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# RARE PLANT SURVEYS AND NATURAL VEGETATION COMMUNITY MAPPING

## Fountain Wind Project

## Shasta County, California

**Prepared for:**

**ConnectGen Operating LLC**


**Prepared by:**

**Kurt Flaig, Andrea Chatfield, and Joel Thompson**

Western EcoSystems Technology, Inc.
2725 NW Walnut Boulevard
Corvallis, Oregon 97330


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## STUDY PARTICIPANTS

| | |
|---|---|
| Andrea Chatfield | Project Manager |
| Joel Thompson | Senior Manager |
| Kurt Flaig | Lead Botanist / field surveyor |
| Greg Johnson | Ecologist / field surveyor |
| Rande Patterson | Biologist / field surveyor |
| Klarissa Lawrence | Biologist / field surveyor |
| Julia Preston-Fulton | Technical Editor |

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## INTRODUCTION

In 2018, Western EcoSystems Technology, Inc. (WEST) performed rare plant surveys and vegetation community mapping at the proposed Fountain Wind Project (Project) in Shasta County, California. The methods and results of the 2018 survey effort are presented in Flaig et al. (2018). In early 2019, the Project layout was amended, and WEST performed supplemental rare plant surveys and vegetation mapping within newly added development corridors. The following memorandum describes the methods and results of rare plant surveys conducted at the Project during the 2018 and 2019 growing seasons. The primary purpose of these surveys was to determine the presence or absence of rare plant species that may be subject to impacts resulting from Project construction. A description of the natural vegetation communities present within the Project evaluation area and information on invasive plant species are also provided.

## SURVEY AREA

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project is early seral mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense-cedar (*Calocedrus decurrens*), and sugar pine (*Pinus lambertiana*).

The Project is located within the Southern Cascades Ecoregion, near the southern terminus of the Cascade Mountains. A Mediterranean climate dominates the region, characterized by hot, dry summers and cold, wet winters. On average, the area receives about 63 inches (in; 160 centimeters [cm]) of precipitation per year, of which 28 in (71 cm) occur as rainfall and 35 in (89 cm) as snowfall (US Climate Data 2018). A number of perennial and intermittent streams flow primarily west and northwest from the Project into the Pit River and Sacramento River watersheds. Soils range from stony to clay loams that have formed in residuum weathered from volcanic rock (Natural Resources Conservation Service 2018). In August 1992, the Fountain Fire burned approximately 64,000 acres (ac; 25,900 hectares [ha]) in and around the Project. Post-fire management included salvage logging, site preparation, and planting in the year following the fire. Within five years of the fire, approximately 17 million seedlings were planted in industrial areas previously supporting timber (Zhang et al. 2008). Planted species included ponderosa pine, Douglas fir and white fir at 10-foot (ft; 3-meter [m]) spacing. Incense cedar were planted along stream buffers. In order to reduce competition for (tree) seedling establishment, growth regulator herbicides were applied in many areas where manzanita (*Arctostaphylos* spp.) and California lilac (*Ceanothus* spp.) had naturally colonized (Zhang et al. 2008). With historic and on-going timber management activities and post-Fountain Fire salvage and reclamation activities, the natural vegetation communities have been periodically altered and/or disturbed, likely having at least some effect on plant species composition, distribution, and diversity in these areas.

For the purpose of conducting rare plant surveys, development corridors were provided in Global Information System (GIS) format by the project proponent. The initial 2018 surveys were performed within development corridors provided by the project proponent on May 11, 2018. Supplemental surveys performed in 2019 were conducted within newly added development corridors provided by the project proponent on May 20, 2019. Both the 2018 and 2019 rare plant survey corridors included areas of potential disturbance during Project construction (Figure 1). The survey corridors varied in size and included buffers of all areas of proposed infrastructure that may be subject to ground disturbance (e.g., newly proposed roads, roads that may be expanded, turbine pads, and underground collection lines). Natural vegetation communities were mapped in a broader evaluation area that encompassed the rare plant survey corridors and additional surrounding lands (Figure 2).

## METHODS

### Rare Plant Surveys

WEST conducted a query of the California Natural Diversity Database (CNDDB), an inventory of the status and locations of rare plants, rare plant communities, and animals in California managed by the California Department of Fish and Wildlife (CDFW), and searched the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants to compile a list of special status plant species and sensitive natural vegetation communities that may have potential to occur within the evaluation area. The CNDDB query was limited to an area within a 10-mile radius of the Project and the CNPS search was focused on Shasta County. Additional special status plant species were identified by CDFW personnel and were added to the list.

Sixty-nine rare plants were identified in the pre-field review (Appendix A). Based on further review of the habitat requirements of the 69 species and knowledge of the natural vegetation communities known to occur within the evaluation area (based on previous WEST surveys in the region), WEST biologists determined that potential suitable habitat was present for 47 of the 69 rare plant species (identified as “Possible” in Appendix A). These 47 species were targeted for rare plant surveys within the Project area. WEST determined that suitable habitat was not present within the Project area for 22 of the original 69 rare plant species (identified as “Unlikely” in Appendix A). Rationales for exclusion included absence of suitable habitat within the Project (e.g., vernal pools) and absence of appropriate substrates (e.g., ultramafic soils, granitic crevices). Two of the 69 species on the initial list were federally-listed, including slender Orcutt grass (*Orcuttia tenuis*; Threatened) and Greene’s tuctoria (*Tuctoria greenei*; Endangered). However, both of these plant species are endemic to vernal pool habitats which are absent from the survey corridors. No state-listed plants are among the 47 rare plant species identified as possibly occurring in the survey area.

Prior to conducting surveys, WEST reviewed species descriptions, habitat requirements, and photographs of all 69 species identified in the initial assessment. Although 22 species were determined “unlikely” to occur based on their habitat requirements, they were included in the pre-

field review because their flowering/fruiting periods overlapped with those of the 47 targeted species (Appendix A).

Focused surveys to determine presence or absence of target species were conducted in 2018 and 2019, during two survey periods. Surveys in 2018 occurred from May 21 – 29 and July 30 – August 3, and were conducted in the northern portion of the Project area (Figure 1). Surveys in 2019 were primarily focused on the southern portion of the Project area (Figure 1), but included additional infrastructure in the northern portion, and were conducted from May 29 – June 3 and July 30 – August 2. The two survey periods were selected to capture the range of flowering and fruiting periods for the 47 targeted species. All surveys were conducted by experienced WEST botanists and botanical field surveyors; qualifications of field surveyors are included in Appendix B. WEST field surveyors conducted pedestrian transect surveys within the survey corridors, with special attention given to areas that might provide suitable habitat for rare plant species, in accordance with the 2018 *CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities*. The survey corridors were uploaded to Global Positioning System units with sub-foot accuracy (Trimble Geo 7x). In addition, surveyors used aerial imagery-based field maps depicting the evaluation area to map natural vegetation communities and invasive plant species and for general navigation.

A list of all vascular plant species encountered during the rare plant surveys was maintained. Plant species were identified to the highest taxonomic level possible when encountered using *The Jepson Manual: Vascular Plants of California, Second Edition* (Baldwin et al. 2012).

**Natural Vegetation Communities**

Mapping of natural vegetation communities within the evaluation area was conducted by WEST during the 2018/2019 rare plant surveys. WEST botanists documented natural vegetation community types while conducting rare plant surveys and while transiting through the evaluation area in route to survey areas. Natural vegetation communities were identified on-site using *A Manual of California Vegetation* (Sawyer et al. 2009). Based on the field data collected during rare plant surveys, natural vegetation communities were hand-drawn on aerial imagery-based field maps created at a scale appropriate for broad-scale mapping (i.e., 1 in = 1,000 ft [2.5 cm = 304.8 m]). The field maps were later digitized in a GIS to incorporate into other GIS mapping efforts.

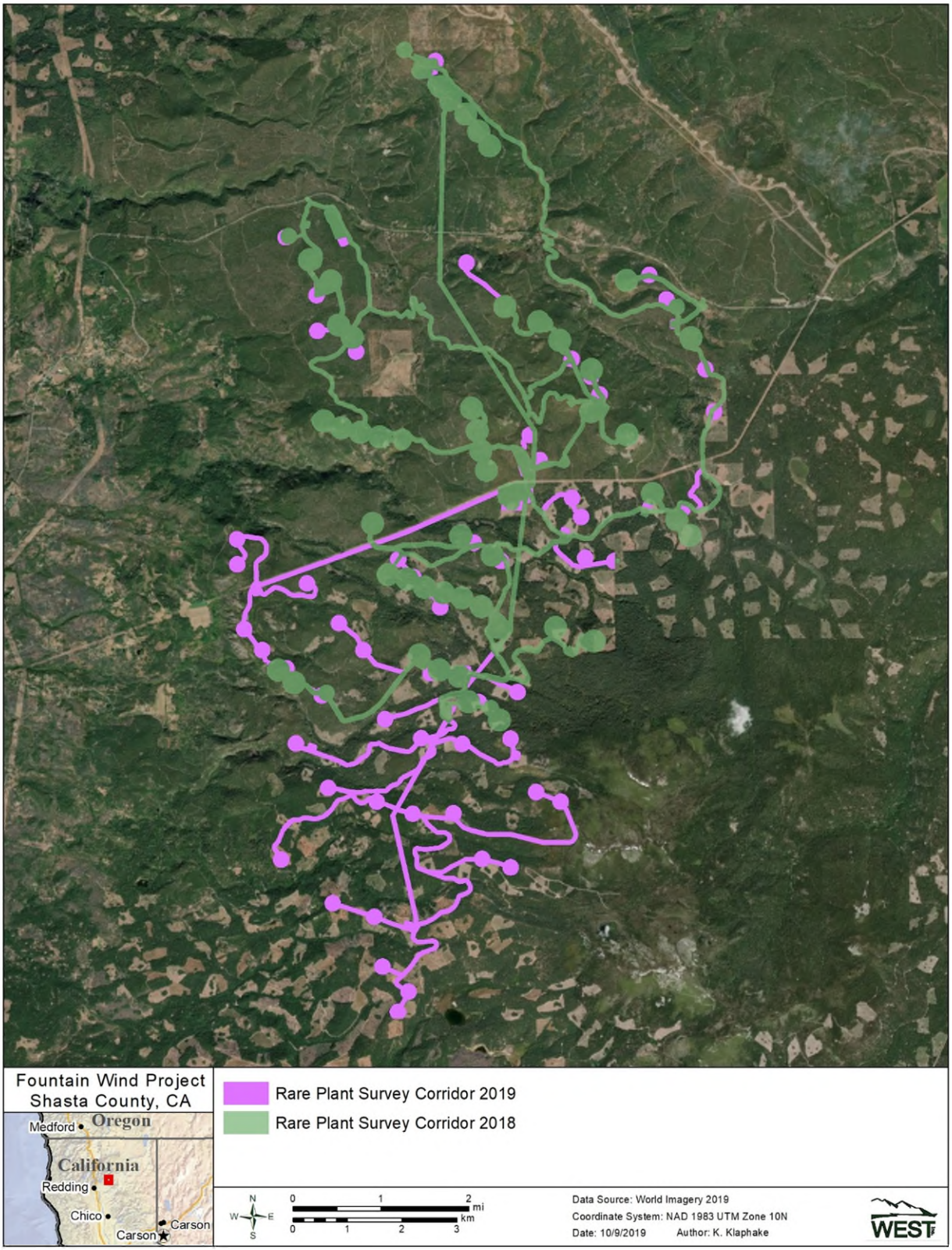


**Figure 1. Survey corridors for 2018 and 2019 rare plant surveys at the Fountain Wind Project, Shasta County, California.**

### Invasive Plant Species

WEST recorded non-native invasive plant species encountered and conducted broad-scale invasive species mapping during the 2018/2019 rare plant surveys. Mapping was primarily focused on roadsides within the corridors. Based on observations during the rare plant surveys, vegetation composition within turbine pad areas (most of which were away from developed roads) was largely native, with only a few, occasional non-native invasive species observed; no mapping of non-native species was conducted within these locations. Additionally, limited mapping was conducted within recently logged (e.g., within the past 10 years) areas because of the abundance of the same three non-native invasive species (i.e., common mullein [*Verbascum Thapsus*], bull thistle [*Cirsium vulgare*], and Klamath weed [*Hypericum perforatum*]) within all such areas.

