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RARE PLANT SURVEYS AND NATURAL VEGETATION COMMUNITY MAPPING

Fountain Wind Project
Shasta County, California

Prepared for:

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INTRODUCTION

Pacific Wind Development LLC (Pacific Wind) has contracted Western EcoSystems Technology, Inc. (WEST) to provide biological support for the development of the proposed Fountain Wind Project (Project). This memorandum described the methods and results of rare plant surveys conducted at the Project during the 2018 growing season. 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 white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

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 (25,900 hectares) 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 (3-m) spacing. Incense cedar (*Calocedrus decurrens*) was 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, survey corridors were provided in GIS format by Pacific Wind. The rare plant surveys 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 1).

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 targeted list of special status plant species and sensitive natural vegetation communities with 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.

A total of 51 rare plants were identified in the CNDDB query and CNPS database review. Based on further review of the habitat requirements of the 51 species and knowledge of the natural vegetation communities known to occur within the evaluation area (based on previous WEST surveys), WEST biologists determined that 36 rare plant species had the highest potential to occur and 15 of the 51 rare plants species were unlikely to occur. Of the 36 species that had the highest potential to occur, only one was federal- or state-listed, the state endangered Boggs Lake hedge-hyssop (*Gratiola heterosepala*). As the reported habitats (e.g., riparian, wet meadow) and flowering/fruiting periods of the 15 species identified as not likely to occur overlapped those of the 36 species with the highest potential to occur, all 51 rare plant species were targeted during the rare plant survey effort (Appendix A). Prior to conducting surveys, WEST reviewed species descriptions, habitat requirements, and photographs of the 51 target species.

Focused surveys to determine presence or absence of target species were conducted during two survey periods: May 21 – 29 and July 30 – August 3, 2018. The two survey periods were selected to capture the range of flowering and fruiting periods for the 51 target species. WEST biologists 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.

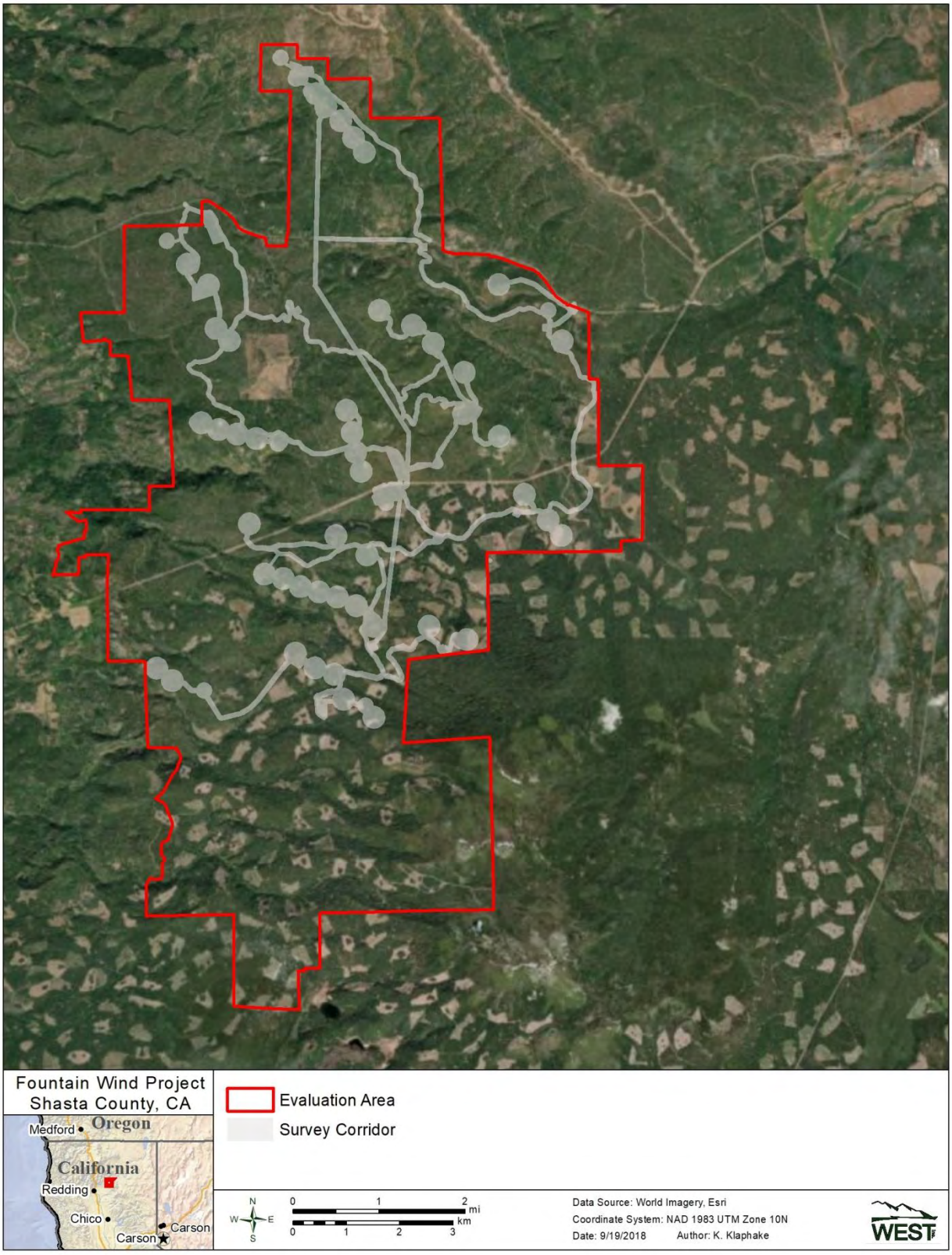

Figure 1. Survey corridors and evaluation area associated with rare plant surveys and natural vegetation community mapping at the Fountain Wind Project, Shasta County, CA.

