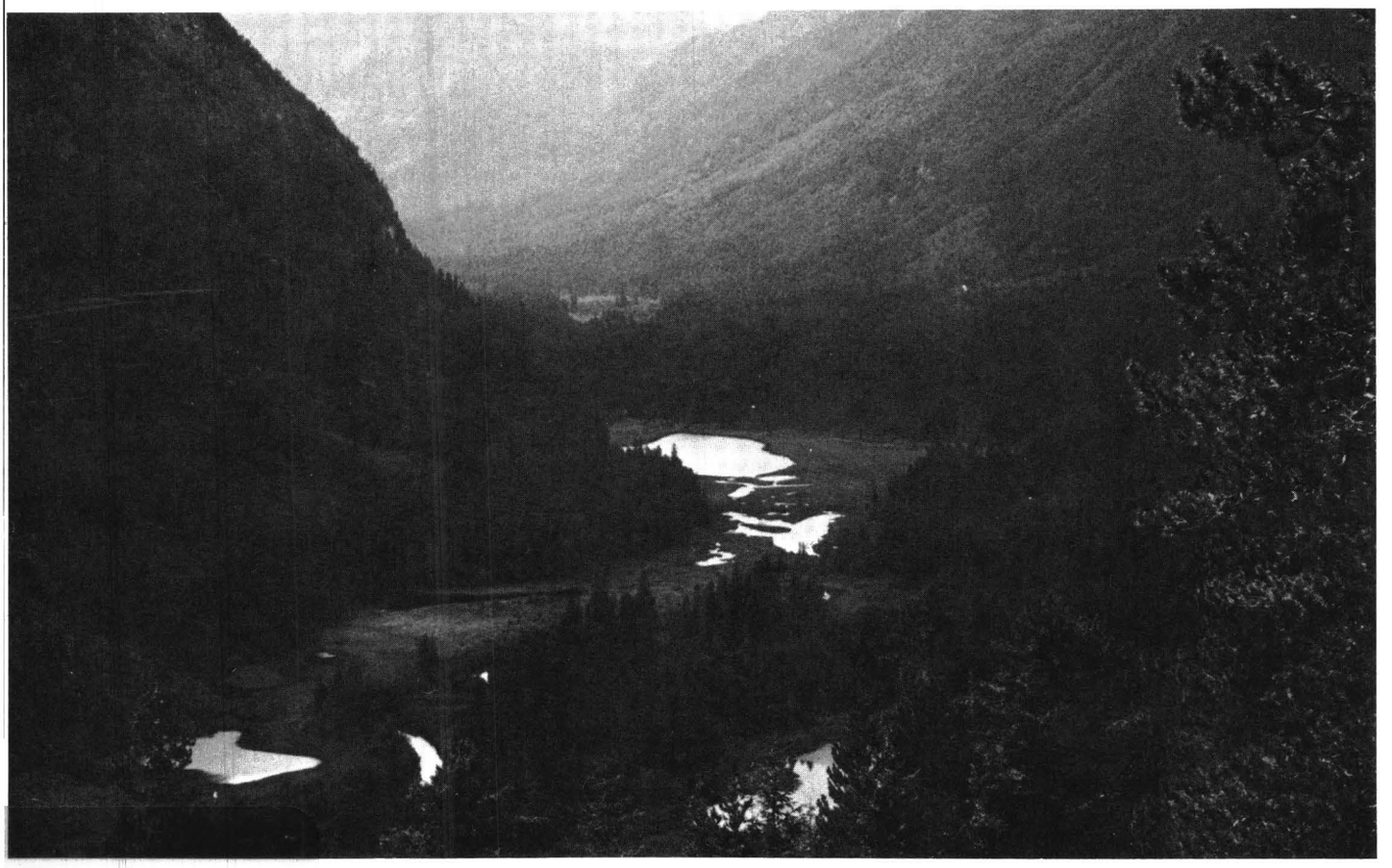
PLANT LIFE OF WASHINGTON STATE:

BIG BEAVER VALLEY AND THE KETTLE RANGE



DOUGLASIA OCCASIONAL PAPERS

WASHINGTON NATIVE PLANT SOCIETY

VOLUME THREE 1988

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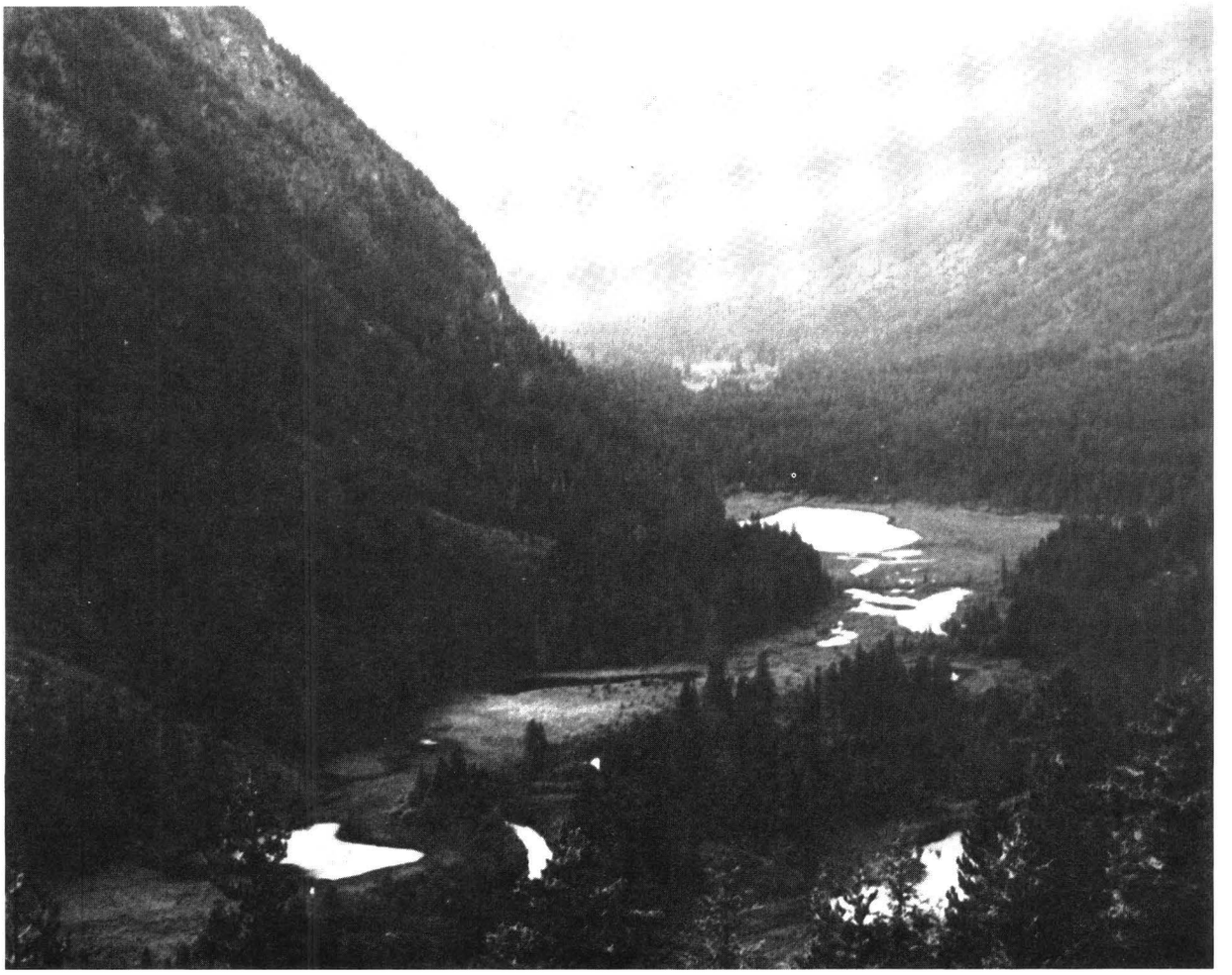

