5 BOTANICAL AND WILDLIFE RESOURCES

Through review of existing information, additional preliminary information gathering, and consultation with agencies, tribes, and other stakeholders (relicensing participants), SCL has identified the need for relicensing studies related to botanical and wildlife resources associated with the Boundary Project. These proposed studies are described in this PSP and are as follows:

- Waterfowl/Waterbird Study
- Inventory of Riparian Trees and Shrubs
- Rare, Threatened, and Endangered (RTE) Plant Species Inventory
- RTE Wildlife Species Study
- Big Game Study
- Bat Surveys and Habitat Inventory

Proposed studies that are related to botanical and wildlife resources but described under a different resource area in this PSP are indicated in the summary table presented in Attachment 1-1. These include:

- Erosion Study (see section 2.1)
- Mainstem Aquatic Habitat Modeling Study (hydraulic routing model and aquatic plant habitat suitability study components; see section 4.1)
- Sediment Transport and Boundary Reservoir Tributary Delta Habitats Study (see section 4.2, Fish and Aquatic Resources)
- Recreation Resource Study (dispersed recreation use, access, and condition analysis component; see section 6.1)

The study area for the botanical and wildlife resource studies varies by study, and is described in each study plan. In addition, throughout this section of the PSP, the study plans refer to both the "Project area" and the "Project vicinity." The area within the FERC-licensing Project boundary (which includes all Project structures, the reservoir, and the transmission line right-of-way from the powerhouse to the BPA interconnection) is considered the "Project area." For the purposes of the botanical and wildlife resource studies, the "Project vicinity" encompasses the Project area as well as any adjacent areas that are included in the study area for each study plan.

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5.1. Waterfowl/Waterbird Study

There are approximately 69 species of waterfowl (ducks, geese, swans), shorebirds (spotted sandpiper, killdeer), waterbirds (loons, grebes, herons, coots, and cormorants), and other water-dependent birds (belted kingfishers, ospreys, and swallows) that potentially use the aquatic, wetland, riparian, and shoreline habitats along Boundary Reservoir (Table 5.1-1). A few of these species are year-round residents; others use the area for nesting and winter further to the south. Many species occur only occasionally during migration; a few may winter in the Project area. This study will focus on two species groups: (1) ground-nesting waterfowl, because they are game species and could potentially be affected by Project operations; and (2) piscivorous waterbirds, double-crested cormorants in particular, because increasing populations of these species could impact the fishery associated with the Project. Data on actual use of the Project area by these two species groups is limited.

5.1.1. Nexus between Project Operations and Effects on Resources

Based on general knowledge of the potential effects of reservoir operations, water-level fluctuations in Boundary Reservoir may reduce wetland/riparian habitat quality for ground-nesting waterfowl. Potential effects of water level fluctuations on these species include: (1) reduced availability of nesting habitat, (2) direct flooding of low-elevation nests during the egg laying or incubation stages, or (3) altered cover and forage for broods and adult birds. Water level fluctuations may directly affect productivity of birds that nest on the ground near the shoreline or in emergent wetland vegetation. This can be of particular concern to waterfowl and shorebirds because their nests are highly susceptible to changes in water level, particularly stage increases. Water-level fluctuations during the fall and winter may also influence habitat conditions for birds that occur in the Project area during these seasons.

In general, there is little existing information on use of the Project area by waterfowl and waterbirds, and this information is needed to identify potential Project effects. Existing information and reconnaissance observations indicate suitable nesting habitats adjacent to Boundary Reservoir are not being used by waterfowl, a circumstance that could potentially be related to effects of the Project. In addition, information is needed on the number of piscivorous waterbirds that inhabit the Project vicinity and the locations in which they congregate and/or breed; piscivorous waterbirds in other areas are known to create a significant mortality factor for juvenile fish.

5.1.2. Agency Resource Management Goals

In addition to providing information needed to characterize Project effects, the waterfowl/waterbird study will provide information to help agencies with jurisdiction over these species in the Project area identify appropriate conditions for the new Project license pursuant to their respective mandates. Agency management goals and policies associated with waterfowl/waterbird management in the context of FERC relicensing of the Boundary Project are summarized in the following sections.

Table 5.1-1. Waterfowl, waterbirds, and other water-dependent birds known to occur or potentially occurring in the Boundary Project vicinity.

Species[1]	NE Washington Status[2]	Status at Box Canyon Reservoir[3]	Species[1]	NE Washington Status[2]	Status at Box Canyon Reservoir [3]
LOONS	**1**		**RAILS**	**3**	
Common Loon	XR(SB), U(M)	M (U)	Virginia Rail	U (SB)	Not Observed
GREBES	**5**		Sora	C (SB)	Not Observed
Pied-billed Grebe	U (R)	B (C)	**PLOVERS**	**2**	
Eared Grebe	U (SB)	M (U)	**Killdeer**	C (SB)	B (C)
Horned Grebe	U (M)	M (U)	Semipalmated Plover	U (M)	Not Observed
Red-necked Grebe	U (SB)	M (U)	**SANDPIPERS**	**12**	
Western Grebe	R (SB)	M (U)	Greater Yellowlegs	C (M)	M (U)
CORMORANTS	**1**		Lesser Yellowleg	C (M)	Not Observed
Double-crested Cormorant	U (SB)	Not Observed	Solitary Sandpiper	U (M)	Not Observed
BITTERNS AND HERONS	**3**		**Spotted Sandpiper**	C (SB)	B (C)
American Bittern	U (SB)		Western Sandpiper	U (M)	Not Observed
Great Blue Heron	C (R)	R (A)	Least Sandpiper	U (M)	Not Observed
Black-crowned Night Heron	R	C (Ca)	Semipalmated Sandpiper	R (M)	Not Observed
WATERFOWL	**27**		Pectoral Sandpiper	U (M)	Not Observed
Tundra Swan	C (M)	W (U)	Long-billed Dowitcher	C (M)	Not Observed
Greater White-fronted Goose	R (M)	Not Observed	Common Snipe	U (R)	B (U)
Snow Goose	U (M), U (W)	Not Observed	Wilson's Phalarope	R (SB)	Not Observed
Canada Goose	C (R)	R (A)	Red-necked Phalarope	X (RM)	Not Observed
Mallard	C (R)	R (A)	**GULLS AND TERNS**	**7**	
Gadwall	C (R)	B (C)	Bonaparte's Gull	R (M)	Not Observed
American Wigeon	C (R)	B (A)	**Ring-billed Gull**	C (R)	Not Observed
Redhead	C (SB), R (W)	B (C)	California Gull	U (M)	M (C)
Lesser Scaup	R (SB), C (W)	R (C)	Herring Gull	R (W)	M (U)
Greater Scaup	U (W)	Not Observed	Caspian Tern	U (M)	Not Observed
Cinnamon Teal	U (SB)	B (U)	Forster's Tern	U (M)	Not Observed
Blue-winged Teal	U (SB)	B (C)	Black Tern	U (SB)	B (U)
Green-winged Teal	U (R)	B (U)	**KINGFISHERS**	**1**	
Wood Duck	U (R)	B (C)	**Belted Kingfisher**	C (SB)	B (C)
Ring-necked Duck	U (R)	B (U)	**DIPPERS**	**1**	
Northern Pintail	U (R), C (M)	M (C)	**American Dipper**	C (R)	Not Observed
Northern Shoveler	U (R), R (W)	B (C)	**SWALLOWS**	**6**	
Canvasback	U (R), C (M)	R (U)	Tree Swallow	C (SB)	M (U)
Hooded Merganser	U (R)	W (U)	**Violet-green Swallow**	C (SB)	B (A)
Common Merganser	U (R)	R (A)	**Northern Rough-winged Swallow**	C (SB)	Not Observed

Table 5.1-1, continued…

Species[1]	NE Washington Status[2]	Status at Box Canyon Reservoir[3]	Species[1]	NE Washington Status[2]	Status at Box Canyon Reservoir [3]
Barrow's Goldeneye	U (R)	Not Observed	**Bank Swallow**	U (SB), C(M)	M (U)
Common Goldeneye	R (R), C (W)	R (C)	**Cliff Swallow**	C (SB)	M (U)
Ruddy Duck	C (R), R (W)	B (C)	**Barn Swallow**	C (SB)	M (U)
Harlequin Duck	R (SB)	M (R)			
Bufflehead	U(R), C(W)	W (C)			
White-winged Scoter	R (W)	Not Observed			
Surf Scoter	R (W)	Not Observed			
American Coot	U(R), R(W)	R (A)			

Source: USFS, USFWS, BLM and WDFW 2001, as modified by Smith et al. 1997.

1 Species observed in Boundary Project area are shown in bold.

2 Northeast Washington Codes: Occurrence status: C=common, U=uncommon, R=rare, XR=extremely rare, (REC)=recorded few records, Seasonal status: (SB)=summer breeder; (W)=winter; (M)=migrant; (R)=resident

3 Box Canyon Reservoir codes: B = breeding, R = resident, W = wintering, M = migrant, C = casual, U = uncertain, (A) = Abundant, (C) = common, (U) = uncommon, (R) = Rare, (Ca) = Casual, (Acc) = Accidental (Reese and Hall 1991).

USDA Forest Service (USFS)

The USFS follows standards and guidelines in the Colville National Forest (CNF) Land and Resource Management Plan (LRMP) (USFS 1988) for managing riparian habitats for fish and wildlife resources. One of the guidelines in the LRMP addresses maintenance and improvement of waterfowl habitat in the CNF. A number of the standards and guidelines in the LRMP have been amended based on the Inland Native Fish Strategy (INFISH) to contribute to attainment of riparian management objectives (USFS 1995).

U.S. Bureau of Land Management (BLM)

The BLM does not have any specific standards or guidelines related to waterfowl and waterbird management.

U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for managing migratory birds, including waterfowl and waterbirds, under the Migratory Bird Treaty Act (MBTA). Executive Order No. 13186 requires that the USFWS "administer, oversee, and enforce the provisions of the MBTA". As such, the USFWS has the responsibility to:

- Avoid or minimize adverse impacts to migratory bird resources.
- Restore and enhance migratory bird habitat.
- Prevent or abate pollution or detrimental environmental alterations to benefit migratory birds.

- Promote plans and programs benefiting migratory birds.
- Ensure that environmental analysis of federal actions evaluates the effects of actions and agency plans on migratory birds.
- Promote interagency inventory, monitoring, management studies, research, and information exchange related to the conservation of migratory birds and their habitats.

In addition, the USFWS sets annual hunting regulations for waterfowl to keep harvest levels at levels compatible with the population maintenance.

Washington Department of Fish and Wildlife (WDFW)

There are no general waterfowl habitat management goals provided by WDFW. However, WDFW does provide management recommendations for the great blue heron, which is considered a priority species in Washington, as summarized below (Quinn and Milner 2004). The WDFW also is responsible for managing the state's waterfowl hunting season. Northeast Washington is part of Goose Management Area 5, which encompasses portions of eastern Washington outside of the Columbia River Basin.

5.1.3. Study Goals and Objectives

The primary goal of the waterfowl/waterbird study is to provide information on suitable habitat in the Project area for ground-nesting waterfowl and use of this habitat, and to characterize any effects of Project operations on this habitat. An additional goal of this study is to provide information on populations of piscivorous waterbirds in the Project area, particularly cormorants. Specific objectives of this study are to:

- Document the extent of existing nesting by ground-nesting waterfowl in wetland, riparian, and shoreline habitats along Boundary Reservoir upstream of Metaline Falls.
- Estimate the amount of waterfowl ground-nesting habitat that could potentially occur in the reservoir fluctuation zone upstream of Metaline Falls.
- Determine the elevation range utilized by ground-nesting waterfowl and evaluate the impact of reservoir water levels on the availability of suitable nesting habitat and on the degree of nest failure due to flooding.
- Estimate the number of piscivorous waterbirds using the Project area and locate their nest sites, if possible, with an emphasis on double-crested cormorants.
- Document levels of use of the Project area by waterfowl and waterbirds during the fall migration and winter time period.

5.1.4. Need for Study

Summary of Existing Information

At Box Canyon, 19 waterfowl species were documented as year-round residents or as present during the breeding season (Reese and Hall 1991). Nesting studies conducted at Box Canyon

confirmed that most ground duck nests hatched in late June and July, and that many early nests are flooded by rising water levels (peak flows occur in June). Broods of mallards, American widgeon, wood duck, gadwall, common goldeneye, and green-winged teal were confirmed at Box Canyon. Brood-rearing habitat at Box Canyon Reservoir was concentrated in sloughs, around islands, and other shallow water habitats.

Reconnaissance-level surveys conducted by SCL in 2005 documented six waterfowl species, as well as the double-crested cormorant, great blue heron, and ring-billed gull (Table 5.1-1). Based solely on shoreline topography, the majority of the potential nesting habitat for waterfowl and waterbirds at Boundary Reservoir likely occurs upstream of Metaline Falls, although a few small areas near Everett Island and the forebay portion of the reservoir could also provide habitat for ground-nesting species. Based on the few surveys conducted, winter use of the reservoir by waterfowl appears to be low.

In terms of water level fluctuations in Boundary Reservoir, SCL voluntarily restricts most water surface fluctuations to a 10-foot range (between forebay elevations 1,980 and 1,990 feet NGVD 29 [1,984–1,994 feet NAVD 88]) to facilitate reservoir access and related recreational activities during daytime hours in the summer (approximately Memorial Day weekend through Labor Day weekend). For the remainder of the year, the typical forebay fluctuation range is between elevations 1,990 feet and 1,970 feet. (See section 1.3 for a description of the Project reservoir and operations.) Between 1987 and 2004, the daily water level fluctuation during the April–August waterfowl nesting and young rearing season was as much as 12.6 feet, as measured at the forebay (PAD Table 3.4-3). However, there is some evidence to suggest that a differential water level response exists upstream, vs. downstream of Metaline Falls. Apparently, the submerged falls acts as a hydraulic control, resulting in significant attenuation in the upstream reach of the reservoir of the relatively large water surface elevation fluctuations that occur downstream of Metaline Falls (PAD section 3.4.2.1). Similarly, the constriction at the site of Metaline Falls would be expected to cause water to back up above the falls during periods of high inflow to the reservoir. In addition, this constriction, which slows the passage of water, may also slow the response time of the Upper Reservoir Reach compared to the portion of reservoir downstream of the Metaline Falls constriction. Thus, both the magnitude and rate of change in water surface elevation is greatly smoothed out in the reservoir upstream of Metaline Falls as compared to the downstream portion. When the Project is operating at forebay water surface elevations lower than the top of Metaline Falls (approximate water surface range of elevation 1,980 feet to elevation 1,975 feet NGVD 29 [1,984–1,979 feet NAVD 88]), there are almost no changes in daily water surface elevations in the upper reservoir reach. Preliminary hydrology data for the years between 1987 and 2004 indicate that reservoir levels upstream of Metaline Falls range from 1,985–2,015 feet elevation, as measured at the U.S. Geological Survey (USGS) gage below Box Canyon Dam.

Need for Additional Information

There is currently inadequate information available for the Boundary Project to describe: (1) the locations and extent of nesting by waterfowl at the Project; (2) the extent to which water level fluctuations may directly flood nests or affect nesting habitat for these species; (3) use of the Project area by waterfowl and waterbirds during the fall and winter; and (4) the estimated populations of piscivorous birds and the habitats they use.

5.1.5. Detailed Description of Study

Study Area

The study area for the waterfowl/waterbird study will be focused primarily on the reservoir, shorelines, and adjacent wetland and riparian habitat along Boundary Reservoir upstream of Metaline Falls (refer to Figure 1.3-2 for a location map of the Boundary Project). The study area will extend approximately 8 miles along the Pend Oreille River from the Box Canyon tailrace downstream to Metaline Falls and will encompass the reservoir, the reservoir fluctuation zone (elevation ≈1,985–2,015 feet NGVD 29 [1,989–2,019 feet NAVD 88], as measured at the USGS gage below Box Canyon Dam), and all suitable waterfowl nesting habitat within 200 feet of the high water level (approximately 2,015 feet NGVD 29 [2,019 feet NAVD 88]) and within the SCL-owned Boundary Wildlife Preserve (BWP).[1] [2] For the purposes of estimating populations of piscivorous waterbirds and the habitats they use, the study area is expanded to include the reservoir from Metaline Falls to Boundary Dam.

The ability to conduct waterfowl surveys on private land within the study area outside the FERC Project boundary may be limited due to access constraints.

Proposed Methodology

The waterfowl/waterbird study will consist of six tasks, each of which is described in the following sections.

Task 1: Map and Estimate Existing Habitat for Ground-nesting Waterfowl

Flows coming into Boundary Reservoir are highly variable in the spring and summer. As a result, reservoir levels during this time can also change substantially, affecting the amount of available habitat for ground-nesting waterfowl over the course of a single breeding season, a well as between breeding seasons. Estimating the amount of suitable habitat for ground-nesting waterfowl under existing operations will require an evaluation of existing hydrology data and the development of GIS maps. The following steps will be required:

1) Daily hydrology data for the April 1 – June 30 period for each year from 1987 through 2004 will be thoroughly analyzed to document the range of reservoir elevations upstream of Metaline Falls, as measured at the USGS gage below Box Canyon Dam, during the nesting season. The Hydraulic Routing Model, which will be developed as part of the Mainstem Aquatic Habitat Modeling Study (see section

[1] The estimated fluctuation range of approximately 1,985–2,015 feet upstream of Metaline Falls is based on the review of existing hydrology, as described in section 1.3.5 of this PSP (see Table 1.3-1). Following completion of the Hydrology Dataset and Statistics in January 2007 (see section 1.4.2), SCL will review and refine, as necessary, this elevation range

[2] As indicated in this and other study plans in the PSP, 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.

4.1), will be used to translate the USGS gage data into corresponding water surface elevations along the length of the study area. Daily water surface elevations over the nesting season will be displayed graphically for a representative normal, wet, and dry year and/or by showing the daily or weekly mean and range for the entire dataset. Additional graphics will show the timing and duration of reservoir levels over the course of the waterfowl nesting season.

2) Bathymetry, LIDAR (Light Detection And Ranging), and vegetation community GIS data will be used to develop a set of maps and acreage estimates of available ground nesting habitat for waterfowl for the representative wet, dry, and normal years based on reservoir level. Each map for each year will show the amount and location of habitat available for the entire nesting season, as well as the amount that is flooded at least once. An alternative would be to display the amount of nesting habitat available early, mid-, and late season. It may also be possible to develop additional quantification relating acreage of waterfowl habitat to reservoir water level via regression equations or other means.

The results of this mapping exercise will provide an understanding of how normal Project operations affect habitat for ground-nesting waterfowl over the course of the breeding season and between breeding seasons with normal, wet, and dry hydrology.

Task 2: Estimate Potential Habitat for Ground-nesting Waterfowl in the Reservoir Fluctuation Zone

Estimating the amount of potential waterfowl nesting habitat in the reservoir fluctuation zone will involve the following steps:

1) Hydrology and bathymetry data will be used to delineate the aerial extent of the reservoir fluctuation zone upstream of Metaline Falls in 5 or 10-foot (vertical) increments.

2) The bathymetry map and GIS data on vegetation cover types will be used as a base for delineating the vegetation communities that could potentially develop in the fluctuation zone if pool levels were held at levels lower than under current operations. This step will assume that existing shoreline vegetation types would expand into the fluctuation zone if the reservoir were operated at lower levels during the growing season and there were no significant changes in topography or substrate. Depending on topography, it may also be necessary to modify the riparian/upland boundary in some locations. Riparian grassland, riparian shrubland, and wetland communities will be assumed to provide the most suitable habitat for ground-nesting waterfowl.

3) GIS will be used to develop a map of cover types representing suitable ground-nesting waterfowl habitat that could potentially develop in the reservoir fluctuation zone. Data in the associated acreage table will be displayed in 5- or 10-foot (vertical) increments. Vegetation types representing potentially suitable habitat for breeding will be identified from the literature for the ground-nesting waterfowl species that use the study area.

This task will be coordinated with the Riparian Tree and Shrub Inventory (see section 5.2) and the Big Game Study (see section 5.5), which also require evaluating the development of potentially suitable habitat in the fluctuation zone.

Task 3: Waterfowl Nest Searches

Nest searches will be conducted to determine waterfowl use of the existing breeding habitat in the study area. Riparian, wetland, and shoreline habitats in the study area will be searched a minimum of four times during April–June to document waterfowl ground nests. Complete surveys of existing suitable nesting habitat will be conducted by biologists systematically walking through accessible areas. Surveyors will attempt to locate nests by flushing females or pairs and then searching for the nest. The location of each nest will be marked with an inconspicuous marker so as not to draw attention to the site (offset from the actual nest). GPS will be used to document locations of nests. If a nest cannot be located after 5 minutes of searching the flushing site, surveyors will revisit the location 2–8 hours later (during daylight hours). If no bird flushes on the second visit, there is no need to conduct any further visits to that site. For each nest, the number of eggs will be counted. An attempt will be made to restore any trampled vegetation to lessen trails that could be used by predators.

Data will be recorded on standard datasheets and will consist of the following for each nest:

- Date and time of visit
- Visit number
- Species
- Species Identification Method (flushed hen, nest characteristics, etc.)
- Nest location
- Nest type
- Clutch size
- Nest elevation
- Horizontal distance from water's edge
- Habitat type
- Concealment vegetation (for ground nests)
- Evidence of human disturbance

Maps showing the surveyed area and locations of nests will be generated using GIS. Nest elevation will be measured using a survey rod and level and recorded relative to the current water level. By noting time of day, the elevation of existing nesting sites can be calculated relative to the known water level at nearby points on the reservoir from the transducers installed for the Hydraulic Routing Study (see section 4.1). The elevation data will allow an assessment of the effects of potential reservoir level fluctuations on current-year nest sites.

Following the nest searches, the quality of existing nesting habitat for waterfowl will be characterized by evaluating the data against nesting ecology information obtained from the

literature or other available sources (e.g., published journals, agency data, Habitat Suitability Index [HSI]) models, etc.).

Task 4: Piscivorous Waterbird Surveys

The number and location of piscivorous waterbirds observed on the reservoir will be recorded concurrently with waterfowl nest searches (Task 3). These species will be recorded for the entire reservoir, not just the area upstream of Metaline Falls. This task will be coordinated with survey efforts being conducted as part of the RTE Wildlife and Big Game studies to provide estimates for multiple days per month in the spring and summer. Results of this task will provide a general estimate of the number of piscivorous waterbirds and their preferred habitats. Species will include the double-crested cormorant, as well as the great blue heron. Any nesting sites found for these species will be mapped; populations in the study area will be estimated as well.

Task 5: Fall Migration and Winter Surveys

During the fall and winter (September–March) of 2007–2008, monthly surveys of the reservoir will be conducted to record waterfowl and waterbird use. Surveys will be conducted from a boat and bird observations will be counted by species and plotted on maps. To the extent possible, these surveys will be coordinated with other field efforts.

Task 6: Documentation and Effects Assessment

All data collected in the field will be recorded on datasheets and/or maps or aerial photographs. Mapped data will be entered into the Project GIS database; other data will be entered into a database for analysis.

Project effects on *existing* waterfowl nesting habitat will utilize information from Task 1. The maps from Task 1 will be used to show how normal Project operations affect the amount of breeding habitat available for ground-nesting waterfowl in years with normal, wet, and dry hydrology. The acreages for each year will be compared in a summary acreage table. Similarly, the amount of habitat *potentially* available for nesting waterfowl in the fluctuation zone will be a quantitative assessment based on the results of Task 2, and will include a map and table of acreage estimates.

Information from the waterfowl nest searches and fall/winter surveys conducted in Tasks 3 and 5 will be used to estimate the amount or percentage of available habitat that is actually used over the year, acknowledging that use will vary. The effects of Project-related activities, as well as other activities (i.e., grazing, off-road-vehicle use) on waterfowl use of the study area will be qualitatively assessed based on field observations.

5.1.6. Work Products

The results of the waterfowl/waterbird surveys will be compiled and discussed in a study report, written in standard scientific format. The study report will include at least the following information:

- Maps and a summary acreage table of waterfowl nesting habitat under current operating conditions for representative normal, dry, and wet years and a graph of pool elevations over the April 1 – June 30 period for each year.
- Maps and a summary acreage table of waterfowl nesting habitat that could potentially occur in the fluctuation zone, in 5- or 10-foot (vertical) increments, upstream of Metaline Falls.
- A summary of the methods used to conduct the waterfowl nesting and fall/winter surveys. This section will include an accounting of when and where the surveys were conducted and a map of the areas covered.
- The results of the surveys, including maps and descriptions of existing and potential nesting habitats (by species), and maps of areas used by waterfowl and waterbirds during the fall and winter. It will also include an assessment of the elevations of nest sites relative to normal daily and seasonal water level fluctuations under existing operating conditions for years with normal, wet, and dry hydrology.
- Estimated numbers of piscivorous waterbirds and the areas/habitats they use throughout the year.
- A discussion of direct and/or indirect Project-related impacts and other activities to waterfowl and their habitats, as determined from the results of this study. The full assessment of potential Project-related impacts, including the effects of the type and timing of Project operations and maintenance and Project-related recreation, will be part of the integrated resource analysis (see section 1.2.5).

5.1.7. Consistency with Generally Accepted Scientific Practice

The methods (as described above) are consistent with generally accepted scientific practices for wildlife field surveys. Similar approaches have been used in published studies of waterfowl/waterbirds by resource agencies and other researchers.

5.1.8. Consultation with Agencies, Tribes, and Other Stakeholders

This study plan was prepared with input from the USFS and WDFW, which was provided at meetings of the Terrestrial Resources Workgroup on June 28, July 26, and August 15, 2006. Input provided at the workgroup meetings is summarized in Attachment 5-1, and can also be found in the workgroup meeting summaries, available on SCL's relicensing website (http://www.seattle.gov/light/news/issues/bndryRelic/). Additional comments were provided by the WDFW in written comments (letter from D. Robison, WDFW, to M. Lynn, SCL, August 28, 2006) and a follow-up phone conversation (Personal communication, D. Robison, WDFW, August 28, 2006) (included in Attachment 5-1). Additional comments were also provided by the USFS in its PAD/Scoping comments and official study requests (letter from R. Brazell, USFS Forest Supervisor, CNF, to M. Salas, FERC, August 31, 2006) (USFS 2006).

5.1.9. Schedule

The Waterfowl/Waterbird Study will be conducted in 2007 and 2008 according to the schedule shown in Table 5.1-2.

Table 5.1-2. Schedule for Waterfowl/Waterbird Study.

Activity	Timeframe
Finalize study implementation details	April 2007
Map and estimate existing and potential breeding habitat for ground-nesting waterfowl	April–October 2007
Conduct nest searches	April–June 2007
Conduct nesting habitat assessment	May–July 2007
Conduct fall surveys	September–December 2007
Prepare draft year-1 study report (first-year results)	November 2007
Submit draft year-1 study report for stakeholder review	December 2007
Revise and finalize year-1 study report	January 2008
Conduct winter surveys	January–March 2008
Conduct nest searches	April–June 2008
Prepare draft Final study report	November 2008
Submit draft Final study report for stakeholder review	December 2008
Revise and finalize Final study report	January 2009

5.1.10. Progress Reports, Information Sharing, and Technical Review

In addition to preparing the study report (as described in the above), there will be several opportunities for information sharing and technical review with relicensing participants. Agency biologists will also be invited to participate in survey efforts. Preliminary survey results will be communicated to relicensing participants as they become available in 2007–2008. Prior to release of the Initial and Updated study reports (which will include the results of this study), SCL will meet with agencies, tribes, and other stakeholders to discuss the study results, as described in section 1.2.4 of this document.

5.1.11. Anticipated Level of Effort and Cost

The waterfowl/waterbird study is expected to involve about 300 hours of field time, as well as additional time for mapping, data summary, analysis, and reporting. The estimated cost for this study is $60,000–$70,000.

5.1.12. Literature Cited

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USFS. 2006. Boundary Hydroelectric Project, FERC No. 2144-035, Response to Scoping Document 1, Comments on Pre-Application Document, and Study Requests. Colville National Forest. August 31, 2006.

5.2. Inventory of Riparian Trees and Shrubs

In general, information on the species composition, distribution, and extent of riparian trees and shrubs in the Project vicinity is incomplete. Vegetation cover types, including riparian and wetland plant communities, were mapped in 2005–2006 and described in the Boundary Project relicensing Pre-Application Document (PAD) (SCL 2006). However, detailed information on distribution, structure and composition of riparian tree and shrub stands was not collected. The proposed inventory will provide information that is required for the relicensing analysis of Project effects on riparian tree and shrub habitats. A preliminary list of riparian tree and shrub species in the study area was developed based on reconnaissance surveys conducted in 2005; these species, listed below, will be the focus of the inventory:

- Black cottonwood *Populus balsamifera* ssp. *trichocarpa*
- Sitka alder *Alnus crispa* ssp. *sinuata*
- Red-osier dogwood *Cornus sericeus*
- Shining willow *Salix lucida* ssp. *lasiandra*
- Coyote willow *Salix exigua*
- Sitka willow *Salix sitchensis*
- Scouler's willow *Salix scouleriana*
- Black hawthorn *Crataegus douglasii*

Western red-cedar (*Thuja plicata*) is not included because it is a common species in upland forests throughout northeastern Washington and in the Project vicinity.

5.2.1. Nexus Between Project Operations and Effects on Resources

Water level fluctuations and shoreline erosion associated with the Project potentially affect the establishment and maintenance of cottonwoods and other hydrophytic tree and shrub species in riparian areas along the reservoir. Other potential Project-related effects on these species include maintenance activities, such as mowing around Project facilities in riparian areas, and recreation. Cottonwood trees, snags, and logs are an important component of riparian areas, providing nesting and foraging habitat for a number of avian species. Willow and other riparian shrubs, which typically occur in thick stands, provide hiding cover for mammals such as deer, as well as food and breeding habitat for a variety of other mammals and birds.

Cottonwood logs also play a major role in aquatic habitat functioning, providing instream structure as large woody debris. Only a few relatively large cottonwood stands are known to occur adjacent to the Project reservoir, and the size and age distribution of these stands are unknown. Stands of riparian shrubs are also relatively rare. Further, there are no data on recruitment of cottonwood and other riparian tree and shrub species. The proposed Inventory of Riparian Trees and Shrubs described in this section will provide information that will be used to identify Project effects related to this type of riparian vegetation. The results of this study will be used in conjunction with data from the Erosion Survey (section 2.1), Mainstem Aquatic Habitat

Modeling Study (hydraulic routing model study component) (section 4.1), bathymetry survey of the reservoir (conducted by SCL, in progress), LIDAR (Light Detection And Ranging) elevation mapping (conducted by SCL in 2005), and Recreation Resource Study (dispersed recreation use, access, and condition analysis component) (section 6.1) to evaluate the following:

- Are there areas where water level fluctuations are apparently affecting recruitment, establishment and maintenance of cottonwoods and other riparian trees and shrubs along the reservoir?
- Are a range of age classes represented by the riparian trees and shrubs in the Project vicinity?
- Where is shoreline erosion affecting the maintenance of riparian trees and shrubs?
- Are there locations where developed and/or dispersed recreation or other human uses (i.e., grazing, mining, and timber harvest) are impacting the establishment and maintenance of riparian trees and shrubs?

This evaluation and the full assessment of Project-related impacts will occur as part of the integrated resource analysis (see section 1.2.5), which will be conducted during the development of the Preliminary Licensing Proposal. This evaluation will, as appropriate, include distinguishing Project-related impacts from the effects of other processes, either human-caused or natural. To the extent possible, the evaluation will attempt to isolate Project effects on reservoir level fluctuations from those resulting from changes to inflow from upstream storage and hydroelectric developments, and the effects of Metaline Falls. This will be accomplished through use of the Hydrologic Routing Model (described in section 4.1) and Scenario Tool (section 1.4.3), with the scenario selected in consultation with relicensing participants. However, the assessment of Project effects will not take the approach of attempting to differentiate fluctuations under current operations from "natural" fluctuations. First, it would be a highly speculative exercise to simulate pre-development conditions, particularly since the Boundary Project was the last dam to be constructed on the Pend Oreille River in the U.S. Moreover, the resulting information would not be relevant to the development of protection, mitigation, and enhancement measures because it would reflect not just the effects of Project operations but also the effects of many other actions on the river system.

5.2.2. Agency Resource Management Goals

In addition to providing information to characterize Project effects, the Riparian Tree and Shrub Inventory will provide information to help agencies with jurisdiction over these species in the Project vicinity identify appropriate conditions for the new Project license pursuant to their respective mandates. The following agencies are those with management responsibility in the context of FERC relicensing of the Boundary Project and management goals related to habitat for aquatic and riparian-dependent species:

USFS and Bureau of Land Management (BLM)

The Interior Columbia Basin Ecosystem Management Project (ICBEMP) outlines management goals for aquatic/riparian/wetland resources on USFS- and BLM- administered land in eastern Washington and Oregon (U.S. Department of Agriculture-U.S. Department of Interior [USDA-

USDI] 2000). The achievement of these goals is proposed through objectives and standards established for riparian conservation areas (RCAs), riparian influence areas, watershed condition indicators, and water quality. One of the primary ICBEMP goals for managing aquatic/riparian/wetland resources is to "maintain, conserve (protect), and/or restore aquatic and riparian-dependent terrestrial resources. Proper ecological function in RCAs is crucial to maintaining aquatic ecosystems and riparian-dependent resources." Maintaining and restoring structure and function of riparian vegetation, particularly with respect to woody riparian species, is considered by ICBEMP to be a critical aspect of proper ecological function (USDA-USDI 2000).

Management of federal lands in the Project vicinity is also directed by the Inland Native Fish Strategy (INFISH). The purpose of INFISH is to provide interim direction, similar to the Pacific Anadromous Fish Strategy (PACFISH) for areas not covered by the Northwest Forest Plan or PACFISH, for native fish habitat management while the USFS and BLM develop long-term management strategies. This strategy is designed to implement measures to arrest the degradation, and begin the restoration of riparian and aquatic ecosystems in watersheds with inland native fish habitat (FR 61, 177, September 11, 1996).

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)

The USFWS and NMFS are responsible for the recovery of species listed as threatened or endangered under the federal Endangered Species Act (ESA). This responsibility involves assessing potential Project effects on listed species, including those that occur in aquatic/riparian habitats. The bald eagle is the only ESA-listed species currently known to occur regularly in the Project vicinity; the bull trout occurred historically in the Pend Oreille River but is now rare in the reservoirs downstream of Albeni Falls. Although bald eagles often nest in large cottonwood trees in riparian areas, they also use other tree species and habitats. There is no federally designated critical habitat or essential fish habitat associated with the Boundary Project.

Washington Department of Fish and Wildlife (WDFW)

Riparian habitats are considered a priority habitat type by the WDFW, which has an overall management goal to maintain or enhance the structural and functional integrity of riparian habitat and associated aquatic systems needed to support fish and wildlife populations on both site and landscape scales (Knutsen and Naef 1997). WDFW management guidelines seek to promote riparian habitat characteristics beneficial to fish and wildlife and include the following:

- Connectivity of riparian vegetation corridors along and adjacent to rivers and streams.
- Vegetation with a diverse mix of growth forms and native species composition.
- Multi-layered, vertical vegetation structure to increase habitat diversity.
- Disturbance regimes associated with natural river processes.
- Snags and large woody debris to provide habitat, structural diversity and stabilization.
- Riparian dimensions (shape and width) needed to retain riparian function.

- Streambanks stabilized with native woody vegetation to promote near-channel habitat.
- Adjacent wetlands to provide transitional habitats between upland and riparian habitats, and generally increase habitat diversity.

5.2.3. Study Goals and Objectives

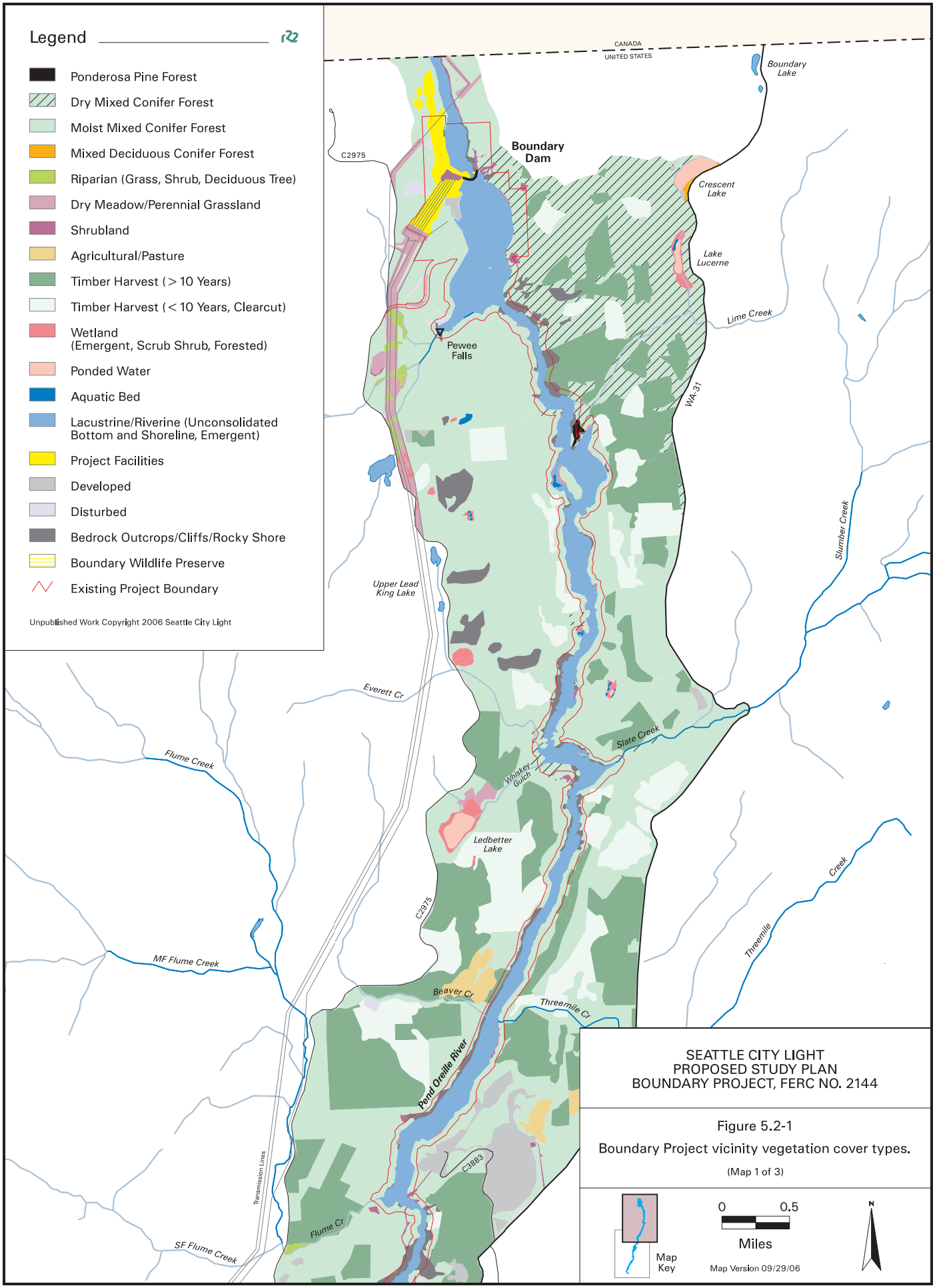
The goal of the Riparian Tree and Shrub Inventory is to provide information needed to determine the extent, types, and structure of riparian tree and shrub species in the Project vicinity, and assess Project effects on these species. Specific objectives of this study are as follows:

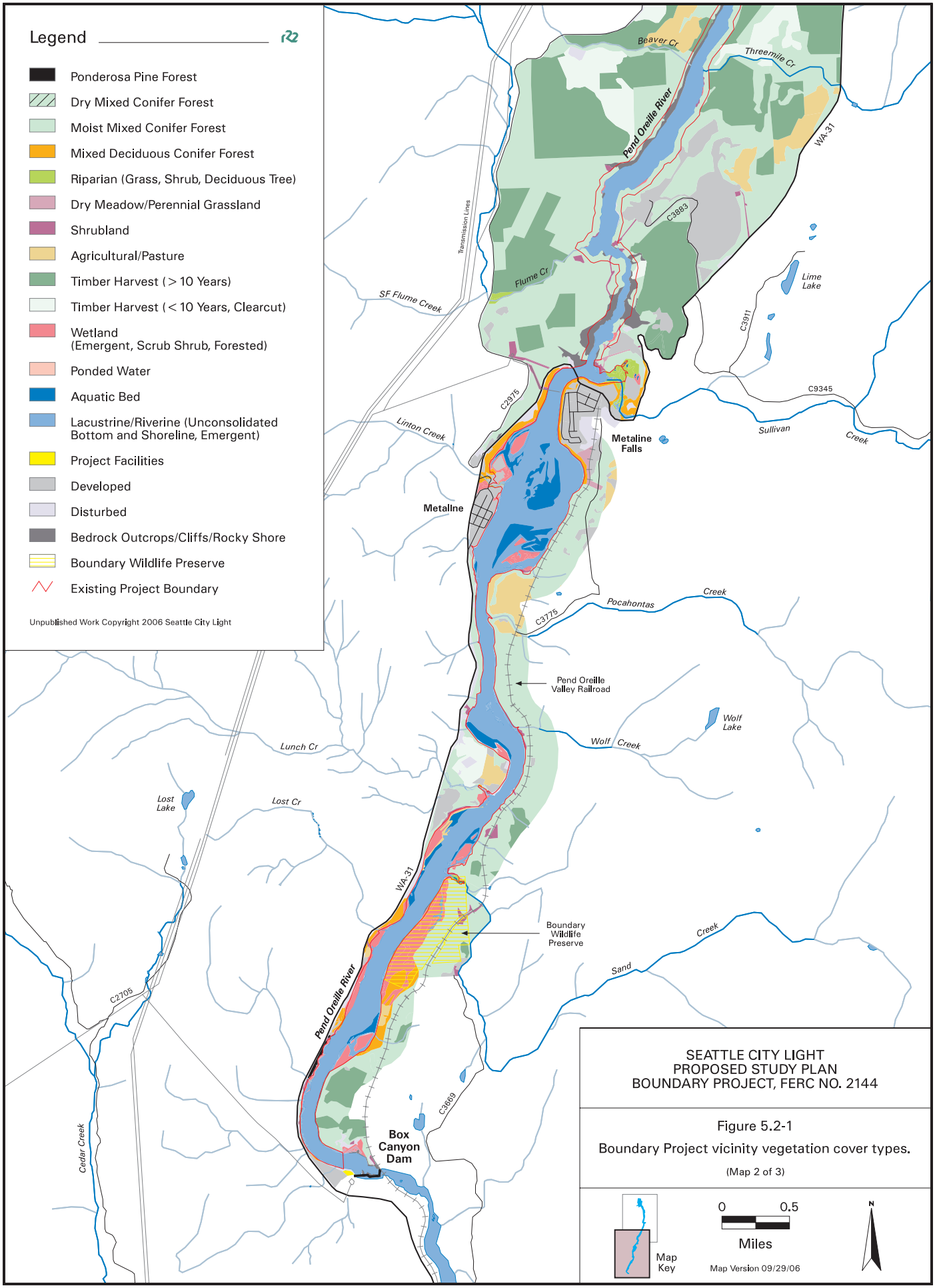
- Identify the current location, extent, and distribution of riparian tree and shrub species.
- Characterize the species composition and structure of riparian tree and shrub stands.
- Document the age structure of cottonwood stands and the number and age class of snags.
- Estimate the distribution and extent of riparian tree and shrub habitat that could potentially occupy the fluctuation zone if the Project were operated differently during the growing season.
- Identify potential threats to existing riparian tree and shrub stands (e.g., infestations of exotic species, beaver, erosion, grazing, trampling, reservoir level fluctuations).

5.2.4. Need for Study

Summary of Existing Information

A total of 43 cover types were identified and mapped in the 13,666-acre Project vicinity in 2005; including 28 upland, 5 riparian, 5 wetland, and 5 littoral/deep water types (Figure 5.2-1). Approximately 2,691 acres, or 20 percent, of the total mapped acreage is within the FERC Project boundary (Project area). Of this area, 1,686 acres (62 percent) is represented by lacustrine, littoral, and riverine cover types, which include reservoir, river, shoreline, and aquatic bed habitats (Table 5.2-1). Riparian and wetland vegetation types dominated by trees and shrubs occupy just 23.8 acres, or slightly less than 1 percent of the Project area, and include 5.8 acres of riparian shrub and 1.7 acres of riparian deciduous tree types, and 12.8 acres of palustrine shrub scrub and 3.5 acres of palustrine forested wetlands (SCL 2006).


Legend
Ponderosa Pine Forest
Dry Mixed Conifer Forest
Moist Mixed Conifer Forest
Mixed Deciduous Conifer Forest
Riparian (Grass, Shrub, Deciduous Tree)
Dry Meadow/Perennial Grassland
Shrubland
Agricultural/Pasture
Timber Harvest (> 10 Years)
Timber Harvest (< 10 Years, Clearcut)
Wetland (Emergent, Scrub Shrub, Forested)
Ponded Water
Aquatic Bed
Lacustrine/Riverine (Unconsolidated Bottom and Shoreline, Emergent)
Project Facilities
Developed
Disturbed
Bedrock Outcrops/Cliffs/Rocky Shore
Boundary Wildlife Preserve
Existing Project Boundary
Unpublished Work Copyright 2006 Seattle City Light
CANADA
UNITED STATES
Boundary Lake
Boundary Dam
C2975
Crescent Lake
Lake Lucerne
Lime Creek
Pewee Falls
WA-31
Slumber Creek
Upper Lead King Lake
Everett Cr
Flume Creek
Slate Creek
Whiskey Gulch
Ledbetter Lake
C2975
Threemile Creek
MF Flume Creek
Beaver Cr
Threemile Cr
Pend Oreille River
C3883
Transmission Lines
Flume Cr
SF Flume Creek
SEATTLE CITY LIGHT
PROPOSED STUDY PLAN
BOUNDARY PROJECT, FERC NO. 2144
Figure 5.2-1
Boundary Project vicinity vegetation cover types.
(Map 1 of 3)
Map Key
0
0.5
Miles
Map Version 09/29/06
N


Legend
Ponderosa Pine Forest
Dry Mixed Conifer Forest
Moist Mixed Conifer Forest
Mixed Deciduous Conifer Forest
Riparian (Grass, Shrub, Deciduous Tree)
Dry Meadow/Perennial Grassland
Shrubland
Agricultural/Pasture
Timber Harvest (> 10 Years)
Timber Harvest (< 10 Years, Clearcut)
Wetland
(Emergent, Scrub Shrub, Forested)
Ponded Water
Aquatic Bed
Lacustrine/Riverine (Unconsolidated Bottom and Shoreline, Emergent)
Project Facilities
Developed
Disturbed
Bedrock Outcrops/Cliffs/Rocky Shore
Boundary Wildlife Preserve
Existing Project Boundary
Unpublished Work Copyright 2006 Seattle City Light
Beaver Cr
Threemile Cr
Pend Oreille River
WA-31
C3883
Transmission Lines
Flume Cr
SF Flume Creek
Lime Lake
C3911
C9345
Sullivan
Creek
C2975
Linton Creek
Metaline Falls
Metaline
Pocahontas
Creek
C3775
Pend Oreille Valley Railroad
Wolf Lake
Wolf Creek
Lunch Cr
Lost Lake
Lost Cr
WA-31
Boundary Wildlife Preserve
Sand
Creek
C2705
Pend Oreille River
C3669
Box Canyon Dam
Cedar Creek
SEATTLE CITY LIGHT
PROPOSED STUDY PLAN
BOUNDARY PROJECT, FERC NO. 2144
Figure 5.2-1
Boundary Project vicinity vegetation cover types.
(Map 2 of 3)
Map Key
0
0.5
Miles
Map Version 09/29/06
N

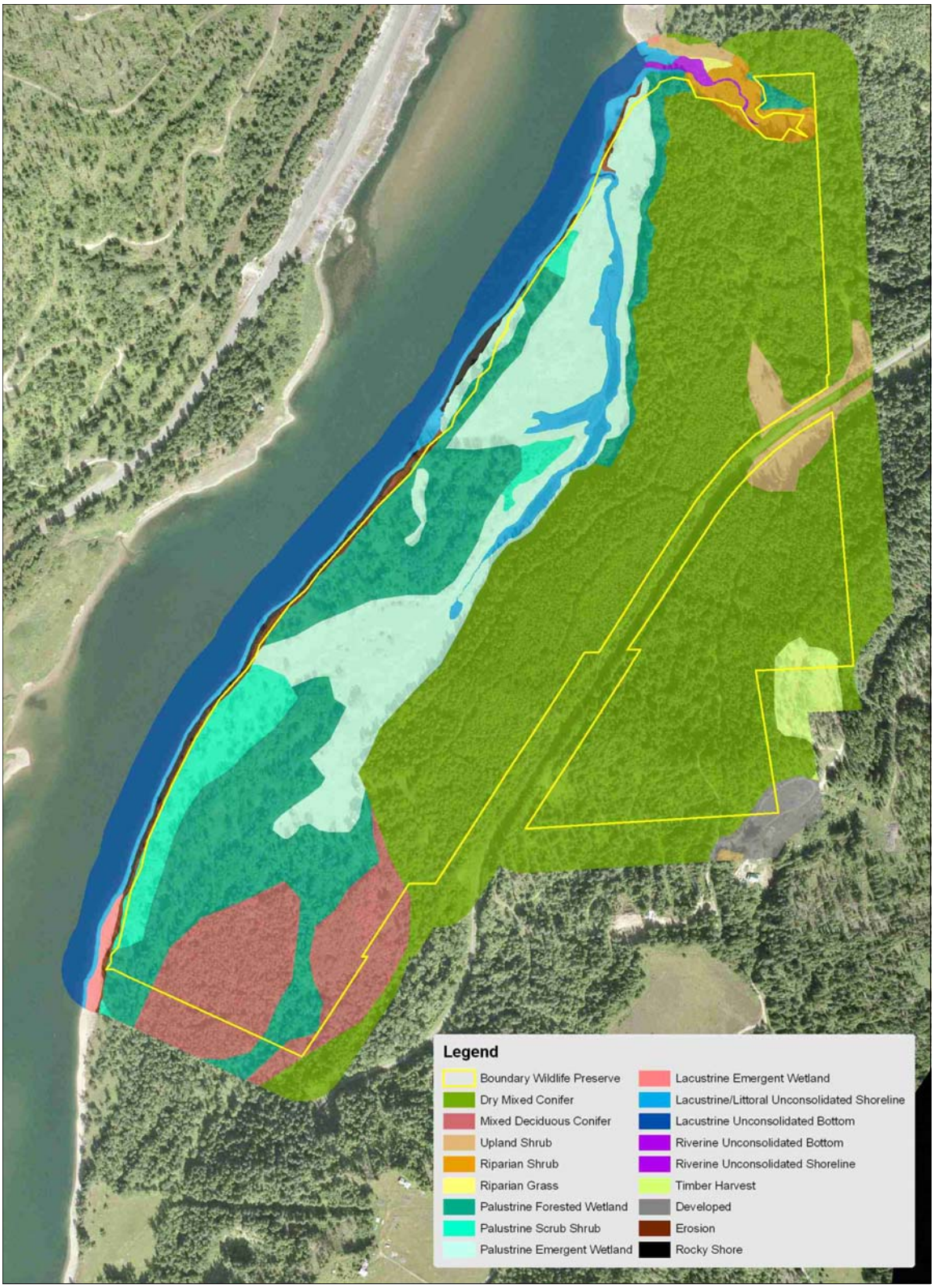


Figure 5.2-1. Boundary Project vicinity vegetation cover types (Map 3 of 3).