Natural Vegetation Communities

Mapping of natural vegetation communities within the evaluation area was conducted by WEST during the 2018 rare plant surveys. WEST botanists documented vegetation community types while conducting rare plant surveys and while transiting through the evaluation area en route to survey areas. Dominant plants within each vegetation community were identified to species, and communities were classified in accordance with the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) or *A Manual of California Vegetation* (2nd Edition, Sawyer et al. 2008). 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 feet [2.5 cm = 304.8 m]). The field maps were later digitized in a GIS to incorporate into other GIS mapping efforts.

Invasive Plant Species

Non-native invasive plant species encountered were recorded during both rare plant survey periods in 2018. Broad-scale mapping of non-native species was conducted during the second rare plant survey period and primarily focused on roadsides within the rare plant survey corridors. Based on observations during the rare plant surveys, vegetation within turbine pad areas (most of which were away from developed roads) was largely composed of native plant species, with only a few, occasional non-native invasive species observed; no mapping of non-native species was conducted within these locations. Additionally, no 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 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 were broken into survey segments identified with a unique letter (A-O), with each segment corresponding to a list of non-native invasive species and their relative distribution documented within the segment. Within each survey segment, 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 51 rare plant species identified as possibly occurring were encountered during the two survey periods in 2018. 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 surveys was compiled and is provided in Appendix B.

Natural Vegetation Communities

A total of 11 natural vegetation communities were identified within the Project evaluation area, including: mixed conifer forest-burned; mixed conifer forest-unburned; mixed montane riparian forest; mixed montane riparian scrub; mixed montane chaparral; black oak woodland; wet montane meadow; montane meadow; logged/recently logged; rock outcrop; and, transmission line corridor (Figure 2; Appendix C). None of the mapped natural vegetation communities were considered sensitive (i.e., none had a state rank of S1-S3; CDFW 2018).

Mixed conifer forest is the predominant vegetation community within the evaluation area (see Figure 2) and is a vegetation community that 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 the riparian communities cross the survey corridors in many areas, these 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 mullein (*Verbascum thapsus*; CAL-IPC ranked “limited”), bull thistle (*Cirsium vulgare*; CAL-IPC ranked “moderate”), Klammathweed (*Hypericum perforatum*; 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 Klammathweed are widespread within all logged and recently logged areas within the evaluation area. A total of three invasive plant species ranked “high” by CAL-IPC were observed within the Project evaluation area, including Himalayan blackberry (*Rubus armeniacus*), yellow starthistle (*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”), field sorrel (*Rumex acetosella*; “moderate”), orchardgrass (*Dactylis glomerata*; “limited”), and English plantain (*Plantago lanceolata*; “limited”; Figure 3).

Based on the data collected during 2018 surveys, a number of invasive plant species are present within proposed survey 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. 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) and are unlikely to contribute to any significant changes in invasive species distributions within the evaluation area. 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.

