A Preliminary Floristics Study of Glacial Heritage Preserve, Thurston County, Washington

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Abstract

A preliminary species list of 109 vascular plants was compiled for Glacial Heritage Preserve, a 459 hectare site in the South Puget Sound lowlands within Thurston County, Washington. Several different vegetation types occur here. Lowland prairie communities of varying qualities occupy much of the area. Riparian shrubland forms a wide strip along the Black River. A narrow band of oak woodland lies between the shrubland and the prairie. Along the southern border and in the northern periphery of the site lies coniferous forest. The exotic weed *Cytisus scoparius* as well as various conifer species are in the process of invading the prairie. Glacial Heritage Preserve is a small fragment of prairie that once extended over much of western Washington's lowlands; therefore, it is important to conserve this area. The Nature Conservancy is using several techniques to control *C. scoparius* populations and it is recommended to burn 100 acres/year in order to maintain the integrity of the prairie.

Introduction

This preliminary floristic study of Glacial Heritage Preserve was completed during the months of April and May 2003. Known formally as Thurston County-Black River-Mima Prairie-Glacial Heritage Preserve, this grassland-dominated site is protected for its unique biodiversity. The preserve is located near the town of Littlerock in Thurston County, southwest of Olympia, WA. Historical evidence suggests management of the site by native peoples, who burned the prairies at intervals of one to five years to encourage production of food plants and to keep the encroaching conifer forest at bay. Prairies once covered much of the area directly south of Puget Sound's southern terminus. Now, due to fire suppression within the last century, only a patchy dispersion of the original prairies exists.

Features of the landscape indicate significant disturbance within the last century. Remnants of at least one homestead within the bounds of the current preserve show the marks of agricultural activity. Inhabitance is presently limited to the county-owned residence that houses the site's caretakers. During World War II an emergency airplane landing strip was mown in the southern half of the preserve; today, a high quality native prairie community with few invasive species exists on the now defunct airstrip, suggesting that exotic plant species have invaded the site only within the past 60 years.

Location and Physical Geography

Glacial Heritage Preserve is located 18 miles southwest of the southern tip of Puget Sound (Olympia), in Thurston County, WA. The Black Hills rise from the Puget lowlands 15 miles directly west of the site; Mt. Rainier forms the skyline 50 miles to the east. The mouth of the Columbia River lies 40 miles to the southwest. The coast of the Pacific Ocean's lies 50 miles to the west. The Olympic Mountains sit 60 miles to the northwest. The closest town is Littlerock, WA.

Glacial Heritage Preserve encompasses 459 hectares along the Black River in central western Washington. Thurston County's Department of Parks and Recreation owns 419 ha of the preserve. The remaining 40 ha, located centrally within the site, belongs to Simpson Timber Company. Grasslands comprise 263 ha, riparian shrubland covers 95 ha, coniferous forest inhabits 81 ha, and oak woodland accounts for the remaining 20 ha.