Table 5.2-1. Aquatic, riparian and wetland cover types within the Boundary Project area.[1] (Note: Tree and shrub types are shaded.)

Cover Types	Acreage[2]	% of Project Area[1,2]
Lacustrine/Littoral Types		
Lacustrine Unconsolidated Bottom (LUB)	1,389.7	51.6%
Lacustrine Aquatic Bed (AB)	112.4	4.2%
Lacustrine/Littoral Unconsolidated Shoreline (LUS)	120.3	4.5%
Littoral Emergent Wetland (LEM)	12.8	0.5%
Rocky Shoreline (ROC)	5.6	0.2%
Lacustrine/Littoral Total	**1,640.7**	**61.0%**
Riverine Types		
Riverine Unconsolidated Bottom (RUB)	34.3	1.3%
Riverine Unconsolidated Shoreline (RUS)	10.8	0.4%
Riverine Total	**45.1**	**1.7%**
Lacustrine/Littoral & RiverineTotal	**1,685.8**	**62%**
Wetland Types		
Palustrine Unconsolidated Bottom (PUB)	0.0	0.0%
Palustrine Aquatic Bed (PAB)	0.3	0.0%
Palustrine Emergent Wetland (PEM)	70.9	2.6%
Palustrine Scrub-Shrub (PSS)	12.8	0.5%
Palustrine Forested Wetland (PFO)	3.5	0.1%
Wetland Total	**87.4**	**3.2%**
Riparian Types		
Riparian Grass (RG)	2.7	0.1%
Riparian Shrub (RS)	5.8	0.2%
Riparian Deciduous Tree (RDT)	1.7	0.1%
Riparian Total	**10.2**	**0.4%**
Total Water Associated Habitat	**1,783.5**	**66.3%**

1 Includes the Boundary Wildlife Preserve (BWP).

2 Project area is 2,691.4 acres and includes 907.9 acres of upland cover types.

Areas that support riparian trees and shrubs within the Project boundary appear to be under the influence of riverine processes, such as normal surface flows, degradation/ aggradation, and periodic flooding. In general, woody riparian vegetation in the vicinity is associated with tributary streams. Stands of riparian trees and shrubs along tributary streams are best developed along Sullivan Creek, but also occur along Sand and Linton creeks. These tributary streams support Sitka alder, shining willow, coyote willow, and Sitka willow. Black cottonwood occurs as scattered individual trees or in small stands intermixed with conifers. Most of the tributary streams to Boundary Reservoir are small and narrow and are overtopped and shaded by adjacent upland forest. These streams support few, if any, riparian trees or shrubs; Sitka alder is the only riparian shrub species found along most of these heavily shaded stream channels.

Relatively few stands of riparian shrubs or trees grow in the reservoir fluctuation zone. In contrast to the species found along tributary streams, coyote willow was the only species observed growing within or in close proximity to this zone. This species occurs in sparse stands on a few gravel/cobble bars that are frequently inundated. Because of their small size, these stands were not mapped as distinct polygons on the vegetation cover type map (Figure 5.2-1).

Riparian trees and shrubs downstream of Boundary Dam were observed only as widely scattered individual plants; this is not unusual along rivers flowing through steep, confined valley bottoms. However, frequent high flows and confined valley bottom combine to create scouring conditions in areas along river banks, which are particularly detrimental when they occur during the growing season when riparian tree and shrub species are trying to establish. The lack of finer-textured sediment may also limit the establishment of riparian trees and shrubs in this reach.

Most of the mapped palustrine forest and scrub-shrub wetlands in the Project vicinity appear to be supported by seeps or springs or by shallow groundwater. A few shrub-dominated wetlands occur in the vicinity of tributaries where high pool levels and tributary inflows combine to contribute to shallow groundwater or inundation. Sitka alder is often the only dominant shrub layer species in these wetlands.

The SCL-owned Boundary Wildlife Preserve (BWP) includes the largest and best examples of forest and scrub-shrub wetlands in the Project vicinity. A large portion of the BWP occurs on a relict floodplain or terrace that is no longer influenced by overbank flows. However, when reservoir levels are high, portions of the old channel through the floodplain are inundated by backwater; other low points or depressions in the floodplain are inundated or saturated, presumably by shallow groundwater affected by the reservoir pool. Riparian tree and shrub species at the BWP include black cottonwood, red-osier dogwood, black hawthorn and various willow species. Large, old black cottonwood trees dominate the terrace forest. Few young cottonwoods were observed in the BWP during reconnaissance trips to this site in 2005, which may indicate that river processes required to facilitate establishment of this species are no longer occurring; foraging by beaver (*Castor canadensis*) and browsing by deer (*Odocoileus hemionus* and *O. virginanus*) may also limit establishment. Red-osier dogwood and willow form an abundant understory component in the cottonwood stands on the BWP. These species are more groundwater-dependent and may become dominant on the terrace as the cottonwood trees die. Black hawthorn is the dominant species in some shrub scrub wetland habitats and also occurs as an understory species in the cottonwood forest. Black hawthorn often colonizes old floodplains or terraces that are infrequently or no longer subjected to overbank flows that scour the landform.

A potential threat to the integrity of the forested and scrub-shrub wetlands on the BWP is reed canarygrass (*Phalaris arundinacea*), an aggressive invasive species with the potential to inhibit reproduction of riparian trees and shrubs. Vegetation and wildlife monitoring conducted in the early 1990s at the BWP (Pacific Wetland Nursery 1992) indicated that reed canarygrass was expanding rapidly in the BWP compared to data from 1987 (Parametrix 1987). SCL planted woody riparian species in the reed canarygrass swards at the BWP but the plantings were unsuccessful.

Need for Additional information

The existing cover type map provides a starting point for compiling comprehensive information on riparian tree and shrub species in the Project vicinity. However, previous surveys, including the reconnaissance level surveys conducted in 2005 and cover type mapping, did not provide detailed information on woody species distribution, composition, structure, and age class in riparian and wetland habitats within the Project boundary. Additional survey and documentation of riparian tree and shrub species are needed to provide the baseline information necessary to assess potential Project-related impacts.

5.2.5. Detailed Description of Study

Study Area

The study area for the Riparian Tree and Shrub Inventory will extend approximately 18 miles along the Pend Oreille River from the Box Canyon tailrace downstream to the U.S.-Canada border (refer to Figure 1.3-2 for a location map of the Boundary Project) and will encompass the following:

- Downstream of Metaline Falls — The reservoir, fluctuation zone allowed under the current license (forebay elevation 1,950–1,990 feet NGVD 29 [1,954–1,994 feet NAVD 88]), and land within the FERC Project boundary (Project area), which 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 BPA interconnection.
- Upstream of Metaline Falls — The reservoir, fluctuation zone (elevation ≈1,985–2,015 feet NGVD 29 [1,989–2,109 feet NAVD 88], as measured at the USGS gage below Box Canyon Dam), and the land within approximately 200 horizontal feet above the high water level (approximately 2,015 feet NGVD 29 [2,019 feet NAVD 88]) along both reservoir shorelines extending to the FERC project boundary for the Box Canyon Project. [3] [4]
- The BWP (155 acres) and adjoining SCL-owned property (85 acres).
- 100 horizontal feet along both sides of the river from Boundary Dam to the U.S.-Canada border (approximately 0.9 mile).

[3] The estimated fluctuation range of approximately 1,985–2,015 feet upstream of Metaline Falls is based on the review of existing hydrology, as described in section 1.3.5 of this PSP (see Table 1.3-1). Following completion of the Hydrology Dataset and Statistics in January 2007 (see section 1.4.2), SCL will review and refine, as necessary, this elevation range

[4] As indicated in this and other study plans in the PSP, 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.

The ability to conduct surveys on private land within the study area outside the FERC Project boundary (mainly upstream of Metaline Falls) may be limited due to access constraints on private lands in this area.

Proposed Methodology

Determining the distribution, composition, and reproduction status of existing riparian tree and shrub species in the study area will require a thorough inventory of the Project reservoir shoreline, BWP, and Pend Oreille River downstream of the dam. This inventory will be conducted by boat along the reservoir shoreline and on foot in the BWP and downstream of Boundary Dam. Estimating the location and extent of riparian tree and shrub habitat that could potentially develop in the fluctuation zone will be primarily a mapping exercise. The four main tasks required to accomplish the Riparian Shrub and Tree inventory are described below.

Task 1: Map Existing Riparian Tree and Shrub Stands

The existing map (Figure 5.2-1) of tree- and shrub-dominated riparian and wetland habitats will serve as a starting point for the more comprehensive inventory and mapping of riparian trees and shrubs. Detailed mapping depicting the current distribution of tree- and shrub- dominated riparian and wetland habitats will be completed in the field. The field mapping will use the Project's orthophotographs, which were derived from true-color aerial photographs taken in 2005, as the base map. If additional resolution is required, mapping will be done on mylar overlays of the original true color aerial photographs (scales of 1 inch = 1,000 feet and 1 inch = 600 feet) or on enlarged versions of these photographs (1 inch = 100 feet). Individual riparian trees or shrubs and any additional stands observed during inventory will be delineated on the field maps or on aerial photographs. Some areas may be difficult to map because shadows on the aerial photographs or the orthophotographs obscure portions of the shoreline. GPS coordinates will be collected to document the occurrence of individual trees or shrubs or small patches of riparian species that are difficult to map. In addition, any errors in the 2005 classification and delineation of existing polygons will be corrected.

All spatial data will be digitized using ESRI's Geographical Information Systems (GIS) ArcMap software (Version 9.0/9.1 or more recent version). The spatial data will then be provided to R2 Resource Consultants to amend the existing shape files used to produce the 2005 cover type map (Figure 5.2-1). R2 Resource Consultants will then create an accurate and comprehensive map depicting the distribution of riparian trees and shrubs in the study area. The data in Table 5.2-1 will be updated to reflect the newly calculated acreages of riparian habitats.

Once the map of riparian trees and shrubs is complete, it will be overlaid with data from the Bathymetry Study and LIDAR elevation mapping. This step will be used to determine the range of elevations in the study area that currently support riparian trees and shrubs.

Task 2: Riparian Tree and Shrub Stand Characterization

Data to characterize the stands (points and polygons) of riparian tree and shrub species in the study area will be collected concurrently with the mapping exercise and will include the following parameters:

- Species composition
- Area (sq feet or acres) estimation for each polygon
- Canopy cover by species in tree and shrub layers
- Average height(s) of shrub and/or tree layer(s)
- Age classes for each species
- Ecotones or transitions to other vegetation layers or habitat types
- Substrate (silt, sand, gravel, small cobble, large cobble, and boulder)
- Potential direct and/ indirect impacts, including Project- and non-Project- related impacts

Data sheets will be developed prior to field work to accommodate data collection and facilitate transfer to a database or spreadsheet format compatible with GIS attribute tables. A brief explanation and discussion of each parameter and its objective is provided below.

Species Composition

Species identification will be fairly straightforward given the few riparian tree and shrub species known to occur within the study area. The identification of willow species may present some difficulties if fieldwork is conducted when no male or female catkins are present. However, willow species currently known to occur in the study area have diagnostic characteristics almost any time during the growing season. Although Sitka alder was the only alder species observed during reconnaissance surveys conducted in 2005, thinleaf alder (*Alnus incana* ssp. *tenuifolia*) has potential to occur in the study area. The presence of alder cones on the previous year's wood and unwinged seeds make this species easy to distinguish from Sitka alder.

Polygon Area Estimation

The purpose of estimating polygon area is to provide an accurate accounting of the total area occupied by each riparian tree and shrub species. Although estimates of the mapped occurrences of riparian tree and shrub species will be calculated using GIS ArcMap software, the area of individual trees and very small stands should be estimated in the field since digitizing them may introduce considerable error.

Canopy Cover

The purpose of assessing canopy cover is to determine the relative abundance of each riparian tree and shrub species within each mapped polygon. The percent canopy cover of each riparian tree and shrub species present will be visually assessed by shrub and/or tree layer(s). The number of shrub and/or tree layers will need to be determined by the sampling crew (for additional information on assessment of layers, see Sawyer and Keeler-Wolf 1995). Since the majority of woody riparian and wetland habitats are small and dominated by one species, this parameter should be easy to assess. Large stands may be more difficult to assess due to structural variability in the tree and shrub layers. For example, the large black cottonwood forest stands in the BWP have a shrub layer in some areas and not in others. When possible, these stands will be stratified or subdivided on field maps into more homogenous units to aid in

assessment of aerial cover. Variable stands that cannot be easily subdivided may require the use of transects and the line intercept method (Hayes et al. 1981) to obtain an estimate of canopy cover.

Average Height(s) of Shrub and/or Tree Layer(s)

The purpose of assessing height is to document the vertical structure of stands of riparian trees and shrubs. The average height and aerial cover of each shrub and/or tree layer will be visually estimated for each polygon or stand.

Age Classes

The purpose of assessing age classes is to determine whether riparian trees and shrubs are establishing and reproducing. The assessment will include estimating and recording the number of individual plants by age classes. For willows and other multi-stem species the following age classes will be used (adapted from Crowley et al. 2006 and Cagney 1993):

1) Seedlings — 1 stem at surface
2) Young — 2–10 stems at ground surface
3) Mature — >10 stems at ground surface and >50 percent live, and
4) Decedent/Dead — >10 stems at ground surface and <50 percent live

For cottonwoods the following age classes will be used (adapted from Crowley et al. 2006):

1) Seedling — Stem is <4.5 feet tall or < 1 inch diameter-at-breast height (dbh);
2) Young — Stems is > or < 4.5 feet and 1 to < 5 inches dbh;
3) Mature — Stem is >= 5 inches dbh;
4) Decedent/Dead — Stem is >= 5 inches dbh with <50 percent live canopy
5) Snag — Stem is > 5 inches dbh and with a completely dead canopy

Where possible, the reproductive status of riparian trees and shrubs will be noted along with age class. The term "reproductive" refers to whether or not flowers and fruit are present. In addition, approximately 10–20 percent of mature trees in each cottonwood stand will be selected for coring to determine actual age. The growing conditions associated with seedling establishment will also be noted. This assessment will be completed for each riparian tree and shrub species present in the stand.

Ecotones

The purpose of assessing ecotones is to document the type and extent (linear distance) of habitats that adjoin the stands of riparian trees and shrubs (i.e., littoral zone, dry mixed conifer forest, emergent wetland, open water, etc.). Completion of this task may include revising the existing cover type map (see Task 1) to more accurately delineate adjoining habitat types. The actual calculations of the linear distance of adjoining habitat types and riparian tree and shrub stands will be conducted using GIS ArcMap software.

Substrate

The purpose of determining the substrate is to gain an understanding of the soil or rock that support riparian trees and shrubs in the study area. Evaluating substrate will involve determining the dominant material composing the site, as categorized below:

- Stones (>10 inches [>250 mm])
- Cobble (3-10 inches [76–250 mm]),
- Gravel (<0.08–3 inches [2–76 mm]), and
- Fines (includes sand and silt)(<0.08 inches [2 mm])

Assessment of Potential Direct and/or Indirect Impacts

Potential and observed impacts to riparian tree and shrub species will be noted in the field. A preliminary list of potential impacts is provided below:

- Water level fluctuations
- Invasive species infestations
- Human activities (developed recreation, timber harvest, etc.)
- Damage or trampling from cattle grazing
- Damage from beaver or other wildlife
- Erosion

Impacts to riparian shrubs and trees will be documented by taking photographs. Both Project-related and non-Project related effects will be included. The site will be revisited if an impact is suspected but cannot be confirmed in one visit.

Task 3: Mapping of Potential Riparian Tree and Shrub Habitat

Developing a map of the area within the reservoir fluctuation zone that could potentially support riparian trees and shrubs will involve the following steps:

1) Hydrology and bathymetry data will be used to delineate the extent of reservoir fluctuation zone upstream and downstream of Metaline Falls in 5- or 10-foot (vertical) increments. The Hydraulic Routing Model, which will be developed as part of the Mainstem Aquatic Habitat Modeling Study (see section 4.1), will be used to translate the USGS gage data into corresponding water surface elevations along the length of the study area.
2) The bathymetry map and the map developed in Task 1 will be overlaid and used as a base for delineating locations in the fluctuation zone that could potentially support riparian trees and shrubs. This step will assume that areas that currently support riparian trees and shrubs would expand into the fluctuation zone if the reservoir was operated at the lower levels during the growing season and there were no significant changes in topography or substrate. Depending on topography, it may also be necessary to modify the riparian/upland boundary in some locations. In addition, some modifications to the expected habitat types in the fluctuation zone may need to

be made to reflect the effects of periodic high flow events, which are outside the control of the Project, but which may affect the establishment and maintenance of riparian trees. Project hydrology data will be used to make this determination.

3) GIS will be used to develop a map of riparian tree and shrub habitat, and a table of associated acreage estimates, that could potentially be supported in the fluctuation zone in 5- or 10-foot (vertical) increments. This task will be coordinated with the Big Game Study and the Waterfowl/Waterbird Study, which also require evaluating the development of potentially suitable habitat in the fluctuation zone.

Task 4: Documentation and Effects Assessment

All data collected in the field will be recorded on datasheets and/or maps or aerial photographs. Mapped data will be entered into the Project GIS database; other data will be entered into a database for analysis.

This task will also describe the effects of the Project and local land uses on the quantity and quality of riparian tree and shrub habitat in the study area. This will involve using information from the literature and data from Tasks 1 and 2 to identify locations where water level fluctuations and/or erosion are affecting the maintenance and/or age class distribution of existing stands of cottonwoods or other riparian shrubs. A similar assessment will be conducted for other local lands uses or threats (i.e. mining operations, logging, weeds). Determining the amount of riparian tree and shrub habitat that could potentially develop in the fluctuation zone at lower reservoir levels will be a quantitative assessment based on the results of Task 3.

5.2.6. Work Products

Work products for the riparian tree and shrub inventory will include the following:

- A detailed riparian/wetland cover type map for the study area, which will be produced using GIS ArcView software and include elevation data. Each stand (polygon) and individual (point) containing riparian tree and shrub species will be assigned to one of four cover types — a riparian shrub (RS), riparian deciduous tree (RDT), palustrine shrub scrub (PSS) or palustrine forested wetland (PFO) — with an additional six-letter species acronym designed to indicate the dominant tree or shrub species. The cover type abbreviation and species acronym information will be clearly indicated in the legend on the cover type map.
- The shape file used to construct the updated cover type map, including an attributes table with the following information:
  - Cover type label
  - Cover type abbreviation plus species acronym for dominant species
  - Acronym for dominant three tree species (3 columns max.)
  - Cover for dominant three tree species (3 columns max.)
  - Acronym for dominant three shrub species (3 columns max.)
  - Cover for dominant three shrub species (3 columns max.)
  - Tree layer cover (as many columns as layers)

  - Tree layer height (as many columns as layers)
  - Shrub layer cover (as many columns as layers)
  - Shrub layer height (as many columns as layers)
  - Comments column for impacts (i.e., type of disturbance, potential impact, link to photo)

  Development of this product will entail adding columns to the existing attributes table for the 2005 cover type shape file. This product will provide SCL with a detailed summary of the data collected for each individual or stand of riparian trees and/or shrubs.

- A map and acreage estimates of potential riparian shrub and tree habitat in the fluctuation zone associated with the lowest normal operating level of the reservoir.
- A report in standard scientific format which summarizes the methods and results of the inventory of existing riparian tree and shrub stands. Results will be presented for three different segments within the study area:
  - Pend Oreille River downstream of Boundary Dam
  - Reservoir shoreline downstream of Metaline Falls to Boundary Dam, including tributaries, seeps and springs supporting riparian trees and shrubs
  - Reservoir shoreline upstream of Metaline Falls to south end of the Project boundary, including tributaries, seeps and springs supporting stands of riparian trees and shrubs, and the BWP
- A description of the extent and composition of riparian shrub and tree cover types, including information on stand size and structure, as well as the distribution, abundance and age classes for individual species.
- A discussion of potential Project effects and other threats to stands of riparian trees and shrubs will also be provided for each study segment, as determined from the results of this study. The full assessment of potential Project-related impacts, including the effects of the type and timing of Project operations and maintenance and Project-related recreation, will be part of the integrated resource analysis (see section 1.2.5).
- A table that presents a comparison of the amount of riparian tree and shrub habitat currently available in each study area section, and the amount that could potentially occur in the fluctuation zone if the reservoir were operated at lower levels.
- A comprehensive list of all riparian trees and shrubs by cover type and study segment.

5.2.7. Consistency with Generally Accepted Scientific Practice

Although there are several standard approaches to monitoring riparian communities, most of these are designed to detect changes over time from restoration activities, particularly fencing or other methods to exclude cattle from these areas (National Riparian Service Team 2004). Techniques from one or more of these approaches may be suitable to monitor the development of riparian habitat in the fluctuation zone if operations are changed for the next license period. There is, however, no standardized approach to conducting inventories for riparian tree and

shrub habitats. The methods described above are consistent with generally accepted practices in the scientific community for mapping and characterizing vegetation communities and incorporate some of the variables and techniques used in riparian monitoring programs.

5.2.8. Consultation with Agencies, Tribes, and Other Stakeholders

This study plan was prepared with input from the USFS, WDFW, and Pend Oreille County Noxious Weed Control Board, which was provided at a meeting of the Terrestrial Resources Workgroup on June 28, 2006. Additional comments were provided by the USFS at a Workgroup meeting on July 26, 2006. Comments provided at the workgroup meetings are summarized in Attachment 5-1 and can also be found in the workgroup meeting summaries, available on SCL's relicensing website (http://www.seattle.gov/light/news/issues/bndryRelic/). Additional comments were also provided by the WDFW in written comments (letter from D. Robison, WDFW, to M. Lynn, SCL, August 28, 2006) and a follow-up phone conversation (Personal communication, D. Robison, WDFW, August 28, 2006) (included in Attachment 5-1) and by the USFS in its PAD/Scoping comments and official study requests (letter from R. Brazell, USFS Forest Supervisor, CNF, to M. Salas, FERC, August 31, 2006) (USFS 2006).

5.2.9. Schedule

The Riparian Tree and Shrub Inventory will be conducted in 2007; however, the need for additional data will be evaluated after the first year of work. Assuming that mapping and data collection can be accomplished in one year, the expected schedule is as shown in Table 5.2-2.

Table 5.2-2. Schedule for Riparian Tree and Shrub Inventory.

Activity	Timeframe
Finalize study implementation details	April 2007
Field work to map and characterize existing riparian tree and shrub stands	June–July 2007
Map potential riparian tree and shrub habitat in the fluctuation zones	August–September 2007
Analyze data and mapping	September–October 2007
Prepare Draft Study Report	November 2007
Submit Draft Study Report for stakeholder review	December 2007
Revise and finalize Study Report	January 2008

5.2.10. Progress Reports, Information Sharing, and Technical Review

In addition to preparing the study report (as described in the above), there will be several opportunities for information sharing and technical review with relicensing participants. Interested agencies will be invited to participate in survey efforts and will be asked to provide input into the operating scenarios selected for analysis. Surveys results will be presented at a workshop in early 2008, as described in section 1.2.4 of this document.

5.2.11. Anticipated Level of Effort and Cost

The riparian tree and shrub inventory is expected to involve about 100 hours of field time (2 botanists for approximately 1 week each), as well as additional time for data summary, analysis, and reporting. The estimated cost for this study is $32,000–42,000.

5.2.12. Literature Cited

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5.3. Rare, Threatened, and Endangered (RTE) Plant Species Inventory

In general, information on rare, threatened, and endangered (RTE) plant species occurrences in the Project vicinity is incomplete. There are some records of RTE plants documented by the USDA Forest Service (USFS) and Washington Department of Natural Resources Natural Heritage Program (WNHP) during earlier survey efforts and by SCL during a reconnaissance trip in 2005. However, the existing plant records do not adequately cover the Project vicinity. In addition, there are many other RTE plant species that could potentially occur in the Project vicinity, for which there are very little data, if any. The proposed RTE Plant Species Inventory will provide information on RTE plants that is required for the relicensing analysis of Project effects.

For the purpose of this study, RTE plant species are defined as follows:

- *Federally Listed or Proposed Species* — Species that are listed and protected under the Endangered Species Act (ESA) of 1973, as Endangered or Threatened, or proposed for listing.
- *Federal Candidates* — Species for which the U.S. Fish and Wildlife Service (USFWS) has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation has not occurred because of other higher priority listing activities. Candidate species receive no statutory protection under the ESA. However, the USFWS encourages the formation of partnerships to conserve these species.
- *State Status* — Species listed by the WNHP on an advisory basis as Endangered, Threatened, Sensitive and Review List 1 and 2. Watchlist species are only included on the target list if they are considered sensitive by BLM and USFS.
- *USFS Sensitive Species* — Species on the July 2004 Regional Forester's List of Sensitive Species for the Colville National Forest (CNF). The Regional Forester's List also includes species already protected under the ESA.
- *U.S. Bureau of Land Management (BLM) Sensitive Species* — Species on the March 2005 Oregon and Washington BLM Special Status Species List. The BLM list also includes species already protected under the ESA or state listed as endangered or threatened.

5.3.1. Nexus between Project Operations and Effects on Resources

Water level fluctuations in Boundary Reservoir and shoreline erosion may have direct and/or indirect effects on RTE plants and the habitats on which they depend. Other Project operations that may physically affect RTE plant species include maintenance of facilities and transmission line rights-of-way, potential new construction, and ground-disturbing activities. Currently, shoreline erosion is known to impact some occurrences of least bladdery milkvetch (*Astragalus microcystis*), a species often observed growing in rocky substrates within the reservoir fluctuation zone (SCL 2006). Reservoir shoreline erosion can be caused by water level

fluctuations (direct Project-related impact) and wave action from watercraft (indirect impact associated with recreation) and wind, as well as other factors. Other potential indirect impacts to RTE plants include recreation associated with developed and undeveloped campgrounds, roads, and trails in the vicinity of RTE plant species occurrences. The spread of invasive plant species from areas disturbed by Project-related activities to habitats that support RTE plants have the potential to indirectly impact these species through competitive exclusion.

SCL conducted a preliminary inventory in 2005 to confirm locations of RTE plant populations previously identified along the reservoir by state and federal agencies. A more thorough survey of habitats in the Project vicinity will be required to assess the occurrence and distribution of RTE plant species and to evaluate potential Project effects.

5.3.2. Agency Resource Management Goals

In addition to providing information needed to characterize Project effects, the RTE plant species inventory will provide information to help agencies with jurisdiction over these species in the Project vicinity identify appropriate conditions for the new Project license pursuant to their respective mandates. Agencies with management responsibility in the context of FERC relicensing of the Boundary Project and management goals related to RTE plants are described below.

USDA Forest Service (USFS)

Department of Agriculture Regulation 9500-4 directs the USFS to manage "habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species." USFS policy implementing the National Forest Management Act, National Environmental Policy Act, and the ESA establishes objectives and direction to ensure that actions on National Forest System (NFS) lands do not contribute to trends toward Federal listing or loss of viability of any native or desired non-native species (Forest Service Manual [FSM] 2672.41). The objectives of the sensitive species program include the development and implementation of management practices to ensure that species do not become threatened or endangered and to maintain viable populations of all native and desired nonnative wildlife, fish and plant species in habitats distributed throughout their geographic range on NFS lands (FSM 2670.22). This requires the agency to monitor other "watch–lists or species of concern" that may be declining, but have reached critical population levels. USFS policy includes the requirement, as part of the NEPA process, to review programs and activities, through a Biological Evaluation, to determine their potential effect on Sensitive Species, and to avoid or minimize impacts to species whose viability has been identified as a concern (FSM 2670.32). The list of sensitive plants for Region 6, which includes the CNF, was last updated July 2004.

U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for the recovery of species listed as threatened or endangered under the ESA.

U.S. Bureau of Land Management (BLM)

The National Forest Management Act also applies to the BLM. BLM's policy for conserving RTE species is directed by BLM Manual 6840 and Instruction Memorandum OR-91-57 (November 5, 1997). Manual 6840 requires that the BLM work with state agencies in achieving conservation goals for locally rare species as designated by state governments. BLM State Directors are responsible for designating sensitive species for management with the purpose of "assisting in maintaining viable gene pools while allowing flexibility under a multiple use mission" (BLM 1990).

The list of BLM Sensitive Species for Oregon and Washington was updated in July 2005 and includes species designated as Sensitive, Assessment, and Tracking (BS, BA, and BT species, respectively). Impacts to BS and BA species on BLM lands are to be addressed as part of the National Environmental Policy Act (NEPA) process. Additionally, Manual 6840 directs the BLM to conduct inventories and monitoring to conserve designated BS species. Special management or protection is discretionary for BT species (BLM 1990).

5.3.3. Study Goals and Objectives

The goal of the RTE Plant Species Inventory is to provide information needed to determine the presence of RTE plant species in the Project vicinity, assess Project effects on these species, and direct management decisions related to RTE plant species. Specific objectives of this study are as follows:

- Identify the RTE plant species occurring in the Project vicinity.
- Map the location, distribution, and extent of RTE plant populations.
- Identify any threats to existing RTE plant populations (i.e., nearby infestations of invasive non-native species, erosion, herbivory, etc) and their habitats, including potential Project effects.

5.3.4. Need for Study

Summary of Existing Information

A target list of RTE plant species with the potential to occur in the Project vicinity was compiled early in 2005 in preparation for the reconnaissance-level assessment of previously documented occurrences of RTE plants in the Project vicinity (see Boundary Project relicensing Pre-Application Document [PAD] Table 4.6-5 [SCL 2006]). This list was updated in 2006 for this study plan based on additional information provided by the USFS and now includes 55 vascular plant, 7 lichen, and 3 moss species (Table 5.3-1).

A total of 53 occurrences of 10 different RTE plant species have been documented in the Project vicinity from previous USFS and WNHP surveys and the 2005 reconnaissance survey (map available from SCL). These are as follows:

- *Astragalus microcystis* (Least bladdery milk-vetch) 8 occurrences

- *Carex flava* (Yellow sedge) 2 occurrences
- *Cicuta bulbifera* (Bulb-bearing water-hemlock) 3 occurrences
- *Cryptogramma stelleri* (Steller's rock-brake) 2 occurrences
- *Dryas drummondii* (Yellow mountain-avens) 17 occurrences
- *Impatiens aurella* (Orange balsam) 2 occurrences
- *Muhlenbergia glomerat*a (Marsh muhly) 1 occurrence
- *Sanicula marinlandica* (Black snake-root) 3 occurrences
- *Sisyrinchium septentrionale* (Blue-eyed grass) 1 occurrence
- *Thalictrum dasycarpum* (Purple meadowrue) 14 occurrences

Thirty-seven of these occurrences were previously documented by the USFS and/or the WNHP. Reconnaissance surveys conducted in 2005 confirmed the presence of 25 (68 percent) of the 37 occurrences; 12 occurrences were not relocated. However, 16 new occurrences of RTE plant species were observed and mapped within the Project boundary. There were no observations and there are no historical records of the federally-listed Ute's Ladies'-tress (*Spiranthes diluvialis*) in the Project vicinity. Mountain lady's-slipper (*Cypripedium montanum*), which was an RTE species until recently, was found on the Boundary Wildlife Preserve (BWP). Detailed information on the taxonomy, status, habitat requirements, and the distribution of the 10 RTE plant species known from the Project vicinity are discussed in the PAD (SCL 2006). Two additional species — kidney-leaved violet (*Viola renifolia*) and crested shield-fern (*Dryopteris cristata*) — were documented along the reservoir shoreline by the USFS in June 2006.

Results of the 2005 reconnaissance surveys suggest that three RTE plant species — yellow mountain avens, purple meadowrue, and least bladdery milk-vetch — are locally abundant in the Project vicinity. Yellow mountain avens is a predominant component of the vegetation growing on the rock faces and cliffs along the lower reservoir. Similarly, least bladdery milk-vetch is relatively common on cobble bars and islands upstream of Metaline Falls. Purple meadowrue was frequently observed in riparian habitats throughout the Project vicinity and was especially prevalent on the BWP.

Need for Additional Information

The existing information provides a starting point for compiling comprehensive information on RTE plant species in the Project vicinity. However, previous surveys, including the reconnaissance level surveys conducted in 2005, did not cover the entire Project vicinity and do not provide complete information on the locations and distributions of RTE plant species in this area. Additional surveys for RTE plant species are needed to provide the baseline information necessary to assess potential Project-related impacts to RTE plant species.

Table 5.3-1. RTE vascular and non-vascular plant species documented or potentially occurring in the vicinity of the Boundary Hydroelectric Project. Species in bold type are known to occur in the Project vicinity.

Scientific Name[1]	Common Name	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WNHP Status[5]	Flowering/ Fruiting	Habitat Requirements/Information
VASCULAR PLANTS							
Antennaria corymbosa	Meadow Pussy-toes	None	S	BA	T	June to Aug.	Bogs. elev. 5,000 feet.
Antennaria parvifolia	Nuttall's Pussy-toes	None	S	BA	S	May to July.	Dry open areas, on sandy or gravelly riverbanks, openings of Ponderosa pine forests. elev. 1,900 to 2,600 feet.
Astragalus microcystis	Least Bladdery Milk-vetch	None	S	BA	S	Late April – Aug.	Open woods near shorelines, riverbanks, floodplains. elev. 1,900 to 2,100 feet.
Botrychium ascendens	Triangular-lobed Moonwort	None	S	BA	S	June–July	Dry meadows. elev. 3,000 to 3,400 feet.
Botrychium crenulatum	Crenulate Moonwort	None	S	BA	S	May–Sept	Western red cedar/western hemlock forests, stream banks, floodplains. elev. 2,030 to 4,600 feet.
Botrychium hesperium	Western Moonwort	None	S	BA	T	Late May – early June	Dry to moist meadows. elev. 3,200 to 3,300 feet.
Botrychium lineare	Skinny moonwort	None	S	FC	T	June	Western redcedar/western hemlock forests, streambanks, floodplains. elev. 2,000 to 4,000 feet.
Botrychium paradoxum	Two-spiked Moonwort	None	S	BA	T	May–Sept.	Meadows, perennial and intermittent streams. elev. 2,500 to 3,600.
Botrychium pedunculosum	Stalked Moonwort	None	S	BA	S	May–Aug.	Dry to moist meadows, perennial streams. elev. 2,500 to 3,300 feet.
Carex capillaries	Hair-like sedge	None	S	BA	S	June–Aug.	Streambanks, wet meadows, wet ledges, marshy lake shores. elev. 2,800 to 6,500 feet.
Carex comosa	Bristly Sedge	None	S	BA	S	May–July	Marshes, lake shores, and wet meadows. elev. 50 to 2,000 feet.
Carex dioica	Yellow bog sedge	None	S	BA	S	June–Aug.	Sphagnum bogs, forested wetlands, and other wet marshy areas. elev. 2,600 to 3,800 feet.
Carex flava	Yellow Sedge	None	S	BA	S	July–Aug.	Wet meadows, forested wetlands, bogs and shores streams and lakes. elev. 2,000 to 4,300 feet.

Table 5.3-1, continued…

Scientific Name[1]	Common Name	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WNHP Status[5]	Flowering/ Fruiting	Habitat Requirements/Information
Carex hystericina	Porcupine Sedge	None	S	BA	W	May–June	Wet depressions, along creek drainages and hillside seeps. elev. 500 to 2,600 feet.
Carex praeceptorum	Teacher's Sedge	None	None	BT	R1	July–Aug.	Wet meadows and areas at higher elevations in mountains
Carex rostrata	Beaked Sedge	None	S	BA	S	July–Aug.	Bogs and fens. elev. 4,600 to 5,000 feet.
Carex saxatilis var. *major*	Russet Sedge	None	S	BA	W	July–Aug	Wet meadows and margins of lakes and streams.
Carex sychnocephala	Many-headed Sedge	None	S	BA	S	July–Sept.	Moist or wet ground adjacent to marshes or along lake shores. Substrates vary from rather rocky to sandy and silty soils
Centunculus minimus	Chaffweed	None	None	None	R1	May–June	Moist ground, ephemeral wet areas elev. ~800 feet.
Chrysosplenium tetrandrum	Northern golden carpet	None	S	BA	S	June	Perennial and intermittent streams, seeps in rock outcrops. elev. 2,000 to 4,000 feet.
Cicuta bulbifera	Bulb-bearing Water-hemlock	None	S	BA	S	Growing season	Edges of marshes, lake margins, in bogs, wet meadows, shallow standing water; slow moving streams, hummocks and floating mats. elev. 240 to 3,700 feet.
Cryptogramma stelleri	Steller's Rock-brake	None	S	BA	S	April–Oct.	Cliffs. elev. 300 to 3,500 feet.
Cypripedium parviflorum	Yellow Lady's-slipper	None	S	BS	T	May–June	Perennial streams on limestone rock under mixed conifer forest. elev. 2,300 to 2,700 feet.
Dryas drummondii	Yellow Mountain-avens	None	S	BA	S	May – early July	In crevices of steep, rocky, dry cliffs, and on limestone rock along rivers. elev. 1,900 to 6,800 feet.
Dryopteris cristata	Crested Shield-fern	None	S	BA	S	June–Sept.	Wet meadows, forested wetlands. Often found on hummocks, downed woody debris or at the base of deciduous shrubs, often with alder. elev. 2,100 to 4,100 feet.
Eriophorum viridicarinatum	Green Keeled Cotton-grass	None	S	BA	S	June–July	Fens and marshes. elev. 2,900 to 4,650 feet.
Gaultheria hispidula	Creeping Snowberry	None	S	BA	S	May–June	Sphagnum wet lands or moist areas in coniferous woods. elev. 2,960 to 3,360 feet.

Table 5.3-1, continued…

Scientific Name[1]	Common Name	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WNHP Status[5]	Flowering/ Fruiting	Habitat Requirements/Information
Geum rivale	Water Avens	None	S	BA	S	June–July	Wet meadows, bogs, riparian zones along perennial streams and moist old pastures. Does not occur under heavy shrub cover. elev. 2,500 to 6,400 feet.
Hierochloe odorata	Common Northern Sweet Grass	None	None	None	R1	Apr. –July	Moist soil of low montane and subalpine slopes and meadows
Hypericum majus	Canadian St. John's-wort	None	S	BA	S	July–Sept.	Along rivers, ponds, lakesides or other low, wet places; elev. 100 to 2,300 feet.
Impatiens aurella	Orange Balsam	None	None	BT	R2	July–Sept.	Moist, open or shaded habitats.
Lobelia kalmii	Kalm's Lobelia	None	S	BS	E	Late July – Aug.	Marl or peat bogs, along shores and in other wet places.
Lomatium sandbergii	Sandberg Desert-parsley	None	None	None	R1	May–July	Open, rocky places at moderate to higher, subalpine habitats
Lycopodiella inundata	Bog Clubmoss	None	S	BA	S	March–Oct.	Mostly in sphagnum bogs, seldom in other very wet places. elev. 1,800 feet.
Lycopodium dendroideum (=Diphasiastrum alpinum)	Treelike Clubmoss	None	S	BA	S	June–July	Rock outcrops, talus or boulder fields, significant moss & organic debris. Between a meadow or wetland and adjacent forest; near base of large boulders. elev. 800 to 3,600 feet.
Muhlenbergia glomerata	Marsh Muhly	None	S	BA	S	July–Aug.	Streambanks, meadows, marshes, bogs, and shores of lakes and ponds. elev. 2,900 to 3,500 feet.
Ophioglossum pusillum	Adder's-tongue	None	S	BS	T	June–Sept.	Moist meadows, pastures, old fields, roadside ditches, and floodplain woods in seasonally wet, rather acid soil. elev. 40 to 3,200 feet.
Penstemon wilcoxii	Wilcox's Penstemon	None	None	None	S	May–July	Open or wooded areas, sometimes in rocky substrates in foothills and middle elevations.
Physaria didymocarpa var. *didymocarpa*	Common Twinpod	None	S	BA	S	June–Aug.	A variety of habitats, including river gravel bars, steep shale outcrops, rocky flats, gravelly prairies, talus slopes, dry hillsides, and road cuts. elev. 2,000 feet.

Table 5.3-1, continued…

Scientific Name[1]	Common Name	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WNHP Status[5]	Flowering/ Fruiting	Habitat Requirements/Information
Platanthera obtusata	Small Northern Bog Orchid	None	S	BA	S	June–July	Damp or wet places in forests, marshes, bogs, meadows, and along streambanks. Areas with Engelmann spruce and/or western red-cedar. elev. 800 to 5,000 feet.
Salix candida	Hoary Willow	None	S	BA	T	May–June	Fens. elev. 2,400 to 3,000 feet.
Salix maccalliana	Maccall's Willow	None	S	BA	S	May–June	Bogs and fens. elev. 2,400 to 3,000feet.
Salix pseudomonticola	Serviceberry willow	None	S	None	None	May–June	Fens and bogs. elev. 2,900 feet.
Sanicula marilandica	Black Snake-root	None	S	BA	S	June – mid-Aug.	Moist lowgrounds such as meadows, riparian floodplains, moist woods and marsh edges. elev. 1,500 to 2,900 feet.
Scutellaria angustifolia ssp. *micrantha*	Narrowleaf Skullcap	None	None	None	R1	May–June	In a variety of open, moist or dry, often rocky habitats east of the Cascade Range
Sisyrinchium montanum	Strict Blue-eyed-grass	None	None	None	T	May	Steep west-facing slopes associated with small seeps/springs; elev. 700 feet.
Sisyrinchium septentrionale	Blue-eyed Grass	None	S	BA	S	May – mid-June	Primarily in open, wet meadows, sometimes in association with perennial streams or in a mosaic of forested wetlands. elev. 2,200 to 3,850 feet.
Spartina pectinata	Prairie Cordgrass	None	S	BA	S	June–July	Wet areas such as swales edges of marshes and ponds, and along streams and riverbanks, in both fresh and saltwater. elev. 2,000 feet.
Spiranthes diluvialis	Ute Ladies'-tress	FT	FT	FT	E	mid-July – August	Stabilized gravel bars that are moist throughout the growing season and inundated early in the growing season; old oxbows, riparian edges, high flow channels, and moist-wet meadows along perennial streams; elev. 720–1,500 feet
Teucrium canadense ssp. *viscidum*	Woodsage	None	S	None	W	June–Aug.	Wet areas around lakes and stream banks in low areas. elev. 0 to 2,300 feet.
Thalictrum dasycarpum	Purple Meadowrue	None	S	BA	S	June–Aug.	Deciduous riparian woods, damp thickets, swamps, wet meadows, often adjacent to and/or within the flood plain. elev. 200 to 2,200 feet.

Table 5.3-1, continued…

Scientific Name[1]	Common Name	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WNHP Status[5]	Flowering/ Fruiting	Habitat Requirements/Information
Utricularia intermedia	Flat-leaved Bladderwort	None	None	BA	S	May (June)	Shallow ponds, slow-moving streams, and wet sedge or rush meadows. elev. 4,000 feet.
Utricularia minor	Lesser Bladderwort	None	None	BT	R1	June–Sept.	Shallow, standing or slow-moving water.
Vaccinium myrtilloides	Velvet-leaved Blueberry	None	S	BA	S	May–June	Western red-cedar/ western hemlock forests. elev. 2,000 to 3,000 feet.
Viola renifolia	Kidney-leaved Violet	None	None	BT	S	Late May – mid-June	Moist lowland forests. elev. 2,270 to 4,355 feet.
NON-VASCULAR PLANTS - LICHENS[6]							
Dermatocarpon luridum	Brook lichen	None	S	None	P1	None	Aquatic; on rocks, boulders and bedrock in streams, rivers, or seeps, usually submerged to inundated most of the year
Leptogium burnetiae var. *hirsutum*	Jellyskin	None	S	None	P2	None	Typically epiphytic on trees but also on decaying rocks and mosses
Leptogium cyanescens	Blue jellyskin	None	S	None	None	None	Bark of conifers and hardwood trees and logs, mossy rocks in cool, moist micro-sites
Nephroma bellum	Naked kidney lichen	None	S	None	None	None	On branches and twigs of trees, especially conifers. Also on mossy rocky in humid forests.
Peltigera neckeri	Black saddle lichen	None	S	None	None	None	Mossy logs, soil and tree bases in wet forest habitats
Peltigera pacifica	Fringed pelt	None	S	None	None	None	Mossy logs, soil and tree bases in wet forest habitats
Tholurna dissimilis	Urn lichen	None	S	None	P1	None	On twigs and branches of exposed conifers in humid subalpine habitats
NON-VASCULAR PLANTS – MOSSES[7]							
Schistotega pennata	Luminous moss	None	S	None	None	None	Damp acidic rock, soil, and decaying wood in dark places, rock crevices or overhangs, animal burrows, on shaded banks, in cervices of root balls or fallen trees or around tree roots in dark, dense forests.
Scouleria marginata	Splashzone moss	None	S	None	None	None	Semi-aquatic; on rocks in the spray-zone of streams and waterfalls, typically submerged at least part of the year

Table 5.3-1, continued…

Scientific Name[1]	Common Name	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WNHP Status[5]	Flowering/ Fruiting	Habitat Requirements/Information
Tetraphis geniculata	Tetaphis moss	None	S	None	None	None	Moist conifer forest with large down logs. Found on cut or broken ends or low sides of decay class 3,4 or 5 rotted logs or stumps and occasionally on peaty banks in moist conifer forests from sea level to subalpine elevations

Source: Modified from the PAD (SCL 2006) based on new information from the USFS and BLM.

1 Species in bold have been documented in the Project vicinity by SCL or USFS.

2 U.S. Fish and Wildlife Service (USFWS) Classification (WDFW 2006): FT=Listed as Threatened

3 USDA Forest Service (USFS) Regional Forester's Sensitive Species, Region 6, updated July 2004 (Note: As of September 2006, this list was not available online). S = Sensitive.

4 Bureau of Land Management Special Status Species, updated March 2005 (Note: As of September 2006, this list was not available online). BLM Special Status Species Categories:

BS = Bureau Sensitive – Nominated by BLM District Managers; must be listed by WNHP to be eligible.

BA = Bureau Assessment – Species known or suspected on USDI-BLM land that are not federally listed, state listed, or BS and that are listed by the WNHP but not eligible as BS.

BT = Bureau Tracking - All species known or suspected on USDI-BLM land that are not federally listed, state listed, BS, or BA, and that are WNHP Review species or Watch species.

5 State Status: WNHP (2006) provides the following explanation of state status:

E = Endangered taxa are at critically low levels or their habitats have been degraded or depleted to a significant degree presenting the danger of becoming extinct or extirpated from Washington within the foreseeable future if factors contributing to its decline continue.

T = Threatened are likely to become Endangered in Washington within the foreseeable future if factors contributing to its population decline or habitat degradation or loss continue.

S = Sensitive taxa are vulnerable or declining and could become Endangered or Threatened in the state without active management or removal of threats;

R = Review taxa are either R1 = Taxon in need of additional field work before a status can be assigned, or, R2 = Taxon with unresolved taxonomic questions.

W = Watch List taxa that are less at risk in Washington than previously assumed.

6 WNHP lichen list is in the process of being revised; state status is based on 1997 list. (WNHP 1997) Priority status groups were developed by scientists using the same criteria as those used for vascular plants: occurrence pattern, vulnerability, threats, degree of protection, and taxonomy.

