wildlife.

Lockwood, R.N., D.M. Benjamin and J.R. Bence. 1999. *Estimating Angling Effort and Catch from Michigan Roving and Access Site Angler Survey Data*. Michigan Department of Natural Resources, Fisheries Research Report No. 2044, Ann Arbor.

Lockwood, R.N. 1999. *Evaluation of Sampling Techniques for the Lake Michigan Angler Survey*. Michigan Department of Natural Resources, Fisheries Research Report No. 2050, Ann Arbor.

Lockwood, R.N. 2000. *Conducting roving and access site angler surveys*. Chapter 14 in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Lockwood, R. N., and G. P. Rakoczy. 2005. *Comparison of interval and aerial count methods for estimating boating effort in Lake Michigan Statistical District MM-6*. Michigan Department of Natural Resources, Fisheries Research Report 2078, Ann Arbor.

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.

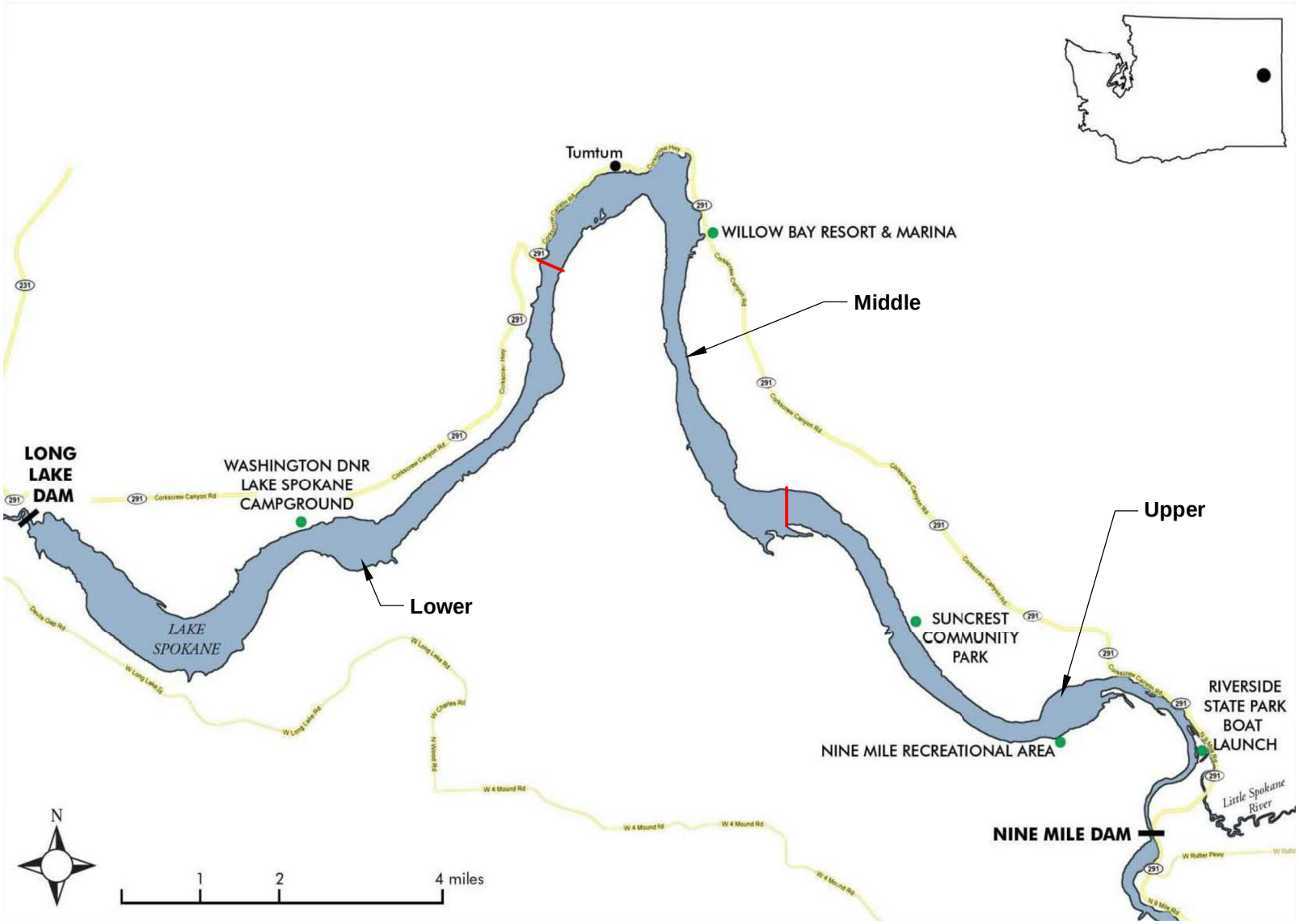
Maiolie, M., M. Liter and J. Fredericks. 2010. Coeur d'Alene Lake Creel Survey – 2009. A cooperative Project between Idaho Fish and Game and the Coeur d'Alene Tribe.