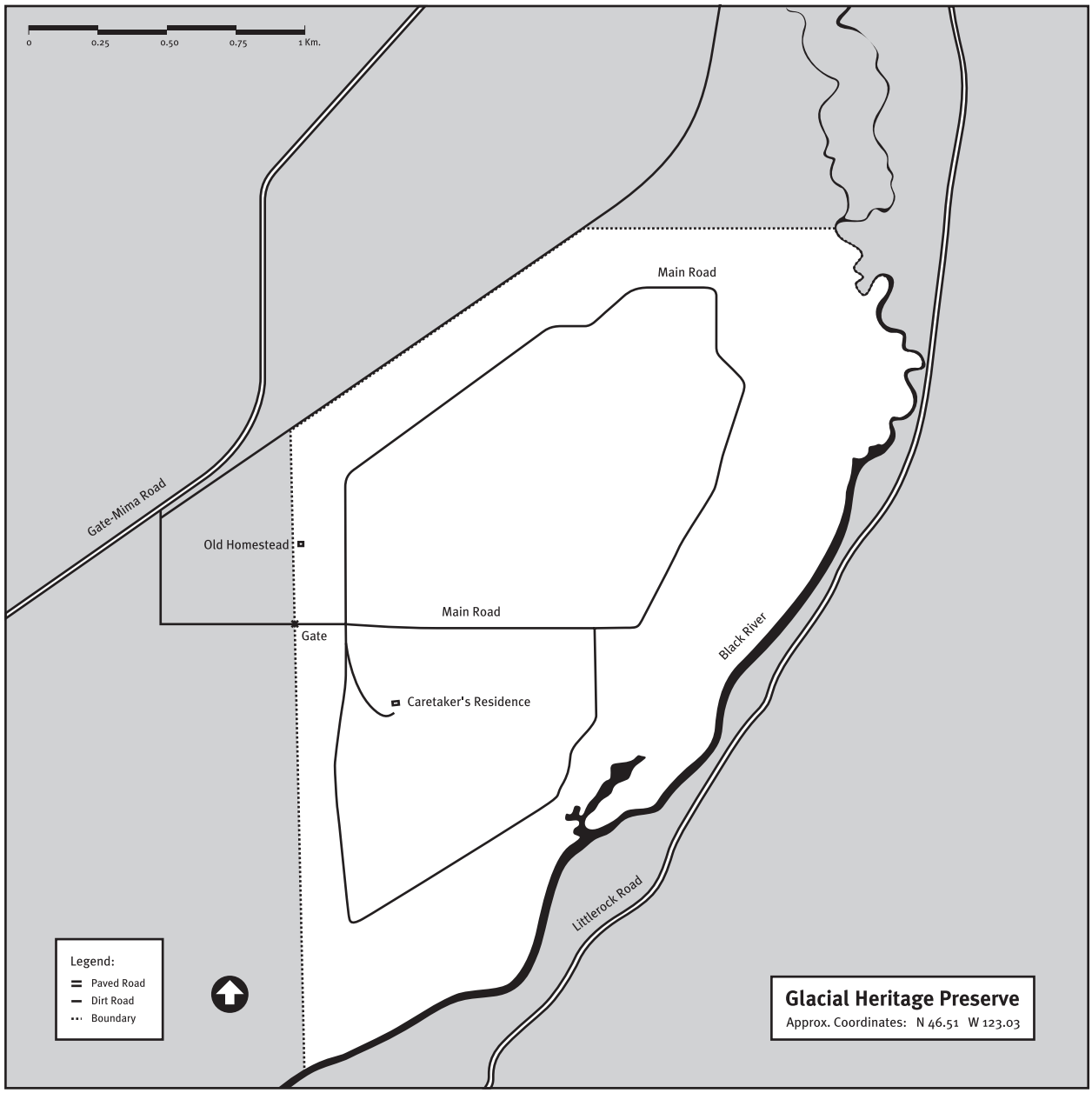
The dominant landform is a gently undulating, mounded grassland characteristic of the local prairies. Many hypotheses offer possible origins of this landscape, but none are well supported by evidence. Proposed explanations include huge Pleistocene pocket gophers that piled glacially-deposited gravel into mounds, earthquakes that may have shaken the stones into piles, and the actions performed by the last continental ice sheet as it retreated north. The Black River forms the eastern boundary of the preserve; agricultural land surrounds the site on all other sides.

Geology

A continuous swath of prairie once extended through western Washington, from the southern tip of what is now Tacoma, through Ft. Lewis Military Base, west to the town of Rochester, and south to Centralia, with patches in both Lewis and Clark Counties. These prairies are the result of relatively recent geologic action. A mere 13,000-15,000 years B.P. the last continental ice sheet, referred to as the Vashon ice sheet, covered the Puget Sound Basin. The southernmost tip of this glacier extended just south of Olympia, Washington. As the glacier began to melt and thus retreat (11,000 years B.P.), three events took place that helped shape the land that would later become the prairies. A thin layer of glacial debris was deposited on preexisting glacial till, major drainage channels were formed to carry off gravel and silt-filled waters, and ice-fed lakes were created along the retreating border of the continental ice flow.

Because of the hilly terrain the flow of glacial melt water did not escape to the south, but to the west, feeding

Fig. 1. Map of Glacial Heritage Preserve.