7 WNHP has not assigned mosses to priority groups due to lack of information (WNHP 2006).

5.3.5. Detailed Description of Study

Study Area

The study area for the RTE plant surveys will extend approximately 18 miles along the Pend Oreille River from the Box Canyon tailrace downstream to the U.S.-Canada border (refer to Figure 1.3-2 for a location map of the Boundary Project) and will encompass the following:

- Downstream of Metaline Falls — The reservoir, fluctuation zone under normal operations (forebay elevation 1,970–1,990 feet NGVD 29 [1,974–1,994 feet NAVD 88]), 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 (forebay elevation 1,990 feet NGVD 29 [1,994 feet NAVD 88]) along both reservoir shorelines and the transmission line right-of-way (ROW) from the powerhouse to the BPA interconnection.
- Upstream of Metaline Falls — The reservoir, fluctuation zone (elevation ≈1,985–2,015 feet NGVD 29 [1,989–2,019 feet NAVD 88], as measured at the USGS gage below Box Canyon Dam) and the land within approximately 200 horizontal feet beyond the high water level (approximately 2,015 feet NGVD 29 [2,019 feet NAVD 88]) along both reservoir shorelines extending to the FERC project boundary for the Box Canyon Project. [5] [6]
- The Boundary Wildlife Preserve (BWP) (155 acres) and adjoining SCL-owned property (85 acres).
- 100 feet around any Project works areas that extend outside the Project boundary.
- 50 feet along both sides of Project-related roads, which include the road between the Boundary Dam and the Vista House, the road to the dam off County Road 2975, and the road from the Vista House to SR31.
- 100 feet horizontal along both sides of the river from Boundary Dam to the U.S.-Canada border (approximately 0.9 mile).

The ability to conduct RTE plant surveys within the study area outside the FERC Project boundary (mainly upstream of Metaline Falls) may be limited due to access constraints on private lands in this area.

[5] The estimated fluctuation range of approximately 1,985–2,015 feet upstream of Metaline Falls is based on the review of existing hydrology, as described in section 1.3.5 of this PSP (see Table 1.3-1). Following completion of the Hydrology Dataset and Statistics in January 2007 (see section 1.4.2), SCL will review and refine, as necessary, this elevation range

[6] As indicated in this and other study plans in the PSP, 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.

Proposed Methodology

The RTE plant surveys will consist of four tasks, each of which is described below.

Task 1: Information Update

The target RTE plant species list (Table 5.3-1) will need to be updated prior to conducting rare plant surveys in 2007. The primary sources for acquiring updated information include the following:

- USFWS, Spokane Office
- Washington Department of Natural Resources, Washington Natural Heritage Program. http://www.dnr.wa.gov/nhp/
- USFS Regional Forester's Sensitive Species List
- BLM Special Status Species List
- BLM Botanist
- USFS Colville National Forest Botanist. Also see http://www.fs.fed.us/r6/colville/forest/education/thenewplantbook04.pdf

The update will include an accounting of potential species omissions and additions, changes in status, and an assessment of whether potential habitat is present in the survey area. The assessment of potential habitat will be based on the existing vegetation cover types and elevation range in the study area.

Task 2: RTE Plant Survey

RTE plant surveys in the study area will be focused on vascular plants; however, select nonvascular RTE species may be included in the surveys if they have been documented on the CNF and if suitable habitat in the study area has the potential to be affected by the Project. SCL will coordinate with the USFS to determine whether any of the nonvascular RTE species or their habitats has the potential to be affected by the Project and will document the discussion and resulting conclusions. All nonvascular RTE species will be recorded if they are encountered and potentially suitable habitat for these species in the study area will be noted.

The RTE plant survey will be conducted using the "intuitive controlled method," whereby study area habitats with high potential to support RTE plants will be surveyed with greater intensity than areas with low potential (Nelson 1985). This method is often used by the USFS and is one of the most common and efficient ways of surveying for RTE plants (USFS 2005b). Prior to initiating surveys, the existing cover type map (see PAD Figure 4.6-1) will be reviewed and used to identify study area habitats with the greatest probability of supporting RTE plants.

Based on the current target list (Table 5.3-1), surveys for RTE plant species would occur during three periods during the growing season to capture the range of plant development and phenology required to increase the likelihood of observing and positively identifying RTE plant species. The survey periods are roughly estimated as three 2-week periods during the growing

season (Table 5.3-2) although it is not anticipated that the entire 2-week period will be needed to adequately survey potential habitat in the study area. The timing of the survey may require fine-tuning depending on the growing season conditions in 2007, as well as any changes to the target RTE plant list. A comprehensive list of all vascular plant species observed and identified during the RTE surveys will be compiled.

Table 5.3-2. Flowering times and approximate survey periods (weeks; S1, S2 and S3) for RTE plant species known or potentially occurring in the study area.

Scientific Name	Flowering Period	May				June				July				August				September			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Antennaria corymbosa	June to Aug.					S1	S1				S2	S2				S3	S3				
Antennaria parvifolia	May to July					S1	S1				S2	S2									
Astragalus microcystis	Late April – Aug.					S1	S1				S2	S2				S3	S3				
Botrychium ascendens	June–July					S1	S1				S2	S2									
Botrychium crenulatum	May–Sept					S1	S1				S2	S2				S3	S3				
Botrychium hesperium	Late May/ June					S1	S1														
Botrychium lineare	June					S1	S1														
Botrychium paradoxum	May–Sept.					S1	S1				S1	S1				S3	S3				
Botrychium pedunculosum	May–Aug.					S1	S1				S2	S2				S3	S3				
Carex capillaris	June–Aug.					S1	S1				S2	S2				S3	S3				
Carex comosa	May–July					S1	S1				S2	S2									
Carex dioica	June–Aug.					S1	S1				S2	S2				S3	S3				
Carex flava	July–Aug.										S2	S2				S3	S3				
Carex hystericina	May–June					S1	S1														
Carex praeceptorum	July–Aug.										S2	S2				S3	S3				
Carex rostrata	July–Aug.										S2	S2				S3	S3				
Carex saxatilis	July-Aug																				
Carex sychnocephala	July–Sept.										S2	S2				S3	S3				
Centunculus minimus	May–June					S1	S1														
Chrysosplenium tetrandrum	June					S1	S1														
Cicuta bulbifera	All season					S1	S1				S2	S2				S3	S3				
Cryptogramma stelleri	April–Oct.					S1	S1				S2	S2				S3	S3				
Cypripedium parviflorum	May–June					S1	S1														
Dryas drummondii	May – early July					S1	S1														
Dryopteris cristata	June–Sept.					S1	S1				S2	S2				S3	S3				
Eriophorum viridicarinatum	June–July					S1	S1				S2	S2									
Gaultheria hispidula	May–June					S1	S1														

Table 5.3-2, continued…

Scientific Name	Flowering Period	May				June				July				August				September			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Geum rivale	June–July					S1	S1				S2	S2									
Hierochloe odorata	Apr. –July					S1	S1				S2	S2									
Hypericum majus	July–Sept.										S2	S2				S3	S3				
Impatiens aurella	July–Sept.										S2	S2				S3	S3				
Lobelia kalmii	Late July – Aug.															S3	S3				
Lomatium sandbergii	May–July					S1	S1				S2	S2									
Lycopodiella inundata	March – Oct.					S1	S1				S2	S2				S3	S3				
Lycopodium dendroideum	June–July					S1	S1				S2	S2									
Muhlenbergia glomerata	July–Aug.										S2	S2				S3	S3				
Ophioglossum pusillum	June–Sept.					S1	S1				S2	S2				S3	S3				
Penstemon wilcoxii	May–July					S1	S1				S2	S2									
Physaria didymocarpa var. *didymocarpa*	June–Aug.					S1	S1				S2	S2				S3	S3				
Platanthera obtusata	June–July					S1	S1				S2	S2									
Salix candida	May–June					S1	S1														
Salix maccalliana	May–June					S1	S1														
Salix pseudomonticola	May–June					S1	S1														
Sanicula marilandica	June – mid-Aug.					S1	S1				S2	S2				S3					
Scutellaria angustifolia ssp. *Micrantha*	May–June					S1	S1														
Sisyrinchium montanum	May					S1	S1														
Sisyrinchium septentrionale	May – mid-June					S1	S1														
Spartina pectinata	June–July					S1	S1				S2	S2									
Spiranthes diluvialis	mid-July – August										S2	S2				S3	S3				
Talinum sediforme	Late May – July					S1	S1				S2	S2									
Teucrium canadense ssp. *Viscidum*	June–Aug.					S1	S1				S2	S2									
Thalictrum dasycarpum	June–Aug.					S1	S1				S2	S2									
Utricularia intermedia	May (June)						S1														
Utricularia minor	June–Sept.					S1	S1				S2	S2				S3	S3				
Vaccinium myrtilloides	May–June					S1	S1														
Viola renifolia	Late May – mid-June					S1	S1														

Task 3: Documentation and Effects Assessment

All sites surveyed for RTE plants within the study area will be mapped onto aerial photographs or USGS 7.5-minute topographic maps. Additional documentation will be provided for surveys conducted on USFS lands in the study area and will follow the protocol described in "Threatened, Endangered, and Sensitive Plants Survey Field Guide" (USFS 2005c; see Attachment 5-2). This guide provides an RTE Plant Survey Field Form and detailed descriptions of the data fields that must be completed to document RTE plant surveys on USFS lands, even if no RTE plant species are found. The USFS botanist for the CNF will be contacted during the survey planning process to discuss a documentation protocol that will ensure that the survey records meet USFS standards but can also be completed efficiently for the study area.

All new occurrences of RTE plant species will be mapped using aerial photographs or USGS 7.5-minute topographic maps. The boundaries of previously known occurrences will be revised, as needed, based on the assessments made during the 2007 survey.

In addition to identifying new occurrences of RTE plants, information on population attributes will be collected for both new and currently known occurrences. Attribute data will include the following:

- Population extent (area [sq. feet])
- Population size – estimated numbers of individual plants or stems for species where this is possible to distinguish
- Habitat characteristics
- Potential threats, including Project effects

Population attributes may be difficult to assess for some species. For example, yellow mountain-avens occurs primarily on cliffs and rock outcrops along the reservoir, with many populations in locations that are inaccessible. High quality, powerful binoculars or a spotting scope will be required to accurately estimate population extent and size for some occurrences of this species even when they are in flower.

The WNHP Rare Plant Sighting Form provides a convenient format (http://www.dnr.wa.gov/nhp/contact/contribute.html) for collecting data on population attributes (Attachment 5-3). These forms will be filled out for all new and previously documented RTE plant species occurrences in the study area and filed with the WHNP. Additional documentation will be provided for occurrences on USFS lands in the study area and will follow the protocol in "Threatened, Endangered, and Sensitive Plants Element Occurrence Field Guide (USFS 2005b; see Attachment 5-4). This guide provides an RTE Element Occurrence Field Form and detailed descriptions of the data fields that must be completed to document RTE plant occurrences on USFS lands. The USFS botanist for the CNF will be contacted during the survey planning process to discuss the element occurrence documentation protocol to ensure that data collected on RTE plants meet USFS standards. For the more common RTE plant species in the study area, particularly yellow mountain avens and purple meadowrue, it will be necessary to determine how an element occurrence is defined and how the additional information required on USFS lands can be collected in a timely manner.

Each RTE plant species occurrence will also be evaluated in the field for potential Project-related impacts and other threats. Data recorded will include location relative to the reservoir fluctuation zone, recreation areas, and/or Project facilities; evidence of inundation, grazing, trampling, insect infestations, or disease; and proximity to erosion and/or invasive species infestations. .

Task 4: Resolution of Outstanding Issues

Some additional issues related to RTE plant taxonomy and identification in the Project vicinity will need to be resolved prior to or during the survey task; these issues are as follows:

- Orange balsamroot is a species with unresolved taxonomic issues. Voucher specimens should be collected and sent to a species expert for positive identification (see Ornduff 1967).
- The identification of the yellow sedge observed along the reservoir shoreline (SCL 2006, Figure 4.3.6., Occurrence CAFL-1) was made when the perigynia were not quite mature. This species identification of this occurrence requires confirmation (i.e., when perigynia/inflorescences are fully mature).
- The purple meadowrue occurrences documented during the 2005 reconnaissance survey were identified using Hitchcock and Cronquiest (1973). However, some specimens had characteristics that overlapped with western meadowrue (*Thalictrum occidentalis*). Voucher specimens should be collected and sent to an expert for positive identification.
- Historical occurrences of Stellar rock-brake were not relocated during the 2005 reconnaissance surveys. Powerful binoculars will be required to adequately survey for this species.
- Ute's ladies'-tress is a federally-listed, threatened species that has potential to occur in some of the wetland habitats along Boundary Reservoir. This species, when present, can be difficult to detect in dense wetland vegetation. The timing of surveys to correspond with its flowering period when it is most visible is critical to increasing the chance of observing and positively identifying this species.

5.3.6. Work Products

The results of the RTE plant survey will be compiled and discussed in a study report, written in standard scientific format. The report will include at least the following information:

- An updated target list of RTE plant species, with habitat information for new additions. The table will be expanded to include an estimation of whether potential habitat is present in the study area for each target species. Rationale will be provided if it is determined that no potential habitat is present (e.g., elevation too low, wrong soils).
- A summary of the methods used to conduct the surveys. This section will include an accounting of when the surveys were conducted and a map of the areas covered.

- The results of the RTE plant surveys, including a list of new and previously documented RTE plant species observed in the study area. A brief description of each species will be provided, which will cover taxonomy and ecology, known distribution within and outside the study area, and habitat within the study area, as well as representative photographs (include close-up) and associated habitat. This section will also include an accounting of how each species was identified (e.g., local or regional flora, voucher sent to expert) and will discuss any questionable or unresolved taxonomic issues.
- A map of the RTE plant locations, at appropriate scale, with unique identification labels for each occurrence.
- WNHP data sheets for all occurrences including previously known occurrences.
- RTE Plant Survey Field Forms and Element Occurrence Field Forms for surveys and RTE plant occurrences on USFS lands in the study area.
- A comprehensive list of all plant species observed and identified during surveys.
- A discussion of direct and/or indirect Project-related impacts and other threats to RTE plant species and their habitats as determined from the results of this study. The full assessment of potential Project-related impacts, including the effects of the type and timing of Project operations and maintenance and Project-related recreation, will be part of the integrated resource analysis (see section 1.2.5).

GIS layers and metadata of RTE plant occurrences will be made available to the agencies, if requested. All new occurrences of RTE plant species documented in or near the study area will be provided to the WNHP for inclusion in the statewide database.

5.3.7. Consistency with Generally Accepted Scientific Practice

The methods (as described above) are consistent with generally accepted practices in the scientific community for conducting RTE plant surveys. USFS protocols for documenting surveys and RTE plant occurrences will be followed on USFS lands.

5.3.8. Consultation with Agencies, Tribes, and Other Stakeholders

This study plan was prepared with input from the USFS and Pend Oreille County Noxious Weed Control Board, which was provided at a meeting of the Terrestrial Resources Workgroup on May 24, 2006. Comments provided by relicensing participants on the draft study plan are summarized in Attachment 5-1 and can also be found in the workgroup meeting summaries, available on SCL's relicensing website (http://www.seattle.gov/light/news/issues/bndryRelic/). SCL further modified the study plan in response to comments and study requests filed with FERC by the USFS (letter dated August 31, 2006, containing the USFS's PAD/Scoping comments and official study requests; USFS 2006). Modifications included adding clarification and additional detail.

5.3.9. Schedule

The RTE Plant Species Inventory will be conducted in 2007 according to the schedule shown in Table 5.3-3.

Table 5.3-3. Schedule for RTE Plant Species Inventory.

Activity	Timeframe
Update the target RTE plant species list, finalize study implementation details, coordinate with the USFS and BLM botanists, and identify field sampling periods	March–April 2007
Field work	May–August 2007, according to the schedule provided in Table 5.3-2
Analysis	September–October 2007
Prepare Draft Study Report	November 2007
Submit Draft Study Report for stakeholder review	December 2007
Revise and finalize Study Report	January 2008

A second season of RTE plant surveys is not anticipated, but it is possible that weather conditions or unresolved taxonomic issues may require some additional field work in 2008.

5.3.10. Progress Reports, Information Sharing, and Technical Review

In addition to preparing the study report (as described above), there will be several opportunities for information sharing and technical review with relicensing participants. Prior to conducting the RTE plant surveys biologists will contact the USFS and BLM botanists to discuss proposed survey times relative to current-year growing/weather conditions. In addition, agencies will be invited to participate in survey efforts. Preliminary survey results will be communicated to relicensing participants in early 2008, as described in section 1.2.4 of this document.

5.3.11. Anticipated Level of Effort and Cost

RTE plant surveys are expected to involve about 300 hours of field time (2 botanists for approximately 3 weeks each), as well as additional time for data summary, analysis, and reporting. The estimated cost for this study is $46,000–56,000.

5.3.12. Literature Cited

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5.4. Rare, Threatened, and Endangered (RTE) Wildlife Species Study

In general, rare, threatened, and endangered (RTE) wildlife species and habitat use in the Project vicinity are not well understood. There is some useful information on bald eagle nesting activity, but the available data need to be supplemented with observations of foraging/perching/roosting activity throughout the year. There are also many other RTE wildlife species that potentially occur in the Project vicinity, for which there are very little data, if any. The proposed RTE Wildlife Species Study will provide information on RTE wildlife species for the relicensing analysis of Project effects.

For the purpose of this study, RTE wildlife species are defined as follows;

- *Federally Listed or Proposed Species* — Species that are listed and protected under the Endangered Species Act (ESA) of 1973, as Endangered or Threatened, or proposed for listing.
- *Federal Candidates* — Species for which the U.S. Fish and Wildlife Service (USFWS) believes it has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species receive no statutory protection under the ESA. However, the USFWS encourages the formation of partnerships to conserve these species.
- *State Listed Species* — Species that are protected by the State of Washington (WAC 232-12-297):
    - State Endangered Species include "species native to the state of Washington that are seriously threatened with extinction throughout all or a significant portion of their range within the state."
    - State Threatened Species include any "species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats."
    - State Sensitive Species are defined as species native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened in a significant portion of their range within the state without cooperative management or removal of threats" (WDFW 2006a).
- *State Candidate Species* — Species that the WDFW will review for possible listing as State Endangered, Threatened, or Sensitive. A species will be considered for designation as a State Candidate if sufficient evidence suggests that its status may meet the listing criteria defined for State Endangered, Threatened, or Sensitive (WDFW 2006a).
- *State Monitor Species* — Species not state listed, but monitored for status and distribution. State Monitor Species are managed by the WDFW, as needed, to prevent them from becoming endangered, threatened, or sensitive (WDFW 2006a).

- *USFS Sensitive Species* — Species on the July 2004 Regional Forester's List of Sensitive Species for the Colville National Forest (CNF). The Regional Forester' List also includes species already protected under the ESA and candidates for listing.
- *USFS Colville National Forest Management Indicator Species (MIS)* — Species on the CNF selected for management. These species "were chosen to provide habitat needs of all vertebrate species, to monitor selected habitats that could become limiting to some species through forest management activities, and to provide sufficient populations of selected species to meet demands for wildlife-related recreation" (USFS 1988).
- *BLM Sensitive Species* — Species on the March 2005 Washington BLM Special Status Species List. The BLM list also includes species already protected under the ESA or state listed as endangered or threatened and candidates for listing.
- *WDFW Priority Species* — Priority species are those species requiring protective measures and/or management guidelines to ensure their perpetuation. These include those that have state status or are commercially or culturally important (WDFW 2006b).

It should be noted that the assessment of RTE wildlife species does not include bats with RTE status; evaluation of potential Project effects on bats and their habitats will be accomplished through a separate study (Bat Surveys and Habitat Inventory; see section 5.6). Similarly, deer (*Odocoileus hemionus* and *O. virginanus*), and elk (*Cervis elaphus*), which are designated MIS on the CNF and WDFW Priority Species, are addressed in the Big Game Study (see section 5.5).

5.4.1. Nexus between Project Operations and Effects on Resources

Water level fluctuations in Boundary Reservoir and other activities related to operation and maintenance of the Project may have direct and/or indirect effects on RTE wildlife or the habitat on which they depend. Direct impacts potentially result from Project activities that remove or alter RTE wildlife habitat, such as maintenance of facilities and transmission line rights-of-way or construction. The spread of invasive plant species from areas disturbed by Project-related activities to native habitats have the potential to indirectly impact RTE wildlife species through habitat degradation. Habitat loss can also be caused by reservoir shoreline erosion from water level fluctuations due to Project operations (direct Project-related impact) and wave action from watercraft (indirect impact associated with recreation) and wind, as well as other factors. Increased human activity and noise resulting from Project operation and maintenance activities can also directly disturb RTE wildlife using habitats near the reservoir and Project facilities. Other potential indirect impacts to RTE wildlife may include disturbance from recreational activities at developed and undeveloped campgrounds, roads, and trails in the Project vicinity.

5.4.2. Agency Resource Management Goals

In addition to providing information needed to characterize Project effects, the RTE Wildlife Species Study will provide information to help agencies with jurisdiction over these species in the Project vicinity identify appropriate conditions for the new Project license pursuant to their respective mandates. The following agencies are those with management responsibility in the

context of FERC relicensing of the Boundary Project and management goals related to RTE wildlife:

USDA Forest Service (USFS)

Department of Agriculture Regulation 9500-4 directs the USFS to manage "habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species." USFS policy implementing the National Forest Management Act, National Environmental Policy Act, and the ESA establishes objectives and direction to ensure that actions on National Forest System (NFS) lands do not contribute to trends toward Federal listing or loss of viability of any native or desired non-native species (Forest Service Manual [FSM] 2672.41 [USFS 1995]). The objectives of the sensitive species program include the development and implementation of management practices to ensure that species do not become threatened or endangered and to maintain viable populations of all native and desired nonnative wildlife, fish and plant species in habitats distributed throughout their geographic range on NFS lands (FSM 2670.22). This requires the agency to monitor other "watch–lists or species of concern" that may be declining, but have reached critical population levels. USFS policy includes the requirement to, as part of the NEPA process, review programs and activities, through a Biological Evaluation, to determine their potential effect on Sensitive Species, and to avoid or minimize impacts to species whose viability has been identified as a concern (FSM 2670.32). The list of sensitive species for USFS Region 6, which includes the CNF, was last updated in March, 2004.

U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for the recovery of species listed as threatened or endangered under the ESA.

U.S. Bureau of Land Management (BLM)

The National Forest Management Act also applies to the BLM. BLM's policy for conserving RTE species is directed by BLM Manual 6840 and Instruction Memorandum OR-91-57 (November 5, 1997). Manual 6840 requires that the BLM work with state agencies in achieving conservation goals for locally rare species as designated by state governments. BLM State Directors are responsible for designating sensitive species for management with the purpose of "assisting in maintaining viable gene pools while allowing flexibility under a multiple use mission" (BLM 1990).

The list of BLM Sensitive Species for Oregon and Washington was updated in July 2005 and includes species designated as Sensitive, Assessment, and Tracking. (Washington and Oregon BLM Website). Impacts to BS and BA species on BLM lands are to be addressed as part of the National Environmental Policy Act (NEPA) process. Additionally, Manual 6840 directs the BLM to conduct inventories and monitoring to conserve designated BS species. Special management or protection is discretionary for BT species (BLM 1990).

Washington Department of Fish and Wildlife (WDFW)

The State of Washington does not have an endangered species act. Species are listed by the Washington Fish and Wildlife Commission as endangered, threatened, or sensitive using listing procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 232-12-297). These procedures include how species listing will be initiated, criteria for listing and de-listing, public review and recovery and management of listed species. Listed species cannot be hunted and the WDFW is required to write a recovery plan for threatened or endangered species.

In addition, the WDFW maintains a list of Priority species (WDFW 2006b). Priority species include those that are state listed or are candidates for listing, as well as other native species believed to require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and /or recreational, commercial, or tribal importance. The WDFW has prepared management guidelines for most Priority species to assist landowners, users, and managers in conducting land-use activities in a manner that incorporates the needs of wildlife.

5.4.3. Study Goals and Objectives

The goal of the RTE Wildlife Species Survey is to provide information needed to determine the presence of RTE species and/or their habitats in the Project vicinity, identify limiting factors in landscape movement across the Project vicinity, and assess Project effects on RTE species and their habitats. Specific objectives of this study are as follows:

- Document historical and recent RTE wildlife species observations in the Project vicinity.
- Identify and map new occurrences of select RTE wildlife species in the Project vicinity.
- Document locations and condition of potential habitat for RTE species and identify any factors that may limit landscape movement of these species across the Project vicinity.
- Identify potential threats to RTE wildlife species or their habitats, including potential Project effects.

5.4.4. Need for Study

Summary of Existing Information

A target list of RTE wildlife species with the potential to occur in the Project vicinity was compiled in 2005 for the preparation of the Boundary Project relicensing Pre-Application Document (PAD; SCL 2006) and was expanded for this study plan to include designated USFS MIS and several other RTE species (Table 5.4-1). Of the 41 RTE wildlife species that could occur, 13 have been documented in the Project vicinity in the past by the USFS or WDFW or during reconnaissance-level surveys conducted by SCL in 2005 and 2006.

Table 5.4-1. RTE wildlife species potentially occurring in the Boundary Project vicinity.

Scientific Name/ Common Name[1]	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WDFW Status[5]	Suitable Habitat	Occurrence
Amphibians (3)						
Bufo boreas **Western Toad**	None	None	BT	SC PS	Breeds at lake margins, ponds, and wetlands	Documented in several lakes and wetlands in the general vicinity of the Project
Rana luteiventris **Columbia Spotted Frog**	FC	FC	BT	SC PS	Breeds in cool, temporary water	Documented in a wetland just downstream of the Project in June 2006; observed in several other lakes and wetlands in the Project vicinity
Rana pipiens Northern Leopard Frog	None	S	None	SE PS	Permanent to semi-permanent lentic habitats for breeding; overwinter in water	Has not been documented in Pend Oreille County for many years
Birds (27)						
Accipiter gentilis Northern Goshawk	None	None	BA	SC PS	Mature conifer forest	Individuals have been detected by the USFS in the Sullivan Lake Ranger District but no nesting has been documented
Aechmophorus occidentalis **Western Grebe**	None	None	None	SC PS	Lakes and wetlands	Observed in fall 2005 on Boundary Reservoir; uncommon migrant at Box Canyon Reservoir (BCR)
Aegolius funereus Boreal Owl	None	None	BT	SM	Subalpine forests	Reported to occur in Pend Oreille County
Aquila chrysaetos **Golden Eagle**	None	None	BT	SC PS	Typically nests on cliffs or large trees in open or semi-open habitats	Rare migrant at BCR; observed in June 2005 near Boundary Dam
Ardea herodias **Great Blue Heron**	None	MIS	BT	SM PS	Nests in trees; forages in wetlands and rivers	Observed along Boundary Reservoir; abundant resident at BCR
Cathartes aura **Turkey Vulture**	None	None	BT	SM	Nests in caves and crevices in cliffs; forage in open habitats	Uncommon breeder at BCR; observed near Mt. Linton, Sullivan Creek mouth, and near Box Canyon Dam
Chaetura vauxi Vaux's Swift	None	None	BT	SC PS	Roosts and nests in tree cavities	Not detected at BCR

Table 5.4-1, continued…

Scientific Name/ Common Name[1]	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WDFW Status[5]	Suitable Habitat	Occurrence
Cypseloides niger Black Swift	None	None	None	SM	Nests in colonies on protected cliffs beneath waterfalls	Not detected at BCR
Dendragapus obscurus Blue Grouse	None	MIS	None	Game PS	Nests in open forests with grass/shrub understory at lower elevations.	Not detected at BCR
***Dryocopus pileatus* Pileated Woodpecker**	None	MIS	BT	SC PS	Forests with large trees and snags	Observed in the Project vicinity; uncommon resident at BCR
Falco columbarius Merlin	None	None	BT	SC PS	Conifer stands near openings	Rare migrant at BCR
Falco peregrinus anatum American Peregrine Falcon	None	S	BS	SS PS	Cliffs for nesting	Observed in Metaline Falls area; suitable cliffs occur
***Gavia immer* Common Loon**	None	S	BT	SS PS	Secluded lakes, emergent wetlands	Has been sighted on Boundary Reservoir; common at Mill Pond and other lakes in the area (non-breeding)
Grus canadensis Sandhill Crane	None	S	SE	SE PS	Emergent wetlands, meadows	Unknown
***Haliaeetus leucocephalus* Bald Eagle**	FT	FT	FT	ST PS	Forest stands with large trees near water	Nests within and near Project area – at least 4 known territories in 2006
Lanius ludovicianus Loggerhead Shrike	None	None	BT	SC PHS	Open, savannah-like habitats	Not detected at BCR
Melanerpes lewis Lewis' Woodpecker	None	None	BT	SC PS	Nests in large, dead cottonwood trees	Not detected at BCR
Otus flammeolus Flammulated Owl	None	None	BT	SC PS	Open mature conifer forests	Not detected at BCR
***Pandion haliaetus* Osprey**	None	None	BT	SM	Nests in large trees or on platforms near water	Nests in and near the Project area – 4 nests documented in 2005
Pelecanus erythrorhynchos American White Pelican	None	None	SE	SE PS	Large lakes and emergent wetlands	Not detected at BCR
Picoides albolarvatus White-headed Woodpecker	None	None	BA	SC PS	Ponderosa pine or mixed conifer forests	Not detected at BCR
Picoides arcticus Black-backed Woodpecker	None	None	BT	SC PS	Post-fire forests with standing dead trees	Not detected at BCR

Table 5.4-1, continued…

Scientific Name/ Common Name[1]	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WDFW Status[5]	Suitable Habitat	Occurrence
Picoides tridactylus Three-toed Woodpecker	None	MIS	BT	SM	Nests in mature lodgepole pine or sub-alpine fir; forages on dead standing trees	Priority Habitat Species database record within 0.5 mile of Project vicinity
Podiceps nigricollis Eared Grebe	None	S	BT	PS	Lakes, wetlands	Uncommon migrant at BCR
Sialia mexicana Western Bluebird	None	None	BT	SM	Fields and open woods	Not detected at BCR
Strix nebulosa Great Gray Owl	None	S	BT	SM	Mature mixed conifer forest	Not detected at BCR
Strix varia Barred Owl	None	MIS	None	None	Lower elevation mature and old growth forest	Not detected at BCR
Mammals (11)						
Canis lupus Gray Wolf	FE	FE	FE	SE PS	Various habitats secluded from human activity	Periodic unconfirmed sightings in vicinity
***Castor canadensis* Beaver**	None	MIS	None	Game	Aquatic and riparian habitats with aspen & willow	Documented in Boundary Reservoir upstream of Metaline Falls
***Corynorhinus townsendii* Townsend's Big-eared bat**	None	S	BA	SC PS	Maternity colonies and roosts found in caves, mines and buildings in a variety of habitats	Documented at several caves on Sullivan Lake Ranger District
Gulo gulo California Wolverine	None	S	BA	SC PS	Conifer forests at higher elevations	Unknown
Lynx canadensis Lynx	FT	FT	FT	ST PS	Various habitats secluded from human activity; more typically at higher elevations	Documented outside Project vicinity
Martes americana Marten	None	MIS	None	Game PS	Mature & old growth mesic conifer forest, down trees at moderate to high elevation	Not detected at BCR
Martes pennanti Pacific Fisher	FC	FC	FC	SE PS	Closed canopy forests with abundant logs and snags and riparian & wetland habitats	PHS record near Slate Creek 1.5 mile east of reservoir
Myotis evotis Long-eared Myotis	None	None	BT	SM PS	Hibernates in caves; summer day roosts under bark of trees in coniferous forests	Unknown

Table 5.4-1, continued…

Scientific Name/ Common Name[1]	USFWS Status[2]	USFS Status[3]	BLM Status[4]	WDFW Status[5]	Suitable Habitat	Occurrence
Myotis volans Long-legged Myotis	None	None	BT	SM PS	Mid-elevation forests; hibernates in winter in mines or caves	Unknown
Rangifer tarandus caribou Woodland Caribou	FE	FE, MIS	FE	SE PS	High elevation forests	Documented outside Project vicinity
***Ursus arctos* Grizzly Bear**	FT	FT, MIS	FT	SE PS	Various habitats secluded from human activity	Occasional observations in area, including the Project vicinity

Source: Modified from the PAD (SCL 2006) based on new information from the USFS, USFWS, BLM, and SCL.

1 Species in bold have been documented in the Project vicinity by SCL, USFS, or WDFW.

2 U.S. Fish and Wildlife Service (USFWS) Classification (WDFW 2006).
FE=Listed as Endangered, FT=Listed as Threatened,
FC=Candidate for federal listing (not protected under ESA)

3 USDA Forest Service (USFS) Regional Forester's Sensitive Species, Region 6, updated July 2004 (Note: As of September 2006, this list was not available online). S = Sensitive
CNF list of Management Indicator Species (1988). This list also includes the northern bog lemming and Franklin's grouse, which are unlikely to occur in the Project vicinity and were therefore not included. Deer and elk, which are also MIS, are covered in the Big Game Study (see section 5.5).
MIS=Management Indictor Species.

4 Bureau of Land Management Special Status Species, updated March 2005 (Note: As of September 2006, this list was not available online). BLM Special Status Species Categories:
BS = Bureau Sensitive – Nominated by BLM District Managers; must be listed by WDFW to be eligible.
BA = Bureau Assessment – Species known or suspected on USDI-BLM land that are not federally listed, state listed, or BS and that are on listed by the WDFW but not eligible as BS.
BT = Bureau Tracking - All species known or suspected on USDI-BLM land that are not federally listed, state listed, BS, or BA, and that are WDFW monitor or species of special concern.

5 Listed by the WDFW. WDFW classifications for Species of Concern include:
SE = State Endangered Species
ST = State Threatened Species,
SC = State Candidate Species,
SS = State Sensitive Species,
SM = State Monitor. State Monitor species are not considered Species of Concern, but are monitored for status and distribution. They are managed by the WDFW, as needed, to prevent them from becoming endangered, threatened, or sensitive (WDFW 2006).
All SE, ST, SC, and SS species are also designated Priority species (PS) by the WDFW; there are also a number of game species that are designed PS. Game species that have no other status except PS, were not included (e.g. wild turkey, mink).

The bald eagle (*Haliaeetus leucocephalus*) is the one federally listed species that is known to occur in the Project vicinity on a routine basis. Four nesting territories have been documented by SCL and/or the WDFW near Boundary Reservoir: (1) Sand Creek on the SCL-owned Boundary Wildlife Preserve (BWP) (found in 1989), (2) Box Canyon (found in 2000), (3) Everett Island (found in 1999; also known as the Z-Canyon site); and (4) Metaline. SCL has supported limited data collection at the Sand Creek bald eagle nest site over the last two decades and productivity data for the other two nesting territories have been collected periodically (Table 5.4-2). Winter use of the Project vicinity by bald eagles is thought to be low, although no standardized surveys have been conducted along the river since the 1980s, when mid-winter counts rarely found bald eagles (USFS unpublished data, CNF Sullivan Lake Ranger District). No information is available on the diets of nesting or wintering bald eagles in the Project vicinity.

Table 5.4-2. Productivity (number fledged) of bald eagle territories in the Boundary Project vicinity.

Year	Nesting Territory			
	Sand Creek	**Everett Island (Z Canyon)**	**Box Canyon**	**Metaline**
1989	1	--	--	
1990	2	--	--	
1991	2	--	--	
1992	2	--	--	
1993	2	--	--	
1994	3	--	--	
1995	3	--	--	
1996	Active, unknown	--	--	
1997	Active, unknown	--	--	
1998	2	--	--	
1999	Active, unknown	2	--	
2000	Unknown	Unknown	2	
2001	Unknown	Unknown	Unknown	
2002	Unknown	Unknown	Unknown	
2003	Unknown	Unknown	Unknown	
2004	Unknown	Unknown	Unknown	
2005	Active, unknown	2	Active, unknown	
2006	Active, unknown	Unknown	1	Active

Sources: WDFW PHS database, SCL unpublished data; and 2005–2006 reconnaissance trips

Several ponds and wetlands in the Project vicinity were surveyed for amphibians as part of a USFS-commissioned project for the CNF Sullivan Lake Ranger District (Hallock 2003). Those surveys documented the presence of western toads (*Bufo boreas*) and Columbia spotted frogs (*Rana luteiventris*) on the CNF. Although no comprehensive surveys were conducted at sites within the Project area, several of the sites surveyed by Hallock (2003) were within the general Project vicinity (Table 5.4-3). Western toads were mostly associated with lakes (Hallock 2003). Columbia spotted frogs were documented in a variety of lentic habitats, most of which were perennial; the most productive sites appeared to be modified by beaver. In addition, a single

Columbia spotted frog was observed by SCL fisheries biologists in June 2006 in a wetland on the east side of the Pend Oreille River, just downstream of the dam. No northern leopard frogs (*Rana pipiens*) were found, and no population has been documented in Pend Oreille County since the 1970s, although unconfirmed sightings were recorded on the Kalispel Indian Reservation in 2001 (Hallock 2003). However, the USFS has recently been conducting surveys for this species in the CNF and there may be new information on leopard frogs in the Project vicinity.

Table 5.4-3. Sites surveyed for amphibians and reptiles by Hallock (2003) that are within or near the Project area.

Site	RTE Species Observed
Box Canyon Area	None
Crescent Lake wetland	Western toad, Columbia spotted frog
South Peewee Pond	Columbia spotted frog, western toad
King Hills Pond	Columbia spotted frog
Boundary Lake wetland	Columbia spotted frog, western toad
Slate Creek wetland	Columbia spotted frog, western toad
Lead King Wetland	Columbia spotted frog
FR 3155010 wetlands	None
Halliday Fen	None
Frisco Standard Ponds (near substation)	Columbia spotted frog
Lime Creek wetland	None
Lake Lucerne wetland	None
Lucky Strike Pond	Bullfrog, western toad
Mill Pond	None

Other federally listed species that have been documented historically in the Project vicinity include the grizzly bear (*Ursus arctos*), gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and woodland caribou (*Rangifer tarandus caribou*). However, observations of these species in the general area of the Project are rare in recent years. More detail on the status, habitat requirements, and occurrence of the RTE wildlife species in the Project vicinity, including historical occurrences, is provided in the PAD (SCL 2006).

Need for Additional Information

The existing information provides a starting point for compiling more comprehensive information on RTE wildlife species in the Project vicinity. However, available data are incomplete or lacking for many RTE wildlife species and do not provide information on habitat location and distribution in or near the Project vicinity. Additional baseline data on habitat and occurrence will help assess potential Project-related impacts on RTE wildlife species.

5.4.5. Detailed Description of Study

Study Area

The "primary" study area for the RTE wildlife study will extend approximately 18 miles along the Pend Oreille River from the Box Canyon tailrace downstream to the U.S.-Canada border (refer to Figure 1.3-2 for a location map of the Boundary Project) and will encompass the following:

- Downstream of Metaline Falls — The reservoir, fluctuation zone under normal operations (forebay elevations 1,970–1,990 feet NGVD 29 [1,974–1,994 feet NAVD 88]), 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 BPA interconnection.
- Upstream of Metaline Falls — The reservoir, fluctuation zone (elevation ≈1,985–2,015 feet NGVD 29 [1,989–2,019 feet NAVD 88], as measured at the USGS gage below Box Canyon Dam) and the land within approximately 200 horizontal feet beyond the high water level (approximately 2,015 feet NGVD 29 [2,019 feet NAVD 88]) along both reservoir shorelines extending to the FERC project boundary for the Box Canyon Project. [7] [8]
- The BWP (155 acres) and adjoining SCL-owned property (85 acres).
- 100 feet around any Project works areas that extend outside the Project boundary.
- 50 feet along both sides of Project-related roads, which include the road between the Boundary Dam and the Vista House, the road to the dam off County Road 2975, and the road from the Vista House to SR31.

[7] The estimated fluctuation range of approximately 1,985–2,015 feet upstream of Metaline Falls is based on the review of existing hydrology, as described in section 1.3.5 of this PSP (see Table 1.3-1). Following completion of the Hydrology Dataset and Statistics in January 2007 (see section 1.4.2), SCL will review and refine, as necessary, this elevation range

[8] As indicated in this and other study plans in the PSP, 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.

- 100 horizontal feet along both sides of the river from Boundary Dam to the U.S.-Canada border (approximately 0.9 mile).

The ability to conduct RTE wildlife surveys within the primary study area outside the FERC Project boundary (mainly upstream of Metaline Falls) may be limited due to access constraints on private lands in this area.

For purposes of addressing RTE wildlife species with large home ranges, a secondary study area will be established that covers the area between the near ridgelines east and west of the Project area. The eastern boundary of the secondary study area will roughly align with Boundary Ridge, Crowell Mountain, and Sand Creek Mountain and the ridge between the reservoir and Sullivan Lake. On the west side, the boundary will follow a line connecting Frisco, Abercrombie, Litton, and Baldy mountains.

Proposed Methodology

Many of the RTE wildlife species that inhabit northeastern Washington, particularly the mammals, are wide-ranging and typically use habitats that are relatively isolated from development and human activity. As a result, RTE mammal species are rarely observed near the Boundary Project, and would be expected to use the habitats in the primary study area mostly during dispersal or seasonal migration. Similarly, some of the RTE bird species potentially occurring in the Project vicinity may only occur rarely and/or during migration. The RTE wildlife study will therefore focus on identifying potential habitat and movement corridors for RTE wildlife in the study area. Surveys will be conducted for the few species that may use study area habitats year-round or during the breeding season and that may be affected by Project-related activities. The RTE wildlife study will consist of three tasks, each of which is described below. A Washington State Scientific Collection Permit will be obtained from the WDFW prior to conducting any surveys that involve handling wildlife.

Task 1: Information Update

The list of RTE wildlife species potentially occurring in the study area (Table 5.4-1) will be updated, including an accounting of species omissions and additions, changes in status, and any new observation records in the primary or secondary study areas. The primary sources for acquiring updated information include the following:

- U.S. Fish and Wildlife Service, Spokane Office
- WDFW, Priority Habitats and Species Program. http://wdfw.wa.gov/hab/phspage.htm
- WDFW, Spokane Office (Steve Zender)
- BLM Sensitive Species List
- USFS Regional Forester's Sensitive Species List
- USFS, CNF Headquarters (Chris Loggers)
- USFS, CNF Sullivan Lake Ranger District (Jim McGowen and Mike Borysewicz).
- Sullivan Watershed Analysis

This task will also include summarizing existing habitat and distribution data in northeastern Washington for RTE species potentially occurring in the primary and secondary study areas. All historic records of RTE wildlife species occurrences in the primary and secondary study areas obtained from the various sources will be entered into a Geographic Information System (GIS) database for the Project. In addition, this task will include a summary of the habitat requirements for all RTE species with occurrence records in the primary or secondary study areas.

Task 2: Identification of Potential Habitat for RTE Wildlife Species

Once the RTE wildlife species list is updated, an assessment of whether potential habitat is present in the primary study area for these species will be conducted. This assessment will be based on information from the literature and local agency documentation on habitat requirements for RTE wildlife species, and existing vegetation cover types and elevation range in the study area. The assessment will be focused on identifying areas that potentially provide habitat for amphibians and nesting birds, as well as for large mammals with ranges that encompass the Project vicinity (i.e., wolves, grizzly bears). The assessment of potential habitat will not be conducted for birds that are either very rare because the study area is considerably outside their typical habitat or range (i.e., merlins, great gray owls), or that may use the reservoir only occasionally during migration (i.e., common loons [*Gavia immer*], American white pelicans [*Pelecanus erythrorhynchos*]). The results of this task will be a series of GIS maps showing potential habitat in the primary study area for each of the RTE species included in the assessment.

Task 3: RTE Wildlife Surveys and Habitat Assessment

Because of the number and diversity of RTE wildlife species potentially occurring in the study area, several types of field surveys will be conducted to collect additional data on species presence, habitat suitability, and potential Project-related threats. Survey efforts will be focused on amphibian and avian species using the primary study area. RTE mammals potentially occurring in the primary study area are wide ranging and only occasionally observed. Although these species cannot be effectively surveyed, information on high quality habitat in the primary study area, possible movement corridors, and potential bottlenecks to movement will be collected. The following sections describe the various field survey and habitat assessment efforts.

Task 3(a): Amphibian Surveys

Potential breeding habitat for the three RTE amphibian species (western toad, Columbia spotted frog, and northern leopard frog) potentially occurring in the primary study area will be surveyed using Visual Encounter Survey (VES) techniques (Heyer et al. 1994; Olson and Leonard 1997). Since all of these species are known to breed in lentic habitats, surveys will focus on shallow waters in the reservoir and wetlands in the study area. Surveys will be conducted at least four times during the amphibian breeding season (late March–June) to maximize detection probability. Each VES visit will involve searching the water column, substrate, emergent and submerged vegetation, and the shorelines of wetlands and shallow water areas of the reservoir. Dipnets will be used to aid in the search by sweeping the water and vegetation. Rocks and logs will be turned over to search for hidden individuals. Survey efforts at each site will be recorded

(e.g., area/length covered, time, and number of sweeps) to standardize abundance estimates. All adults, egg masses, and larvae will be identified to species and released.

Task 3(b): Seasonal Surveys for Avian RTE Species

Surveys will be conducted during each season (winter, spring, summer, and fall) over a 2-year period, to document observations of RTE wildlife or their sign (8 surveys total). These seasonal surveys will focus on determining use of primary study area habitats by RTE avian species. Surveys of the reservoir and adjacent habitats, including cliffs and waterfalls, will be conducted by boat. Terrestrial-based survey routes will be established along roads and trails in the BWP and in the vicinity of Project facilities. The spring and summer surveys will be timed to document active bald eagle nest sites and productivity, and will most likely be conducted in April and June. Spring surveys are also expected to determine use of the study area by RTE woodpecker species and migratory waterfowl, as well as the peregrine falcon (*Falco peregrinus*); summer surveys in June will document observations of nesting activity by ospreys (*Pandion haliaetus*), other raptors, black swifts (*Cypseloides niger*) and turkey vultures (*Cathartes aura*) in and near the primary study area. The main purpose of the winter surveys will be to determine winter use of the reservoir by bald eagles; migratory raptors and waterfowl may be observed during fall surveys. During the course of the spring and summer surveys, biologists will document the status of the bald eagle nesting territories but will avoid approaching the nest sites until after young have fledged.

Task 3(c): RTE Wildlife Habitat Assessment

During the RTE amphibian and seasonal surveys, sites that potentially provide high-quality habitat for one or more species will be mapped. High quality habitat will be identified based on published habitat requirement information obtained in Tasks 1 and 2. For example, forest stands with high snag densities may be mapped as potentially high quality habitat for some of the RTE woodpecker species. The high-quality habitat areas will be entered into the GIS and displayed on the maps of potential habitat produced as part of Task 2. Qualitative data will also be recorded in the field to describe habitat conditions.

In addition, this task will involve mapping locations along the reservoir that represent the potential crossing opportunities for RTE mammal species, as well as sites that could be possible bottlenecks to movement. This effort will be focused on the area between Boundary Dam and Metaline Falls, with an emphasis on identifying locations that could be used by grizzly bears or wolves. These areas will be mapped in the field, entered into the GIS and displayed on the maps of potential habitat produced as part of Task 2.

Task 4: Documentation and Effects Assessment

Locations of all RTE wildlife detections will be recorded and mapped with Global Positioning System (GPS), on 7.5-minute USGS quad maps, or on mylar overlays of the SCL 2005 true-color aerial photos (scales of 1 inch = 1,000 feet and 1 inch = 600 feet) or on enlarged versions of these photographs (1 inch = 100 feet). In addition, the habitat characteristics for each RTE species occurrence will be recorded. Observations and habitat information will be entered into a GIS database for summarization.

Each RTE species documented in the study area during Task 3 (3a and 3b) will also be evaluated in the field for potential Project-related impacts and other threats. Data recorded will include location relative to the reservoir fluctuation zone, existing recreation areas, and/or Project facilities; evidence of habitat inundation or desiccation; grazing; logging; and proximity to erosion and/or invasive species infestations (including aquatic weeds that may affect RTE waterfowl). .

Wide-ranging RTE species potentially occur in the study area but are unlikely to be observed during surveys. The assessment of effects for these species will be qualitative and will utilize the map developed in Task 3(c) to determine the number and significance of sites along the reservoir that could be possible bottlenecks to movement. In addition, the cumulative effects of roads, development, and other land uses on habitat quality for these species will be assessed.

5.4.6. Work Products

The results of the RTE wildlife study will be compiled and discussed in a study report, written in standard scientific format. The report will include the following information:

- An updated target list of RTE wildlife species known to occur or potentially occurring in the primary and secondary study area, with refined information on habitat requirements. The table will be expanded to include a description of potentially suitable habitat in the study area for each target species. Rationale will be provided if it is determined that no potential habitat is present (e.g., elevation too low, wrong vegetation communities).
- GIS maps of potentially suitable habitat for RTE wildlife species in the primary study area that also depict areas of high quality habitat, as determined in the field for amphibian and avian RTE species, and movement corridors and bottlenecks for large mammal RTE species.
- A summary of the methods used to conduct the field surveys for RTE amphibians and avian species. This section will include an accounting of when the surveys were conducted and a map of the areas covered.
- The results of the RTE wildlife surveys, including a list of new and previously documented RTE wildlife species observed in the study area. A brief description of each species will be provided, which will address habitat requirements, known distribution within the primary and secondary study areas, and habitat used within the primary study area.
- A map of historical and new RTE wildlife detections in the primary and secondary study areas, at appropriate scale, with unique identification labels for each occurrence.
- Completed data sheets for all occurrences.
- A comprehensive list of all wildlife species observed and identified during surveys.
- A discussion of potential threats and Project impacts to RTE wildlife species occurring or potentially occurring in the study area, as determined from the results of this study. The full assessment of potential Project-related impacts, including the

effects of the type and timing of Project operations and maintenance and Project-related recreation, will be part of the integrated resource analysis (see section 1.2.5).

