

Revised Study Plan
Boundary Hydroelectric Project (FERC No. 2144)

Study No. 17
Rare, Threatened, and Endangered (RTE) Plant Species Inventory

Seattle City Light

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Study No. 17 – Rare, Threatened, and Endangered Plant Species Inventory

1.0 INTRODUCTION

In general, information on rare, threatened, and endangered (RTE) plant species occurrences in the Boundary Project (Project) vicinity¹ 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 Seattle City Light (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 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.

¹ The study area for the botanical and wildlife resource studies varies by study, referring to both the “Project area” and “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 lands that are included in the study area.

2.0 STUDY PLAN ELEMENTS

2.1. 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 bladderly milkvetch (*Astragalus microcystis*), a species often observed growing in rocky substrates within the reservoir fluctuation zone (SCL 2006a). 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.

2.2. 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).

2.3. 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:

- Survey for and 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 (e.g., nearby infestations of invasive non-native species, erosion, herbivory) and their habitats, including potential Project effects.

2.4. 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 2006a]). 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 2.4-1).

A total of 58 occurrences of 10 different vascular 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 bladderly milk-vetch) 9 occurrences
- *Carex flava* (Yellow sedge) 3 occurrences
- *Cicuta bulbifera* (Bulb-bearing water-hemlock) 3 occurrences
- *Cryptogramma stelleri* (Steller's rock-brake) 3 occurrences
- *Dryas drummondii* (Yellow mountain-avens) 17 occurrences
- *Impatiens aurella* (Orange balsam) 3 occurrences
- *Muhlenbergia glomerata* (Marsh muhly) 1 occurrence
- *Sanicula marinlandica* (Black snake-root) 3 occurrences
- *Sisyrinchium septentrionale* (Blue-eyed grass) 1 occurrence
- *Thalictrum dasycarpum* (Purple meadowrue) 14 occurrences
- *Viola renifolia* (Kidney-leaved violet) 1 occurrence

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 in 2005 and 5 new occurrences in 2006. Two new occurrences of RTE plants – kidney-leaved violet and Steller's rock-brake – were reported to have been found in the Project area by the USFS in June 2006. Steller's rock-brake was reported found growing on cliffs at the mouth of Slate Creek. Kidney-leaved violet was documented growing along the reservoir shoreline. Detailed information on the taxonomy, status, habitat requirements, and the distribution of the 11 RTE plant species documented in the Project vicinity in or prior to 2006 are discussed in the PAD (SCL 2006a) and in a supplemental report (SCL 2007) based on 2006 field work that updates the PAD information on RTE plants.

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).

Results of the 2005 reconnaissance surveys suggest that three RTE plant species — yellow mountain avens, purple meadowrue, and least bladderly 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 bladderly 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.

There is relatively little known about the 10 non-vascular RTE plants on the target list for the CNF. Only one species—naked kidney lichen (*Nephroma bellum*)—has been documented near the Project. This species was found on the CNF about 2 miles east of the Project near Holiday Fen. Suitable habitats for this species and the nine other non-vascular plants on the target list could potentially occur in the Project area (K. Ahlenslager, Botanist, USFS, personal communication, January 9, 2007; included in Attachment 4 of this RSP).

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 2.4-1. 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							
<i>Antennaria corymbosa</i>	Meadow Pussy-toes	None	S	BA	T	June to Aug.	Bogs. elev. 5,000 feet.
<i>Antennaria parvifolia</i>	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.
<i>Astragalus microcystis</i>	Least Bladdery Milk-vetch	None	S	BA	S	Late April – Aug.	Open woods near shorelines, riverbanks, floodplains. elev. 1,900 to 2,100 feet.
<i>Botrychium ascendens</i>	Triangular-lobed Moonwort	None	S	BA	S	June–July	Dry meadows. elev. 3,000 to 3,400 feet.
<i>Botrychium crenulatum</i>	Crenulate Moonwort	None	S	BA	S	May–Sept	Western red cedar/western hemlock forests, stream banks, floodplains. elev. 2,030 to 4,600 feet.
<i>Botrychium hesperium</i>	Western Moonwort	None	S	BA	T	Late May – early June	Dry to moist meadows. elev. 3,200 to 3,300 feet.
<i>Botrychium lineare</i>	Skinny moonwort	None	S	FC	T	June	Western redcedar/western hemlock forests, streambanks, floodplains. elev. 2,000 to 4,000 feet.
<i>Botrychium paradoxum</i>	Two-spiked Moonwort	None	S	BA	T	May–Sept.	Meadows, perennial and intermittent streams. elev. 2,500 to 3,600.
<i>Botrychium pedunculosum</i>	Stalked Moonwort	None	S	BA	S	May–Aug.	Dry to moist meadows, perennial streams. elev. 2,500 to 3,300 feet.
<i>Carex capillaries</i>	Hair-like sedge	None	S	BA	S	June–Aug.	Streambanks, wet meadows, wet ledges, marshy lake shores. elev. 2,800 to 6,500 feet.
<i>Carex comosa</i>	Bristly Sedge	None	S	BA	S	May–July	Marshes, lake shores, and wet meadows. elev. 50 to 2,000 feet.
<i>Carex dioica</i>	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.
<i>Carex flava</i>	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 2.4-1, continued...

