

Boundary Hydroelectric Project (FERC No. 2144)

***Study No. 19
Big Game Study
Interim Report***

**Prepared for
Seattle City Light**

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Study No. 19: Big Game Study

Interim Report

Boundary Hydroelectric Project (FERC No. 2144)

1 INTRODUCTION

Study No. 19, the Big Game Study, is being conducted in support of the relicensing of the Boundary Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) No. 2144, as identified in the Revised Study Plan (RSP; SCL 2007) submitted by Seattle City Light (SCL) on February 14, 2007, and approved by the FERC in its Study Plan Determination letter dated March 15, 2007. This interim report describes the study efforts through November 2007.

The target big game species for this study are elk (*Cervus elaphus*), white-tailed deer (*Odocoileus virginianus*), and mule deer (*O. hemionus*), although moose (*Alces alces*), black bears (*Ursus americanus*), and cougars (*Puma concolor*) are frequently observed in the Project area, and wolves (*Canis lupus*) and grizzly bears (*Ursus arctos*) occur in the Project vicinity. Wolves and grizzly bears are federally listed species and, therefore, are addressed separately in the Study 18, Rare, Threatened, and Endangered (RTE) Wildlife Species Interim Report (SCL 2008).

2 STUDY OBJECTIVES

The goal of the Big Game Study is to provide information needed to determine locations of important shoreline segments for big game in terms of habitat, access to water, and suitable crossing sites. The study is to provide information on potential Project effects caused by water level fluctuations and Project-related roads to big game and their habitats. Specific objectives of the study are to:

- Document and characterize locations of important big game habitats along Boundary Reservoir.
- Assess the potential effects of reservoir fluctuations on the structure and function of big game habitat and travel/crossing corridors.
- Determine the density and type of roads in the Project vicinity, the contribution of Project-related roads, and potential effects on habitat quality for deer and elk.
- Estimate the amount of big game habitat potentially available in the reservoir fluctuation zone.

3 STUDY AREA

The study area for the Big Game Study extended approximately 18 miles along the Pend Oreille River from the Box Canyon Dam tailrace downstream to the U.S.-Canada border (Figure 3.0-1). Within this linear extent, primary and secondary study areas were defined.

Identification of important shoreline habitats for deer and elk was focused on the area within the Project boundary, the “primary” study area, and encompassed the following:

- Downstream of Metaline Falls — The reservoir fluctuation zone under existing operations, and the land within the FERC Project boundary (Project area). The Project area includes most Project facilities, the area 200 horizontal feet (i.e., along the ground surface, perpendicular to the shoreline) beyond the high water level along both reservoir shorelines, and the transmission line right-of-way (ROW) from the powerhouse to the Bonneville Power Administration (BPA) interconnection.
- Upstream of Metaline Falls — The reservoir fluctuation zone and the land within approximately 200 horizontal feet of the high water level (approximately 2,019 feet NAVD 88 [2,015 feet NGVD 29]) along both reservoir shorelines extending to the FERC Project boundary for the Box Canyon Project.^{1,2}
- The Boundary Wildlife Preserve (BWP) (155 acres) and adjoining SCL-owned property (85 acres).

Concerning the reservoir fluctuation zone, the range of water surface elevations recorded during the survey periods for this study is presented below; these ranges represent typical operating conditions for the period in which data were collected. Existing conditions at the time of surveys were considered adequate to acquire all data required for this study:

- From Box Canyon Dam to Metaline Falls – Elevation 1,988–2,003 feet NAVD 88 (1,984-1,999 feet NGVD 29), as measured at the USGS gage 12396500
- From Metaline Falls to Boundary Dam – Elevation 1,987-1,993 feet NAVD 88 (1,983-1,989 feet NGVD 29), as measured at the SCL gage located in the Boundary forebay

(Note: The estimate of potential habitat [Task 5] will be conducted down to elevation 1,954 feet NAVD [1,950 feet NGVD 29].)

For determining road densities and potential Project-related effects related to roads, the secondary study area included the primary study area and the following:

- From Metaline Falls to Boundary Dam — Between State Route 31 and the eastern edge of the Project boundary and between County Road 2975 and the western edge of the Project boundary.
- From the Box Canyon Dam tailrace to Metaline Falls — 0.5 mile on either side of the primary study area.

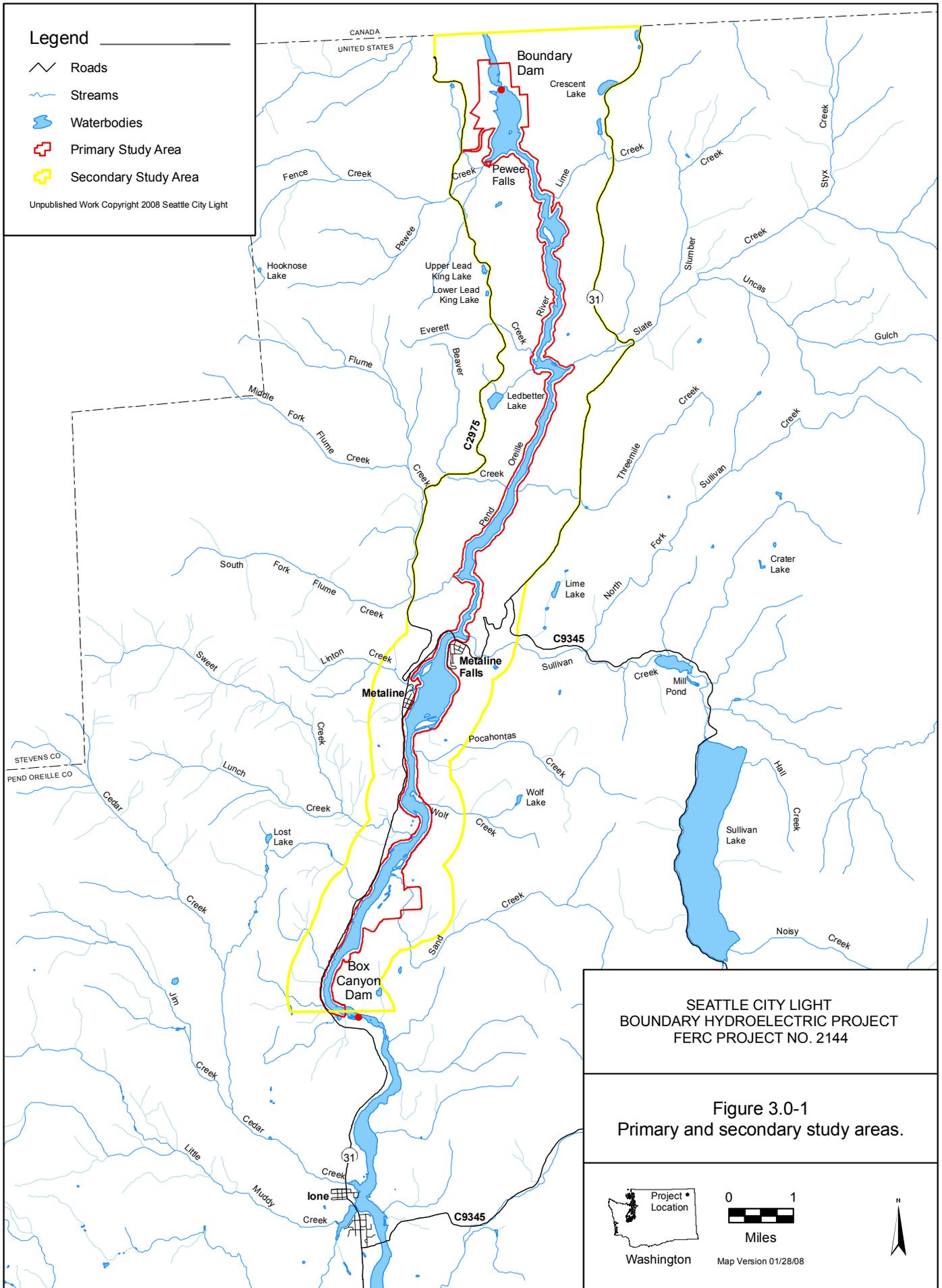
¹SCL is in the process of converting all Project information from an older elevation datum (National Geodetic Vertical Datum of 1929 [NGVD 29]) to a more recent elevation datum (North American Vertical Datum of 1988 [NAVD 88]). As such, elevations are provided relative to both data throughout this document. The conversion factor between the old and new data is approximately 4 feet (e.g., the crest of the dam is 2,000 feet NGVD 29 and 2,004 feet NAVD 88).

²As indicated in this and other study report in the Initial Study Report, SCL agrees it is appropriate to study the existing fluctuation range of the reservoir; however, for development of the Preliminary Licensing Proposal (PLP) and License Application, SCL will base its assessment of potential protection, mitigation, and enhancement measures on that portion of the fluctuation zone that is determined to be under the influence of Boundary Project operations, versus the effects of inflows and Metaline Falls that are beyond the control of the Project.

Legend

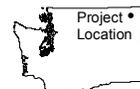
-  Roads
-  Streams
-  Waterbodies
-  Primary Study Area
-  Secondary Study Area

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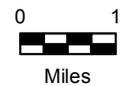


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Figure 3.0-1
Primary and secondary study areas.



Washington



Map Version 01/28/08



4 METHODS

The Big Game Study included six tasks:

1. Compiling existing information
2. Mapping and characterizing shoreline conditions
3. Assessing big game use in shoreline segments
4. Calculating road densities and estimating road use
5. Estimating potential big game habitat in the fluctuation zone
6. Documenting and assessing effects

The methodologies for tasks completed or initiated in 2007 are described in detail below; methods for tasks to be completed in 2008 are described in the RSP.

4.1 Compile Existing Information

The direction for this task was to review and summarize available information on the extent and distribution of big game habitat in the primary study area, and to identify any site-specific habitat management actions that have been implemented by land management agencies. To date, information readily available from SCL or from the literature has been collected but has not yet been evaluated. Further, no formal contacts have been made with the U.S. Forest Service (USFS), Washington Department of Fish and Wildlife (WDFW), or B.C. Hydro, the expected primary sources for additional big game habitat information; this information will be collected early in 2008.