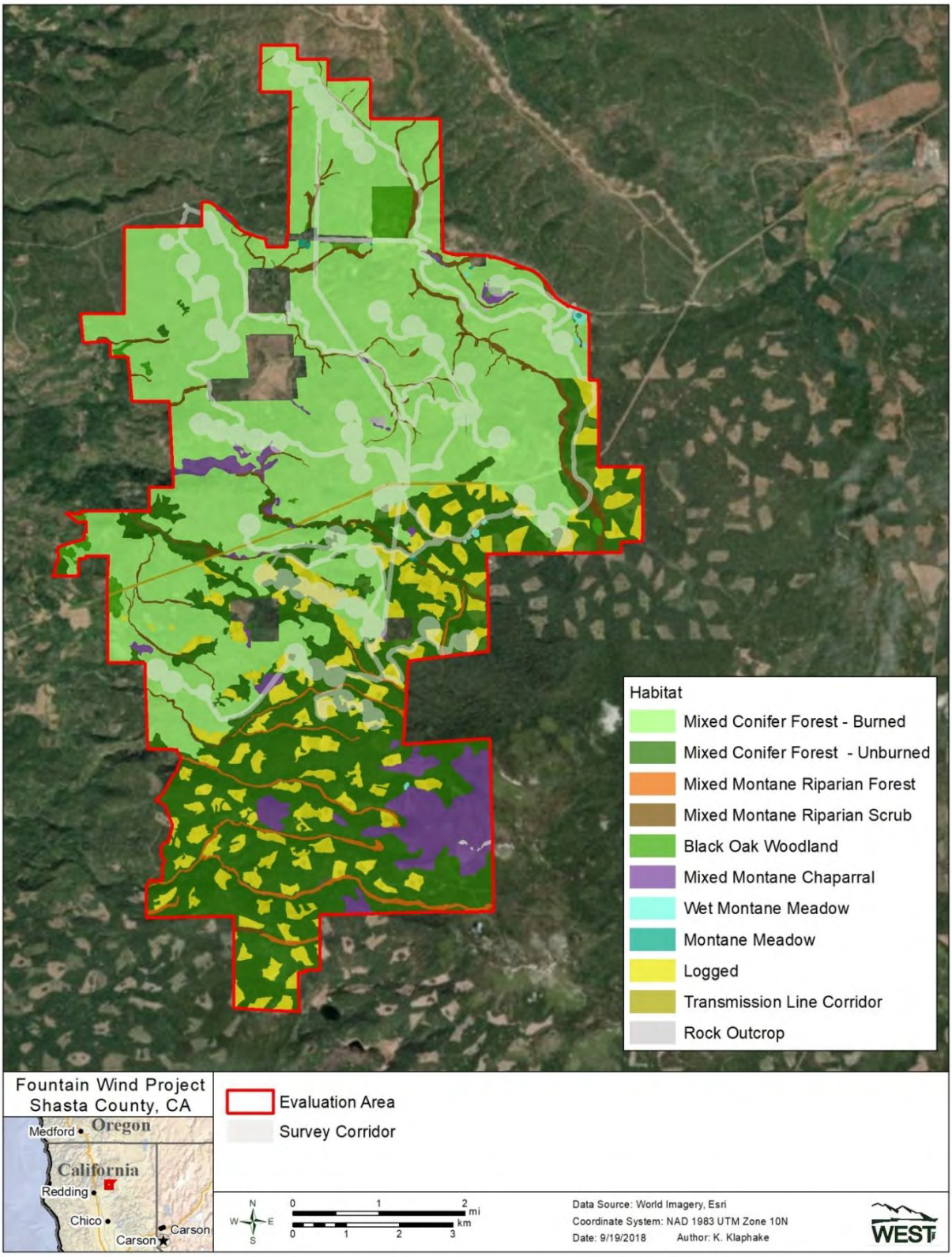

Figure 2. Vegetation communities identified and mapped during plant surveys conducted in 2018 at the Fountain Wind Project, Shasta County, California.