Scientific Name ¹	Common Name	USFWS Status ²	USFS Status ³	BLM Status ⁴	WNHP Status ⁵	Flowering/ Fruiting	Habitat Requirements/Information
<i>Carex hystericina</i>	Porcupine Sedge	None	S	BA	W	May–June	Wet depressions, along creek drainages and hillside seeps. elev. 500 to 2,600 feet.
<i>Carex praeceptorum</i>	Teacher's Sedge	None	None	BT	R1	July–Aug.	Wet meadows and areas at higher elevations in mountains
<i>Carex rostrata</i>	Beaked Sedge	None	S	BA	S	July–Aug.	Bogs and fens. elev. 4,600 to 5,000 feet.
<i>Carex saxatilis</i> var. <i>major</i>	Russet Sedge	None	S	BA	W	July–Aug	Wet meadows and margins of lakes and streams.
<i>Carex sychnocephala</i>	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
<i>Centunculus minimus</i>	Chaffweed	None	None	None	R1	May–June	Moist ground, ephemeral wet areas elev. ~800 feet.
<i>Chrysosplenium tetrandrum</i>	Northern golden carpet	None	S	BA	S	June	Perennial and intermittent streams, seeps in rock outcrops. elev. 2,000 to 4,000 feet.
<i>Cicuta bulbifera</i>	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.
<i>Cryptogramma stelleri</i>	Steller's Rock-brake	None	S	BA	S	April–Oct.	Cliffs. elev. 300 to 3,500 feet.
<i>Cypripedium parviflorum</i>	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.
<i>Dryas drummondii</i>	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.
<i>Dryopteris cristata</i>	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.
<i>Eriophorum viridicarinatum</i>	Green Keeled Cotton-grass	None	S	BA	S	June–July	Fens and marshes. elev. 2,900 to 4,650 feet.
<i>Gaultheria hispidula</i>	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 2.4-1, continued...

Scientific Name ¹	Common Name	USFWS Status ²	USFS Status ³	BLM Status ⁴	WNHP Status ⁵	Flowering/ Fruiting	Habitat Requirements/Information
<i>Geum rivale</i>	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.
<i>Hierochloe odorata</i>	Common Northern Sweet Grass	None	None	None	R1	Apr. –July	Moist soil of low montane and subalpine slopes and meadows
<i>Hypericum majus</i>	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.
<i>Impatiens aurella</i>	Orange Balsam	None	None	BT	R2	July–Sept.	Moist, open or shaded habitats.
<i>Lobelia kalmii</i>	Kalm's Lobelia	None	S	BS	E	Late July – Aug.	Marl or peat bogs, along shores and in other wet places.
<i>Lomatium sandbergii</i>	Sandberg Desert-parsley	None	None	None	R1	May–July	Open, rocky places at moderate to higher, subalpine habitats
<i>Lycopodiella inundata</i>	Bog Clubmoss	None	S	BA	S	March–Oct.	Mostly in sphagnum bogs, seldom in other very wet places. elev. 1,800 feet.
<i>Lycopodium dendroideum</i> (= <i>Diphasiastrum alpinum</i>)	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.
<i>Muhlenbergia glomerata</i>	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.
<i>Ophioglossum pusillum</i>	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.
<i>Penstemon wilcoxii</i>	Wilcox's Penstemon	None	None	None	S	May–July	Open or wooded areas, sometimes in rocky substrates in foothills and middle elevations.
<i>Physaria didymocarpa</i> var. <i>didymocarpa</i>	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 2.4-1, continued...