Frontispiece. Big Beaver Valley, looking westward from the south slope of Pumpkin Mountain. The valley was carved by alpine glaciers and eroded by Big Beaver Creek into a broad, U-shaped valley with steep walls. Extensive wetland communities are present along the valley floor and dense forest communities cover the valley walls.

A Floristic Survey of Big Beaver Valley

Ronald Vanbianchi and Steven J. Wagstaff

ABSTRACT

This report describes the vascular plant flora of Big Beaver Valley, located in the North Cascade Mountain Range of Washington State. Portions of the valley lie within both North Cascades National Park and North Cascades National Recreation Area. Plant communities are mapped, and species' distributions described. Ten species are reported for the first time from the North Cascades, and new populations of three Sensitive plant species are recorded.

ACKNOWLEDGEMENTS

This project was funded by a grant from the Skagit Environmental Endowment Commission. We gratefully acknowledge their financial support.

In addition, it is a pleasure to thank the following individuals: Joe and Margaret Miller for their expertise and companionship in the field, and for editorial comments; Ronald J. Taylor for his guidance and encouragement throughout the project; Robert R. Wasem and North Cascades National Park staff for providing logistical support; Lilla Samsom for sharing her artistic talents; Steve Sweeney, Art Kruckeberg, and Ralph and Dorothy Naas for their editorial comments; Kirsten Bird for contributing her word processing expertise. Thanks also to Parametrix, Inc. and the Biology Department at Western Washington University for providing access to computer, darkroom, and herbarium facilities.

DEDICATION

This effort was for Neal, Adriana, and Carmen. So the valley as we know it will be waiting when they are ready to explore the North Cascades.

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INTRODUCTION

In the early 1970's Big Beaver Valley became a focal point of controversy. To satisfy Seattle's increasing demand for electricity, Seattle City Light proposed raising Ross Dam, which would have flooded the east half of Big Beaver Valley. Because information concerning natural resources in the valley was limited, scientists and conservation groups combined efforts to determine what would be lost. Much information was generated during the controversy, particularly concerning the old growth western redcedar stands in the valley bottom. The controversy was resolved when the Canadian government agreed to provide electricity to Seattle City Light until the year 2061. However, due to the time limit the agreement may be only a temporary reprieve from the threat of inundation.

The location of the boundary between North Cascades National Park and Ross Lake National Recreation Area is further evidence that the valley is not adequately protected. When the North Cascades National Park boundary was drawn, Big Beaver Valley was divided administratively into two portions. The eastern and largest portion was included in Ross Lake National Recreation Area, and the remaining portion of the valley fell within North Cascades National Park. The portion of the valley that would be flooded if Ross Dam were raised was intentionally included in the National Recreation Area, which does not afford the same restrictions to alteration as a National Park. Given the time limit on the agreement between The City of Seattle and the Canadian Government, and the fact that a portion of the valley is excluded from North Cascades National Park, there seems to be no assurance that Big Beaver Valley is protected from inundation.

The National Park Service has proposed Big Beaver Valley for Research Natural Area (RNA) status, recognizing the significant features of the area reported by previous workers. The purpose of our study was to provide additional information that could be used to determine whether the biological features of the valley meet RNA criteria. Because earlier research emphasized the old-growth western redcedar stands, we concentrated our energies on the pristine wetlands that dominate the valley floor. We documented the species composition of wetland and nonforested communities, identified rare plant populations, and mapped the vegetation within the proposed RNA.

General Description

Big Beaver Valley is a pristine natural area located in the northwestern portion of Washington State on the west slope of the North Cascade Range (Figure 2). Forest communities dissected by rock outcroppings carpet the steep walls, and the valley bottom supports wetland and riparian plant communities. Big Beaver Creek meanders through the valley, and many small tributary creeks drain the upper slopes and snowfields on the surrounding peaks. Big Beaver Valley is an outstanding example of a low elevation, glacially carved riparian ecosystem.