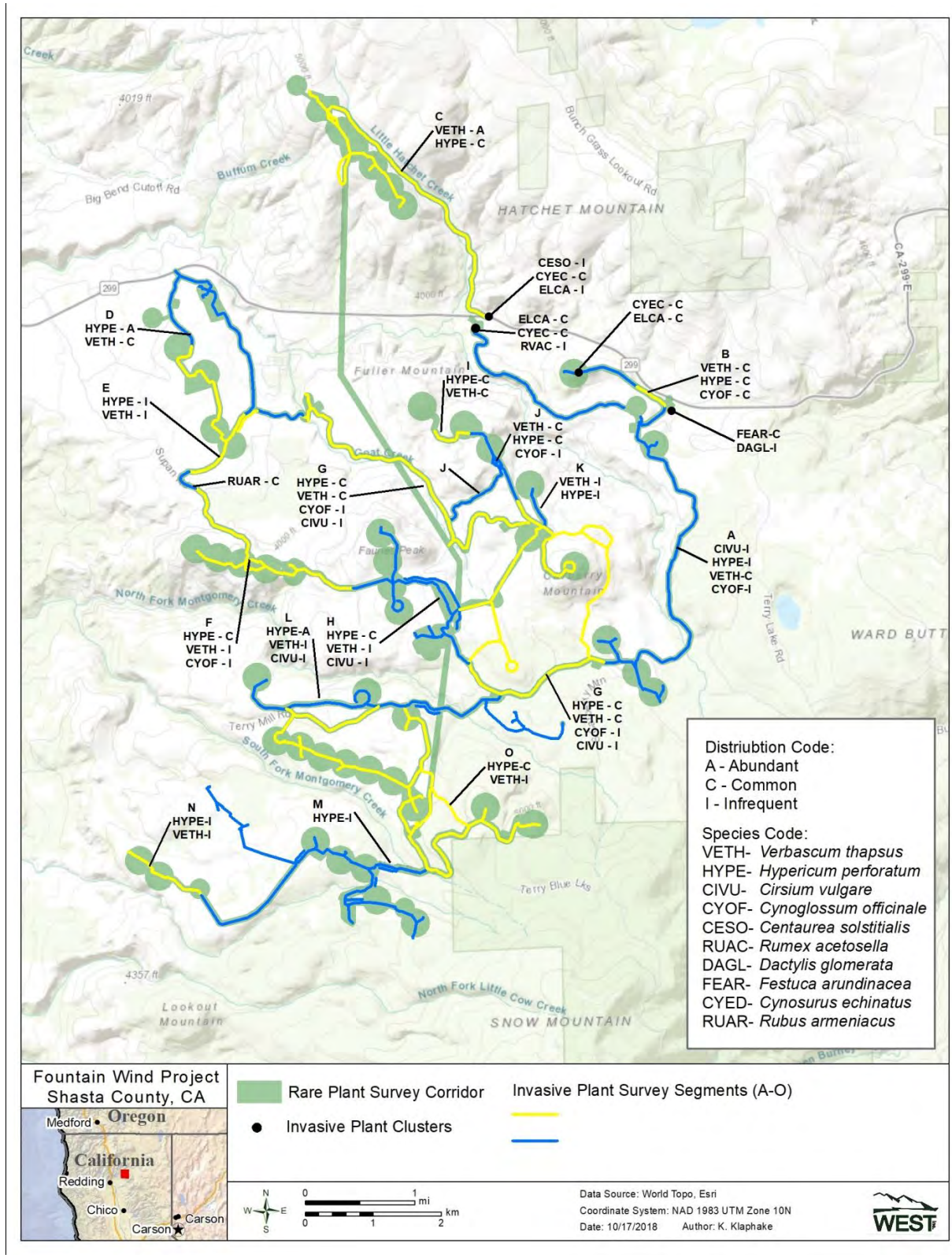

Figure 3. Non-native invasive plant species mapping within the Fountain Wind Project, Shasta County, CA. To differentiate adjacent survey segments (A-O) alternating blue and yellow lines with accompanying notation as to the species present (4-letter species codes) and relative distribution (1-letter 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, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State 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.** CNDDB documents species occurrence 10 miles west of site
vanilla-grass *Anthoxanthum nitens* ssp. *nitens*			2B.3	Apr-July	Meadows and seeps	**Possible.** Suitable wetland habitat limited within site
Klamath manzanita *Arctostaphylos klamathensis*			1B.2	May-Aug	Chaparral and upper montane and subalpine coniferous forests; rocky outcrops and slopes	**Possible.** Suitable habitat present within the site; 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 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	**Possible.** Suitable habitat present within the site
upswept moonwort *Botrychium ascendens*			2B.3	July-Aug	Lower montane coniferous forests; grassy fields and woodlands near springs and creeks	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
scalloped moonwort *Botrychium crenulatum*			2B.2	June-Sept	Lower montane coniferous forests; moist meadows near creeks; marshes	**Possible.** Suitable habitat may be present within the site; CNDDB documents species occurrence three miles(five km) south of site
mingan moonwort *Botrychium minganense*			2B.2	July-Sept	Creek banks in mixed conifer forests	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
western goblin *Botrychium montanum*			2B.1	July-Sept	Creek banks in old-growth coniferous forests	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State 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	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
rattlesnake fern *Botrypus virginianus*			2B.2	June	Streams; bogs and fens; lower montane coniferous forest; meadows and seeps	**Possible.** Suitable habitat may be present; CNDDB documents species occurrence about 3.5 miles west of site
watershield *Brasenia schreberi*			2B.3	Apr-Oct	Freshwater marshes and swamps	**Possible.** Potentially suitable wetland habitat limited within site; CNDDB documents presence seven miles east of site
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.** CNDDB documents species presence 3.5 miles (5.6 km) east of site
Callahan's mariposa lily *Calochortus syntrophus*			1B.1	May-June	Cismontane woodland; vernally mesic valley and foothill grassland	**Possible.** Suitable habitat may be present; CNDDB documents species presence 2.5 miles south of site
Castle Crags harebell *Campanula shetleri*			1B.3	June-Sept	In protected rock crevices in granite; lower montane coniferous forests	**Unlikely.** Granitic rock outcrops absent from site
bristly sedge *Carex comosa*			2B.1	May-Sept	Marshes and swamps (lake margins); valley and foothill grasslands	**Possible.** Suitable wetland habitat may be present within the ; CNDDB documents species occurrence six miles north of site
woolly-fruited sedge *Carex lasiocarpa*			2B.3	June-July	Bogs and fens; freshwater marshes and swamps, lake margins	**Possible.** Potentially suitable wetland habitat limited within site; CNDDB documents presence six miles north of site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State 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.** CNDDB documents species presence seven miles to east of site
northern clarkia *Clarkia borealis* ssp. *borealis*			1B.3	June-Sept	Cismontane woodland; lower montane coniferous forest	**Possible.** Suitable habitat may be present within site; CNDDB documents species occurrence approximately 3.5 miles west of site
silky cryptantha *Cryptantha crinita*			1B.2	April-May	Gravelly streambeds of cismontane woodlands, valley foothill grasslands, lower montane coniferous forests, and riparian forests	**Possible.** CNDDB documents occurrence 8.5 miles (13.7 km)south of site
English sundew *Drosera anglica*			2B.3	June-Sept	Bogs and fens; meadows	**Possible.** Suitable wetland habitat limited within site; CNDDB documents species presence seven miles to northeast of site
Oregon fireweed *Epilobium oreganum*			1B.2	June-Sept	Montane coniferous forests; in and near springs and bogs; sometimes on serpentine	**Possible;** but suitable wetland habitat limited within site
blushing wild buckwheat *Eriogonum ursinum var. erubescens*			1B.3	June-Sept	Rocky sites within lower montane coniferous forest and montane chaparral	**Possible.** Suitable rocky habitat may be present within site
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 site
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.** Suitable habitat not present within site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Boggs Lake hedge-hyssop *Gratiola heterosepala*		E	1B.2	April-Aug	Freshwater marshes and swamps, vernal pools; clay soils	**Possible.** Suitable wetland habitat may be present within site
Stebbins' harmonia *Harmonia stebbinsii*			1B.2	May-June	Chaparral and lower montane coniferous forests; in ultramafic soils, often along roads	**Unlikely.** Ultramafic soils not present within site
little hulsea *Hulsea nana*			2B.3	July-Aug	Alpine boulder and rock fields, subalpine coniferous forests; volcanic substrates	**Unlikely.** Suitable habitat not present; CNDDB documents species presence nine (15 km) miles to east of site.
Castle Crags ivesia *Ivesia longibracteata*			1B.3	June	Crevices in granitic cliffs; lower montane coniferous forests	**Unlikely**. Granitic cliff habitat not present within site
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*			1B.1	March-May	Vernally mesic meadows and seeps; valley and foothill grassland; vernal pools	**Possible.** Suitable habitat present on site; CNDDB documents species occurrence seven miles to northeast of site
Santa Lucia dwarf rush *Juncus luciensis*			1B.2	April-July	Vernal pools, ephemeral drainages, wet meadows habitats and streamsides	**Possible.** Suitable habitat present on site; CNDDB documents occurrence five miles (eight km) to east of site
Cantelow's lewisia *Lewisia cantelovii*			1B.2		Mesic, granite; lower montane coniferous forest; cismontane woodland	**Unlikely.** Suitable granite habitat not present within site
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*			1B.2	April-June	Mesic; cismontane woodland; meadows and seeps	**Possible.** Suitable wetland habitat limited within site
tufted loosestrife *Lysimachia thyrsiflora*			2B.3	May-Aug	Meadows and seeps; mesic; upper montane coniferous forest	**Possible.** Suitable habitat present within site; CNDDB documents occurrence seven miles east of site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence 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.** Suitable wetland habitat limited within site
Shasta snow-wreath *Neviusia cliftonii*			1B.2	May-June	Lower montane coniferous forests, riparian woodlands; shady, north-facing or sheltered canyons	**Possible.** Suitable habitat present within site; CNDDB documents occurrence six miles west of site
slender Orcutt grass *Orcuttia tenuis*	T	E	1B.1	May-Oct	Vernal pools	**Unlikely.** Suitable vernal pool habitat absent; CNDDB documents occurrence seven miles to northeast of site
Cascade grass-of-Parnassus *Parnassia cirrata* var. *intermedia*			2B.2	Aug-Sept	Rock serpentine soils; montane coniferous forests, meadows and seeps, bogs and fens; 780 – 1,980 m	**Possible.** Suitable wetland habitat limited within 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.** Potential suitable habitat present within site
Engelmann spruce *Picea engelmannii*			2B.2		Upper montane coniferous forest	**Possible.** Potential suitable habitat on site; nearest CNDDB occurrence approximately 16 miles northeast of site
Sierra blue grass *Poa sierrae*			1B.3	April-June	Lower montane coniferous forests; shady, moist, rock slopes; often in canyons	**Possible.** Potential suitable habitat present within site; CNDDB documents occurrence six miles to west of site
Modoc County knotweed *Polygonum polygaloides* ssp. *esotericum*			1B.1	May-Sept	Mesic; lower montane coniferous forest (vernal pools/wetlands)	**Possible.** Potential suitable habitat within site
marsh sckullcap *Scutellaria galericulata*			2B.2	June-Sept	Marshes and swamps of lower montane coniferous forests	**Possible.** Suitable wetland habitat limited within site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Canyon Creek stonecrop *Sedum obtusatum* ssp. *paradisum*			1B.3	May-June	In crevices of exposed granite; chaparral and coniferous forests; 1,060 – 1,860 m	**Unlikely.** No exposed granite habitat present within site
long-stiped campion *Silene occidentalis* ssp. *longistipitata*			1B.2	July-Aug	Lower and upper montane coniferous forest	**Possible.** Suitable habitat present within site; CNDDB documents occurrence within five miles to east and northeast of site
Klamath Mountain catchfly *Silene salmonacea*			1B.2	June-July	Openings, usually serpentine, within lower montane coniferous forest	**Possible.** Potential suitable habitat within site
hairy marsh hedge-nettle *Stachys pilosa*			2B.3	June-Aug	Mesic sites in Great Basin scrub	**Unlikely.** Suitable scrub habitat not present; CNDDB documents species presence four miles (six km) east of site
long-leaved starwort *Stellaria longifolia*			2B.2	May-July	Meadows and seeps, riparian woodlands	**Possible.** CNDDB documents species presence seven miles to northeast of site
Greene's tuctoria *Tuctoria greenei*	E	R	1B.1	May-July	Vernal pools	**Unlikely.** Suitable vernal pool habitat absent; CNDDB documents occurrence within approximately 20 miles northeast of site
Shasta huckleberry *Vaccinium shastense* ssp. *shastense*			1B.3	Dec-May (June-Sept uncommon)	Acidic, mesic site; often on streambanks; sometimes on rocky outcrops, seeps, roadsides, and disturbed areas within chaparral, lower montane and subalpine coniferous forest, and riparian forest	**Possible.** Suitable habitat may be present within site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
oval-leaved viburnum *Viburnum ellipticum*			2B.3	May-June	Chaparral, cismontane woodlands, and lower montane coniferous forests	**Possible.** Potential suitable habitat within site; nearest known occurrence approximately 16 miles southwest of site