Mapping of non-native invasive species along access roads was conducted by walking and slowly driving roads and estimating the number of individuals of non-native invasive species observed. Non-native plant species for which mapping was conducted included all species identified by the California Invasive Plant Council (CAL-IPC) as “high” (i.e., species that have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure), “moderate” (i.e., species that have substantial and apparent, but generally not severe ecological impacts on physical processes, plant and animal communities, and vegetation structure), and “limited” (i.e., species that are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score). Survey corridors in which invasive species were encountered were broken into survey segments identified with alternating blue and yellow lines (see Figure 2) to differentiate the non-native invasive species present and their relative distribution documented within the segment. Within these segments, non-native invasive plant species-level distributions were rated as “Abundant” (A: over one thousand plants), “Common” (C: 200-1,000 individuals), or “Infrequent” (I: less than 200 individuals). Additional non-native invasive plant species mapping included several point locations along roads where invasive plants were concentrated/clustered. These locations were typically located in high-disturbance areas (e.g., near gates).

## RESULTS AND DISCUSSION

### Rare Plant Surveys

None of the 47 rare plant species identified as possibly occurring was encountered during the two survey periods in 2018 or 2019. Given the lack of rare plants identified in the survey corridors, no impacts to rare plants are anticipated during Project construction. A comprehensive list of plant species encountered during the 2018/2019 surveys was compiled and is provided in Appendix C.

Precipitation data for Redding, California, the nearest town for which historical data was reported, was reviewed to determine if adequate seasonal climatic conditions existed for the 2018 and 2019 surveys. During the winter and spring time period preceding the 2018 surveys (November 1, 2017 − May 31, 2018) precipitation was 63% of average (US Climate Data 2019). While this is somewhat lower than normal for the Region, it would be expected that individuals of the targeted

plant species would have been visible during the 2018 botanical survey, if present. Recorded precipitation during the same time period preceding the 2019 surveys was 138% of average (US Climate Data 2019). This indicates that seasonal climatic conditions were most favorable (i.e., well above average) for the 2019 survey year and that the likelihood of detection of individuals of the targeted plant species, if present, was high. Despite the variation in seasonal differences preceding the 2018 and 2019 surveys, WEST botanists observed no noticeable differences in the composition or abundance of flowering plant species between years.

### Natural and Sensitive Vegetation Communities

Eight natural vegetation communities were identified within the Project evaluation area (Figure 2). These include: *Pinus ponderosa* Forest Alliance; *Pinus ponderosa* Forest Alliance–Logged/Recently Logged; *Abies concolor–Pseudotsuga menziesii* Forest Alliance; *Quercus kelloggii* Forest Alliance; *Acer glabrum* Provisional Shrubland Alliance; *Arctostaphylos patula* Shrubland Alliance; *Carex utriculata* Herbaceous Alliance, and; *Agrostis* (*gigantea,stolonifera*)–*Festuca arundinacea* Harbaceous Semi-Natural Alliance. Descriptions of the eight natural vegetation communities are provided in Appendix D. One of the mapped natural vegetation communities may be considered a sensitive natural community by the CDFW. The *Acer glabrum* Provisional Shrubland Alliance is designated as a State Rank “3?” natural community by the CDFW. Vegetation communities with a State Rank of S1−S3 are considered sensitive natural communities by CDFW. The question mark in the ranking denotes “an inexact numeric rank because we (CDFW) know we have insufficient samples over the full expected range of the type, but existing information points to this rank…” (CDFW 2019). Based on the 2018/2019 vegetation community mapping at the Project, approximately 1,036 ac (419 ha) within the evaluation area are classified as *Acer glabrum* Provisional Shrubland Alliance (4.1%), most of which are located in the southeastern portion of the Project (Figure 2). Within the 2019 development corridors, this vegetation community occurs on just 31 ac (12 ha) or 1.5% of the total area potentially impacted by Project development. .

Mixed coniferous forest (i.e., *Pinus ponderosa* Forest Alliance and *Abies concolor–Pseudotsuga menziesii* Forest Alliance) is the predominant vegetation cover type within the evaluation area (see Figure 2). This cover type is heavily managed for timber production throughout the region. Other vegetation communities occur in far lesser amounts and are largely outside of areas potentially at risk of disturbance due to Project construction. While riparian communities cross the develoment corridors in many areas, they are largely at existing road crossings or in areas where future roads may be constructed. It is assumed that any future modifications to habitat along streams (e.g., riparian areas) due to added road work will incorporate riparian protections consistent with other ongoing management activities (i.e., timber harvesting) in the region.

### Invasive Plant Species

The most common invasive plant species observed within the Project evaluation area included common mullein (CAL-IPC ranked “limited”), bull thistle (CAL-IPC ranked “moderate”), Klamath weed (CAL-IPC ranked “limited”), and houndstongue (*Cynoglossum officinale*; CAL-IPC “moderate”). Based on other plant survey work conducted by WEST within the Project vicinity (Young et al. 2007), these four species are ubiquitous in the area. As mentioned above, mullein,

bull thistle, and Klamath weed are widespread within all logged and recently logged areas within the evaluation area. Three invasive plant species ranked "high" by CAL-IPC were observed within the Project evaluation area, including Himalayan blackberry (*Rubus armeniacus*), yellow star thistle (*Centaurea solstitialis*), and medusahead (*Elymus caput-medusae*; Figure 3). Additional CAL-IPC ranked invasive plant species observed within the evaluation area included annual dogtail grass (*Cynosurus echinatus*; "moderate"), tall fescue (*Festuca arundinacea*; "moderate"), common velvet grass (*Holcus lanatus*; "moderate"), field sorrel (*Rumex acetosella*; "moderate"), orchardgrass (*Dactylis glomerata*; "limited"), and English plantain (*Plantago lanceolata*; "limited"; Figure 3).

Based on the data collected during 2018/2019 surveys, a number of invasive plant species are present within proposed development corridors. These results are not unexpected given the primary land use (i.e., commercial timber production), which results in recurring disturbance throughout the area and relatively high traffic volumes resulting from timber harvest activities, and WEST knowledge of invasive plant species within the region. Many of the invasive species are actively managed by the landowners to minimize competition with conifer seedlings and enhance timber growth. Many disturbances related to Project construction will be similar to those which occur in the Project evaluation area already (e.g., harvest of trees, road construction and widening, seasonal/temporary increases in vehicle traffic). While Project construction will create some additional disturbance to the landscape, once construction is complete, the Project will have minimal influence on the future distribution of invasive species relative to the influence of ongoing commercial timber operations.

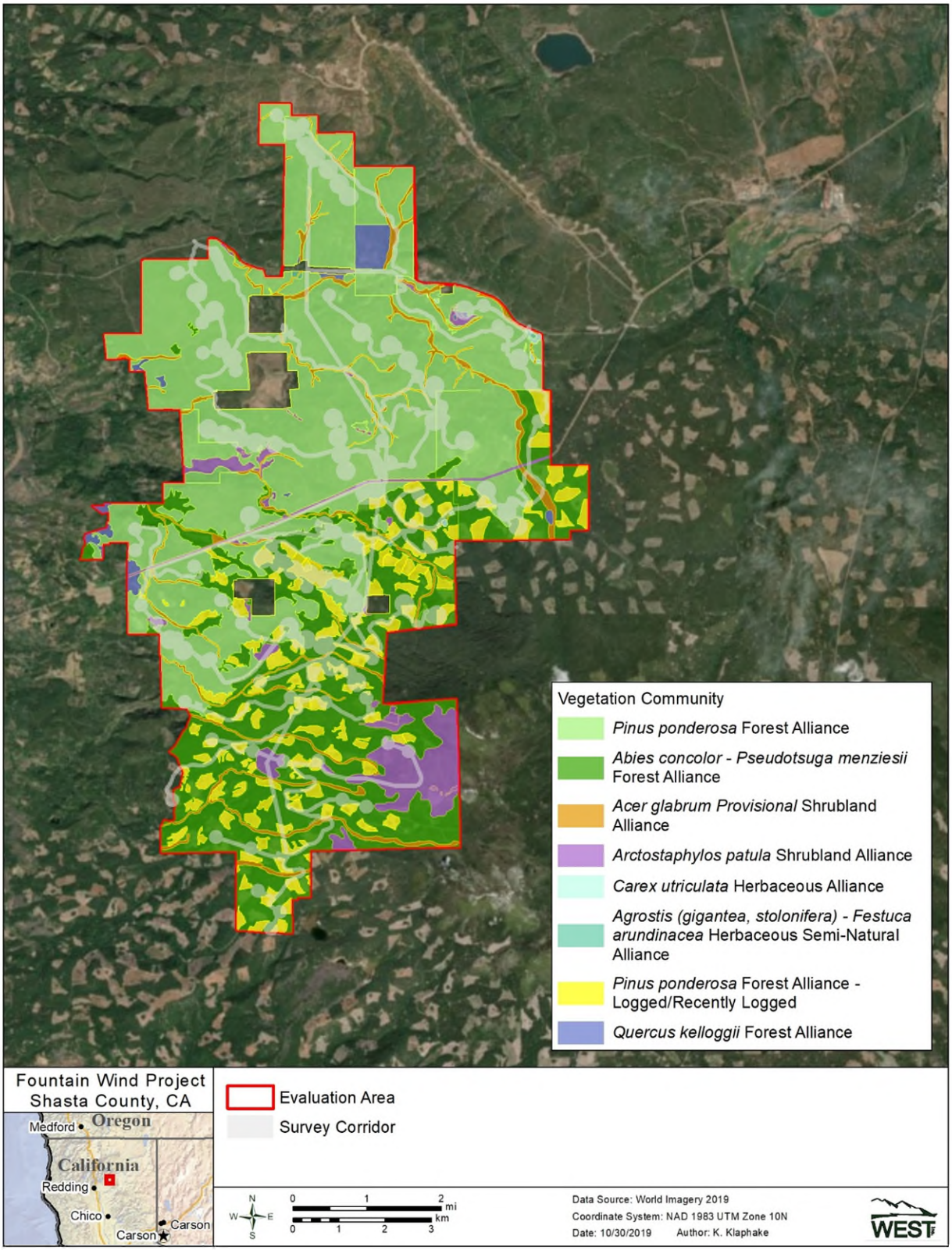


**Figure 2. Vegetation communities identified and mapped during rare plant surveys conducted in 2018 and 2019 at the Fountain Wind Project, Shasta County, California.**