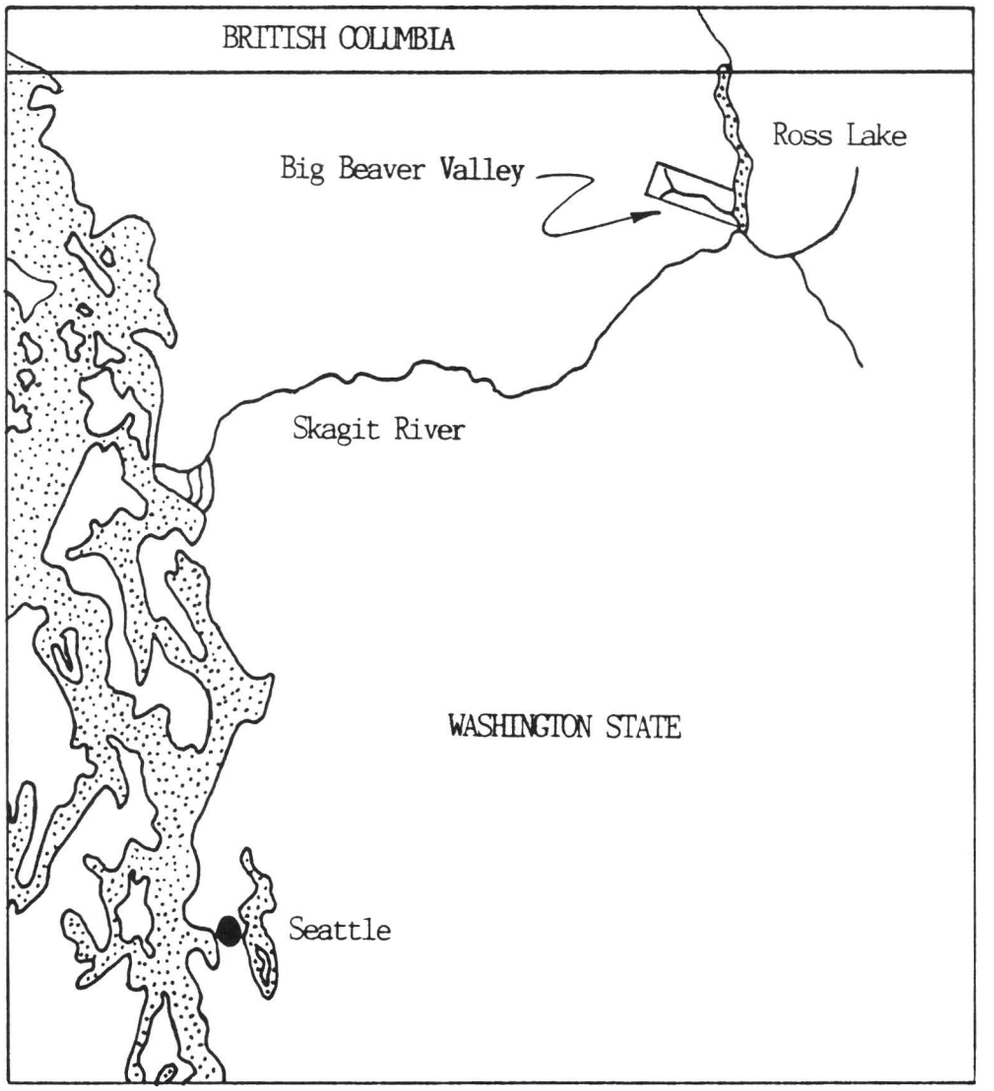

Figure 2. Location Map.

The valley is approximately six and one-half miles long from the confluence of McMillan and Big Beaver creeks to the point where Big Beaver Creek flows into Ross Lake, and approximately three-fourths of a mile wide at the 2200-foot contour throughout its length.

Previous Botanical Explorations

We found no botanical records or descriptions of Big Beaver Valley preceding the controversy over raising Ross Dam. However, since 1970 there have been several studies. Joe and Margaret Miller spent much time exploring and describing the biological diversity of the valley in the early 1970's, first describing the western redcedar communities in the valley bottom (Miller and Miller, 1970), then conducting a preliminary ecological survey and an inventory of plants and animals (Miller and Miller, 1971). Valley plant communities were also described and mapped as part of a survey of the entire Ross Lake Basin (Scott, Barber, and Long, 1971; Scott and Reese 1974).

Douglas (1971) described the forest communities in Big Beaver Valley as part of a survey of potential Research Natural Area sites. Sharpe (1974) assessed the western redcedar stands in the valley for characteristics that would make them suitable for inclusion in a western redcedar Research Natural Area. Ralph and Dorothy Naas have spent many years botanizing throughout the North Cascades, but ventured into Big Beaver Valley for only a short time in 1970. More recently, Agee and Kertis (1986) mapped and described vegetative cover types for the entire North Cascades National Park complex.

During a recent study to determine how hydroelectric development on the Skagit River has affected wildlife, Brueggeman et al (1987) used Big Beaver Valley wetland and forest communities as models for similar communities that were inundated by Ross, Diablo, and Gorge Lakes. Their report includes quantitative plant community data, and a map with a classification system similar to the one used for this report.

INFLUENCES ON THE VEGETATION OF BIG BEAVER VALLEY

Location and Topography

Big Beaver Valley is located in the rugged North Cascade range of Washington in Whatcom County, on the west side of Ross Lake approximately three miles north of Ross Dam. The valley is oriented on a northwest-southeast axis.

The topographic relief of the surrounding area is great, with drastic changes in elevation occurring within short distances. The valley floor slopes gradually downward from 1900 feet near the confluence of McMillan Creek and Big Beaver Creek to 1615 feet where Big Beaver Creek flows into Ross Lake. Sourdough Mountain (6107 feet), Elephant Butte (7380 feet), and Luna Peak (8285 feet) rise to the south and west, whereas Mt. Prophet (7547 feet) and Pumpkin Mountain (3482 feet) loom above the north side of the valley.

Within Big Beaver Valley, all outstanding features were ground away by the glaciers that moved through during past ice ages. As a result, the valley is broadly U-shaped in cross section with a wide, flat bottom and steep walls (see Frontispiece). Since the glaciers have retreated, streams have carved channels in the valley walls, and the valley bottom has filled in with weathered parent material and decaying plant remains. Big Beaver Creek meanders across the valley floor, carves new channels and cuts off portions of the old, but the basic configuration of the valley remains unchanged since the glaciers retreated.

Drainage

Several streams cascade down the valley walls and join Big Beaver Creek. Thirtynine Mile Creek and Pierce Creek are the only named streams, possibly because they are the only ones considered perennial. However, during the 1986 field season, a small stream on a north-facing slope was still flowing in September and is presumably perennial. Similarly, a stream on a south-facing wall was perennial downslope to approximately 1900 feet elevation, where it disappeared into the streambed. Several other tributary streams may also do this, given the porous nature of the soils on the sideslopes of the valley.

Climate

The climate in Big Beaver Valley is determined by general weather patterns in the North Cascades, which are modified by topographic features in and around the valley. Air masses originating as frontal systems over the Pacific Ocean release moisture in the form of rain or snow as they are forced to rise over the Pickett Range. The resulting rainshadow on the lee side of the range influences Big Beaver Valley and Ross Basin. Miller and Miller (1971) reported a moisture gradient within the valley, with the west end receiving more moisture than the east end.

In addition to the rainshadow effect, the orientation of the valley on a northwest-southeast axis creates strong microclimatic variation. The north-facing slopes stay cool and moist through the summer months because they never receive direct sunlight. In contrast, south-facing slopes receive sunlight daily and the soils dry out quickly after summer rains. A good example of the dramatic difference between the two slopes is present near the west end of the valley. Cold air draining off a small snowfield on the north-facing slope modifies the microclimate of the area directly below, creating conditions favorable for the growth of subalpine plant species. Directly across the valley on the south-facing slope where snow disappears early and sunlight is intense, the valley walls are dominated by dry coniferous forest communities.