4.2 Map and Characterize Shoreline Conditions

Characterization of shoreline conditions is in the process of being completed and will result in maps delineating habitat types and features important to big game. As this process is not yet complete, only the maps of forage sites and big game trail locations are presented in this interim report (see Appendix 1 for the maps of forage sites; see Figure 5.2-1 for the big game trail maps). The list of all features that will be mapped includes hiding, thermal, and forage cover; trails and river access points; slope and aspect; and facilities/structures.

To produce maps for this task, polygons from the vegetation/land cover type maps developed for the Pre-Application Document (SCL 2006b) were overlaid onto the aerial photograph base layer. Locations of big game trails perpendicular or parallel to the reservoir shoreline were either delineated directly onto the maps or recorded using a Global Positioning System (GPS) unit and described in field notes. Trail locations, combined with the topographic data layer, will be used in winter 2008 to further refine the maps, showing the most likely sites where big game regularly cross the reservoir. Further, a map of the stands along the river's edge classified as foraging sites was provided to botanists conducting the Riparian Tree and Shrub Study (Study 16); these staff recorded the dominant shrubs, forbs, and sedges/grasses found at each site (Appendix 1). The palatability of these forage species to big game will be evaluated in 2008 and discussed in the Updated Study Report (USR).

4.3 Assess Big Game Use in Shoreline Segments

Two methods were used to assess relative big game use of the reservoir shoreline. These were: 1) interviewing SCL staff at the Project and relicensing study team members familiar with the reservoir to identify areas where big game have been routinely observed, and 2) ocular surveys. To date, staff interviews have been informal, with more structured interviews planned for winter 2008; preliminary information obtained from Project staff and study team members was utilized by placing greater emphasis during surveys on areas where big game sightings were reported. Ocular estimates of big game were made during reservoir-based surveys and walking surveys of the BWP, which were conducted six times between June and October 2007. Big game were also recorded during RTE wildlife surveys conducted in April and May, and incidentally recorded during other field studies.

Information collected from the ocular surveys was used to evaluate whether pellet group counts would provide useful information on big game use of the primary study area. Pellet group counts can provide an index of big game use by location and habitat, and the work conducted by Boulanger et al. (2000) along the Pend Oreille River in Canada (downstream of the Project area) provides a model for conducting such a study. However, after comparing Boulanger et al.'s and Boundary's study area conditions, it became evident that a full scale pellet group count study, including clearing of survey sites prior to the winter season, would provide little useful information. This conclusion was based on the following factors: 1) the big game densities in the Boundary Project area are low, 2) the Boundary Project study area is relatively small (representing only 10 percent of the Boulanger et al. study area), 3) potential survey sites are small, and 4) and only one year of data would be collected. In addition, other problems inherent to pellet group counts (e.g., unknown winter defecation rates) could contribute to an inability to derive meaningful conclusions from such an approach. These factors were discussed with representatives of the USFS (phone conference on October 19, 2007) and WDFW (email response on October 26, 2007) and all parties agreed that a modified approach would be appropriate. To be conducted in the spring of 2008, the task will be limited to quantifying the distribution of pellet groups by species (deer, elk, moose) at select sites representing various habitats and regions in the study area. (For clarification, this approach did not include clearing sites of previous year's pellets prior to the winter season.)

4.4 Calculate Road Densities and Estimate Use

For purposes of calculating road densities, the study area was expanded to include a secondary study area (see Section 3). The discussion of this task refers to the secondary study area (which incorporates the primary study area). Calculating road densities and estimating use of roads in the study area involved the following steps:

1. Acquiring and reviewing the USFS Geographic Information System (GIS) roads layer for the study areas;
2. Updating the USFS roads layer for the study area based on field analysis (driving or walking all the roads considered to be potentially accessible to vehicles) - Crews marked up hard copies of the USFS maps while in the field and entered these data into the GIS files;

3. Calculating road densities in the study area overall and in six sub-areas: east and west sides of the reservoir upstream (southeast and southwest) and downstream (east-central and west-central) of Metaline Falls and east and west side (northeast and northwest) to the Pend Oreille River from Boundary Dam to the U.S.-Canadian border - Road densities were calculated from the maps developed in Step 1;
4. Determining road ownership (will be presented in the USR);
5. Estimating the contribution of Project-related roads to the overall and sub-area densities within the study area;
6. Assessing road use by incorporating data from Study 22, the Land and Roads Study and collecting additional field data (i.e., winter use) (in progress; will be presented in the USR); and
7. Assessing the potential effects of local road densities on big game populations using USFS models and other research.

For Step 7, the potential effects of roads in the study area on big game were assessed using the Thomas et al. (1979) habitat effectiveness model. In the RSP, it was contemplated that the Wisdom et al. (2005) model would be applied, but it was determined that the detailed road use information required for this model was not available. Roads negatively influence the optimal use of available habitat by deer and elk, and the Thomas et al. (1979) model, adapted from Perry and Overly (1977), quantifies this relationship. In general, as little as one mile of main or secondary road per square mile of habitat results in a significant decline in elk use, while significant declines in deer use occur when densities are greater than 3 miles of road (all types) per square mile of habitat. The Thomas et al. (1979) model does not require actual traffic volume data (e.g., vehicles per day), but rather classifies roads into main, secondary, and primitive, and assumes that traffic volume decreases as road quality decreases. Main roads are at least one and one-half lanes wide and regularly maintained (paved or oiled); secondary roads are one and one-half lanes wide, are somewhat improved, and are not maintained regularly; and primitive roads are single-lane roads, are unimproved and are seldom maintained. In general, all paved and oiled roads in the study area were considered main roads, unoiled USFS arterial roads were considered secondary, and old mining and/or timber harvest roads still passable were considered primitive. The specific contribution of Project-related roads to decreased habitat effectiveness in the study area was also assessed.

4.5 Estimate Potential Big Game Habitat in the Fluctuation Zone

The hydrologic and bathymetric datasets required to estimate potential big game habitat in the reservoir fluctuation zone were still under development at the writing of this interim report. Thus, this task will be completed in 2008 and the results will be reported in the USR.

4.6 Documentation and Effects Assessment

All data collected in the field were recorded on datasheets using GIS and/or maps or aerial photographs. Field forms were scanned and archived, and data were entered into spreadsheets for analysis. Location data were entered into the Project GIS database and output as maps for reporting.

Because the Big Game Study is a 2-year study, data collection and subsequent analyses are not complete. Consequently, the assessment of Project effects on big game is not addressed in this interim report but will be included in the USR.

5 PRELIMINARY RESULTS

5.1 Compile Existing Information

To date, existing information on local big game populations available from SCL's files, Project GIS databases, the WDFW Priority Habitats and Species (PHS) database, and literature have been compiled, but not yet fully evaluated. Also not yet completed are formal requests to the USFS and WDFW for current big game use and management information, and specific requests to Boundary Dam staff knowledgeable of big game use in the study area. This will be completed in winter 2008.

In general, white-tailed deer dominate the Pend Oreille Valley, and are the deer most commonly harvested during the annual fall hunt (although mule deer can be found here as well, as reflected in the results shown in Section 5.3). The west side of the Pend Oreille River within the study area is managed as white-tailed deer winter range (USFS 1988). Elk were largely eliminated from eastern Washington by the late 1800s, but then reintroduced into Pend Oreille County in 1932 and again in the 1970s. By 2003, the population known as the Selkirk Herd had grown to about 1,450 individuals, some of which can be found along the Pend Oreille River, including the study area. The east side of the Boundary Reservoir, south of Metaline Falls, is managed as elk winter range, but the quality and quantity of winter browse and spring grass foraging areas may be limiting the northern Selkirk Herd (Zender and Hickman 2001). Black bear and cougars are often reported in the study area and Pend Oreille County reports some of the highest densities of these species in the state. While moose are occasionally seen along the reservoir edge, they mainly occur outside of the study area. A more detailed assessment of big game and how managed will be provided in the USR.

5.2 Map and Characterize Shoreline Conditions

Classifying big game habitat along the reservoir shoreline as hiding, thermal, and foraging cover within the primary study area downstream of Metaline Falls is mostly complete, but work remains for the area above Metaline Falls. This remaining work will be completed in 2008 and presented in the USR. In general, thermal cover is lacking because of the second-growth nature of most forests. Hiding cover is found in mixed conifer stands, but rarely in Ponderosa pine (*Pinus ponderosa*) or Douglas-fir (*Pseudotsuga menziesii*) dominated stands. There are few open forage areas below Metaline Falls, and many of these sites are dominated by species of low palatability such as Sitka alder (*Alnus sinuata*), although some sedges (*Carex* spp.), important forage for elk, occur in the moister areas. Above Metaline Falls, the wetter sites are dominated by reed canarygrass (*Phalaris arundinacea*) and common tansy (*Tanacetum vulgare*) (both of low palatability), although beaked hazelnut (*Corylus cornuta*) and common snowberry (*Symphoricarpos albus*), all good winter forage for white-tailed deer, dominate the drier slopes. Thickets of red-osier dogwood (*Cornus stolonifera*) are found at several locations (Metaline sewage ponds, some islands, and the BWP), and are commonly used by white-tailed deer for

cover and forage. A more complete list of the dominant plants in shoreline polygons classified as forage sites is provided in Appendix 1. An investigation of the palatability of these plant species continues and will be used to address the value of these forage sites to big game. This work will be completed in 2008 and presented in detail in the USR.