Normandeau Associates, Inc. 2010. *Lake Spokane Fishery Enhancement and Creel Survey Plan.*

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 Reservoir angler and boater user survey*. Report to the Washington Water Power Company, Spokane.

Spotts, J., J. Shields, K. Underwood and T. Cichosz. 2002. Lake Roosevelt Fisheries Evaluation Program, Part A; Fisheries Creel Survey and Population Status Analysis. 1998 Annual Report Project No. 199404300. 96 electronic pages. BPA Report DOE/BP-32148-4.



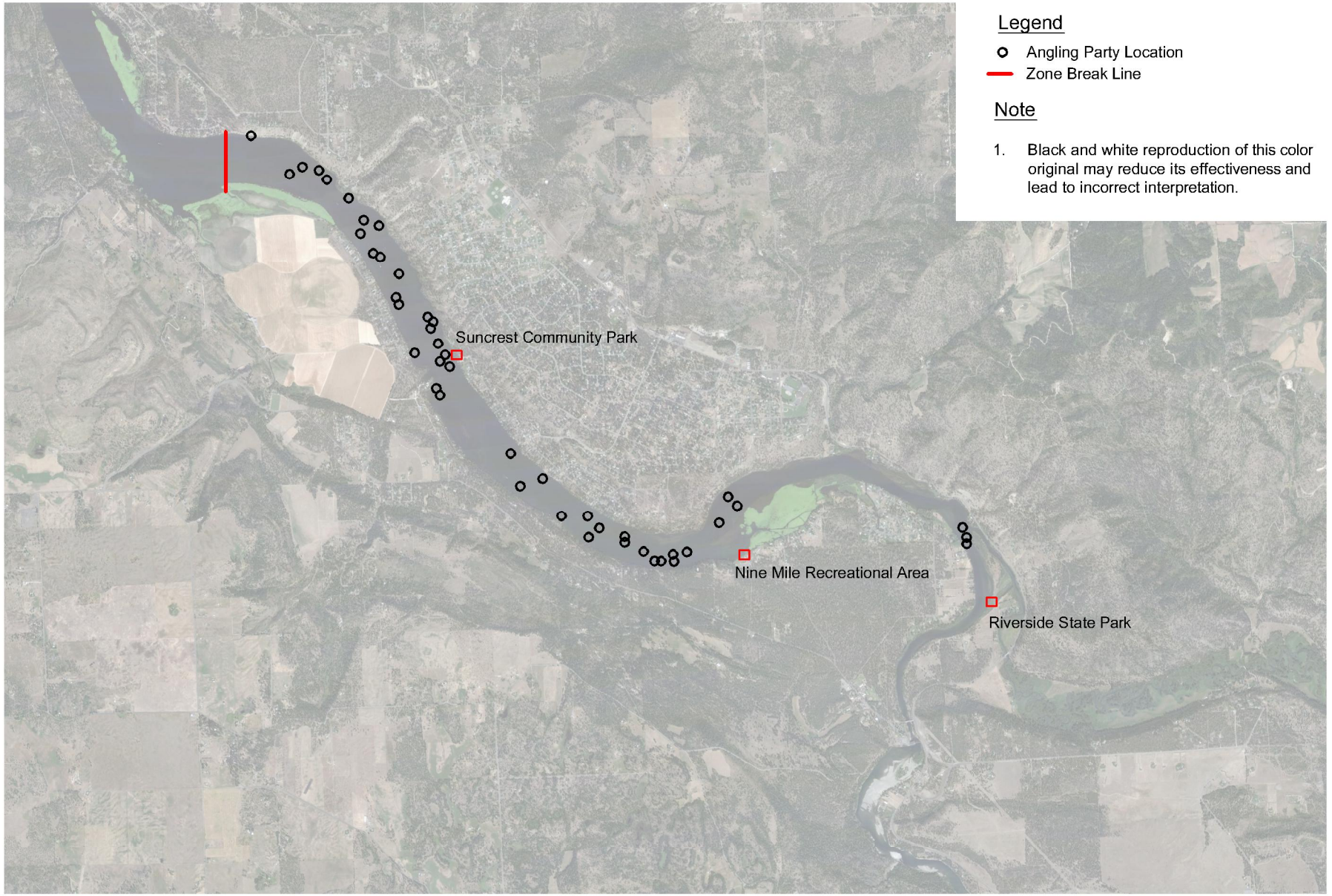
Source: Fishery Enhancement and Creel Survey Plan (2011)