Geologic History

The geologic evolution of the North Cascade Mountains is complex (McKee, 1972). The age of the oldest rocks, metamorphosed gneisses, is unknown. Perhaps they are as old as Precambrian. Marine sedimentation and volcanism occurred throughout the Jurassic and Cretaceous periods and produced thick stratigraphic sequences. These were uplifted, folded, faulted and metamorphosed during a Cretaceous orogeny. Granitic batholiths were also emplaced during the Cretaceous and these intrusions continued into the Tertiary period. By mid-Tertiary however, the mountains had been eroded to low smooth hills. The present mountain range was uplifted into a broad north/south trending arc during the Pliocene.

A gradual cooling trend culminated in several continental and alpine glacial episodes during the Pleistocene; each was interrupted by warm interglacial periods (Waitt, 1977). The cordilleran ice sheet advanced as far south as the Skagit River gorge below Ross Dam. Because of microclimatic differences, alpine glaciers originating on high mountain peaks west of the Upper Skagit Valley merged with the massive cordilleran ice sheet, whereas east-side glaciers did not reach the trunk glacier. The disruption of volcanic ash layers suggests that late Wisconsin alpine glaciers last advanced prior to the eruption of Glacier Peak about 11,250 years ago (Beget, 1982). In response to Holocene climatic changes, alpine glaciers expanded again during the Holocene approximately 8,400 years ago, between 5,100 and 3,400 years ago, and within the last 1,000 years.

Fire History

The fire history of the valley has been summarized by Sharpe (1974) who describes three major fires in recent history, in 1770, 1918, and 1926. All three fires burned portions of the valley below Tenmile shelter. The 1926 fire burned the greatest area, originating from a lightning strike on the north slope and burning from Tenmile shelter out to the mouth of Big Beaver Creek, then sweeping north up the Skagit Valley.

From 1970 to 1979, frequent lightning strikes on the valley walls burned a total of 34 acres (Fire Management Plan, 1981). U.S. Forest Service records dating back to 1925 record a similar fire frequency during this time interval.

Fire evidence is still obvious on the north side of the valley. Many of the large trees have areas of blackened bark, and burned logs still lie scattered on the forest floor. There is no record of fire on the south side of the valley, and since 1926, there have been no fires reported in the valley bottom (Allen, personal communication).

Spruce budworm has been detected in much of Big Beaver Valley. Heavy insect infestations have resulted in extensive forest mortality which could potentially affect fire intensity and behavior (Fire Management Plan, 1981).

Human Impact

The valley was home to early settlers and receives recreational use, so evidence of human activity is obvious near the campsites, along the hiking trail, and in some remote areas.

In the late 1800's, a Canadian miner named John MacMillan moved into Big Beaver Valley and established a homestead on the south side of the creek near the mouth of the valley. McMillan lived there from 1884 until 1922, trapping, raising vegetables, and working at temporary jobs for the Forest Service (Luxenberg, 1986). Although he built several structures, he never registered his claim and did not hold title to the land (Thompson, 1970). Since his death, the trail into his homestead has slowly overgrown, but the remains of his cabin still stand, and many stumps and felled trees also mark the site.

Several weedy species grow in the valley (Table 1). Most of the species we observed were in areas of recent and continuing human activity: the campgrounds, trails, and horsecamps. Transported there by humans or pack animals, they will probably persist in these areas. Weeds also grow on gravel bars and creek banks, but in this habitat they may not be as persistent as they are along trails and in campgrounds. Miller and Miller (1971) reported four exotic species, Capsella bursa-pastoris, Cirsium arvense, Plantago lanceolata, and Rumex acetosella, on the gravel bar at the confluence of Thirtynine Mile Creek and Big Beaver Creeks. Of these four species, we found only Rumex acetosella, and not on gravel bars, but restricted to the main hiking trail through the valley.

We observed two exotic species growing in areas without recent human disturbance. Lactuca muralis is established around the site of McMillan's homestead and in moist forest stands along Big Beaver Creek. Vallisneria americana, a submerged aquatic species, is present in several ponds. Neither species typically outcompetes native species, and they do not presently threaten native plant populations. Similarly, none of the other exotic species we observed are threatening the native flora of Big Beaver Valley.

The Influence of Beavers in Big Beaver Valley

Perhaps the most obvious influence on the vegetation in the valley bottom is the work of beavers. As they constantly reshape their channels, alter water levels, and harvest vegetation for food and construction materials, beavers profoundly affect the vegetation. They create and maintain

Table 1. Introduced and weedy vascular plant species.

Species	Habitat
Aira caryophyllaea	trails and campsites
Capsella bursa-pastoris	reported by Millers (1971), not observed during 1986 field season
Cerastium viscosum	gravel bars
Cerastium vulgatum	gravel bars
Cirsium arvense	reported by Millers (1971), not observed during 1986 field season
Lactuca muralis	gravel bars, trails, campsites, forests
Plantago lanceolata	reported by Millers (1971), not observed during the 1986 field season
Poa annua	trails and campsites
Poa bulbosa	Big Beaver Campground
Poa pratensis	gravel bars
Rumex acetosella	trails and campsites
Sagina procumbens	trails and gravel bars
Taraxacum officinale	gravel bars
Trifolium repens	trails and campsites
Vallisneria americana	ponds
Veronica serpyllifolia var. serpyllifolia	trails and campsites

wetlands, flood and kill large areas of riparian forest, and disperse plants that reproduce vegetatively. Beavers are a common sight in the ponds in the valley, and their work is evident throughout the wetlands and adjacent forest communities. Many of the small ponds in the valley are perched on terraces created by beaver dams.

The beavers also retard the advance of trees into marshes and shrub-dominated swamps with their food-gathering and dam-building activities. A beaver pond just west of Thirtynine Mile Creek is the largest example of this phenomenon in the valley. Here, beavers have constructed a dam across a sidechannel of Big Beaver Creek, and the resulting pond flooded a large area of coniferous forest. The dam was created at least twenty years ago, as the pond appears on photos taken in 1968. Many standing snags are still present around the margin of the pond, and the beavers are still active.

NATURAL VEGETATION OF BIG BEAVER VALLEY

Historical Trends

Because of its geographic location, the area surrounding Ross Lake is a transition zone between moist coastal forests west of the Cascade crest and dry interior forests (Franklin and Dyrness, 1973). This situation is evident in Big Beaver Valley which shares plant associations and floristic affinities with both regions. The species listed in Table 2 were observed in Big Beaver Valley, but are more widely distributed east of the Cascade crest. Whether these disjuncts were isolated following Pliocene uplift of the Cascades or whether they are founder populations expanding west of the Cascade crest during a Holocene drying trend is unclear.