Scientific Name ¹	Common Name	USFWS Status ²	USFS Status ³	BLM Status ⁴	WNHP Status ⁵	Flowering/ Fruiting	Habitat Requirements/Information
<i>Platanthera obtusata</i>	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.
<i>Salix candida</i>	Hoary Willow	None	S	BA	T	May–June	Fens. elev. 2,400 to 3,000 feet.
<i>Salix maccalliana</i>	Maccall's Willow	None	S	BA	S	May–June	Bogs and fens. elev. 2,400 to 3,000feet.
<i>Salix pseudomonticola</i>	Serviceberry willow	None	S	None	None	May–June	Fens and bogs. elev. 2,900 feet.
<i>Sanicula marilandica</i>	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.
<i>Scutellaria angustifolia</i> ssp. <i>micrantha</i>	Narrowleaf Skullcap	None	None	None	R1	May–June	In a variety of open, moist or dry, often rocky habitats east of the Cascade Range
<i>Sisyrinchium montanum</i>	Strict Blue-eyed-grass	None	None	None	T	May	Steep west-facing slopes associated with small seeps/springs; elev. 700 feet.
<i>Sisyrinchium septentrionale</i>	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.
<i>Spartina pectinata</i>	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.
<i>Spiranthes diluvialis</i>	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
<i>Teucrium canadense</i> ssp. <i>viscidum</i>	Woodsage	None	S	None	W	June–Aug.	Wet areas around lakes and stream banks in low areas. elev. 0 to 2,300 feet.
<i>Thalictrum dasycarpum</i>	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 2.4-1, continued...

Scientific Name ¹	Common Name	USFWS Status ²	USFS Status ³	BLM Status ⁴	WNHP Status ⁵	Flowering/ Fruiting	Habitat Requirements/Information
<i>Utricularia intermedia</i>	Flat-leaved Bladderwort	None	None	BA	S	May (June)	Shallow ponds, slow-moving streams, and wet sedge or rush meadows. elev. 4,000 feet.
<i>Utricularia minor</i>	Lesser Bladderwort	None	None	BT	R1	June–Sept.	Shallow, standing or slow-moving water.
<i>Vaccinium myrtilloides</i>	Velvet-leaved Blueberry	None	S	BA	S	May–June	Western red-cedar/ western hemlock forests. elev. 2,000 to 3,000 feet.
<i>Viola renifolia</i>	Kidney-leaved Violet	None	None	BT	S	Late May – mid-June	Moist lowland forests. elev. 2,270 to 4,355 feet.
NON-VASCULAR PLANTS - LICHENS⁶							
<i>Dermatocarpon luridum</i>	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
<i>Leptogium burnetiae</i> var. <i>hirsutum</i>	Jellyskin	None	S	None	P2	None	Typically epiphytic on trees but also on decaying rocks and mosses
<i>Leptogium cyanescens</i>	Blue jellyskin	None	S	None	None	None	Bark of conifers and hardwood trees and logs, mossy rocks in cool, moist micro-sites
<i>Nephroma bellum</i>	Naked kidney lichen	None	S	None	None	None	On branches and twigs of trees, especially conifers. Also on mossy rocky in humid forests.
<i>Peltigera neckeri</i>	Black saddle lichen	None	S	None	None	None	Mossy logs, soil and tree bases in wet forest habitats
<i>Peltigera pacifica</i>	Fringed pelt	None	S	None	None	None	Mossy logs, soil and tree bases in wet forest habitats
<i>Tholurna dissimilis</i>	Urn lichen	None	S	None	P1	None	On twigs and branches of exposed conifers in humid subalpine habitats
NON-VASCULAR PLANTS – MOSSES⁷							
<i>Schistotega pennata</i>	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.
<i>Scouleria marginata</i>	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 2.4-1, continued...

Scientific Name ¹	Common Name	USFWS Status ²	USFS Status ³	BLM Status ⁴	WNHP Status ⁵	Flowering/ Fruiting	Habitat Requirements/Information
<i>Tetraphis geniculata</i>	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 2006a) 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: FT=Listed as Threatened, likely to become endangered (WNHP 2006).
- 3 USDA Forest Service (USFS) Regional Forester's Sensitive Species, Region 6, updated July 2004 (USFS 2004). S = Sensitive.
- 4 Bureau of Land Management Special Status Species, updated March 2005 (BLM 2005). 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).

2.5. 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 (see Figure 1.3-2 in the Proposed Study Plan [PSP; SCL 2006b] 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 \approx 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.^{2 3}
- 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, and other roads identified as necessary for Project purposes (as identified by the results of Study No. 22, Land and Roads Study).
- 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.

² 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 the PSP (see Table 1.3-1; SCL 2006b). Following completion of the Hydrology Dataset and Statistics in March 2007 (see Attachment 1, section 3.1 of this RSP), SCL will review and refine, as necessary, this elevation range.

³ As indicated in this and other study plans in the RSP, 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 and Pre-Field Review

The target RTE plant species list (Table 2.4-1) may 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.

Prior to beginning field surveys botanists will review the morphological characteristics of target RTE plant species to develop a search image to improve detection and recognition abilities. This process will include reviewing herbarium specimens and collecting information on vegetative, floral, and fruit characteristics for each target species and other species that are closely related or otherwise difficult to distinguish from the target species. This pre-field review step will be particularly important for the 10 non-vascular RTE species.