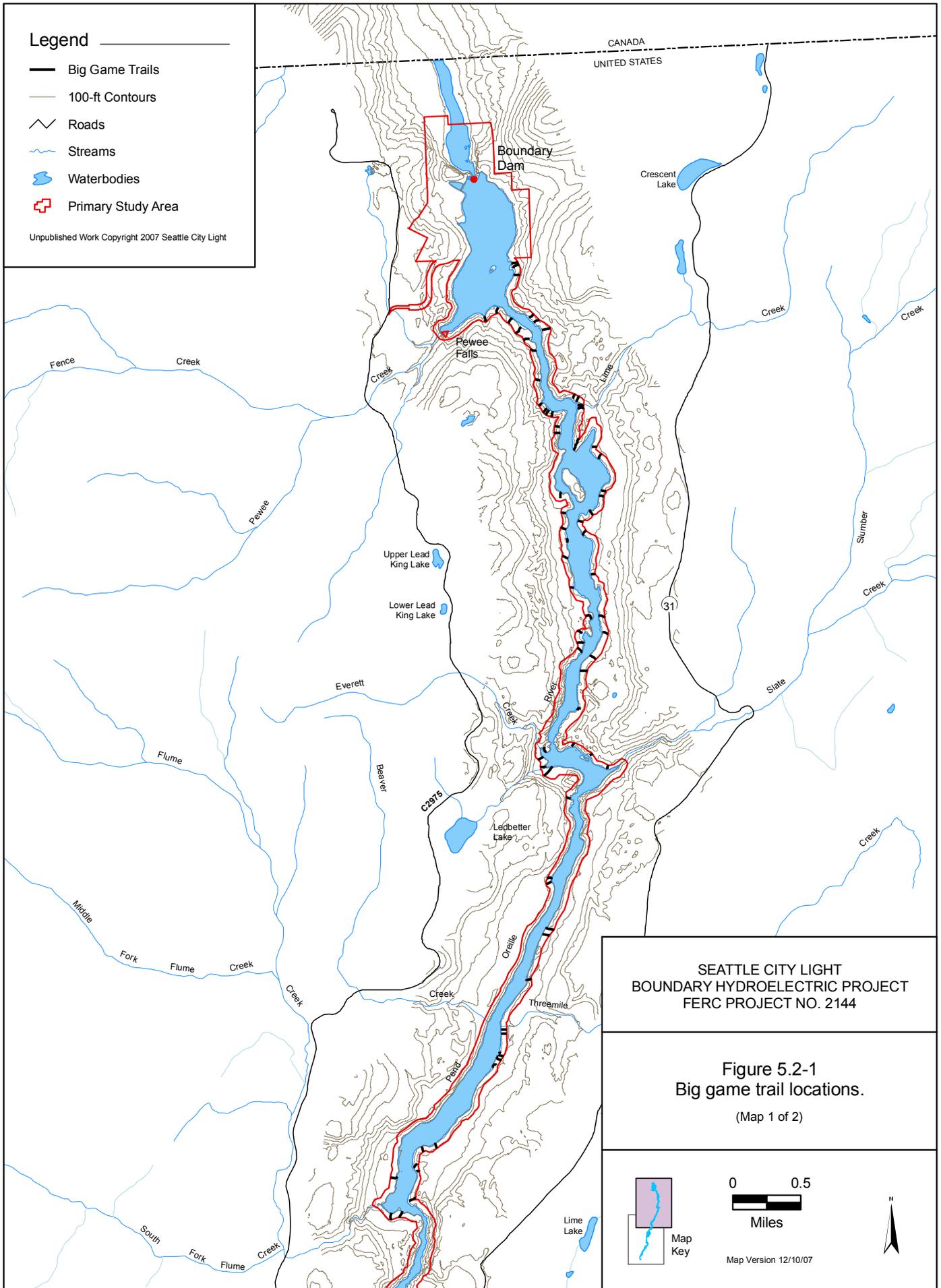
Established game trails indicate where big game access the reservoir or travel along the shorelines. Trails may also be indicative of locations where big game routinely cross the reservoir. In turn, these crossings, when viewed from a larger scale, may form part of an important travel corridor bisecting the Project area. A map of the locations of trails recorded along the reservoir shoreline is provided as Figure 5.2-1. Below Metaline Falls, big game trails can be found virtually anywhere the topography allows easy access to the reservoir edge, although some trails were also noted in rather precarious locations. Conversely, above the falls, the topography is gentler and there are few established (topographically forced) trails. Big game appear to be moving more diffusely through the study area above Metaline Falls.

Actual crossing locations are more difficult to determine. Preliminary evidence, mostly in the form of two well-used trails opposing each other on the river banks, suggests that big game regularly cross the reservoir above Metaline Falls near the Box Canyon gaging station, near Wolf Creek, and near Pocahontas Creek. Two white-tailed deer bucks were observed crossing the reservoir at the latter location. Below the falls there appears to be a number of locations where big game are crossing, but not always under the most ideal situations. For example, a doe observed crossing the reservoir in the canyon reach appeared to have a difficult time gaining enough traction to scramble up the steep rocky shoreline, and was swept a little ways down river before exiting (although the presence of the research boat may have influenced the choice of the crossing location). Trail location data will be supplemented this winter with snow trail data, then linked to study area topographic and aerial photo data to determine the most likely crossing sites, and to identify associated travel corridors crossing the study area. This analysis will be completed in 2008 and the results presented in the USR.

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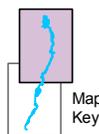
-  Big Game Trails
-  100-ft Contours
-  Roads
-  Streams
-  Waterbodies
-  Primary Study Area

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Figure 5.2-1
Big game trail locations.
(Map 1 of 2)



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Miles

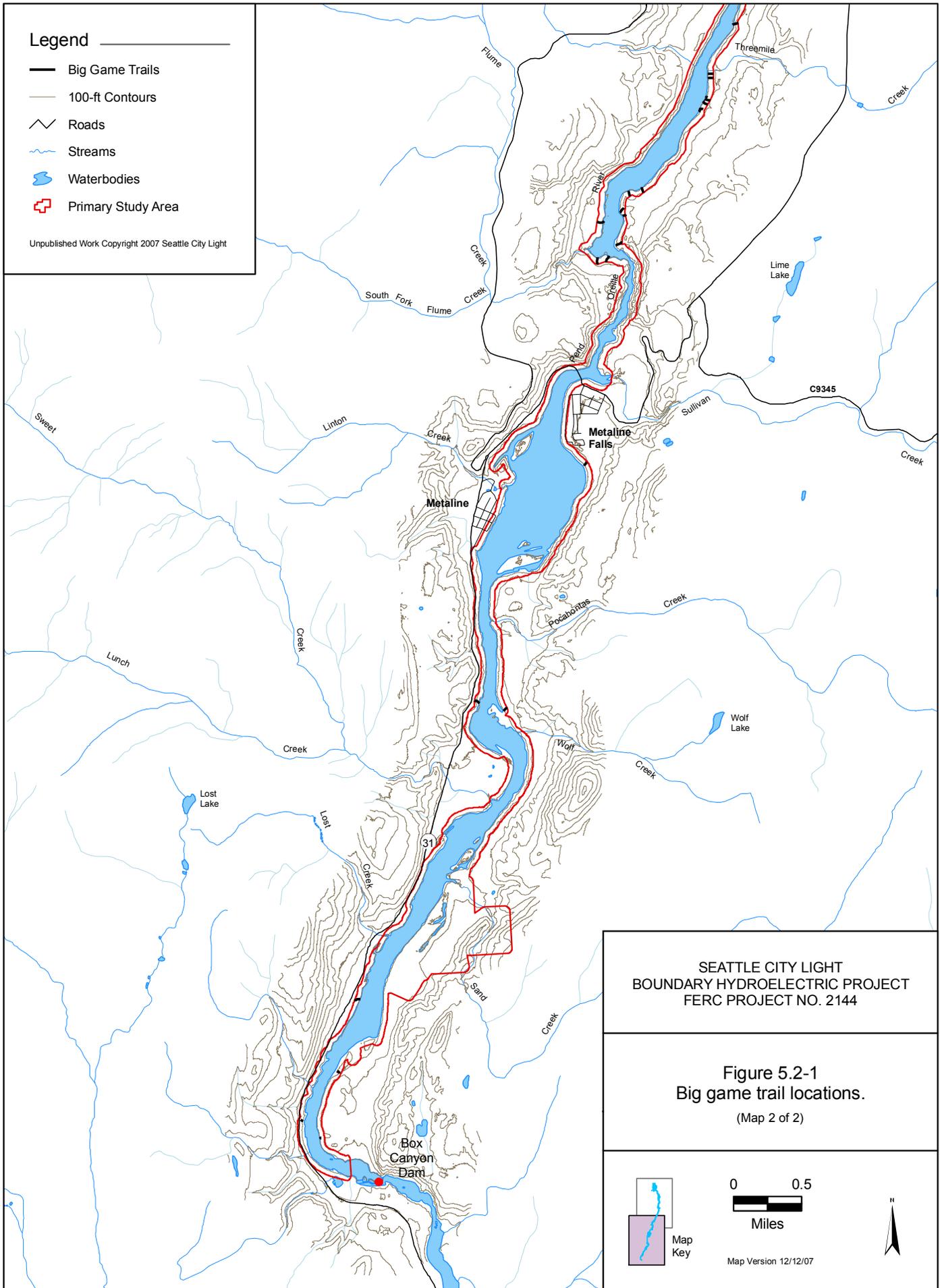


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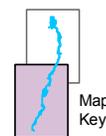
- Big Game Trails
- 100-ft Contours
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Figure 5.2-1
Big game trail locations.
(Map 2 of 2)



0 0.5
Miles



Map Version 12/12/07

5.3 Assess Big Game Use in Shoreline Segments

Of the six big game species known to occur in the Project vicinity, only three — white-tailed deer, mule deer, and elk — were observed during the course of the 2007 wildlife surveys and relatively few individuals of each species were seen (Table 5.3-1, Figure 5.3-1). All but 1 of the 13 mule deer sightings were recorded downstream of Metaline Falls, and all mule deer were observed in the spring. One particular location downstream of Metaline Falls, a small cove at Project river mile (PRM) 20.9 appeared to be especially attractive to mule deer. On two occasions, several (5 on one occasion and 3 on another) deer were observed at this site feeding on floating mats of vegetation, including Eurasian watermilfoil (*Myriophyllum spicatum*), curlyleaf pondweed (*Potamogeton crispus*), and reed canarygrass (that likely originated from upstream and washed into the cove). Mule deer were also incidentally recorded along Highway 31 on the edge of the secondary study area.

Table 5.3-1. Number of individuals of each big game species seen in study area during wildlife surveys, spring through fall 2007.