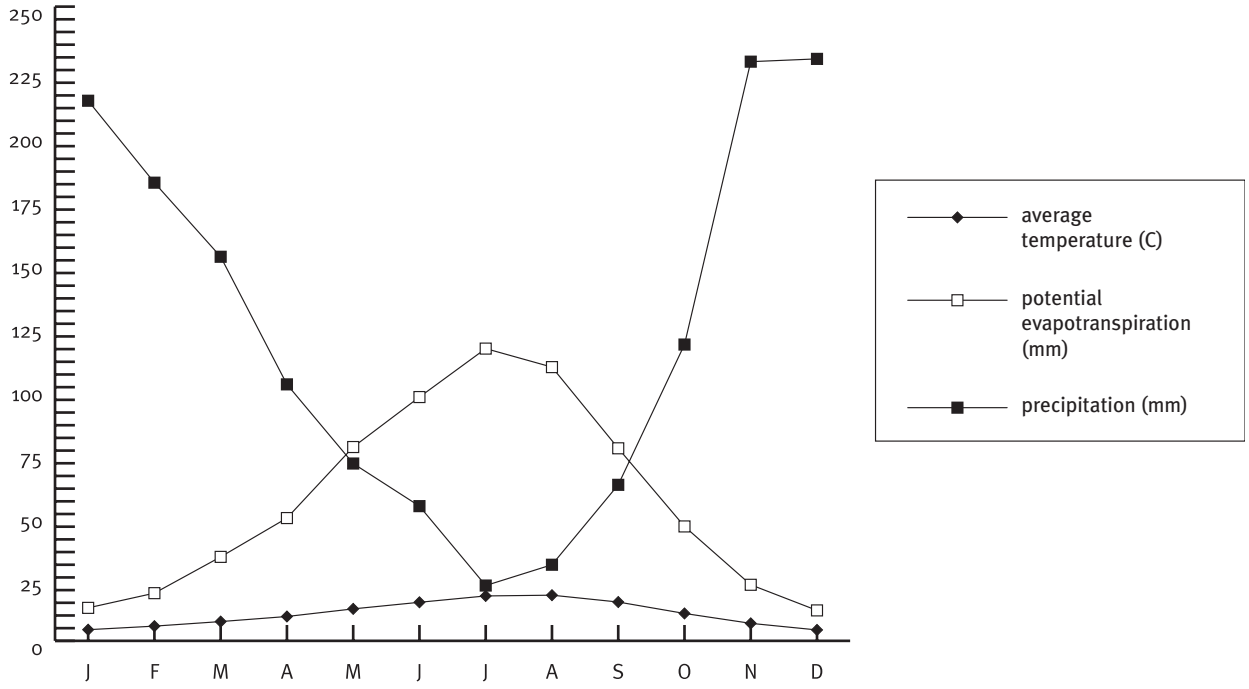


the Chehalis River. The Black River, which forms the easternmost boundary of the preserve and once extended to the western-most boundary of the site, was once the largest tributary of the Chehalis River. For 1,500 years the Vashon ice sheet fed the prairie-to-be with cobble, gravel, and silt. The Soil Survey of Thurston County characterizes the soils found at Glacial Heritage Preserve as Spanaway-Nisqually association. Commonly found on glacial outwash terraces, these soils are very deep, somewhat excessively drained, nearly level to rolling soils.

Climate

The local climate in Oakville, WA, 10 miles west of the site and the location of the nearest weather station, is characterized by a relatively short growing period during which the daylight hours are long, with a daily temperature rarely exceeding 30 C. Fitting the climate model of a Mediterranean environment, precipitation reaches its annual low during the high point of the growing season, when evapotranspiration rates are at their apex. (Fig. 2) Annual average precipitation is 1456.8 mm, while the average annual temperature is 10.7 C. The amplitude of temperature fluctuations at this inland location is lessened by its proximity to Puget Sound and the Pacific Ocean. Although the temperature often dips below 0 C during the winter, the reserve only occasionally receives significant snowfall.

Fig. 2 Thornthwaite diagram for Oakville, Washington



Based on climatic data collected between 1971 and 2000. Western Regional Climate Center, Desert Research Institute, Nevada. http://www.wrcc.dri.edu/

Vegetation

Grassland

Grassland forms the main body of the site. Many endemic taxa found here are not present anywhere else. Restoration efforts focus on this unique vegetation type, which has greatly diminished in the last 100 years. *Festuca idahoensis* var. *roemeri* dominates the more intact expanses of grassland, while introduced pasture grasses dominate the remainder. Common associates of all these are *Viola adunca*, *Hypochaeris radicata*, *Camassia quamash*, *Lomatium utriculatum*, *Ranunculus occidentalis*, and *Delphinium menziesii* var. *pyrimidale*. Threatened, endangered, or rare species that may be found in the grasslands include *Castilleja levisecta*, *Castilleja hispida*, and *Antenaria neglecta* var. *attenuata*.

The open grassland is highly susceptible to invasion by *Cytisus scoparius*, a dense thicket-forming, shrubby perennial weed. *C. scoparius* populations fix atmospheric nitrogen into the soil, providing a means for nonnative pasture grasses to outcompete native bunchgrasses and forbs, further contributing to the low biodiversity of such thickets. In addition, Douglas-fir forests have expanded in recent years due chiefly to fire suppression, overtaking areas formerly dominated by native grasses and perennial forbs. Extended land use by humans has contributed to degradation; the remains of many old structures are scattered throughout the site.

In an effort to support native dominance and push back the encroaching forest, current burning recommendations are set at 100 acres/year, over a 12 year repeating cycle.

Riparian Shrubland

This vegetation type occupies a strip of land between the oak woodland and the Black River. A vegetation gradient occurs as a function of the proximity to the river; peripheral dominant species include *Rubus spectabilis*, which grows in concert with *Abies grandis* in some locations. Closer to the river, hydrophilic species such as *Cornus stolonifera* and *Physocarpus* sp. dominate. The sparse overstory is dominated by *Fraxinus latifolia*.

Oak Woodland

A narrow strip of oak woodland intercedes between the grassland and the riparian shrubland, running north by northeast along the eastern edge of the site. *Quercus garryana* composes the overstory, with *Symphoricarpos albus* dominating the understory. Common associates are *Viola glabella* and *Rosa* spp. This strip of woodland is perhaps 50 meters wide at its thickest point, although some breaks in formation occur in areas formerly occupied by human structures. Restoration activities are under way to replant oaks in these locations.

Douglas-fir and Grand fir forests are in the process of overtaking the oak woodland in many areas throughout the site, offering an interesting glimpse of forest succession.