In addition, USFS field guides and protocols for sensitive species surveys and documentation will be reviewed, particularly the following:

- An Online Guide to Sensitive Plants on the Colville National Forest (USFS 2005a)
- "Threatened, Endangered, and Sensitive Plants Element Occurrence Field Guide" (USFS 2005b; Appendix 3 of this study plan). This guide provides an Element Occurrence Field Form and detailed descriptions of the data fields that must be completed to document sensitive plant occurrences on NFS lands.
- "Threatened, Endangered, and Sensitive Plants Survey Field Guide" (USFS 2005c; Appendix 1 of this study plan). This guide provides a Sensitive Plant Survey Field

Form and detailed descriptions of the data fields that must be completed to document sensitive plant surveys on NFS lands, even if no sensitive species are found.

Task 2: RTE Plant Survey

Surveys for vascular RTE plants will be conducted using the “intuitive controlled method,” whereby study area habitats with high potential to support these species 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; SCL 2006a) will be reviewed and used to identify study area habitats with the greatest probability of supporting RTE plants. The cliffs along Boundary reservoir downstream of Metaline Falls will probably require the use of powerful binoculars to survey for several species, particularly Stellar’s rock-brake, a small fern that occurs in crevices.

Survey protocols for non-vascular plants follow those for vascular plants found in the USDA Threatened, Endangered and Sensitive Plant Survey Field Guide and Form. USFS botanists searching for these species typically look for textural differences in the cover of non-vascular plants on trees and rocks while conducting surveys in potential habitats for vascular and non-vascular RTE plants. Habitat features with observed textural differences are investigated further for the presence of RTE non-vascular plants (K. Ahlenslager, Botanist, USFS, personal communication, January 9, 2007). Similar methods will be used in searching for non-vascular plants in the study area. These searches will be focused on USFS lands and will be conducted in conjunction with surveys for vascular RTE species. Particular attention will be given to mossy rocks, large tree trunks, and down trees when these habitat features are encountered.

Based on the current target list (Table 2.4-1), surveys for vascular RTE plants will be scheduled to 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 these species. The survey periods are roughly estimated as three 2-week periods during the growing season (Table 2.5-1) 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. Ute ladies’-tress, for example, has potential to occur in some of the wetland habitats along Boundary Reservoir but can be difficult to detect in dense vegetation. The timing of surveys to correspond with its flowering period is critical to observing and positively identifying this species. Surveys for non-vascular RTE plants can occur at any time during the spring, summer, or fall but will be conducted concurrently with surveys for vascular species.

RTE plants will be identified in the field using the Flora of the Pacific Northwest (Hitchcock and Cronquist 1973) and the Field Guide to Selected Rare Plants of Washington (WNHP 2004). A variety of sources will be utilized to verify tentative species identification including other floras, published papers, herbarium specimens, and consultation with appropriate taxonomic specialists. Plant species of questionable or unknown identification will be collected and sent to taxonomic specialists. Because so little is known about non-vascular plants in the study area, specimens of uncommon or unusual species will also be collected and provided to the USFS for a baseline

reference collection. In addition, a comprehensive list of all plant species observed and identified during the RTE surveys will be compiled.

Table 2.5-1. Flowering times and approximate survey periods (weeks; S1, S2 and S3) for vascular RTE plant species known or potentially occurring in the study area. ¹

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
<i>Antennaria corymbosa</i>	June to Aug.					S1	S1			S2	S2			S3	S3						
<i>Antennaria parvifolia</i>	May to July					S1	S1			S2	S2										
<i>Astragalus microcystis</i>	Late April – Aug.					S1	S1			S2	S2			S3	S3						
<i>Botrychium ascendens</i>	June–July					S1	S1			S2	S2										
<i>Botrychium crenulatum</i>	May–Sept					S1	S1			S2	S2			S3	S3						
<i>Botrychium hesperium</i>	Late May/ June					S1	S1														
<i>Botrychium lineare</i>	June					S1	S1														
<i>Botrychium paradoxum</i>	May–Sept.					S1	S1			S1	S1			S3	S3						
<i>Botrychium pedunculatum</i>	May–Aug.					S1	S1			S2	S2			S3	S3						
<i>Carex capillaris</i>	June–Aug.					S1	S1			S2	S2			S3	S3						
<i>Carex comosa</i>	May–July					S1	S1			S2	S2										
<i>Carex dioica</i>	June–Aug.					S1	S1			S2	S2			S3	S3						
<i>Carex flava</i>	July–Aug.									S2	S2			S3	S3						
<i>Carex hystericina</i>	May–June					S1	S1														
<i>Carex praeceptorum</i>	July–Aug.									S2	S2			S3	S3						
<i>Carex rostrata</i>	July–Aug.									S2	S2			S3	S3						
<i>Carex saxatilis</i>	July-Aug																				
<i>Carex synchnocephala</i>	July–Sept.									S2	S2			S3	S3						
<i>Centunculus minimus</i>	May–June					S1	S1														
<i>Chrysosplenium tetrandrum</i>	June					S1	S1														
<i>Cicuta bulbifera</i>	All season					S1	S1			S2	S2			S3	S3						
<i>Cryptogramma stelleri</i>	April–Oct.					S1	S1			S2	S2			S3	S3						
<i>Cypripedium parviflorum</i>	May–June					S1	S1														
<i>Dryas drummondii</i>	May – early July					S1	S1														
<i>Dryopteris cristata</i>	June–Sept.					S1	S1			S2	S2			S3	S3						
<i>Eriophorum viridicarinatedum</i>	June–July					S1	S1			S2	S2										
<i>Gaultheria hispidula</i>	May–June					S1	S1														
<i>Geum rivale</i>	June–July					S1	S1			S2	S2										
<i>Hierochloa odorata</i>	Apr. –July					S1	S1			S2	S2										