Species	Wildlife Survey Number ¹									
	1	2	3	4	6	7	8	9	10	11
White-tailed deer (<i>Odocoileus virginianus</i>)	2	5	2	3	1	4	1	10	1	0
Mule deer (<i>O. hemionus</i>)	2	7	4	0	0	0	0	0	0	0
Elk (<i>Cervus elaphus</i>)	0	0	1	0	0	0	0	0	0	0
Black bear (<i>Ursus americanus</i>)	0	0	0	0	0	0	0	0	0	0
Moose (<i>Alces alces</i>)	0	0	0	0	0	0	0	0	0	0
Cougar (<i>Puma concolor</i>)	0	0	0	0	0	0	0	0	0	0

Notes

1 Survey dates: 1—April 20–22; 2—May 9–12; 3—May 30–June 1; 4—June 14–17; 5—no big game surveys during wildlife survey 5; 6—July 9–11; 7—July 25–26; 8—Aug 13–17; 9—Sep 6–8; 10—Oct 11–13; 11—Nov 12–14.

White-tailed deer were more commonly observed than mule deer, especially along the reservoir upstream of Metaline Falls; of the 29 individuals seen, only 5 (17 percent) were recorded below Metaline Falls. In general, white-tailed deer appear to be most common above the falls where deciduous forests are prevalent, while mule deer are mostly seen below the falls where conifer habitats dominate.

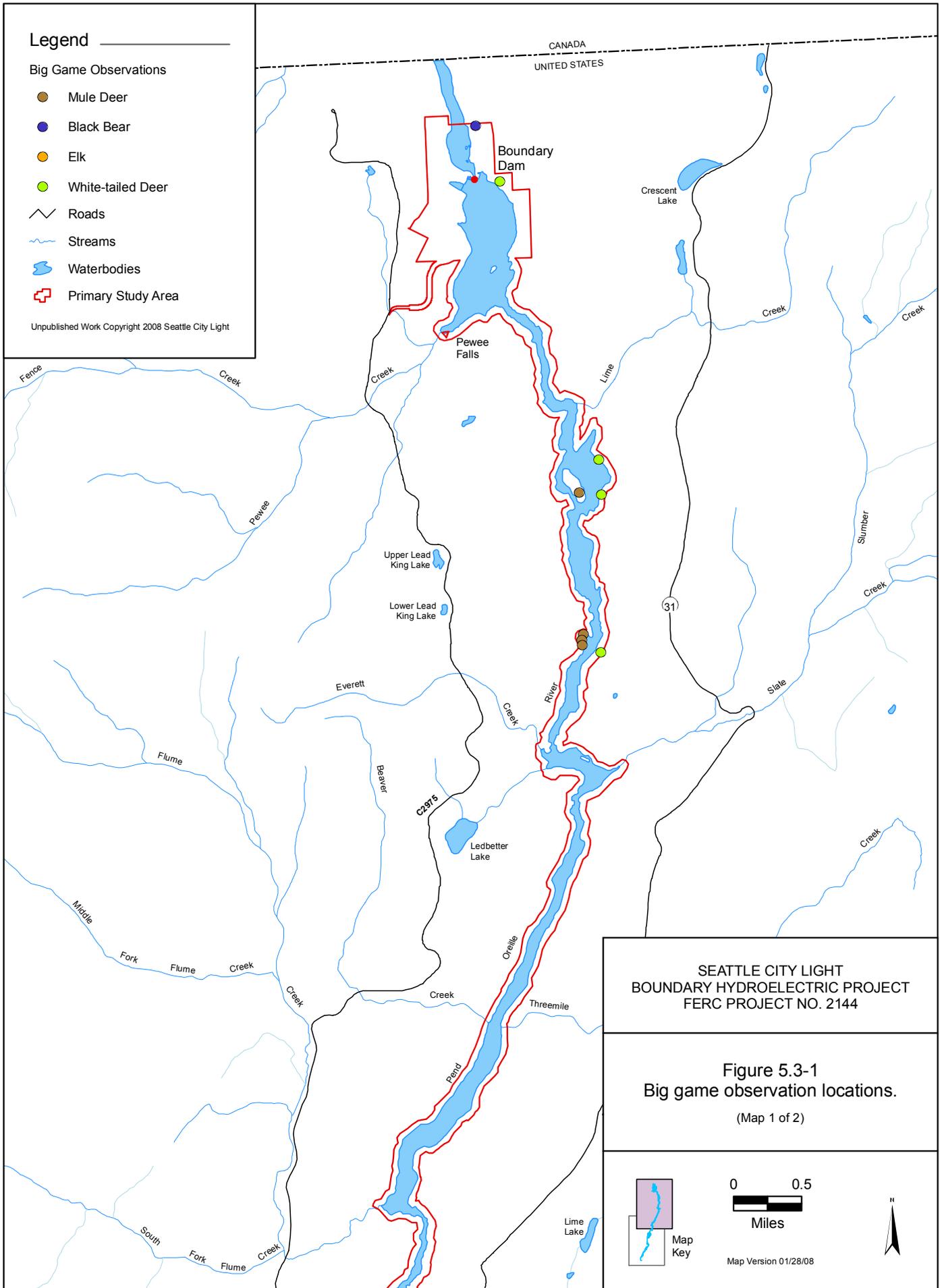
Only one elk, a cow, was observed in the primary study area (on an island at PRM 28.9), although elk were incidentally observed along roads within the secondary study area (along County Road 2975 to Boundary Dam and along the road leading to the BWP). Considerable elk sign (tracks, pellets, and beds) was noted on the BWP and below Boundary Dam along Forest Road 200. Based on the amount of sign, a small group of elk appears to regularly use the BWP at night. The security staff at Boundary Dam have regularly observed elk while traveling to and from Boundary Dam on County Road 2975, within the secondary study area.

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Big Game Observations

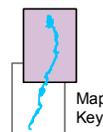
-  Mule Deer
-  Black Bear
-  Elk
-  White-tailed Deer
-  Roads
-  Streams
-  Waterbodies
-  Primary Study Area

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Figure 5.3-1
Big game observation locations.
(Map 1 of 2)



0 0.5
Miles



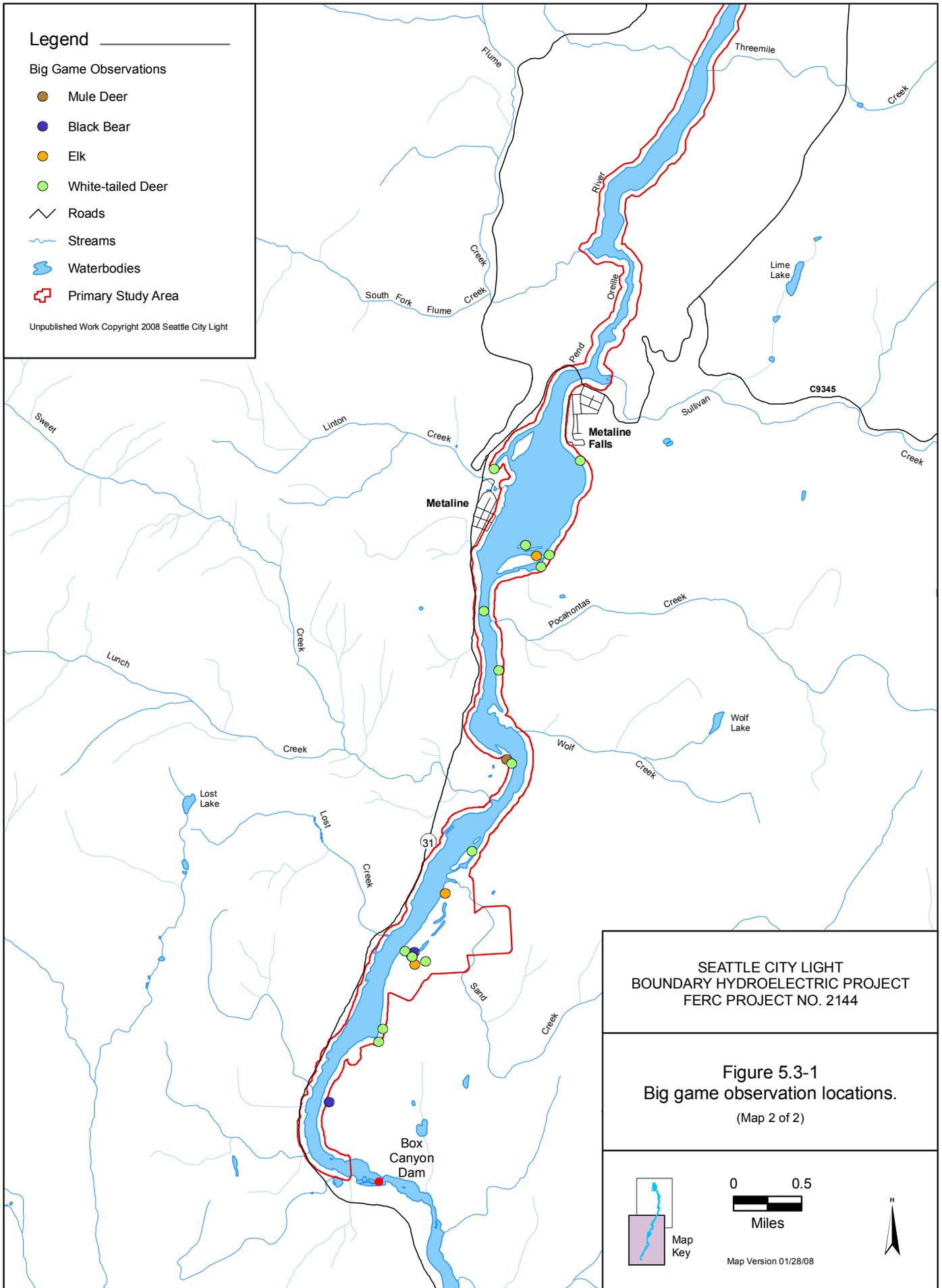
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Big Game Observations

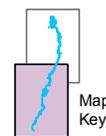
- Mule Deer
- Black Bear
- Elk
- White-tailed Deer
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Figure 5.3-1
Big game observation locations.
(Map 2 of 2)



0 0.5
Miles



Map Version 01/28/08

Although the other three big game species known to occur in the Project vicinity — black bear, moose, and cougar — were not recorded during the 2007 wildlife surveys, these species were observed incidentally in or near the study area, or have been documented in the past. A small brown-phase black bear (variously reported as a grizzly bear cub but photo-verified as a black bear) was reported in the spring near the security gate to Boundary Dam by the security guards and a non-wildlife survey crew. Other bear sightings reported by non-wildlife survey crews include: three sightings of a bear eating apples at the BWP; and, various bear sightings on the road leading to Monument Bar, outside of the primary study area, but within the secondary study area. Finally, bear tracks were recorded at the BWP and below Boundary Dam in the tailrace area (east bank); at the latter location, tracks of a sow and cubs were noted during a bat survey on July 20, 2007.