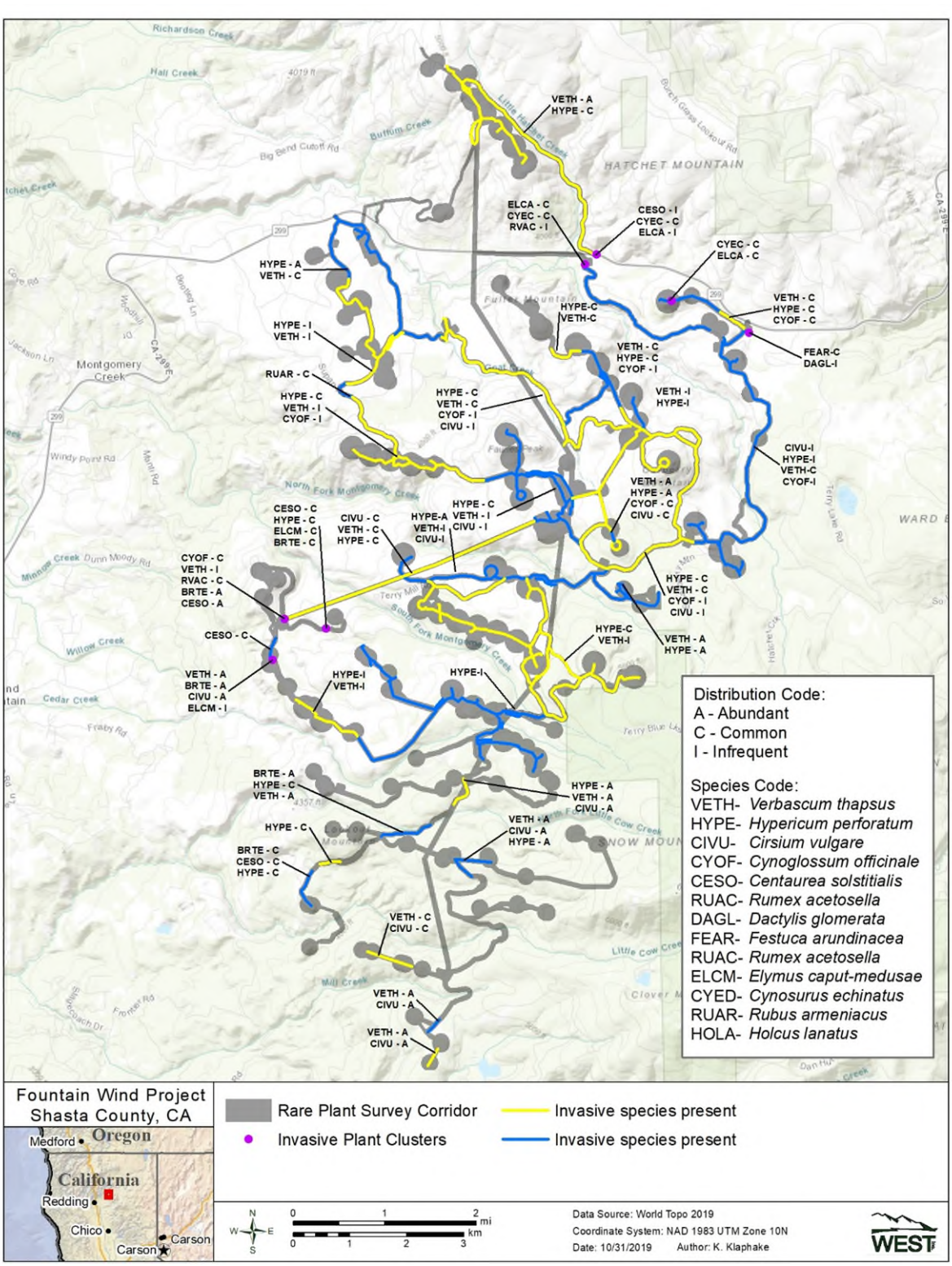


**Figure 3. Non-native invasive plant species mapping within the Fountain Wind Project, Shasta County, California. To differentiate adjacent survey segments in which invasive species were encountered, alternating blue and yellow lines with accompanying notations as to the species present (4-letter species codes) and relative distribution (1-letter distribution code) were used.**

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# Appendix A. Federally listed, State-listed, and California Native Plant Society Rare Plant Species and Their Potential for Occurrence within the Fountain Wind Project

**Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.**

| Species | Federal Status* | CNPS Status** | Survey period | Habitat Requirements | Potential for Occurrence within the Project |
|---|---|---|---|---|---|
| Shasta ageratina *Ageratina shastensis* | | 1B.2 | June-Oct | Rocky, often carbonate sites; lower montane coniferous forest | **Possible.** Although uncommon, suitable habitat may be present within the Project |
| Scabrid alpine tarplant *Anisocarpus scabridus* | | 1B.3 | June-Sept | Open ridges or slopes on metamorphics | **Possible.** Suitable habitat may be present within the Project |
| Slender silver-moss *Anomobryum julaceum* | | 4.2 | | Rocky, moist (bryophyte-moss) | **Possible.** Although far from its known range, suitable habitat may be present within the Project |
| vanilla-grass *Anthoxanthum nitens* ssp. *nitens* | | 2B.3 | Apr-July | Meadows and seeps | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| Klamath manzanita *Arctostaphylos klamathensis* | | 1B.2 | May-Aug | Chaparral and upper montane and subalpine coniferous forests; rocky outcrops and slopes | **Possible.** Although uncommon, suitable habitat may be present within the Project; CNDDB documents only 2 occurrences in Shasta County |
| marbled wild-ginger *Asarum marmoratum* | | 2B.3 | Apr-Aug | Understory of lower montane coniferous forests | **Possible.** Suitable habitat may be present within the site |
| northern spleenwort *Asplenium septentrionale* | | 2B.3 | July-Aug | Chaparral and montane coniferous forests; form grass-like tufts in granitic rock crevices | **Unlikely.** No granitic rock crevices present within the survey corridors |
| upswept moonwort *Botrychium ascendens* | | 2B.3 | July-Aug | Lower montane coniferous forests; grassy fields and woodlands near springs and creeks | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |
| scalloped moonwort *Botrychium crenulatum* | | 2B.2 | June-Sept | Lower montane coniferous forests; moist meadows near creeks; marshes | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |
| mingan moonwort *Botrychium minganense* | | 2B.2 | July-Sept | Creek banks in mixed conifer forests | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |
| western goblin *Botrychium montanum* | | 2B.1 | July-Sept | Creek banks in old-growth coniferous forests | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |

**Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.**

| Species | Federal Status* | CNPS Status** | Survey period | Habitat Requirements | Potential for Occurrence within the Project |
|---|---|---|---|---|---|
| northwestern moonwort *Botrychium pinnatum* | | 2B.3 | July-Oct | Montane coniferous forests; in meadows or along creek banks | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |
| rattlesnake fern *Botrypus virginianus* | | 2B.2 | June | Streams; bogs and fens; lower montane coniferous forest; meadows and seeps | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |
| Watershield *Brasenia schreberi* | | 2B.3 | Apr-Oct | Freshwater marshes and swamps | **Possible.** Although extremely limited, suitable wetland habitat may be present within the Project |
| long-haired star-tulip *Calochortus longebarbatus* var. *longebarbatus* | | 1B.2 | June-Aug | Clay, mesic sites in Great Basin scrub, lower montane coniferous forest openings, meadows and seeps | **Possible.** Suitable habitat may be present within the Project |
| Callahan's mariposa lily *Calochortus syntrophus* | | 1B.1 | May-June | Cismontane woodland; vernally mesic valley and foothill grassland | **Possible.** Suitable habitat may be present within the Project |
| Butte County morning-glory *Calystegia atriplicifolia* ssp. *buttensis* | | 4.2 | May-July | Dry, rocky places in open forest, chaparral | **Possible.** Suitable habitat may be present within the Project |
| Castle Crags harebell *Campanula shetleri* | | 1B.3 | June-Sept | In protected rock crevices in granite; lower montane coniferous forests | **Unlikely.** No granitic rock outcrops present within the survey corridors |
| bristly sedge *Carex comosa* | | 2B.1 | May-Sept | Marshes and swamps (lake margins); valley and foothill grasslands | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| woolly-fruited sedge *Carex lasiocarpa* | | 2B.3 | June-July | Bogs and fens; freshwater marshes and swamps, lake margins | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| Lassen paintbrush *Castilleja lassenensis* | | 1B.3 | June-Sept | Meadows and seeps; subalpine forest (volcanic) | **Unlikely.** Known occurrences restricted to flanks of Lassen and granite substrates in the Sierras |

**Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.**

| Species | Federal Status* | CNPS Status** | Survey period | Habitat Requirements | Potential for Occurrence within the Project |
|---|---|---|---|---|---|
| Shasta clarkia *Clarkia borealis* ssp. *arida* | | 1B.1 | June-Aug | Cismontane woodlands | **Possible.** Suitable habitat may be present within the Project |
| northern clarkia *Clarkia borealis* ssp. *borealis* | | 1B.3 | June-Sept | Cismontane woodland; lower montane coniferous forest | **Possible.** Suitable habitat may be present within the Project |
| silky cryptantha *Cryptantha crinita* | | 1B.2 | April-May | Gravelly streambeds of cismontane woodlands, valley foothill grasslands, lower montane coniferous forests, and riparian forests | **Possible.** Although limited, suitable streambed habitat may be present within the Project |
| Jepson's dodder *Cuscuta jepsonii* | | 1B.2 | July-Sept | Broadleafed upland forest, lower and upper montane coniferous forest (host spp. are *Ceanothus diversifolius* and *C. prostratus*) | **Possible.** Suitable habitat may be present within the Project |
| English sundew *Drosera anglica* | | 2B.3 | June-Sept | Bogs and fens; meadows | **Possible.** Although extremely limited, suitable wetland habitat may be present within the Project |
| Oregon fireweed *Epilobium oreganum* | | 1B.2 | June-Sept | Montane coniferous forests; in and near springs and bogs; sometimes on serpentine | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| Tracy's eriastrum *Eriastrum tracyi* | | 3.2 | June-July | Open areas on shale or alluvium | **Possible.** Suitable habitat may be present within the Project |
| blushing wild buckwheat *Eriogonum ursinum var. erubescens* | | 1B.3 | June-Sept | Rocky sites within lower montane coniferous forest and montane chaparral | **Possible.** Suitable habitat may be present within the Project |
| Shasta limestone monkeyflower *Erythranthe taylorii* | | 1B.1 | April-May | Openings, carbonate crevices and rocky outcrops of cismontane woodlands and lower montane coniferous forest | **Unlikely.** Suitable carbonate habitat not present within survey corridors |
| Shasta fawn lily *Erythronium shastense* | | 1B.2 | March-April | Usually carbonate, rocky, north-facing or shaded slopes in cismontane woodland and lower montane coniferous forest | **Unlikely.** No suitable carbonate habitats present within the survey corridors |

**Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.**

| Species | Federal Status* | CNPS Status** | Survey period | Habitat Requirements | Potential for Occurrence within the Project |
|---|---|---|---|---|---|
| Butte County fritillary *Fritillaria eastwoodiae* | | 3.2 | March-June | Dry benches, slopes of yellow pine forest, chaparral | **Possible.** Suitable habitat may be present within the Project |
| Boggs Lake hedge hyssop *Gratiola heterosepala* | | 1B.2 | April-Aug | Freshwater marshes and swamps, vernal pools; clay soils | **Possible.** Although extremely limited, suitable wetland habitat may be present within the Project |
| Stebbins' harmonia *Harmonia stebbinsii* | | 1B.2 | May-June | Chaparral and lower montane coniferous forests; in ultramafic soils, often along roads | **Unlikely.** No ultramafic substrates present within the Project |
| little hulsea *Hulsea nana* | | 2B.3 | July-Aug | Alpine boulder and rock fields, subalpine coniferous forests; volcanic substrates | **Unlikely.** Suitable habitat not present within the Project |
| Baker's globe mallow *Iliamna bakeri* | | 4.2 | June-Sept | Chaparral, juniper woodland | **Possible.** Suitable habitat may be present within the Project |
| Castle Crags ivesia *Ivesia longibracteata* | | 1B.3 | June | Crevices in granitic cliffs; lower montane coniferous forests | **Unlikely**. No granitic cliff habitat present within the survey corridors |
| Finger rush *Juncus digitatus* | | 1B.1 | May-June | Vernal pools, swales, volcanic seeps | **Possible.** Although extremely limited, suitable wetland habitat may be present within the Project |
| Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus* | | 1B.1 | March-May | Vernally mesic meadows and seeps; valley and foothill grassland; vernal pools | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| Santa Lucia dwarf rush *Juncus luciensis* | | 1B.2 | April-July | Vernal pools, ephemeral drainages, wet meadows habitats and streamsides | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| Cantelow's lewisia *Lewisia cantelovii* | | 1B.2 | May-Oct | Mesic, granite; lower montane coniferous forest; cismontane woodland | **Unlikely.** Suitable granitic or serpentine seeps not present within the Project |
| Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana* | | 1B.2 | April-June | Mesic; cismontane woodland; meadows and seeps | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| tufted loosestrife *Lysimachia thyrsiflora* | | 2B.3 | May-Aug | Meadows and seeps; mesic; upper montane coniferous forest | **Possible.** Although limited, suitable wetland habitat may be present within the Project |

**Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.**

| Species | Federal Status* | CNPS Status** | Survey period | Habitat Requirements | Potential for Occurrence within the Project |
|---|---|---|---|---|---|
| Three-ranked hump-moss *Meesia triquetra* | | 4.2 | July | Wetlands (fens) | **Possible.** Although extremely limited, suitable wetland habitat may be present within the Project |
| broad-nerved hump-moss *Meesia uliginosa* | | 2B.2 | July, Oct | Moss on damp soil within meadows and seeps, bogs and fens, upper montane coniferous forest, and subalpine coniferous forest | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| Shasta snow-wreath *Neviusia cliftonii* | | 1B.2 | May-June | Lower montane coniferous forests, riparian woodlands; shady, north-facing or sheltered canyons | **Possible.** Although limited, suitable habitats may be present within the Project |
| slender Orcutt grass *Orcuttia tenuis* | T | 1B.1 | May-Oct | Vernal pools | **Unlikely.** No vernal pool habitat present within the survey corridors |
| Cascade grass of Parnassus *Parnassia cirrata* var. *intermedia* | | 2B.2 | Aug-Sept | Rock serpentine soils; montane coniferous forests, meadows and seeps, bogs and fens | **Unlikely.** Suitable habitat absent from the survey corridors; nearest occurrence approximately 30 miles northwest of site |
| thread leaved beardtongue *Penstemon filiformis* | | 1B.3 | May-July | Cismontane woodlands and lower montane coniferous forests; dry stony sites, grassy openings, and meadows | **Possible.** Suitable habitat may be present within the Project |
| Engelmann spruce *Picea engelmannii* | | 2B.2 | May-June | Upper montane coniferous forest | **Possible.** Suitable habitat may be present within the Project |
| Sierra blue grass *Poa sierrae* | | 1B.3 | April-June | Lower montane coniferous forests; shady, moist, rock slopes; often in canyons | **Possible.** Suitable habitat may be present within the Project |
| Profuse flowered pogogyne *Pogogyne floribunda* | | 4.2 | May-Sept | Vernal pools, seasonal lakes | **Unlikely.** No suitable habitat present within the survey corridors |
| Modoc county knotweed *Polygonum polygaloides* ssp. *esotericum* | | 1B.3 | May-Sept | Mesic; lower montane coniferous forest (vernal pools) | **Unlikely.** No vernal pool habitat present within the survey corridors |

**Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.**

| Species | Federal Status* | CNPS Status** | Survey period | Habitat Requirements | Potential for Occurrence within the Project |
|---|---|---|---|---|---|
| Eel grass pondweed *Potamogeton zosteriformis* | | 2B.2 | June-July | Freshwater marsh | **Unlikely.** No suitable habitat present within the survey corridors |
| Newberry's cinquefoil *Potentilla newberryi* | | 2B.3 | May-Aug | Receding shorelines | **Unlikely.** No suitable habitat present within the survey corridors |
| Pacific fuzz wort *Ptilidium californicum* | | 4.3 | May-Aug | Bark of standing mature or recently fallen logs | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| marsh sckullcap *Scutellaria galericulata* | | 2B.2 | June-Sept | Meadows and freshwater marshes of lower montane coniferous forests | **Possible.** Although limited, suitable wetland habitat may be present within the Project |
| Canyon creek stonecrop *Sedum obtusatum* ssp. *paradisum* | | 1B.3 | May-June | In crevices of exposed granite; chaparral and coniferous forests | **Unlikely.** No exposed granite habitat present within the survey corridors |
| long-stiped campion *Silene occidentalis* ssp. *longistipitata* | | 1B.2 | July-Aug | Lower and upper montane coniferous forest | **Possible.** Suitable habitat may be present within the Project |
| Klamath Mountain catchfly *Silene salmonacea* | | 1B.2 | June-July | Openings, usually serpentine, within lower montane coniferous forest | **Unlikely.** Potential suitable habitat likely absent within the survey corridors |
| English Peak greenbriar *Smilax jamesii* | | 4.2 | May-July | Riparian, streambanks, lake margins | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |
| hairy marsh hedgenettle *Stachys pilosa* | | 2B.3 | June-Sept | Mesic sites in Great Basin scrub | **Unlikely.** Suitable scrub habitat not present within the survey corridors |
| Long leaved starwort *Stellaria longifolia* | | 2B.2 | May-July | Meadows and seeps, riparian woodlands | **Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project |
| Fineleaf pondweed *Stuckenia filiformis* ssp. *alpina* | | 2B.2 | May-July | Shallow, clear water of lakes, drainage channels | **Unlikely.** Potential suitable habitat absent from the survey corridors |
| Piorkowski's clover *Trifolium piorkowski* | | 1B.2 | April-May | Chaparral, cismontane woodland, lower montane coniferous forest (volcanic clay) | **Unlikely.** Potential suitable habitat likely absent within site; nearest occurrence over 30 miles north of site |

**Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.**

| Species | Federal Status* | CNPS Status** | Survey period | Habitat Requirements | Potential for Occurrence within the Project |
|---|---|---|---|---|---|
| Siskiyou clover *Trifolium siskiyouense* | | 1B.1 | June-July | Wet mountain meadows | **Unlikely.** Potential suitable habitat likely absent from the survey corridors; nearest occurrence on volcanic plateau approximately 30 miles south of Project |
| Greene's tuctoria *Tuctoria greenei* | E | 1B.1 | May-July | Vernal pools | **Unlikely.** No vernal pool habitat present within the survey corridors |
| Shasta huckleberry *Vaccinium shastense* ssp. *shastense* | | 1B.3 | Dec-May | Acidic, mesic site; often on streambanks; sometimes on rocky outcrops, seeps, roadsides, and disturbed areas (chaparral, lower montane and subalpine coniferous forest, and riparian forest) | **Possible.** Although limited, suitable habitat may be present within the Project |
| oval-leaved viburnum *Viburnum ellipticum* | | 2B.3 | May-June | Chaparral, cismontane woodlands, and lower montane coniferous forests | **Possible.** Suitable habitat may be present within the Project |

Information from CNPS 2019, California Natural Diversity Database 2019, US Fish and Wildlife Service 2017.

*E: Federally listed endangered species; T: Federally listed threatened species

**CNPS: California Rare Plant Ranks (CNPS 2019):

CNPS 1A: Plants presumed extirpated in California and either rare or extinct elsewhere.

CNPS 1B: Plants rare, threatened, or endangered in California and elsewhere.

CNPS 2A: Plants presumed extirpated in California, but common elsewhere.

CNPS 2B: Plants rare, threatened, or endangered in California, but more common elsewhere.

CNPS 3: Plants about which more information is needed – a review list.

CNPS 4: Plants of limited distribution – a watch list.

**Threat Ranks**

- 0.1 – Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat).
- 0.2 − Moderately threatened in California (20-80% of occurrences threatened/moderate degree and immediacy of threat).
- 0.3 – Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known).

# Appendix B. Botanical Field Surveyor Qualifications

# Kurt F. Flaig, *Plant Ecologist*

## PROFESSIONAL EXPERIENCE

| | |
|---|---|
| 2004-Present | *Plant Ecologist,* Western EcoSystems Technology, Inc., Cheyenne, Wyoming |
| 2001-2003 | *Plant Ecologist,* H.T. Harvey & Associates, San Jose, California |
| 2000-2001 | *Range Technician,* Colorado State Cooperative Extension Program and Division of Wildlife, Weston, Colorado |
| 2000-2001 | *Natural Resource Technician,* Center for Ecological Management of Military Lands, Fort Collins Colorado |
| 1999-2000 | *Biological Science Technician,* U.S. Forest Service, Canyon Lakes District, Fort Collins, Colorado |
| 1998-1999 | *Range Technician,* Colorado State Cooperative Extension Program, Fort Collins, Colorado and Y-Cross Ranch, Horse Creek, Wyoming |
| 1996-1999 | *Graduate Research Assistant,* Department of Rangeland Ecosystem Science, Fort Collins, Colorado and Fort Richardson, Alaska |

## EDUCATION

M.S.
Colorado State University
Fort Collins, Colorado
1999
Range Ecology

B.S.
Colorado State University
Fort Collins, Colorado
1995
Natural Resource Management

B.A.
Florida Atlantic University
Boca Raton, Florida
1989
Political Science

## SCIENTIFIC ORGANIZATION MEMBERSHIPS

California Native Plant Society

Colorado Native Plant Society

Wyoming Native Plant Society

Society of Wetland Scientists

## SPECIALTY AREAS

**Rare Plants:** Kurt has been conducting rare plant assessments and surveys for county, state, BLM, and USFS sensitive species, and ESA listed species since 2001. This experience includes evaluating project impacts to rare plant species and communities, and designing and implementing mitigation measures to address such impacts. Kurt has detected numerous occurrences of special-status plant species, including federally threatened and endangered species, in the western U.S. This experience includes locating occurrences in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Texas, Utah, Washington, and Wyoming.

**Wetlands:** Kurt has 15 years of experience in conducting wetland delineations throughout the western U.S. He has prepared and assisted clients in preparing USACE Section 404 permits, California Department of Fish and Game Streambed Alteration Agreements, and in complying with various states' waters regulatory requirements. Kurt has designed wetland mitigation sites and conducted extensive mitigation monitoring. He also has formal training and considerable experience in conducting wetland functional assessments.

**Vegetation Classification, Mapping and Monitoring:** Kurt has extensive experience in the classification and mapping of vegetation in a variety of community and ecosystem types throughout the western U.S. This includes detailed descriptions of habitats and identification of component flora. Kurt has over 15 years of experience in conducting vegetation monitoring in systems ranging from shortgrass and coastal prairies to mixed coniferous forest and coastal salt marsh. This experience includes baseline studies and short- and long-term monitoring studies for projects involving range inventories, grassland restoration, wetland/riparian restoration and mitigation, and soil erosion analysis. Kurt is proficient in the utilization of numerous sampling methods.

**Technical Report Preparation:** Kurt is an accomplished technical writer and editor. He provides expertise in the preparation of various NEPA related documents, including Environmental Impacts Statements, Biological Assessments, Biological Evaluations, and Habitat Conservation Plans, and has authored numerous technical reports and documents.

## ADDITIONAL TRAINING & CERTIFICATION

WAFWA Lesser Prairie Chicken Vegetation Monitoring Training, 2014

Wyoming Reclamation and Restoration Center Workshop, 2012

Functional Assessment of Colorado Wetlands (FACWet) Methodology Training, 2009

Biological Assessment/Biological Evaluation Preparation Training, 2008, USFS

Advanced Hydric Soils Course, 2005, Wetland Training Institute (CA)

Wetland Delineation Course, 2003, Wetland Training Institute (CA)

California Native Plant Society Rapid Assessment Course for Vegetation Mapping, 2001

EIR/EIS Preparation and Review, 2001, University of California Davis Extension

Wetland Regulations, 2001, University of California Davis Extension

## RARE PLANT SURVEYS CONDUCTED

(Served as lead botanist for all projects with asterisk*)

*Fountain Wind Project (2018/2019) – Shasta County, California*
Surveyed for 51 state and ESA listed plant species and mapped natural vegetation communities.

*Zapata Wind Project (2018) – Zapata County, Texas*
Surveyed for Zapata bladderpod, ashy dogweed, prostrate milkweed, and bushy Whitlow-wort.

*Desert Quartzite Solar Energy Project (2017) – Riverside County, California*
Surveyed for Harwood's eriastrum.

*Dyno Nobel Project (2017) – Laramie County, Wyoming*
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

*Moran Wind Project (2016) – Allen County, Kansas*
Surveyed for western prairie fringed orchid and Mead's milkweed.

*Infigen Strata Solar Project (2015) – Eddy County, New Mexico*
Surveyed for Tharp's blue-star, Scheer's beehive cactus, and gypsum wild buckwheat.

*Spar Canyon-Round Valley Transmission Line (2014) – Custer County, Idaho*
Surveyed for Challis milkvetch, Lemhi milkvetch, white eatonella, Welsh's buckwheat, Salmon wildrye, Challis crazyweed, Simpson's hedgehog cactus, elusive Jacob's-ladder, and wavy-leaf thelypody.

*WYDOT US Highway Hazard Tree Removal Project (2014) – Albany County, Wyoming*
Surveyed for 53 special status plant species including federally listed species and USFS sensitive species.

*WYDOT Shutts Flat/Burgess Junction South Section (2014) – Sheridan County, Wyoming*
Surveyed for Sartwell's sedge, leafy thistle, Russet cotton-grass, slender cotton-grass, Howard forget-me-not, Hall's fescue, common sweetgrass, northern twayblade, broad-leaved twayblade, pink coil-beaked lousewort, large-leaved pondweed, hairy tranquil goldenweed, Nagoonberry, soft aster, slim-pod Venus' looking-glass, and lesser bladderwort.

*Meritage Pipeline Project (2013) – Platte and Laramie counties, Wyoming*
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

*Rising Tree Wind Energy Project (2013) – Kern County, California*
Surveyed for Bakersfield cactus.

*Uinta County 3D Seismic Project (2012) – Uintah County, Wyoming*
Surveyed for Unita greenthread and Cedar Mountain Easter daisy.

*Bear Den Pipeline Project (2012) – Dunne and McKenzie counties, North Dakota*
Surveyed for Missouri foxtail cactus and Hooker's Townsend daisy.

*Bakken Natural Gas Liquids Pipeline Project (2011-2012) – Laramie, Goshen, Niobrara, Weston, and Crook counties, Wyoming*
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

*Wildflower Green Renewable Energy Project (2010, 2011) – Los Angeles County, California*
Surveyed for round-leaved filaree, golden goodmania, Coulter's goldfields, Pierson's morning glory, Barstow woolly sunflower, and pale-yellow layia.