Table 2.5-1, 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
<i>Hypericum majus</i>	July–Sept.									S2	S2			S3	S3						
<i>Impatiens aurella</i>	July–Sept.									S2	S2			S3	S3						
<i>Lobelia kalmii</i>	Late July – Aug.													S3	S3						
<i>Lomatium sandbergii</i>	May–July					S1	S1			S2	S2										
<i>Lycopodiella inundata</i>	March – Oct.					S1	S1			S2	S2			S3	S3						
<i>Lycopodium dendroideum</i>	June–July					S1	S1			S2	S2										
<i>Muhlenbergia glomerata</i>	July–Aug.									S2	S2			S3	S3						
<i>Ophioglossum pusillum</i>	June–Sept.					S1	S1			S2	S2			S3	S3						
<i>Penstemon wilcoxii</i>	May–July					S1	S1			S2	S2										
<i>Physaria didymocarpa</i> var. <i>didymocarpa</i>	June–Aug.					S1	S1			S2	S2			S3	S3						
<i>Platanthera obtusata</i>	June–July					S1	S1			S2	S2										
<i>Salix candida</i>	May–June					S1	S1														
<i>Salix maccalliana</i>	May–June					S1	S1														
<i>Salix pseudomonticola</i>	May–June					S1	S1														
<i>Sanicula marilandica</i>	June – mid-Aug.					S1	S1			S2	S2			S3							
<i>Scutellaria angustifolia</i> ssp. <i>Micrantha</i>	May–June					S1	S1														
<i>Sisyrinchium montanum</i>	May					S1	S1														
<i>Sisyrinchium septentrionale</i>	May – mid-June					S1	S1														
<i>Spartina pectinata</i>	June–July					S1	S1			S2	S2										
<i>Spiranthes diluvialis</i>	mid-July – August									S2	S2			S3	S3						
<i>Talinum sediforme</i>	Late May – July					S1	S1			S2	S2										
<i>Teucrium canadense</i> ssp. <i>Viscidum</i>	June–Aug.					S1	S1			S2	S2										
<i>Thalictrum dasycarpum</i>	June–Aug.					S1	S1			S2	S2										
<i>Utricularia intermedia</i>	May (June)					S1															
<i>Utricularia minor</i>	June–Sept.					S1	S1			S2	S2			S3	S3						
<i>Vaccinium myrtilloides</i>	May–June					S1	S1														
<i>Viola renifolia</i>	Late May – mid-June					S1	S1														

1 Surveys for non-vascular RTE plants can occur at any time during the spring, summer, or fall but will be conducted concurrently with surveys for vascular species.

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). 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
- Relative population location (reservoir fluctuation zone, recreation areas, Project facilities, erosion site, etc.)

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 and other RTE plants occupying cliffs and rock outcrops, 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 (Appendix 2 of this study plan). 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). 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 study area 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 (PAD Figure 4.3.6., Occurrence CAFL-1; SCL 2006a) 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 Cronquist (1973). However, some specimens had characteristics that overlapped with western meadowrue (*Thalictrum occidentale*). Voucher specimens should be collected and sent to an expert for positive identification.

2.6. Work Products

The results of the RTE plant survey will be compiled and discussed in a final 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. There will be an associated table that summarizes the number of populations of each RTE plant by land ownership (USFS, BLM, SCL, and private).
- 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 Attachment 1, section 2.4 of this RSP).

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.

2.7. 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.

2.8. 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 the PSP Attachment 5-1 (SCL 2006b) 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 (USFS 2006). Modifications included adding clarification and additional detail. A proposed plan for the RTE Plant Species Inventory addressing these comments was included in the PSP that was filed with FERC on October 16, 2006.