During the early Miocene, 23 to 28 million years ago, the regional vegetation included a rich, broad-leaved, deciduous forest that extended from Northern China and Japan into Alaska south to the Pacific Northwest (Wolfe, 1969 and Daubenmire, 1975 and 1978). Many subtropical elements of this forest such as Magnolia, Castanea, and Cercidiphyllum became extinct by late Miocene, 10-14 million years ago. At the same time, species such as Alnus incana and Betula occidentalis were restricted east of the Cascades. In general, temperate broad-leaved deciduous forests dominated lowland areas and an upland coniferous forest occupied a broad area from central British Columbia to northeastern California east to Idaho.

Pliocene uplift of the Cascade Mountains, 2-10 million years ago, created a barrier that extracted progressively more moisture from oceanic westerlies resulting in reduced precipitation on the leeward side. Daubenmire (1975) suggested that the onset of a pronounced summer drought and a gradual decline in summer temperatures was responsible for the disappearance of deciduous trees such as Carya, Fagus, Liquidambar, Ulmus, Platanus, and Aesculus. Increased aridity may have also provided an opportunity for the expansion of herbs such as Agropyrum, Elymus, Festuca, and Poa that were restricted to dry, rock outcrops on the margins of northern boreal forests (Daubenmire, 1975).

Climatic fluctuations that accompanied Pleistocene glacial and interglacial episodes, 2 million-10,000 years ago, fragmented regional floras. During episodes of glacial advance, species ranges were contracted and population sizes reduced. Species were elevationally displaced or retreated south, and many lineages became extinct. During warm interglacial periods, species migrated up mountain slopes or to higher latitudes by founding new populations. The combined effects of genetic drift and natural selection acting upon small isolated founder populations has likely had a profound impact on the genetic structure of present populations in Big Beaver Valley.

A major warming trend, called a hypsithermal, occurred during the Holocene. Diminished precipitation during this time resulted in decreased stream discharge. Naturally flooded basins began to accumulate soil, sea levels rose, and vegetation adapted to dry climates expanded into more arid

Table 2. Vascular plants observed in Big Beaver Valley with distributions primarily east of the Cascade Crest.

Species	Habitat
Agropyrum spicatum	rock outcrops
Arnica cordifolia	dry coniferous forests
Arabis holboellii var. retrofracta	rock outcrops
Arabis lyrata	rock outcrops and gravel bars
Berberis repens	rock outcrops and dry coniferous forests
Calamagrostis rubescens	rock outcrops and dry coniferous forests
Carex paupercula	gravel bar and meadows
Festuca occidentalis	rock outcrops and dry coniferous forests
Juniperus scopulorum	rock outcrops and dry coniferous forests
Lomatium ambiguum	rock outcrops
Microsteris gracilis var. humilior	rock outcrops
Sparganium emersum var. multipedunculatum	ponds
Suksdorfia ranunculifolia	seasonally moist rock outcrops
Tiarella unifoliata	moist forests
Vaccinium scoparium	dry coniferous forests
Woodsia scopulina	rock outcrops

regions. Post hypsithermal climatic fluctuations have resulted in three abnormally cool periods in which alpine glaciers have expanded.

As a consequence of geologic and climatic changes that occurred during the Tertiary, the regional vegetation was dramatically modified and the modern flora in Big Beaver Valley has diverse origins (Wolfe, 1969). Many taxa were once members of a vast mixed mesophytic forest that dominated the Pacific Northwest during the Miocene and have since become adapted to cool, dry summers. These include: Populus trichocarpa, Salix lasiandra, Alnus rubra, Berberis aquifolium, Berberis nervosa, Berberis repens, Amelanchier alnifolia, Holodiscus discolor, Acer macrophyllum, Acer glabrum, Ceanothus velutinus, and Cornus nuttalli. Others such as Salix scouleriana, Salix hookeriana, Alnus sinuata, Rubus idaeus, Acer circinatum, Gaultheria shallon, Vaccinium alaskaense, and Symphoriocarpus albus migrated into the region from the north following the late-Miocene extinction of many elements of the mixed mesophytic forest.

Late-Miocene coniferous forests of the Cascades and Columbia Plateau were also notably different from extant forests. They consisted of Abies concolor, Abies magnifica, Picea breweriana, Picea magna, Pinus monticola, Pinus ponderosa, Tsuga heterophylla, Thuja plicata, and Sequoia sempervirens. Pseudotsuga menziesii was probably not a dominant element of Tertiary forests in the Pacific Northwest. Abundant Pseudotsuga pollen did not appear in fossil assemblages until the middle or late Pleistocene (Wolfe, 1969).

Description of the Existing Vegetation

An intricately interwoven network of rock outcrop communities, old-growth forests, and pristine wetlands exists in Big Beaver Valley. These communities represent a continuum of overlapping species tolerances to sharp environmental gradients. Rugged mountain peaks intercept moisture-laden air, creating a climatic gradient from the headwaters of Big Beaver Creek to its mouth. Topographic gradients are created on north and south facing slopes. Soil moisture gradients exist from the stony well-drained soils on the upper slope to the saturated soils on the valley floor. Water temperature gradients exist as streams cascading from alpine glaciers feed Big Beaver Creek, its side channels, and ultimately several small ponds.

The vegetation map included as Appendix II represents the portion of the valley proposed for RNA status. The mapped area extends from the mouth of Big Beaver Creek westward to the confluence of McMillan and Big Beaver Creeks, and up the sideslopes on both sides of the valley to the 2200 foot contour. The map was created from aerial photographs taken in 1976, and from our observations during the summer of 1986. In the decade since the photos were taken, there have been no fires, floods, landslides or other catastrophic events that significantly changed the landscape in the valley. Normal successional changes such as the reduction of pond surface areas by the encroachment of emergent vegetation were not apparent from the photos due to lack of sufficient resolution, scale, and baseline data. Because many aspects of successional change are poorly understood, especially for wetland communities, Big Beaver Valley would provide an excellent area for long-term successional studies if granted RNA status.

The vegetation map contains two levels of information. Color defines thirteen broad vegetation types such as marsh, Thuja-dominated forest, and Carex meadow. Within each colored area, greater detail is provided by numbered polygons identifying the classes described below. The class descriptions provide general information on the composition of the plant communities, and in most cases the relationships between the communities and published accounts of similar plant associations. Most of the classes are named after the dominant species or general vegetation type, or for physical features when plant cover is sparse or absent.

Wetlands

Extensive pristine wetland communities in Big Beaver Valley have developed in response to topographical, geological, and biological factors. Groundwater drains rapidly through the thin stony soils on the valley walls, recharging the wetland communities on the valley bottom. Beavers divert streams and create ponds, and the ponds are gradually replaced by marshes, swamps, and bogs (Figures 3 and 4).