Information from CNPS 2017, CNDDB 2017, USFWS 2017.

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

**E: State-listed endangered species; R: State-listed rare species (CNDDB 2017)

***CNPS: California Native Plant Society rare species categories (CNPS 2001):

CNPS 1B.1: Plants seriously threatened in California and at a minimum rare elsewhere.

CNPS 1B.2: Plants fairly threatened in California and at a minimum rare elsewhere.

CNPS 1B.3: Plants not vey threatened in California and at a minimum rare elsewhere.

CNPS 2B.1: Plants seriously threatened in California but more common elsewhere

CNPS 2B.2: Plants fairly threatened in California but more common elsewhere.

CNPS 2B.3: Plants which are not very threatened in California and are more common elsewhere.

Appendix B. Plant Species Encountered within the Fountain Wind Project

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
ALLIACEAE	***Allium parvum***	dwarf onion
	***Allium* sp.**	onion
ANACARDIACEAE	***Toxicodendron diversilobum***	poison oak
APIACEAE	***Angelica breweri***	Brewer's angelica
	Heracleum lanatum	cow-parsnip
	Ligusticum californicum	angelica
	***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 speciosa***	showy milkweed
ASTERACEAE	***Achillea millefolium***	common yarrow
	Agoseris grandiflora	giant mountain dandelion
	Arnica cordifolia	heart leaved arnica
	Centaurea solstitialis	yellow starthistle
	Cichorium intybus	chicory
	Cirsium vulgare	bull thistle
	Ericameria nauseosa	gray rabbitbrush
	***Erigeron* sp.**	fleabane
	Eriophyllum lanatum	woolly sunflower
	Grindelia hirsutula	hairy gumweed
	Helenium bigelovii	Bigelow's sneezeweed
	Helianthella californica	California helianthella
	Hieracium nudicaule	naked-stemmed hawkweed
	Hypochaeris sp.	cat's ear
	Lactuca serriola	prickly lettuce
	Madia glomerata	mountain tarweed
	***Senecio* sp.**	groundsel
	***Solidago* sp.**	goldenrod
	Symphyotrichum bracteolatum	Eaton's aster
	Taraxacum officinale	common dandelion
	Wyethia mollis	mountain mule ear
	Tragopogon dubius	yellow salsify
BETULACEAE	***Alnus incana* ssp *tenuifolia***	creek alder
	Corylus cornuta* var. *californica	beaked hazelnut
BORAGINACEAE	***Cryptantha* spp.**	cryptantha
	Cynoglossum officinale	hound's tongue
	Eriodictyon californicum	California yerba santa
	Eriodictyon lobbii	matted yerba santa
	Plagiobothrys stipitatus* var. *micranthus	stalked popcornflower
BRASSICACEAE	***Erysimum capitatum***	western wallflower
	Lepidium campestre	field peppergrass
	Nasturtium officinale	watercress
	Sisymbrium altissimum	tall tumblemustard
CAMPANULACEAE	***Asyneuma prenanthoides***	California harebell
CAPRIFOLIACEAE	***Lonicera involucrata***	twinberry
	Sambucus mexicana	blue elderberry
	Symphoricarpos mollis	creeping snowberry
CARYOPHYLLACEAE	*Dianthus deltoides*	maiden pink