Since filing the PSP, SCL has continued to work with relicensing participants on its proposed study plans. In response to comments made during the November 15 study plan meeting and comments filed with FERC by the USFWS (2007) and USFS (2007), SCL has further modified the plan for the RTE Plant Species Inventory. (SCL's responses to comments are summarized in Attachment 3 and consultation documentation is included in Attachment 4 of this RSP.)

Modifications included adding clarification, additional supporting rationale, and additional detail to address FERC, USFWS and USFS comments. SCL believes that these agencies' comments are adequately addressed in this revised plan.

2.9. Schedule

The RTE Plant Species Inventory will be conducted in 2007 according to the schedule shown in Table 2.9-1.

Table 2.9-1. 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 2.5-1
Analysis	September–October 2007
Prepare draft study report	November–December 2007
Distribute draft study report for relicensing participant review	January 2008
Meet with relicensing participants to review efforts and results	February 2008
Include final study report in Initial Study Report (ISR) filed with FERC	March 2008
Hold ISR meeting and file meeting summary with FERC	March 2008

A second season of RTE plant surveys is not anticipated, but it is possible that weather conditions in 2007 or unresolved taxonomic issues may require some additional field work in 2008.

2.10. Progress Reports, Information Sharing, and Technical Review

In addition to preparing the study reports (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 Attachment 1, section 2.3 of this RSP.

2.11. 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.

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**Appendix 1: 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 (<i>spatial feature</i>)	Survey Polygon (<i>spatial feature</i>)
Survey ID	Survey ID
Survey Status	Survey Status
Survey Area (<i>Auto-generated in NRIS</i>)	Survey Area (<i>Auto-generated in NRIS</i>)
Area Unit of Measure (<i>Auto-generated, acres</i>)	Area Unit of Measure (<i>Auto-generated, acres</i>)
State (<i>Auto-generated in NRIS</i>)	Survey Type
County (<i>Auto-generated in NRIS</i>)	Survey Focus
Region (<i>Auto-generated in NRIS</i>)	Visit Dates
National Forest (<i>Auto-generated in NRIS</i>)	Examiners
District (<i>Auto-generated in NRIS</i>)	Target species plant code(s) (<i>i.e. objects of survey</i>)
	Suitable habitat found (<i>for the target species</i>)
	Target species found
	State (<i>Auto-generated in NRIS</i>)
	County (<i>Auto-generated in NRIS</i>)
	Region (<i>Auto-generated in NRIS</i>)
	National Forest (<i>Auto-generated in NRIS</i>)
	District (<i>Auto-generated in NRIS</i>)

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.

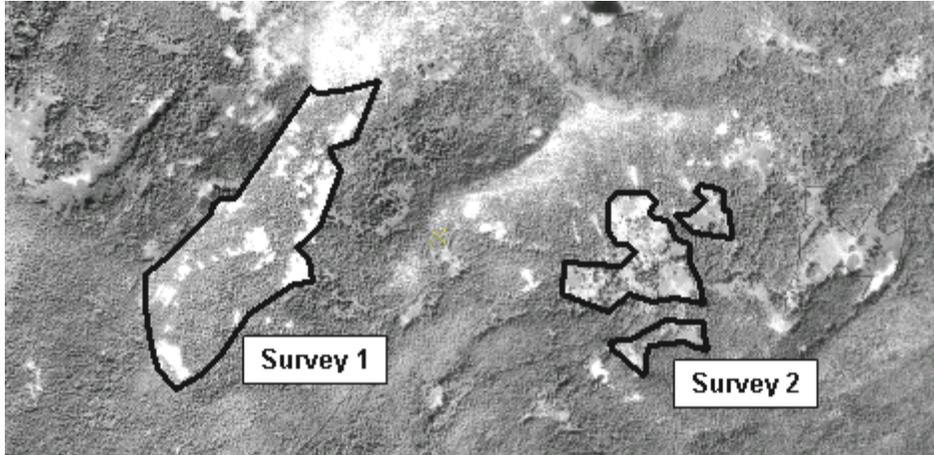


Figure 1: Survey 1 is single survey represented by one contiguous polygon. Survey 2 is a single survey represented by a multi-part polygon.

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 $\frac{1}{4}$; 2 equals $\frac{1}{2}$, and 3 equals a $\frac{3}{4}$ 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 1/4).

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 1/4 NE 1/4).

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 1/4 NW 1/4 NE 1/4).

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 1/4 SE 1/4 NW 1/4 NE 1/4).

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., <i>et al.</i> 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 <i>riparian</i> .
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 (<i>Isoetes</i>). 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

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:

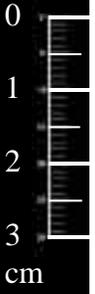
42) Directions to Survey Area

43) Sketch of Survey Area



**Appendix 2: Washington Natural Heritage Program
Rare Plant Sighting Form**

Washington Natural Heritage Program Rare Plant Sighting Form



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): _____

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



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 form. 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 than 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.