*Rising Tree Wind Energy Project (2010, 2011) – Kern County, California*
Surveyed for alkali mariposa-lily, white pygmy-poppy, Mojave spineflower, white-bracted spineflower, desert cymopterus, Bakersfield cactus, Barstow woolly sunflower, Red Rock

poppy, short-joint beavertail, and golden goodmania.

*China Mountain Wind Energy Project (2010) – Twin Falls County, Idaho*
Surveyed for slickspot peppergrass.

**Mojave Solar Energy Project (2010) – Kern County, California*
Surveyed for alkali mariposa-lily, white pygmy-poppy, Mojave spineflower, white-bracted spineflower, desert cymopterus, Barstow woolly sunflower, Red Rock poppy, short-joint beavertail, and golden goodmania.

**WYDOT Douglas West Section (2010) – Converse County, Wyoming*
Surveyed for Ute ladies'-tresses.

**Kanda to Wamsutter Expansion Pipeline Project (2008) – Sweetwater County, Wyoming*
Surveyed for Ute ladies'-tresses, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread.

**WYDOT Cody Northeast Section (2010) – Park County, Wyoming*
Surveyed for Ute ladies'-tresses.

**WYDOT Douglas-Glenrock Section (2010) – Converse County, Wyoming*
Surveyed for Ute ladies'-tresses.

**Sidewinder Wind Energy Project (2008) – San Bernardino County, California*
Surveyed for Lane Mountain milkvetch, desert cymopterus, Barstow woolly sunflower, Mojave monkeyflower, short-joint beavertail.

**White Hills Wind Energy Project (2008) – Mohave County, Arizona*
Surveyed for Las Vegas bearpoppy, clustered barrel cactus, silverleaf sunray, and Navajo bridge cactus.

**Victor, Longreach, and Ballard Petroleum Project (2008) – Campbell County, Wyoming*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, Barr's milkvetch, Iowa moonwort, and narrow-leaf moonwort.

**Overland Pass Pipeline Project (2007-2008) – Larimer, Weld, Logan, Washington, and Yuma counties, Colorado; Albany, Carbon, Laramie, Lincoln, and Sweetwater counties, Wyoming*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, dwarf milkweed, prairie moonwort, sandhills goosefoot, showy gentian, Wyoming feverfew, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread.

**Halligan Seaman Water Supply Project EIS (2006-2008) – Larimer and Weld counties, Colorado*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, lavender hyssop, Larmier aletes, slender wildparsley, dwarf milkweed, Park milkvetch, kittentails, prairie moonwort, lesser-panicled sedge, Rocky Mountain sedge, yellow lady's-slipper, wood lily, white adder's-mouth orchid, purple cliff brake, Bell's twinpod, western polypody, Rocky Mountain cinquefoil, and prairie goldenrod.

**WYDOT Tisdale Creek Section (2008) – Campbell County, Wyoming*
Surveyed for Ute ladies'-tresses.

**Hatchet Ridge Wind Energy Project (2007) – Shasta County, California*
Surveyed for scabrid alpine tarplant, Butte County morning glory, long stolon sedge, western campion, northern clarkia, and Callihan's mariposa lily.

**PPM Dry Lake Wind Energy Project (2006) – Navajo County, Arizona*
Surveyed for roundleaf errazurizia, paper-spined cactus, and Peebles Navajo cactus.

*Vantage Wind Energy Project (2006) – Kittitas County, Washington*

*Whiskey Ridge Wind Energy Project (2006) – Kittitas County, Washington*

*Valentine National Wildlife Refuge (2005) – Cherry County, Nebraska*
Surveyed for western prairie fringed orchid.

*Rosebud Wind Energy Project (2005) – Todd County, South Dakota*
Surveyed for western prairie fringed orchid.

*WYDOT Saratoga South Section (2005) – Carbon County, Wyoming*
Surveyed for Ute ladies'-tresses.

*Westside Irrigation District EIS (2005) – Big Horn and Washakie counties, Wyoming*
Surveyed for Ute ladies'-tresses.

*Entrega Pipeline Project (2004-2005) – Laramier, Weld, Rio Blanco and Moffat counties, Colorado; Albany, Carbon, Laramie, and Sweetwater counties, Wyoming*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, dwarf milkweed, prairie moonwort, sandhills goosefoot, showy gentian, Wyoming feverfew, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, Dudley Bluffs bladderpod, Piceance twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread.

*Hoover's woolly-star (Eriastrum hooveri) Survey (2003) – Los Angeles County and Kern County, California*
Surveyed for Hoover's woolly-star at various locations throughout the Antelope Valley in support of its proposed delisting as a Federal-threatened species by the USFWS.

*Vista Oaks Draft Environmental Impact Report (2003) – Placer County, California*

*Dublin Ranch/Fallon Road Initial Study (2003) – Alameda County, California*

*Kottinger Ranch Initial Study (2003) – Contra Costa County, California*

# Gregory D. Johnson, *Research Biologist*

## Professional Experience

| | |
|---|---|
| 1991-Present | Research Biologist, Western EcoSystems Technology, Inc., Cheyenne, Wyoming |
| 1987-1991 | *Study Director/Project Manager*, Wildlife International, Easton, Maryland |
| 1985-1987 | *Research Assistant,* University of Wyoming, Laramie, Wyoming |
| 1984-1986 | *Teaching Assistant,* University of Wyoming, Laramie, Wyoming |
| 1984 | *Wildlife Technician,* U.S. Forest Service, Laramie, Wyoming |
| 1983 | *Wildlife Technician,* University of Wyoming, Laramie, Wyoming |

## EDUCATION

M.S.
University of Wyoming
Laramie, Wyoming
1987
Zoology and Physiology

B.S.
University of Wyoming
Laramie, Wyoming
1983
Wildlife Conservation and Management

## CERTIFICATIONS

Certified Senior Ecologist,
Ecological Society of America

Certified Wildlife Biologist,
The Wildlife Society

Professional Wetland Scientist,
Society of Wetland Scientists

## Professional Summary

Greg Johnson has been an Ecologist and Project Manager for WEST since 1991. He received a B.S. degree in Wildlife Conservation and Management and a M.S. degree in Zoology and Physiology from the University of Wyoming. He has over 30 years of consulting experience in wildlife and ecological studies. He is a Certified Wildlife Biologist through The Wildlife Society, a Professional Wetland Scientist through the Society of Wetland Scientists, and a certified Senior Ecologist through the Ecological Society of America. His specialty areas include wildlife research with an emphasis on contaminants and wind power development; endangered species; wetland delineation, mitigation, and functional value assessment; and vegetation sampling. He is the author/coauthor of 49 professional journal articles, book chapters or peer reviewed proceedings papers and is an author/coauthor of 61 presentations at scientific meetings.

## Relevant Work Experience

Mr. Johnson has extensive experience sampling vegetation. He prepared a weed management plan and collected quantitative data on weed cover to establish baseline conditions prior to implementing the plan for a reservoir project in CO. He collected transect data on willows and alders along 7.5 miles of stream south of Rawlins, WY to establish baseline conditions of woody riparian habitats used for mitigation purposes. He has collected quantitative plot and transect data on over 60 created and restored wetlands. In 1995 and 1996, he monitored success of reclamation of the 41-mile Wasatch Sour Gas Gathering System pipeline on the Utah/Wyoming border through quantifying vegetation species composition and % cover. He has identified wetland plants on over 100 project sites while conducting wetland delineations. In the summer of 1984, he collected quantitative vegetation data on an elk winter range in southern WY. In the summers of 1979-82, he was employed by the USDA Agricultural Research Service, where he collected extensive vegetation data on reclaimed mined lands in southeast WY. He has mapped vegetation, described vegetation types, and prepared the vegetation portion of numerous EIS's, EA's, and BA's. He has also conducted numerous searches for rare and sensitive plant species prior to construction activities in Wyoming, Idaho, Colorado, Oregon, Washington and California.

He has been certified as a Professional Wetland Scientist (PWS) by the Society of Wetland Scientists since 1997. He is formally trained in wetland delineations, wetland construction and restoration, and wetland plant identification. He has 23 years of wetland experience and has delineated over 5,000 acres of wetland using the Corps of Engineers 1987 manual on over 100 project sites. He was selected by the Corps of Engineers to peer review the Great Plains Region and Western Mountains, Valleys and Coast Region regional supplements to the 1987 Corps of Engineers wetland delineation manual. He has selected numerous wetland mitigation sites and assisted engineers with designs of created wetlands for mitigation purposes. He has quantitatively assessed the functions and values of

impacted wetlands as well as wetlands created for mitigation purposes to ensure that proposed wetland mitigation plans will result in created wetlands that completely replace the functions and values of impacted wetlands. He has also monitored the success of over 75 created wetlands using quantitative line transect and plot methods to measure vegetative composition and success.

**Rare Plant Survey Experience**:

2018 Fountain Wind Energy Project, Shasta County, California.
Species: Fifty-one state and ESA listed plant species

2017 Proposed Quartzsite Solar Energy Project, Riverside County, California.
Species: Harwood's eriastrum (*Eriastrum harwoodii*)

2014 U.S. Highway 14 reconstruction project, Sheridan County, Wyoming.
Species: 59 species of U.S. Forest Service and Wyoming Natural Diversity database sensitive species.

2013 Highway 130 roadside hazard tree clearing project, Carbon County, Wyoming.
Species: 53 species of U.S. Forest Service sensitive species.

2013 Confidential Pipeline, Laramie and Platte Counties,Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2012 Cheyenne Prairie Generating Station Pipeline, Laramie County, Wyoming
Species: Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2006 Wyoming State Highway 150 Reconstruction Project, Campbell County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2006 Lance Creek East Highway Reconstruction Project, Niobrara County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2005 Entrega Gas Pipeline Project, Carbon County, Wyoming
Species: Nelson's milkvetch (*Astragalus nelsonianus*), Gibben's penstemon (*Penstemon gibbensii*)

2004 Reuter-Hess Reservoir Project, Parker, Colorado
Species: Carrionflower (*Smilax lasioneura*) and American black currant (*Ribes americanum*). Located over 40 currant and over 300 carrionflower plants for transplant from the reservoir site.

2004 Entrega Gas Pipeline Project, Rio Blanco and Moffat Counties, Colorado
Species: debris milkvetch (*Astragalus detritalis*), narrow-stem gilia (*Gilia stenothysra*), Rollins cryptanth (*Oreocarya rollinsii*)

2004 City of Cheyenne Belvoir Ranch Landfill and Access Road, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2004 Bear Creek Bridge replacement project, Goshen County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2004 Happy Jack Road Reconstruction Project, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2004 Basin - Greybull Highway Reconstruction Project, Bighorn County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2004 Farson-Lander Highway Reconstruction Project, Sweetwater County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Casper East I-25 Reconstruction Project, Natrona County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Evanston South Highway Reconstruction Project, Uinta County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Henry's Fork Bridge replacement Project, Uinta County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Wild Horse Wind Development Project, Kittitas County, Washington.
Species: Tall agoseris (*Agoseris elata*), Pasque flower (*Anemone nuttalliana*), Palouse milk-vetch (*Astragalus arrectus*), Columbia milk-vetch (*Astragalus columbianus*), Pauper milk-vetch (*Astragalus misellus* var. *pauper*), Dwarf evening-primrose (*Camissonia pygmaea*), Naked-stemmed evening primrose (*Camissonia scapoidea*), Bristle-flowered collomia (*Collomia macrocalyx*), Golden corydalis (*Corydalis aurea*), Beaked cryptantha (*Cryptantha rostellata*), Shining flatsedge (*Cyperus bipartitus*), Wenatchee larkspur (*Delphinium viridescens*), White eatonella (*Eatonella nivea*), Basalt daisy (*Erigeron basalticus*), Piper's daisy (*Erigeron piperianus*), Sagebrush stickseed (*Hackelia hispida* var. *disjuncta*), Longsepal globemallow (*Iliamna longisepala*), Hoover's desert-parsley (*Lomatium tuberosum*), Suksdorf's monkey-flower (*Mimulus suksdorfii*), Coyote tobacco (*Nicotiana attenuata*), Cespitose evening-primrose (*Oenothera cespitosa* ssp.*cespitosa*), Hedgehog cactus (*Pediocactus simpsonii* var. *robustior*), Brewer's cliff-brake (*Pellaea breweri*), Fuzzytongue penstemon (*Penstemon eriantherus* var.*whitedii*), Least phacelia (*Phacelia minutissima*), Sticky goldenweed (*Pyrrocoma hirta* var. *sonchifolia*), Seely's silene (*Silene seelyi*), Ute ladies'-tresses (*Spiranthes diluvialis*), and Hoover's tauschia (*Tauschia hooveri*).