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	***Silene* sp.**	silene
CHENOPODIACEAE	*Chenopodium album*	lamb's quarters
CONVOLVULACEAE	***Calystegia atriplicifolia* ssp. *buttensis***	Butte County morning glory
	Convolvulus sp.	morning glory
CORNACEAE	***Cornus nuttallii***	mountain dogwood
CUPRESSACEAE	***Calocedrus decurrens***	incense cedar
CYPERACEAE	***Carex comosa***	bristly sedge
	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***	bracken
EQUISETACEAE	***Equisetum arvense***	common horsetail
	Equisetum hymale	scouringrush horsetail
ERICACEAE	***Arctostaphylos patula***	greenleaf manzanita
	Chimaphila menziesii	pipsissewa
	Pterospora andromedea	pinedrops
	Pyrola picta	white veined shinleaf
	Rhododendron occidentale	western azalea
FABACEAE	***Acmispon americanus***	Spanish clover
	Hosackia crassifolia	broad leaved 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* sp.**	phaclia
HYPERICACEAE	*Hypericum perforatum*	Klamathweed
IRIDACEAE	***Iris missouriensis***	western blue flag
	Iris tenuissima	slender iris
	Sisyrinchium bellum	western blue eyed grass
JUNCACEAE	***Juncus balticus***	Baltic rush
	Juncus ensifolius	sword leaved rush
	Juncus tenuis	slender rush
	Juncus xiphiodes	iris leaved rush
LAMIACEAE	***Mentha arvensis***	American wild mint
	Prunella vulgaris	self heal
	Stachys adjugoides* var. *rigida	rigid hedge nettle
	Scutellaria nana	little skullcap
LILIACEAE	***Fritillaria recurva***	scarlet fritillary
	Lilium pardalinum	leopard lily

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	Lilium washingtonianum	Washington lily
	Triteleia hyacinthina	wild hyacinth
	Triteleia ixioides	pretty face
	Zigadenus venenosus	death camas
MALVACEAE	***Sidalcea malviflora***	checkermallow
	Sidalcea oregana* ssp. *spicata	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
ONOGRACEAE	***Epilobium angustifolium***	fireweed
	Epilobium brachycarpum	fringed willowherb
	Epilobium ciliatum	California fuchsia
OPHIOGLOSSACEAE	***Botrychium multifidum***	leather grape-fern
ORCHIDACEAE	***Corallorhiza maculata***	spotted coralroot
	Corallorhiza striata	hooded coralroot
	Listera convallarioides	broad lipped twayblade
	Platanthera dilitata* var. *leucostachys	Sierra bog orchid
	Spiranthes romanzoffiana	hooded ladies tresses
OROBANCHACEAE	***Boschniakia strobilacea***	California ground-cone
	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 ponderosa	ponderosa pine
	Pseudotsuga menziesii	Douglas fir
PLANTAGINACEAE	*Plantago lanceolata*	English plantain
	Veronica anagallis-aquatica	water speedwell
PHRYMACEAE	***Mimulus breviflorus***	short flowered monkey flower
	Mimulus guttatus	seep monkey flower
POACEAE	***Agrostis scabra***	rough bent grass
	Alopecurus aequalis	short awned foxtail
	Alopecurus geniculatus	marsh foxtail
	Bromus carinatus	mountain brome
	Bromus tectorum	cheatgrass
	Calamagrostis canadensis	bluejoint reedgrass
	Cynosurus echinatus	annual dogtail grass
	Dactylis glomerata	orchardgrass
	Deschampsia cespitosa	tufted hairgrass
	Deschampsia danthonioides	annual hair grass
	Elymus caput-medusae	medusahead
	Elymus elymoides	bottlebrush
	Elymus glaucus	blue wild-rye
	Elymus trachycaulus	slender wheatgrass
	Festuca arundinacea	tall fescue

Appendix B. 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's bluegrass
	Stipa nelsonii	mountain needle grass
POLEMONIACEAE	***Gilia aggregata***	scarlet gilia
	Navarretia divaricata	mountain navarretia
POLYGONACEAE	***Eriogonum lobbii***	buckwheat
	Eriogonum nudum	naked buckwheat
	***Eriogonum* sp.**	buckwheat
	Eriogonum umbellatum	sulfur buckwheat
	Eriogonum vimineum	wicker-stem wild 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 colombianum***	monkshood
	Aquilegia formosa	columbine
	Delphinium nudicaule	canyon larkspur
	Ranunculus aquatilis	whitewater crowfoot
	Thalictrum fendleri	meadow-rue
RHAMNACEAE	***Ceanothus cordulatus***	mountain whitethorn
	Ceanothus cuneatus	buck brush
	Ceanothus integerrimus	deer brush
	Ceanothus prostratus v. prostratus	Mahala mat
	Ceanothus velutinus	tobacco brush
	Frangula californica	California coffee berry
ROSACEAE	***Amelanchier alnifolia***	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	Douglas spiraea
RUBIACEAE	***Gallium aparine***	common bedstraw
RUSCACEAE	***Maianthemum racemosum***	feathery false lily of the valley
	Maianthemeum stellatum	starry false lily of the valley
SALICACEAE	***Populus tremuloides***	quaking aspen
	Salix scouleriana	Scouler willow