**Appendix 3: 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 (<i>spatial feature</i>)
FS Site ID
Date
NRCS Plant Code for EO species
Scientific Name for Plant Code
Record Source
Examiner(s)
Ownership
Area of occupancy (<i>Auto-generated in NRIS</i>)
Area Unit of Measure (<i>Auto-generated, acres</i>)
Survey ID (<i>if record source = field survey</i>)
State (<i>Auto-generated in NRIS</i>)
County (<i>Auto-generated in NRIS</i>)

Required Attributes
Region (<i>Auto-generated in NRIS</i>)
National Forest (<i>Auto-generated in NRIS</i>)
District (<i>Auto-generated in NRIS</i>)

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.

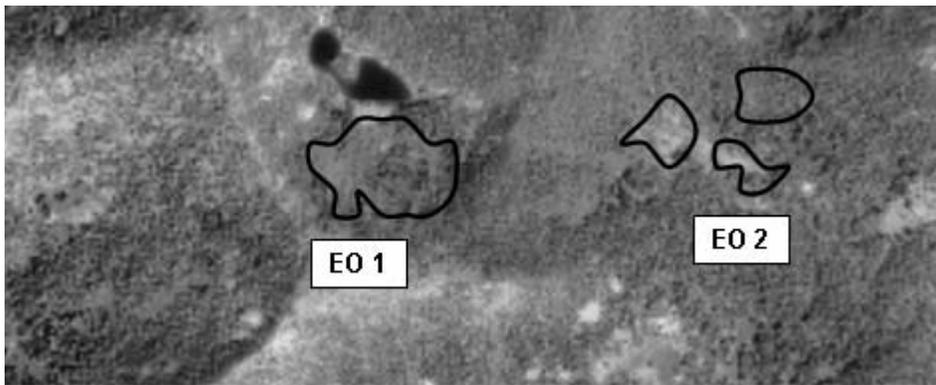


Figure 1: EO 1 is single element occurrence represented by one contiguous polygon. EO 2 is a single element occurrence represented by a multi-part polygon.

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) FS Site ID: Required.

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) Date: Required.

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) Site Name:

Informal descriptive name assigned to the EO site or area.

4) NRCS Plant Code: Required:

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) Scientific Name: Required.

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) Record Source: Required (LOV).

Indicate the source of data for this EO, such as Field Survey or herbarium specimen.

7) Survey ID: Conditionally Required.

If the record source is “Field Survey,” indicate the Survey ID Number. Refer to the Survey Protocol for Survey ID coding conventions.

8) Survey Name:

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) Examiner(s): Required.

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) Ownership: Required.

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) E.O. #:

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) New Occurrence:

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) Canopy Cover Method: Conditionally Required (LOV).

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) EO Canopy Cover:

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) Lifeform: (LOV).

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) Number of Subpopulations:

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) Plant Found:

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) Plant Count:

Indicate the number of individual plants of the EO species.

26) Count Type: (LOV).

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) Count (Actual or Estimate):

Indicate if the plant count was a precise count or an estimate.

28) Revisit Needed:

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) Revisit Date:

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) Revisit Justification:

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) Phenology by %:

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) Population Comments:

An open text field, to record observations regarding the status of the population, including distribution, vigor, density, phenology and dispersal.

33) Evidence of disease, competition, predation, collection, trampling, or herbivory:

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) Soil Moisture: (LOV).

Moisture state of the soil for the time period being described. See Appendix B for a List of Values.

46) Soil Texture: (LOV).

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) Soil Type:

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) Light Exposure: (LOV).

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) Non-native Species Comment:

Comments and observations concerning non-native species occurrences within or adjacent to the specific EO.

60) Current Land Use Comment:

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) Lifeform Canopy Cover (% Cover or Class): (LOV).

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) Ground Cover Type (% Cover or Class): (LOV).

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) Completeness of Species List: Conditionally required (LOV).

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) Species List Comment:

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) NRCS Plant Code and Scientific Name:

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) Lifform: (LOV).

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

68) Dominant:

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

69) Percent Cover or Class: (LOV).

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) Non-Native:

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) Reference for ID:

Record the appropriate flora or reference material used to identify the TES plant taxon.

72) Primary Collector: Conditionally Required.

Required if specimen collected. Record the primary collector of the specimen, who is responsible for assigning the collection number.

Other Collectors:

If additional collectors were involved in the collection.

73) Collection #:

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) ID Confirmed: Conditionally Required (LOV).

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) Verification:

Name and institution or agency of the individual who provides authoritative verification of the specimen identification.