According to Rigg (1925, 1940, and 1951), and Neiland (1971), bogs in the Pacific Northwest occur as a successional stage in which the bog surface is devoid of hard soil and composed entirely of Sphagnum mats resting on fibrous brown peat composed of partially or completely disintegrated Sphagnum. Generally, bogs are successional to lakes or swamps. Submergent plants such as Chara and Utricularia vulgaris, and rhizomatous emergent plants with floating leaves such Menyanthes trifoliata, Potamogeton natans, and Nuphar polysepalum, are early colonizers that form floating mats of vegetation that are gradually replaced by Carex species. Sphagnum is slowly established on the margins of ponds and swamps. The cell walls of Sphagnum have a remarkable ability to selectively absorb basic ions and release hydrogen ions. This feature when coupled with the incomplete decomposition of organic matter decreases water pH, exerting a selective influence on the vegetation. Several species are characteristic of bogs including: Drosera rotundifolia, Carex leptalea, and Rhynchospora alba. In later stages, Spaghnum bogs are invaded by forest.

Ponds, marshes, swamps, and bogs are represented on the vegetation map. The distinction between marsh and swamp is based on the nature of the dominant plants. Herbaceous species dominate marshes, while woody plants form the dominant cover in swamps. Marsh vegetation is shown in Figure 5. Although bogs may be dominated by herbaceous or woody species, they are mapped separately in recognition of their unusual plant assemblages.

1. **Marsh** Marshes are wetland areas dominated by herbaceous species, with few or no woody plants present. Sedges, including Carex rostrata, Carex sitchensis, and Carex vesicaria, commonly dominate these communities, which cover large areas of the valley bottom. Common sub-dominant species include Carex canescens, Carex brunnescens, Carex lenticularis, Potentilla palustris, Habenaria dilatata, Glyceria elata, and Puccinellia pauciflora.

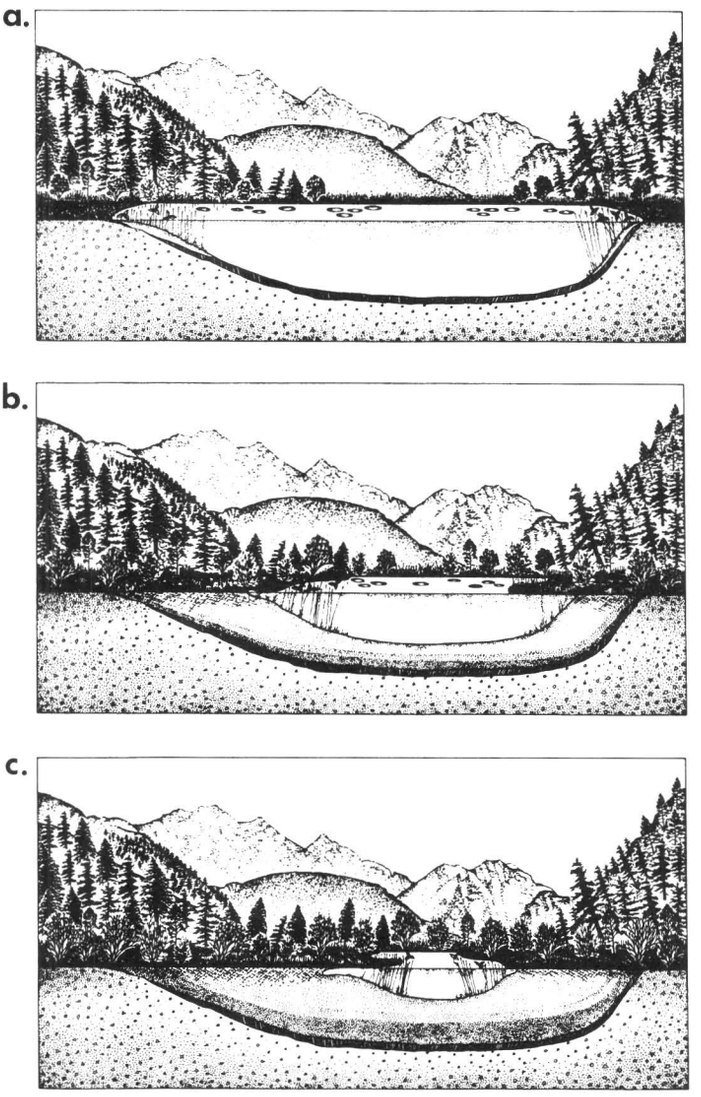

Figure 3. A bog successional sequence in Big Beaver Valley. a: A gradual deposition of fine clay and silt and an accumulation of dead and decaying plant material allows the encroachment of Sphagnum and emergent vascular plants along pond margins. b: The incomplete decomposition of Sphagnum forms thick mats of fibrous brown peat, and is accompanied by a decrease in water pH. Acidic water exerts a selective influence on the vegetation colonizing the Sphagnum mat. c: In late stages, bogs support forest vegetation.