Although moose were not recorded in the study area in 2007, they have been observed in the recent past along the reservoir and at Upper Lead King Lake along the west side of County Road 2975, just south of its intersection with the Boundary West Side Access Road. Similarly, cougars were not recorded in 2007, although in previous years they have been captured on security cameras at Boundary Dam.

5.4 Calculate Road Densities and Estimate Use

For the secondary study area (which includes the primary study area) there are 1.48 miles/square mile of main road, and 0.51 and 2.48 miles/square mile of secondary and primitive road, respectively (Table 5.4-1). The sub-area with the greatest road density (east-central) is located east of the river between Metaline Falls and Boundary Dam (Figure 5.4-1). The presence of Highway 31 and numerous primitive roads associated with past timber and mining activity account for the higher road densities in this sub-area.

Table 5.4-1. Road densities in the secondary study area and 6 sub-areas, and approximate habitat effectiveness for deer and elk (from Thomas et al. 1979).

Sub-area	Road Density (miles of road/square mile)			Habitat Effectiveness ⁴	
	Main ¹	Secondary ²	Primitive ³	Deer	Elk
Northwest (0.67 mi ²)	2.35	0.35	0.77	85%	32%
West-central (7.54 mi ²)	1.53	0.07	2.44	84%	46%
Southwest (3.94 mi ²)	2.27	0.22	1.90	82%	39%
Northeast (2.02 mi ²)	0.90	0.40	0.77	91%	45%
East-central (7.42 mi ²)	1.72	0.71	3.41	62%	25%
Southeast (4.93 mi ²)	0.54	1.17	2.54	77%	38%
Overall (26.52 mi ²)	1.48	0.51	2.48	80%	36%

¹ Main road – at least one and one-half lanes wide and regularly maintained (paved or oiled).

² Secondary road – one and one-half lanes wide, are somewhat improved, and are not regularly maintained.

³ Primitive road – single-lane roads are unimproved and seldom maintained.

⁴ Habitat effectiveness – The effectiveness of deer and elk in obtaining optimum use of the maximum area of available habitat; the higher the road density, the lower the habitat effectiveness.

Overall, the road densities in the study area are not high enough to greatly influence deer use of available habitat. Results of the Thomas et al. model, indicate that 77 to 91 percent of the habitat

effectiveness for deer is maintained in five of the six sub-areas (Table 5.4-1). The exception is the east-central sub-area where the overall road density is nearly 6 miles per square mile, which reduces habitat effectiveness to 62 percent. Elk are more sensitive to the presence of roads, particularly main and secondary roads, which is reflected in the modeling results. Habitat effectiveness is less than 50 percent in all sub-areas, and is 36 percent overall. Habitat effectiveness is especially low in the northwest, east-central, and southeast sub-areas where main road densities are highest. The high road densities in the northwest sub-area are a result of the small size of the sub-area relative to the number of roads associated with the dam and maintenance facilities. The east-central and southeast sub-areas are affected by the presence of Highway 31 and paved and unpaved roads associated with mines, schools, and motels just outside the city limits of Metaline Falls.

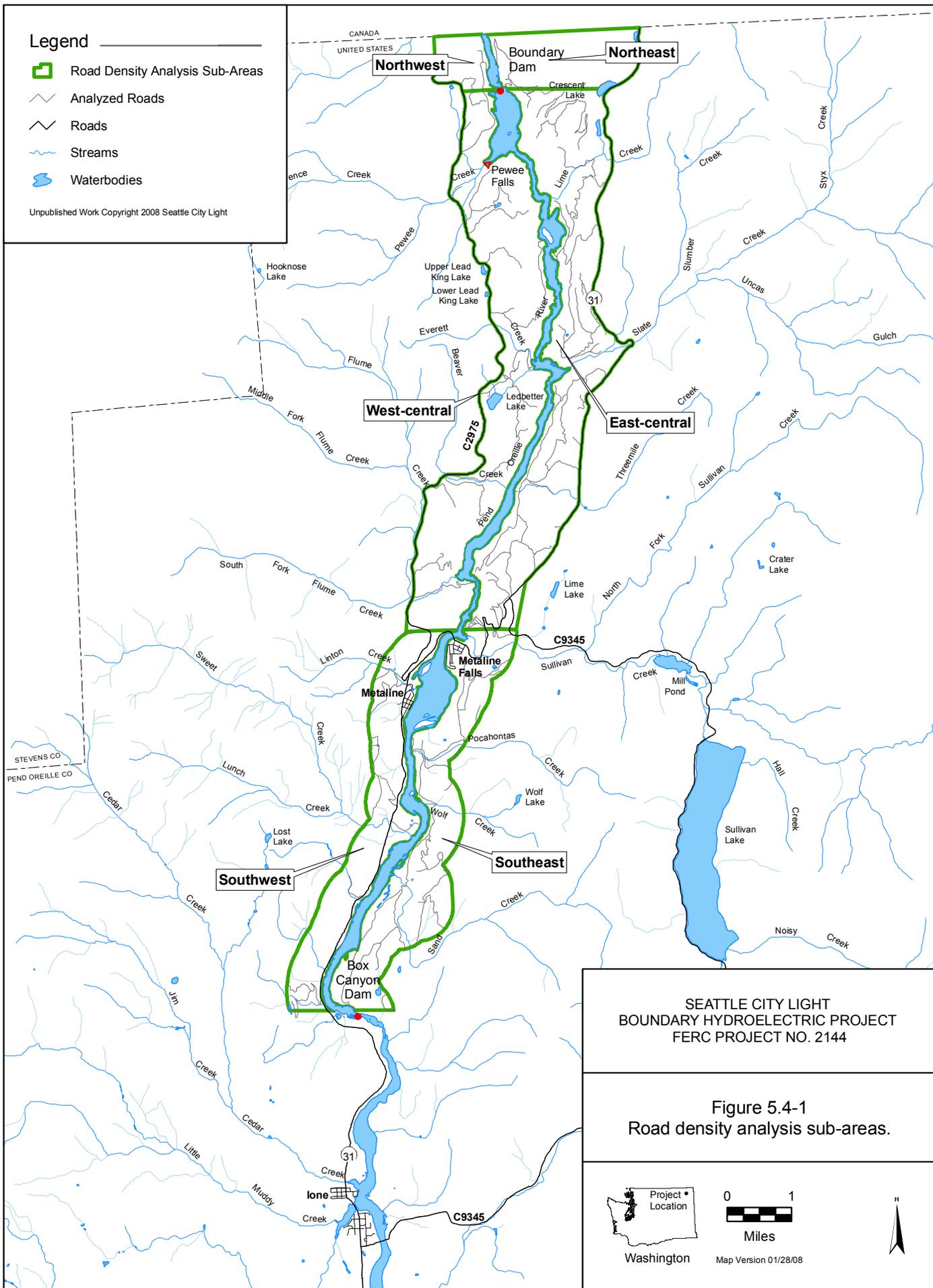
The road classifications, particularly the secondary and primitive classifications, are preliminary and will be refined for the USR. Also, there may be additional areas that should be classified as non-habitat and excluded from the analysis, particularly the Pend Oreille Village and the Pend Oreille Mine (both are currently included as habitat in the analysis). Finally, since roads form the boundaries of the sub-areas, there may be a resulting imbalance in the calculation of habitat effectiveness. Since the Thomas et al. (1979) model assumes that both sides of a road are contributing to the reduction in habitat effectiveness, the contribution of bordering roads should probably be down-weighted by half to reflect that one side of the road does not occur in the study area. Thus, the initial road density results presented in this report should be considered preliminary as they may change once these factors are more fully integrated into the analysis.

Project-related roads were identified as part of Study 22, the Land and Roads Study. Approximately 9.4 miles of road are used for Project-related purposes, representing approximately 8 percent of the 118.5 miles of roads (including border roads) identified within the secondary study area. Project-related roads contribute significantly to the road density in the northwest sub-area, where 89 percent of the 2.3 miles of road are used for Project purposes, while there are no Project-related roads in the southwest or southeast sub-areas.

Legend

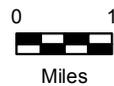
-  Road Density Analysis Sub-Areas
-  Analyzed Roads
-  Roads
-  Streams
-  Waterbodies

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Figure 5.4-1
Road density analysis sub-areas.



Map Version 01/28/08



5.5 Estimate Potential Big Game Habitat in the Fluctuation Zone

The analysis to determine the amount of potential big game habitat that could develop in the fluctuation zone will be conducted in 2008 and the results will be presented in the USR.

5.6 Documentation and Effects Assessment

The assessment of Project effects on big game will not be conducted until all of the study tasks are complete. The results from this assessment will be provided in the USR.

6 SUMMARY

Relatively low numbers of big game were recorded between April and November 2007. Preliminary results suggest that white-tailed deer are ubiquitous along the reservoir above Metaline Falls, but present only in small numbers below the falls. Mule deer are few and confined mostly to the area below the falls where their presence may be seasonal. Elk are using the BWP and the area below Boundary Dam but are rarely sighted. Deer and elk trails leading to the reservoir are found wherever the topography allows or forces movement patterns. The large number of relatively modest trails suggests a diffuse movement of big game across the reservoir. No major travel corridors have yet been recorded, although a broad-scale evaluation of how the local and regional topography could influence big game movements has not yet been conducted; winter snow tracking and additional animal sightings will contribute to an understanding of this subject. Moose were not sighted in the study area in 2007 but have been observed in the past. Finally, black bears seasonally use the BWP to forage, but otherwise have mostly been observed near Boundary Dam.