GIS layers and metadata of RTE wildlife occurrences and potential habitat will be made available to the agencies, if requested. All new occurrences of RTE species documented in or near the study area will be provided to the WDFW for inclusion in the PHS database.

5.4.7. Consistency with Generally Accepted Scientific Practice

The methods (as described above) are consistent with generally accepted practices in the scientific community for conducting RTE wildlife surveys.

5.4.8. Consultation with Agencies, Tribes, and Other Stakeholders

This study plan was prepared with input from the USFS, WDFW, USFWS, and Pend Oreille County Noxious Weed Control Board, which was provided at a meeting of the Terrestrial Resources Workgroup meeting on July 26, 2006. Comments provided by the Terrestrial Resources Workgroup on the draft study plan are summarized in Attachment 5-1 and can also be found in the workgroup meeting summaries, available on SCL's relicensing website (http://www.seattle.gov/light/news/issues/bndryRelic/). Additional comments were provided by the WDFW in written comments (letter from D. Robison, WDFW, to M. Lynn, SCL, August 28, 2006) and a follow-up phone conversation (Pers. comm., D. Robison, WDFW, August 28, 2006) (see Attachment 5-1).

5.4.9. Schedule

The RTE Wildlife Species Study will be conducted in 2007–2008, with habitat-related tasks and VES surveys planned for 2007. The seasonal surveys for avian species will be conducted for 2 years to optimize the chances that species will be observed. The expected schedule is as shown in Table 5.4-4.

Table 5.4-4. Schedule for RTE Wildlife Species Study.

Activity	Timeframe
Update the target RTE species list	January–February 2007
Identify potential habitat for RTE species	February–September 2007
Conduct 2007 seasonal surveys for avian species (4)	January–December 2007
Conduct VES surveys for breeding RTE amphibians (4)	late March – June 2007
Conduct RTE wildlife habitat assessment	January–December 2007
Prepare draft year-1 study report (first-year results)	November 2007
Submit draft year-1 study report for stakeholder review	December 2007
Revise and finalize year-1 study report	January 2008
Conduct 2008 seasonal surveys for avian species	January–December 2008
Prepare draft Final study report	November 2008
Submit draft Final study report for stakeholder review	December 2008
Revise and finalize Final study report	January 2009

A second season of VES surveys for breeding RTE amphibians is not anticipated, but it is possible that weather conditions or other issues may require some additional field work for these species in 2008.

5.4.10. Progress Reports, Information Sharing, and Technical Review

In addition to preparing the study report (as described in the above), there will be several opportunities for information sharing and technical review with relicensing participants. Prior to conducting the RTE wildlife surveys biologists will contact the USFS and BLM biologists to discuss proposed survey times relative to current-year weather conditions. In addition, agencies will be invited to participate in survey efforts. Preliminary survey results will be communicated to relicensing participants in early 2008, as described in section 1.2.4 of this document.

5.4.11. Anticipated Level of Effort and Cost

RTE wildlife surveys are expected to involve about 560 hours of field time (2 biologists for approximately 36 days each), as well as additional time for data summary, analysis, and reporting. The estimated cost for this study is $77,000–90,000.

5.4.12. Literature Cited

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5.5. Big Game Study

Big game utilize habitats in the Project vicinity for forage and cover throughout the year and most likely cross the river corridor. Mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginanus*), and elk (*Cervis elaphus*) are the most common big species that occur in the Project vicinity, but other species such as black bear (*Ursus americanus*), cougar (*Felis concolor*), and moose (*Alces alces*) are also observed frequently. In addition, there are fairly recent records of two large mammals that are federally listed threatened species—the gray wolf (*Canis lupus*) and grizzly bear (*Ursus arctos*)—occurring in the Project vicinity. Analyses of potential Project effects on these two species are addressed in the study plan for Rare, Threatened, and Endangered (RTE) Wildlife Species (see section 5.4). The proposed Big Game Study will be focused on deer and elk, but will also provide information that can be used to analyze Project effects on other large mammal species. Deer and elk are designated as Management Indicator Species (MIS) for the Colville National Forest (CNF) (USFS 1988) and are important game species in Washington (WDFW 2006).

Although there are some data on deer and elk populations in the Project vicinity, there is little information available to assess the importance and use levels of shoreline habitats, seasonal ranges, and the locations where big game may cross the Project reservoir. In addition, available data are insufficient to determine the potential effects of roads in the Project vicinity on these species. Further, data are lacking on how reservoir fluctuations may be affecting important habitat areas. The proposed Big Game Study will provide information to identify sections of the Boundary Reservoir shoreline that are particularly important for big game and will assess Project effects on big game, their habitats, and travel corridors. It will also identify potential effects to big game habitat quality from Project-related roads. The study results should be useful to the USFS, WDFW, and other entities in the management of these species.

5.5.1. Nexus between Project Operations and Effects on Resources

Big game, including deer and elk, can cross waterbodies by wading or swimming, when necessary. The topography of the Boundary Reservoir shoreline affects the locations where these species can access the water. Water level fluctuations, which influence the structure and composition of riparian vegetation and contribute to erosion in some locations, may also affect how big game use the reservoir shoreline. In addition, Project-related roads may impact the use of otherwise suitable habitat for deer, elk, and other big game.

5.5.2. Agency Resource Management Goals

In addition to providing information needed to characterize Project effects, the Big Game Study will provide information to help agencies with jurisdiction over these species in the Project vicinity identify appropriate conditions for the new Project license pursuant to their respective mandates. Agency management goals and policies associated with big game management in the context of FERC relicensing of the Boundary Project are summarized below.

USDA Forest Service (USFS)

Department of Agriculture Regulation 9500-4 directs the USFS to manage "habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species." In addition, the National Forest Management Act (NFMA) directs that national forests be managed to "provide for a diversity of plant and animal communities…." 16 U.S.C. 1604(g) (3) (B). The regulations for implementing NFMA require that "[p]lan decisions affecting ecosystem diversity must provide for maintenance or restoration of the characteristics of ecosystem composition and structure within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period…" (36 CFR 219.20 (b) (1) and that "[p]lan decisions affecting species diversity must provide for ecological conditions that…provide a high likelihood that those conditions are capable of supporting over time the viability of native and desired non-native species well distributed throughout their ranges within the plan area" (36 CFR § 219.20 (b) (2) (i). Further, policy directs the USFS to "[m]itigate the negative effects of other resource projects upon wildlife and fish habitat" (FSM 2630.3 (3).

The standards and guidelines in the Colville National Forest Plan (USFS 1988) direct that "when evaluating the potential effects of an activity on any species, the species status, its dependency on the affected habitat, and the extent or limitation of the habitat, will be evaluated as they influence the viability of populations within the Forest or the range of the species." In addition, the USFS is mandated to protect species listed as Management Indicator Species (MIS). On the CNF, deer (mule and white-tailed) and elk are Management Indicator Species (MIS) (USFS 1988). The USFS manages areas east of the Pend Oreille River for elk and areas west of the river for deer (USFS 1988). A significant portion of the land east of Boundary Reservoir and south of Metaline Falls is managed for elk winter range, mostly at lower elevations in USFS Management Areas 6 and 8 (USFS 1988). The Colville National Forest Plan objective within designated elk winter range is to provide a 50:50 ratio of forage area to thermal cover (USFS 1995). Another USFS objective related to elk management is to limit open road density to no more than 0.4 mile per square mile.

U.S. Bureau of Land Management (BLM)

The National Forest Management Act also applies to the Bureau of Land Management (BLM). The BLM, where appropriate, manages lands to preserve and protect their natural condition to provide food and habitat for fish and wildlife and domestic animals, and to provide for outdoor recreation and human occupancy and use (BLM Manual 1601 Rel 1-1666 11/22/00). Guidelines in the BLM's Spokane District Resource Management Plan (BLM 1985) indicate that the Scattered Tracts Management Unit, which encompasses several parcels in the Project vicinity, is to be managed to maintain sufficient forage and cover for existing or target population levels of wildlife species. There are no specific management actions aimed at deer or elk in the particular BLM-administered tracts in the Project vicinity.

Washington Department of Fish and Wildlife (WDFW)

The harvest of deer and elk and other big game is managed by WDFW; deer and elk are also designated by the WDFW as a Priority Species because of their importance as game species.

The Project is located within Game Management Units (GMUs) 111 and 113, with the Pend Oreille River forming the boundary between these two GMUs (http://wdfw.wa.gov/wlm/game/hunter/huntregs2006.pdf). The GMUs north of the Spokane River (GMUs 111 and 113) are managed to encourage elk population growth for recreational hunting opportunities (Personal communication, D. Robison, WDFW, August 28, 2006).

Three primary goals in the WDFW Selkirk Elk Herd Plan (Zender and Hickman 2001) are: (1) to manage the elk herd for a sustained yield; (2) to manage elk for a variety of recreational, educational and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing, and photography; and (3) to preserve, protect, perpetuate, manage, and enhance elk and their habitats to ensure healthy, productive populations (WDFW 2003).

5.5.3. Study Goals and Objectives

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

- 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.

5.5.4. Need for Study

Summary of Existing Information

Although both mule deer and white-tailed deer occur in the Project vicinity, Pend Oreille County is most known for its white-tailed deer population (USFS 1988). Currently, most of the area immediately surrounding the Project is relatively unproductive for both deer species. Deer population densities in Pend Oreille County are estimated to be 4.1 to 4.9 deer per square mile. Deer populations in the region peaked during the two decades following large wildfires that occurred in the 1920s and 1930s, which created an abundance of browse in regenerating forests (USFS 1988). Some deer live near Boundary Reservoir year-round, but during winter additional animals migrate into the area from higher elevations. Results of a study along the Pend Oreille River in southeastern British Columbia determined that winter range habitat selection by white-tailed deer was driven primarily by local topography (slope, aspect, and elevation), with habitat type and structure selected on an additive basis (Boulanger et al. 2000).

Most elk in the Project vicinity are thought to be resident (pers. comm., D. Robison, WDFW, August 28, 2006). According to the draft Selkirk Elk Herd Plan (Zender and Hickman 2001), "the Selkirk elk herd is a reintroduced herd resulting from a transplant of stock from Montana in 1915 and subsequent augmentations in 1932, 1969, 1970 and most recently in 2000 of stock from Yakima and Rattlesnake Hills (Hanford) Washington." During most of the year, elk are dispersed throughout the region, but in the winter they tend to concentrate at lower elevations in the river valley. The Selkirk elk population was estimated to be 1,450 in 2003, which is within the population range objective of 1,377–1,523 animals set by the WDFW.

Reconnaissance-level shoreline investigations conducted by SCL for the Boundary Project relicensing Pre-Application Document (PAD) indicated that a large portion of the reservoir, particularly downstream of Metaline Falls, may be inaccessible to big game because of topography, primarily high, steep slopes and rock cliffs (SCL 2006, Table 4.3-3). However, there are several locations in this reach, as well as much of the area upstream of Metaline Falls, which could provide access for big game to cross the reservoir. Although several sections of shoreline are occupied by Project-related recreation facilities or influenced by other human uses that may affect big game access, human disturbances are expected to be lower during the period when big game winter along the reservoir.

Currently, the USFS management areas for big game east of the reservoir have a road density of 2.9 miles per square mile south of Metaline Falls and 1.4 miles per square mile north of Metaline Falls (USFS 1995, USFS 1998). The USFS closes selected roads during the fall hunting season (September 1 to November 30), thereby achieving an open road density of 0.9 miles per square mile in the "quality hunt" area (USFS 1995).

In addition to road density, research has shown that the type of road and the amount of vehicle traffic it receives affect big game habitat quality and use. Studies from the 1970s suggest that elk use in areas within 400 feet of primary roads and 200 feet of secondary roads is significantly less than would be expected (Witmer 1981). In western Washington and Oregon, road densities of >5 miles of open primary road per sq. mile were found to decrease habitat effectiveness for deer and elk by about 90 percent; 1 mile of open road per sq. mile reduced usability by about 30 percent. More than 5 miles of open secondary road per sq. mile decreased habitat usability by about 35 percent, while 1 mile of open road per sq. mile had less than a 5 percent effect (Witmer et al. 1985).

Results of more recent research in northeastern Oregon found that the consistency of elk selecting areas away from roads is positively correlated with increasing traffic; in general, elk were found to select areas farther away from roads with day rates of >1 vehicle/12 hours. Mule deer seem less sensitive to traffic, actually selecting areas closer to roads that had use levels of >4 vehicles/12 hours during daylight hours (Wisdom et al. 2005). Routine use of forest roads for management activities appears to be less disruptive than intermittent use associated with hunting and other recreational activities. Roads closed to vehicular traffic minimize disturbance to big game, and in fact are sometimes used for foraging, bedding, and travel (Witmer et al. 1985 and Rowland et al. 2006).

Need for Additional Information

There are some general reports from USFS and WDFW that identify regular big game use near Slate Creek and Sullivan Creek. Deer use has also been documented in the SCL-owned Boundary Wildlife Preserve (BWP) by SCL staff. However, very little site-specific information is available on big game use of the Project vicinity, particularly related to use and movement along the reservoir shoreline and across the reservoir. Lower elevations near the river are thought to be important for big game, particularly during severe winters, but specific habitats or locations are unknown. Road densities have not been calculated for the Project vicinity and the contribution of Project-related roads to the overall density has not been determined. Additional information will facilitate identification of important shoreline habitats (particularly during the winter), travel/crossing corridors, and potential Project-related impacts on big game.

5.5.5. Detailed Description of Study

Study Area

The study area for the Big Game Study will extend approximately 18 miles along the Pend Oreille River from the Box Canyon Dam tailrace downstream to the U.S.-Canada border (refer to Figure 1.3-2 for a location map of the Boundary Project). Within this linear extent, study areas at two different scales are proposed. Identification of important shoreline habitats for deer and elk will be focused on the area within the Project boundary and will be conducted in a "primary" study area that will encompass the following:

- Downstream of Metaline Falls — The reservoir, fluctuation zone allowed under the current license (forebay elevation 1,950–1,990 feet NGVD 29 [1,950–1,994 feet NAVD 88]), and land within the FERC Project boundary (Project area). The Project area includes most Project facilities, the zone 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 (elevation ≈1,985–2,015 feet NGVD 29 (1,989–2,019 feet NAVD 88), as measured at the USGS gage below Box Canyon Dam) and the land within approximately 200 horizontal feet of the high water level (approximately 2,015 feet NGVD 29 [2,019 feet NAVD 88]) along both reservoir shorelines extending to the FERC Project boundary for the Box Canyon Project. [9] [10]
- The BWP (155 acres) and adjoining SCL-owned property (85 acres).

[9] The estimated fluctuation range of approximately 1,985–2,015 feet upstream of Metaline Falls is based on the review of existing hydrology, as described in section 1.3.5 of this PSP (see Table 1.3-1). Following completion of the Hydrology Dataset and Statistics in January 2007 (see section 1.4.2), SCL will review and refine, as necessary, this elevation range

[10] As indicated in this and other study plans in the PSP, 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.

For determining road density and potential Project-related effects related to roads, the study area will be expanded to include 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.

This larger area will be referred to as the secondary study area. The ability to conduct surveys on private lands within the study area outside the FERC Project boundary (mainly upstream of Metaline Falls) may be limited due to access constraints in this area.

Proposed Methodology

The Big Game Study will consist of six tasks, each of which is described below.

Task 1: Compile Existing Information

Existing information will be reviewed and summarized to estimate the extent and distribution of big game habitat in the primary study area and identify site-specific habitat management actions that have been implemented by land management agencies. Most of this information is expected to come from the following sources:

- The Boundary Project PAD (SCL 2006)
- USFS Geographic Information System (GIS) data
- BC Hydro studies
- WDFW, Spokane Office (Steve Zender)
- USFS, CNF Headquarters (Chris Loggers) and Sullivan Lake Ranger District (Jim McGowen and Mike Borysewicz)
- Other published and gray literature

All existing geographic data will be entered into a GIS database.

Task 2: Map and Characterize Shoreline Conditions

Developing a map of shoreline conditions specific to big game will involve use of GIS to divide the shoreline into segments based on environmental characteristics such as slope, aspect, erosion stability, habitat/cover type, road density, and presence of facilities/structures. This analysis will initially involve overlaying the data from the existing vegetation/land cover type map (PAD section 4.6), shoreline map (PAD section 4.3.4), topography, and other useful GIS layers (e.g., roads), and incorporating any big game habitat and use information obtained from the USFS and WDFW. Shoreline segments will be delineated to be as homogenous as possible, based on apparent environmental characteristics, and will thus be variable in length.

Once the shoreline segments have been determined, vegetation cover types will be assigned thermal cover, hiding cover, and forage habitat categories based on vegetation and landform position characteristics, and information from the literature and the USFS and WDFW. Land cover types such as rock outcrops and cliffs, will not be included as habitat for deer and elk. The GIS-generated map will then be field verified. During the field verification, data will be collected in each segment of shoreline to document the following:

- Evidence of big game use
- Availability of forage species
- Sites or shoreline segments where deer and elk can access the reservoir

Documenting evidence of deer and elk use will involve locating and mapping obvious game trails within the primary study area. Trails will be located in the field and delineated on the map or onto mylar overlays of the 2005 aerial photographs of the Project vicinity. Because of access considerations, trails will not be mapped in areas on top of the rock cliffs that border portions of the reservoir downstream of Metaline Falls. Instead, trail mapping will focus on shoreline sites or segments that are accessible to the reservoir, particularly areas in proximity to high value forage habitats, such as croplands, that could influence the location of movement corridors. Trails both parallel and perpendicular to the reservoir will be mapped; trails that extend beyond the study area will be noted but will be mapped only to the edge of the study area. Mapping big game trails will be done primarily as part of the map verification process in 2007, but may also involve some additional mapping when snow is present to identify winter use areas.

Determining the availability of big game forage species will involve a qualitative assessment of the vegetation within the shoreline segments. This process will likely require development of categories to provide a gross estimate of the percent of each shoreline segment that supports shrubs that provide browse (i.e., serviceberry, elderberry) and the percent that supports grasses and forbs.

The shoreline erosion, topographic, and bathymetry maps will provide a good starting point for identifying sites where big game can access and/or cross the reservoir. Cliffs, rock outcrops, and high, steep cutbanks can be eliminated from consideration as access locations. However, a more refined analysis will be required to determine the suitability of some sites. This will involve evaluating slope gradient and height along the shoreline under normal high and low pool conditions for both deer and elk. It is likely that some locations may provide access only under low water conditions; for example, benches exposed at lower pool levels may be used by big game as travel corridors and/or provide access for crossing the reservoir. Additionally, elk may be able to access the reservoir from shoreline sections with greater cutbank heights than deer. The rationale for segments of shoreline deemed inaccessible to big game will be described in terms of slope gradient and/or height, as determined from the literature. Sites identified as providing access to the reservoir for deer and elk will be delineated on an overlay to the shoreline erosion map. The seasonal availability of access locations will also be discussed.

Data on big game trails and accessible sites will be entered into the GIS database. The outcome of the field verification will be a refined map of shoreline habitat conditions for deer and elk and

tabular summaries of the characteristics of each segment. Mapping the locations where big game can access the reservoir should be coordinated with the comparable task for RTE Wildlife Studies.

Task 3: Assess Big Game Use in Shoreline Segments

At least two and possibly three methods will be utilized to assess relative use of reservoir shoreline segments by big game. First, Project staff familiar with the reservoir will be interviewed to see if there are any particular areas where big game are routinely observed. Next, standardized ocular surveys will be used to count big game along the reservoir shoreline segments throughout the year. The number and location of survey routes will be stratified based on evidence of big game use in the shoreline segments, as determined by field verification of the maps developed in Task 2, information from Project staff, and proximity to croplands or other high quality forage habitats that could influence shoreline use. Field data sheets will be developed to tie survey routes and results to the shoreline segments.

Ocular surveys of big game use will be conducted at least 4 times per season, starting in summer 2007 and continuing through spring 2008 (16 times total). Surveys will be standardized to occur within a set number of hours after sunrise and prior to sunset and will be conducted by boat. For areas that cannot be effectively viewed from the reservoir (e.g., the BWP), surveys will be conducted on foot. Although the timing of the surveys within each season may vary, particular emphasis will be placed on conducting winter surveys after snowfall events that may force animals to move to lower elevations. If conditions in 2007–2008 are atypical, particularly during the winter, a second year of surveys may be considered. The level of big game use observed each season will be displayed using GIS.

To better understand big game use of the reservoir shoreline during the winter, pellet group counts may be conducted in select shoreline segments in March or April 2008, immediately following snowmelt in the study area. Pellet group counts can provide an index of total habitat use among broad areas, but pellet data should not be interpreted at too fine a habitat scale because of differences in defecation rates during travel and resting. In addition, the range of proportional use in any given winter range area is highly dependent on the big game population present on the range and the length of time spent (Boulanger et al. 2000). Consequently, if big game populations along the reservoir are low in 2007–2008, the results of the pellet group counts will not provide much insight into relative use among reservoir shoreline segments.

Information from Project staff and results of the spring, summer, and fall ocular surveys will be used to evaluate whether pellet counts will provide useful data. If it is decided to implement pellet counts, information from Project staff and the ocular surveys will be used to identify the individual shoreline segments, or groups of adjacent segments, for conducting pellet counts. Pellet count surveys will involve establishing transects and plots in the selected shoreline segments. Survey design, including transect length and plot size, number, and distribution, will be determined from the literature and adapted to fit the scale of the primary study area (see British Columbia Ministry of Environment, Lands and Parks Resources, Inventory Branch, 1998 for a summary of various survey designs for pellet counts). The final survey design will be discussed with the Terrestrial Resources Work Group prior to implementation. The study along the Pend Oreille River in BC involved establishing 100-square-foot circular plots, spaced about

60–250 feet apart along variable length transects (Boulanger et al. 2000). This study may also be able to provide information on estimated defecation rates for white-tailed deer, which are needed to estimate numbers of animals, and can be extremely variable depending on location and season. A study of white-tailed deer in Minnesota, for example, found that defecation rates for white-tailed deer averaged 34 pellet groups/day during the winter (Rogers 1987), but other studies have indicated lower values. Defecation rates for elk will be researched by reviewing the literature and consulting with big game biologists from the WDFW and USFS.

Task 4: Calculate Road Densities and Estimate Use

Developing an estimate of road densities will involve delineating roads in GIS using the 2005 aerial photographs of the secondary study area. The USFS's GIS layer of roads for the CNF will provide a base of information for much of the secondary study area, but this map will need to be expanded to cover roads on private and BLM lands. Once this step is complete, the BLM, USFS, and other parties, as needed, will be consulted to confirm road ownership and to develop estimates of use. At least some field verification may be needed to confirm road location, ownership and status (open, seasonally closed, permanently closed), and to get an indication of use (overgrown, recent tire tracks). Use for all roads will be determined in late summer or early fall, when the cumulative effects of summer use should be most apparent. Local and USFS (CNF) law enforcement officers will be contacted to determine if snowmobile use of closed roads, particularly on the east side of the reservoir, is an issue. In addition, selected roads east of the reservoir will be checked for tire and snow mobile tracks during the winter of 2007/2008. This will be done periodically, in conjunction with other field surveys. Use will be categorized based on information from Wisdom et al. (2005) and other relevant research. The roads, ownership, and level of use data will be entered into GIS to create a map.

GIS will be used to calculate overall road density for the entire secondary study area, and for six sub-areas: east and west sides of the reservoir upstream and downstream of Metaline Falls and east and west side of the Pend Oreille River from Boundary Dam to the U.S.-Canada border. In addition, the contribution of Project-related roads to the overall and sub-area densities within the secondary study area will be determined. It may be logical to exclude the towns of Metaline Falls and Metaline from the analysis since these developed areas do not provide deer and elk habitat and have a large number of roads that could skew the results, particularly for the sub-areas. Road densities and vehicle use levels will be analyzed for different sub-areas, and the secondary study area as a whole, to determine the effects of roads on habitat quality for deer and elk.

Task 5: Estimate Potential Big Game Habitat in the Fluctuation Zone

Estimating the amount of potential big game habitat in the reservoir fluctuation zone will involve the following steps:

1) Hydrology and bathymetry data will be used to delineate the extent of the reservoir fluctuation zone in 5- or 10-foot (vertical) increments. The Hydraulic Routing Model, which will be developed as part of the Mainstem Aquatic Habitat Modeling Study (see section 4.1), will be used to translate the USGS gage data into corresponding water surface elevations along the length of the study area.

2) The bathymetry map and GIS data on vegetation cover types and shoreline conditions (Task 2) will be overlaid and used as a base for delineating the cover types that could potentially develop in the reservoir fluctuation zone. This step will assume that existing shoreline vegetation types would expand into the fluctuation zone if the reservoir were operated at lower levels during the growing season and there were no significant changes in topography or substrate. Depending on topography, it may also be necessary to modify the riparian/upland boundary in some locations. In addition, some modifications to the expected cover types in the fluctuation zone may be needed to reflect the effects of periodic high flow events, which are outside the control of the Project, but which may affect the establishment and maintenance of riparian trees. Project hydrology data will be used to make this determination.
3) GIS will be used to develop a map of cover types and tables of associated acreage estimates, by ownership (USFS, BLM, SCL, and private), that could potentially occur in the reservoir fluctuation zone, in 5- or 10-foot (vertical) increments. Vegetated cover types will also be converted to thermal cover, hiding cover, and forage habitat categories based on information from Task 2 to assess big game habitat availability.

This task will be coordinated with the Inventory of Riparian Trees and Shrubs (see section 5.2) and the Waterfowl/Waterbird Study (section 5.1), which also require evaluating the development of potentially suitable habitat in the fluctuation zone.

Task 6: Documentation and Effects Assessment

All data collected in the field will be recorded on datasheets and/or maps or aerial photographs or with GPS. Mapped data will be entered into the Project GIS database; other data will be entered into a database for analysis.

This task will also describe the effects of the Project and local land uses on big game habitat quantity and quality in the study area. For *existing* big game habitat, this will involve using information from the literature and data from Tasks 1 – 4 to quantitatively or qualitatively assess the effects of: (1) the reservoir and Project-induced erosion on crossing opportunities for big game; (2) reservoir water level fluctuations on big game habitat structure and function; (3) road density, including Project-related roads, on habitat usability by deer and elk; and (4) local land uses (timber harvest, mining, recreation, residential/commercial development) on habitat structure and function. Although this assessment will be qualitative, it may be possible to develop an index of habitat quality based on availability and/or length of crossing locations, the relative amount (ratio) of suitable forage and cover, and road density that can be applied to each of the reservoir shoreline segments. In addition, the amount of habitat *potentially* available for big game in the reservoir fluctuation zone will be quantitatively assessed based on the results of Task 5.

5.5.6. Work Products

The results of the Big Game Study will be compiled and presented in a written study report written in the standard scientific format. The report will include the following information:

- Maps and accompanying tables of big game habitat conditions in each shoreline segment, including documented forage species, mapped game trails, and sites where deer and elk can access the reservoir.
- Maps and accompanying tables of potential big game habitat in the reservoir fluctuation zone, in 5- or 10-foot (vertical) increments, downstream and upstream of Metaline Falls. These maps will show both the potential vegetation communities as well as their designation as forage, hiding cover, or thermal cover.
- A summary of the methods used to conduct the ocular surveys and pellet counts to determine big game use. This section will include an accounting of when the surveys were conducted and a map of the routes and transects.
- The results of the surveys to determine big game use, by season and location.
- Completed data sheets for all surveys and a comprehensive list of all wildlife species observed and identified during surveys.
- A map of roads in the secondary study area with information on road ownership and estimated level of use.
- Calculated road densities for the entire secondary study area and each sub-area.
- A discussion of potential threats and Project impacts to the quantity and quality of existing and potential big game habitat and travel/crossing corridors, as determined from the results of this study. The full assessment of potential Project-related impacts, including the effects of the type and timing of Project operations and maintenance and Project-related recreation, will be part of the integrated resource analysis (see section 1.2.5).

GIS layers and metadata of existing big game habitat and roads, as well as maps of potential habitat in the fluctuation zone, will be made available to the agencies, if requested.

5.5.7. Consistency with Generally Accepted Scientific Practice

This study is not intended to be a comprehensive study of big game populations and/or habitat quality in the Project vicinity. Rather, it is designed to provide qualitative information on habitat conditions along the reservoir shoreline and an indication of the relative use of these habitats by big game. As such, it is not comparable to generally accepted methods for conducting big game studies in the scientific community. Calculations of road density are consistent with standard practices.

5.5.8. Consultation with Agencies, Tribes, and Other Stakeholders

This study plan was prepared with input from the USFS, WDFW, and Pend Oreille County Noxious Weed Control Board. Input was provided at meetings of the Terrestrial Resources Workgroup on July 26 and August 15, 2006. Comments provided by relicensing participants at the workgroup meetings are summarized in Attachment 5-1 and can also be found in the workgroup meeting summaries, available on SCL's relicensing website (http://www.seattle.gov/light/news/issues/bndryRelic/). Additional comments were provided by WDFW in written

comments (letter from D. Robison, WDFW, to M. Lynn, SCL, August 28, 2006) and a follow-up phone conversation (Personal communication, D. Robison, WDFW, August 28, 2006) (included in Attachment 5-1), and by the USFS in its PAD/Scoping comments and official study requests (letter from R. Brazell, USFS Forest Supervisor, CNF, to M. Salas, FERC, August 31, 2006) (USFS 2006).

5.5.9. Schedule

The tasks for the Big Game Study will be conducted primarily in 2007, although the ocular surveys of big game use along the reservoir will continue through spring of 2008 and pellet counts, if conducted, will occur in March–April 2008. The need for a second year of ocular surveys will be evaluated after the first year of ocular surveys are completed in June 2008. Assuming one year of ocular surveys, the expected schedule is as shown in Table 5.5-1.

Table 5.5-1. Schedule for Big Game Study.

Activity	Timeframe
Review existing information	February–March 2007
Finalize study implementation details	April 2007
Map shoreline conditions	April–May 2007
Map potential big game habitat in the fluctuation zone	August–September 2007
Conduct ocular surveys of seasonal big game use of shorelines	June 2007–December 2007
Map roads and calculate densities	August–October 2007
Evaluate the usefulness of pellet counts to assess winter use	October–November 2007
Prepare draft year-1 study report (first-year results)	November 2007
Submit draft year-1 study report for stakeholder review	December 2007
Revise and finalize year-1 study report	January 2008
Conduct pellet counts (if needed) to estimate relative winter use of shoreline habitats	March–April 2008
Continue ocular surveys of seasonal big game use of shorelines	January–May 2008
Prepare draft Final study report	August 2008
Submit draft Final study report for stakeholder review	September 2008
Revise and finalize Final study report	October 2008

5.5.10. Progress Reports, Information Sharing, and Technical Review

In addition to preparing the study report (as described in the above), there will be several opportunities for information sharing and technical review with relicensing participants. Agency biologists will also be invited to participate in survey efforts. Preliminary survey results will be

communicated to relicensing participants as they become available in 2007–2008. Prior to release of the Initial and Updated study reports (which will include the results of this study), SCL will meet with agencies, tribes, and other stakeholders to discuss the study results, as described in section 1.2.4 of this document.

5.5.11. Anticipated Level of Effort and Cost

The Big Game Study is expected to involve about 100 hours of field time (2 biologists for approximately 5 days each) to verify shoreline habitat conditions and map trails and reservoir access locations. About 128 hours of field time (1 biologist for 1 day, for 16 surveys) will be needed for ocular surveys, and about 200 hours of field time will be required for the pellet counts (2 biologists for 5 days for clearing and set up, 2 biologists for 5 days for the count). Additional time will be needed for road mapping and verification, data summary, analysis, and reporting. The estimated cost for this study is $67,000–80,000, assuming only a single year of ocular surveys. There is also the potential to train Project staff to conduct the ocular surveys.

5.5.12. Literature Cited

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5.6. Bat Surveys and Habitat Inventory

In general, there is very little information available to describe the occurrence of bat species and their use of caves, mines, and human-built structures within the Project vicinity. Due to the colonial behavior of most bats, they are especially vulnerable to disturbance and elimination of sites used for day roosts, hibernacula, or maternity colonies. Bat colonies have also been shown to be flooded on occasion (e.g., Tuttle 2004). Twelve bat species, six of which have status as rare, threatened, or endangered (RTE), potentially occur in northeastern Washington (Johnson and Cassidy 1997, Nagorsen and Brigham 1993).

The USDA Forest Service (USFS) has conducted some inventory surveys to document use of caves, mines, and bridges on the Colville National Forest (CNF), which includes portions of the Project vicinity. However, few, if any, of the 18 sites with bat activity identified by the USFS that are within the FERC Project boundary (Project area) or close to Project facilities have been thoroughly documented for use by bat species. In addition, other bat habitats may be discovered in the Project vicinity with a more thorough survey. The proposed Bat Surveys and Habitat Inventory described in this study plan will provide information necessary to ascertain the potential for Project-related impacts on bats.

5.6.1. Nexus between Project Operations and Effects on Resources

Bats likely forage for flying insects over Boundary Reservoir and may use some of the many caves, mine adits, and other man-made structures in the Project vicinity for day roosts, winter hibernacula, or maternity colonies. Some species may also use large trees and snags near the reservoir and Project facilities for roosts. Water level fluctuations in Boundary Reservoir, other Project operation and maintenance activities, and Project-related recreational activities may have direct and/or indirect effects on bats or their habitats. Direct impacts potentially result from Project activities that make caves, mines, or other structures inaccessible to bats or cause direct mortality of bats at these sites (Tuttle 2004). Maintenance of facilities and transmission line rights-of-way or construction can also remove large trees suitable for roosting. In addition, water level fluctuations could affect the suitability of wetland areas (e.g., the Boundary Wildlife Preserve [BWP]) to provide insect prey for bats. Human activity in the vicinity of sensitive bat sites can also result in adverse disturbance effects. Human disturbance in bat hibernacula or maternity colonies can cause critical energy loss, and a reduction in winter survival and productivity.

5.6.2. Agency Resource Management Goals

In addition to providing information needed to characterize Project effects, the Bat Surveys and Habitat Inventory will provide information to help agencies with jurisdiction over these species in the Project vicinity identify appropriate conditions for the new Project license pursuant to their respective mandates. None of the state or federal agencies has specific management goals related to bats. There are, however, agency management goals and policies associated with conservation of RTE wildlife, which include a number of bat species. The agencies with management responsibility in the context of FERC relicensing of the Boundary Project and management goals related to RTE bat species are described below.

USDA Forest Service (USFS)

The National Forest Management Act of 1974 (16 U.S.C. §§ 1600-1614, as amended) states that federal agencies need to maintain viable populations of all desired native wildlife species, and this includes wildlife species considered rare or sensitive on national forest system lands. According to USFS Manual 2670 (USFS 1995), the Regional Forester is directed to maintain a list of sensitive species. This list includes threatened, endangered, and proposed species under the Endangered Species (ESA), as well as sensitive species. Sensitive species are rare species that are threatened by human activities. If not managed appropriately, these species could become the next species proposed for listing. The list of sensitive species for Region 6, which encompasses the CNF, was last updated in March 2004 and includes one bat species, the Townsend's big-eared bat (*Corynorhinus townsendii*).

Based on USFS Manual 2670 (USFS 1995) "sensitive species of native plant and animal species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing. There must be no impacts to sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species as a whole. It is essential to establish population viability objectives when making decisions that would significantly reduce sensitive species numbers."

The Federal Cave Resources Protection Act of 1988, Forest Service Manual 2356 (USFS 2003), and the Northwest Forest Plan (USFS and BLM 1994) provide guidance and legal requirements for the management of caves on national forest system lands. "Significant" caves are designated by the Forest Supervisor and possess features, characteristics, values or opportunities related to biota, cultural, geologic-mineralogic-paleontologic, or hydrologic resources or have recreational, educational, or scientific value (USFS n.d.). The USFS has prepared cave management handbooks for some national forest system lands, such as the Umpqua National Forest (USFS n.d.) that identify cave management actions, provide information on naming and recording caves, and specify the criteria for designating significant caves. A cave management handbook for the CNF has not yet been developed; however, the USFS looks to the cave management handbooks from other forests for guidance on cave management in the CNF.

The current Land and Resource Management Plan for the CNF (USFS 1988) does not include any specific goals, objectives, or policies regarding the management of bats or their habitats. However, this plan is in the process of being updated, and in recent years the USFS has been closing abandoned mines on the CNF to protect the public and provide secure refuges for bats.

U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for the recovery of species listed as threatened or endangered under the ESA. None of the bat species listed under the ESA are known to be present in Washington.

U.S. Bureau of Land Management (BLM)

The National Forest Management Act, Federal Cave Resources Protection Act, and the Northwest Forest Plan (USFS and BLM 1994) also apply to the BLM. The BLM's policy for

conserving RTE species is directed by BLM Manual 6840 and Instruction Memorandum OR-91-57. Manual 6840 requires that the BLM work with state agencies in achieving conservation goals for locally rare species as designated by state governments. BLM State Directors are responsible for designating sensitive species for management with the purpose of "assisting in maintaining viable gene pools while allowing flexibility under a multiple use mission" (BLM 1990).

The list of BLM Sensitive Species for Oregon and Washington was updated in July 2005 and includes the Townsend's big-eared bat as a BLM Assessment (BA) species; four other bat species are designated as BLM Tracking (BT) species (BLM 2005). Impacts to BA species on BLM lands are to be addressed as part of the National Environmental Policy Act (NEPA) process. Special management or protection is discretionary for BT species (BLM 1990).

Washington Department of Fish and Wildlife (WDFW)

The WDFW classifies the Townsend's big-eared bat and roosting concentrations of big bats, myotis bats (*Myotis* spp.), and pallid bats (*Antrozous pallidus*) as Priority Species. Caves are similarly designated as Priority Habitats. WDFW has developed a number of management recommendations for Priority Habitats and Species (PHS) to assist landowners, users, and managers in conducting land-use activities in a manner that incorporates the needs of wildlife. WDFW is in the process of preparing a conservation plan for bats (pers. comm. D. Robinson, Biologist, WDFW, Spokane, Washington. July 7, 2006).

In addition, the WDFW has designated the Townsend's big-eared bat as a candidate for state listing as threatened or endangered; five other bat species are considered State Monitor species. State Monitor species are not considered Species of Concern, but are monitored for status and distribution. They are managed by the WDFW, as needed, to prevent them from becoming endangered, threatened, or sensitive.

5.6.3. Study Goals and Objectives

The goal of the Bat Surveys and Habitat Inventory is to provide information needed to determine the presence of bat species and/or their important habitats in the Project vicinity and assess ongoing Project effects on these species. Specific objectives of this study are as follows:

- Document bat species occurrence in the Project vicinity.
- Inventory and characterize structures potentially used for day roosting, night roosting, maternity colonies, or hibernacula.
- Document use of selected structures during the breeding and winter hibernation time periods.
- Assess the level of use of selected foraging areas (e.g., the BWP).
- Identify threats to bat species or habitats, including potential Project effects.

5.6.4. Need for Study

Summary of Existing Information

Of the 12 bat species potentially occurring in northeastern Washington, only one, the Townsend's big-eared bat, has actually been confirmed in the vicinity of the Boundary Project (Table 5.6-1). This species is known to hibernate in a number of mine adits near the Project area (Table 5.6-2). Several other species have been documented by the USFS on the Sullivan Lake Ranger District. The USFS also mapped at least 20 sites potentially used by bats in the Project vicinity, including mines, caves, and the Highway 31 bridge near Metaline Falls. Not all of these sites were surveyed specifically for bats, but bats were recorded in five locations, with hibernation documented at three of the five locations in 2005 (Table 5.6-2).

A study conducted in the Pend Oreille Valley in the vicinity of the Seven Mile Project in British Columbia, just downstream of the Boundary Project, documented nine bat species in a 5-year study from 1994 to 1998, all of which appeared to be using the area for breeding (Vonhof and Gwilliam 2000). Little brown (*Myotis lucifugus*) and big brown (*Eptesicus fuscus*) bats were found to roost primarily in buildings; Townsend's big eared bats were observed roosting in mines, caves, and buildings. Species using tree roosts included big brown, silver-haired bats (*Lasionycteris noctivagans*), California, long-eared and long-legged myotis (*M. californicus*, M. evotis and *M. volans*). Most tree roosts for big brown and silver-haired bats were located in live but unhealthy aspen trees, usually in natural hollows and cavities abandoned by woodpeckers and other primary cavity-nesting birds. California, long-eared and long-legged bats almost always roosted under loose bark in conifer trees. The study identified several potential threats to bats, including habitat loss associated with clear cutting and transmission line construction and reduced forage base from loss of riparian habitat.

The BLM has also conducted bat surveys in mines in northeastern Washington, although their survey sites are located considerably south (> 23 miles) of the Boundary Project. These surveys have documented night roosting by Townsend's big-eared bats in most adits in the area (pers. comm., J. Whitney, Wildlife Biologist, BLM, Spokane District, Washington, August, 2006).

Table 5.6-1. Bat species potentially occurring in the Boundary Project vicinity[1].

Scientific Name/ Common Name[2]	USFS Status[3]	BLM Status[4]	WDFW Status[5]	Suitable Habitat	Occurrence
Corynorhinus townsendii **Townsend's big-eared bat**	S	BA	SC	Maternity colonies and roosts found in caves, mines and buildings in a variety of habitats	Documented at several caves near the Project in Sullivan Lake Ranger District
Myotis evotis Long-eared myotis	None	BT	SM	Hibernates in caves; summer day roosts under bark of trees in coniferous forests	Unknown
Myotis volans Long-legged myotis	None	BT	SM	Mid-elevation forests; hibernates in winter in mines or caves	Documented outside of Project boundary in Sullivan Lake Ranger District
Myotis yumanensis Yuma myotis	None	None	None	Variety of habitats, ranging from juniper and riparian woodlands to desert regions near open water	Documented outside of Project boundary in Sullivan Lake Ranger District
Myotis thysanodes Fringed myotis	None	BT	SM	Woodlands at moderate elevation in mountains; night and day roosts include caves, mines, and buildings (typically abandoned); hibernacula include caves and buildings	Unknown
Myotis lucifugus Little brown myotis	None	None	None	Day and night roosts are used by active bats and include, but are not limited to, buildings, trees, under rocks, and in piles of wood; Hibernacula usually include abandoned mines or caves	Documented outside of Project boundary in Sullivan Lake Ranger District
Eptesicus fuscus Big brown bat	None	None	None	Roosts in tree hollows, natural caves, or openings in rock ledges; some hibernate in caves	Documented outside of Project boundary in Sullivan Lake Ranger District
Myotis ciliolabrum Small-footed myotis	None	BT	SM	Wide ecological range, from rock outcrops on open grasslands to canyons in the foothills to lower mountains with yellow pine woodlands. Day roosts are variable, but include cracks and crevices in cliffs, beneath tree bark, in mines and caves, and human dwellings. Night roosts are under a variety of natural and human-induced structures. Hibernacula include caves, mines, and tunnels.	Unknown
Myotis californicus California myotis	None	None	None	Desert-shrub-oak woodland to ponderosa pine. Roost in crevices and cracks of canyon walls, caves and mine shafts	Unknown

Table 5.6-1, continued…

Scientific Name/ Common Name[1,2]	USFS Status[3]	BLM Status[4]	WDFW Status[5]	Suitable Habitat	Occurrence
Lasionycteris noctivagans Silver-haired bat	None	None	None	Hardwoods with ponds or streams nearby. Roost behind loose tree bark, particularly willow, maple and ash trees, hollow snags, buildings; during the winter, they hibernate inside trees, buildings, rock crevices, and similar protected structures.	Unknown
Lasiurus cinereus Hoary bat	None	None	None	Preference for coniferous versus broadleaf trees	Unknown
Antrozous pallidus Pallid bat	None	None	SM	Rocky, montainous areas near water; prefer to forage in the open; day roost is usually in a warm, horizontal opening such as in attics or rock cracks; night roost is usually in the open, near foliage; the hibernation roost is often in buildings, caves, or cracks in rocks.	Unknown

Sources: Johnson and Cassidy 1993; Nagorsen and Brigham 1993

1 None of the bat species potentially occurring in the Project vicinity are listed under ESA.

2 Species in bold have been documented in the Project vicinity by the USFS.

3 USDA Forest Service (USFS) Regional Forester's Sensitive Species, Region 6, updated July 2004. (Note: As of September 2006, this list was not available online). S = Sensitive

4 Bureau of Land Management Special Status Species, updated March 2005 (Note: As of September 2006, this list was not available online). BLM Special Status Species Categories:

BA = Bureau Assessment – Species known or suspected on USDI-BLM land that are not federally listed, state listed, or BS and that are on listed by the WDFW but not eligible as BS.

BT = Bureau Tracking - All species known or suspected on USDI-BLM land that are not federally listed, state listed, BS, BA, and that are WDFW monitor or species of special concern.

5 Listed by the WDFW (WDFW 2006). WDFW classifications for Species of Concern include:

SC = State Candidate Species for listing as threatened or endangered,

SM = State Monitor. State Monitor species are not considered Species of Concern, but are monitored for status and distribution. They are managed by the WDFW, as needed, to prevent them from becoming endangered, threatened, or sensitive (WDFW 2006).

Table 5.6-2. Summary of USFS bat survey locations in the Boundary Project vicinity.

Site Name	Structure type	Owner-ship	General Location	Twn	Rge	Sec	1/4	1/16	Closure type	Surveyed for bats?	Bat Use[1]
Bluebucket	Mine adit	Private	Highway 31	39N	43E	32			None	No	Unknown
Emerald	Mine adit	Private	North of Metaline Falls	39N	43E	15			None	No	Unknown
Flusey Group	Unknown	BLM	Unknown						Unknown	Unknown	Unknown
Galena	Mine adit	??	4 miles east of reservoir	40N	44E	22			Unknown	Unknown	Unknown
Giant #1	Mine adit	USFS	50' N. of powerline	40N	43E	22	SW	NE	Gate	Yes	Known roost; no evidence of hibernating bats in 2005 or 2006
Giant #2	Mine adit	USFS	100' off Boundary Dam Rd.	40N	43E	22	SW	NE	Gate	Yes	1 possible big brown bat hibernating in 2005 & 2006
Grandview	Mine adit	Private	North of Metaline Falls	39N	43E	15			None	No	Unknown
Hanley	Mine adit	Private	Under Boundary Reservoir?	40N	43E	10			None	No	Unknown
Hoague	Mine adit	USFS	Boundary Dam Road	40N	43E	22	SW		Gate	Yes	Known roost; no evidence of hibernating bats in 2005 or 2006
Lakeview	Mine adit	USFS	FR 3140320 (Crescent Lake)	40N	43E	1	SW	SE	None	Yes	1 hibernating bat (unknown species) in 2005 & 2006
Lead King		USFS	Boundary Dam Road	40N	43E	27			None	No	Unknown
Lucky Strike #1	Mine adit	USFS	North of Slate Creek mouth	40N	43E	35	NE	NW	None	No	Unknown
Lucky Strike #2	Mine shaft	USFS	North of Slate Creek mouth	40N	43E	35	NE	NW	None	No	Unknown
Lucky Strike Cave #1	Cave	USFS	Lucky Strike Mine	40N	43E	26	SE		None	No	Unknown
Metaline Falls Bridge	Bridge	WDOT	Metaline Falls	39N	43E	21	SE	NW	None	Yes	Unknown
Metaline Mine	Mine adit	Private	South of Metaline	39N	43E	32	NE	NE	None	No	Unknown

Table 5.6-2, continued…

Site Name	Structure type	Owner-ship	General Location	Twn	Rge	Sec	1/4	1/16	Closure type	Surveyed for bats?	Bat Use[1]
Oriole	3 Mine adits	USFS	West of Metaline near Litton Creek, west of BPA line	39N	43E	19	SE	SE	Gates on 2 adits	Yes	13 Townsend's & 8 possible big brown bats hibernating in 2005; ≈49 Townsend's & 7 possible big brown bats hibernating in 2006
Pend Oreille Mine	Mine adit	Private	North of Metaline Falls	39N	43E	15	NW		None	No	Unknown
PO River Grotto #1	Cave	USFS	FR 3100190	40N	43E	35			None	No	Unknown
PO River Grotto #2	Cave	USFS	FR 3100190	40N	43E	35			None	No	Unknown
Robert E. Lee	??	BLM	??								
Riverside	Unknown	Private?	SW of mouth of Slate Creek	40N	43E	35			None	No	Unknown
Sullivan	Mine adit	Private	Gold Hill	39N	43E	16			None	No	Unknown
Tom Cat	??	??	??								
Unknown Cave above Lime Creek	Cave	Unknown	Unknown location above Lime Creek	--	--	--	--	--	None	No	Unknown
Wolf Creek	Unknown	Private	Unknown						Unknown	No	Unknown
Washington	Mine adit	BLM	Washington Rock	39N	43E	21			None	No	Unknown
Yellowhead	Mine adit	Private	Gold Hill	39N	43E	16			None	No	Unknown
Z Canyon	Mine adit	USFS	Submerged under reservoir	40N	43E	11	NW	NW	--	--	No
Z Canyon Grotto 1, 2, and 3	3 Caves	USFS	SW of Slat Creek mouth	40N	43E	11	SW	SW	Unknown	No	Unknown

Sources: USFS database (Bat_survey_database.mdb.—document #624), and memos from M. Borysewicz to P. Ormsbee (March 7, 2005 and March 1, 2006)

1 2005 and 2006 surveys for hibernating bats were conducted by M. Borysewicz, USFS Wildlife Biologist, Newport-Sullivan Lake RD on March 7, 2005 and February 13, 2006 (see Attachment 5-5 for more detail).