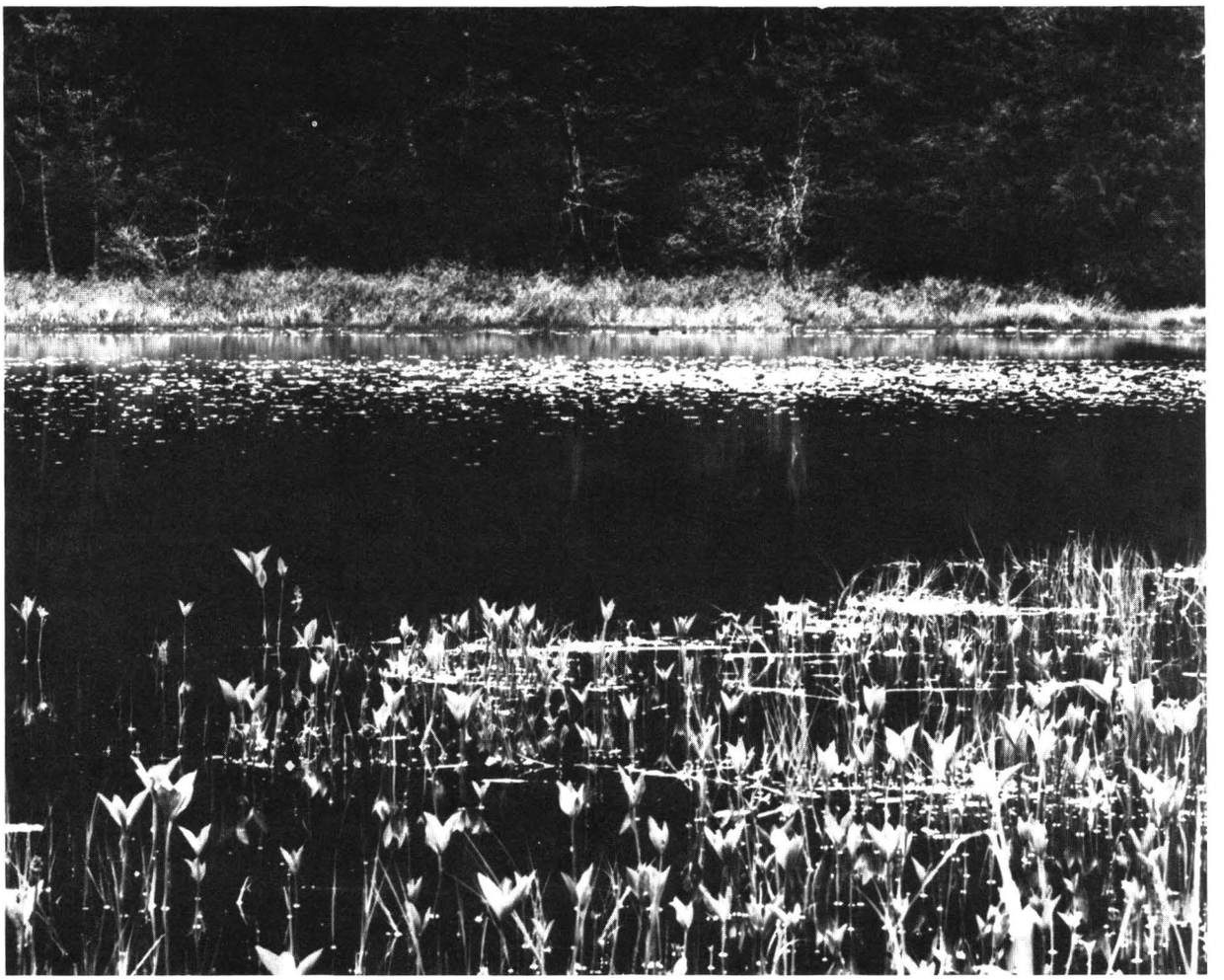

Figure 4. Emergent vegetation along pond margins in Big Beaver Valley includes Potamogeton natans, Menyanthes trifoliata, and Equisetum fluviatile.

Figure 5. Steep, forested slopes contrast sharply with extensive wetlands in Big Beaver Valley. Carex sitchensis, Carex rostrata, and Habenaria dilatata grow abundantly in the valley's marshes.

2. **Bog** The bogs in the valley are characterized by Sphaghnum spp., Drosera rotundifolia, Scheuchzeria palustris, Rhynchospora alba, Tofieldia glutinosa, Hypericum anagalloides, Carex muricata, Carex leptalea and Carex limosa. Despite scattered trees, shrubs, and snags, the overall appearance is an herb-dominated community. In addition to the two areas indicated on the map, several small patches of bog vegetation have developed in association with ponds or other wetland communities.

The mapped areas are excellent examples of bog communities. They support most of the plant species characteristic of bogs in western Washington, with the notable exception of Ledum glandulosum and Kalmia occidentalis. Kalmia occidentalis is replaced by Kalmia microphylla, the typical species in high elevation bogs. Populations of a state-listed Sensitive species, Lycopodium inundatum, are present at two locations.

3. **Salix/Spiraea Swamp** Dominated by Salix sitchensis, Salix lasiandra, and Spiraea douglasii, these communities also contain several additional shrub species, including Cornus stolonifera and Lonicera involucrata. A poorly developed herb community is characteristic, due in part to the dense shrub canopy, and in part to standing water which is generally present throughout the year (Figure 6).

4. **Salix/Carex Swamp** This community covers large areas of the valley floor, often forming the transition zone between marshes and adjacent forest communities. Typical shrubs include Salix sitchensis, Salix lasiandra, and Spiraea douglasii. The herb layer is usually dominated by Carex sitchensis or Carex rostrata, with Angelica genuflexa, Aster modestus, and Cicuta douglasii contributing small amounts of cover (Figure 7).

5. **Thuja/Salix/Carex Swamp** This community has characteristics similar to the Salix/Carex swamps, and in addition has increased structural diversity due to the presence of large live and dead Thuja plicata.

6. **Alnus rubra Swamp** A few small patches of Alnus rubra swamp have developed adjacent to Big Beaver Creek. These stands are dominated by Alnus rubra with dense understories formed by Rubus spectabilis, Oplopanax horridum, Lysichitum americanum, and Athyrium filix-femina. Standing water is present throughout the year.

7. **Pond** Miller and Miller (1971) listed eight shallow ponds in the lower portion of Big Beaver Valley. The three largest cover approximately 15, 4, and 4 acres. Aquatic plant species most frequently observed in the ponds we visited include Nuphar polysepalum, Potamogeton natans, Utricularia vulgaris, and the green alga, Chara. Equisetum fluviatile, Menyanthes trifoliata, and Dulichium arundinaceum often form a band of vegetation in low standing water on pond margins as shown in Figures 4 and 5.

8. **Big Beaver Creek** The area indicated on the map includes the main channel, major side channels, and seasonally exposed gravel bars, but does not include small side channels that exist near the confluence with McMillan Creek (Figure 8).