The habitat quality for deer and elk is still under investigation, but foraging habitat within the primary study area below Metaline Falls appears to be greatly limited, supporting similar observations by the USFS. Most of the forest in the primary study area can be characterized as second-growth forest, resulting from large-scale timber harvest and wildfires in the early 20th Century. Thermal cover is developing, but still marginal, and steep slopes below Metaline Falls contribute to sub-optimal habitat. Above the falls there is very little hiding and thermal cover within the primary study area, but there are southwest facing slopes that may provide winter foraging habitat. Once the field habitat investigations and winter big game surveys are complete, a more informed understanding of deer and elk use of the primary study area will be known, and will be reported in the USR.

7 VARIANCES FROM FERC-APPROVED STUDY PLAN AND PROPOSED MODIFICATIONS

Few deviations from the FERC-approved RSP were made. Because big game were recorded during reservoir-based surveys targeting other species (e.g., waterfowl), more survey data on big game use were collected than originally proposed in the RSP. In addition, although not called for in the RSP, incidental big game sightings were recorded by non-wildlife research teams.

Further, the RSP contemplated using the Wisdom et al. (2005) model to investigate the effects of local roads on big game habitat. However, this model requires traffic volume data, partitioned by day and night. Because no traffic data (e.g., number of vehicles per day) are available for the study area, the Thomas et al. (1979) model was used to evaluate the influence of roads on big game habitat effectiveness. The Thomas et al. model classifies roads based on road quality and assumes traffic volume decreases as road quality decreases. Finally, the suitability of conducting a pellet group count study was evaluated. By agreement between the USFS, WDFW, and SCL, a modified version of the pellet group count methodology used by Boulanger et al. (2000) will be designed in winter 2008 and implemented in April 2008.

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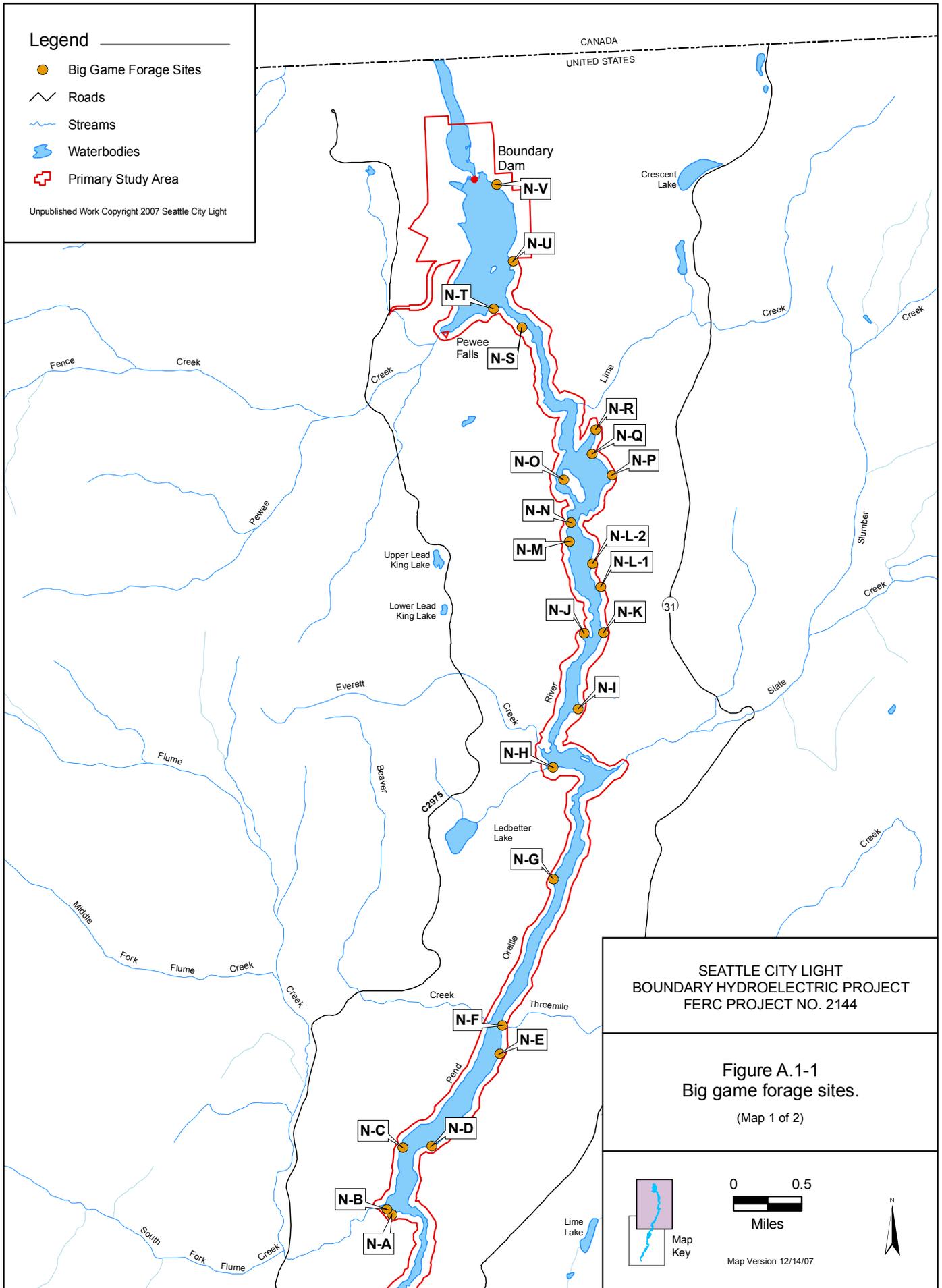
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Appendix 1. Plant Species Documented at Mapped Big Game Forage Sites

Legend

-  Big Game Forage Sites
-  Roads
-  Streams
-  Waterbodies
-  Primary Study Area

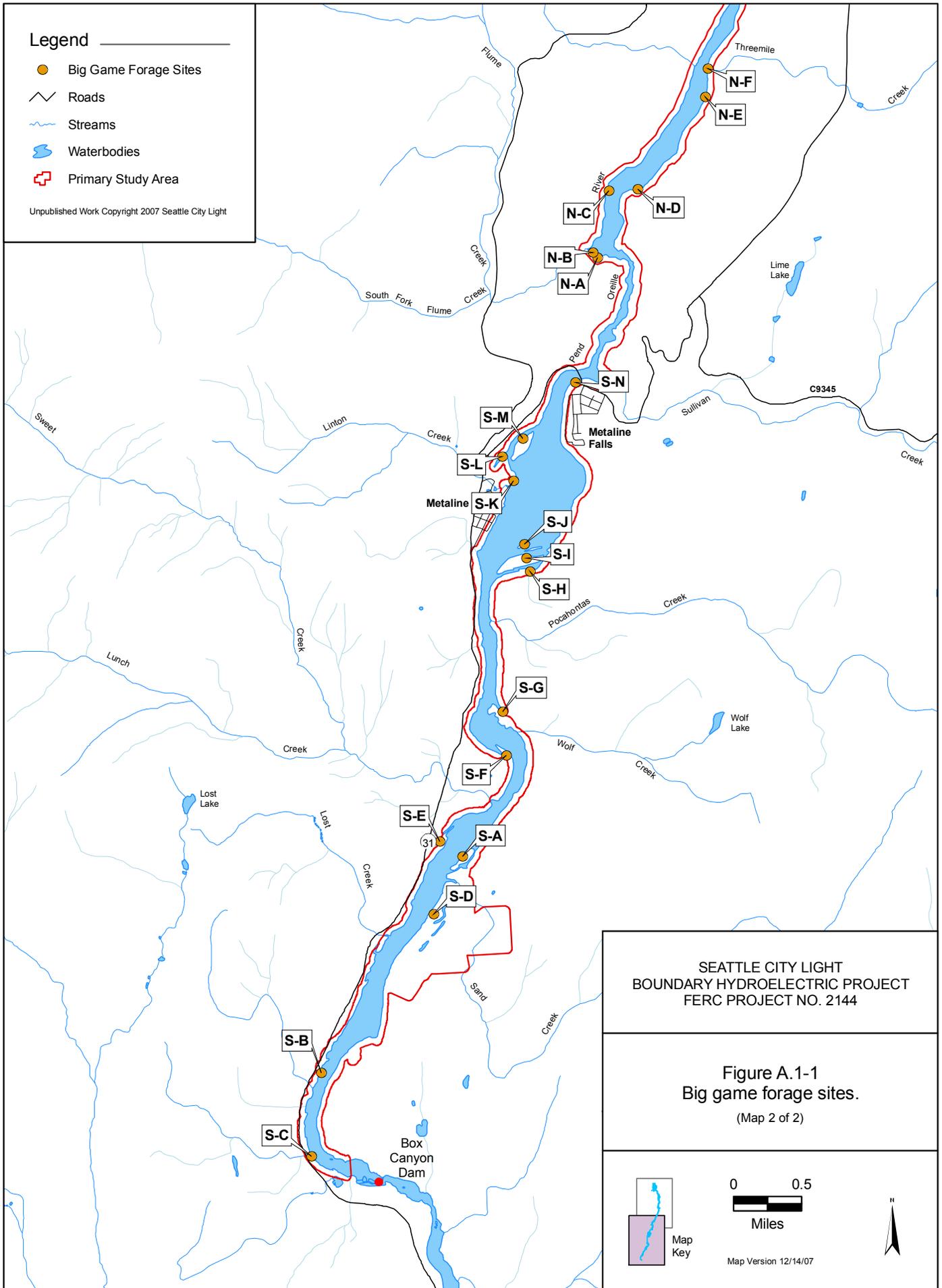
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Legend

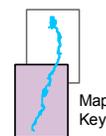
- Big Game Forage Sites
- ∩ Roads
- ~ Streams
- Waterbodies
- ⊕ Primary Study Area

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Figure A.1-1
Big game forage sites.
(Map 2 of 2)



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Map Version 12/14/07

Table A.1-1. Scientific and common names of the dominant plant species at big game forage sites in the primary study area.