Need for Additional Information

The existing information provides a starting point for compiling comprehensive information on bat species in the Project vicinity. However, available data are incomplete or lacking for many bat species and do not provide information on habitat location and distribution in or near the Project vicinity. Additional baseline data on habitat and occurrence are necessary to assess potential Project-related impacts on bat species.

5.6.5. Detailed Description of Study

Study Area

The study area for the Bat Survey and Habitat Inventory will extend approximately 18 miles along the Pend Oreille River from the Box Canyon tailrace downstream to the U.S.-Canada border (refer to Figure 1.3-2 for a location map of the Boundary Project) and will encompass the following:

- Downstream of Metaline Falls — The reservoir, fluctuation zone (forebay elevation 1,950–1,990 feet NGVD 29 [1,954–1,994 feet NAVD 88]) allowed under the current license, and the land within the FERC Project boundary (Project area), which includes most Project facilities, the area 200 horizontal feet (i.e., along the ground surface, perpendicular to the shoreline) beyond the high water level (forebay elevation 1,990 feet NGVD 29 [1,994 feet NAVD 88]) along both reservoir shorelines and the transmission line right-of-way (ROW) from the powerhouse to the BPA interconnection. (See Task 2, below, for clarification on the types of activities to be conducted from forebay elevations 1,950–1,970 feet NGVD 29 [1,954–1,974 feet NAVD 88]).
- Upstream of Metaline Falls — The reservoir, fluctuation zone (elevation ≈1,985—2,015 feet NGVD 29 [1,989–2,019 feet NAVD 88] at the USGS gage below Box Canyon Dam), and land within approximately 200 horizontal feet of the high water level (approximately 2,015 feet NGVD 29 [2,019 feet NAVD 88]) along both reservoir shorelines extending to the FERC project boundary for the Box Canyon Project. [11] [12]
- The BWP (155 acres) and adjoining SCL-owned property (85 acres).
- 100 feet around any Project works areas that extend outside the Project boundary.
- Land within 100 horizontal feet along both sides of the river from Boundary Dam to the U.S.-Canada border (approximately 0.9 mile).

[11] The estimated fluctuation range of approximately 1,985–2,015 feet upstream of Metaline Falls is based on the review of existing hydrology, as described in section 1.3.5 of this PSP (see Table 1.3-1). Following completion of the Hydrology Dataset and Statistics in January 2007 (see section 1.4.2), SCL will review and refine, as necessary, this elevation range

[12] As indicated in this and other study plans in the PSP, 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.

The ability to conduct bat surveys within the study area outside the FERC Project boundary (mainly upstream of Metaline Falls) may be limited due to access constraints on private lands in this area.

Proposed Methodology

The bat survey and habitat inventory will consist of seven tasks, each of which is described below. A Washington State Scientific Collection Permit will be obtained from WDFW prior to conducting any surveys that involve handling wildlife.

Task 1: Information Update

Existing information and current literature will be reviewed and summarized to document bat species occurrence in the Project vicinity, habitat association, and site-specific management actions that have been implemented by land management agencies. Most of this information is expected to come from the USFS database of surveys conducted periodically between the early 1980s and 2006. Sources include the following:

- BC Hydro bat studies (e.g., Vonhof and Gwilliam 2000)
- USFWS, Spokane Office
- WDFW, Priority Habitats and Species Program (http://wdfw.wa.gov/hab/phspage.htm)
- WDFW, Spokane Office (Howard Ferguson, Wildlife Biologist)
- USFS, CNF Sullivan Lake Ranger District (Mike Borysewicz, Wildlife Biologist)
- BLM, Spokane District Office (Joyce Whitney, Wildlife Biologist)
- Interviews with local/regional spelunking groups and individuals
- Other published and gray literature

Information on each species and known or potential roost sites, hibernacula, and maternity colonies will be summarized. In addition, a list of sites potentially used by bats that require additional data collection and characterization will be developed in coordination with the USFS. All existing roost sites, hibernacula, and maternity colonies that have accurate geographic coordinates will be entered into a Geographic Information System (GIS) database.

Task 2: Inventory and Characterization of Bat Habitats

All known caves, mines, buildings, bridges, and other SCL-built structures that potentially provide roosting, hibernacula, or maternity colony habitat will be visited in the field to:

1) verify locations with Global Positioning System (GPS);
2) collect data to characterize the site;
3) photo document the site;
4) make a determination of the species that would potentially use the site (based on site type, size, and location); and

5) determine the need for additional bat surveys.

In addition to the previously known roost sites, other sites within the study area will be documented by examining Project-related structures (e.g., the original construction mucking tunnel, maintenance buildings, built structures at recreation sites), traversing accessible areas and using a boat to survey shorelines near normal full pool (elevation 1,990 feet NGVD 29 [1,994 feet NAVD 88]), as well as near normal low pool level (elevation 1,970 feet NGVD 29 [1,974 feet NAVD 88] downstream of Metaline Falls; elevation upstream of Metaline Falls to be determined). Caves and mines will be evaluated externally; buildings or other Project tunnels that can be safely entered may be assessed internally, which will also provide the opportunity to confirm the presence of potential roosting sites. For each site the following information will be recorded:

- Temperature
- Airflow
- Relative humidity
- Opening size
- Elevation
- Evidence of human visitation or other disturbances
- Presence of standing water
- Obvious crevices
- Obstacles (vegetation, limbs, trash, portal or headframe timbers, etc.)
- Guano deposits
- Vegetation species
- Approximate distance from project structure or reservoir

These data will be used to make a determination of whether bats are likely to use the site and the most probable species to occur. This will require using information from the literature (Task 1) to determine the types of habitats most likely used by bats potentially occurring in the Project vicinity and their temperature and humidity requirements at roosting, maternity, and hibernation sites. Sites likely to be used by bats will be recorded using GPS and entered into the GIS database for the Project.

Very infrequently, Project maintenance requires that the Boundary Project forebay be drawn down below the normal low pool (elevation 1,970 feet NGVD 29 [1,974 feet NAVD 88]) to elevation 1,950 feet NGVD 29 (1,954 feet NAVD 88). This area may include potential habitat for bats; however, surveys of the reservoir fluctuation zone below normal low pool will be difficult because drawdown to 1,950 feet occurs only rarely and may not be scheduled during the timeframe for this study. Therefore, old photographs will be examined to determine if potential habitat for bats exists along the reservoir at elevations between 1,950 and 1,970 feet. This exercise will be focused on the study area between Metaline Falls and Boundary Dam because

this section of the reservoir contains the most potentially suitable habitat and was extensively photographed in 1965 prior to filling the reservoir (SCL 1966). Other photographs may also be available from SCL archives. Based on the photographs, cave and mine adit locations will be delineated on the bathymetry maps and entered into the GIS database for the Project.

Task 3: Roost Site and Maternity Colony Surveys

All sites above the normal high water level identified as having potential for bat use will be investigated at least twice during June–August to determine if they are being used for roosting or as maternity colonies. This will be accomplished by conducting nocturnal emergence/dispersal surveys (Kunz et al. 1996), which are conducted without entering the structures to minimize disturbances to bats. At this time, no internal surveys of mines or caves are anticipated. However, human-built structures may be entered during daylight hours to determine if the structures are being used as day roosts. Daytime surveys of bridges and other human-built structures will also be conducted to evaluate day roost use.

During each emergence/dispersal survey, observers will be positioned such that flying bats are silhouetted against the sky, but positioned as far from the entrance as feasible to minimize disturbance. Set up will occur at least 30 minutes before dark and continue for at least two hours after sunset (Tuttle and Taylor 1998). Observers will count the number of exits and entries over the survey period to estimate the number of bats using the site. Night-vision devices may also be used along with additional illumination for optimum bat viewing. A headlamp with an opaque lens and a photographic filter or any red or infra-red filter is suitable. For very large colonies, emergence/dispersal surveys result in only a rough estimate of numbers of bats as it is impossible to track the many exits and re-entries of individual bats.

It is often difficult or impossible to identify bat species by observation only because many species, particularly the *Myotis*, are of similar size and appearance. The Townsend's big eared bat and pallid bat are the only two species expected to occur in the study area that may be identifiable by observation alone during an emergence/dispersal survey. Consequently, ultrasonic bat detectors will also be deployed during the emergence/dispersal surveys at roost sites. This equipment detects echolocating bats. Analyzing recordings from the ultrasonic detectors will increase confidence of detecting bat activity and will be used to identify bat species (although some *Myotis* species are very difficult to differentiate with recorded calls). Recorded calls will be analyzed on a personal computer by comparing the sonograms with reference recordings. Local reference recordings for some species may be available from the USFS, BLM, or WDFW.

Trapping may be performed at selected roost sites if it is determined that the external surveys do not provide adequate information. The trapping would involve deploying mistnets or Harp traps outside of the openings (Jones et al. 1996). The nets would be constantly monitored during one or two nights of survey effort at each site. Captured bats would be immediately removed from the net, held in cloth bags, measured, identified to species, sexed, and if possible, aged as adults or juveniles (young of the year), and released. Trapping will only be conducted on federal or SCL lands; trapping on federal lands will be closely coordinated with the USFS and/or BLM.

If a bat maternity colony is suspected in a Project facility or at a site potentially affected by Project activities, then limited trapping may be conducted to determine if the site is a maternity colony and the species using it. Trapping will be conducted only if it can be accomplished in a manner that does not disrupt or cause evacuation of the colony. Trapping at a suspected maternity colony will be closely coordinated with the USFS or BLM, and USFS personnel will assist with the trapping effort. Once the colony has dispersed, a visual search of the site will document whether the site was a maternity colony and, if so, what species possibly occupied the site.

Task 4: Hibernacula Surveys

Sites that may be potentially used by hibernating bats during the winter will be identified, in coordination with the USFS, from the data collected in Task 2. Sites suspected of being winter hibernacula will be surveyed one or two times during the fall when bats are entering and swarming around their hibernacula (Vonhof and Gwilliam 2000). The fall surveys will be conducted by using the ultrasonic detectors deployed near the potential hibernacula; temperature, relative humidity, and air flow data will also be recorded.

Use of caves or mine adits by hibernating bats can only be confirmed by entering these structures. Consequently, up to six potential hibernacula sites on federal land in the study area that have not been included in past USFS surveys will be selected for winter surveys. The site selection process and the surveys will be conducted in coordination with the USFS. As required by the USFS for safety reasons, surveys of caves and adits will require the involvement of a certified minerals inspector. Data on temperature, air flow, and relative humidity will be measured at 8 inches below the ceiling within the twilight zone of the adit/cave entrance and every 50 feet beyond. Additional USFS guidelines for surveying potential hibernacula are provided in Attachment 5-5.

Task 5: Foraging Site Sampling

At least seven sites in the study area will be sampled with mistnets and ultrasonic detectors to document foraging bat species. Potential sampling sites include the following:

- The ponds and associated wetlands on the BWP
- The wetland and riparian habitat near the mouth of Sullivan Creek
- The mouth of Slate Creek
- The riparian zone just downstream of Box Canyon Dam
- The riparian zone just downstream of Boundary Dam
- A site near Boundary Dam or the Forebay
- Suitable open forested/upland sites

At each site, 2–5 mistnets will be deployed directly over the surface of water bodies or perpendicular to forest edges and roadways, depending on the characteristics of the netting site. In addition, harp traps may be utilized if warranted. Biologists will directly supervise the traps for 2–4 nighttime hours. Captured bats will be immediately removed from the net, held in cloth

bags, measured, identified to species and sexed and released. If possible, captured bats will also be aged as adults (with reproductive status determined) or juveniles (young of the year). Information from this task will be used to characterize available forage habitat for bats in the study area.

Task 6: Tree Roost Mapping

Sites in the study area with an abundance of potential roost trees will be mapped, and qualitative information collected, incidental to the other field surveys. Locations with quaking aspen trees or large-diameter, intermediate decay-class conifer trees will be documented during the inventory of bat habitats in the study area (Task 2). These trees were shown to be the most often-used day roosts for several bat species in the Pend Oreille River basin of British Columbia (Vonhof and Gwilliam 2000). This information will be entered into GIS and integrated with the other wildlife surveys.

Task 7: Documentation and Effects Assessment

Data from all survey efforts will be entered on datasheets in the field and transferred to a database. In addition, all roost, maternity, hibernacula, and forage sites surveyed will be assessed in the field for potential Project-related impacts (e.g., proximity to reservoir fluctuation zone, potential disturbance from maintenance activities) and other threats (e.g., human access). All survey locations, occurrences of bat detections, and potential tree roosting habitat will be maintained in a GIS database and made available to agencies but not included in reports available to the public.

5.6.6. Work Products

The results of the bat survey and habitat inventory will be compiled and presented in a written study report written in the standard scientific format. The report will include the following information:

- An updated list of bat species, and habitat information for new additions. The table will be expanded to include a description of suitable habitat in the study area for each target species. Rationale will be provided if it is determined that no potential habitat is present.
- A summary of the methods used to conduct the surveys and inventory. This section will include an accounting of when the surveys were conducted and a map of the areas covered.
- The results of the surveys, including a list of documented or suspected species observed in the study area. A brief description of each species will be provided, which will address habitat requirements, known distribution within the study area and Project vicinity, habitat used within the study area, and important sites.
- GIS database of survey locations and results, including any identified roost sites and documented or suspected maternity colonies and hibernacula.
- Completed data sheets for all surveys.

- A comprehensive list of all wildlife species observed and identified during surveys.
- An assessment of potential threats and Project impacts to bats and their habitats, by site, as determined from the results of this study. The full assessment of potential Project-related impacts, including the effects of the type and timing of Project operations and maintenance and Project-related recreation, will be part of the integrated resource analysis (see section 1.2.5).

GIS layers and metadata resulting from the bat surveys and habitat inventory will be made available to the agencies upon request (but not to the public, because of the sensitive nature of the information).

5.6.7. Consistency with Generally Accepted Scientific Practice

The methods (as described above) are consistent with generally accepted practices in the scientific community for conducting bat investigations and include recommendations from the USFS for surveying caves and mine adits for hibernating bats.

5.6.8. Consultation with Agencies, Tribes, and Other Stakeholders

This study plan was prepared with input from the USFS, WDFW, USFWS, and Pend Oreille County Noxious Weed Control Board, which was provided at a meeting of the Terrestrial Resources Workgroup on July 26, 2006. Comments provided by relicensing participants at the workgroup meeting are summarized in Attachment 5-1 and can also be found in the workgroup meeting summaries, available on SCL's relicensing website (http://www.seattle.gov/light/news/issues/bndryRelic/). Additional recommendations were provided by the USFS in its PAD/Scoping comments and official study requests (letter from R. Brazell, USFS Forest Supervisor, CNF, to M. Salas, FERC, August 31, 2006) (USFS 2006).

5.6.9. Schedule

The Bat Surveys and Habitat Inventory will be conducted primarily in 2007 and early 2008, although some follow-up work may be required later in 2008 and early 2009. The expected schedule is as shown in Table 5.6-3.

Table 5.6-3. Schedule for Bat Surveys and Habitat Inventory.

Finalize study implementation details	**April 2007**
Review existing information and develop preliminary list of known and potential habitat sites to be surveyed	February–March 2007
Conduct 2007 roost/maternity colony site surveys	June–August 2007
Conduct foraging site surveys	July–August 2007
Conduct fall surveys at potential hibernacula	September–October 2007
Prepare draft year-1 study report (first-year results)	November 2007
Submit draft Initial Study Report for stakeholder review	December 2007
Revise and finalize year-1 study report	January 2008
Conduct winter surveys at potential hibernacula	January–early March 2008
Conduct follow-up surveys (if required)	June 2008 – January 2009
Prepare draft Final study report	November 2008
Submit draft Final study report for stakeholder review	December 2008
Revise and finalize Updated Study Report	January 2009

5.6.10. Progress Reports, Information Sharing, and Technical Review

In addition to preparing the study report (as described above), there will be several opportunities for information sharing and technical review with relicensing participants. Prior to conducting the bat surveys, USFS and BLM biologists will be contacted to discuss proposed survey times relative to current-year conditions and for information on sites potentially used by bats for roosting, maternity colonies, or hibernation. In addition, agencies will be invited to participate in survey efforts; caves and mine adits on federal lands will not be entered unless accompanied by the USFS or BLM biologist and certified minerals inspector. Preliminary survey results will be communicated to relicensing participants in early 2008, as described in section 1.2.4 of this document.

5.6.11. Anticipated Level of Effort and Cost

The Bat Surveys and Habitat Inventory is expected to involve about 590 hours of field time (2 biologists for approximately 23 days each), as well as additional time for data summary, analysis, and reporting. The estimated cost of this study is $80,000–95,000.

5.6.12. Literature Cited

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Attachment 5-1: Summary of Stakeholder Comments on Botanical and Wildlife Study Plans

Summary of comments on draft botanical and wildlife study plans made at the Terrestrial Workgroup meetings (2006).

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
2006 Early Information Development Efforts					
Verbal	5-24-06	G. Koehn	USFS-Colville NF	G. Koehn asked if the data to be collected in June 2006 will produce a complete inventory of the Project area for noxious weeds.	SCL said that it would produce a complete inventory.
Verbal	5-24-06	S. Sorby	POC Weed Board	S. Sorby commented that the season for identifying some of the early developing noxious weeds is a few weeks late this year. Early-to-mid July should be a good time to conduct field work. Sharon would like to accompany EDAW's botanist to survey the shoreline downstream of Sullivan Creek to see if any infestations of *Centaurea nigra* have established in this area.	Comment acknowledged.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes said that he and Kathy Ahlenslager still need to review the 2005 EID on noxious weeds. Kathy might also be interested in accompany EDAW's botanist in the field on one of the trips.	Comment acknowledged.
Terrestrial Resources Process flow chart					
Verbal	6-28-06	D. Robison	WDFW	D. Robison asked if SCL had a process for PM&E development. He further suggested that some discussion about PM&Es could occur after the first study season, when there is some indication of what Project effects will be on terrestrial resources and what potential mitigation measures could be taken.	The ILP is functioning within a very compressed timeframe, and SCL is looking for opportunities to include stakeholders in PM&E development. The FERC-required meeting after the first study season is a potential opportunity to start the discussion on PMEs.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes asked if SCL would be producing a synthesis report that would include the results of all studies. Mike also noted that he agreed with the idea of having a check in point in early 2008 in case changes need to be made to existing studies or additional studies need to be added.	The document produced for the Preliminary Licensing Proposal (PLP) will be a synthesis of all studies and it isn't likely that SCL would have the time to produce a separate synthesis study.

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
Verbal	6-28-06	D. Robison	WDFW	D. Robison commented that he would like to see the data from any studies that will be used as input to models. He said that problems can be avoided when agencies/stakeholders are given the opportunity to review the raw data. That way, questions related to data can be separated from the modeling results.	All studies will follow scientific format and will include methods, results, and discussion sections. Each individual study will then be analyzed in conjunction with other studies to produce the PLP. There will be stakeholder engagement throughout this process.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes said that another project he had worked on produced a comprehensive "Wildlife Resources Report" which was a summary of the analysis and synthesis of wildlife resource studies with other resource area studies. He said that preceding the production of this document were sessions on preliminary results in which stakeholders brainstormed potential mitigation measures and study designs. Mike said he thought this was a valuable process and would send Michele an electronic copy of that document (E.3-2-45, Hell's Canyon). Mike also said that the results of this report could probably then be copied and pasted to produce the PLP.	Comment acknowledged.
Draft Terrestrial Study Plans: Waterfowl/Waterbird Survey					
Verbal	6-28-06	D. Robison	WDFW	D. Robison discussed identifying potential waterfowl habitat that is affected by the Project in terms of a natural hydrograph based on the unique hydrology of the Boundary Project.	There were a number of questions related to how the natural hydrograph would be defined. It would be valuable to talk with Kim Pate (SCL) to better understand the hydrology and its effect on the area above Metaline Falls. SCL said it would gather some information and bring it up at a later date.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes added that he would like to see the Waterfowl/Waterbird study be based on a habitat analysis, and would like to have this discussion as soon as possible.	Decisions regarding this study could be made at the August workgroup meeting.

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes commented that it appeared this study would be addressing presence/absence of waterfowl and waterbirds, but he felt it was more important to understand what was happening to the actual habitat in terms of water fluctuations and vegetation cover types.	Perhaps the study could be scaled back from the current species inventory approach to include some surveys related to waterfowl use of the project area, but with a second focus on habitat. A combination of vegetation cover maps, bathymetry data, flow models, and shoreline erosion mapping could be used to identify potentially affected habitat. The group decided that the WDFW and USFWS should be contacted to get their feedback on the proposed study before making any changes to the existing study plan.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes said he wants the Riparian Tree and Shrub Study to include an estimate of acres affected in the fluctuation zone, just as he requested for the Big Game Study.	Trying to determine the type of habitat that may occur in the fluctuation zone is somewhat of a crystal ball exercise. But, the assumption could be made that the vegetation that would develop in the fluctuation zone would be similar to the existing shoreline vegetation
Verbal	7-26-06	D. Robison	WDFW	D. Robison said that the initial study proposal appeared rather ambitious and that he could support a reduction in effort, as described by SCL.	Comment acknowledged.
Verbal	7-26-06	C. McShane	SCL	C. McShane clarified that the focus of the study would be the area above Metaline Falls, given that there isn't much suitable nesting habitat north of the falls.	
Verbal	7-26-06	D. Robison	WDFW	D. Robison was concerned that only the relative distance of nests to the water would be mapped as water levels could change.	A relative distance of nests to the water would be measured with a rod and level and that elevation could then be calculated based on the reservoir level at that location. The time would also be recorded to later determine actual water levels at the

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					time of field data collection. A GPS location would be taken as well.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes said the data would benefit from doing vegetation typing around nests. He thinks the conditions recorded should be compared to what the literature says about selection of nest sites. He wants to be prepared to discuss enhancement opportunities if nesting is occurring in marginal habitat.	Vegetation typing would be included in the methods.
Verbal	7-26-06	D. Robison	WDFW	D. Robison noted that nests on islands could be made available to ground predators if habitat becomes connected during drawdowns.	Comment acknowledged.
Verbal	7-26-06	D. Robison	WDFW	D. Robison said that WDFW has observed that heron colonies throughout the state are being abandoned and that biologists do not know why this is occurring. He said that .any nests or colonies noted during surveys (even if they are located outside of the study area) should be documented.	SCL will include in the methods that any herons seen nesting should be noted.
Verbal	8-15-06	D. Robison	WDFW	D. Robison asked how SCL will define "lowest normal operating level." He said the analysis will require that some sideboards be established. Doug also asked what level of involvement by stakeholders SCL envisioned for determining the lowest operating level, and stated that he would like to be involved.	SCL is hoping to conduct the analysis of "lowest normal operating level" by the end of 2006, as this information will be needed when the scopes of work are finalized. The details on how the analysis will be framed have not yet been determined. SCL's intent is to include stakeholders in that analysis, but can't confirm at this time what level of involvement will be extended to stakeholders. The restricted timeline for studies makes it difficult to include stakeholders to the degree that might be desired.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes asked if a literature search would be conducted to define optimal habitat for the ground-nesting species that will be the focus of this study.	Literature search will be conducted.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes inquired about the cost estimates that	The cost estimates were developed at

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				were developed for the various terrestrial study plans. He said that he didn't follow the logic that was used to arrive at the estimates. Mike also said that if prioritization has to occur between studies, he wants to make sure the most important issues, such as erosion, receive the most emphasis.	a much earlier date and since many of the plans have been reworked, the cost estimates would need to be reviewed.
Draft Terrestrial Study Plans: Rare, Threatened, and Endangered (RTE) Plant Species Inventory					
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes noted that this study is an inventory of RTE plant species in the Project area, but embedded in this is an analysis of project effects. He suggested that this should be more clearly reflected in the title.	This study will include an analysis but SCL will not be able to conduct final levels of analysis until late 2008. Hence, this is an information gathering study and the analysis will be conducted later.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes commented that he was aware that many of the studies are dependent on other studies, and wanted clarity where information will come from and how it will be synthesized. Mike had considered two approaches: 1) a separate, standalone document that discussed project effects, or 2) a results section in the inventory study that includes both synthesis and analysis details.	SCL needs to consider how to approach the synthesis of information from overlapping studies. SCL will need to get back to the group on how it plans to proceed, not just with this study, but with all studies.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes commented that he has updated lists for USFS Sensitive Species and BLM Special Status Species, Mike noted that he had additional comments on Table 5.3-1 that he would pass to Colleen in a redlined copy of the study plan.	Comment acknowledged.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes commented that non-vascular lichens and mosses should be added to the list of species that should be considered under this study.	Comment acknowledged.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes noted that the order of components in the study plans were different than he had seen in documents for other hydro projects using the ILP, and asked if there was a reason for this.	SCL was not aware of any change in order and would check the order of the seven steps described by FERC.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes requested that SCL provide him with the vegetation data collected on USFS land. He said that the scale and format of the vegetation map for	SCL will provide Mike the vegetation data. EDAW will be collecting more comprehensive

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				the Boundary Wildlife Preserve was particularly useful and asked if it was possible to use that same scale and format for other parts of the study area.	vegetation data over the next two months. There was also some additional refinement of the cover type mapping that would be done once the bathymetry data were available. After the maps are revised the complete data set would be available to send to the USFS, probably sometime in late summer or early fall. The maps can be produced at a variety of scales and overlaid with the digital orthophotos to produce maps similar to the BWP.
Verbal	*5-24-06*	*M. Gerdes*	*USFS*	M. Gerdes noted that the USFS has very detailed field forms and strict protocols for collecting vegetation and RTE plant species data, and suggested that SCL use these protocols and forms in the RTE plant species inventory. Mike provided Colleen with hard copies and Michele with electronic versions of the following: --Threatened, Endangered, and Sensitive Plants Survey Field Guide (March 2005) --Threatened, Endangered, and Sensitive Plants Element Occurrence Field Guide (October 2005)	The methods in the study plan were fairly standard for this type of inventory, but SCL will review the USFS protocols to see if any modifications were needed to ensure that the RTE plant surveys met USFS needs for data collection and reporting. As currently written, RTE plants would be documented using the Washington Natural Heritage Program Rare Plant survey form. It might also be possible to use the USFS form as well on USFS lands if necessary. Mike responded that he would speak with Kathy Ahlenslager and let Colleen know.
Verbal	*5-24-06*	*M. Gerdes*	USFS	M. Gerdes said he wants to make sure that all the work products will be presented in a standard scientific reporting format.	Work products will be in scientific format.
Verbal	5-24-06	J. Short	WDOE	J. Short asked if wetlands had been addressed in this study plan, and if project operations affect wetlands. Jamie noted that Pend Oreille County has plans to update their Shoreline Master Program which will include a condition of no net loss of ecological	If possible changes in operation were identified that could affect wetlands, a study would be created to address this issue.

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				function shoreline or associated wetland.	
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes said that he confirmed that SCL would need to use USFS botanical survey forms on USFS lands.	Comment acknowledged.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes said that he thought surveys should be conducted for nonvascular RTE species, although he was waiting for confirmation of this from Kathy Ahlenslager (USFS).	It is not typical to survey for nonvascular plants in relation to a hydropower relicensing process. The reason they were not included is that the majority of these plants are found on trees in forested habitats and thus would not be expected to be impacted by Project operations.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes said that the USFS is still considering whether to propose a separate task to conduct an analysis of project-related impacts. He said the USFS will most likely not ask for this, but the final decision has not yet been made.	The last bullet under "Work Products" is intended to get at this issue.
Draft Terrestrial Study Plans: Rare, Threatened, and Endangered Wildlife					
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes noted that a watershed analysis exists for Sullivan watershed from (around) 1995 that may be applicable. He said that SCL might try to glean information from that analysis as it applies to wide-ranging species. M. Gerdes agreed and noted that this study could primarily be a literature search using mapping to overlay vegetation cover types and topography. Mike added that it would be beneficial to check perennial streams with emergent vegetation and ponded water for amphibians.	SCL could consider an approach based on assessing suitable habitat since plentiful vegetation data will be available. It would be important to get information on movement corridors, identify areas where wildlife could access the reservoir for crossing, and identify suitable nesting habitat for bald eagles.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes raised the issue of connectivity, asking if the Project creates some sort of landscape fragmentation that would inhibit movement of wildlife. The concern probably wouldn't apply as much to large mammals as it might to smaller species such as amphibians.	SCL could potentially examine this concern with a GIS exercise once the wildlife studies have been performed. Mike Gerdes (USFS) agreed that a GIS exercise could answer this question and thought it would probably fit into the analysis phase of studies.

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes noted that Colville National Forest has a list of Management Indicator Species that needs to be included in this study (if they are not already to be addressed in another study). He said he would give Colleen that list.	Comment acknowledged.
Verbal	7-26-06	D. Trochta	USFWS	D. Trochta said that his agency no longer maintains a Species of Concern list.	The document will be revised accordingly.
Verbal	7-26-06	D. Robison	WDFW	D. Robison told the group that Steve Zender (WDFW) had flown through Pend Oreille County and found new Bald Eagle nests along the Boundary Reservoir.	SCL will check with Steve Zender for those locations.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes said that he would like to see an addition to the study objectives identifying factors affecting landscape movement of larger home range species.	That objective fits with what SCL is trying to accomplish under the objective: "document locations and condition of potential habitat for RTE species".
Verbal	7-26-06	D. Robison	WDFW	D. Robison raised the concern that species could have a relationship to the Project, but occur greater than 200 ft. from the reservoir. Doug also expressed concern that if data collection stops at 200 ft it would be more difficult to effectively develop PMEs outside of that area.	Any species found relatively close, but outside of 200 ft of the study area will be included. Michele added that SCL did not intend to limit the evaluation of potential PMEs to 200ft. Colleen said that the PHS database could be queried for RTE species observations roughly from ridge top to ridge top, which could then be characterized as the secondary study area.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes said he had some concern about wide-ranging species. Mike suggested using a secondary study area in conjunction with the 200 ft. boundary from the reservoir. He said that this secondary study area could be constrained to known habitats and existing information based on habitat types.	Same response as above.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes commented that the Sullivan Watershed Analysis and other relevant information pertaining to the Sullivan Lake District should be included in the updated lists of RTE wildlife species in the	Comment acknowledged.

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				Project area.	
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes said that he thought it would be valuable to assess potential habitat for some rare or generalist species in case of future enhancement opportunities.	The habitat needs for some of these species could be researched and described in the report, as opposed to including maps because she didn't think maps would be very informative. Further, if an issue surfaces related to any of these species during the field surveys, a plan would be developed for follow up.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes asked if SCL would provide him with GIS and metadata of the results of this study.	The metadata will be available to agencies upon request.
Verbal	7-26-06	G. Koehn	USFS	G. Koehn suggested that the road from the county road to the Vista House be considered a Project road, and hence included in the study area.	SCL is currently conducting a road inventory and this road will potentially be included as a Project road.
Verbal	7-26-06	D. Robison	WDFW	D. Robison noted that there may be additional comments on the study plans reviewed at today's meeting from WDFW wildlife biologists	Given the tight timeline to revise the study plans before the August meeting, comments received after today will not be reflected in the next draft.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes said that most of his comments were similar to those provided on the studies discussed earlier in the meeting. Concerning the Study Area, Mike said that although his written comments say that the study area should be expanded down to 1,950 feet, that is an error. For this particular study, it is appropriate for the study area to extend down to 1,970 feet at the lowest point.	SCL asked Mike to clarify whether he agreed that the 1,970 feet level should apply to the RTE plant study as well. Mike said yes.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes suggested adding Barred Owl to the species list included in the list of RTE species potentially occurring in the study area.	This species was included in Table 5.4-1 because it is a Management Indicator Species (MIS) for the Colville National Forest.
Verbal	8-15-06	D. Robison	WDFW	D. Robison said that, building on his earlier comments about Project effects, he's concerned about having the right kind of data that will be	SCL understood Doug's concern but asked him to recognize that it is a tricky task to spell out *exactly* what is

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				useful when we get to the discussion of mitigation. Doug said that, to determine the type of mitigation – and the degree to which it should be provided – in addition to the appropriate way to operate the Project, SCL will need to do more than just *identify* (see last bullet under "Goals and Objectives") potential effects. It seems that *quantify* is more of what's needed. If we only identify, we are effectively providing only a list, versus quantifying, which gets at when, where, and how much.	caused by Project operations, given the many other factors at play in the system. Compared to other resources, such as fisheries, shoreline stability, and even vegetation, it can be very difficult, if not impossible, to quantify ongoing effects of Project operations on wildlife. In many cases, only a qualitative assessment is possible. For example, it will be impossible to quantify Project effects on big game populations or wide-ranging RTE species that use the Project area. SCL will do its best to quantify Project impacts, but there are inherent limitations.
Draft Terrestrial Study Plans: Riparian-obligate Tree and Shrub Species Inventory					
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes commented that SCL had adequately captured his concerns in the 2/16/06 meeting summary about riparian vegetation. He clarified that his interest in mapping potential vegetation communities is that it provides guidance for determining management for future site conditions.	Mapping of potential vegetation communities would be more relevant if specific sites are targeted for habitat management. This determination wouldn't occur until the studies are completed.
Verbal	5-24-06	M. Gerdes	USFS	M. Gerdes noted that there is a new USFS document on Wetland/Riparian classification that he wanted to bring to the attention of SCL. He added that the document could be found on the USFS website. Colleen McShane noted that they had a copy of the document and had reviewed it in preparing the PAD.	SCL had a copy of the document and had reviewed it in preparing the PAD.
Verbal	6-28-06	D. Robison	WDFW	D. Robison asked if SCL would be inventorying cedar in this study.	SCL would not be inventorying cedar because they are wide-ranging in the study area and not restricted to riparian zones.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes asked if SCL would consider taking out "obligate" in the title of this study as that term has	SCL changed the title to *Inventory of Riparian Tree and Shrub Species* and

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				very specific connotations.	will list the species that will be inventoried.
Verbal	6-28-06	D. Robison	WDFW	D. Robison raised concerns that this study did not appear to be asking questions, only performing an inventory. Robison said that he wanted to be sure that SCL was considering the types of questions that should be addressed related to riparian tree and shrub species, and that they left time in the process to answer those questions.	The inventory will provide preliminary information, and combined with bathymetry and hydrology data, should allow SCL to both frame and answer relevant study questions. The end of 2007 would be an appropriate time to reassess this study, as SCL would have a better idea of what the relevant questions would be at that time. SCL could also revise the study plan to provide more detail on how the results of the inventory will be used.
Verbal	6-28-06	D. Robison	WDFW	D. Robison commented that the inventory would not get at habitat and function. For example, inventorying snags isn't as important as understanding whether the population is providing for ongoing snag recruitment.	Some of the information related to riparian habitat function would come from the literature. But, the basic data on the condition of riparian tree and shrub habitats in the study area would be addressed by this study.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes said that he thought the proposed inventory of age classes of trees would provide information on recruitment. Mike said that as cottonwood snags are relatively short-lived, recruitment would be the most important measure to indicate the overall health of the riparian system. Mike said that if recruitment is strong, then an adequate number of snags could be assumed. Mike added that he would like to see recruitment periodicity measured by age classes of trees addressed in the study goals. He said that this information would indicate whether or not the riparian areas will be able to continue to thrive.	Some of the information related to riparian habitat function would come from the literature. But, the basic data on the condition of riparian tree and shrub habitats in the study area would be addressed by this study.
Verbal	6-28-06	D. Robison	WDFW	D. Robison said that SCL would need the elevation of riparian stands for comparison with hydrology	SCL would have elevation of stands from the cover type mapping

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				data.	combined with the lidar and bathymetry data.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes added that the document *1994 Hydraulic and Erosion Processes Affecting Boundary Wildlife Preserve* shows where islands are being inundated near the Wildlife Preserve. He suggested that Doug might want to take a look at this document.	Only the title and author for this document are posted on the Boundary relicensing website. Michele Lynn would send a copy of the document to Doug Robison per his request.
Verbal	6-28-06	D. Robison	WDFW	D. Robison asked what reservoir level SCL would be using as a baseline for riparian surveys, specifically addressing vegetation that does not occur due to a Project effect. D. Robison agreed that that was an appropriate point of view to serve as baseline.	It is reasonable to think that any plants that were going to establish in the fluctuation zone would have done so by now as the reservoir has been in existence for 50 years. SCL will examine the fluctuation zone for vegetation but will conceptually use full pool as the baseline.
Verbal	6-28-06	S. Sorby	POC Weed Board	S. Sorby commented on a passage in the *Inventory of Riparian Tree and Shrub Species* study plan saying that SCL had planted woody riparian species in the reed canary grass swards at the Boundary Wildlife Preserve but the plantings were unsuccessful. Sharon said that she has information that SCL could use to help solve this problem, perhaps in the PM&E development stage.	Comment acknowledged.
Verbal	6-28-06	D. Robison	WDFW	D. Robison pointed out that the listed amounts of vegetation types in the Project area were not the same in the PAD and the study plan for the *Inventory of Riparian Tree and Shrub Species*.	The PAD only included the Project boundary and not the 200ft buffer that SCL will include outside of the Project boundary for the riparian inventory. The study area for the riparian inventory will include 200 horizontal feet above the high water level for the full length of the reservoir.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes said that he brought two documents for SCL: *Greenline Riparian-Wetland Monitoring* (which he gave to Michele Lynn), and a USFS Stream Team document on long-term monitoring	This could be a valuable next step. It would be most logical to perform the initial inventory, and then use that information to isolate areas that SCL

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				(which he will email to Michele Lynn). Mike suggested that long-term monitoring could help examine trends in recruitment periodicity. Mike said he realized long-term monitoring would be in the arena of PM&Es, but he suggested that, if SCL thinks long-term monitoring will occur in the future, that the appropriate protocols should be established now.	would like to monitor.
Verbal	6-28-06	G. Koehn	USFS-Colville NF	G. Koehn asked how potential direct and/or indirect impacts on riparian species would be documented by technicians during data collection in the field. Glenn said an assessment of a given impact is not necessarily clear-cut, and asked that if technicians are unsure or think that the impact may appear differently under different conditions, they note that fact and potentially revisit the site under different conditions.	Biologists conducting the inventory will take notes and photographs if possible, and it would be valuable to note any questions that may warrant another visit to the site.
Verbal	6-28-06	G. Koehn	USFS-Colville NF	G. Koehn suggested that it would be valuable to add language into the inventory plan stating that SCL will potentially perform a second year of study if it is needed.	That fact will be clarified in the document.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes suggested adding elements addressing recruitment and periodicity of riparian tree and shrub species. M. Gerdes responded that he was referring to examining flow data to analyze opportunities for high flows to provide scour and deposition of materials thereby enhancing riparian recruitment. He said he would feel comfortable holding this as a potential opportunity for enhancement later in the relicensing process.	Recruitment and periodicity had been addressed by looking at age structure; if seedlings were apparent, recruitment could be assumed.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes said that he would like to include the drawdown zone to 1,950 feet in the study area as opposed to 1,970 feet.	SCL was attempting to look at normal operating conditions and 1,970 feet is typically the lowest elevation at which the Project is operated. The reservoir is only rarely

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					drawn down to 1,950 feet for maintenance and in fact cannot operate at that level due to air entering the turbines. SCL was concerned about the assumptions that would need to be made to extrapolate cover types down to 1,950 feet. SCL would need to consider this further.
Verbal	8-15-06	D. Robison	WDFW	D. Robison said that he did not think "Assessing Project effects" on riparian tree and shrub species in the Goals and Objectives section was adequately linked to the Work Products. Doug wants more clarity between natural water level fluctuations vs. Project-induced fluctuations.	Project effects would be addressed in the study results and that would be clarified in the study plan.
Draft Terrestrial Study Plans: Bat Surveys and Habitat Inventory					
Verbal	6-28-06	D. Robison	WDFW	D. Robison commented that the proposed study was a good, comprehensive study, more than he would have expected.	Comment acknowledged.
Verbal	6-28-06	G. Koehn	USFS-Colville NF	G. Koehn noted that, concerning management of bats, the USFS gets their direction from the federal Cave Resource Protection Act of 1988.	Comment acknowledged.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes said he would send Michele a copy of the Cave Management Handbook that was published pursuant to the Act.	Comment acknowledged.
Verbal	6-28-06	D. Robison	WDFW	D. Robison asked how SCL would be addressing potential flooding of caves and adits from refilling the reservoir following drawdown.	The group discussed how frequently and for what duration the reservoir would be drawn down to 1950 feet. SCL would need to gather more information to discuss this subject thoroughly. Suggestion of examining pre-Project photos for caves and adits between 1950 and 1990 feet to gain information on the number of caves and adits that could potentially be flooded with changing reservoir

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					elevations.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes said that the goals and objectives section should be revised to include an inventory of hibernacula and maternity sites, which would need to be conducted at the appropriate time of the year.	That revision will be made.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes noted that researchers cannot positively identify hibernacula or maternity sites without entering caves. He added that to identify hibernacula, caves would need to be examined in January, which is the time of deepest torpor for bats. Mike said he felt it would be valuable if SCL performed two years of study to look for hibernacula.	Due to human safety and disturbance to bats, SCL had not planned on entering caves, but if a site is suspected to be a hibernacula or maternity site, researchers could flag the site and SCL could talk with the USFS about entry. A second year of data collection would be helpful to identify hibernacula, and SCL changed the schedule to include surveys in January and February of 2008.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes commented that Big-eared bats can detect mistnets, and hence this is not a reliable method for capture. Mike also noted that Big-eared bats feed on canopy *Lepidoptera*, so SCL should include a foraging site sample that includes a forested upland site with a small stream or pond.	SCL will adjust the methods accordingly.
Verbal	6-28-06	M. Gerdes	USFS	M. Gerdes said that he would give documents to the SCL team, including: --Mike Borysewicz's 2006 Bat inventory --USFS Cave Management Handbook --a paper on Big-eared Bats on the Deschutes River National Forest for additional background biological information --USFS Bat roost and hibernacula survey guidelines --*Scientific Approaches for Evaluating Hydro-Project Effects,* Stillwater Sciences	Comment acknowledged.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes suggested adding interviews with local spelunking groups as a method to gain information.	Comment acknowledged.

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
				Mike said he has other comments that are relatively minor that would be provided in the versions of the study plans that he is preparing.	
Draft Terrestrial Study Plans: Big Game					
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes asked if the reservoir ever froze, and if so, pointed out that that could increase predation of deer and elk at the edge of the reservoir, within the fluctuation zone. Mike suggested that SCL clearly identify that potential impact in the fluctuation zone.	There have been some reports of the reservoir freezing, and that potential impact will be included in the study plan.
Verbal	7-26-06	D. Robison	WDFW	D. Robison said that Steve Zender has a lot of personal observations in the local area relative to big game. Doug encouraged SCL to have their technical consultant contact Steve before beginning studies.	SCL will make sure that happens.
Verbal	7-26-06	D. Robison	WDFW	D. Robison asked if SCL would be evaluating the effect of road density on species. He asked if road usage, timing, and seasonality would be included in the evaluation.	SCL will be evaluating the effect of road densities on deer and elk, and would include usage, timing, and seasonality.
Verbal	7-26-06	G. Koehn M. Gerdes S. Sorby	USFS USFS POC Weed Board	G. Koehn noted that there is quite a bit of snowmobile activity on the east side of the reservoir, although it is closed to snowmobile use. M. Gerdes said that information on violations could be useful to the USFS. S. Sorby added that a study conducted in Idaho showed very high snowmobile use in closed areas.	A qualitative first step could be speaking with USFS and local enforcement agencies to gain information on the number of snowmobile violations. That could be followed by winter surveys checking for tracks to see if this is an issue that needs more attention.
Verbal	7-26-06	D. Robison	WDFW	D. Robison commented that animals could potentially be trapped in areas exposed when the reservoir is low and then cut off from escape routes when refilled. He said he thought it would be valuable to examine bathymetry to isolate these areas and see if there are available escape routes.	This condition would be expected only if there were benches or beaches at the base of cliffs exposed at low water levels that were inundated at higher pools. Many areas of the reservoir downstream of Metaline Falls are bordered by sheer cliffs that go straight into the water even under low pool conditions and so would not trap animals. The reservoir level rises slowly, but SCL could further

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
					discuss this issue and review bathymetry. SCL will have more information on the rate of rise and flows when the hydraulic routing model is completed.
Verbal	7-26-06	M. Gerdes D. Robison	USFS WDFW	M. Gerdes commented that the fluctuation zone is no longer functioning as its historical habitat type, and that the fluctuating reservoir is precluding habitat development. He thought SCL should consider the loss of that habitat to big game. D. Robison noted that this is an issue in other studies and should be addressed globally.	This idea would extend to other studies, particularly the: *Riparian Tree and Shrub Inventory and Waterfowl/Waterbird Study. The RTE Plant Inventory* would identify any RTE species growing in the drawdown zone and the *Bat Survey and Habitat Inventory* would identify caves down to about 1950 ft using the oblique photographs taken prior to filling the pool in 1965. SCL understands that reservoir fluctuation affects the ability of wildlife to use habitat in the drawdown zone and would need to give some thought as to how to address this issue.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes said that in mapping shoreline conditions, he thought it would be valuable to include aspect and nearby facilities.	Those inclusions will be added.
Verbal	7-26-06	M. Gerdes D. Robison	USFS WDFW	M. Gerdes asked what method would be used to assess big game use in shoreline segments. He said that if the intent is to map locations where animals are accessing the shoreline, methods other than ocular estimates may prove more successful (such as pellet groups). Mike suggested a potential mix of approaches, perhaps in the following order: 1) talk to people with local knowledge about access sites; 2) do ocular estimates, but stratify timing; 3) if high densities are noted, go to pellet groups. D. Robison added that looking at impacts on browse can add to observations.	SCL had planned on using ocular estimates for ease of access and best use of time. It makes sense to use an approach such as that suggested by Mike.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes asked when stakeholders could expect to	All study plans will be posted in

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
				see revised study plans.	track changes before the August 15, 2006 workgroup meeting. SCL may not be able to post the documents within seven working days before the meeting, but it would do its best to post them as soon as possible.
Verbal	7-26-06	G. Koehn	USFS	G. Koehn noted that the USFS needs to file comments on the Pre-Application Document at the end of August. He said that notwithstanding workgroup discussions, SCL may get some comments and requests for study plans that they haven't seen before. He also indicated that the USFS comments will include their changes to existing studies discussed at work groups. G. Koehn said that he did not note any issues that had not been addressed in workgroup meetings; there were potentially just different takes on how studies would be done to be able to meet their policies and standards. There may be one or two additional study requests as well, such as a roads study.	Comment acknowledged.
Verbal	7-26-06	M. Gerdes	USFS	M. Gerdes added that an Analysis/Synthesis integration of studies would be broken out as a study request.	Comment acknowledged.
Verbal	8-15-06	M. Gerdes	USFS	M. Gerdes said that he would like to see an evaluation of the entire drawdown zone to 1,950 feet, including an estimate of vegetation that could be expected to develop if the reservoir didn't fluctuate down to that level.	SCL noted this request in the discussion on the Riparian Tree and Shrub Inventory.
Verbal	8-15-06	M. Gerdes D. Robison	USFS WDFW	M. Gerdes said he would be comfortable identifying key winter areas and establishing a few pellet transects in those areas. If no useful data are collected, then SCL could abandon that approach. D. Robison added that he would like WDFW biologists to review this plan and he would get those comments to SCL as soon as possible.	SCL was concerned that the level of effort in pellet counts may be high with little result. SCL cited a 20-year study conducted in Canada, downstream of Boundary Dam, wherein a high level of effort was invested using pellet counts with minimal data obtained in years when population levels were low. A single

Comment format	Date	Stakeholder	Affiliation	Stakeholder comment	SCL response to comment
					year of pellet counts (or even 2 years) represents a "snapshot" and may not provide useful data, particularly if big game populations in the Project vicinity are low in the winter of 2007-2008. SCL would like to hear the perspectives of the WDFW biologists who are familiar with the big game populations in the area.

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Region 1 Office: 2315 North Discovery Place, Spokane Valley, WA 99216-1566 - (509) 892-1001
HABITAT PROGRAM
Major Projects Division

June 15, 2006

Michele Lynn
Senior Environmental Analyst
Environment and Safety Division
Seattle City Light
P.O. Box 34023
Seattle, WA 98124-4023

SUBJECT: WDFW Comments on Proposed Waterfowl / Waterbird Surveys, dated 5/5/06, Boundary Hydroelectric Project, FERC No. 2144.

Dear Michele,

The Washington Department of Fish and Wildlife (WDFW) has reviewed the above referenced document, and we offer the following comments.

Generally, the proposed survey for waterfowl and waterbirds is good and we only have a few comments and questions.

In the section on Nexus Between Project Operations and Effects on Resources, it is stated that, "Potential effects of water level fluctuations on these species include: (1) reduced availability of nesting habitat, and (2) direct flooding of low-elevation nests during the egg laying or incubation stages…" We are particularly interested in these two potential effects. The study goals and objectives are to characterize any effects of Project operations on waterfowl, waterbirds, shorebirds, and other water-dependent birds. This includes evaluating the impact of reservoir water level fluctuations on the availability of suitable nesting habitat and the degree of nest failure due to flooding. The Need for Additional Information includes the extent to which water level fluctuations may directly flood nests or affect nesting and rearing habitat for these species.