Conifer Forest

Currently, the presence of coniferous forest on the site is much greater than it was 60 years ago, presumably due to fire suppression, soil disturbance, and lack of logging. The forest encroaches primarily from the south, as well as around the northern periphery, but not typically from

Table 1: Numbers of families, genera, and species summarized for Glacial Heritage Preserve, Washington.

Taxonomic group	Number of families	Percent of total families	Number of genera	Percent of total genera	Number of species	Percent of total species
Ferns and fern allies	1	2.5	3	3.4	3	3.0
Gymnosperms	1	2.5	5	5.6	5	5.1
Angiosperms	38	95.0	83	93.3	91	91.9
Dicotyledons	34	85.0	70	78.7	78	78.8
Monocotyledons	4	10.0	13	14.6	13	13.1
Total	40	100%	89	100%	99	100%

the east, where the preserve is bordered by the Black River.

Two forest types occur: Douglas-fir forest and grand fir forest. Douglas-fir forest, dominated by *Pseudotsuga menziesii*, is the more common of the two. Common associates include *Tsuga heterophylla* and *Polystichum munitum*. There is a notable absence of *Thuja plicata*, indicating a young forest ecosystem, or perhaps soil incompatibilities. Grand fir (*Abies grandis*) forest is overtaking oak woodland in the northeast corner of the site. Several unique and/or sensitive species may be found in relative abundance here including *Trillium chloropetalum*, *Lilium columbianum*, and *Erythronium oreganum*. The understory is largely dominated by *Rubus spectabilis*.

Roadside/Other Disturbed Areas

Roadsides and areas adjacent to human habitations on the site are dominated almost entirely by weedy, introduced species. Depending on the area, these can be annual forbs or exotic annual grasses.

History of Biological Research

There has been little plant research conducted at the site. In 1993, a group of individuals composed a general flora of the glacial outwash prairies of Pierce and Thurston Counties. A group of Evergreen students conducted the first floristic evaluation of the preserve in the spring of 2000. Our surveys were conducted from April through June 2003. We focused our efforts on the grassland core of the site and the grand fir forest on the preserve's eastern border. Our study is the first to include the collection of voucher specimens from the site.

Past biological research at the site includes: an oak (*Q. garryana*) acorn study conducted by the United States Forest Service, and a University of Washington study of bumblebees. Dan Grisboll, the site's caretaker, monitors birds and maintains a program for the conservation of endangered butterflies. The Nature Conservancy monitors the *C. scoparius* population and general prairie quality, as well as the effects of controlled burning on the site.

Flora

We documented 99 specific taxa across 79 genera, as well as 10 other genera which we could not further identify, for a total of 109 documented plants, 66 percent of which (72 plants) are native. Rosaceae, Liliaceae, and Asteraceae in that order, are the most well-represented families in our study. Together they comprise 30 percent (33 plants) of the documented vegetation. This ranking is almost certain to change with the inclusion of future floristic research within the preserve. There is particularly high diversity among the families Asteraceae, Poaceae and Fabaceae; many taxa within these families are not included in this study.

Management History; Recommendations

Thurston County purchased Glacial Heritage Preserve in a complicated land swap in 1988. The Nature Conservancy (TNC) began to manage and restore the site in 1995. Dan Grisboll began volunteering with TNC in 1996 and shortly thereafter started leading volunteer workdays at the preserve. In 2001, Dan and Penny Kelly became the caretakers of the site. Currently, their management of the site focuses on the removal of exotic invasive species and the restoration of an ecologically healthy and functioning lowland prairie. The efforts of TNC and its volunteers have dramatically changed the character of the preserve. Dan's reports of his first 1996 visit to the site include descriptions of dense stands of *C. scoparius*, forming ten foot walls along the roads. Today a large amount of *C. scoparius* persists, but the population is a greatly reduced fragment of its former self.

C. scoparius (Scot's broom) is very difficult to remove. It is a hardy species whose seeds persist in the soil for up to 30 years. This plant is also adapted to benefit from fire, which scarifies its seeds' coats and potentiates their germination. Consequently, Scot's broom invasion necessitates a multifaceted approach to its removal. To control this and other noxious weeds, the prairie is tilled, burned, mowed, and subjected to infrequent herbicide treatments. The herbicide treatments are executed with a device that applies herbicide only to plants growing at a certain height. Since Scot's broom is taller than its native competitors, this method is effective and does not damage the native ecosystem. Dan does not envision the site without Scot's broom but over the next 15 years would like to see its presence reduced to the point where it can be managed by hand pulling.

Other conservation and restoration practices include native plant propagation, seed collection, bird and bat habitat enhancement, and controlled burning. Fire on the prairie is a sensitive issue because of air quality restrictions and fire control regulations. To complicate matters further, the preserve is surrounded by highly developed agriculture, and it is expected that the area around the preserve will only become more developed in the coming years. However, we nonetheless suggest continued controlled burning as a way to maintain the open prairie and oak woodlands, and to restrict the encroachment of coniferous trees.