76) Specimen Repository: Conditionally Required.

Required if a specimen is collected. Text field to indicate the herbarium or location where the collected specimen is stored.

Image Information

77) Image ID:

Text field used to denote related photograph exposure numbers or computer file designations.

78) Image Description(s):

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) USGS Quad Number:

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) 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 NRIS application. EOs may cross into more than one*)

81) 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 NRIS application. EOs may cross into more than one*)

82) 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 NRIS application. EOs may cross into more than one)

83) 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 EO, when desired.)

Meridian:

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.

Township/Direction:

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.

Range/Direction:

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

Section:

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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- USDA Forest Service Manual, Washington, Title 2600 - Wildlife, Fish, and Sensitive Plant Habitat Management, Amendment No. 2600-95-7, Effective June 23, 1995.
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- USDA Forest Service. 2005a. TES Plant Survey Protocol. Draft, in press.
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- USDA Forest Service. 2005c. Terrestrial Ecological Unit Inventory (TEUI) Technical Guide
- USDA NRCS, 1998. Soil Survey Staff. Field Book for Describing and Sampling Soils, National Soil Survey Center, Lincoln, NE.
- USDA NRCS 2002. The PLANTS database, version 3.5. National Plant Data Center, Baton Rouge, LA <http://plants.usda.gov>

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 deposits (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 cryptogammic 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: <i>Genets/Ramets/Undetermined</i>		27) Count: <i>Actual or Estimate</i>
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, <i>or</i> 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	

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: _____

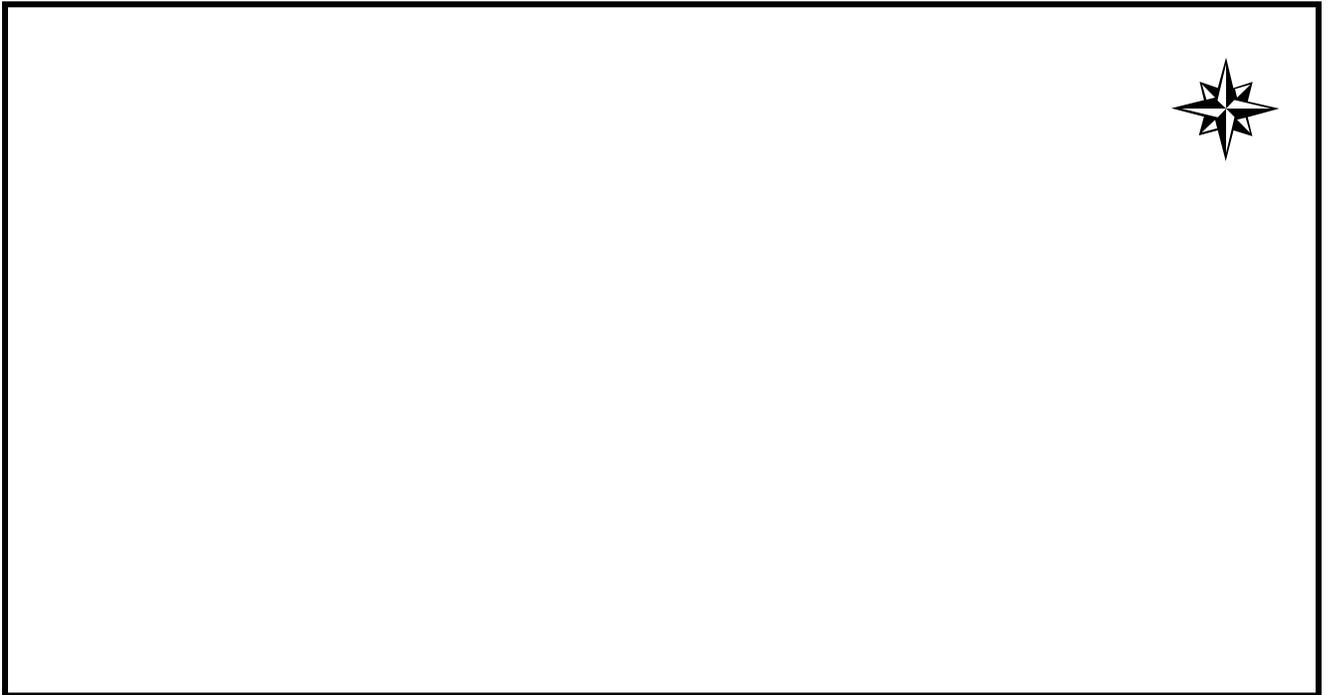
86) GPS Equipment Used (Manufacturer and Model):

87) Metes and Bounds

FS SITE ID:

88) Directions to Site

89) Sketch of Site or Area



90) General EO Comments