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

LANDAU ASSOCIATES

Avista Creel Survey	**Vicinity Map**	Figure 1



Aerial Source: Google Earth Pro 2010, Dated 2011

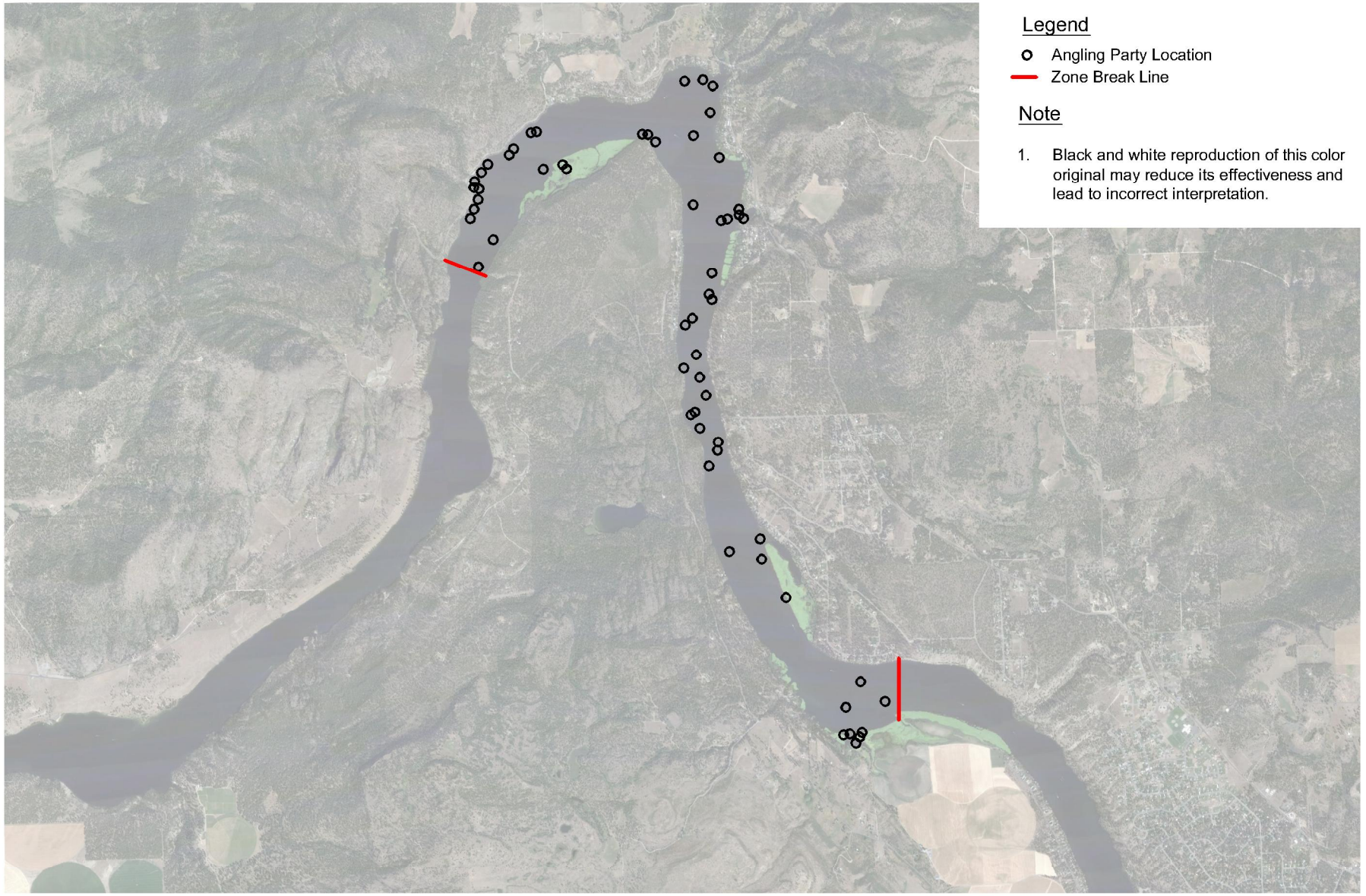
LANDAU ASSOCIATES

0 5,000 10,000
Scale in Feet