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	Salix lasiandra	Pacific willow
	Salix lasiolepis	arroyo willow
SAPINDACEAE	***Acer circinatum***	vine maple
	Acer glabrum	Rocky Mountain maple
	Acer macrophyllum	bigleaf maple
SAXIFRAGACEAE	***Heuchera sp.***	alumroot
SCROPHULARIACEAE	***Castilleja* sp.**	paintbrush
	Mimulus guttatus	seep monkey flower
	Mimulus torreyi	Torrey's monkeyflower
	***Pedicularis* sp.**	lousewort
	Penstemon neotericus	Plumas County beardtongue
	***Penstemon* sp.**	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 C. Natural Vegetation Communities Mapped within the Fountain Wind Project Evaluation Area.

Mixed Conifer Forest – Burned (MCF-B)

Areas mapped as this vegetation community type cover a majority of the Project and correspond to the Sierran mixed conifer forest natural community (Holland 1986). This community type intergrades with Sierran white fir forest, western ponderosa pine forest, and lower and upper montane chaparral communities in many places. The MCF-B community structure and composition within the Project have been significantly altered for many decades through active forest management (e.g., timber harvesting, tree planting). Additionally, these areas were burned during the 1992 Fountain Fire.

In the years following the Fountain Fire millions of ponderosa pine, Douglas fir, and white fir seedlings were planted at 10-foot spacing. Thus, the MCF-B vegetation community type was composed of even-aged stands of mixed conifer forest, generally between 23-25 years old, featuring a partially open canopy. Some thinning has occurred in this MCF-B mapped at the Project on the south side of Highway 299, and logging/thinning slash has been left in place. No thinning was observed in this vegetation community within the Project on the north side of the Highway 299. Overall, woody and herbaceous understory vegetation within the MCF-B was variable in composition and density, but typically included some combination of the following woody species: Mahala mat (*Ceanothus prostratus* var. *prostratus*), greenleaf manzanita (*Arctostaphylos patula*), whitethorn (*Ceanothus cordulatus*), Sierra gooseberry (*Ribes roezlii*), and creeping snowberry (*Symphoricarpos mollis*); and 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 dominant overstory species, incense cedar is present throughout the majority of areas mapped as MCF-B.

Mixed Conifer Forest – Unburned (MCF-U)

Mixed conifer forest-unburned was primarily mapped in the east-central and southern portions of the Project, where it formed a mosaic with recently logged areas. Areas mapped as MCF-U were not burned in the Fountain Fire. Within the Project this vegetation community featured a mostly-closed canopy of mature mixed conifer species, including sugar pine (*Pinus lambertiana*), incense cedar, red cedar (*Abies magnifica*), and Douglas fir, with some California black oak (*Quercus kelloggii*), ponderosa pine, and white fir. As a result of the closed canopy, understory vegetation was sparse and mostly composed of herbaceous species, including bracken, Pacific starflower, coralroot (*Corallorhiza* spp.), white veined shinleaf (*Pyrola picta*), and pipsissewa (*Chimaphila menziesii*). Scattered seedlings and saplings of the overstory tree species were also present in the understory. On rockier substrates MCF-U typically had a more open canopy and featured a denser understory composed of a variety of the woody and herbaceous species observed in MCF-B. The MCF-U communities mapped within the Project represent a managed (i.e., periodically disturbed) forest. As such, most stands were even-aged, but because of the different intervals at which harvest occurred a mosaic of different age-class even-aged stands exists within MCF-U communities at the Project.

Mixed Montane Riparian Forest (MMRF)

Mixed montane riparian forest was mapped in the southern half of the Project within MCF-U communities. It was documented primarily along perennial stream corridors but also occurred along intermittent streams in some areas. The overstory vegetation was typically composed of mature mixed conifer species which had not been harvested. Riparian tree species commonly observed in the mid-story canopy included bigleaf maple (*Acer macrophyllum*) and thinleaf alder (*Alnus incana* ssp. *tenuifolia*), with a shaded, woody understory of Rocky Mountain maple (*Acer glabrum*), vine maple (*Acer circinatum*), beaked hazelnut (*Corylus cornuta* var. *californica*), twinberry (*Lonicera involucrata*), and mountain dogwood (*Cornus nuttallii*). Understory vegetation was generally sparse and commonly included lily of the valley (*Maianthemum* spp.), common bedstraw (*Galium aparine*), and sweet cicely (*Osmorhiza berteroi*). Areas mapped as MMRF included patches of wetlands that were too small to map independently. These areas included fringe wetlands and small bands of wet montane meadow adjacent channels.

Mixed Montane Riparian Scrub (MMRS)

Mixed montane riparian scrub was primarily mapped throughout the northern half of the Project. Similar to the MMRF community type it occurred along perennial and intermittent drainages, but it can be distinguished (from MMRF) by the absence of a tree-dominated canopy and the presence of a shrub-dominated canopy that included several willow species (*Salix* spp.). The MMRS community type was typically composed of an inner band of vegetation immediately adjacent a drainage channel that was dominated by true riparian species, surrounded by a buffer of mixed montane chaparral species. MMRS was mapped along steep, broad, rocky drainages as well as gently sloping, narrow riparian corridors. Riparian species commonly observed along the immediate channel included arroyo willow (*Salix lasiolepis*), shining willow (*S. lucida*), scouler willow (*S. scouleriana*), thinleaf alder, and mountain dogwood. Shrub species adjacent this inner band of vegetation often included cascara (*Rhamnus purshiana*), blue elderberry (*Sambucus mexicana*), Rocky Mountain maple, and, to a lesser extent, Sierra gooseberry (*Ribes roezlii*) and bitter cherry (*Prunus emarginata*). Herbaceous understory vegetation was variable in composition and density, and typically included similar species as those observed in MMRF. Areas mapped as MMRS include patches of wetlands that were too small to map independently. These areas included fringe wetlands and small bands of wet montane meadow adjacent channels.