2002 Crystal Canyon Pipeline Project, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2002 Harriman Road Interchange, Interstate 80, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2002 Dubois - Moran Junction Highway Reconstruction project, Fremont County, Wyo.
Species: Pink agoseris (*Agoseris lackschewitzii*), Teton wire-lettuce (*Stephanoneria fluminea*).

2001 Unnamed tributary to Lone Tree Creek, Albany County, Wyoming, Prestridge Stock Reservoir Project
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2001 South Fork of Crow Creek, Laramie County, Wyoming, City of Cheyenne Diversion Dam Rehabilitation Project
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2001 City of Cheyenne water line crossing of the South Fork of Crow Creek
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2000 & 2001 Seminoe Dam Road improvement project, Carbon County, Wyo.
Species: blowout penstemon (*Penstemon haydenii*)

2000 22 abandoned bentonite mines, Crook and Weston counties, Wyo.
Species: water-thread pondweed (*Potamogeton diversifolius*), slender bulrush (*Scirpus heterochaetus*), matted broom-spurge (*Euphorbia serpens*), spring forget-me-not (*Myosotis verna*), small-flowered flame-flower (*Talinum parviflorum*), prairie three-awn (*Aristida oligantha*), roundleaf water-hyssop (*Bacopa rotundifolia*), Texas spreading loeflingia (*Loeflingia squarrosa* var. *texana*)

2000 Sand mining operation, BP Amoco Soda Lake Remediation site, Casper, Wyo.
Species: blowout penstemon (*Penstemon haydenii*)

1999 Snow Sail project, Teton County, Wyoming
Species: Soft aster (*Aster mollis*), Boreal draba (*Draba borealis*), Narrowleaf goldenweed *(Haplopappus macronema* var. *linearis)*, Payson's bladderpod *(Lesquerella paysonii)*

1999 Haul Road construction project, Hanna, Wyoming
Species: bun milk-vetch (*Astragalus simplicifolius*), bedstraw milkweed (*Asclepias subverticillata*)

1998 Sinks Canyon Highway Reconstruction Project, Fremont County, Wyoming
Species: Fremont bladderpod (*Lesquerella fremontii*), Beaver Rim phlox (*Phlox pungens*), Rocky Mountain twinpod (*Physaria saximontana* var *saximontana*), Barneby's clover (*Trifolium barnebyi*)

1998 Dubois - Moran Junction Highway Reconstruction project, Fremont County, Wyo.
Species: Wyoming Tansymustard *(Descurainia torulosa),* Sweet-flowered Rock Jasmine *(Androsace chamaejasme),* Upward-lobe Moonwort *(Botrychium ascendens),* Seaside Sedge (*Carex incurviformis*), Narrowleaf Goldenweed (*Haplopappus macronema*)

1997 Proposed campground site, Bighorn National Forest, Wyoming
Species: limestone columbine *(Aquilegia jonsii)*, northern arnica *(Arnica lonchophylla)*, soft aster *(Aster mollis)*, balsamroot *(Balsamorhiza X tomentosa)*, moonwort *(Botrychium lunaria)*, livid sedge *(Carex livida)*, northern single-spike sedge *(Carex scirpoidea)*, conimitella *(Conimetella williamsii)*, Williams waterparsnip *(Cymopterus williamsii)*, yellow ladyslipper *(Cypripedium calceolus)*, mountain ladyslipper *(Cypripedium montanum)*, giant helleborine *(Epipactis gigantea)*, rough fescue *(Festuca hallii)*, broad-leaved twayblade *(Listera convallaroides)*, marsh muhly *(Muhlenbergia glomerata)*, Kotzebue's grass of parnassus *(Parnasia kotzebuei)*, mountain lousewort *(Pedicularis pulchella)*, Cary beardtongue *(Penstemon caryii)*, Pacific bluegrass *(Poa gracillima)*, greenland primrose *(Primula egaliksensis)*, nagoonberry *(Rubus acaulis)*, Hapeman's saxifrage *(Sullivantea hapmanii)*

1997 Three abandoned uranium mines, Gas Hills in Fremont County, Wyoming
Species: cedar rim thistle (*Cirsium aridum*), contracted Indian ricegrass (*Oryzopsis contracta*), Payson beardtongue (*Penstemon paysoniorum*), bun milk-vetch (*Astragalus simplicifolius*), Nelson's milkvetch (*Astragalus nelsonianus* a.k.a. *Astragalus pectinatus* var. *platyphyllus*)

1995 Five abandoned uranium mines, Gas Hills in Fremont County, Wyoming
Species: cedar rim thistle (*Cirsium aridum*), contracted Indian ricegrass (*Oryzopsis contracta*), Beaver Rim phlox (*Phlox pungens*), meadow pussytoes (*Antennaria arcuata*), Payson beardtongue (*Penstemon paysoniorum*), wild yellowcress (*Rorippa truncata*), Brandegee's Jacob's-ladder (*Polemonium brandegei*), swamp willow-herb (*Epilobium palustre* var *palustre*), bun milk-vetch (*Astragalus simplicifolius*), Nelson's milkvetch (*Astragalus nelsonianus* a.k.a. *Astragalus pectinatus* var. *platyphyllus*)

1995 One abandoned bentonite mine, Crook County, Wyoming
Species: Texas spreading loeflingia (*Loeflingia squarrosa* var. *texana*)

1995 Proposed Tribal Casino, Klamath Basin, Oregon
Species: Applegate's milk-vetch (*Astragalus applegatei*), Pumice grape-fern (*Botrychium pumicola*), long-bearded mariposa-lily (*Calochortus longebarbatus* var. *longebarbatus*),

pygmy monkeyflower (*Mimulus pygmaeus*), red-root yampah (*Perideridia erythrorhiza*), Columbia cress (*Rorippa columbiae*)

1995 Two proposed reservoir sites, Park County, Wyoming
Species: sand dropseed (*Sporobolus cryptandrus*), persistant sepal yellowcress (*Rorippa calycina*)

1994 Five abandoned coal mine sites near Hanna, Wyoming
Species: bun milk-vetch (*Astragalus simplicifolius*), bedstraw milkweed (*Asclepias subverticillata*

# Klarissa Lawrence, *Wetland Specialist/Biologist*

## PROFESSIONAL EXPERIENCE

| | |
|---|---|
| 2018-Present | *Wetland Specialist/Biologist,* Western EcoSystems Technology, Inc., Fort Collins, Colorado |
| 2006-2018 | *Biological Field Technical,* Western EcoSystems Technology, Inc., Cheyenne, Wyoming |
| 2017-2017 | *Wetland Ecology Technician,* Center for Environmental Management of Military Lands (CEMML) Fort Greely, Delta Junction, Alaska |

## SPECIALTY AREAS

Klarissa Lawrence has over 13 years' experience in wetland and floristic surveys, including rare plant surveys, wetland delineations, and habitat mapping. Klarissa has had the opportunity to work in much of the Western United States and interior Alaska. Areas of focus include northern California, the high plains of Montana, Wyoming, and Colorado, and the northern plains of North and South Dakota. Her wide range experience includes energy pre- and post-construction, rare plant surveys, wetland delineations, habitat surveys, and species-specific surveys. Target species include eagles, bats, whooping cranes, lesser prairie chicken, Dakota skipper, Preble's meadow jumping mouse, Utes ladies'-tresses, Colorado butterfly plant, and numerous other plant species. She has worked on several interstate pipeline projects ranging from small collection lines to large-scale multi-state transmission lines; wind projects across the US with a focus in the plains states, rocky mountain region, and pacific northwest; and timber harvest projects.

## SKILLS AND EXPERTISE

Rare plant surveys (Threatened and Endangered; State, USFS, and BLM specific)

Wetland delineations

Sensitive Species-Surveys, including big game, pigmy rabbits, black-footed ferrets, fishers, prairie dogs, whooping cranes, mountain plovers, burrowing owls, and northern spotted owls

Habitat mapping for sensitive plant and animal species

Post Construction Monitoring (Pipeline and Wind Turbine), including vegetation re-growth analysis, habitat monitoring, wetland plantings, erosion control, and bird & bat fatality counts

Pre-Construction Monitoring

Aerial Surveys (Fixed wing and helicopter)

Date Entry, collection, and organizational procedures

Field Coordination

Field Crew Management

Client Interactions

## ADDITIONAL TRAINING & CERTIFICATION

Certified Hydric Soil Investigator, 2019, Swamp School, NC

1st Aid/CPR/AED Training, 2019, American Red Cross, CO

Lesser Prairie Chicken Vegetation Monitoring Training, 2014, WAFWA, KS

Wetland Delineation Course, 2008, Wetland Training Institute, CA

## EDUCATION

B.A.
Metropolitan State University
Denver, Colorado
2004
Biology

A.S.
Metropolitan State University
Denver, Colorado
2004
Chemistry

## SCIENTIFIC ORGANIZATION MEMBERSHIPS

California Native Plant Society

Colorado Native Plant Society

National Audubon Society

## RARE PLANT SURVEYS CONDUCTED

*Fountain Wind Project (2019) – Shasta County, California*
Surveyed for 51 state and ESA listed plant species.

*North Bakken Pipeline Expansion Project (2019) – McKenzie County, North Dakota*
Surveyed for 14 USFS sensitive species on the Little Missouri National Grassland.

*Zapata Wind Project (2018) – Zapata County, Texas*
Surveyed for Zapata bladderpod, ashy dogweed, prostrate milkweed, and bushy Whitlow-wort

*Roseburg Resource Timber Harvest (2016) – Siskiyou and Shasta Counties, California*
Surveyed for 71 state listed plant species.

*Sam's Creek Transmission Line (2015 - 2016) – Jackson and Josephine Counties, Oregon*
Surveyed for 21 state listed plant species.

*Bakken Natural Gas Liquids Pipeline Project (2012) – Laramie, Goshen, Niobrara, Weston, and Crook counties, Wyoming*
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

*Sunstone Pipeline Project (2008)— Elmore and Ada Counties, Idaho*
Surveyed for slickspot peppergrass.

*Overland Pass Pipeline Project (2007) – Larimer, Weld, Logan, Washington, and Yuma counties, Colorado; Albany, Carbon, Laramie, Lincoln, and Sweetwater counties, Wyoming*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, dwarf milkweed, prairie moonwort, sandhills goosefoot, showy gentian, Wyoming feverfew, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread

*Hatchet Ridge Wind Energy Project (2007) – Shasta County, California*
Surveyed for scabrid alpine tarplant, Butte County morning glory, long stolon sedge, western campion, northern clarkia, and Callihan's mariposa lily.