Avista Creel Survey

Upper Zone Angling Party Locations March-November 2011

Figure 2



Aerial Source: Google Earth Pro 2010, Dated 2011

LANDAU ASSOCIATES

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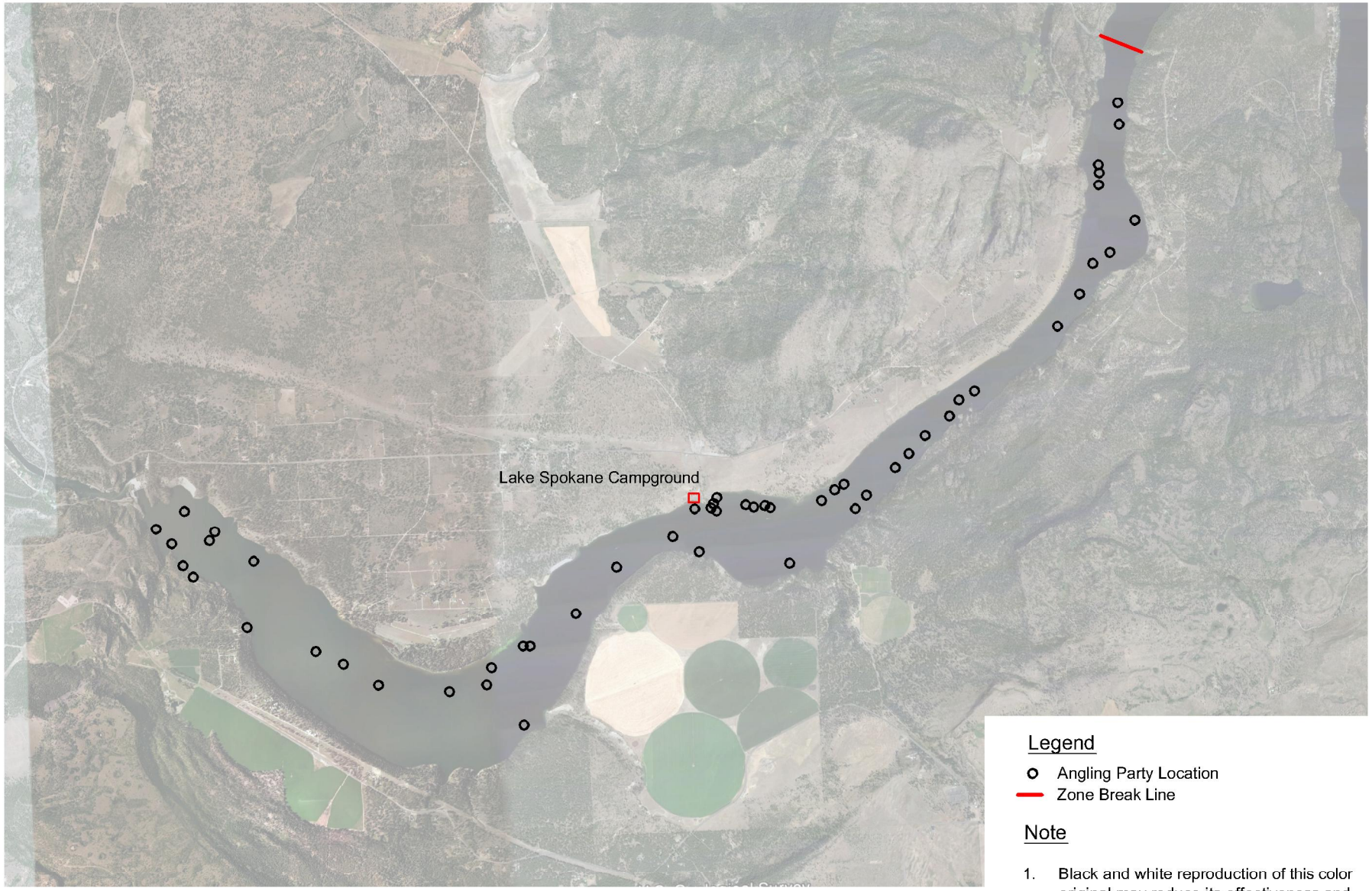
Scale in Feet