It is not clear how the Proposed Methodology, which looks at water level fluctuations, adequately or thoroughly address the study goals and objectives, and the nexus to Project

operations. One of the bullets under the Methodology section is for a Nesting Habitat Assessment. Under Task 2, it states that this will only be for current operations, and furthermore, it states that it will be a characterization of the habitat. Characterizing habitat under current operations then evaluating impacts to habitat under current operations will likely dismiss the true effects of the Project. It appears that Project influences on water levels above Metaline Falls are within the natural hydrological range or the natural hydrograph. Therefore, it would seem more appropriate to be comparing a natural hydrograph to the timing and range of Project operations in order to adequately assess and evaluate the impact that manipulating reservoir levels may be having on waterfowl and waterbird habitat and timing of life history needs.

In the Proposed Methodology, there is a discussion on water level fluctuations. It states that the elevation of the nests relative to the current water level will be measured. It also says that the elevations of nests will be evaluated relative to the normal water level fluctuations at nearby points on the reservoir, as measured by transducers installed for the Hydraulic Routing Study. Normal water level fluctuations can be construed to mean natural fluctuations or Project manipulations. Please clarify this statement. It is unclear how the hydraulic routing and varial zone models will be used with nest elevation data. Please elaborate on the methods that will be used. Water levels may be changing during the survey on any particular day, so there should be some explanation on how the data may be normalized so equivalent comparisons can be made throughout the survey and for the season and compared to the natural hydrograph. This section also states, "If an adequate number of nests are located, nest success, fledging rates, and other parameters will be calculated." What is an adequate number? How does this relate to the proposed methodology?

Data that will be recorded includes: elevation of ground nest (recorded relative to the current water level) and horizontal distance from water's edge. There should be some static reference mark or elevation for purposes of comparison. A nest recorded one day may be 20 feet from the water, and on another day, a neighboring nest may be 10 feet from the water's edge. The nests may be side-by-side but have different distances from the water's edge. How is the water's edge defined? Is it at full pool for that location or is it the pool elevation at the time of the nest elevation measurement? What makes most sense for characterizing nesting habits with regard to Project operations and effects?

The above issues should be considered and clarification should be provided in a revised proposal. Please reflect any changes in the section on Work Products as well.

We appreciate the opportunity to review this proposal and provide comment. If you have any questions, you may contact Doug Robison by email (robisdlr@dfw.wa.gov) or by phone at 509-892-1001 ext. 322.

Best regards,

Doug Robison
Mitigation Coordinator

From: Michele Lynn
To: Robison, Doug
Date: 7/7/2006 2:25:37 PM
Subject: Re: Bat Survey comments

Doug,

Thanks for the additional comments. We'll review them and let you know if we have any questions.

Michele

>>> "Doug Robison" <robisdlr@DFW.WA.GOV> 07/07 10:39 AM >>>

Michele,

Here area a few comments on the Bat Survey and Habitat Inventory proposal.

- Missing reference for citation (Johnson and Cassidy (1997).
- WDFW is working on a draft Conservation Plan for bats, but it will not be available for another month.
- For more info on bats in the project area you may want to contact Joyce Whitney of BLM. They may have conducted surveys in this area. I don't have her number though.
- For cave and tunnel surveys, please list the protocol that will be used.
- When they mist net, they may want to use a zip line method to collect "local" calls to create a local call library of bat calls which will make there analysis & identification of sounds more reliable. Call Pat Ormsby who is a bat specialist working for USFS at 541-225-6442 for more information.

Thanks,

Doug

CC: gkoehn@fs.fed.us

From: Michele Lynn
To: ssorby@cahnrs.wsu.edu
Date: 8/11/2006 10:04:55 PM
Subject: Re: Tuesday Meeting

Sharon,

Thanks for your message. I'm sorry you can't make the meeting but I'm happy to hear that you're feeling good about how things are going. Please be sure to contact me if you have additional thoughts about the study plans, either before or after they are filed with FERC.

Take care,

Michele

Michele Lynn
Senior Environmental Analyst
Environment and Safety Division
Seattle City Light
206-386-4578 - phone
206-386-4589 - fax
michele.lynn@seattle.gov
>>> Sharon Sorby <ssorby@cahnrs.wsu.edu> 08/11/06 2:31 PM >>>
Hi Michele,

I won't be able to make it to the meeting Tuesday. I'm good with all we've discussed to date. Hopefully I'll see you next time. I had a very enjoyable day out with Rich and Rachel. I'm very comfortable with their attention to detail and feel they've done a good and thorough job in the project area.

Sharon

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CC: LynnM@Seattle.Gov

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Region 1 Office: 2315 North Discovery Place, Spokane Valley, WA 99216-1566 - (509) 892-1001
HABITAT PROGRAM
Major Projects Division

August 28, 2006

Michele Lynn
Environment & Safety Division
Seattle City Light
P.O. Box 34023
Seattle, WA 98124-4023

SUBJECT: WDFW Comments on Study Proposals, Boundary Hydroelectric Project, FERC No. 2144.

Dear Michele,

The Washington Department of Fish and Wildlife (WDFW) has completed review of the various study proposals developed to date and offers the following comments. While many of our comments and concerns have already been expressed in workgroup meetings and may be repeated here, we have a few additional comments. Comments are listed by study proposal.

Botanical and Wildlife Resources

Rare, Threatened, and Endangered (RTE) Wildlife Species Study:
On page 5 under the Summary of Existing Conditions, more recent information is available on bald eagle nests. Please consult with WDFW District Wildlife Biologist, Steve Zender and contact the Wildlife Program in Olympia for current Heritage data: request Gretchen Blatz (360-902-2484).

Additionally, please add the Rocky Mountain Tailed frog and Black swift to the list of species potentially occurring in the Boundary Project vicinity. Tailed frogs are found in adjacent BC and ID and could be found in fast steams in the Project vicinity (e.g. Slate Creek). A Black swift nest was reported at Lime Creek. These swifts nest under

waterfalls and should be looked for in such places, e.g. PeeWee Falls. Summer evenings are the best time to look for them near the falls.

Special emphasis on searching for peregrine falcon nests would be appropriate and appreciated.

Please add the pine marten to the species list. They occur in the mountains on each side of the study area and could likely occur in the study area. The study area may be important for habitat connectivity and movement as well.

Table 5.1.4-2 needs to be revised. There are more nests now and additional information is available. Please consult with WDFW District Wildlife Biologist, Steve Zender and contact the Wildlife Program in Olympia for current Heritage data. For example, WDFW has monitored a nest at Z Canyon for many years that is not listed in the table.

Tables 5.1.4-3. To our knowledge, frog surveys were conduced in ponds only. We would like to see surveys conducted in fast flowing streams: tailed frogs should be included in the survey.

Identifying potential threats to RTE wildlife species or their habitats, including potential project effects is included in the study goals and objectives. Work products include a discussion of potential threats and Project impacts to RTE species occurring in the study area. We hope that a substantial effort will be made in quantifying or qualifying Project related impacts to RTE species in and around the Project area.

Big Game Study

The first sentence mentions migration between seasonal ranges. We believe big game likely cross the Pend Oreille River to extend home range use, disperse juveniles, and to escape predators and hunters. Seasonal migration may only be one of the reasons big game cross the reservoir.

On page 2, game management for PMU No. 10 is only a draft and is not applicable for a small area such as the Project area. GMU 109 is now divided into GMU 108 and 111, and covers the Project area. GMUs north of the Spokane River (111 & 113) are managed to encourage elk population growth for recreational hunting opportunities. In 2005, deer harvest in GMU 111 was 497, and for GMU 113 it was 653. Please see Go Hunt on our web site or additional information.

Page 3: Elk were introduced to the Pend Oreille River basin in 1932 and by 1950 they were on both sides of the river. Please see the Draft Selkirk Elk Plan on our web site under Wildlife Science.

Page 7, Task 2 – Map Shoreline Conditions: For likely locations for big game concentrations, look at nearby cropland (esp. oats) as well.

Page 8, Task 3 – Big game use along shorelines: Documenting deer and elk use along the various reservoir segments may be difficult by boat alone due to the low vantage point and high bluffs. For better results, it may be necessary to get on top of the bluffs and into the canopy. About the fourth paragraph down, it is stated that the availability of forage species will involve a qualitative assessment of the vegetation with the shoreline segments. We recommend looking outside the 200 foot Project area for high value forage habitat, such as agricultural crops, that may have a strong influence on the location of movement corridors.

For winter use determination, we support the use of pellet group counts; however, we are concerned about the effectiveness of pellet counts in winter due to snow fall and cover. Pellet counts are frequently conducted in March and April, after the snow melts. Other potential methods appropriate for determining winter use include remote cameras and snow tracking. Snow tracking would provide good data on game trails. Remote cameras would be good for data on species and frequency hits per day.

In the introduction on the first page, it is stated that the Big Game Study will assess Project effects on big game, their habitats and travel corridors. In the section on Work Products, there is bullet only for a discussion of potential threats and Project impacts to big game shoreline habitats. The work product needs to reflect the goals and objectives of the study; therefore, please add to the discussion/assessment/analysis Project effects on big game access, use and travel corridors.

<u>Waterfowl / Waterbird Study</u>
Under the Study Goals and Objectives (page 4), second bullet, please define the drawdown zone for the lowest normal reservoir operating level and how it is determined. In the third bullet, please clarify that the interest in reservoir water level fluctuations is focused on Project operations (as indicated in the section on Project Nexus) and not necessarily natural influences. There are other places in the document where this should be clarified as well.

On page 5, middle paragraph, there is a discussion on the constriction at the site of Metaline Falls that slows the passage of water. There is also a statement that concludes that the rate of change in water surface elevation is greatly smoothed out in the reservoir upstream of Metaline Falls as compared to the downstream portion. It should be clarified that this is for drawdowns only: the opposite would be true for a spring freshet when the constriction can cause to water to backup. The Project affects water levels above Metaline Falls and therefore may exacerbate the rate and magnitude of the stage increase at this location. As noted in the section on Project Nexus, stage increases are of particular concern regarding waterfowl and shorebird nesting. It is also stated that between 1987 and 2004, the daily water level fluctuation during the April-August waterfowl nesting and young rearing season was as much as 12.6 feet. It should be noted where this was measured. Our focus is above Metaline Falls, so references on stage fluctuation should be at this location (PAD Table 3.4-3 is for the Boundary Dam forebay water surface elevations).

In the Study Goals and Objectives (page 4), it is stated that one of the primary goals is to characterize any effects of Project operations on waterfowl use and nesting habitat. The section on Work Products (page 8-9) basically includes maps, methods and survey data. The Work Product section should include a discussion/assessment/analysis of the primary goals of the study, i.e. the potential effects of Project operations.

Inventory of Riparian Trees and Shrubs

The title indicates that information gathered will be an inventory of riparian trees and shrubs. In the introduction, it is stated that the proposed inventory will provide information that is required for the relicensing analysis of Project effects on riparian tree and shrub habitats. On page 4, Study Goals and Objectives, it is indicated that the goal of the inventory is to provide information needed to assess Project effects on these species. Currently the section on Work Products does not reflect the intent or goal of the inventory. Please include as a work product a discussion/assessment/analysis of the primary goals of the study, i.e. the potential effects of Project operations on riparian trees and shrubs.

On page 2, the first bullet, (and other places in the document) please clarify water level fluctuations to differentiate Project operations from natural water level fluctuations. It is important to be able to identify how the Project is influencing riparian habitats.

****

We appreciate the opportunity to review these proposals and provide comment. If you have any questions, you may contact me by email (robisdlr@dfw.wa.gov) or by phone at 509-892-1001 ext. 322.

Best regards,

Doug Robison
Mitigation Coordinator

Seattle City Light

Memorandum

DATE: August 28, 2006

TO: Consultation file

FROM: Michele Lynn

SUBJECT: Follow-up conversation with Doug Robison (WDFW) re: PSP terrestrial study plans

Colleen and I spoke with Doug Robison by phone to discuss the written comments he provided this morning. The conclusions/decisions we reached are briefly summarized below:

RTE Wildlife Study

Item #1 - Colleen will contact the WDFW biologist to get current information. If the informatin can be made available immediately, it will be incorporated into the PSP.

Item #2 - Colleen explained that the Rocky Mountain Tailed frog is not known to occur in the vicinity of Boundary Dam; the only documented locations in the state are in southeaster Washington. There are known populations in the mountains of southeastern British Columbia and in the Idaho Panhandle, but none of these are in Selkirk Range, which is the range closest to the Project. Doug agreed to omit it from the list if we think we'd be going too far afield to include it. The Black swift will be added to the list; during the seasonal surveys, biologists will be on the lookout for Black swift nests. Clarification will be made in PSP.

Item #3 - Colleen explained that there are no protocol surveys for peregrine falcons but agreed that biologists will keep an eye out for nests during the seasonal surveys. Clarification will be made in PSP.

Item #4 - Pine marten is on the list but it is referred to as marten. No action needed.

Item #5 - Same response as Item #1.

Item #6 – Colleen explained that none of the RTE frog species potentially occurring in the study area are stream-dwelling species, therefore this comment doesn't apply. Colleen mentioned that the folks doing Aquatics surveys/studies will be asked to keep an eye out for amphibians. Doug mentioned that WDFW is interested in conducting statewide inventories for amphibians, and would therefore appreciate any information we collect during our surveys. No action needed.

Item #7 - This is the same issue Doug brought up at the August 15 workgroup meeting. Colleen explained that a separate task will be added to all the terrestrial studies that identifies potential threats/effects associated with the project. She said that, in the bigger picture, each study will serve as a snapshot of the issues and it will all be pulled together in the final integration analysis that will be in the license application. Doug said he appreciated that but also wants to reiterate that we should collect as much pertinent information as possible to help arrive at an understanding of what the project effects are. I said that SCL is equally interested in documenting project effects and will do its very best to collect data in a way that satisfies that interest. No action needed.

Big Game Study

Item #1 - WDFW wants to make sure we aren't singularly focused on this one aspect of movement across the reservoir. Colleen will revise the PSP to acknowledge this concern.

Item #2 - Colleen will refer to the references provided to get the most up-to-date info.

Item #3 - This clarification will be included in the text.

Item #4 - Doug explained that locations of croplands could be used to help identify areas where animals might be accessing the reservoir. That is, if an animal is feeding in an agricultural field, it might be accessing the shoreline in an adjacent location. We agreed that this would be useful information. The PSP will be revised to note that segments of the reservoir shoreline that are in close proximity to the reservoir should be used to focus survey efforts to determine big game use.

Item #5 - WDFW is concerned that if we look for animals exclusively by boat, we'd likely miss a lot of them. Colleen said that the first step would be to conduct a GIS exercise to assess where animals might be using the shoreline, targeting areas that should be followed up by foot surveys. She clarified that we aren't likely to spend much time on the high cliffs since access to the shoreline from these sites would be limited. Colleen also said that it will be necessary to conduct surveys by foot in the Boundary Wildlife Preserve since a good portion of the area isn't visible by boat. She will revise the PSP to address these concerns.

RE: the last sentence in Item #5 - this is the same point made in Item #4.

Item #6 - Doug explained that conducting pellet counts in winter could potentially reveal only the most recent pellets, as snow would cover other ones. This would be a misrepresentation of the numbers of animals out there. Colleen said that pellet counts

will be scheduled to occur after the snow melts to address this concern. She agreed that snow track counts can be a good indicator of winter use but was concerned that these surveys could be difficult to schedule and conduct; it might be possible to include them as something that would be done incidental to other field work under appropriate conditions.

Item # 7 - Same as Item #7 under RTE Wildlife.

Waterfowl/Waterbird Study

Item #1 - I reiterated that SCL's goal is to conduct the analysis of "lowest normal reservoir operating level" by the end of 2006 and that we don't have enough info. at this time to explain the process/methods that will be used. Doug explained that this is a recap of his comments from the August 15 meeting and he was just taking the opportunity to formalize his concern. No action needed.

RE: the second part of Item #1 - I explained that SCL will attempt to tease apart natural vs. Project-related influences to the degree that it's possible, as we have an interest in knowing one influence from the other. Doug said he understands this but that WDFW is particularly interested in Project-related effects. No action needed.

Item #2 - Again, Doug wants to go on record with his concern about the Project's influence above Metaline Falls. He mentioned that he read the summary from FERC's public scoping meeting and noted the comment from Carl McKenzie about flooding on his property in Metaline. He is tracking this issue from all sides and wants to make sure we're also tracking it closely. Doug also said that the way the topic is characterized in the PAD, it could be interpreted as if the Project has only a beneficial effect (re: attentuation of flows); he wanted to make it clear that the Project has impacts above the falls and these impacts need to be understood. I assured Doug that we share his interest and are doing all we can to understand the influence the Project has on flows above the falls, as well as below. No action needed.

Item #3 - Same issue as with all other study plans.

Riparian Tree and Shrub Inventory

Items #1 and #2 - Same issues as with other study plans.

Attachment 5-2: Threatened, Endangered, and Sensitive Plants Survey Field Guide

United States
Department of
Agriculture

Forest Service

**Rangeland
Management
Staff**

Washington, DC

March, 2005

Threatened, Endangered And Sensitive Plants Survey

Field Guide

USDA Forest Service
Threatened, Endangered and Sensitive Plants
Survey Field Guide

March, 2005

USDA Forest Service
Threatened, Endangered and Sensitive Plants
Survey Field Guide

March, 2005

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USDA Forest Service
Threatened, Endangered and Sensitive Plant
Survey Field Guide

Overview

General Description

Plant surveys typically consist of searching a specific geographic area to determine the presence of particular species, or to evaluate the habitat suitability for those species in that area. Surveys are commonly conducted to search for threatened, endangered and sensitive (TES) plants. Tracking of "watch" species, or species of concern at a Forest level, may also be accomplished using this protocol. The purpose of this protocol is to describe corporate data standards and attributes that summarize information about a TES Plant Survey. It is important to know where and when these surveys were conducted, even if the object of the survey (the target species) was not located. Although lack of detection does not absolutely prove lack of presence, information on the absence of a rare plant species can be as valuable as information on the presence of the species in a specific area. The ***USDA Forest Service TES Plant Survey Protocol*** is a consistent way to record the date, surveyor(s), location, type, target species, and results for a survey.

The TES Plant Survey Protocol is used to document the actual search or survey process. When a target species is located, data about the distribution and condition of that particular population is recorded using the ***USDA Forest Service TES Plant Element Occurrence Protocol*** (USDA Forest Service. 2005).

Plant surveys are conducted for a number of legal, policy and management reasons. A project proposal, such as a timber sale, prescribed burn, or road construction, will often require a survey under the auspices of the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and USDA Forest Service policy. In such cases, the purpose for the survey is to locate any threatened, endangered or sensitive plant species within the project area that might be affected by the proposed project. In other cases, the purpose of the survey may be to search for locations of TES plant species where potential habitat has been identified. Such "targeted" surveys are conducted outside the context of a project, and are typically used as part of a status assessment for specific species.

Some survey information needs to be compiled prior to fieldwork, including general survey location information, the target species, survey type and focus. This preliminary (or *Pre-survey*) information is needed by the surveyors to help them perform the survey, and map any detected element occurrences.

National Data Standards

Following a corporate approach for collection of TES plant survey data facilitates:

- data sharing within the agency
- data sharing with partners
- data storage, tracking and reporting
- program consistency and efficiencies

The national TES Plant Program has developed agency data standards for collection and storage of TES plant data. Beginning in November 2001, a program working group, consisting of the Regional Botanists and a group of botanists on the National Forests and Ranger Districts, provided the guidance for protocol development. In May 2004, the draft products were reviewed in detail by a larger group of field botanists across the agency, representing the program user community.

All of the corporate data standards and attributes published in this protocol are supported in the Natural Resource Information System (NRIS). A required set of core attributes must be collected during field work and electronically stored in the corporate NRIS application to meet the minimum business needs of this protocol. All other fields are considered optional and can be used as needed or conditionally required at the Regional or local level to meet specific objectives. Table 1 lists the required attributes for plant surveys. Some attributes are auto-generated and populated in the NRIS application from the polygon feature. Detailed attribute descriptions and collection standards follow later in this document.

Pre-Surveys and Active Surveys	Completed Surveys
Survey Polygon *(spatial feature)*	Survey Polygon *(spatial feature)*
Survey ID	Survey ID
Survey Status	Survey Status
Survey Area *(Auto-generated in NRIS)*	Survey Area *(Auto-generated in NRIS)*
Area Unit of Measure *(Auto-generated, acres)*	Area Unit of Measure *(Auto-generated, acres)*
State *(Auto-generated in NRIS)*	Survey Type
County *(Auto-generated in NRIS)*	Survey Focus
Region *(Auto-generated in NRIS)*	Visit Dates
National Forest *(Auto-generated in NRIS)*	Examiners
District *(Auto-generated in NRIS)*	Target species plant code(s) *(i.e. objects of survey)*
	Suitable habitat found *(for the target species)*
	Target species found
	State *(Auto-generated in NRIS)*
	County *(Auto-generated in NRIS)*
	Region *(Auto-generated in NRIS)*
	National Forest *(Auto-generated in NRIS)*
	District *(Auto-generated in NRIS)*

Table 1: Fields required by the USDA Forest Service TES Plant Survey Protocol

Pre-survey information can be entered into the NRIS TES Plants application, and reports generated that can be utilized by the field crews. Since some surveys may extend over many weeks, data can be entered into NRIS prior to the survey being complete (active surveys). Completed surveys must have all required fields populated.

Data can be recorded in the field using the standard field form for TES Plant Surveys (Appendix C) and then entered into NRIS using the TES Plants application. The NRIS application uses an ArcMap "Task Assistant" and Windows data entry forms to guide the user through a common workflow to enter and edit the spatial representation of the survey polygon and the associated attribute data. The data entry screens mimic the workflow as presented on the paper field form. Block headings on the paper form

correspond to tabs or buttons on the electronic forms. Future development work may also support field data entry on electronic portable data recorders (PDRs).

This TES Plant Survey Field Guide makes occasional references to the NRIS TES Plants computer application. However, the field guide is not meant to be a user guide for the NRIS application as a whole. User Guides, Administrative Guides, Stewardship Guides and other relevant information can be accessed via the NRIS FSWeb website (**http://fsweb.nris.fs.fed.us/)**

Area of Use

The TES Plant Survey Protocol is applicable to all vegetation types in terrestrial, riparian and aquatic environments. The protocol can be applied to surveys conducted on National Forest System (NFS) lands and other ownerships as appropriate.

Mapping the Survey Area

This protocol requires spatially locating and delineating each survey to display the location and the extent of the survey. Spatial representation can be created by a number of methods:

- Hand-drawing the perimeter of the survey on maps or aerial photos, then redrawing the survey polygon within the NRIS TES Plants application;
- Using a GPS (Global Positioning System) device to define smaller areas, converting them to a shapefile, and importing the file into the ESRI SDE TESP layer using native ArcMap functionality;
- Digitizing the survey polygon with a computerized mapping system (Geographic Information System [GIS]) and importing it into the SDE TESP layer using native ArcMap functionality.

Regardless of the method used to delineate a plant survey in the field, the protocol requires that basic location information and the polygon be digitized and stored in ArcMap format. Survey polygons must be entered into NRIS before additional survey attributes can be entered.

To ensure consistency, the scale for hand-drawn survey polygons on maps should be 1:24,000. This is the scale of United States Geological Survey (USGS) 7.5-minute quadrangle (quad) maps. Note that maps with a variety of scales are utilized in Alaska. Aerial photos, orthophoto quads and remote sensing approaches can also be useful formats for delineation.

There is no minimum size for a delineated survey polygon. The NRIS application will allow very small surveys to be accurately depicted and located.

To facilitate consistency and information sharing in GIS, all TES plant surveys will be mapped and stored as polygons. Line and point data (layers) will not be supported. Surveys that could be mapped as “lines,” such as those occurring along ridges, streams, trails, or roadsides, will be stored as long, narrow polygons.

Figure 1 illustrates two possible ways in which a survey can be entered spatially using the TES Plant Survey protocol. In some cases the survey area may simply include one contiguous polygon (“Survey 1”), while in other cases a survey area may consist of adjacent subunits that are all part of the same survey (“Survey 2”). For example, a timber sale with multiple non-contiguous units that need to be surveyed for the same purpose and target species would be a multiple polygon survey. Survey data

apply to the ***entire*** survey. Detailed data for each separate polygon of the survey is not specifically tracked in the collection methods, field form, or NRIS application. Although each "subpolygon" will be drawn in the NRIS application, acres for all subpolygons comprising one survey are combined to calculate and auto-populate the survey area in the NRIS application. If there are significant differences in survey type, focus, or target species between polygons, it may be appropriate to identify and document them as separate surveys.

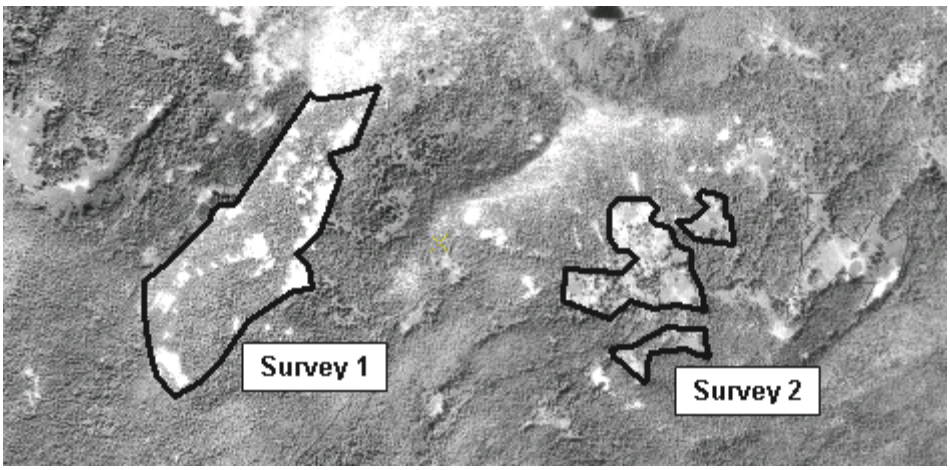

Figure 1: Survey 1 is single survey represented by one contiguous polygon. Survey 2 is a single survey represented by a multi-part polygon.

In addition to storing the spatial representation of the survey, the NRIS TES Plants application will automatically derive and populate required tabular geopolitical fields (State, County, Region, Forest and District) based on the location of the survey polygon feature in the NRIS application. Tabular location fields beyond those mentioned above are provided in the field form and the application, but are purely optional. These fields can be used to record a representative point or area for the survey when desired (available tabular location fields are outlined in the "Location Details Section").

GPS technology can be helpful in locating, mapping and relocating the survey. A photograph of the general setting and location may also be helpful but is not required.

Survey Field Form Instructions

Descriptions of data fields are presented below. Required data fields are also indicated in the description and on the attached field form. Category headings and field numbers correspond to the layout and naming conventions used on the attached TES Plant Survey Field Form. Fields that have a standard "List of Values" (LOV) associated with them are listed in Appendix B. The TES Plant Survey field form is found in Appendix C of this field guide.

General Information

1) Survey ID: *Required.*
Assign a unique identification number to the survey. Each survey should have a unique Survey ID at the Forest level. This field is the unique identifier for the survey polygon(s). The Survey ID can be any combination of numbers and letters, up to 30 characters in length. It is recommended that Regions establish and follow a consistent approach for labeling survey IDs. It is highly recommended that the combination of Region, Forest and District numbers form the first six digits of the Survey ID, followed by "S" and a unique survey number (example: RRFFDDS##### [060805S00055]). This convention will facilitate consistent tracking and reporting within regional data centers.
2) Survey Name:
Enter a descriptive label for the survey. Up to 240 alphanumeric characters can be used. Include the project type as appropriate in the survey name. Examples: *Salmon River Meadows Prescribed Burn* or *Elkhorn Timber Sale*.
3) Survey Status: *Required (LOV).*
This field is used primarily to support tracking in the NRIS TES Plants application and to indicate when survey results are ready for use in analysis. The application can be used to enter certain data prior to, during, or after survey field data collection. The "Survey Status" field tracks this information and includes five choices that are described in Appendix B.
Survey Quality Control (Q/C) Certification Flag: (NRIS application feature). A yes/no indicator that the completed survey information has been reviewed and accepted by the appropriate data steward and deemed ready for use in comprehensive analysis and data sharing *("no" is the default value until certified).* Survey Status must be set to "Complete" which indicates that all required field work and data entry is complete, before a survey can be certified. The certification date and person's name is auto-populated in the database form when the Q/C flag is switched to "yes." Only a person with the ***Data Steward Role*** can certify the survey within the NRIS application. Persons with the NRIS Data Entry Role can enter and edit data, including changing the survey status to Complete as appropriate. Once a Survey is flagged certified by the data steward, it is locked for general editing.
4) Source of Work: *(LOV).*
Indicate the primary work force used to perform the survey work. The List of Values is documented in Appendix B.
5) Survey Type: *Required (LOV).*
Enter the type of survey that was conducted. Up to three survey types may be entered. If the survey types are significantly different from one another, however, use the "Survey Comment" field to describe why. The List of Values is documented in Appendix B.
6) Survey Focus: *Required (LOV).*
Record the predominant focus of the survey from the List of Values. More than one choice can be recorded if survey target species occur in more than one of these general habitats. The List of Values is documented in Appendix B.

7) Area Surveyed: *Required.*
On the paper field form, record an estimated size in acres of the area within the survey perimeter. The actual area in acres, however, will be calculated and auto-populated from the spatial feature once the polygon is drawn in the NRIS application. A single survey may be comprised of more than one polygon. Acres for all polygons comprising a particular survey are combined to calculate and auto-populate the total survey area in the application.
8) Elevation:
For the spatial extent of the survey, record the maximum, minimum, and average (or "predominant") elevation of the area.
9) Elevation Unit of Measure: *(LOV).*
Record whether the unit elevation was measured in feet or meters. ***If elevation is entered this field is required.***

Geopolitical units, fields 10 – 14
Note that the descriptions for State, County, Region, Forest and District are found on page 13 of this guide. These fields are required on the field form but will be auto-populated in the NRIS application based on the survey polygon(s) drawn in the application.

15) Parameters of Survey:
Enter the parameters, strategies or ecological characteristics that were used to define or direct the survey. They could include such characteristics as habitat types, north slopes, calcareous soils, or distance in feet on each side of the road. Information in this field will be useful for interpreting survey results and for defining necessary fieldwork in pre-survey documentation. Text up to 2000 characters in length can be entered into NRIS.
16) Survey Comments:
This field is available to document any relevant information about the survey. Record general comments about the survey work, the survey area or findings. Include comments about specific visits, survey focus, land management within the survey area, etc., as needed. Text up to 2000 characters in length can be entered into NRIS.

Survey Visits

17) Visit Date(s): *Required.*
Plant surveys may be conducted over days, weeks and even months. The protocol allows you to record each day of field survey. The date format is MM/DD/YYYY. Record the calendar month, day, and year for all survey visits. These were the actual days that the survey was performed in the field and not the date(s) the data were entered into NRIS. Survey dates provide information about the time of year plants or habitats were observed. Surveys conducted at certain times of year may not reveal certain species that have already senesced or have yet to emerge in the spring. This field also indicates the age of the survey information, which may help identify the need for follow-up surveys.
18) Examiner(s): *Required (LOV).*
Record the last name and first name of all examiners present on any given visit date.

Target Species

19) NRCS Plant Code and 20) Scientific Name: *Required (LOV).*
Record all plant species (plant code and/or scientific name) that are the object of the survey. Codes for plant species must follow the USDA *PLANTS* database, plant symbols convention (USDA, NRCS 2002). Botanical nomenclature should follow a standard flora for the geographic area being sampled. Target species are typically determined via a pre-field review of information about the habitats that are known or suspected to occur in the survey area.

There is no limit to the number of target species that may be entered. It is a good habit to write out the name or a portion of the name on the field form to minimize misapplication of plant codes. The NRIS TES Plant application will auto-populate the entire scientific name when plant codes are entered, and can auto-populate the NRCS plant code when the scientific name is chosen from a standard list. Include the genus, species, and subspecies or variety as needed to properly identify the TES plant.

Plant lists can be created and stored in NRIS by the regional and local plant data stewards for repeated use in the TES Plant application. Many plant species can be quickly imported from a stored plant list to save data entry time for a long list of target species. The list of target species that is imported can then be modified to accurately represent the current survey.

21) Suitable Habitat Found: *Required (LOV).*
Habitat for a target species may be present even though the species itself may not be present. Record (yes/no) whether or not suitable habitat for each particular target species was found during this survey. This field may only be left blank if target species data are entered for pre-survey purposes or during an active survey while fieldwork is still ongoing. A yes or no must be entered for every target species before the survey can be considered complete. (Alternatively, if a target species initially included in a search list was not assessed in the field, the species name should be removed from the target species list in order to tag the survey as complete.)

22) Plant Found: *Required (LOV).*
Record (yes/no) whether or not an occurrence of each particular target species was found during this survey. This field may only be left blank if target species data are entered for pre-survey purposes or during an active survey while fieldwork is still ongoing. A yes or no must be entered for every target species before the survey can be considered complete. (Alternatively, if a target species initially included in a search list was not assessed in the field, the species name should be removed from the target species list in order to tag the survey as complete.)

23) FS Site ID:
If a target species is located during this survey, you are required to create an **Element Occurrence (EO) Record** for each unique occurrence of this species in the survey area. *FS Site ID* is a required field on the EO form *(refer to the USDA Forest Service TES Element Occurrence Protocol [USDA Forest Service. 2005)*. (**Note**: this ID number is separate from the "EO #" which is created and managed by the state Natural Heritage Program and Conservation Data Center offices.) Including the FS Site ID field on the paper survey form simply provides a link to any associated element occurrence records.

Species List of Surveyed Area

Optional. A list of all plant species found during the survey, or a partial list of species found to meet some desired criteria, can be stored for the survey area. The reasons for compiling species lists for surveyed areas include: 1.) developing floristic information for a Ranger District, National Forest or Grassland; 2.) assembling additional habitat characterization information for any associated TES plant species; and 3.) refining knowledge about the distribution and frequency of plant species on a Ranger District, National Forest or Grassland.

24) Completeness of Species List: *(LOV).*
An indication of how thorough the list of species recorded is for the survey area. ***If a list of species is recorded, this field is required.*** The List of Values is documented in Appendix B.
25) Cover Method: *(LOV).*
Required only if percent cover is recorded for any of the plant species on the species list. This field defines the method used for estimating cover: either a cover class set of codes or actual (continuous variable) estimates. **NOTE**: In this case, cover values are estimated and recorded for the survey polygon(s) as a whole (e.g., these values are **not** recorded using plot- or transect-based methods). The purpose for entering cover values in this case is simply to provide relative estimates that might be used to compare the general abundance of species in the survey area. As such, these cover values would **not** be appropriate for more rigorous quantitative analyses of vegetation data. If such rigorous data are desired, then the examiner(s) should use one of the appropriate vegetation protocols available such as ocular macroplot, cover-frequency, or line intercept (USDA Forest Service, 2003). The List of Values is documented in Appendix B.
26) Comments:
A text field to describe what guidelines were used for recording species or to give a text description of how complete or thorough the species list is. It is good practice to explain in this comment section what criteria were used to collect any partial plant list.
27) and 28) NRCS Plant Code and Scientific Name: *(LOV).*
Record all plant species (plant code and/or scientific name) that are to be included in the survey area plant list. Codes for plant species must follow the USDA *PLANTS* database, plant symbols convention (USDA, NRCS, 2002). Botanical nomenclature should follow a standard flora for the geographic area being sampled.

There is no limit to the number of species that may be entered. It is a good habit to write out the name or a portion of the name on the field form to minimize misapplication of plant codes. The NRIS TES Plant application will auto-populate the entire scientific name when plant codes are entered, and can auto-populate the NRCS plant code when the scientific name is chosen from a standard list. Include the genus, species, and subspecies or variety as needed to properly identify the plant.

29) Lifeform: (*LOV*).
Lifeform is defined as the characteristic form or appearance of a species at maturity. As desired, enter the lifeform code for each species recorded in the survey. The List of Values is documented in Appendix B.
29) Scientific Name: *(LOV*).
Refer to description under field 27.
30) Habitat:
Text field to briefly indicate the habitat in which that particular species was found in the survey area.

31) Percent Cover or Class: *(LOV)*.
Ocular estimates of canopy cover of live foliage for plant species are an effective way to quickly collect abundance information about plants. This information can be collected using direct values or by using established canopy cover classes. Indicate the cover class method used (field 25). Cover class codes come from a list of values, whereas actual estimates are recorded as a number from 0.1 to 100.0. Since survey areas can be large, these estimates are merely approximate values, and are intended simply to give a general picture of the composition and relative abundance of species in the area. See the note in the description of field 25 regarding the use of cover data in this form. The List of Values is documented in Appendix B.
32) Non-Native: *(LOV*).
Flag any species (y = yes) recorded on the list that are considered to be non-native plants. Refer to the USDA *PLANTS* database for this specification (USDA, NRCS 2002).

Location Details

This protocol requires spatially delineating each survey to display the location and the extent of the survey (refer to *Mapping the Survey Area* on page 5). In addition to storing the spatial representation, the NRIS TES Plants application will automatically derive and populate required tabular geopolitical units in the application based on the location of the survey polygon (State, County, Region, Forest and District fields).

Geopolitical Units

It can be useful to record the political or administrative units on the field form. A survey may span two or more geopolitical units for any particular field. For example, a survey may extend across a state, county or National Forest boundary. In this case, record all that apply.

10) State: *Required (LOV).*
Record the code for the state (or states) in which the survey is located. These codes are the same as the postal state codes. State codes will be auto-populated in the application when the spatial feature (survey polygon[s]) is entered.
11) County: *Required (LOV).*
Record the county (or counties) in which the survey is located. County codes will be auto-populated in the application when the spatial feature (survey polygon[s]) is entered.
12) Region: *Required (LOV).*
Record the Forest Service Region (or Regions) in which the survey is located. Region codes will be auto-populated in the application when the spatial feature (survey polygon[s]) is entered. This field is not required when ownership is on non-Forest Service lands.
13) National Forest/Grassland: *Required (LOV).*
Record the National Forest or Grassland (or more than one) in which the survey is located. Forest/Grassland codes will be auto-populated in the application when the spatial feature (survey polygon[s]) is entered. This field is not required when ownership is on non-Forest Service lands.
14) District: *Required (LOV).*
Record the Ranger District (or Districts) in which the survey is located. District codes will be auto-populated in the application when the spatial feature (survey polygon[s]) is entered. This field is not required when ownership is on non-Forest Service lands.

Alternative Location Methods

Tabular location fields beyond those mentioned above are provided in the field form and in the application, but are purely optional. These fields can be used to record a representative point or area for the location of the survey, when desired.

Tabular data can be recorded about quad maps or for any of the three location methods described below.

A. Legal description
B. Latitude and Longitude
C. GPS UTM location

33) USGS Quad Number:
The number of the primary USGS quadrangle map containing the survey. These codes are stewarded nationally by the ALP application. *(Note: currently only one representative quad can be entered in the application and surveys may commonly cross into more than one)*

34) USGS Quad Name:
The name of the primary USGS quadrangle map containing the survey. These codes are stewarded nationally by the ALP application. *(Note: currently only one representative quad can be entered in the application and surveys may commonly cross into more than one)*

35) Forest Quad Number:
The locally stewarded number for the primary USGS quad map where the survey is located. *(Note: currently only one representative quad can be entered in the application and surveys may commonly cross into more than one)*

36) Forest Quad Name:
The locally stewarded name for the primary USGS quad map where the survey is located. *(Note: currently only one representative quad can be entered in the application and surveys may commonly cross into more than one)*

37) Legal Description (Public Land Survey System or "PLSS"):
For areas of the country where the Public Land Survey System is available, it is desirable and required to record this information to an appropriate level of detail **on the field form only**. Since legal descriptions will not be auto-populated in the NRIS application, this information must be manually entered into the NRIS TES Plants data entry form if it is desired to be electronically stored. (These fields can be used only to record a representative point or area for the survey, when desired.)

Meridian: (LOV).
Record the code for the line of longitude from north to south that is the basis for local legal descriptions. These lines are also known as Principal Meridians and have distinct names.

Township/Direction: (LOV).
A Township is a unit of land containing 36 mile-square sections. Townships run in rows that parallel the local Base line. Each Township row is sequentially numbered relative to the row's order from, and whether it's north or south of, the local Base line; e.g., T2N (for the second township row north of the local Base line). To accommodate fractions of townships an additional code is required after the Township number, where 0 will equal no fraction; 1 equals ¼; 2 equals ½, and 3 equals a ¾ township (see table of examples below).

Range/Direction: (LOV).
The Range numbers run parallel to the local Principal Meridian. Range rows are sequentially numbered relative to the row's order from, and whether it's east or west of, the Principal Meridian; e.g. R2E (for the second Range row east of the Principal Meridian).

Township/Dir & Range/Dir Example	Description
7 N 14 E	Township 7 North Range 14 East
7.1 N 16 E	Township 7 1/4 North Range 16 East
8.2 N 12.0 W	Township 8 1/2 North Range 12 West

Section: (LOV).
Each 36 square-mile township is subdivided into smaller squares called Sections. Record the Section where the center of the survey polygon is located. A Section is equal to one square mile, 2.59 square kilometers, 640 acres, or 1/36 of a township. *(Note: only one representative section can be entered in the application and surveys may commonly cross into more than one)*

Quarter Section: (LOV).
The quarter-section subdivision where the center of the survey polygon is located. For example: the NE quarter of section 4 (NE ¼).

Quarter, Quarter Section: (LOV).
The quarter-quarter section subdivision where the center of the survey polygon is located. For example: the NW quarter of the NE quarter of Section 4 (NW ¼ NE ¼).

Quarter, Quarter, Quarter Section: (LOV).
The quarter-quarter-quarter section subdivision where the center of the survey polygon is located. For example: the SE quarter of the NW quarter of the NE quarter of Section 4 (SE ¼ NW ¼ NE ¼).

Quarter, Quarter, Quarter, Quarter Section: (LOV).
The quarter-quarter-quarter-quarter section subdivision where the center of the survey polygon is located. For example: the SW quarter of the SE quarter of the NW quarter of the NE quarter of Section 4 (SW ¼ SE ¼ NW ¼ NE ¼).

38) Latitude and Longitude:

Degrees, Minutes and Seconds

Geodetic Datum: *(LOV).*
Record the geodetic datum for the latitude and longitude coordinates. Latitude and longitude in degrees/minutes/seconds will be automatically converted to decimal degrees.

Datum	Description
NAD-27	North American Datum of 1927
NAD-83	North American Datum of 1983
WGS-84	World Geodetic System (1984)

Latitude - Degrees:
(Range 0 to 90) The latitude degrees of the center of the survey as measured by GPS. (Default: North Latitude).

Minutes:
(Range 0 to 59) The latitude minutes of the center of the survey as measured by GPS. (Default: North Latitude).
Seconds:
(Range 0 to 59.99) The latitude seconds of the center of the survey as measured by GPS. (Default: North Latitude)
Longitude – Degrees:
(Range 0 to 180) The longitude degrees of the center of the survey as measured by GPS. (Default: West Longitude).
Minutes:
(Range 0 to 59) The longitude minutes of the center of the survey as measured by GPS. (Default: West Longitude).
Seconds:
(Range 0 to 59.99) The longitude seconds of the center of the survey as measured by GPS. (Default: West Longitude).

Decimal Degrees

Geodetic Datum: *(LOV).*
Record the geodetic datum for the Latitude and Longitude coordinates. See table above for datums.
Latitude Decimal Degree:
Latitude in a degree value. Consists of the latitude in degrees to at least 6 decimal places.

Code Example	Description
42.206088	Decimal degrees

Longitude Decimal Degree:
Longitude in a degree value. Consists of the longitude in degrees to at least 6 decimal places.

Code Example	Description
105.105206	Decimal degrees

39) UTM Location
UTM Datum: *(LOV).*
Record the datum for the UTM projection.

Datum	Description
NAD-27	North American Datum of 1927
NAD-83	North American Datum of 1983
WGS-84	World Geodetic System (1984)

UTM Zone:
The zone for the UTM projection. This can be obtained from quad maps or from GPS devices. UTM zone coordinates measure in meters east and north from two perpendicular reference baselines. (Up to two alphanumeric characters.)

UTM Zone Example	Description
13	Ranges from 1 to 60

Easting:
The distance in meters, east or west, from the central meridian of the UTM Zone, which is designated at a value of 500,000 meters.

Code Example	Description
71204000.52	Recorded to the hundredth of a meter.

Northing:
The distance in meters north from the equator from the UTM Zone origin, which is designated as a value of zero meters. (This protocol addresses only north latitudes.)

Code Example	Description
1687534000.25	Recorded to the hundredth of a meter.

40) GPS Equipment Used:
The manufacturer and model number of the GPS unit used. *(Note: this is not stored in NRIS at this time.)*

41) Metes and Bounds:
Metes and bounds is a system or method of describing property or real estate when it is surveyed**.** The system was used in England and, by custom, was applied in the original 13 colonies that became the United States**.** The system uses physical features of the geography along with directions and distances to define a piece of land. It is sometimes referred to as a *Boundary Survey*. The NRIS TES Plants application accommodates text up to 2000 characters in length.

Directions

42) Directions to Survey Area
A general description of the survey location, with directions as needed to return to the survey area. The NRIS TES Plants application accommodates text up to 2000 characters in length.

43) Sketch of Survey Area
Attach copies of air photos or quad maps with notations to identify the survey area, or include a sketch showing directions to the site, a map of the general location, or to display the location of the survey on the landscape. *(Not stored in NRIS at this time.)*

Appendix A - Literature Cited

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USDA, NRCS 2002. The PLANTS database, version 3.5. National Plant Data Center, Baton Rouge, LA ***http://plants.usda.gov***

Appendix B – TES Plants Survey List of Values

3) Survey Status: *Required.*

Code	Description
Pre-Survey	Prior to beginning fieldwork, information can be entered to help with survey planning and fieldwork preparation. In addition to the spatial survey boundary, the survey ID and survey status are required at this stage of data entry. If pre-field review information is available to formulate a target species list, that list may also be entered at this stage, and would enable printing a list of target species to take in the field.
Active Survey	Used when initial survey results are being entered into the application, but fieldwork (or data entry work) is not yet complete. Since surveys may span an extended period of time within the field season, it may be advantageous to begin data entry prior to the completion of fieldwork. This category indicates that the survey is incomplete and should not be used for final data interpretations. In addition to the spatial survey boundary, the survey ID and survey status are required at this stage of data entry. "Active" will be the default value for this field in NRIS until set otherwise.
Inactive Survey	Surveys that have been suspended for a variety of reasons, including when the proposed project that required the survey is postponed or suspended.
Cancelled	Surveys that are stopped before they are completed because the proposed project that triggered the need for the survey was cancelled, or for other relevant reasons, including funding and personnel changes or modified priorities.
Completed Survey	Fieldwork and data entry work are complete for the survey, and survey data are ready to be certified for analysis. The survey polygon and all required fields from the field survey protocol must be entered before the status field of "Complete" can be used in the application.

4) Source of Work:

Code	Description
Force Account	Seasonal or permanent Forest Service employees
Contract	A contracted work crew or consultant(s)
Volunteer	Survey provided by unpaid volunteer(s)
Academia	Faculty, graduate student(s) or researcher(s) from an academic or research institution
Historic	Survey conducted previously, with source of work unknown

5) Survey Type: *Required.*

Code	Description
Field Check	In a Field Check, the survey area is given a quick "once over" but the surveyor does not walk completely through the project area. The entire area is not examined.
Cursory	A Cursory survey is appropriately used to confirm the presence of species of interest identified in previous surveys or in the pre-field analysis. By its nature, the cursory survey is rapid, and does not provide in-depth environmental information. The entire area is traversed at least once. For example, stand condition as seen in aerial photography can be verified by a cursory survey. Also, a cursory survey can be used to determine if a plant population that had been previously documented at a site remains present or intact.
General	The survey area is given a closer review by walking through the area and its perimeter or by walking more than once through the area. Most of the area is examined
Focused (Intuitive Controlled)	The Focused, or Intuitive Controlled, survey is the most commonly used and most efficient method of surveying for TES plants. During pre-field analysis, potential suitable habitat is identified for each species of interest and the survey effort is focused in those areas. This method requires adequate knowledge of suitable habitat in order to accurately select the areas of focused searching. When conducting intuitive controlled surveys, an area somewhat larger than the identified suitable habitat should be searched to validate current suitable habitat definitions.
Random	Random surveys employ an undirected, typically non-linear, traverse through a project area. They are employed either when there is inadequate natural history information about a species to discern its suitable habitat and the surveyor is simply searching for occurrences, or when a target species is very abundant within a search area and the surveyor is attempting to make estimates of population parameters such as intra-patch variations in density or the occurrence of predation or herbivory. However, a stratified random survey may be more effective in these latter cases.
Stratified Random	The Stratified Random survey is most often used within known population areas of target species, or when an area to be surveyed is of unknown habitat suitability and is relatively large. Stratified random surveys employ a series of randomly selected plots of equal size within a project area that are each thoroughly searched for target species. When conducting a stratified random survey, it is important to sample an adequate number of plots that are of sufficient size if statistical inference regarding the survey area is desired (for discussion of sample designs, see Elzinga, C., *et al.* 1998)**.**
Systematic	The Systematic survey is typically used in limited areas where the likelihood of occurrence of a target species may be evenly distributed throughout the survey area. Systematic surveys are often employed either within focused search areas (e.g., stratified random and intuitive controlled methods), or when a proposed project is likely to produce significant habitat alterations for species that are especially sensitive to the proposed activities.

6) Survey Focus: *Required*.