# Appendix C. Plant Species Encountered within the Fountain Wind Project

**Appendix C. Plant Species Encountered within the Fountain Wind Project.**

| Family | Scientific Name* | Common Name |
|---|---|---|
| **ALLIACEAE** | ***Allium parvum*** | dwarf onion |
| | ***Allium* spp.** | onion |
| **ANACARDIACEAE** | ***Toxicodendron diversilobum*** | poison oak |
| **APIACEAE** | ***Angelica breweri*** | Brewer's angelica |
| | ***Heracleum lanatum*** | common cow parsnip |
| | ***Ligusticum californicum*** | California licorice root |
| | ***Lomatium* spp.** | lomatium |
| | ***Osmorhiza berteroi*** | sweet cicely |
| **APOCYNACEAE** | ***Apocynum androsaemifolium*** | bitter dogbane |
| **ARISTOLOCHIACEAE** | ***Asarum hartwegii*** | Hartweg's wild ginger |
| | ***Asarum caudatum*** | creeping wild ginger |
| **ASCLEPIADACEAE** | ***Asclepias cordifolia*** | heart leaf milkweed |
| | ***Asclepias speciosa*** | showy milkweed |
| **ASTERACEAE** | ***Achillea millefolium*** | common yarrow |
| | ***Agoseris grandiflora*** | giant mountain dandelion |
| | ***Arnica cordifolia*** | heartleaf arnica |
| | *Centaurea solstitialis* | yellow star thistle |
| | *Cichorium intybus* | chicory |
| | *Cirsium vulgare* | bull thistle |
| | ***Ericameria nauseosa*** | gray rabbitbrush |
| | ***Erigeron* spp.** | fleabane |
| | ***Eriophyllum lanatum*** | woolly sunflower |
| | ***Grindelia hirsutula*** | hairy gumweed |
| | ***Helenium bigelovii*** | Bigelow's sneezeweed |
| | ***Helianthella californica*** | California helianthella |
| | ***Hieracium nudicaule*** | naked-stemmed hawkweed |
| | *Hypochaeris* spp. | cat's ear |
| | *Lactuca serriola* | prickly lettuce |
| | ***Madia glomerata*** | mountain tarweed |
| | ***Senecio* spp.** | groundsel |
| | ***Solidago* spp.** | goldenrod |
| | ***Symphyotrichum bracteolatum*** | Eaton's aster |
| | *Taraxacum officinale* | common dandelion |
| | ***Wyethia mollis*** | mountain mule ear |
| | *Tragopogon dubius* | yellow salsify |
| **BETULACEAE** | ***Alnus incana* ssp. *tenuifolia*** | mountain alder |
| | ***Corylus cornuta* var. *californica*** | beaked hazelnut |
| **BORAGINACEAE** | ***Cryptantha* spp.** | cryptantha |
| | *Cynoglossum officinale* | houndstongue |
| | ***Eriodictyon californicum*** | California yerba santa |
| | ***Eriodictyon lobbii*** | matted yerba santa |
| | ***Plagiobothrys stipitatus* var. *micranthus*** | stalked popcornflower |
| **BRASSICACEAE** | ***Erysimum capitatum*** | western wallflower |
| | *Lepidium campestre* | field pepperweed |
| | ***Nasturtium officinale*** | watercress |
| | *Sisymbrium altissimum* | tall tumblemustard |
| | ***Streptanthus tortuosus*** | mountain jewelflower |
| **CAMPANULACEAE** | ***Asyneuma prenanthoides*** | California harebell |
| **CAPRIFOLIACEAE** | ***Lonicera involucrata*** | twinberry honeysuckle |
| | ***Sambucus mexicana*** | blue elderberry |
| | ***Symphoricarpos mollis*** | creeping snowberry |
| **CARYOPHYLLACEAE** | *Dianthus deltoides* | maiden pink |
| | ***Silene bernardina*** | Palmer's catchfly |

**Appendix C. Plant Species Encountered within the Fountain Wind Project.**

| Family | Scientific Name* | Common Name |
|---|---|---|
| **CELASTRACEAE** | ***Paxistima myrsinites*** | Oregon boxleaf |
| **CHENOPODIACEAE** | *Chenopodium album* | lamb's quarters |
| **CONVOLVULACEAE** | *Convolvulus* spp. | morning glory |
| **CORNACEAE** | ***Cornus nuttallii*** | mountain dogwood |
| | ***Cornus sessilis*** | blackfruit dogwood |
| **CUPRESSACEAE** | ***Calocedrus decurrens*** | Incense-cedar |
| **CYPERACEAE** | ***Carex densa*** | dense sedge |
| | ***Carex inops* ssp. *inops*** | long-stoloned sedge |
| | ***Carex nebrascensis*** | Nebraska sedge |
| | ***Carex praegracilis*** | field sedge |
| | ***Carex subfusca*** | brown sedge |
| | ***Carex utriculata*** | beaked sedge |
| | ***Carex spp.*** | sedge |
| | ***Eleocharis acicularis*** | needle spikerush |
| | ***Eleocharis macrostachya*** | common spikerush |
| | ***Schoenoplectus acutus*** | tule |
| | ***Scirpus microcarpus*** | mountain bog bulrush |
| **DENNSTAEDTIACEAE** | ***Pteridium aquilinum* var. *pubescens*** | Western brackenfern |
| **EQUISETACEAE** | ***Equisetum arvense*** | common horsetail |
| | ***Equisetum hymale*** | Scouring-rush horsetail |
| **ERICACEAE** | ***Arctostaphylos patula*** | greenleaf manzanita |
| | ***Chimaphila menziesii*** | pipsissewa |
| | ***Pterospora andromedea*** | pinedrops |
| | ***Pyrola picta*** | whiteveined shinleaf |
| | ***Rhododendron occidentale*** | western azalea |
| **FABACEAE** | ***Acmispon americanus*** | Spanish clover |
| | ***Hosackia crassifolia*** | Broad-leaved lotus |
| | ***Hosackia pinnata*** | pinnate lotus |
| | ***Lathyrus lanszwertii*** | Nevada pea |
| | *Trifolium pratense* | red clover |
| **FAGACEAE** | ***Chrysolepis sempervirens*** | chinquapin |
| | ***Quercus kelloggii*** | California black oak |
| **GROSSULARIACEAE** | ***Ribes roezlii*** | Sierra gooseberry |
| | ***Ribes divaricatum*** | spreading gooseberry |
| **HYDROPHYLLACEAE** | ***Phacelia* spp.** | phacelia |
| **HYPERICACEAE** | *Hypericum perforatum* | Klamath weed |
| **IRIDACEAE** | ***Iris missouriensis*** | western blue flag |
| | ***Iris tenuissima*** | slender iris |
| | ***Sisyrinchium bellum*** | western blue-eyed grass |
| **JUNCACEAE** | ***Juncus balticus*** | Baltic rush |
| | ***Juncus ensifolius*** | swordleaved rush |
| | ***Juncus tenuis*** | slender rush |
| | ***Juncus xiphiodes*** | iris leaved rush |
| **LAMIACEAE** | ***Mentha arvensis*** | field mint |
| | ***Prunella vulgaris*** | self-heal |
| | ***Stachys adjugoides* var. *rigida*** | rigid hedge nettle |
| | ***Scutellaria nana*** | little skullcap |
| **LILIACEAE** | ***Calochortus tolmiei*** | hairy star tulip |
| | ***Clintonia uniflora*** | bride's bonnet |
| | ***Fritillaria recurva*** | scarlet fritillary |
| | ***Lilium pardalinum*** | leopard lily |
| | ***Lilium washingtonianum*** | Washington lily |
| | ***Triteleia hyacinthina*** | wild hyacinth |

**Appendix C. Plant Species Encountered within the Fountain Wind Project.**

| Family | Scientific Name* | Common Name |
|---|---|---|
| | ***Triteleia ixioides*** | golden brodiaea |
| | ***Zigadenus venenosus*** | death camas |
| **MALVACEAE** | ***Sidalcea malviflora*** | checkermallow |
| | ***Sidalcea oregana* ssp. *spicata*** | Oregon checker mallow |
| **MELANTHIACEAE** | ***Trillium albidum*** | giant white wakerobin |
| | ***Trillium ovatum*** | Pacific trillium |
| | ***Veratrum californicum*** | California corn lily |
| **MONTIACEAE** | ***Claytonia lanceolata*** | lanceleaf springbeauty |
| | ***Claytonia perfoliata*** | miner's lettuce |
| **MYRSINACEAE** | ***Lysimachia latifolia*** | Pacific starflower |
| **NYMPHACEAE** | ***Nuphar polysepala*** | Rocky Mountain pond-lily |
| **OLEACEAE** | ***Fraxinus latifolia*** | Oregon ash |
| **ONOGRACEAE** | ***Epilobium angustifolium*** | fireweed |
| | ***Epilobium brachycarpum*** | tall annual willowherb |
| | ***Epilobium ciliatum*** | fringed willowherb |
| **OPHIOGLOSSACEAE** | ***Sceptridium multifidum*** | leather grapefern |
| **ORCHIDACEAE** | ***Corallorhiza maculata*** | spotted coralroot |
| | ***Corallorhiza striata*** | hooded coralroot |
| | ***Goodyera oblongifolia*** | rattlesnake plantain |
| | ***Listera convallarioides*** | broadlipped twayblade |
| | ***Platanthera dilitata* var. *leucostachys*** | Sierra bog orchid |
| | ***Spiranthes romanzoffiana*** | hooded lady's tresses |
| **OROBANCHACEAE** | ***Boschniakia strobilacea*** | California groundcone |
| | ***Castilleja tenuis*** | hairy Indian paintbrush |
| | ***Pedicularis densiflora*** | Indian warrior |
| **PAPAVERACEAE** | ***Dicentra formosa*** | bleeding heart |
| **PINACEAE** | ***Abies concolor*** | white fir |
| | ***Abies magnifica*** | red fir |
| | ***Pinus lambertiana*** | sugar pine |
| | ***Pinus jeffreyi*** | Jeffrey pine |
| | ***Pinus ponderosa*** | ponderosa pine |
| | ***Pseudotsuga menziesii*** | Douglas fir |
| **PLANTAGINACEAE** | *Plantago lanceolata* | English plantain |
| | ***Veronica anagallis-aquatica*** | water speedwell |
| **PHRYMACEAE** | ***Mimulus breviflorus*** | shortflower monkeyflower |
| | ***Mimulus guttatus*** | seep monkeyflower |
| **POACEAE** | ***Agrostis scabra*** | rough bent grass |
| | *Agrostis stolonifera* | bent grass |
| | ***Alopecurus aequalis*** | shortawn foxtail |
| | ***Alopecurus geniculatus*** | marsh foxtail |
| | ***Bromus carinatus*** | mountain brome |
| | *Bromus tectorum* | cheatgrass |
| | ***Calamagrostis canadensis*** | bluejoint reedgrass |
| | *Cynosurus echinatus* | annual dogtail grass |
| | *Dactylis glomerata* | orchardgrass |
| | ***Danthonia californica*** | California oatgrass |
| | ***Deschampsia cespitosa*** | tufted hairgrass |
| | ***Deschampsia danthonioides*** | annual hairgrass |
| | *Elymus caput-medusae* | medusahead |
| | ***Elymus elymoides*** | bottlebrush |
| | ***Elymus glaucus*** | blue wild rye |
| | ***Elymus trachycaulus*** | slender wheatgrass |
| | *Festuca arundinacea* | tall fescue |

**Appendix C. Plant Species Encountered within the Fountain Wind Project.**

| Family | Scientific Name* | Common Name |
|---|---|---|
| | ***Festuca occidentalis*** | western fescue |
| | ***Glyceria borealis*** | Northern mannagrass |
| | ***Glyceria striata*** | fowl mannagrass |
| | *Phleum pratense* | Timothy |
| | *Poa bulbosa* | bulbous bluegrass |
| | *Poa palustris* | fowl bluegrass |
| | *Poa pratensis* | Kentucky bluegrass |
| | ***Poa secunda*** | Sandberg bluegrass |
| | ***Stipa lemmonii*** | Lemmon's needlegrass |
| | ***Stipa nelsonii*** | mountain needle grass |
| **POLEMONIACEAE** | ***Gilia aggregata*** | scarlet gilia |
| | ***Navarretia divaricata*** | mountain navarretia |
| **POLYGONACEAE** | ***Bistorta bistortoides*** | American bistort |
| | ***Eriogonum lobbii*** | Lobb's wild buckwheat |
| | ***Eriogonum nudum*** | naked buckwheat |
| | ***Eriogonum* spp.** | buckwheat |
| | ***Eriogonum umbellatum*** | sulfur buckwheat |
| | ***Eriogonum vimineum*** | wickerstem buckwheat |
| | *Polygonum aviculare* | prostrate knotweed |
| | ***Polygonum bistortoides*** | American bistort |
| | *Rumex acetosella* | field sorrel |
| | *Rumex salicifolius* | willow dock |
| **PRIMULACEAE** | ***Primula hendersonii*** | mosquito bill |
| **PTERIDACEAE** | ***Myriopteris gracillima*** | lace lip fern |
| **RANUNCULACEAE** | ***Aconitum columbianum*** | monkshood |
| | ***Aquilegia formosa*** | columbine |
| | ***Delphinium nudicaule*** | canyon larkspur |
| | ***Ranunculus aquatilis*** | White water crowfoot |
| | ***Thalictrum fendleri*** | meadow-rue |
| **RHAMNACEAE** | ***Ceanothus cordulatus*** | mountain whitethorn |
| | ***Ceanothus cuneatus*** | buckbrush |
| | ***Ceanothus integerrimus*** | deerbrush |
| | ***Ceanothus prostratus* var. *prostratus*** | Mahala mat |
| | ***Ceanothus velutinus*** | tobacco brush |
| | ***Frangula californica*** | California coffeeberry |
| **ROSACEAE** | ***Amelanchier alnifolia*** | Saskatoon serviceberry |
| | ***Cercocarpus betuloides*** | birch leaf mountain mahogany |
| | ***Fragaria virginiana*** | mountain strawberry |
| | ***Geum macrophyllum*** | Large-leaved avens |
| | ***Potentilla gracilis*** | Northwest cinquefoil |
| | ***Prunus emarginata*** | bitter cherry |
| | ***Rhamnus purshiana*** | cascara |
| | ***Rosa woodsii* var. *ultramontana*** | interior rose |
| | *Rubus armeniacus* | Himalayan blackberry |
| | ***Rubus parviflorus*** | thimbleberry |
| | ***Sorbus californica*** | mountain ash |
| | ***Spiraea douglasii*** | rose spirea |
| **RUBIACEAE** | ***Galium aparine*** | common bedstraw |
| **RUSCACEAE** | ***Maianthemum racemosum*** | feathery false lily of the valley |
| | ***Maianthemeum stellatum*** | starry false lily of the valley |