Avista Creel Survey

Middle Zone Angling Party Locations March-November 2011

Figure 3



Aerial Source: Google Earth Pro 2010, Dated 2011

LANDAU ASSOCIATES

0 5,000 10,000
Scale in Feet

Avista Creel Survey

Lower Zone Angling Party Locations March-November 2011

Figure 4

APPENDIX A

Internet Based Creel Survey

INTRODUCTION

This appendix summarizes the methods and results of the Internet portion of the creel survey conducted from 1 March to 30 November, 2011 on Lake Spokane, located in Spokane, Stevens, and Lincoln Counties, Washington. The overall study was completed to assess baseline angler use of Lake Spokane prior to stocking the lake with rainbow trout in 2013 or 2014.

METHODS

Two separate field-based sampling components were used to estimate fishing activity and success at Lake Spokane in 2011 – angler counts by boat (Angler Counts), and completed-trip interviews of anglers as they exit the water at access points (Access Point Surveys). To collect completed-trip angling information from lakeshore residents who access the lake from their private property rather than one of the surveyed access point locations, an Internet-based version of the survey was created using icontact.com. Lakeshore residents were solicited to participate in the Internet-based survey through two separate mailers during the survey period. Anglers were also solicited to participate in the Internet-based survey in the Summer and Fall versions of the Spokane River Newsletter published quarterly by Avista. In addition, anglers contacted during the return boating trip following each angler count were invited to participate in the Internet version of the survey when they returned home.

The internet-based angler survey was created on icontact.com to mimic the field-based angler survey conducted at the access points. The internet-based survey was used to gather information from anglers including, but not limited to: angler party size; target species; number of fish caught by species; number of hour's fished; and residential zip code. Additional questions were included to obtain more specific information on angler trip satisfaction.

Once the study period ended on 30 November 2011, Internet-based survey response data were downloaded from the icontact.com website and analyzed to characterize responses. A summary of response information is included in the results section below.

RESULTS

This section summarizes results of the Internet-based angler survey conducted on Lake Spokane in the March – November 2011 sampling period.