Plot No.	Trees	Shrubs	Forbs	Grass-like Plants
N-A	<i>Thuja plicata</i> western redcedar	<i>Cornus canadensis</i> bunchberry	<i>Aralia nudicaulis</i> wild sarsaparilla	<i>Carex</i> spp. sedges
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Linnaea borealis</i> twinflower	<i>Clintonia uniflora</i> queen's cup	<i>Festuca occidentalis</i> western fescue
		<i>Corylus cornuta</i> beaked hazelnut		
		<i>Chimaphila umbellata</i> prince's-pine		
N-B	<i>Thuja plicata</i> western redcedar	<i>Corylus cornuta</i> beaked hazelnut	<i>Aralia nudicaulis</i> wild sarsaparilla	<i>Carex</i> spp. sedges
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Linnaea borealis</i> twinflower	<i>Clintonia uniflora</i> queen's cup	<i>Festuca occidentalis</i> western fescue
	<i>Abies grandis</i> grand fir	<i>Symphoricarpos albus</i> common snowberry	<i>Hypericum perforatum</i> common St. John's wort	
		<i>Alnus sinuata</i> Sitka alder	<i>Aster</i> spp.	
N-C	<i>Thuja plicata</i> western redcedar	<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Aster</i> spp.	
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Corylus cornuta</i> beaked hazelnut	<i>Tanacetum vulgare</i> common tansy	<i>Carex</i> spp. sedges
		<i>Berberis aquifolium</i> tall Oregon-grape	<i>Plantago lanceolata</i> ribwort	
		<i>Holodiscus discolor</i> oceanspray	<i>Aster</i> spp.	
N-D	<i>Thuja plicata</i> western redcedar	<i>Berberis aquifolium</i> tall Oregon-grape	<i>Tanacetum vulgare</i> common tansy	<i>Carex</i> spp. sedges
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Shepherdia canadensis</i> russet buffaloberry	<i>Plantago lanceolata</i> ribwort	
	<i>Abies grandis</i> grand fir	<i>Salix</i> spp. willow	<i>Melilotus alba</i> white sweet-clover	
		<i>Alnus sinuata</i> Sitka alder	<i>Aster</i> spp.	
N-E	<i>Thuja plicata</i> western redcedar	<i>Corylus cornuta</i> beaked hazelnut	<i>Smilacina stellata</i> star-flowered false Solomons seal	<i>Carex</i> spp. sedges
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Acer glabrum</i> Rocky Mountain maple		
	<i>Abies grandis</i> grand fir	<i>Berberis nervosa</i> dull Oregon-grape		
	<i>Larix occidentalis</i> western larch	<i>Linnaea borealis</i> twinflower		
	<i>Taxus brevifolia</i> western yew			

Table A.1-1, continued...

Plot No.	Trees	Shrubs	Forbs	Grass-like Plants
N-F	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Aster</i> spp.	<i>Muhlenbergia mexicana</i> Mexican muhly
	<i>Thuja plicata</i> western redcedar	<i>Juniperus occidentalis</i> western juniper		
	<i>Alnus sinuata</i> Sitka alder	<i>Shepherdia canadensis</i> russet buffaloberry		
	<i>Betula papyrifera</i> paper birch			
N-G		<i>Alnus sinuata</i> Sitka alder	<i>Plantago lanceolata</i> ribwort	
		<i>Shepherdia canadensis</i> russet buffaloberry	<i>Tanacetum vulgare</i> common tansy	
			<i>Aster</i> spp.	
			<i>Melilotus alba</i> white sweet-clover	
N-H	<i>Pinus contorta</i> lodgepole pine	<i>Alnus sinuata</i> Sitka alder	<i>Clintonia uniflora</i> queen's cup	
	<i>Larix occidentalis</i> western larch	<i>Shepherdia canadensis</i> russet buffaloberry	<i>Aster</i> spp.	
	<i>Thuja plicata</i> western redcedar	<i>Vaccinium membranaceum</i> thinleaf huckleberry	<i>Fragaria virginiana</i> wild strawberry	
	<i>Tsuga heterophylla</i> western hemlock	<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Silene oregana</i> Oregon silene	
		<i>Gautheria ovatifolia</i> western teaberry	<i>Aralia nudicaulis</i> wild sarsaparilla	
N-I	<i>Larix occidentalis</i> western larch	<i>Alnus sinuata</i> Sitka alder		
	<i>Thuja plicata</i> western redcedar			
	<i>Pseudotsuga menziesii</i> Douglas-fir			
N-J		<i>Alnus sinuata</i> Sitka alder	<i>Apocynum androsaemifolium</i> spreading dogbane	<i>Phalaris arundinacea</i> reed canarygrass
		<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Pteridium aquilinum</i> western brackenfern	<i>Carex</i> spp. sedges
		<i>Rubus parviflorus</i> thimbleberry	<i>Aster</i> spp.	
N-K	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Corylus cornuta</i> beaked hazelnut	<i>Hieracium caespitosum</i> meadow hawkweed	<i>Calamagrostis canadensis</i> bluejoint
	<i>Thuja plicata</i> western redcedar	<i>Holodiscus discolor</i> oceanspray	<i>Antennaria racemosa</i> raceme pussytoes	
	<i>Larix occidentalis</i> western larch	<i>Amelanchier alnifolia</i> Saskatoon serviceberry	<i>Aster</i> spp.	

Table A.1-1, continued...

Plot No.	Trees	Shrubs	Forbs	Grass-like Plants
	<i>Abies grandis</i> grand fir	<i>Rosa woodsii</i> Woods' rose		
		<i>Berberis</i> spp. Oregon-grape		
		<i>Linnaea borealis</i> twinflower		
N-L-1	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Alnus sinuata</i> Sitka alder	<i>Pteridium aquilinum</i> western brackenfern	<i>Phalaris arundinacea</i> reed canarygrass
	<i>Larix occidentalis</i> western larch	<i>Rubus parviflorus</i> thimbleberry	<i>Hypericum perforatum</i> common St. John's wort	<i>Elymus glaucus</i> blue wildrye
	<i>Abies grandis</i> grand fir	<i>Symphoricarpos albus</i> common snowberry	<i>Clintonia uniflora</i> queen's cup	<i>Danthonia spicata</i> poverty oatgrass
	<i>Pinus contorta</i> lodgepole pine	<i>Linnaea borealis</i> twinflower		<i>Agrostis</i> spp.
N-L-2	<i>Abies grandis</i> grand fir	<i>Alnus sinuata</i> Sitka alder	<i>Hieracium caespitosum</i> meadow hawkweed	<i>Agrostis</i> spp.
	<i>Larix occidentalis</i> western larch	<i>Rubus parviflorus</i> thimbleberry	<i>Aster</i> spp.	
	<i>Thuja plicata</i> western redcedar	<i>Linnaea borealis</i> twinflower	<i>Fragaria virginiana</i> wild strawberry	
		<i>Symphoricarpos albus</i> common snowberry	<i>Viola</i> spp. violet	
		<i>Pteridium aquilinum</i> western brackenfern		
N-M	<i>Abies grandis</i> grand fir	<i>Alnus sinuata</i> Sitka alder	<i>Apocynum androsaemifolium</i> spreading dogbane	<i>Bromus ciliatus</i> fringed brome
	<i>Larix occidentalis</i> western larch	<i>Spiraea douglasii</i> western spiraea	<i>Hypericum perforatum</i> common St. John's wort	<i>Phalaris arundinacea</i> reed canarygrass
	<i>Pinus monticola</i> western white pine	<i>Rubus parviflorus</i> thimbleberry	<i>Solidago gigantea</i> giant goldenrod	<i>Agrostis</i> spp.
	<i>Thuja plicata</i> western redcedar	<i>Linnaea borealis</i> twinflower		
	<i>Symphoricarpos albus</i> common snowberry			
N-N	<i>Thuja plicata</i> western redcedar	<i>Shepherdia canadensis</i> russet buffaloberry	<i>Hieracium caespitosum</i> meadow hawkweed	<i>Agrostis</i> spp.
	<i>Larix occidentalis</i> western larch	<i>Acer glabrum</i> Rocky Mountain maple	<i>Verbascum thapsus</i> common mullein	<i>Poa</i> spp.
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Juniperus scopulorum</i> Rocky Mountain juniper	<i>Solidago gigantea</i> giant goldenrod	
		<i>Corylus cornuta</i> beaked hazelnut	<i>Medicago lupulina</i> black medick	
		<i>Arctostaphylos uva-ursi</i> kinnikinnick		

Table A.1-1, continued...

Plot No.	Trees	Shrubs	Forbs	Grass-like Plants
N-O	<i>Larix occidentalis</i> western larch	<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Melilotus alba</i> white sweet-clover	<i>Calamagrostis canadensis</i> bluejoint
	<i>Thuja plicata</i> western redcedar	<i>Juniperus scopulorum</i> Rocky Mountain juniper	<i>Apocynum androsaemifolium</i> spreading dogbane	<i>Carex</i> spp. sedges
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Shepherdia canadensis</i> russet buffaloberry		<i>Agrostis</i> spp.
	<i>Pinus monticola</i> western white pine	<i>Corylus cornuta</i> beaked hazelnut		
N-P	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Physocarpus malvaceus</i> mallow ninebark	<i>Centaurea biebersteinii</i> spotted knapweed	<i>Elymus glaucus</i> blue wildrye
	<i>Pinus ponderosa</i> ponderosa pine	<i>Corylus cornuta</i> beaked hazelnut	<i>Aster</i> spp.	<i>Danthonia spicata</i> poverty oatgrass
	<i>Larix occidentalis</i> western larch	<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Smilacina racemosa</i> false Solomons seal	<i>Festuca occidentalis</i> western fescue
	<i>Pinus monticola</i> western white pine	<i>Rosa woodsii</i> Woods' rose	<i>Antennaria racemosa</i> raceme pussytoes	
N-Q	<i>Thuja plicata</i> western redcedar	<i>Shepherdia canadensis</i> russet buffaloberry	<i>Aster</i> spp.	<i>Carex deweyana</i> Dewey sedge
	<i>Larix occidentalis</i> western larch	<i>Alnus sinuata</i> Sitka alder	<i>Aralia nudicaulis</i> wild sarsaparilla	<i>Bromus ciliatus</i> fringed brome
	<i>Pinus ponderosa</i> ponderosa pine	<i>Corylus cornuta</i> beaked hazelnut	<i>Smilacina stellata</i> star-flowered false Solomons seal	<i>Elymus glaucus</i> blue wildrye
	<i>Betula papyrifera</i> paper birch	<i>Acer glabrum</i> Rocky Mountain maple	<i>Melilotus alba</i> white sweet-clover	<i>Agrostis</i> spp.
		<i>Symphoricarpos albus</i> common snowberry		
N-R	<i>Abies grandis</i> grand fir	<i>Alnus sinuata</i> Sitka alder	<i>Cirsium arvense</i> Canada thistle	<i>Agrostis</i> spp.
	<i>Thuja plicata</i> western redcedar	<i>Shepherdia canadensis</i> russet buffaloberry	<i>Hypericum perforatum</i> common St. John's wort	<i>Poa</i> sp.
	<i>Pinus ponderosa</i> ponderosa pine	<i>Symphoricarpos albus</i> common snowberry	<i>Aster</i> spp.	<i>Phalaris arundinacea</i> reed canarygrass
	<i>Betula papyrifera</i> paper birch	<i>Acer glabrum</i> Rocky Mountain maple	<i>Angelica arguta</i> Lyll's angelica	<i>Carex</i> spp. sedges
	<i>Larix occidentalis</i> western larch	<i>Corylus cornuta</i> beaked hazelnut	<i>Disporum</i> sp.	
N-S	<i>Thuja plicata</i> western redcedar	<i>Alnus sinuata</i> Sitka alder	<i>Pteridium aquilinum</i> western brackenfern	<i>Elymus glaucus</i> blue wildrye
	<i>Betula papyrifera</i> paper birch	<i>Corylus cornuta</i> beaked hazelnut	<i>Aster</i> spp.	<i>Festuca</i> spp.
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Shepherdia canadensis</i> russet buffaloberry	<i>Lycopodium complanatum</i> groundcedar	<i>Phalaris arundinacea</i> reed canarygrass