Mixed Montane Chaparral (MMC)

Mixed montane chaparral intergraded with almost all other community types within the Project. It was mapped in areas receiving full sunlight, on rocky ridgetops, on steep, rocky slopes, adjacent riparian areas, and in previously burned and logged areas. The majority of MMC observed within the Project corresponds to the *Arctostaphylos patula* Shrubland Alliance (Sawyer et al. 2008), which is characterized by the presence of dense, nearly impenetrable thickets dominated by greenleaf manzanita. Numerous other shrub species that sometimes occurred as co-dominants with greenleaf manzanita were observed within MMC within the Project. Such species included mountain whitethorn, deer brush (*Ceanothus integerrimus*), tobacco brush (*C. velutinus*), buck brush (*C. cuneatus*), bush chinquapin (*Chrysolepis sempervirens*), and golden chinquapin (*C. chrysophylla*). In several locations within the Project

greenleaf manzanita formed an association with scrub-form black oak. Because of the thicket-like growth form of mixed montane chaparral no understory vegetation was observed.

Black Oak Woodland (BOW)

Black oak woodland was mapped in several areas within the Project. It typically either occurred at lower elevations or in previously burned areas, where it formed a mosaic with mixed montane chaparral. The BOW community type corresponds to the *Quercus kelloggii* Forest Alliance, which is composed of a wide variety of vegetation associations (Sawyer et al. 2008). Within the Project the majority of BOW featured a mostly open canopy of black oak with scattered greenleaf manzanita in the shrub strata. The BOW stands typically supported a well-developed herbaceous understory composed primarily of grasses, including Lemmon's needlegrass (*Achnatherum lemmonii*) and blue wildrye (*Elymus glaucus*).

Wet Montane Meadow (WMM)

Wet montane meadow was mapped throughout the Project in areas adjacent to stream corridors, ponds, and springs or seeps with high water tables. The WMM community can be distinguished from the montane meadow community (MM) because it typically remains saturated throughout the growing season. The WMM community within the Project was composed of a diversity of hydrophytic species including grasses, sedges, rushes, and perennial forbs. Commonly observed herbaceous plant species in WMM at the Project included redtop (*Agrostis alba*), bluejoint reedgrass (*Calamagrostis canadensis*), marsh foxtail (*Alopecurus geniculatus*), beaked sedge (*Carex rostrata*), bristly sedge (*C. comosa*), Nebraska sedge (*C. nebrascensis*), brown sedge (*C. subfusca*), swordleaf 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 monkey flower (*Mimulus guttatus*). One of the WMM communities mapped within the south-central portion of the Project featured several shallow bogs within the larger meadow. Shrub species observed around the perimeter of WMM and sometimes interspersed but not dominant included rose spirea (*Spiraea douglasii*), willow, and thinleaf alder seedlings and saplings. Additional small patches of WMM habitat were observed along drainage channels within MMRF and MMRS communities. Because of the small size of these patches, they were included in the larger riparian community mapping (i.e., they were not mapped independently).

Montane Meadow (MM)

Within the Project, montane meadow was mapped in forest openings and adjacent wet montane meadow and riparian habitats. This community type supports mesic and upland herbaceous vegetation but is distinguished from WMM by featuring soils that are not saturated during the growing season. Common grasses and forbs occurring within MM mapped within the Project included Timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), redtop, tall fescue (*Festuca arundinacea*), orchardgrass (*Dactylis glomerata*), blue wildrye, yarrow (*Achillea millefolium*), and goldenrod (*Solidago* sp.).

Logged/Recently Logged (L)

Logging operations are ongoing within the Project, particularly south of Highway 299. Areas mapped as logged have been harvested at various intervals within the last several years (or more). Most logged sites featured planted seedlings and saplings of various age classes. Ponderosa pine and, to a lesser extent, white fir were the most common tree species planted within recently logged areas. The majority of logged areas included small patches of mature trees that were presumably left to provide wildlife habitat. Understory vegetation was typically sparse in logged areas and was mostly composed of ruderal, disturbance-tolerant herbaceous species.

Rock Outcrop (RO)

The majority of areas mapped as rock outcrop included rocky knolls and outcrops that either featured sparse vegetation or were completely devoid of vegetation. Where vegetation was observed, it was mostly restricted to shelves, cracks, and crevices in the rock, and to scree slopes below the outcrops. Herbaceous species observed within this vegetation community included lace lip fern (*Myriopteris gracillima*), sulfur buckwheat (*Eriogonum umbellatum*), buckwheat (*Eriogonum* sp.), Plumas County beardtongue (*Penstemon neotericus*), and onion (*Allium* sp.).

Transmission Line Corridor (TLC)

A transmission line corridor was mapped in the central portion of the Project. It was situated on a more or less east-west axis. Vegetation within this corridor is maintained to deter the establishment of woody plant species, primarily trees. Dominant plant species observed along the corridor included bracken and a mix of recently established woody chaparral species (*Arctostaphylos* spp., *Ceanothus* spp.). Small patches devoid of vegetation were also observed along this corridor.