Code	Description
Terrestrial	Upland areas.
Riparian	Areas of seasonal or periodic flooding and/or areas of transition from aquatic to upland areas.
Aquatic	Aquatic surveys are confined to surveys within water bodies such as springs, streams, lakes, ponds and irrigation canals. Vegetation can be classified as emergent, floating, hydrophytic, or submergent. For surveys that include the transition zone to uplands and areas of seasonal or periodic flooding, also record *riparian*.
Features	The survey focused on an area in and adjacent to developed features such as roads, trails, campgrounds, parking lots and boat launches.

24) Completeness of Species List:

Code	Description
Complete	Represents an attempt to list all species found. The survey area was surveyed intensively.
Reduced	Incomplete species list for some reason, e.g., partial search, only species above a certain cover value were recorded, etc. Indicate any specific criteria in the Comments field (field 26).
Selected	Only recorded species according to some selection criteria, such as only certain life forms, only species of specific interest, etc. Indicate any specific selection criteria in Comments field (field 26).

25) Cover Method:

Code	Description
DAUBEN	Daubenmire Canopy Cover Classes, modified to include trace.
NRMCOV	Cover Ten Codes - National Rangeland Methodologies Data Dictionary Canopy Cover Classes
Actual	The actual estimated canopy cover percent.

29) Lifeform:

Code	Name	Description
AL	Algae	A general name for the single-celled plant plankton, seaweeds, and their freshwater allies.
FB	Forb/herb	Vascular plant without significant woody tissue above or at the ground. Forbs and herbs may be annual, biennial, or perennial, but always lack significant thickening by secondary woody growth and have perennating buds borne at or below the ground surface. Federal Geographic Data Committee (FGDC, 1997) definition includes graminoids, forbs, and ferns; in

Code	Name	Description
		PLANTS, graminoids are separated.
FU	Fungi	A non-flowering plant of the kingdom Fungi, lacking chlorophyll.
GR	Graminoid	Grass or grass-like plant, including grasses (Poaceae), sedges (Cyperaceae), rushes (Juncaceae), arrow-grasses (Juncaginaceae), and quillworts (*Isoetes*). An herb in the FGDC classification (FGDC, 1997).
LC	Lichen	Organism generally recognized as a single plant that consists of a fungus and an alga or cyanobacterium living in symbiotic association. Often attached to solid objects such as rocks or living or dead wood rather than soil.
LI	Liana	Climbing plant found in forests with long, woody, rope-like stems of anomalous anatomical structure. A shrub in the FGDC classification (FGDC, 1997).
NP	Nonvascular	Nonvascular, terrestrial green plant, including mosses, hornworts, and liverworts. Always herbaceous, and often attached to solid objects such as rocks or living or dead wood rather than soil.
SH	Shrub	Perennial, multi-stemmed woody plant that is usually less than 4 to 5 meters or 13 to 16 feet in height. Shrubs typically have several stems arising from or near the ground, but may be taller than 5 meters or single-stemmed under certain environmental conditions.
SS	Subshrub	Low-growing shrub usually under 0.5 m or 1.5 feet tall (never exceeding 1 meter or 3 feet tall) at maturity. A dwarf-shrub in the FGDC classification (FGDC, 1997).
TR	Tree	Perennial, woody plant with a single stem (trunk), normally greater than 4 to 5 meters or 13 to 16 feet in height; under certain environmental conditions, some tree species may develop a multi-stemmed or short growth form (less than 4 meters or 13 feet in height).
UN	Unknown	Lifeform is unknown.
VI	Vine	Twining/climbing plant with relatively long stems, which can be woody or herbaceous. FGDC classification (FGDC, 1997) considers woody vines to be shrubs and herbaceous vines to be herbs.

31) Percent Cover or Class:

Modified Daubenmire Classes: Set Code = DAUBEN

Code	Cover Class	Mid Point
T	0 - 1.0%	0.5
1	1.1 - 5.0%	3.0
2	5.1 - 25.0%	15.0
3	25.1 - 50.0%	37.5
4	50.1 - 75.0%	62.5
5	75.1 - 95.0%	85.0
6	95.1 - 100%	97.5

National Range Management "Cover Ten Codes": Set Code = NRMCOV

Code	Cover Class	Mid Point
T	0.1 - 1%	0.50
0	1.1 - 5%	3.0
1	5.1 - 15%	10.0
2	15.1 - 25%	20.0
3	25.1 - 35%	30.0
4	35.1 - 45%	40.0
5	45.1 - 55%	50.0
6	55.1 - 65%	60.0
7	65.1 - 75%	70.0
8	75.1 - 85%	80.0
9	85.1 - 95%	90.0
A	95.1 - 100%	97.5
X	99.1 - 100%	99.5

Appendix C - USDA Forest Service TES Plant Survey Field Form

(® = Required Fields)

General Information

1) SURVEY ID: ®		**2) SURVEY NAME:**		
3) SURVEY STATUS: ®		**4) SOURCE OF WORK**:		
5) Survey Type: ®				
6) Survey Focus: ®				
7) Estimate of Survey Area Size (acres): ®				
8) Elevation: Min: Max: Average:				**9) Elevation UOM:**
10) State: ®	**11) County:** ®	**12) Region:** ®	**13) Forest:** ®	**14) District:** ®

15) Parameters of Survey (*Describe any ecological parameters, criteria or combinations of these used to focus the survey. (I.e., north slopes, specific habitat types, certain soils within certain forest conditions, etc.):*

16) Survey Comments *(Directions, area description, specific comments by visit date, etc.):*

Survey Visits

Required. Enter a Date (MM/DD/YYYY) and Examiners for each visit made.

17) VISIT DATE ®	**18) LAST NAME ® AND FIRST NAME OF EXAMINERS FOR EACH VISIT**

Target Species

Required. List all targeted plant species (TES, special forest products, or other species of concern) that are the focus of the survey. Enter all the species individually using the NRCS *PLANTS* code and/or scientific name. All columns are required.

19) ® NRCS Plant Code	**20) ® Scientific name**	**21) ® Suitable habitat found**	**22) ® Plant found**	**23) ® FS Site ID(s) for EOs (If EO forms completed)**

Species List of Surveyed Area

Optional. List other species found during the survey. Record the NRCS *PLANTS* Code, scientific name or both. Indicate habitat (locally defined), lifeform and cover abundance (all optional). Indicate non-native plants with "X"

24) Completeness of species list:	**25) Cover Method** *(if cover recorded):*

26) Comments *(e.g. details about species list approach, habitat focus, vegetation types or structure, etc.):*

27) NRCS Plant Code	28) Scientific Name	29) Life Form	30) Habitat	31) % Cover or Class	32) Non-native

Optional Location Information

Location information to represent the survey area may be recorded,
in addition to entering the spatial feature in the application

33) USGS Quad Number:	**34) USGS Quad Name:**
35) Forest Quad Number:	**36) Forest Quad Name:**

37) Legal Description: Required where public land survey is available.

Meridian: **Township and Range:**

Section:__ **Q Sec:___** **QQ Sec: ____** **QQQ Sec: ____** **QQQQ Sec: ____**

38) Latitude and Longitude (either in degrees, minutes, seconds or in decimal degrees)

Geodetic Datum:

Latitude: Degrees __ __ N **Minutes** **Seconds __ __.__ __**

Longitude: Degrees __ __ __ W **Minutes** **Seconds __ __.__ __**

GPS Datum:

GPS Lat. Dec. Degrees: **GPS Long. Dec. Degrees:**

39) UTM

UTM Datum: **UTM Zone:**

Easting: __ __ __ __ __ __ **Northing: __ __ __ __ __ __**

40) GPS Unit Used: Manufacturer:	**Model:**

41) Metes and Bounds:

42) Directions to Survey Area

43) Sketch of Survey Area

Attachment 5-3: Washington Natural Heritage Program Rare Plant Sighting Form

Washington Natural Heritage Program
Rare Plant Sighting Form

0 1 2 3 cm

Please read instructions page. Shaded boxes are for Natural Heritage Staff use only.

Taxon Name: _____ EO #

Are you confident of the identification? ❑ yes ❑ no Explain: _____

_____

Survey Site Name: _____

Surveyor's Name/Phone/Email: _____

Survey Date: _____ (yr-mo-day) County: _____

Quad Name: _____ Quad Code:

Township: _____ N Range: _____ Section(s): _____ 1/4 of 1/4:_____
(e.g. NW of NE)

Directions to site: _____

_____

_____

_____

Mapping (see instructions): Attach a copy of the USGS 7.5 minute quad with the location and extent of the rare plant population clearly drawn. Do not reduce or enlarge the photocopy or printout of the map. If your map is a different scale (not recommended) please write the scale on the map.
Please answer the following:

1. I used GPS to map the population: ❑ No (skip to #2) ❑ Yes (complete #1 & #3)
   ❑ Coordinates are in electronic file on diskette (preferred) ❑ Coordinates written below or attached
   Description of what coordinates represent: _____
   _____
   GPS accuracy: ❑ Uncorrected ❑ Corrected to <5m
   GPS datum:_____
   GPS coordinates:_____

2. I used a topographic map to map the population:
   ❑ yes (complete #2) ❑ no (provide detailed directions & description above, and skip to #3)

   I am confident I have accurately located and mapped the population at map scale: ❑ yes (skip to #3)
   ❑ no, but I am confident the population is within the general area indicated on the map as follows:
   On the same map, use a highlighter to identify the outer boundary of the area where the population could be, given the uncertainties about your exact location.

3. I used the following features on the map to identify my location (stream, shoreline, bridge, road, cliff, etc.):
   _____

To the best of my knowledge, I mapped the entire extent of this population
❑ yes ❑ no ❑ unknown If no or unknown, explain:_____

Is a revisit needed? ❑ no ❑ yes - if yes, why?: _____

Ownership (if known): _____

Revised April 2002 - see instructions

Population Size (# of individuals or ramets) or estimate: _____

Population (EO) Data (include population vigor, microhabitat, phenology, etc.):_____

_____

_____

_____

Plant Association (include author, citation, or classification, e.g. Daubenmire): _____

_____

Associated Species (include % cover by layer and by individual species for dominants in each layer):

Lichen/moss layer: _____

Herb layer: _____

_____

Shrub layer(s): _____

_____

Tree layer: _____

_____

General Description (include description of landscape, surrounding plant communities, land forms, land use, etc.):

_____

_____

_____

_____

_____

Minimum elevation (ft.): _____ Maximum elevation (ft.): _____

Size (acres): _____ Aspect: _____ Slope: _____

Photo taken? ❑ yes ❑ no

Management Comments (exotics, roads, shape/size, position in landscape, hydrology, adjacent land use, cumulative effects, etc.):

_____

_____

_____

_____

Protection Comments (legal actions/steps/strategies needed to secure protection for the site): _____

_____

_____

_____

Additional Comments (discrepancies, general observations, etc.): _____

_____

_____

Please mail completed form with map:

WASHINGTON NATURAL HERITAGE PROGRAM
DEPARTMENT OF NATURAL RESOURCES
PO BOX 47014, OLYMPIA WA 98504-7014

WASHINGTON STATE DEPARTMENT OF
Natural Resources

Instructions for Washington Natural Heritage Program Rare Plant Survey Form

(Form for external data contributors)

Please complete all sections except for the shaded areas. Those will be completed by WNHP staff.

Taxon Name: Please enter a complete scientific name.

Are you confident of the identification? If you had trouble with the identification, please explain why (e.g. immature or senescent plants, similarity to other species, etc.). If a specimen was verified by an expert on the taxon, please indicate, such as "verified by ....".

Survey Site Name: This should be a place name near the population, preferably something that appears on the USGS quad map. It should help someone, not intimately familiar with the area, locate this population.

Surveyor's Name: Enter the name(s) of the person who located the plant. Include their contact information so that they can be contacted if more information is need.

Survey Date: When was the plant located? Please use year-month-day format (e.g. 2001-07-05)

County: In what county is the site located?

Quad Name: Please enter name of the USGS 1:24,000 scale quad map where the site is located.

Township, Range, Section, and _ of _: Enter the legal description of this site. Quarter sections should be entered in the form "NW of SE", which indicates that the site is within the northwest quarter of the southeast quarter-section.

Directions to site: Please explain how someone else could relocate the site, starting from a named paved road.

Mapping: Attach a copy of the USGS 7.5 minute quadrangle map with the location and extent of the rare plant population clearly drawn. Do not reduce or enlarge the photocopy or printout of the map . If you're using a map at a different scale (not recommended) please write the scale on the map. Follow the three steps listed in describing your location. Include detailed comments here; these are useful to us.

> **1**. **GPS:** When mapping with GPS, the best way to submit data to us is to export this data to a floppy disk and mail with your survey from. Submitting a short list of GPS coordinate values is also acceptable. Whether you submit a disk or a list, please provide the accuracy and datum used by your GPS. Also, write a description of what these coordinates represent. For instance, do your GPS points represent the centers of individual patches, each with an estimated size?
>
> **2**. **Topographic Map:** Submitting this is helpful to interpreting your survey, even if you are submitting data collected via GPS. If neither a map nor GPS was used to collect to the information you are reporting, we will rely on written comments in 'directions to site' and mapping question #3.
>
>> **I am confident I have accurately located and mapped the population at map scale:** The most common answer is 'no'. When surveying away from roads or mapped streams, one usually cannot reference their position accurately to map scale. Use this rule of thumb: to map at 1:24,000 scale, your marks must be within one pencil line's width of their correct location. Often the field biologist can estimate location to within a small area visible on the map (i.e., 'I know I'm between these two streams and between 1000 and 1400 ft. elevation'). If you can estimate your location, draw this area surrounding your mapped feature.

3. I used the following features on the map to identify my location: Please include comments that will help us map the site accurately. If the population is located near or within some feature on the map, please describe. For instance, we want to know if the plants are located within a wetland, at the base of a cliff, on the west bank of a river, or within the littoral zone of a lake.

I mapped the entire extent of the population? Might there be more of these plants in this general area? For instance, did you do an exhaustive survey of all surrounding appropriate habitat, or did you stop at a fence line or ownership boundary.

Is a revisit needed? Check yes if, for instance, identification should be verified at another time, the population should be mapped more accurately, if you did not survey all of the potential habitat, if you think there is some imminent threat, etc.

Ownership: If you know who owns the property, please enter that here.

Population Size: Your count or estimate of the number of individuals or ramets.

Population Data: Describe the population quality and phenology. For example: "45 plants scattered in a wet depression with an area of 10 by 45 meters. Vigorous plants with 30% flowering and 70% vegetative."

Plant Association: If you have access to a vegetation key, please include the plant association of the immediate area along with the author of the key.

Associated Species: Please enter the scientific names of the other plant species that are found in the immediate area and their percent cover, if determined. These should be described by layer as listed on the form.

General Description: Describe the local landscape, including physical land forms, vegetation, and land use.

Minimum & Maximum Elevation: Enter values in feet and a maximum elevation only if this is a large population with a range of elevations.

Size: How many acres does the population cover? If less that 0.1 acre, you can leave this blank.

Aspect: Enter the direction of slope as degrees or as a compass direction such as SW.

Slope: Enter as degrees or percent.

Photo taken? Check yes if you took a photograph of the population, otherwise, check no.

Management Comments: Enter information about land use and threats (exotic species, recreation, road maintenance, grazing, etc.) here as well as recommended changes in site use that will help ensure continued existence of the population.

Protection Comments: Enter any legal steps that you think should be taken to protect the population.

Additional Comments: Enter anything that you think is important about this population that did not fit in any other space on the form.

Attachment 5-4: Threatened, Endangered, and Sensitive Plants Element Occurrence Field Guide

United States
Department of
Agriculture

Forest Service

**Rangeland
Management
Staff**

Washington, DC

October, 2005

Threatened, Endangered And Sensitive Plants Element Occurrence

Field Guide

USDA Forest Service
Threatened, Endangered and Sensitive Plants
Element Occurrence Field Guide

October, 2005

USDA Forest Service
Threatened, Endangered and Sensitive Plants
Element Occurrence Field Guide

October, 2005

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USDA Forest Service
Threatened, Endangered and Sensitive Plants
Element Occurrence Field Guide

Overview

Following is an overview and general description of the Forest Service's national protocol for collecting information about Threatened, Endangered and Sensitive plant occurrences.

General Description

The Threatened, Endangered and Sensitive (TES) Plant Protocol focuses on tracking the presence, location, extent, and abundance of ***TES plant occurrences***. Tracking of "watch" species, or species of concern at a Forest level, may also be accomplished using this protocol. The protocol also includes methods to record and track site information for each TES plant occurrence, such as site morphometry, plant community, associated species, soil characteristics, disturbances or threats. One method of monitoring TES plant occurrences consists of repeated observations over time, noting relative changes in location, extent, and density of the plant population, as well as changes in existing or potential threats and habitat conditions. This method of monitoring may also be accomplished using the protocol.

Standardized tracking of TES plant occurrences directly supports the policy and legal requirements to maintain the viability of such species on National Forest System lands (FSM 2670; National Forest Management Act; Endangered Species Act). Business needs of the national TES Plant Program that will be supported by this protocol include:

- Completion of Biological Assessments (BAs) and Biological Evaluations (BEs),
- Status summaries for TES plants,
- Completion of conservation assessments and conservation strategies for TES plants,
- Occurrence-level monitoring of TES plant populations over time (presence/absence, or abundance as measured by repeated censuses of the populations), and
- Establish plant-habitat relationships.

National Standards

Following a corporate approach for collection of TES plant occurrence data facilitates:

- Data sharing within the agency,
- Data sharing with partners,
- Data storage, tracking and reporting, and
- Program consistency and efficiencies.

The national TES Plant Program has developed agency data standards for collection and storage of TES plant data. Beginning in November 2001, a program working group, consisting of the Regional Botanists and a small number of botanists on the National Forests and Ranger Districts, provided the guidance for draft protocol development. In May 2004, the draft products were

further reviewed by a larger group of field botanists across the agency, representing the program user community. Additional protocol modifications were included in early 2005 as a result of feedback during prototype testing of the corporate database application for TES plants. Throughout the course of protocol development, reference was made to requirements in ***Biotics***, the NatureServe database application used nationally by the network of state Natural Heritage Programs. TES plant information gathered by Forest Service programs will be entered and stored in the Natural Resource Information System (NRIS), the corporate database and interface for stewarding TES plant data in the Forest Service. NRIS design will also facilitate a cooperative agreement with NatureServe to electronically submit new ***element occurrence*** data from NRIS to the Biotics databases at individual Natural Heritage Programs. This agreement and application design will also address the need to view element occurrence records from Biotics in conjunction with NRIS TES Plants.

An **element occurrence (EO)** is an area of land and/or water in which a TES plant species is, or was, present. TES plant occurrences that are entered in the NRIS application are synonymous with the element occurrences that are entered in Biotics by the Natural Heritage Programs. The terms “plant occurrence”, “element occurrence”, “EO” or “occurrence” as used in this document may be considered interchangeable.

A required set of core attributes must be collected during field work and electronically stored in the corporate NRIS application to meet the minimum business needs of this protocol. Required attributes are established to meet corporate expectations of reporting, monitoring or data sharing (e.g., with Biotics). All other fields are considered optional and can be used as needed or conditionally required at the Regional or local level to meet specific program objectives. All required and optional fields in this protocol are supported in the NRIS application. Table 1 lists the required attributes for TES plant occurrences. Some attributes are auto-generated and populated in the NRIS application from the spatial feature. Detailed attribute descriptions and collection standards follow later in this document.

Required Attributes
Plant Occurrence Point or Polygon *(spatial feature)*
FS Site ID
Date
NRCS Plant Code for EO species
Scientific Name for Plant Code
Record Source
Examiner(s)
Ownership
Area of occupancy *(Auto-generated in NRIS)*
Area Unit of Measure *(Auto-generated, acres)*
Survey ID *(if record source = field survey)*
State *(Auto-generated in NRIS)*
County *(Auto-generated in NRIS)*

Required Attributes
Region *(Auto-generated in NRIS)*
National Forest *(Auto-generated in NRIS)*
District *(Auto-generated in NRIS)*

Table 1: Fields required by the USDA Forest Service TES Plant Element Occurrence Protocol

Data can be recorded in the field using the standard field form for TES Plant Element Occurrences (Appendix C) and then entered into NRIS using the TES Plants application. The NRIS application uses ArcMap, an NRIS "Task Assistant" and Windows data entry forms to guide the user through a standard workflow to enter and edit the spatial representation of the plant occurrence site and the associated attribute data. The data entry screens mimic the workflow as presented on the paper field form. Block headings on the paper form generally correspond to tabs or buttons on the electronic forms. Future development work may also support field data entry on electronic portable data recorders (PDRs).

This TES Plant Element Occurrence Field Guide makes occasional references to the NRIS TES Plants computer application. However, the field guide is not meant to be a user guide for the NRIS application as a whole. User Guides, Administrative Guides, Stewardship Guides and other relevant information can be accessed via the NRIS FSWeb website (http://fsweb.nris.fs.fed.us/).

Mapping

This protocol requires spatially locating and delineating each element occurrence. TES plant occurrences can be mapped and stored as either points or polygons. Occurrences that could be mapped as "lines," such as those occurring along ridges or streams, will be stored as long, narrow polygons. Spatial representation can be created by a number of methods:

- Hand-drawing the perimeter of the occurrence or a representative point on maps or aerial photos, then redrawing the occurrence within the NRIS TES Plants application;
- Using a GPS (Global Positioning System) device to define smaller areas, converting them to a shapefile, and importing the file;
- Digitizing the occurrence with a computerized mapping system (Geographic Information System [GIS]) and importing it.

Regardless of the method used to delineate a TES plant occurrence in the field, the protocol requires that basic location information and the point or polygon be digitized and stored in ArcMap format. The point or polygon feature must be entered into NRIS before additional tabular attributes can be entered.

To ensure consistency, the scale for hand-drawn occurrences on maps should be 1:24,000. This is the scale of United States Geological Survey (USGS) 7.5-minute quadrangle (quad) maps. Note that maps with a variety of scales are utilized in Alaska. *(**Note:** the 1:24,000 scale is also the standard for invasive plant mapping as recommended by the International Mapping Standards for Invasive Plants).* Aerial photos, orthophoto quads and remote sensing approaches can also be useful formats for delineation.

There is no minimum size for a delineated polygon; however, occurrences less than .01 acre are generally mapped as points. The NRIS application will allow very small occurrences to be accurately depicted and located. It will also facilitate monitoring small changes in size.

A single TES plant occurrence may be comprised of more than one polygon (Figure 1). For example, a single occurrence may be defined by clumps of the same population in close proximity with intervening habitat. Recorded plant occurrence data, however, apply to the ***entire*** occurrence. Detailed data for each "subpopulation" of the survey is not specifically tracked in the TES plant occurrence data collection methods, field form, or NRIS application. Although each subpopulation can be individually drawn in the NRIS application, acres for all subpopulations comprising a particular occurrence are combined to calculate and auto-populate the occurrence area in the NRIS application. Text notes about specific subpopulations can be recorded and stored in the "EO comments" field.

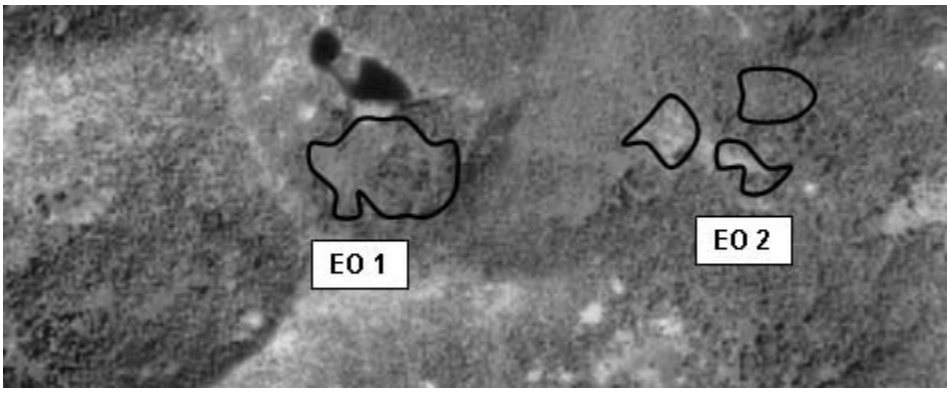

Figure 1: EO 1 is single element occurrence represented by one contiguous polygon. EO 2 is a single element occurrence represented by a multi-part polygon.

In addition to storing the spatial representation of the plant occurrence, the NRIS TES Plants application will automatically derive and populate required tabular geopolitical fields (State, County, Region, Forest and District) based on the location of the spatial feature in the NRIS application. Tabular location fields beyond those mentioned above are provided in the field form and the application, but are purely optional. These fields can be used to record a representative point or area for the plant occurrence when desired (available tabular location fields are outlined in the "Location Details Section").

Monitoring TES Plant Occurrences (Revisits)

An essential element of TES plant management is monitoring changes or stability in populations over time. Subsequent visits to a known site for remeasurement will be considered ***revisits***. Revisiting TES plant occurrences may also allow for detection of changes of threats to an occurrence. Each visit to a TES plant occurrence will require the completion of a new element occurrence form and the creation of a new record in the NRIS database to document that visit. Individual observations will be identified with the same *FS Site ID*, but differentiated by the visit date. Record "No" in the "New Occurrence" field for all revisit records. Some of the general site and location information from the previous visit can be automatically transferred to the new

record within the NRIS TES Plant application when appropriate. You can then update information about the plant occurrence based on the current site visit.

The *FS Site ID* and Element Occurrence number (if applicable) must remain constant for a particular occurrence through time (see data field descriptions later in this document). Changes in the occurrence data (i.e. size, shape, plant abundance, habitat or threats) can be traced over time through subsequent visits, differentiated by the *Visit Date*. The NRIS application will track these changes through time and record or display the history of any given site.

Extirpated Occurrences

All visual evidence of a formerly documented occurrence could be lacking during a revisit of the site. Though the plant may have disappeared above ground, there may be roots, rhizomes, or other plant parts that may recover and sprout. The relative time of visit compared to other years and/or yearly climate fluctuations may also affect the observation. Also, seeds of some species are stored in the soil and may remain viable for many years. For these reasons it is important to monitor some sites for many years, even after all evidence of the plant may have disappeared during an earlier visit.

For revisits that turn up no visual evidence of the TES plant, enter a new polygon or point representing the occurrence by copying the most recent spatial feature for that EO. Enter "No" for the "Plants Found" field and uncheck this flag in the application. Enter a canopy cover and plant count of zero (0). Enter appropriate comments in the "Population Comment" field and the "Revisit Justification" field. Other fields pertaining to habitat and threats (which may or may not be causal agents for change to the plant population) should be recorded. Recording a new revisit polygon/point and related data in the interim allows for monitoring of the site until there is adequate evidence that the occurrence has in fact disappeared.

Quality Control

The NRIS application for TES Plant Element Occurrences includes a quality control (Q/C) flag to indicate when the information for a particular EO is complete and has been reviewed and accepted by the appropriate data steward. At that point it is deemed ready for use in comprehensive analysis and for data sharing with partners *("no" is the default value until certified).* All required field work and data entry must be complete before a TES plant occurrence can be certified. The certification date and the person's name are auto-populated in the database form when the certification flag is switched to "yes." Only a person with the ***Data Steward Role*** can certify the plant occurrence within the NRIS application. Persons with the NRIS Data Entry Role can enter and edit data as appropriate. Once an occurrence is flagged certified by the data steward, it is locked and cannot be further edited.

Element Occurrence Field Form Instructions

Following is a list of data attributes (or data fields) and instructions for recording specific data about a TES plant occurrence. These attributes are supported by the methods of this protocol and by the NRIS TES Plants application.

Collecting information for a TES plant element occurrence that are not required by this protocol, such as soil characteristics, existing vegetation community type and/or associated species, potential vegetation types, aspect, slope and elevation is encouraged. This information will be useful in establishing habitat relationships and modeling to predict where one might find or search for a particular species, as well as inferring the potential for a particular species to occur in an area either at present or in the future. Additional information about dominant ecological processes, threats, and current or expected management activities aid in predicting stability of that particular occurrence.

Required data fields are indicated below and on the attached field form. Data attributes are grouped into general categories. Categories and field numbers correspond to the layout and naming conventions used on the attached TES Plant Element Occurrence field form. Fields that have a standard "List of Values" (LOV) associated with them are listed as well. The specific values for each LOV are listed in Appendix B. The field form layout may be used as is or modified to cater to your unit (e.g., drop fields never used on your Forest, pre-populate Region or Forest fields, etc.) However, please note:

- ***Only*** the attributes listed on the field form along with the documented coding conventions will be supported in the NRIS TES Plant application.
- The workflow within the NRIS application will mimic the grouping, flow and presentation of data fields as presented in the attached standard EO field form.

General Information

1) <u>FS Site ID: *Required*</u>.
Forest Service Site Identifier. Assign a ***unique*** identification to each element occurrence. The FS Site ID can be any combination of letters and numbers up to 30 characters in length. Regions are encouraged to adopt a standard coding convention to facilitate tracking. It is highly recommended that the combination of Region, Forest and District numbers and the letters, "EO" form the first eight digits of the FS Site ID (example: RRFFDDEO##### [060805EO00055]). This convention will facilitate consistent tracking and reporting within regional data centers. Since field sheets may get split up, it is a good idea to repeat the FS Site ID at the top of each page.

Each TES plant occurrence will be mapped separately so that each FS Site ID will document a single occurrence. Revisits to the same occurrence should continue to track using this ***same*** FS Site ID but with a different date. (Note: The Natural Heritage Program is responsible for assigning ***element occurrence (EO) numbers***. Thus, an EO number will not be available as a unique identifier for new occurrences, until they are entered in Biotics. Likewise, "watch" species or Forest "species of concern" that wouldn't be submitted to the state Natural Heritage Program will need a unique FS Site ID for tracking, but will not receive an actual EO number.

2) <u>Date: *Required*</u>.
Date when the field data for this element occurrence was collected (not the date the record was entered into the computer). Use date format of: MM/DD/YYYY. Date provides information about the time of year plants and habitats were observed and indicate the age of the occurrence information, which may help identify the need for revisits.

3) <u>Site Name:</u>
Informal descriptive name assigned to the EO site or area.

4) <u>NRCS Plant Code: *Required:*</u>
Required by the application, but not on the field form if scientific name is entered. Enter one code for the TES plant being documented in this particular EO. Codes for plant species must follow the USDA *PLANTS* database, plant symbols convention (USDA, NRCS 2002). Botanical nomenclature should follow a standard flora for the geographic area being sampled.

5) <u>Scientific Name: *Required*.</u>
The scientific name of the TES plant as needed, if the NRCS code is not known. It is a good habit, however, to write out the name or portion of the name on the field form to minimize misapplication of plant codes. The TES application will auto-populate the scientific name when codes are entered or will auto-populate the NRCS plant code when the scientific name is chosen from a standard list. Include the genus, species, and subspecies or variety as needed to properly identify the TES plant.

6) <u>Record Source: *Required (LOV).*</u>
Indicate the source of data for this EO, such as Field Survey or herbarium specimen.

7) <u>Survey ID: *Conditionally Required.*</u>
If the record source is "Field Survey," indicate the Survey ID Number. Refer to the Survey Protocol for Survey ID coding conventions.

8) <u>Survey Name:</u>
If the record source is "Field Survey," enter the name of the field survey (also include the project type here if desired, i.e. Black Butte Timber Sale, Yellow Springs Road Realignment, etc.).

9) <u>Examiner(s): *Required.*</u>
Provide the name(s) of the field surveyors. This will provide a point of contact for questions during data entry or for future reference.

10) <u>Ownership: *Required.*</u>
Record the land ownership where the occurrence is located. Where the occurrence exists on two or more ownerships or jurisdictions, enter all that apply.

11) <u>E.O. #:</u>
Element occurrence number, when available, as assigned by the State Natural Heritage Program/Conservation Data Center. This will be null for new occurrences that are not yet submitted for Heritage review and data entry.

12) <u>New Occurrence:</u>
May need to be completed after the field survey. A yes/no flag to indicate whether this is a new occurrence (Y) or, if it is an existing occurrence (N). Revisits to an existing EO, for example, are not new occurrences and should reuse the established FS Site ID and EO number (if one exists).

Geopolitical Units

It can be useful to record the political or administrative units on the field form. An occurrence may span two or more geopolitical units for any particular field. For example, a survey may extend across a state, county or National Forest boundary. In this case, record all that apply.

13) State: *Required.*
It is useful to enter this information on the field form; however, this will be auto-populated in the application when the spatial feature (EO polygon) is entered. Record the code for the state in which the site is located. These codes are the same as the postal state codes.
14) County Name: *Required.*
It is useful to enter this information on the field form; however, this will be auto-populated in the application when the spatial feature (EO polygon) is entered. Enter the county in which the EO is located. If the element occurrence crosses county lines, record appropriate counties.
15) Region: *Required.*
It is useful to enter this information on the field form; however, this will be auto-populated in the application when the spatial feature (EO polygon) is entered. Record the Region number where the occurrence is located, regardless of which Region is currently administering the site. This field is not required when ownership is on non-Forest Service lands.
16) National Forest/Grassland: *Required.*
It is useful to enter this information on the field form; however, this will be auto-populated in the application when the spatial feature (EO polygon) is entered. Record the National Forest or Grassland (or more than one) where the occurrence is located. This field is not required when ownership is on non-Forest Service lands.
17) District: *Required.*
It is useful to enter this information on the field form; however, this will be auto-populated in the application when the spatial feature (EO polygon) is entered. Record the Ranger District number(s) where the site is located. This field is not required when ownership is on non-Forest Service lands.
18) Entire Extent Mapped:
Indicates whether the entire area occupied by the element occurrence was mapped or not, or "uncertain" if that is not known. It is intended that the entire extent of any EO should be mapped whenever possible.
19) Area (Area of Occupancy):
Optional to collect in the field. The NRIS application will auto-populate the area in acres. Record the estimated size of the area occupied by this single TES plant occurrence as depicted in a mapped polygon or group of polygons on the field form if desired. The area will also be auto-populated in the application from the spatial feature or GPS information once the polygon(s) are entered. If subpopulations exist and are mapped, size will be calculated by adding the area from all related subpopulations to determine the total size of the EO. If the EO is a point, the NRIS application will indicate area as 0 acres in the data editing forms, but for output and reporting purposes points will be buffered and reported as having an area of 0.001 acres.
20) Area Unit of Measure*:*
Record the unit of measure if an area estimate is entered on the field form. Units can be acres, square meters, or hectares, but acres will be the default value in the NRIS application.

Element Occurrence Data

Canopy Cover

A measurement of canopy cover is encouraged for the EO species and optional for associated species and lifeform classes. Ocular estimates of canopy cover of live foliage for plant species or groups of plant species are an effective way to quickly collect abundance information about

plants. Cover is a meaningful attribute for nearly all plant life forms, which allows their abundances to be evaluated in comparable terms (Daubenmire 1968, Mueller-Dombois and Ellenberg 1974). ***Percent cover*** can be defined generically as "the vertical projection of the crown or shoot area to the ground surface expressed as … percent of the reference area" (Mueller-Dombois and Ellenberg 1974). ***Canopy cover*** is "the percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included" (SRM 1989, NRCS 1997). Canopy cover is synonymous with canopy closure (Helms 1998). For woody plants, canopy cover is synonymous with crown cover (NRCS 1997, Helms 1998).

Cover values are estimated and recorded for the EO polygon(s) or site as a whole (e.g., these values are ***not*** recorded using plot- or transect-based methods). The purpose for entering cover values is simply to provide relative estimates that might be used to compare the abundance of species at the EO site. As such, these cover values would ***not*** be appropriate for more rigorous quantitative analyses of vegetation data. If such rigorous data are desired, then the examiner(s) should use one of the appropriate vegetation protocols available such as ocular macroplot, cover-frequency, or line intercept (USDA Forest Service, 2003).

Estimating Canopy Cover

Project the outline of the plant's live foliage vertically to a horizontal plane to determine what percentage of the EO polygon area that it covers at the time of the survey. For canopy cover by lifeform or for associated species, contributing plants do not have to be rooted in the polygon to be counted for canopy cover (e.g., they can overhang the edges of the polygon in which cover is being estimated). The area of foliar cover included in the polygon, expressed as a percent of the total sampling area, represents the canopy cover for that individual species or plant group being estimated. Different lifeform groups or plants may overlap and, therefore, it is common for the canopy cover "sum" across lifeforms or across multiple plant species to be greater than 100% within a polygon. No single lifeform class or plant species, however, can total greater than 100%.

Canopy cover information can be collected using actual values or by using established canopy cover classes. If canopy cover classes are used to measure canopy cover, indicate the cover class set used.

21) <u>Canopy Cover Method: *Conditionally Required (LOV)*</u>.
If cover values are recorded for any of fields 22, 61, 62 or 69, then indicate the one method used for making any cover estimates at this site. Choices are Actual (0.1-100%), Daubenmire (modified) Cover Class Set, and National Range Cover Ten Class Set. If canopy cover sets are not used, draw a line or record N/A for "Not Applicable" in this space on the field sheet. See Appendix B for a list of canopy cover sets and the cover class codes for each set.

22) <u>EO Canopy Cover:</u>
The percent cover or cover class of the TES plant species within the EO polygon(s) or site. See Appendix B for a List of Values.

23) <u>Lifeform: *(LOV)*.</u>
The lifeform of the rare plant. Lifeform is defined as the characteristic form or appearance of a species at maturity. See Appendix B for a List of Values.

24) <u>Number of Subpopulations:</u>
If the EO is not mapped as one contiguous polygon, map each subpopulation considered to be a component of this particular EO. Data stored in the NRIS application, however, will be relevant to the entire EO polygon only, and detailed data for each subpopulation is not tracked in the application. Text notes about subpopulations can be recorded and stored in the EO comment field. Although each "subpopulation" will be drawn into the NRIS application, acres for all subpopulations combined for a particular EO will be combined to calculate and auto-populate an accurate size in the application for the entire EO.

XX) <u>Plant Found:</u>
Indicate whether the EO plant species was observed during a revisit to the EO. This flag should be checked yes for all new occurrences (and is defaulted to yes in the database). If the plant is not observed during a revisit to the EO, record plants found as "no" and uncheck the "plant found" box in the application.

25) <u>Plant Count:</u>
Indicate the number of individual plants of the EO species.

26) <u>Count Type: *(LOV).*</u>
Indicate what was counted: Genets, Ramets, or Undetermined. Counts of genets represent the number of genetically independent individuals in an occurrence. Counts of ramets represent the number of vegetative units that are produced by the genets in an occurrence. For example, a plant occurrence that has five individual plants, each of which has produced five stems, consists of 5 genets and 25 ramets. See Appendix B for a List of Values.

27) <u>Count (Actual or Estimate):</u>
Indicate if the plant count was a precise count or an estimate.

28) <u>Revisit Needed:</u>
Yes or No flag to indicate need for a follow-up visit. Record *yes* if fieldwork is not completed and additional survey is needed or *yes* if a follow-up visit is anticipated or desired for monitoring purposes.

29) <u>Revisit Date:</u>
Record a desired date to re-visit the occurrence if that is identified. For example, enter a projected date if a particular study or set of circumstances require the EO to be re-examined two years from now or for monitoring purposes after project completion, or perhaps later in the same growing season. For visits over multiple years, it is generally best to compare sites at the same time each year.

30) <u>Revisit Justification:</u>
Give reason a revisit is desired. Examples include: post-project monitoring, successional monitoring, recovery or stability after protection, where revisits are part of a sampling method for a particular species protocol, etc.

31) <u>Phenology by %:</u>
Record the percentage of the occurrence that was in each stage at the time of visit: vegetative, flower/bud, fruit/dispersed, seedlings/juvenile. Values should total to 100%. See Appendix B for a List of Values.

32) <u>Population Comments:</u>
An open text field, to record observations regarding the status of the population, including distribution, vigor, density, phenology and dispersal.

33) <u>Evidence of disease, competition, predation, collection, trampling, or herbivory</u>:
Yes or No flag to indicate any evidence of these effects on the population.

34) Evidence Comments:
If Yes is checked for field above, give a brief explanation. If possible, record the cause of the effect(s).
35) Pollinator Observed*:*
Indicate whether pollinators were observed visiting flowers or reproductive structures of the TES plant (yes or no).
36) Pollinator Type(s): *(LOV).*
The organism(s) observed pollinating the TES plant. See Appendix B for a List of Values.
37) Pollinator Comments:
Text field, if needed, for further explanation of pollinator observations.

Site Morphometry

38) Percent Slope:
The average slope that is characteristic of the EO polygon or site, expressed as a percentage as measured in the field.
39) Slope position: *(LOV).*
Record the two-dimensional position of the occurrence on the landform as observed in the field. See Appendix B for the List of Values.
40) Aspect:
Record the predominant aspect as measured in the field that is characteristic of the EO polygon or site. Either azimuth in degrees (preferred) or cardinal direction can be used.

> **Azimuth:**
> (Range 0-360). The direction that the landscape predominantly faces at a defined position, such as the center point of the occurrence. Azimuth is recorded in degrees from north, in a clockwise manner. Use "360" for north. Use "0" when there is no slope.
> **Cardinal: *(LOV).***
> The generalized cardinal direction that the landscape predominantly faces at a defined position, such as the center point of the occurrence. (Accuracy Standard: ± 11.25 degrees). See Appendix B for a List of Values.

41) Elevation:
For the spatial extent of the occurrence, record the average (or a "predominant") elevation of the area occupied by the species as measured either in feet or meters above sea level. Minimum and maximum elevation should be recorded only if it is determined that the elevation range is significant for that particular occurrence (e.g., an occurrence on a steep slope or a large occurrence on an undulating landscape).
42) Elevation Unit of Measure: *Conditionally Required (LOV)*.
Record the unit elevation was measured in; Feet or meters.

Soil Characteristics and Light Conditions

43) Substrate on which EO occurs: *(LOV).*
Record the predominant substrate that the rare plant species is rooted in. See Appendix B for a complete List of Values.
44) Parent Material: *(LOV).*
The unconsolidated material, mineral or organic, from which the substrate in the occurrence polygon developed. See Appendix B for List of Values.

45) <u>Soil Moisture: *(LOV).*</u>
Moisture state of the soil for the time period being described. See Appendix B for a List of Values.
46) <u>Soil Texture: *(LOV).*</u>
The code for the proportions of the various size groups of individual mineral soil grains less than two millimeters equivalent diameter in a mass of soil, expressed as a class, or names for other materials or physical state, measured at the surface horizon. See Appendix B for a List of Values.
47) <u>Soil Type:</u>
If desired, record the dominant soil map unit or soil series as indicated on a soils or ecological unit inventory map. Refer to locally stewarded soil maps or GIS layers to obtain this information. This information is not entered into the NRIS TES Plant Application. It would be obtained by intersecting appropriate spatial layers.
48) <u>Light Exposure: *(LOV).*</u>
Record the predominant light exposure throughout the occurrence polygon. Choose one of three values (full sun/ partial shade/ full shade). See also Appendix B for a List of Values and definitions.

Site Classifications

Record taxonomic units by type if published classifications exist for the area. Taxonomic classifications are not developed at the time of TES plant inventory. Use locally appropriate field keys and guides to describe the TES plant occurrence habitat within the terms of locally accepted and published classification systems. Contact your local or Regional ecologist for appropriate information available for use in your area. Available taxonomic classifications sanctioned for your area by regional and local stewards have been previously entered into NRIS and are used in the TES plants application as Lists of Values.

Taxonomic information about plant communities and site potential, along with other site morphometry measures and associated species, provide valuable information to model, track and predict the potential for TES plant species occurrences in time and space. Examples include focusing surveys on suspected habitats, predictive insight on the stability or successional status of the associated vegetation for a given population, and the ability to document and refine predictive models. Available taxonomic classifications and detail vary by Region within the USFS.

Existing Vegetation classifications provide context regarding the seral stage or current plant community in which the species occurs and should be recorded whenever possible. Existing vegetation classifications developed by the USFS, NatureServe or other partners may include hierarchical levels (i.e. classification levels) such as broad cover types, or alliances, or more detailed classifications at the association or community type level. Since most classification systems are hierarchical by design, record the most detailed classification level available (e.g., an association vs. an alliance).

Potential vegetation (or "Potential Natural Vegetation") or **Ecological Type classifications** provide context to determine areas that may now or in the future contain suitable habitat for a given species, and predictive insight on the stability of the population on that particular site in

time. For example, based on knowing the site capability where the EO occurs, the site may become more or less favorable through time for that particular TES plant species. Potential vegetation classifications include hierarchical levels (i.e. classification levels) with nomenclature such as series, plant association, habitat types, or phases of plant associations and habitat types. Ecological type information, which by design integrates soil, geology, geomorphology and potential vegetation, should be used at the landtype or landtype phase level when available.

49) Existing Veg:
Record the taxonomic classification name or code for the existing vegetation type that accurately describes the EO. In addition to code and name, the following fields are used in NRIS (as stewarded and stored regionally) to locate the correct record from a List of Values: Classification Level, Classification Code, Classification Short Name and Classification Set.
50) Potential Veg:
Record the taxonomic classification name or code for the potential natural vegetation type that accurately describes the EO. In addition to code and name, the following fields are used in NRIS (as stewarded and stored regionally) to locate the correct record from a List of Values: Classification Level, Classification Code, Classification Short Name and Classification Set.
51) Ecotype:
Record the taxonomic classification name or code for the ecological type classification that accurately describes the EO. In addition to code and name, the following fields are used in NRIS (as stewarded and stored regionally) to locate the correct record from a List of Values: Classification Level, Classification Code, Classification Short Name and Classification Set.

Habitat Quality and Management

The following fields are also contained in Biotics (Natural Heritage Program database).

52) Habitat Description:
Text field. A description or observations about the habitat that the EO occupies.
53) Dominant Process: (LOV).
Record a value indicating the dominant disturbance regime influencing the EO, if any. See Appendix B for a List of Values.
54) Process Comment:
Text field. Record any comments about the observed dominant disturbance.
55) Community Quality:
Enter a qualitative ranking for the overall quality of the habitat or plant community(-ies) with which the TES plant is associated. Choices: Low, Medium, High.
56) Landscape Integrity:
Enter a qualitative ranking for the overall quality of the landscape setting in which the TES plant is located. Choices: Low, Medium, High.
57) Disturbance/Threat (present or imminent): (LOV).
Record threats or potential threats, e.g., noxious weeds, OHV trails, or environmental problems that could affect the TES plant habitat. See Appendix B for a List of Values.
58) Disturbance/Threat Comment:
Record any comments about the extent or severity of the threat(s).

59) <u>Non-native Species Comment</u>:
Comments and observations concerning non-native species occurrences within or adjacent to the specific EO.
60) <u>Current Land Use Comment:</u>
Comments and observations about current land uses within or adjacent to the EO, including recommendations for modifications.

Lifeforms and Ground Cover

These lifeform canopy cover and ground cover estimates are approximate values. They are intended simply to give a general picture of the composition and relative abundance by lifeform category at the EO site during the visit. Use the same method for estimating covers as indicated in field 21, "Canopy Cover Method". See the Canopy Cover Section earlier for more detail regarding the use of cover data in this form.

61) <u>Lifeform Canopy Cover (% Cover or Class): (LOV).</u>
List the canopy cover for each lifeform represented in the EO, expressed as either percent cover values or canopy cover classes. Use the same method or class set for estimating cover for all cover estimates made for various lifeforms at this EO. See Appendix B for List of Cover Class Codes.
62) <u>Ground Cover Type (% Cover or Class): (LOV).</u>
The composition of the ground surface within the EO at the time of visit. Record each ground surface cover type present in the EO, expressed as a percent cover value or cover class code. This includes organic material, vegetation basal cover (live and standing dead), mosses, lichens, litter/duff, and inorganic material such as exposed mineral soil, gravel, rock, bedrock and any road surface. Ground surface for each type is estimated within only a two dimensional plane (unlike foliage cover); thus the total of all types should approximate 100%. See Appendix B for List of Cover Class Codes.

Associated Species

Associated species are those found in the same habitat and same location as the EO and should not include species that are not directly within or related to the EO polygon or site. Associated species help to establish habitat relationships and can help in habitat modeling. Associated species in the more general area surrounding the EO polygon can be listed in the associated TES plant field survey field form.

There is no limit to the number of species that may be entered. It is a good habit to write out the name or portion of the name on the field form to minimize misapplication of plant codes. The NRIS TES Plant application will auto-populate the entire scientific name when plant codes are entered, and can auto-populate the NRCS plant code when the scientific name is chosen from a standard list. Include the genus, species, and subspecies or variety as needed to properly identify the plant.

63) <u>Completeness of Species List: *Conditionally required (LOV).*</u>
It is helpful to know if the species list is a best attempt to document all associated species at the EO site (complete list) or if just certain species of interest were listed (selected or reduced by

some abundance level, or due to time constraints). Indicate how thorough the list of associated species is for an EO observation by selecting one of the standard choices listed in Appendix B (Complete, Reduced or Selected). This field is conditionally required if associated species are listed.

64) <u>Species List Comment:</u>

A text field to describe what guidelines were used for recording species or to give a text description of how complete or thorough the associated species list is. It is good practice to explain in this comment section what criteria were used to collect any partial plant list.

65) and 66) <u>NRCS Plant Code and Scientific Name:</u>

Record all associated plant species (plant code and/or scientific name) that are to be included in the EO site plant list. Codes for plant species must follow the USDA *PLANTS* database, plant symbols convention (USDA, NRCS, 2002). Botanical nomenclature should follow a standard flora for the geographic area being sampled.

67) <u>Lifeform: (*LOV*).</u>

Lifeform is defined as the characteristic form or appearance of a species at maturity. As desired, enter the lifeform code for each associated species listed for the EO. See Appendix B for a List of Values.