Dan's *modus operandi* concerning the preserve is this: the goal of every effort to manage the prairie should be the maintenance of biological diversity. Thus, conifers should only be removed if their abstraction is good for the overall health of the site, not because their wood fetches a handy price on the lumber market. Likewise, although the preserve provides an opportunity for recreation and could serve as an excellent educational tool, these sorts of endeavors should only be undertaken if their repercussions do not threaten the biological diversity of the site. It is important to keep the health of the prairie ecosystem foremost in one's mind when regarding potential alterations to or uses of the site.

Future Research Needs

Glacial Heritage is ripe with opportunities for research. This preliminary compilation of floristic data is only the second such study to come to fruition at the preserve in the fifteen years since the county purchased the land. Owing to its unique flora and geology, a diverse population of pollinators and other fauna may be expected at the site.

A comprehensive floristic study of the site is needed, and a plethora of opportunities for future research exist. Potential topics include prescribed burns, flora and fauna investigations, and much more.

In addition to research opportunities, regular volunteer workdays are scheduled for Tuesdays and the second Saturday of every month. Efforts are concentrated primarily on the removal of Scot's broom.

Acknowledgments

Foremost, we wish to thank Dan Grisboll & Penny Kelly for graciously opening their home to us. Their knowledge, assistance, and hospitality were invaluable to the success of our project. Thanks also to: Frederica Bowcutt for providing the tools and the guidance we needed to get this project started; Thurston County for permission to collect specimens on the preserve; David Giblin of the University of Washington Herbarium for allowing us access to the collection, and for granting us the benefit of his expertise.

Annotated List of Vascular Plants

Voucher specimens are housed in the Evergreen State College herbarium. Voucher specimens exist for 43 percent of the taxa represented in this study (47 species). Nomenclature, for the most part, follows Hitchcock & Cronquist (1973).

Key to reading this list:

[Family Name] [A].[B].[C].[D]

A = number of specific (includes subspecific) taxa
B = total number of genera
C = number of genera not identified to species
D = number of nonnative, specific taxa

* denotes naturalized exotic taxa
† denotes non-proliferating relicts from previous human habitations

Pterophyta

Polypodiaceae 3.3.0.0

Polypodium glycyrrhiza D.D. Eaton. Licorice fern. Occasional. Coniferous forest and oak woodland. Generally found growing epiphytically on *Acer macrophyllum*.

Polystichum munitum (Kaulf.) Presl. Sword fern. Common understory plant in conifer forests.

Pteridium aquilinum (L.) Kuhn. Bracken fern. Abundant in much of the grassland and oak woodland. Less commonly found in sunny spots in conifer forest.

Coniferophyta

Pinaceae 5.5.1.0

Abies grandis (Dougl.) Forbes. Grand fir. Dominant tree in coniferous forest in northeastern corner of site. Less commonly found in Douglas-fir forest.

†*Abies procera* Rehder. Noble fir. Rare. A few individuals planted near site of former homestead north of entry gate along western fence. Constance, Doyle, Hinchliff, Sheedy 67

†*Picea* sp. A. Dietr. Spruce. Rare. Apparently only present near site of old homestead, see entry for Abies procera.

Pinus contorta Dougl. var. *latifolia* Engelm. Beach pine. Occasional. Grassland, periphery of coniferous forest. Constance, Doyle, Hinchliff, Sheedy 13

Pseudotsuga menziesii (Mirbel) Franco. Douglas-fir. Dominant tree in majority of coniferous forest.

Tsuga heterophylla (Raf.) Sarg. Western hemlock. Occasional. Coniferous forest.

Anthophyta

Aceraceae 2.1.0.0

Acer macrophyllum Pursh. Big-leaf maple. Occasional. Coniferous forest and riparian shrubland.

Acer circinatum Pursh. Vine maple. Common in coniferous forest; occasional in riparian shrubland. Constance, Doyle, Hinchliff, Sheedy 37

Apiaceae 4.3.0.1

**Anthriscus scandicina* (Weber) Mansfeld. Chervil. Occasional in disturbed areas, oak woodland. European native. (*A. caucalis*). Constance, Doyle, Hinchliff, Sheedy 61; 63

Lomatium triternatum ssp. *triternatum* var. *triternatum* (Pursh) Coult. & Rose. Nine-leaf lomatium. Occasional in grassland. Constance, Doyle, Hinchliff, Sheedy 58

Lomatium utriculatum (Nutt.) Coult. & Rose. Fine-leaved desert parsley. Abundant in grassland. Constance, Doyle, Hinchliff, Sheedy 3

Osmorhiza chilensis H. & A. Sweet-cicely. Occasional. Disturbed areas and grassland. Constance, Doyle, Hinchliff, Sheedy 57

Asteraceae 7.8.1.4

Achillea millefolium L. Yarrow. Common in grassland, occasional in oak woodland.

Antenaria neglecta Greene var. *attenuata* (Fern.) Cronq. Pussytoes. Rare. One known population centrally located within site a few meters to the north of main road.

Balsamorhiza deltoidea Nutt. Deltoid balsamroot. Locally abundant in northernmost grassland. Rare elsewhere. Sensitive species.