**Appendix C. Plant Species Encountered within the Fountain Wind Project.**

| Family | Scientific Name* | Common Name |
|---|---|---|
| **SALICACEAE** | ***Populus tremuloides*** | quaking aspen |
| | ***Salix scouleriana*** | Scouler's willow |
| | ***Salix lasiandra*** | Pacific willow |
| | ***Salix lasiolepis*** | arroyo willow |
| **SAPINDACEAE** | ***Acer circinatum*** | vine maple |
| | ***Acer glabrum*** | Rocky Mountain maple |
| | ***Acer macrophyllum*** | bigleaf maple |
| **SAXIFRAGACEAE** | ***Heuchera* spp.** | alumroot |
| **SCROPHULARIACEAE** | ***Castilleja* spp.** | paintbrush |
| | ***Mimulus torreyi*** | Torrey's monkeyflower |
| | ***Pedicularis* spp.** | lousewort |
| | ***Penstemon neotericus*** | Plumas County beardtongue |
| | ***Penstemon* spp.** | penstemon |
| | *Verbascum thapsus* | common mullein |
| **URTICACEAE** | ***Urtica dioica*** | stinging nettle |
| **VALERIANACEAE** | ***Valeriana californica*** | California valerian |
| **VERBENACEAE** | ***Verbena lasiostachys*** | western vervain |
| **VIOLACEAE** | ***Viola adunca*** | Western dog violet |
| | ***Viola glabella*** | stream violet |
| | ***Viola lobata*** | pine violet |
| | ***Viola purpurea*** | mountain violet |

*Native plant species in bold.

# Appendix D. Natural Vegetation Communities Mapped within the Fountain Wind Project Evaluation Area.

### *Pinus ponderosa* Forest Alliance (Ponderosa pine forest)

Areas mapped as this vegetation community type cover a majority of the northern half of the Project (Figure 2) and were burned in the 1992 Fountain Fire. In the years following the fire millions of ponderosa pine, Douglas fir, and white fir seedlings were planted at 10-ft spacing. Thus, this forest alliance is composed of even-aged stands of mixed conifer forest, generally about 25 years old, featuring a partially open canopy. Ponderosa pine is the dominant overstory species but white fir and Douglas fir are common. Since the fire, forest thinning has occurred and much of the slash remains in place, particularly within areas mapped as this alliance on the south side of Highway 299.

Overall, woody and herbaceous understory vegetation is highly variable in composition and density, but typically includes some combination of the following woody species: Mahala mat (*Ceanothus prostratus* var. *prostratus*), greenleaf manzanita (*Arctostaphylos patula*), mountain whitethorn (*Ceanothus cordulatus*), Sierra gooseberry (*Ribes roezlii*), and creeping snowberry (*Symphoricarpos mollis*). Herbaceous vegetation is predominantly composed of the following herbaceous species: bracken (*Pteridium aquilinum* var. *pubescens*), bottlebrush (*Elymus elymoides*), Pacific starflower (*Lysimachia latifolia*), and mountain needle grass (*Achnatherum nelsonii*). Although not as common as the other conifers in the overstory, incense cedar is present throughout this alliance.

### *Pinus ponderosa* Forest Alliance (Ponderosa pine forest) – Logged/Recently Logged

Logging operations are ongoing within the evaluation area, particularly south of Highway 299. Areas mapped as ponderosa pine forest–logged/recently logged have been harvested at various intervals within the last 10−15 years. Most logged sites featured planted seedlings and saplings of various age classes. Ponderosa pine and, to a lesser extent, white fir are the most common tree species planted within recently logged areas. The majority of logged areas include small patches of more mature trees that were presumably left to provide wildlife habitat. Understory vegetation is typically sparse in this alliance and, when present, is mostly composed of invasive, disturbance-tolerant herbaceous species such as mullein, bull thistle, Klamath weed, and houndstongue. Additionally, bottlebrush squirreltail, a native grass species, is often present.

### *Abies concolor – Pseudotsuga menziesii* Forest Alliance (White fir – Douglas fir forest)

The white fir-Douglas fir forest alliance was primarily mapped in the east-central and southern portions of the Project, where it formed a mosaic with the logged/recently logged ponderosa pine forest community. Areas mapped as this alliance were not burned in the Fountain Fire. Within the Project this vegetation community featured a mostly-closed canopy of mature mixed conifer species, including white fir, Douglas fir, sugar pine, ponderosa pine, incense cedar, and red fir (*Abies magnifica*), with some California black oak (*Quercus kelloggii*), particularly in small forest openings. Largely because of the closed canopy, understory vegetation is sparse and mostly composed of herbaceous species, including bracken, Pacific starflower, coralroot (*Corallorhiza* spp.), whiteveined shinleaf (*Pyrola picta*), and pipsissewa (*Chimaphila menziesii*). Scattered seedlings and saplings of the overstory tree species are also present in the understory. On rockier

substrates, the white fir–Douglas fir forest alliance typically has a more open canopy and features a denser understory composed of a variety of the woody and herbaceous species observed in the ponderosa pine forest alliance. Both of these forested vegetation communities mapped within the evaluation area represent a managed (i.e., periodically disturbed) forest system. As such, most stands are even-aged, but because of the different intervals at which timber harvesting has occurred, a mosaic of different age-class even-aged stands exist within the Project and surrounding area.

### ***Quercus kelloggii* Forest Alliance (California black oak forest)**

California black oak forest typically occurs at lower elevations within the Project (e.g., the far western portion), or in previously burned areas where it forms a mosaic with the green leaf manzanita chaparral alliance. Within the Project the majority of this vegetation community features a mostly open canopy of black oak with scattered green leaf manzanita in the shrub strata and a dense herbaceous understory composed primarily of grasses. Common understory species include Lemmon's needlegrass (*Stipa lemmonii*), blue wild rye (*Elymus glaucus*), mountain brome (*Bromus carinatus*), and yarrow.

### ***Acer glabrum* Provisional Shrubland Alliance (Rocky Mountain maple thickets)**

Riparian areas, mostly dominated by Rocky Mountain maple, were mapped along ephemeral, intermittent, and perennial drainages throughout the Project. Creek alder (*Alnus incana* ssp. *tenuifolia*) is often a codominant, particularly along shaded stream corridors more common to the southern portion of the Project. Woody and herbaceous understory vegetation composition is highly variable and is dependent on moisture regime (e.g., dry, mesic) and overstory canopy cover. In the northern portion of the Project, primarily within areas burned in the Fountain Fire, plant species better adapted to drier conditions are more common. Although Rocky Mountain maple, and often Scouler's willow (*Salix scouleriana*), is still common immediately along the drainage, the streambanks and adjacent riparian habitat are dominated by more xeric species including ceanothus (*Ceanothus* spp.), green leaf manzanita, blue elderberry (*Sambucus mexicana*), mountain dogwood (*Cornus nuttallii*), and bitter cherry (*Prunus emarginata*). In the southern portion of the Project, primarily in areas that escaped the Fountain Fire, more mesic conditions exist within the Rocky Mountain shrubland alliance. Incense cedar and Douglas fir often create a well-shaded forest canopy above dense woody riparian habitat dominated by Rocky Mountain maple and creek alder. Other common shrub and tree species include blackfruit dogwood (*Cornus sessilis*), twinberry honeysuckle (*Lonicera involucrata*), vine maple (*Acer circinatum*), willow (*Salix* spp.), Oregon boxleaf (*Paxistima myrsinites*), western azalea (*Rhododendron occidentale*), and bigleaf maple (*Acer macrophyllum*). Although variable across the Project, understory herbaceous vegetation is relatively sparse and typically includes some combination of the following species: common bedstraw (*Galium aparine*), feathery false lily of the valley (*Maianthemum racemosum*), bride's bonnet (*Clintonia uniflora*), common cow parsnip (*Heracleum lanatum*), arrowleaf ragwort (*Senecio triangularis*), and sweet cicely (*Osmorhiza berteroi*).

### *Arctostaphylos patula* Shrubland Alliance (Green leaf manzanita chaparral)

Green leaf manzanita chaparral intergrades with almost all other vegetation communities within the Project. It occurs in areas receiving full sunlight, including rocky ridgetops, rocky slopes and flats, forest openings, and recently burned or logged areas. This vegetation community is characterized by the presence of dense, nearly impenetrable thickets dominated by green leaf manzanita. Additional shrub species that sometimes occur as co-dominants include bush chinquapin (*Chrysolepis sempervirens*), mountain whitethorn (*Ceanothus cordulatus*), deerbrush (*Ceanothus integerrimus*), tobacco brush (*Ceanothus velutinus*), and buckbrush (*Ceanothus cuneatus*). Because of the dense growth form of this shrubland alliance understory vegetation is virtually absent, except in small openings. Scattered herbaceous species observed in small, rocky openings within green leaf manzanita chaparral include Plumas County beardtongue (*Penstemon neotericus*), mountain jewelweed (*Streptanthus tortuosus*), lace lip fern (*Myriopteris gracillima*), sulfur buckwheat (*Eriogonum umbellatum*), buckwheat (*Eriogonum* sp.), and onion (*Allium* sp.).

Green leaf manzanita chaparral was also mapped along the transmission line corridor that extends across the central portion of the Project. Vegetation along this corridor is managed to discourage the establishment of tall shrub and tree species. In addition to other chaparral species (e.g., *Ceanothus* spp.), green leaf manzanita has established along much of the corridor. Portions of the transmission line where chaparral species have not established feature dense stands of Western brackenfern (*Pteridium aquilinum* var. *pubescens*), scattered shrubs, including Sierra gooseberry (*Ribes roezlii*), bitter cherry, creeping snowberry (*Symphoricarpos molllis*), and rose (*Rosa* spp.), and barren patches.

### *Carex utriculata* Herbaceous Alliance (Beaked sedge meadows)

Beaked sedge meadows were mapped throughout the Project in seasonally or permanently saturated areas adjacent to stream corridors and ponds. Generally, these meadows are composed of a wide diversity of hydrophytic species, including grasses, sedges, rushes, and forbs. Beaked sedge is typically the dominant plant species in these meadows, but commonly observed species include bluejoint reedgrass (*Calamagrostis canadensis*), marsh foxtail (*Alopecurus geniculatus*), Nebraska sedge (*C. nebrascensis*), brown sedge (*C. subfusca*), sword leaved rush (*Juncus ensifolius*), Baltic rush (*Juncus balticus*), common spikerush (*Eleocharis macrostachya*), tufted hairgrass (*Deschampsia cespitosa*), American bistort (*Polygonum bistortoides*), horsetail (*Equisetum* spp.), Bigelow's sneezeweed (*Helenium bigelovii*), and seep monkeyflower (*Mimulus guttatus*). Scattered shrubs, including rose spirea (*Spiraea douglasii*), willow, and thinleaf alder seedlings and saplings, occur in some of these meadows. Additional patches of beaked sedge meadow were observed along drainage channels within the two forest alliances in the Project but were too small to map independently, and were thus included in the larger riparian community mapping.

### *Agrostis* (*gigantea*, *stolonifera*) – *Festuca arundinacea* Herbaceous Semi-Natural Alliance (Bent grass – tall fescue meadows)

Montane meadows dominated by bent grass and/or tall fescue were mapped in forest openings and adjacent some of the beaked sedge meadows within the Project. They are considered a semi-natural alliance because, although native species are present, both of the dominant species are non-natives. These meadows are typically somewhat disturbed and are not saturated during the growing season. They support mesic and/or upland herbaceous vegetation. Common grasses and forbs include common yarrow (*Achillea millefolium*), goldenrod (*Solidago* sp.), Timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), orchardgrass, and blue wildrye. Bent grass – tall fescue meadows occasionally include some of the herbaceous plant species found in the beaked sedge meadow vegetation community, particularly when they abut one another.