68) <u>Dominant:</u>

If desired, indicate whether the species is dominant at this site (Y = yes)

69) <u>Percent Cover or Class: *(LOV).*</u>

These cover estimates are approximate values, and are intended simply to give a general picture of the composition and relative abundance of each species at the EO site during this visit. Use the same method for estimating covers as indicated in field 21, "Canopy Cover Method". See the Canopy Cover Section earlier for more detail regarding the use of cover data in this form.

70) <u>Non-Native:</u>

Flag any species (y = yes) recorded on the list that are considered to be non-native plants. Refer to the USDA *PLANTS* database for this specification (USDA, NRCS 2002).

EO Specimen Documentation

Record appropriate documentation for EO voucher specimens collected for non-federally listed plants.

71) <u>Reference for ID:</u>

Record the appropriate flora or reference material used to identify the TES plant taxon.

72) <u>Primary Collector: *Conditionally Required*.</u>

Required if specimen collected. Record the primary collector of the specimen, who is responsible for assigning the collection number.

<u>Other Collectors:</u>

If additional collectors were involved in the collection.

73) <u>Collection #:</u>

Required if a specimen is collected. Record a unique number, assigned by the primary collector, for the specimen. If no collection number is assigned to the specimen, enter "s.n."

74) <u>ID Confirmed: *Conditionally Required (LOV).*</u>

Required if a specimen is collected. Indicate whether a positive identification has been confirmed for the specimen. See Appendix B for a List of Values.

75) <u>Verification:</u>
Name and institution or agency of the individual who provides authoritative verification of the specimen identification.
76) <u>Specimen Repository: *Conditionally Required*.</u>
Required if a specimen is collected. Text field to indicate the herbarium or location where the collected specimen is stored.

Image Information

77) <u>Image ID:</u>
Text field used to denote related photograph exposure numbers or computer file designations.
78) <u>Image Description(s):</u>
Text field used to describe the subject of any photograph or electronic image taken.

Location Information

This protocol requires spatially delineating each TES plant occurrence to document the location and extent of the occurrence (refer to *Mapping the Survey Area* on page 7). In addition to storing the spatial representation, the NRIS TES Plants application will automatically derive and populate required tabular geopolitical units in the application based on the location of the occurrence polygon or point (State, County, Region, Forest and District fields).

Alternative Location Methods

Tabular location fields beyond those mentioned above are provided in the field form and in the application, but are purely optional. These fields can be used to record a representative point or area for the location of the element occurrence, when desired. Tabular data can be recorded about quad maps or for any of the four location methods described below.

- Legal description
- Latitude and Longitude
- GPS UTM location
- Metes and Bounds

79) <u>USGS Quad Number:</u>
The number of the primary USGS quadrangle map containing the survey. These codes are stewarded nationally by the ALP application. *(Note: only one representative quad can be entered in the NRIS application. EOs may cross into more than one)*
80) <u>USGS Quad Name:</u>
The name of the primary USGS quadrangle map containing the survey. These codes are stewarded nationally by the ALP application. *(Note: currently only one representative quad can be entered in the NRIS application. EOs may cross into more than one)*
81) <u>Forest Quad Number:</u>
The locally stewarded number for the primary USGS quad map where the survey is located. *(Note: currently only one representative quad can be entered in the NRIS application. EOs may cross into more than one)*

82) <u>Forest Quad Name:</u>
The locally stewarded name for the primary USGS quad map where the survey is located. *(Note: currently only one representative quad can be entered in the NRIS application. EOs may cross into more than one)*

83) <u>Legal Description (Public Land Survey System or "PLSS"):</u>
For areas of the country where the Public Land Survey System is available, it is desirable and required to record this information to an appropriate level of detail **on the field form only**. Since legal descriptions will not be auto-populated in the NRIS application, this information must be manually entered into the NRIS TES Plants data entry form if it is desired to be electronically stored. (These fields can be used only to record a representative point or area for the EO, when desired.)

<u>Meridian:</u>
Record the code for the line of longitude from north to south that is the basis for local legal descriptions. These lines are also known as Principal Meridians and have distinct names. This information is available on the USGS Quadrangle map.

<u>Township/Direction:</u>
A Township is a unit of land containing 36 mile-square sections. Townships run in rows that parallel the local Base line. Each Township row is sequentially numbered relative to the row's order from, and whether it's north or south of, the local Base line; e.g., T2N (for the second township row north of the local Base line). To accommodate fractions of townships an additional code is required after the Township number, where 0 will equal no fraction; 1 equals ¼; 2 equals ½, and 3 equals a ¾ township (see table of examples below). This information is available on the USGS Quadrangle map.

<u>Range/Direction:</u>
The Range numbers run parallel to the local Principal Meridian. Range rows are sequentially numbered relative to the row's order from, and whether it's east or west of, the Principal Meridian; e.g. R2E (for the second Range row east of the Principal Meridian). This information is available on the USGS Quadrangle map.

Township/Dir & Range/Dir Example	Description
7 N 14 E	Township 7 North Range 14 East
7.1 N 16 E	Township 7 1/4 North Range 16 East
8.2 N 12.0 W	Township 8 1/2 North Range 12 West

<u>Section:</u>
Each 36 square-mile township is subdivided into smaller squares called Sections. Record the Section where the center of the EO is located. A Section is equal to one square mile, 2.59 square kilometers, 640 acres, or 1/36 of a township. This information is available on the USGS Quadrangle map. *(Note: Only one representative section can be entered in the application and surveys may commonly cross into more than one)*

Quarter Section:
The quarter-section subdivision where the center of the EO is located. For example: the NE quarter of section 4 (NE ¼).

Quarter, Quarter Section:
The quarter-quarter section subdivision where the center of the EO is located. For example: the NW quarter of the NE quarter of Section 4 (NW ¼ NE ¼).

Quarter, Quarter, Quarter Section:
The quarter-quarter-quarter section subdivision where the center of the EO is located. For example: the SE quarter of the NW quarter of the NE quarter of Section 4 (SE ¼ NW ¼ NE ¼).

Quarter, Quarter, Quarter, Quarter Section:
The quarter-quarter-quarter-quarter section subdivision where the center of the EO is located. For example: the SW quarter of the SE quarter of the NW quarter of the NE quarter of Section 4 (SW ¼ SE ¼ NW ¼ NE ¼).

84) Latitude and Longitude:
Arbitrary measurements used to describe any point on the Earth or similar globe. Borrowing from theories of ancient Babylonians, later expanded by the famous Greek thinker and geographer Ptolemy, a full circle is assigned 360 degrees. Latitude is the term for the distance from the middle of the circle, or, in the case of the Earth, the equator. The equator is designated 0 degrees, with each pole being 90 degrees. Longitude is the vertical measurement--current convention places the zero degree point at Greenwich, England (also known as the Prime Meridian), with 180 degrees being on the opposite point on the globe.

Geodetic Datum: *(LOV).*
Record the geodetic datum for the latitude and longitude coordinates. Latitude and longitude in degrees/minutes/seconds will be automatically converted to decimal degrees.

Examples of Commonly Used Datums	Description
NAD-27	North American Datum of 1927
NAD-83	North American Datum of 1983
WGS-84	World Geodetic System (1984)

Latitude:

Degrees:
(Range 0 to 90) The latitude degrees of the center of the EO as measured by GPS. (Default: North Latitude).

Minutes:
(Range 0 to 59) The latitude minutes of the center of the EO as measured by GPS. (Default: North Latitude).

Seconds:
(Range 0 to 59.99) The latitude seconds of the center of the EO as measured by GPS. (Default: North Latitude)

Longitude:

Degrees:
(Range 0 to 180) The longitude degrees of the center of the EO as measured by GPS. (Default: West Longitude).

Minutes:
(Range 0 to 59) The longitude minutes of the center of the EO as measured by GPS. (Default: West Longitude).

Seconds:
(Range 0 to 59.99) The longitude seconds of the center of the EO as measured by GPS. (Default: West Longitude).

GPS Datum:
Record the geodetic datum used by the GPS unit for the Latitude and Longitude coordinates. See table above for examples of commonly used datums.

Latitude Decimal Degree:
Latitude in a degree value. Consists of the latitude in degrees to at least 6 decimal places.

Code Example	Description
42.206088	Decimal degrees

Longitude Decimal Degree:
Longitude in a degree value. Consists of the longitude in degrees to at least 6 decimal places.

Code Example	Description
105.105206	Decimal degrees

85) UTM Location:
The Universal Transverse Mercator Map Projection. A special case of the Transverse Mercator project. Abbreviated as the UTM Grid it consists of 60 north-south zones, each 6 degrees wide in longitude.

UTM Datum:
Record the datum for the UTM projection.

Examples of Commonly Used Datums	Description
NAD-27	North American Datum of 1927
NAD-83	North American Datum of 1983
WGS-84	World Geodetic System (1984)

UTM Zone:
The zone for the UTM projection. This can be obtained from quad maps or from GPS devices. UTM zone coordinates measure in meters east and north from two perpendicular reference baselines. (Up to two alphanumeric characters.)

UTM Zone Example	Description
13	Ranges from 1 to 60

Easting:
The distance in meters, east or west, from the central meridian of the UTM Zone, which is designated at a value of 500,000 meters.

Code Example	Description
71204000.52	Recorded to the hundredth of a meter.

Northing:
The distance in meters north from the equator from the UTM Zone origin, which is designated as a value of zero meters. (This protocol addresses only north latitudes.)

Code Example	Description
1687534000.25	Recorded to the hundredth of a meter.

86) GPS Equipment Used:
The manufacturer and model number of the GPS unit used.
87) Metes and Bounds:
Metes and bounds is a system or method of describing property or real estate when it is surveyed. The system was used in England and, by custom, was applied in the original 13 colonies that became the United States. The system uses physical features of the geography along with directions and distances to define a piece of land. It is sometimes referred to as a *Boundary Survey*. The NRIS TES Plants application accommodates text up to 2000 characters in length.

Directions

88) Directions to the Site:
Text field. A narrative description of the EO location, with directions as needed for someone to follow in order to return to the site.
89) Sketch of Site or Area:
Make a general sketch, if desired, on the field form of the element occurrence to facilitate relocation or to point out any particular characteristics or features of the area. Include a general scale, with north at the top (unless otherwise indicated).
90) General Element Occurrence Comments:
Include any additional comments related to this EO that are not accounted for in other fields. Examples include details about subpopulations that may exist.

Appendix A – References

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Appendix B - List of Values (Standard Codes) for TES Plant Element Occurrence Field Form

Following are the standard codes or List of Values used for this protocol. Additional values should not be added to these lists without National approval because they will not be able to be entered into the NRIS TES Plants application.

6) Record Source List of Values:

Code	Name	Description
FS	Field Survey	A systematic search of a geographical area for a particular target species or group of species. Refer to the TES Plant Survey Protocol for conducting field surveys.
IN	Incidental	The EO was discovered informally while conducting other fieldwork (not part of a formal plant survey.
HS	Herbarium Specimen	The record source for the EO was obtained in the course of examining an herbarium specimen
EO	Existing Natural Heritage Program record	The record source for the EO is from an existing Natural Heritage Program record
RV	Revisit	This data record is a new visit to an existing plant occurrence for purposes of monitoring population stability, habitat change or threats to the occurrence. If the revisit occurs as part of another formal survey, use “Field Survey” as record source, and answer NO for the new occurrence field.

21) Canopy Cover Class Sets List of Values:

Code	Name	Description
DAUBEN	Modified Daubenmire	Daubenmire Canopy Cover Classes, modified to include trace.
NRMCOV	National Rangeland Methodologies - Cover Ten Codes	Cover Ten Codes - National Rangeland Methodologies Data Dictionary Canopy Cover Classes

22) Canopy Cover Class Values – Listed by Set

Modified Daubenmire Classes: Set Code = DAUBEN

Code	Cover Class	Mid Point
T	0 - 1.0%	0.5
1	1.1 - 5.0%	3.0
2	5.1 - 25.0%	15.0
3	25.1 - 50.0%	37.5
4	50.1 - 75.0%	62.5
5	75.1 - 95.0%	85.0
6	95.1 - 100%	97.5

National Range Management "Cover Ten Codes": Set Code = NRMCOV

Code	Cover Class	Mid Point
T	0.1 - 1%	0.50
0	1.1 - 5%	3.0
1	5.1 - 15%	10.0
2	15.1 - 25%	20.0
3	25.1 - 35%	30.0
4	35.1 - 45%	40.0
5	45.1 - 55%	50.0
6	55.1 - 65%	60.0
7	65.1 - 75%	70.0
8	75.1 - 85%	80.0
9	85.1 - 95%	90.0
A	95.1 - 99%	97.5
X	99.1 - 100%	99.5

23) and 66) Lifeform List of Values:

Code	Name	Description
FB	Forb/herb	Vascular plant without significant woody tissue above or at the ground. Forbs and herbs may be annual, biennial, or perennial but always lack significant thickening by secondary woody growth and have perennating buds borne at or below the ground surface. Federal Geographic Data Committee (FGDC) definition includes graminoids, forbs, and ferns; in PLANTS, graminoids are separated.
GR	Graminoid	Grass or grass-like plant, including grasses (Poaceae), sedges (Cyperaceae), rushes (Juncaceae), arrow-

Code	Name	Description
		grasses (Juncaginaceae), and quillworts (Isoetes). An herb in the FGDC classification.
LC	Lichen	Organism generally recognized as a single plant that consists of a fungus and an alga or cyanobacterium living in symbiotic association. Often attached to solid objects such as rocks or living or dead wood rather than soil.
LI	Liana	Climbing plant found in forests with long, woody, rope-like stems of anomalous anatomical structure. A shrub in the FGDC classification.
NP	Nonvascular	Nonvascular, terrestrial green plant, including mosses, hornworts, and liverworts. Always herbaceous, and often attached to solid objects such as rocks or living or dead wood rather than soil.
SH	Shrub	Perennial, multi-stemmed woody plant that is usually less than 4 to 5 meters or 13 to 16 feet in height. Shrubs typically have several stems arising from or near the ground, but may be taller than 5 meters or single-stemmed under certain environmental conditions.
SS	Subshrub	Low-growing shrub usually under 0.5 m or 1.5 feet tall (never exceeding 1 meter or 3 feet tall) at maturity. A dwarf-shrub in the FGDC classification.
TR	Tree	Perennial, woody plant with a single stem (trunk), normally greater than 4 to 5 meters or 13 to 16 feet in height; under certain environmental conditions, some tree species may develop a multi-stemmed or short growth form (less than 4 meters or 13 feet in height).
UN	Unknown	Lifeform is unknown.
VI	Vine	Twining/climbing plant with relatively long stems, which can be woody or herbaceous. FGDC classification considers woody vines to be shrubs and herbaceous vines to be herbs.
AL	Algae	A general name for the single-celled plant plankton, seaweeds, and their freshwater allies.
FU	Fungi	A non-flowering plant of the kingdom Fungi, lacking chlorophyll.

26) Plant Count Type List of Values:

Code	Name	Description
Genets	Genets	A plant that originates from seed, all parts of which thus share exactly the same genes. Counts of genets represent the number of genetically independent individuals in an occurrence. A genet may consist of numerous ramets.
Ramets	Ramets	Vegetative units that are initially physically attached to, and hence arise from, the same parent plant (genet). Examples include rosettes, stems or tillers (grasses), each of which have the potential for an independent existence if severed from the parent plant. Counts of ramets represent the number of vegetative units that are produced by the genets in an occurrence.
Undetermined	Undetermined	It is not clear whether the plant count is of genets, ramets, or a combination of both.

31) Phenology List of Values:

Code	Abbreviation	Meaning
VEG	Vegetative	Non-flowering or non-reproducing stems or individual plants.
FLB	Flower/Bud	Stems or individual plants that are in bud or flowering.
FRD	Fruit/Dispersed	Stems or individual plants that are fruiting, or have fruits that are dispersing, or have dispersed, seed.
SJ	Seedlings/Juvenile	Seedling or immature (pre-reproductive) stages.

36) Pollinator Type List of Values:

Code	Name
ANT	Ant
BAT	Bat
BIRD	Bird
BEE	Bee
BEET	Beetle
BUTTER	Butterfly
FLY	Fly
MOTH	Moth
OTUN	Other/Unknown

39) *Slope Position* List of Values:

Code	Name	Description
BS	Backslope	The steepest portion of the slope where material is generally in transit.
FS	Footslope	The lower portion of the slope where material is generally re-deposited.
SH	Shoulder	The upper slope where material generally moves through creep processes.
SU	Summit	The uppermost slope.
TS	Toeslope	The lowermost slope position where material moves generally through alluvial processes.

40) Aspect: Cardinal Direction List of Values:

Code	Name	Description
A	Includes all aspects	Where a population is on a conical depression or elevation and all aspects are represented
E	East	East
ENE	East northeast	East northeast
ESE	East southeast	East southeast
FL	Flat (no aspect)	Flat (no aspect)
N	North	North
NE	Northeast	Northeast
NNE	North northeast	North northeast
NNW	North northwest	North northwest
NW	Northwest	Northwest
S	South	South
SE	Southeast	Southeast
SSE	South southeast	South southeast
SSW	South southwest	South southwest
SW	Southwest	Southwest
W	West	West
WNW	West northwest	West northwest
WSW	West southwest	West southwest

43) Substrate on which EO Occurs List of Values:

Code	Name	Description
CL	Cliff	Any high, very steep to perpendicular or overhanging face of rock; a precipice.
DU	Duff	Leaf and needle litter, and duff not yet incorporated into the decomposed top humus layer. Non-continuous litter is not included
GR	Gravel	Rock fragments between 2 and 75 mm in diameter.
L	Log	An unhewn length of the trunk or large limb of a felled tree. The trunk or limbs of a felled tree or large fallen tree limbs.
M	Moss	Nonvascular, terrestrial green plant, including mosses, hornworts, and liverworts. Always herbaceous. This code does not apply to moss growing on bare soil in dry rangeland conditions.
O	Other	Other substrates not included in this list of values.
RS	Roadside	The disturbed area adjacent to a road surface.
R	Rock	Relatively hard, naturally formed mineral or petrified matter >1/8 inch in diameter appearing on soil surface, as small to large fragments, or as relatively large bodies, cliffs, outcrops or peaks.
S	Soil	Soil particles < 2 mm Bare soil, particles < 2 mm, not covered by rock, cryptogams, or organic material. Does not include any part of a road.
W	Water	Where the water table is above the ground surface during the growing season, such as streams, swamps, marshes, and ponds.

44) Parent Material List of Values:

Code	Name	Description
ALLU	Alluvium	A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sediment in the bed of the stream or on its flood plain or delta, as a cone or fan at the base of a mountain slope
CIND	Cinders	A juvenile vitric vesicular pyroclastic fragment that falls to the ground in an essentially solid condition
COLL	Colluvium	A general term applied to any loose, heterogeneous, and incoherent mass of soil material and/or rock fragments deposited by rainwash, sheetwash, or slow continuous downslope creep, usually collecting at the base of gentle slopes or hillsides
EOLI	Eolian deposit	A sedimentary deposit accomplished by the wind.
GLAC	Glacial deposit	Materials produced by or derived from glaciers and ice

Code	Name	Description
		sheets.
HUCA	Human caused/constructed	Materials created by the acts of humans, such as crushed rock or screened gravel.
LACU	Lacustrine sediments	Pertaining to sedimentary deposits produced by, or formed in a lake or lakes.
LADE	Landslide deposits	Deposits related the mass movement, including topples, falls, slides and debris flows
LAHA	Lahar (volcanic mudflow)	Deposits from mudflows originating from volcanic activities, and commonly found along the flanks of volcanoes.
MIXE	Mixed parent material	Mixed parent material, such as where a landslide deposit has mixed with alluvium.
MUCK	Muck	Dark finely divided well decomposed organic material, intermixed with a high percentage of mineral matter, usually silt; it forms surface deposits in some poorly drained areas, e.g. areas of permafrost and lake bottoms
ORGA	Organic deposiits (undifferentiated)	A general term for organic deposits, including muck or peat
PEAT	Peat	An unconsolidated deposit of semicarbonized plant remains in a watersaturated environment, such as a bog or fen, and of persistently high moisture content (at least 75%).
RESI	Residuum	Deeply weathered in place bedrock.
TALU	Talus	Rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep, rocky slope. Also, the outward sloping and accumulated heap or mass of such loose broken rock, considered as a unit, and formed chiefly by gravitational falling, rolling, or sliding.
TEPH	Tephra	A general term for all pyroclastics of a volcano; particles that have been ejected through the air from volcanic activities, including ash, cinders and bombs
VOAS	Volcanic ash	Fine pyroclastic material under 2.0mm in diameter;

45) Soil Moisture List of Values:

Code	Abbreviation	Meaning
D	Dry	No moisture observed, at the wilting point (>15 bars of tension, realizing that various perennials, shrubs, trees and other native vegetation have wilting points up to 66 bars of tension).
M	Moist	Moisture state is between the wilting point and field capacity.
W	Wet	The moisture state is at field capacity or wetter.

46) Soil Texture List of Values:

Code	Name	Description
C	clay	A term used in the U.S. and by the International Society of Soil Science for a rock or mineral particle in the soil, having a diameter less than 0.002 mm (2 microns)
CL	clay loam	A soil containing 27-40% clay, 20-45% sand, and the remainder silt.
L	loam	A rich, permeable soil composed of a friable mixture of relatively equal and moderate proportions of clay, silt, and sand particles, and usually containing organic matter
S	sand	A term used in the U.S. for a rock or mineral particle in the soil, having a diameter in the range of 0.05-2 mm.
SI	silt	A rock or mineral particle in the soil, having a diameter in the range of 0.002-0.05 mm.
SIL	silt loam	A soil containing 50-88% silt, 0-27% clay, and 0-50% sand; e.g. one with at least 50% silt and 12-27% clay, or one with 50-88% silt and less than 12% clay.
SL	sandy loam	A soil containing 43-85% sand, 0-50% silt, and 0-20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30, or containing 43-52% sand, less than 50% silt, and less than 7% clay.

48) Light Exposure List of Values:

Code	Name	Description
SUN	Full Sun	Full Sun characterizes the predominant light exposure condition across the EO.
PSH	Partial Shade	Partial Shade characterizes the predominant light exposure condition across the EO.
FSH	Full Shade	Full Shade characterizes the predominant light exposure condition across the EO.

53) Dominant Process List of Values:

Code	Name	Description
10	Insects (general)	Any of numerous usually small arthropod animals of the class Insecta, having an adult stage characterized by three pairs of legs and a body segmented into head, thorax, and abdomen and usually having two pairs of wings. Insects include the flies, crickets, mosquitoes, beetles, butterflies, and bees.
19	General diseases	A general category for a pathological condition of a part or system of an organism resulting from various causes, such as infection, genetic defect, or environmental stress, and characterized by an identifiable group of signs or symptoms. Included are biotic damage, root/butt diseases, stem decays/cankers/parasitic/epiphytic plants, decline complexes/diebacks/wilts, foliage diseases, stem rusts and broom rusts.
30	Fire	Disturbances related to natural or human caused fires.
41	Wild animals	Disturbances related to the activities of wild animals
42	Domestic animals	Disturbances related to domestic animals.
50	Abiotic damage	Disturbances related to a wide variety of abiotic events, including air pollution, chemicals, drought, flooding, lightning, snow/ice, avalanches and landslides.
51	Erosion	Disturbances related to the group of natural processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is worn away from the earth's surface.
60	Competition	Disturbances related to the simultaneous demand by two or more organisms for limited environmental resources, such as nutrients, living space, or light.
70	Human activities	Disturbances related to human activities, including herbicides, imbedded objects, land clearing, logging damage, roads, vehicle damage and compaction.
90	Unknown	The mechanism creating the disturbance is unknown.

55) Community Quality List of Values

Code	Name	Description
L	Low	
M	Medium	
H	High	

56) Landscape Integrity List of Values

Code	Name	Description
L	Low	
M	Medium	
H	High	

57) Threats List of Values

Code	Name	Description
CO	Collecting	Collecting; includes scientific collecting, or gathering by gardeners or others with the intent of cultivation, or collecting for medicinal or wildcrafting use
EX	Exotic Plant Species	Threats related to the invasion of an invasive plants infestation.
FC	Change in fire regime	Successful fire suppression activities have lead to changes in the seral stage that may contribute to a greater threat of catastrophic fires.
FF	Fire suppression activities	Fire suppression activities, including hand lines, dozer lines, back burning, etc.
FI	Increased fire frequency	Changes in the vegetation community are contributing to an increased fire frequency.
FL	Federally Listed Species	Not currently known to occur on NFS lands in a given state, but currently included by USFWS on the species lists for the National Forests in that state; = listed species potentially occurring on NFS lands
FR	Fire (direct effects)	The effects of burning from a fire.
FS	Stand-replacing fires	The effects of intense fire that leads to mortality and stand replacement
GI	Grazing, Indirect Effects	Indirect effects of livestock grazing (e.g., changes in moisture regime)
GZ	Grazing, Direct effects	Direct effects of livestock grazing (e.g., browsing, trampling)
FX	Fire exclusion	Due to fire exclusion, the population is threatened.
HC	Hydrological regime	Changes; includes alterations to wetland habitats (e.g., peatlands, aquatic habitats) that might result indirectly from management activities elsewhere in the watershed

Code	Name	Description
MN	Mining	The direct and indirect effects of mining including removal of material, stockpiling or disposal of tailings and discharge of fluids.
NW	Not protected by existing wetland protections	Not adequately protected by existing wetland/SMZ/BMP guidelines (e.g., isolated wetlands < 1 acre, as not covered by PACFISH/INFISH)
OV	Off highway vehicles	Off-highway vehicles and motorized recreation
PA	Pathogens	Pathogens are affecting the population.
PL	Pipelines	Direct and indirect disturbances related to pipeline construction and maintenance
RC	Recreation	Recreation (hiking, stock use, mountain bike use, trail construction, etc.)
RD	Road construction	Direct and indirect disturbances related to road construction.
RE	Review	Review of status, threats, and ecological specialization needed by Forest specialists
RM	Road maintenance	Direct and indirect disturbances related to road maintenance.
RP	Riparian zone disturbances	Generic code for disturbances in riparian zones related to human activities
SU	Succession	The natural vegetation succession is creating habitat that is threatening the population
TH	Timber harvest	Timber harvest activities, including felling, yarding and disposal activities are threatening the population.
XX	Herbicide spray and drift	Direct application of herbicides and indirect effects of drift are affecting the population.

61) Ground Cover List of Values

Code	Name	Description
BARE	Bare soil (soil particles < 2 mm)	Bare soil, not covered by rock, cryptogams, or organic material. Does not include any part of a road (see definition for road).
BAVE	Basal vegetation	Basal vegetation, not differentiated by lifeform. For use when basal vegetation is not separated into more detailed codes.
BEDR	Bedrock Outcrop	A general term for the rock, usually solid, that outcrops at the surface
GRAV	Gravel	Rock fragments between 2 and 75 mm in diameter.
LICH	Lichen	an organism generally recognized as a single plant that consists of a fungus and an alga or cyanobacterium living in a symbiotic association. For lichen growing on bare soil in dry rangeland conditions see cryptogrammic crusts (CRYP).

LITT	Litter and duff	Leaf and needle litter, and duff not yet incorporated into the decomposed top humus layer. Non-continuous litter is not included (for example, scattered needles over soil is classified as BARE).
MOSS	Moss	Nonvascular, terrestrial green plant, including mosses, hornworts, and liverworts. Always herbaceous. This code does not apply to moss growing on bare soil in dry rangeland conditions. For rangeland conditions, see cryptogrammic crusts (CRYP).
ROAD	Road	Improved roads, paved roads, gravel roads, improved dirt roads, and off-road vehicle trails regularly maintained or in long-term continuing use. Generally constructed using machinery. Includes cut banks and fills.
ROCK	Rock	Relatively hard, naturally formed mineral or petrified matter >1/8 inch in diameter appearing on soil surface, as small to large fragments, or as relatively large bodies, cliffs, outcrops or peaks. Includes bedrock. Generic term used by Inven.
WATE	Water	Where the water table is above the ground surface during the growing season, such as streams, swamps, marshes, and ponds.

63) Completeness of Species List List of Values:

Code	Name	Description
C	Complete	Represents an attempt to list all species found in association with the EO. The occurrence polygon or the survey area was surveyed intensively.
R	Reduced	Incomplete species list for some reason, e.g., partial search, only listed species above a certain cover value, etc. Indicate any specific criteria in a separate note.
S	Selected	Only listed species according to some selection criteria, such as only certain life forms, only species of specific interest, etc. Indicate any specific selection criteria in a separate note.

***74) ID Confirmed* List of Values:**

Code	Name	Description
Y	Yes	Identification of the specimen has been confirmed
N	No	Identification of the specimen has not been confirmed, pending follow-up verification
Q	Questionable	Identification of the specimen can't currently be confirmed

Appendix C - TES Plant Element Occurrence Field Form

USDA FOREST SERVICE 2005

® = required field, ®* = conditionally required field

General Information

1) FS SITE ID: ®	**2) DATE: ®**	**3) SITE NAME:**
4) NRCS PLANT CODE: ®		
5) SCIENTIFIC NAME: ®		
6) RECORD SOURCE: ®	**7) SURVEY ID: ®***	**8) Survey Name:**
9) EXAMINER(S)- LAST: ®	**FIRST:**	**MIDDLE INITIAL:**
LAST:	**FIRST:**	**MIDDLE INITIAL:**
10) OWNERSHIP: ®		
11) E.O. #	**12) NEW OCCURRENCE – YES:** *OR* **NO:**	
13) STATE: ®*	**14) COUNTY: ®***	
15) REGION: ®*	**16) FOREST: ®***	**17) DISTRICT: ®***
18) Entire extent mapped: Yes: No: Uncertain:	**19) Area (Est):**	**20) Area UOM: ®***
21) Canopy Cover Method ®* (circle one): COVER PERCENT; DAUBEN; NRMCOV		

Element Occurrence Data

22) EO Canopy Cover: %Cov: ***or*** Cover Class Code:		**23) Lifeform:**
24) Number of subpopulations:	**XX) Plants Found: Yes or No**	
25) Plant Count:	**26)Count Type: *Genets/Ramets/Undetermined***	**27) Count: *Actual* or *Estimate***
28) Revisit needed - Yes *or* No	**29) Revisit Date:**	
30) Revisit Justification:		
31) Phenology by % *(Sum to 100%):* Vegetative . . . . . ___ Flower/Bud . . . ___ Fruit/Dispersed . ___ Seedlings/ Juvenile . . . . . ___	**32) Population Comments:** (e.g., distribution, vigor, density, phenology, dispersal) **33) Evidence of disease, competition, predation, collection, trampling, or herbivory:** Yes___ *or* No ___ **34) Evidence Comments:**	
35) Pollinator observed – Yes *or* No	**36) Pollinator type(s):**	
37) Pollinator comments:		

Site Morphometry

38) Percent Slope:	**39) Slope position:**
40) Aspect: azimuth: ***or*** cardinal:	
41) Elev.: Ave: Min: Max:	**42) Elev UOM: ®***

Soil Characteristics and Light Conditions

43) Substrate on which EO occurs:		
44) Parent Material:	**45) Soil Moisture:**	**46) Soil Texture:**
47) Soil Type:		**48) Light Exposure:**

FS SITE ID:

Site Classifications

Record taxonomic units of the given type(s) if published classifications exist for the area.			
CLASSIFICATION TYPE	**CLASS CODE**	**CLASSIFICATION SHORT NAME**	**CLASSIFICATION SET**
49) Existing Veg			
50) Potential Veg			
51) Ecotype			

Habitat Quality and Management Comments

52) Habitat Description:	
53) Dominant Process:	
54) Community Quality *(L, M, H):*	**55) Landscape Integrity *(L, M, H):***
56) Process Comment:	
57) Disturbance/Threats (present or imminent):	
58) Disturbance/Threats Comment:	
59) Non-Native Comment:	
60) Current Land Use Comment:	

Canopy Cover

Record % canopy cover by actual percent, ***or*** by cover class (*as indicated in General Information Block*).			
Lifeform Canopy Cover	**61) % Cov *or* Code**	**Ground Cover**	**62) % Cov *or* Code**
Tree		Bare	
Shrub		Gravel	
Forb		Rock	
Graminoid		Bedrock	
Non-vascular		Moss	
Lichen		Litter/Duff	
Algae		Basal Veg	
		Water	
		Road surface	
		Lichen	

FS SITE ID:

Associated Species

List species directly associated with the EO species on this site. Record the NRCS Plant Code, scientific name or both. If desired, indicate lifeform, dominant species, % cover for each species and flag non-native species.

63) Completeness of Species List: ®* C, R, OR S

64) Species List Comment:

65) NRCS Plant Code	66) Scientific Name	67) Life Form	68) Dom. (Y/N)	69) % Cov or Class	70) Non-native

EO Specimen Documentation

71) Reference for ID:

72) Primary Collector – Last Name: **First Name:** **M.I.**

Other Collectors – Last Name: **First Name:** **M.I.**

73) Collection #: ®* | **74) ID Confirmed: ®*** Y: or N: or Questionable:

75) Verification:

76) Specimen Repository: ®*

Image Information

77) Image ID	78) Image Description

Location Information

(State, County, Region, Forest, District will be auto-populated by the database application when the spatial feature is entered)

79) USGS Quad Number:	80) USGS Quad Name:
81) Forest Quad Number:	82) Forest Quad Name:

83) Legal Description: Required where public land survey is available.

Meridian: **Township and Range:**

Section:__ **Q Sec:___** **QQ Sec: ____** **QQQ Sec: ____** **QQQQ Sec: ____**

84) Latitude and Longitude (either in degrees, minutes, seconds or in decimal degrees)

Geodetic Datum:

Latitude: **Degrees __ __ N** **Minutes** **Seconds __ __.__ __**

Longitude: **Degrees __ __ __ W** **Minutes** **Seconds __ __.__ __**

GPS Datum:

GPS Lat. Dec. Degrees: **GPS Long. Dec. Degrees:**

85) UTM

UTM Datum: **UTM Zone:**

Easting: __ __ __ __ __ __ **Northing: __ __ __ __ __ __**

86) GPS Equipment Used (Manufacturer and Model):

87) Metes and Bounds

FS SITE ID:

88) Directions to Site

89) Sketch of Site or Area

90) General EO Comments

Attachment 5-5: USFS Inventory Methods for Cave Resources and Bat Species and Data from 2005–2006 Hibernacula Surveys

ATTACHMENT 5-5

USFS INVENTORY METHODS FOR CAVE RESOURCES AND BAT SPECIES AND DATA FROM 2005-2006 HIBERNACULA SURVEYS

(received from M. Gerdes, USFS, July 26, 2006)

Example of Inventory Methods:

Cave Resources – Bat Species

Introduction: The Townsend's big-eared bats are considered "cave specialists", and are commonly associated with cave or mine microclimates. Clark et al. (1996) reported average temperatures of 12.8 - 16.3° C (55 - 61° F) and average humidity of 86-95% over 2 seasons for 19 Ozark big-eared bat (*Corynorhinus townsendii ingens*) maternity roosts at caves in Arkansas and cited similar results for studies on the species in Arkansas and Oklahoma (Harvey 1986 and Clark 1991, as described in Clark 1996). Temperatures where bats clustered were significantly cooler than temperatures where solitary bats roosted (temp differences were approximately 3° C/37° F). At 2 maternity roosts of Virginia big-eared bats *(Corynorhinus townsendii virginianus)* in caves, nighttime mean minimum temperatures recorded June - August were 14.8-15.8° C (58.6-60.4° F) and nighttime mean maximum temperatures were 23.3-23.8°C (74- 75° F; Lacki et al. 1994).

Temperatures between -1.5-3 ° C (29-37 ° F) have been recorded at Townsend's big-eared bat hibernacula in caves in Washington and Idaho (Adler 1977, Doering 1998) and averaged 50% humidity (Doering 1996).

Temperature data for cave sites used for fall reproductive activity (swarming sites) has not been collected, although these same sites also may be used for hibernation or migration staging (Fenton 1969, Thomas et al. 1979, Schowalter 1980, Perlmeter 1998). This activity is the basis for suspecting that some bats that spend summer in lower elevation in temperate climates may migrate upslope to hibernate in caves where temperatures remain consistently low through the winter. Hibernating in areas where temperatures remain consistently low is a strategy that avoids energy expenditure associated with arousal, thermoregulation, winter foraging, or roost switching (Fenton 1993).

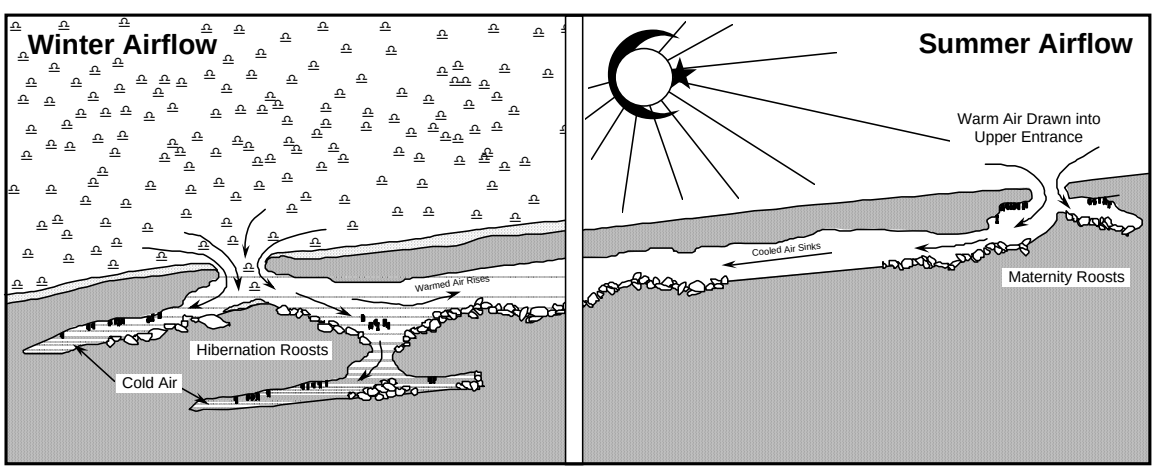

Figure 1: *Seasonal shifts in airflow and temperature associated with cave or mine habitat dictate where bats select warm weather or cold weather roost sites.*

Suitable habitat: Hibernacula - caves or mine adits that are generally close to freezing; maternity sites - typically located in sites above 50 degrees F., in shallow caves or old abandoned buildings; and roosting sites – caves, mine adits, old buildings, large hollow old growth trees and the undersides of bridges.

Existing habitat: Numerous mine adits and several caves are located in the study area. These include: Flusey Group (BLM), Galena, Gardner, Giant (FS), Grandview, Hanley, Hoage (FS), Lakeview(FS), Lead King (FS), Robert E. Lee (BLM), Lucky Strike #1(FS?), Metaline (pvt), Oriole (FS), Riverside, Tom Cat, Wolf Creek (pvt), Yellowhead (BLM?), Z Canyon (submerged), Z Canyon Grotto # 1,2&3, River Grotto #1&2, and Unk cave above Lime Ck.

Current survey data: On February 13, 2006, Mike Borysewicz (Wildlife Biologist, Newport-Sullivan Lake RD, CNF) and Rod Lentz (Certified Minerals Examiner for the Colville and Okanagon National Forests) surveyed the Oriole mine and found roughly 40 hibernating Townsend's bats in Oriole #1 (lower adit); a significant hibernacula in northeast WA. They found no bats in the Giant #1, Giant #2 or Hoage workings.) On March 2nd and 3rd, 2005, Rod Lentz and Mike Borysewicz surveyed several mine adits (tunnels) on the ranger district for hibernating bats. Monitoring Results for 3/2/2005 include:

<u>Giant #1</u> – This adit has been closed with a bat friendly gate and is located just above County Road 2975 (Boundary Dam Road). No bats were detected in this working.

<u>Giant #2</u> – This adit has been closed with a bat friendly gate and is located on the slope above Giant #1. One bat was found (possibly a big brown bat) in the short side drift off the main tunnel.

<u>Hoague</u> – This adit has been closed with a bat friendly gate and is located just east of the Boundary Dam Road on a side spur. No bats were detected in this working.

<u>Lakeview</u> – This adit is located north of Crescent Lake off Forest Road (FR) 3140320. Because of its relatively remote / hidden location, it was not identified as a priority for closure and remains open. One unknown species of bat was found hanging in the main shaft near the back of the adit (beyond a major bend to the right). This animal had brown pelage, black extremities, and mouse-like ears. It appeared to be smaller than a big brown bat.

<u>Lakeshore</u> – This adit has been closed with a bat friendly gate and is located above the southeast shore of Sullivan Lake. In past years, internal surveys of this working in the summer have revealed one or two bats roosting. During one early October survey the total was three, and a survey conducted in late October revealed eight animals. A total of 15 out of 17 total bats documented by various observers during these surveys were identified as Townsend's bats. The other two were unknown species. It is possible that at least some of the bats thought to be Townsend's during these surveys were misidentified. I think there may have been a propensity for us to class any larger sized bat as a Townsend's big eared bat, without taking a hard, subjective look at the evidence.

Six bats were found during our survey, distributed from the front of the adit (perhaps three feet from the gate) to the rear. Only the one in front appeared to be a Townsend's bat. The rest were all the same size and possibly big brown bats, although one appeared to have lighter colored, patchy pelage. These animals all appeared to have smaller ears.

Monitoring Results for 3/3/2005 include:

Oriole – This working has three entrances and is located west of the town of Metaline. A bat friendly gate has been installed on the main, mid-slope entrance. The upper stope and lower adit have large culverts installed with bat friendly gates inside them. We entered the main and lower adits.

> *Main adit* – Two bats were detected (possibly big brown bats) hanging about 80 feet and 110 feet from the adit entrance. Temperature recorders were hung near the bats and at the entrance of this adit.
>
> *Lower adit* – Within 10-15 feet of the end of the culvert in the adit portal were at least 13 Townsend's bats and 6 other individuals (possibly big brown bats), hanging in small clusters or singly. These numbers are a conservative estimate as it was difficult to tell how many were in a cluster, and the surveyors could have easily missed individuals behind irregularities in the mine ceiling. The Townsend's bats were all either tightly clumped or at least touching other individuals. Some of the bats of the other species were hanging by themselves. Individuals of both species were grouped and touching one another in one instance.
>
> Surveyors did not want to risk disturbing the animals to obtain a more accurate count. Surveyors simply counted what could see from right at the end of the culvert. There did not appear to be any additional animals beyond 15 feet of the end of the culvert. There was a small pool of water (perhaps a foot or so deep) on the adit floor that many of the bats were hanging over. A temperature recorder was hung from the end of the culvert in this adit.

Bead Lake – This adit is located just south of Bead Lake on a short spur road originating from County Road 3029. The Forest Service originally closed this mine with a bat friendly gate. However, after a year or two, material above the portal raveled down and effectively closed the entrance. Last summer a track hoe was used to re-open the adit. A large culvert was installed in front of the gate and wedged in place with rocks and soil.

An internal survey of this mine conducted on 9/15/99 revealed a total of 43 bats, two of which were larger and might have been Townsend's.

Survey methods:

1) Identify all known caves and mine adits in the study area, including those inundated by the Project reservoir. Identify cave potential in the limestone cliff between normal reservoir high water mark and the normal low water mark known as the fluctuation zone.

2) Field reconnaissance will be conducted to locate and document suitable habitat. Surveys for bats will be conducted in two phases: 1) during the summer for day roosts and evidence of maternity colonies and 2) during the winter for hibernacula surveys.

Federal employees are only permitted to enter mines when accompanied by a certified mining inspector. Internal surveys for bats in mines must include on-site involvement of a certified minerals examiner. Information about these requirements can be found in the Forest Service Health and Safety Code Handbook under 22.81 – Mines and Mineral Surveys.

Safety is a major consideration when entering mines and caves. Individuals entering either should be prepared with radios in case of an emergency. Relying on radios for communicating from inside a cave or mine is unrealistic as radio connections will be broken once the cave or mine is entered. Standard procedure for interior examination of caves or mines includes:

- Providing Dispatch and the appropriate supervisor with an itinerary and locations of mines or caves to be entered.
- Dispatch or a supervisor is contacted by radio when entering and emerging from underground.
- Including these and other safety precautions in a job hazard analysis and safety plan before surveys are started.

Internal Visual Observations - caves and mines

Provided safety requirements and skills are met, internal searches can be completed as follows:

- A minimum of 2 people enter the cave or mine.
- An additional person (spotter) remains outside the cave or mine entrance if a hazard analysis has identified this as a needed precaution.
- Avoid conversation, unnecessary noise, and extraneous activity inside the cave or mine by determining responsibilities of all parties prior to entering the cave or mine and by having needed accessories (headlamps, paper and pencil) easily available and functional.
- Wear “soft” clothing such as fleece or cotton to reduce noise, avoid “noisy” clothing such as nylon and velcro, and use soft cloth collection bags instead of plastic or paper.

- Carry temperature, humidity, and airflow monitors (e. g. Kestrel, Hobo) and record results measuring at 20 cm below the ceiling within the twilight zone and every 15 m beyond (Sherwin et al. 2003). This data can be used to compare local conditions where bats are known to roost.

- Use white light to negotiate the cave or mine and look for guano deposits, insect remains (e.g. moth wings), and bat carcasses on the floor and use a deep red filter placed over a headlamp or auxiliary light to search for bats and urine and body oil stains on the ceiling and upper walls. Night vision equipment, auxiliary infrared lighting, or both, can be used for internal surveys. Where there are high ceilings or deep crevices, it may be necessary to briefly use a white spotlight to detect bats. Investigate all crevices, including drill holes in ceilings and walls of mines.

- Stay alert to audible sounds emitted by bats and use a bat detector to pick up echolocations. Search in all directions going into a cave or mine as well as when departing.

- If bats are detected, avoid walking beneath them, keep as far away from the bats as possible and low to the ground, stay quiet, avoid movement, stay against a wall or hidden if possible, use only a red light or night vision equipment, and minimize the bats exposure to the red light, especially if the bats are hibernating. Although presence has been determined at this point, obtain a quick estimate of the number and location of bats. When < 20 bats are observed or when bats are roosting solitarily or in small dispersed clusters, make a quick count of the bats. For larger groups of bats clustered tightly together, obtain a quick estimate of the number and location of bats by completing a partial count of bats for a small area in the cluster and extrapolate over the area covered by the cluster. The numbers of bats in a cluster can vary greatly depending on the season, presence of young, and size of cluster. Published packing densities also can be a good resource for this information, but they are typically reported by species (see Thomas and La Val 1988). Quickly scan other areas for bats roosting solitarily or in small clusters.

- Do not attempt to handle bats. Identify bats visually by obvious features only if possible without disturbing them.

- Quickly note the number and location of bats. More detailed notes and sketches should be recorded upon exiting the cave or mine to avoid additional disturbance to bats. Recording notes and sketches immediately after exiting the cave is recommended so the information is fresh in ones mind.

- If a thorough search going into a cave or mine shows no sign of bats, increase the use of white light in the outgoing search to improve detection of guano, insect wings, and urine and body oil stains on ledges, and to better map the extent of the cave or mine. Remain quiet. Note side passages that may lead to additional roosting habitat, potential for other types of roosting (e.g. ceiling domes with cracks and moisture to support hibernating bats, warm dry pockets for maternity sites), and characteristics that may inhibit roosting (e.g. high water levels, evidence of predators, and lack of airflow). If bats are detected

during the exit search, immediately switch to a red light and use the discrete survey methods described above.

- If no bats but signs of bats are detected, record type, freshness, amount, and map the location of signs. Measurements of stained areas where bats have roosted or the size of guano piles can be used to estimate cluster size and apply published packing densities.

- If bats are not detected but other indications of bat use are present, formulate a plan to determine periods of use by bats. This may involve additional surveys, guano traps, or remote monitoring equipment

- Additionally, stay alert to cave features, plants, cultural remnants, water, and signs of other animals that would be important in managing the site for resources other than bats. Map or note additional feature information to pass on to appropriate specialists or personnel.

- If you want to establish baseline data on microclimate conditions, install temperature, humidity, and airflow data collectors inside the cave or mine. You must be prepared to return to the site to collect the data typically once a year. This type of data collected where bats are not located can be as important as data collected where bats are located because it provides information on microclimatic conditions that can help predict where bats will and will not roost. You can use this data to assess habitat conditions year to year, or between sites.

Work Products: The following products will be provided:

- Regular updates: e-mails and/or website describing study status, preliminary findings, unanticipated issues, etc.
- Memorandums or data summaries will be provided at a level of detail required for the particular decision
- Draft and final technical report: including description of study objectives, study area, methods of the existing information review and surveys, field methods, survey results, and assessment of Project effects. A summary of the methods used to conduct the surveys and inventory. This section will include an accounting of when the surveys were conducted and a map of the areas covered. The results of the surveys, including a list of documented or suspected species observed in the study area. A brief description of each species will be provided, which will address habitat requirements, known distribution within the study area and Project vicinity, habitat used within the study area, and important sites. An assessment of potential threats and Project impacts to bats and their habitats, by site.
- The report will also include more detailed species summaries (e.g., life history, habitat requirements, current status and threats) within the study area.
- An updated list of bat species, and habitat information for new additions. The table will be expanded to include a description of suitable habitat in the study area for each target species. Rationale will be provided if it is determined that no potential habitat is present.

- Completed wildlife sighting forms and maps - hard copy and electronic data submitted to the Colville National Forest
- GIS database of survey locations and results that will be available to agencies.
- Completed data sheets for all surveys.
- A comprehensive list of all wildlife species observed and identified during surveys.