**Cirsium* spp. Thistle. Occasional. Prefers disturbed areas, common near roadsides, human habitations. Large population present at site of old homestead. See entry for *Abies procera*. European native.

**Hypochaeris radicata* L. Hairy cat's ear. Abundant in grassland. Weedy European native.

**Leucanthemum vulgare* Lam. Oxe-eye daisy. Abundant in grassland. European native.

Solidago spathulata DC. var. *neomexicana* (Gray) Cronq. Abundant. Grassland.

**Taraxacum officinale* Weber. Dandelion. Occasional. Prefers disturbed areas. European native. Constance, Doyle, Hinchliff, Sheedy 4

Betulaceae 2.2.0.0

Alnus rubra Bong. Red alder. Occasional. Riparian shrubland.

Corylus cornuta Marsh. Beaked hazelnut. Rare. Coniferous forest.

Berberidaceae 3.3.0.0

Achlys triphylla (Smith) DC. Vanillaleaf. Occasional. Coniferous forest, particularly grand fir forest.

Mahonia aquifolium (Pursh) Nutt. Holly-leaved barberry. Rare. One known population, suffering on the periphery of oak woodland, centrally within site.

Vancouveria hexandra (Hook.) More. & Dcne. White inside-out flower. Locally dominant forb in grand fir forest.

Boraginaceae 1.1.0.1

**Myosotis discolor* Pers. Yellow and blue forget-me-not. Locally abundant near human habitation. Weedy; prefers roadsides and other disturbed areas. Introduced species. Constance, Doyle, Hinchliff, Sheedy 53

Brassicaceae 2.2.0.1

Cardamine oligosperma var. *oligosperma* Torrey & A. Gray. Bittercress. Abundant throughout vegetative types. Highly plastic, well-adapted weed. Constance, Doyle, Hinchliff, Sheedy 16; 19; 22; 32

**Teesdalia nudicaulis* (L.) R. Br. Shepherd's cress. Common in grassland. Primary colonizer of burned areas. Highly plastic, European native. Constance, Doyle, Hinchliff, Sheedy 10; 17; 24

Caprifoliaceae 2.3.1.0

Lonicera sp. L. Honeysuckle. Occasional in coniferous forest, less common in oak woodland.

Sambucus racemosa L. Red elderberry. Occasional in coniferous forest, a few isolated, suffering individuals present near sites of former human structures in grassland. Constance, Doyle, Hinchliff, Sheedy 66

Symphoricarpos albus (L.) Blake. Snowberry. Dominant understory shrub in oak woodland. Occasional in coniferous forests and riparian shrubland.

Caryophyllaceae 2.2.0.2

**Cerastium glomeratum* Thuill. Chickweed. Common in disturbed areas. European native. Constance, Doyle, Hinchliff, Sheedy 50

**Stellaria media* (L.) Cyrill. Starwort. Occasional in oak woodlands, periphery of coniferous forest. More common near recent human habitation. European native. Constance, Doyle, Hinchliff, Sheedy 60

Clusiaceae 1.1.0.1

**Hypericum perforatum* L. Common St. John's wort. Common in grassland, oak woodland. European native.

Cornaceae 1.1.0.0

Cornus stolonifera Michx. Red-osier dogwood. Common in riparian shrubland.

Cyperaceae 0.1.1.0

Carex spp. L. Sedge. At least one sp. common in grassland. Other spp. occasional in riparian shrubland, grand fir forest.

Ericaceae 2.2.0.0

Arctostaphylos uva-ursi (L.) Spreng. Kinnikinnick. Rare. Grassland. One known population a few meters to the north of main road, several hundred meters east of entry gate. Constance, Doyle, Hinchliff, Sheedy 25

Vaccinium parvifolium Sm. Red huckleberry. Rare. Oak woodland. One plant found growing on top of snag.

Fabaceae 6.4.1.4

**Cytisus scoparius* L. Link. Scot's broom. Highly invasive European endemic, dominant in much of grassland. Not present in coniferous forest, oak woodland, or riparian shrubland. Constance, Doyle, Hinchliff, Sheedy 47

Lupinus lepidus var. *lepidus* Dougl. Prairie lupine. Occasional. Grassland, roadside.

Lupinus rivularis Dougl. Stream lupine. Occasional. Grassland.

**Trifolium subterraneum* L. Subterranean clover. Common in disturbed areas; less so in grassland. European native. Constance, Doyle, Hinchliff, Sheedy 55

**Trifolium* spp. L. Clover. Abundant. Grassland, oak woodland. Very present near areas of human habitation. Some introduced spp.

Vicia americana Muhl. var. *truncata* (Nutt.) Brew. American vetch. Occasional. Oak woodland.

**Vicia sativa* L. var. *angustifolia* Wahlb. Common vetch. Abundant in grasslands located adjacent disturbed areas. Occasional elsewhere and in oak woodland. European native. Constance, Doyle, Hinchliff, Sheedy 56

Fagaceae 1.1.0.0

Quercus garryana Dougl. Oregon white oak. Dominant tree in oak woodland. Isolated populations occur within grassland. Occasionally found suffering within coniferous forest in areas which were once oak woodland.