Table A.1-1, continued...

Plot No.	Trees	Shrubs	Forbs	Grass-like Plants
	<i>Larix occidentalis</i> western larch	<i>Cornus canadensis</i> bunchberry	<i>Fragaria virginiana</i> wild strawberry	
	<i>Pinus monticola</i> western white pine	<i>Philadelphus lewisii</i> Lewis's mock-orange	<i>Clintonia uniflora</i> queen's cup	
		<i>Linnaea borealis</i> twinflower		
N-T	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Alnus sinuata</i> Sitka alder	<i>Aster</i> spp.	<i>Agrostis</i> spp.
	<i>Thuja plicata</i> western redcedar	<i>Corylus cornuta</i> beaked hazelnut	<i>Clintonia uniflora</i> queen's cup	<i>Luzula parviflora</i> smallflowered woodrush
	<i>Larix occidentalis</i> western larch	<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Fragaria virginiana</i> wild strawberry	
	<i>Betula papyrifera</i> paper birch	<i>Shepherdia canadensis</i> russet buffaloberry	<i>Pteridium aquilinum</i> western brackenfern	
		<i>Holodiscus discolor</i> oceanspray		
N-U	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Corylus cornuta</i> beaked hazelnut	<i>Centaurea biebersteinii</i> spotted knapweed	<i>Festuca</i> spp.
	<i>Thuja plicata</i> western redcedar	<i>Holodiscus discolor</i> oceanspray	<i>Aster conspicuus</i> showy aster	
	<i>Abies grandis</i> grand fir	<i>Alnus sinuata</i> Sitka alder	<i>Antennaria</i> spp. pussytoes	
		<i>Arctostaphylos uva-ursi</i> kinnikinnick	<i>Fragaria virginiana</i> wild strawberry	
		<i>Philadelphus lewisii</i> Lewis's mock-orange	<i>Clintonia uniflora</i> queen's cup	
N-V	<i>Thuja plicata</i> western redcedar	<i>Alnus sinuata</i> Sitka alder	<i>Aralia nudicaulis</i> wild sarsaparilla	<i>Carex</i> spp. sedges
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Symphoricarpos albus</i> common snowberry	<i>Pteridium aquilinum</i> western brackenfern	<i>Elymus glaucus</i> blue wildrye
	<i>Larix occidentalis</i> western larch	<i>Rubus parviflorus</i> thimbleberry	<i>Aster</i> spp.	
	<i>Betula papyrifera</i> paper birch	<i>Corylus cornuta</i> beaked hazelnut		
		<i>Rosa woodsii</i> Woods' rose		
S-A			<i>Equisetum</i> spp. horsetail	<i>Phalaris arundinacea</i> reed canarygrass
			<i>Mentha</i> spp. mint	<i>Carex</i> spp. sedges
S-B	<i>Pinus ponderosa</i> ponderosa pine	<i>Crataegus douglasii</i> black hawthorn	<i>Centaurea biebersteinii</i> spotted knapweed	
		<i>Symphoricarpos albus</i> common snowberry	<i>Plantago lanceolata</i> narrowleaf plantain	
		<i>Rosa woodsii</i> Woods' rose	<i>Apocynum cannabinum</i> Indianhemp	

Table A.1-1, continued...

Plot No.	Trees	Shrubs	Forbs	Grass-like Plants
		<i>Salix exigua</i> narrowleaf willow		
S-C	<i>Alnus incana</i> mountain alder	<i>Cornus sericea</i> red-osier dogwood	<i>Artemisia</i> spp. sagebrush	
	<i>Populus balsamifera</i> black cottonwood	<i>Salix exigua</i> narrowleaf willow		
		<i>Cornus sericea</i> red-osier dogwood		
S-D	<i>Populus balsamifera</i> black cottonwood	<i>Symphoricarpos albus</i> common snowberry	<i>Solidago gigantea</i> giant goldenrod	<i>Phalaris arundinacea</i> reed canarygrass
		<i>Crataegus douglasii</i> black hawthorn	<i>Artemisia</i> spp. sagebrush	<i>Carex vesicaria</i> blister sedge
			<i>Mentha</i> spp. mint	
			<i>Lysimachia</i> spp. loosestrife	
S-E			<i>Mentha arvensis</i> field mint	<i>Phalaris arundinacea</i> reed canarygrass
			<i>Equisetum</i> spp. horsetail	<i>Carex</i> spp. sedges
S-F			<i>Potentilla anserina</i> silverweed	<i>Phalaris arundinacea</i> reed canarygrass
			<i>Mentha arvensis</i> field mint	<i>Carex vesicaria</i> blister sedge
			<i>Myosotis scirpoides</i> forget-me-not	<i>Carex vulpinoidea</i> fox sedge
				<i>Scirpus microcarpus</i> small-flowered bulrush
S-G	<i>Pinus ponderosa</i> ponderosa pine	<i>Salix exigua</i> narrowleaf willow	<i>Apocynum cannabinum</i> Indianhemp	<i>Agrostis</i> spp.
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Juniper scopulorum</i> Rocky Mountain juniper	<i>Artemisia ludoviciana</i> white sagebrush	<i>Phleum pratense</i> timothy
			<i>Melilotus alba</i> white sweet-clover	<i>Agropyron</i> spp.
S-H	<i>Populus balsamifera</i> black cottonwood	<i>Alnus sinuata</i> Sitka alder	<i>Mentha arvensis</i> field mint	<i>Phalaris arundinacea</i> reed canarygrass
		<i>Salix exigua</i> narrowleaf willow	<i>Cirsium arvense</i> Canada thistle	<i>Carex</i> spp. sedges
		<i>Salix sitchensis</i> Sitka willow	<i>Centaurea biebersteinii</i> spotted knapweed	
		<i>Cornus sericea</i> red-osier dogwood		
S-I		<i>Cornus sericea</i> red-osier dogwood	<i>Artemisia ludoviciana</i> white sagebrush	<i>Carex</i> spp. sedges
			<i>Cirsium arvense</i> Canada thistle	

Table A.1-1, continued...

Plot No.	Trees	Shrubs	Forbs	Grass-like Plants
			<i>Helenium autumnale</i> common sneezeweed	
			<i>Lysimachia ciliata</i> fringed loosestrife	
			<i>Lysimachia thyrsoiflora</i> tufted loosestrife	
S-J		<i>Cornus sericea</i> red-osier dogwood	<i>Lysimachia ciliata</i> fringed loosestrife	<i>Phalaris arundinacea</i> reed canarygrass
			<i>Lysimachia thyrsoiflora</i> tufted loosestrife	
			<i>Cirsium arvense</i> Canada thistle	
S-K	<i>Pinus ponderosa</i> ponderosa pine	<i>Cornus sericea</i> red-osier dogwood	<i>Melilotus alba</i> white sweet-clover	<i>Phalaris arundinacea</i> reed canarygrass
	<i>Populus balsamifera</i> black cottonwood	<i>Symphoricarpos albus</i> common snowberry		
		<i>Crataegus douglasii</i> black hawthorn		
		<i>Amelanchier alnifolia</i> Saskatoon serviceberry		
S-L			<i>Artemisia ludoviciana</i> white sagebrush	<i>Phalaris arundinacea</i> reed canarygrass
			<i>Lysimachia thyrsoiflora</i> tufted loosestrife	
			<i>Lysimachia ciliata</i> fringed loosestrife	
			<i>Cirsium arvense</i> Canada thistle	
			<i>Myosotis scorpioides</i> true forget-me-not	
			<i>Mentha arvensis</i> field mint	
S-M		<i>Alnus sinuata</i> Sitka alder	<i>Spiraea douglasii</i> western spiraea	<i>Phalaris arundinacea</i> reed canarygrass
		<i>Cornus sericea</i> red-osier dogwood		<i>Scirpus microcarpus</i> small-flowered bulrush
		<i>Salix lucida</i> shining willow		
S-N	<i>Thuja plicata</i> western redcedar	<i>Cornus sericea</i> red-osier dogwood	<i>Tanacetum vulgare</i> common tansy	<i>Phalaris arundinacea</i> reed canarygrass
	<i>Larix occidentalis</i> western larch	<i>Symphoricarpos albus</i> common snowberry		
	<i>Pseudotsuga menziesii</i> Douglas-fir	<i>Shepherdia canadensis</i> russet buffaloberry		
	<i>Betula papyrifera</i> paper birch			

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