A total of 14 individuals accessed the Internet-based survey to provide information. Two individuals accessed the survey to provide general comments about Lake Spokane rather than to provide specific completed-trip angling information. Anglers surveyed were instructed to provide information about all the anglers in their angling party. As such, Internet-based angler survey information was collected on a total of 34 anglers. Anglers completing the Internet-based survey were mostly males

ranging in age from 38 – 75 (Table 1). Internet-surveyed anglers fished from a boat (53%) more often than from the shoreline (47%). Internet-surveyed anglers fished more often with bait (57%) than with artificial lures (43%). Of those that provided a response, Internet-surveyed anglers were satisfied (38%) or very satisfied (33%) with their angling experience on Lake Spokane. Most of the Internet-surveyed anglers reside in one of three zip codes in Spokane County – 99026 (Nine Mile Falls), 99034 (Nine Mile Falls), or 99208 (Spokane).

Table 1. Characteristics of Lake Spokane Internet-surveyed anglers, March – November 2011.

Gender	Age	# Anglers in Party	Angling Party Mode	Angling Party Method	Angling Party Satisfaction
Male	70	1	Shore	Artificial	Satisfied
Male	64	4	Boat	No Answer	No Answer
Female	51	3	Shore	Bait	Very Satisfied
Male	64	9	Shore	No Answer	No Answer
Male	32	2	Boat	Artificial	Satisfied
Male	38	3	Shore	Artificial	Very Satisfied
Male	52	2	Boat	Bait	Neutral
Male	60	2	Boat	Artificial	Very Dissatisfied
Male	47	1	Boat	Bait	Satisfied
Male	43	1	Boat	Artificial	Very Satisfied
Male	55	4	Boat	Bait	Satisfied
Male	75	2	Boat	Bait	Very Dissatisfied

Based upon the Internet survey, the 34 anglers surveyed caught 38 total fish (Table 2). Fish species caught included yellow perch *Perca flavescens* (32%), crappie *Pomoxis* spp. (24%), smallmouth bass *Micropterus dolomieu* (22%), northern pikeminnow *Ptychocheilus oregonensis* (14%), largemouth bass *Micropterus salmoides* (3%), mountain whitefish *Prosopium williamsoni* (3%), carp *Cyprinus carpio* (3%), and sucker *Catostomus* spp. (3%). Approximately one-third of the Internet-surveyed anglers targeted anything they could catch on their Lake Spokane fishing experience.

Table 2. Fish species targeted and caught by Internet-surveyed anglers, March – November 2011.

Species	# Anglers Targeting	Percent Targeted	Number Caught	Percent Caught
Anything	16	32	N/A	N/A
Yellow Perch	10	20	12	32
Largemouth Bass	8	16	1	3
Crappie	7	14	9	24
Smallmouth Bass	6	12	8	22
Northern Pikeminnow	3	6	5	14
Mountain Whitefish	0	0	1	3
Carp	0	0	1	3
Sucker	0	0	1	3
TOTAL	50	100	37	100

APPENDIX B

Sampling Schedule

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

APPENDIX C

Angler Survey Form

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?

From: Vore, Tim
Sent: Tuesday, May 08, 2012 11:24 AM
To: Simon, Graham A (DFW)
Cc: Goloborodko, Yelena; Fitzhugh, Speed (Elvin)
Subject: Lake Spokane Creel Survey, 2011; Spokane River License Article 406

Good Morning-

As described in the Spokane River License Article 406, Avista conducted a creel survey of anglers on Lake Spokane. The survey was conducted between March 1st and November 30th in 2011 following the methods described in the approved "Lake Spokane Fishery Enhancement and Creel Survey Plan."

The attached report titled "Lake Spokane Creel Survey, 2011, Lake Spokane Fishery Enhancement, Spokane River Hydroelectric Project, FERC Project No. 2545" provides the results of the 2011 creel survey. If you have any questions please contact me at (509) 495-8612.

I look forward to working with you as we continue to implement the enhancement plan.

Thank you,

Lake Spokane Creel Survey 2011...

Tim Vore | Avista Corp.
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509.495.8612 | tim.vore@avistacorp.com