Geraniaceae 1.1.0.1

**Geranium molle* L. Dovefoot geranium. Abundant in disturbed areas. European native. Constance, Doyle, Hinchliff, Sheedy 51

Grossulariaceae 0.1.1.0

Ribes sp. L. Currant; Gooseberry. Rare. Oak woodland and riparian shrubland.

Iridaceae 1.1.0.0

Sisyrinchium angustifolium P. Mill. Blue-eyed grass. Rare. Grassland. One diffuse population along subsidiary road running east-west, central within site.

Liliaceae 11.10.0.1

Camassia quamash var. *quamash* . Common camas. Abundant in grassland. Less so around periphery of oak woodland, coniferous forest. Constance, Doyle, Hinchliff, Sheedy 2; 23; 26

Disporum hookeri (Torr.) Nichols. Fairy bells. Occasional. Grand fir forest.

Erythronium oreganum Applegate. Giant fawn-lily. Locally abundant within grand fir forest, some sizable populations present in oak woodland. Constance, Doyle, Hinchliff, Sheedy 31

Fritillaria lanceolata Pursh. Chocolate lily; Mission bells. Occasional in grassland. More common on the tops of mounds. Constance, Doyle, Hinchliff, Sheedy 12

†*Hyacinthus orientalis* L. Garden hyacinth. Rare. Only known population at site of former homestead. See entry for *Abies procera*.

Lilium columbianum Hanson. Columbia lily; tiger lily. Occasional. Grand fir forest, oak woodland.

Maianthemum dilatatum (Wood) Nels. & Macbr. False lily-of-the-valley. Abundant throughout grand fir forest, locally dominant in some areas. Constance, Doyle, Hinchliff, Sheedy 30

Smilacina stellata (L.) Desf. Star-flowered false Solomon's seal. Occasional. Grand fir forest. Constance, Doyle, Hinchliff, Sheedy 39

Trillium chloropetalum var. *chloropetalum* (Torr.) Howell. Sessile trillium. Occasional to common. Grand fir forest. Sensitive species.

Trillium ovatum Pursh. Western trillium. Occasional to common. Grand fir forest, Douglas-fir forest. Constance, Doyle, Hinchliff, Sheedy 34; 40

Zigadenus venenosus var. *venenosus* S. Wats. Meadow death-camas. Common. Grassland.

Oleaceae 1.1.0.0

Fraxinus latifolia Benth. Oregon ash. Dominant overstory tree along edge of Black River. Scattered individuals occur within oak woodland.

Onagraceae 1.1.0.0

Epilobium angustifolium L. Fireweed; Willow herb. Rare. Grassland. Prefers disturbed areas.

Poaceae 1.1.0.0

Festuca idahoensis Elmer. var. *roemeri* (Pavlick) Alexeev. Blue bunchgrass; Idaho fescue. Abundant. Grassland.

Plantaginaceae 2.1.0.2

**Plantago lanceolata* L. Lance-leaved plantain; English plantain. Occasional. Grasslands and disturbed areas. European native. Constance, Doyle, Hinchliff, Sheedy 11

**Plantago major* var. *major* L. Englishman's footstep. Rare in grasslands. Common in disturbed areas. European var.

Polygonaceae 1.1.0.1

**Rumex acetosella* L. Field sorrel; Sour weed. Common. Grasslands and disturbed areas. European native. Constance, Doyle, Hinchliff, Sheedy 54

Portulacaceae 2.1.0.0

Montia perfoliata (Donn) Howell. Miner's lettuce. Common in disturbed areas, oak woodlands, coniferous forests. (*Claytonia p.*) Constance, Doyle, Hinchliff, Sheedy 64

Montia siberica (L.) Howell. Siberian miner's lettuce. Common in disturbed areas. Occasional in oak woodlands, coniferous forest. (*Claytonia s.*) Constance, Doyle, Hinchliff, Sheedy 36

Primulaceae 1.1.0.0

Dodecatheon hendersonii Gray. Broad-leaved shooting star. Locally abundant in more intact grasslands along northern edge of site, periphery of oak woodland. Constance, Doyle, Hinchliff, Sheedy 20

Ranunculaceae 7.5.0.1

Actaea rubra (Ait.) Willd. Actaea. Occasional. Grand fir forest. Constance, Doyle, Hinchliff, Sheedy 45

Aquilegia formosa Fisch. Western columbine. Rare. Oak woodland.

Delphinium menziesii DC. var. *pyrimidale* (Ewan) Hitchc. Menzies' larkspur. Locally abundant throughout grasslands. Populations tend to be dense. Prefers tops of mounds.

Ranunculus occidentalis Nutt. Western buttercup. Abundant. Grassland, oak woodland. Constance, Doyle, Hinchliff, Sheedy 1

**Ranunculus repens* L. Creeping buttercup. Occasional. Oak woodland, grand fir forest. European native.

Ranunculus uncinatus D. Don. Little buttercup. Occasional. Oak woodland, grand fir forest. Constance, Doyle, Hinchliff, Sheedy 38

Thalictrum polycarpum (Torr.) Wats. Meadowrue. Locally abundant within grand fir forest. Constance, Doyle, Hinchliff, Sheedy 35

Rhamnaceae 1.1.0.0

Rhamnus purshiana DC. Cascara. Common. Grasslands, oak woodland, coniferous forest.

Rosaceae 14.13.4.5

Amelanchier alnifolia Nutt. Serviceberry. Occasional. Coniferous forest, oak woodland. Isolated individuals present within grasslands. Constance, Doyle, Hinchliff, Sheedy 48

Crataegus douglasii Lindl. Black hawthorn. Rare. Isolated individuals present in grassland. Constance, Doyle, Hinchliff, Sheedy 65

**Crataegus monogyna* Jacq. Oneseed hawthorn. Rare. One known plant located less than 100 meters north of entry gate, adjacent north/south running road which bisects main road. Escaped European cultivated species. Constance, Doyle, Hinchliff, Sheedy 62

Fragaria virginiana Duchesne. var. *platypetala* (Rydb.) Hall. Strawberry. Common. Grassland. Constance, Doyle, Hinchliff, Sheedy 14

Geum macrophyllum Willd. Largeleaf avens. Occasional. Grand fir forest.

Holodiscus discolor (Pursh) Maxim. Oceanspray. Occasional. Riparian shrubland.

†**Malus sylvestris* P. Mill. European apple. Occasional. A few relatively old trees present near areas of former human habitation, other younger ones scattered throughout grassland, riparian shrubland. Cultivated European fruit tree. Constance, Doyle, Hinchliff, Sheedy 43; 69

Oemleria cerasiformis (H. & A.) Landon. Osoberry. Common. Oak woodland, coniferous forest.

Physocarpus sp. Maxim. Ninebark. Abundant. Riparian shrubland, oak woodland.

Potentilla gracilis Dougl. Cinquefoil. Common. Grassland.

Prunus sp. L. Cherry. Occasional. Coniferous forest.

Rosa spp. L. Rose. Occasional. Grasslands, oak woodlands, coniferous forest.

**Rubus discolor* Weihe & Nees. Himalayan blackberry. Occasional. Primarily occurring in disturbed areas within grassland.

**Rubus laciniatus* Willd. Cutleaf blackberry. Rare. Generally occurs in disturbed areas. European native.

Rubus ursinus Cham. & Schlect. Trailing blackberry. Occasional. Coniferous forest.

Rubus spectabilis Pursh. Salmonberry. Dominant understory shrub in much of grand fir forest; occasional within riparian shrubland. Constance, Doyle, Hinchliff, Sheedy 41

Rubus spp. L. Occasional. Unidentified species present in northern grasslands.

**Sorbus aucuparia* L. Rowan tree; Mountain ash. Rare. Grand fir forest. European native.

Rubiaceae 2.2.0.1

Galium aparine L. Cleavers. Common. Oak woodland, disturbed areas. Constance, Doyle, Hinchliff, Sheedy 59

**Sherardia arvensis* L. Blue field-madder. Occasional. Grassland. Mediterranean native.

Salicaceae 0.1.1.0

Salix spp. L. Willow. Common in riparian shrubland.

Saxifragaceae 2.2.0.0

Saxifraga integrifolia var. *integrifolia* Hook. Swamp saxifrage. Rare. Present in grasslands along periphery of oak woodland in northeast corner of site. Constance, Doyle, Hinchliff, Sheedy 28

Tellima grandiflora (Pursh) Dougl. Fringecup. Common. Grand fir forest, riparian shrubland. Constance, Doyle, Hinchliff, Sheedy 42

Scrophulariaceae 4.3.0.2

Castilleja levisecta Greenm. Golden paintbrush. Rare. One known population, currently flagged, north of northernmost section of road. Threatened species.

Castilleja hispida Benth. Harsh paintbrush. Rare. One known population located adjacent to oak woodland. Flagged. Sensitive species.

**Digitalis purpurea* L. Foxglove. Rare. Disturbed areas. European native.

**Veronica arvensis* L. Wall speedwell. Abundant in disturbed areas. European native. Constance, Doyle, Hinchliff, Sheedy 49; 52

Violaceae 3.1.0.0

Viola adunca Sm. Early blue violet. Abundant in grasslands. Populations tend to be dense. Prefers growing on mounds. Constance, Doyle, Hinchliff, Sheedy 6;15; 27

Viola nuttallii Pursh. var. *praemorsa* (Dougl.) Wats. Upland yellow violet. Rare. Seemingly present only in northernmost expanse of grassland. Constance, Doyle, Hinchliff, Sheedy 21

Viola glabella Nutt. Stream violet. Common. Grand fir forest, oak woodland. Constance, Doyle, Hinchliff, Sheedy 29; 33

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