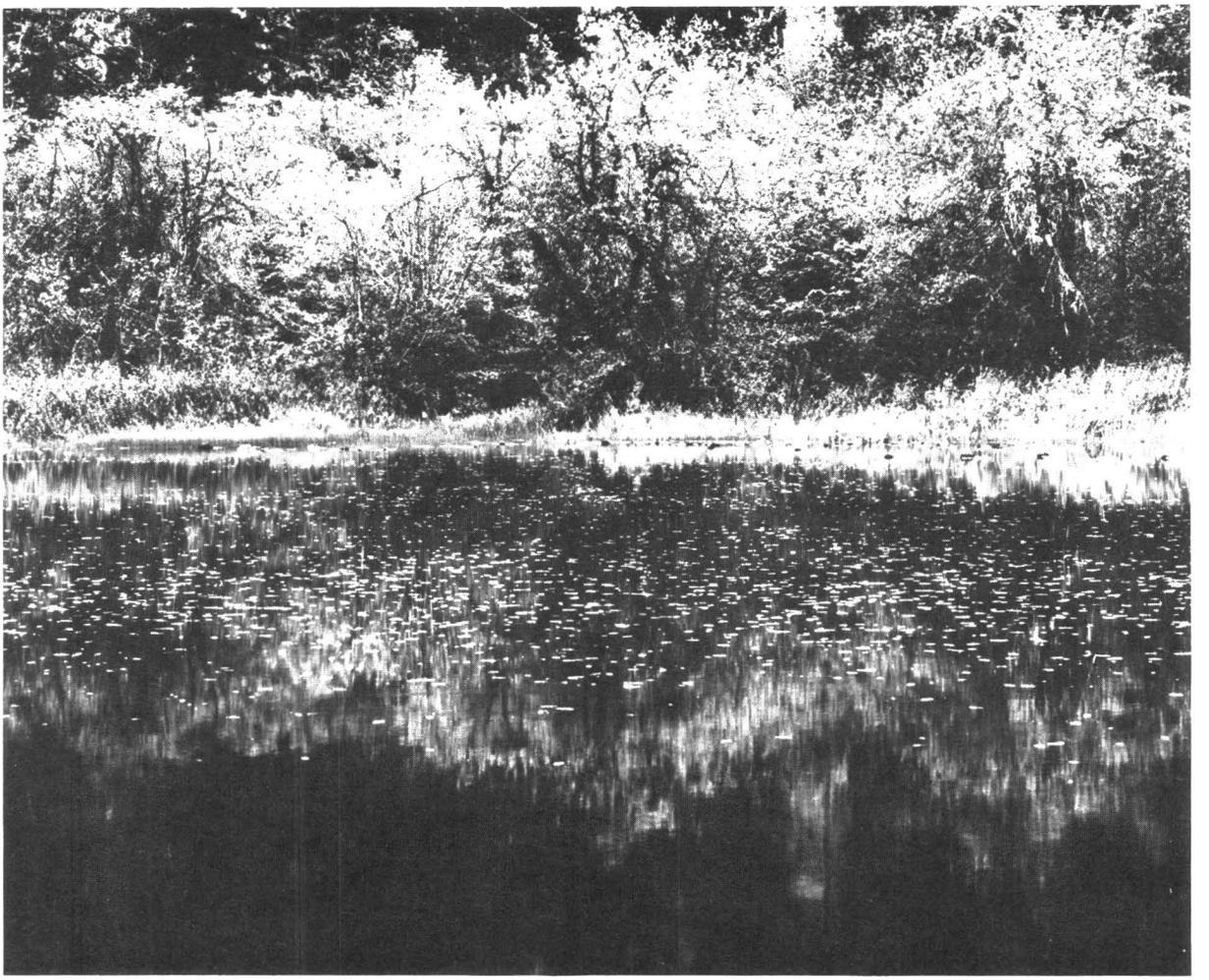

Figure 6. Dense thickets of Salix sitchensis, Salix lasiandra, Cornus stolonifera, and Pyrus fusca border wetland and forest communities.

Figure 7. Emergent vegetation along pond margins intergrades with marshes, shrub swamps, and forests.

Figure 8. Gravel bars provide favorable habitat for a diversity of herbs including Achillea millefolium, Aquilegia formosa, and Penstemon serrulatus.

Prior to the construction of Ross Dam, Big Beaver Creek was a tributary of the Skagit River (Seattle City Light, 1931). Between the mouth of the valley and the Skagit river, the creek dropped 300' in elevation, and included a section known as "The Falls". Now Big Beaver Creek flows directly into Ross Lake, and only when the reservoir is at low pool is the upper portion of The Falls visible.

Shrub Communities

9. **Acer circinatum/Cornus stolonifera Thicket** Throughout much of the length of the valley, Big Beaver Creek is bordered by a dense shrub thicket composed of Acer circinatum, Cornus stolonifera, Sambucus racemosa, Lonicera involucrata, and several others. The soil is moist in these communities, but standing water is not characteristic. This community forms large thickets in some areas, especially on the insides of creek bends, but is usually restricted to a narrow band, too small to delineate on the map. This community is the major obstacle limiting access to Big Beaver Creek.

10. **Acer circinatum/Alnus sinuata Thicket** Avalanche chutes, stream canyons, and moist talus slopes all support this shrub-dominated community. It occurs most frequently on cool, moist, north-facing valley walls, but also covers some of the south-facing walls.

Nonforested Upland Areas

11. **Talus** Boulder-covered slopes on both sides of the valley typically support only a sparse cover of vascular plants. Acer circinatum, Acer glabrum var. douglasii, and Alnus sinuata are common shrubs at forest/talus transitions and in occasional pockets of soils developed within the talus slopes. Close inspection of the boulder's surfaces reveals a dense moss and lichen community consisting of Rhacomitrium canescens, Polytrichum piliferum, Cladonia sp., and Umbilicaria sp.

12. **Rock Outcrops** Rock outcrop communities exist on both sides of Big Beaver Valley, but are particularly extensive on the southwest-facing slopes where they descend nearly to the valley floor. A rich herb community develops on these sites, with occasional shrubs or trees providing microclimatic diversity. Species inhabiting rock crevices include Spiranthes romanzoffiana, Woodsia scopulina, Fragaria virginiana, Cryptogramma crispa, Elymus glauca, and Sedum oreganum. Open areas with thin soils support Montia sibirica, Erythronium grandiflorum, Achillea millefolium, Eriophyllum lanatum, Microsteris gracilis, and many others.

13. **Carex meadow** A small snowfield exists on a north-facing slope just east of the confluence of McMillan and Big Beaver Creeks. Below the snowfield, Carex spectabilis and Elymus sp. dominate a small meadow, with Oxyria digyna, Athyrium distentifolium and Achillea millefolium as associated species (Figure 9).

Figure 9. A moist sedge meadow community bordered by Alnus sinuata/Acer circinatum thickets, near the west end of the valley. Mt. Redoubt is in the background.

Forest Communities

Pockets of relatively moist, deep, soil on the south-facing slopes of the valley support forest stands dominated by Pseudotsuga menziesii. In drier areas, stands of Pinus contorta regenerate following fire or represent an edaphic climax where rock outcroppings and shallow soils limit forest development.

Agee and Kertis (1986) reported that within the North Cascades National Park Complex, forests dominated by Pseudotuga menziesii are concentrated in the Ross Lake area. Williams and Lillybridge (1983) recognize Pseudotsuga menziesii as a major climax species in upland zones in the Okanogan National Forest, whereas Henderson and Peter (1985) recognize it as a seral species in the Mt. Baker National Forest. In Big Beaver Valley, Pseudotsuga apparently assumes both roles, depending on whether it is growing on a hot and dry or a cool and moist site.

On the lower slopes and valley bottom, Pseudotsuga menziesii and Pinus contorta are replaced by Tsuga heterophylla and Thuja plicata, or by Abies amabilis in the coolest areas. Associations dominated by Thuja plicata are visually dominant in the valley bottom, but are usually placed in the Tsuga heterophylla series because there are fewer young Thuja than Tsuga reproducing in the understory.

Tsuga heterophylla and Abies amabilis are absent or seral in most stands in the Okanogan National Forest (Williams and Lillybridge, 1983). Thuja plicata is found in wet areas throughout the Okanogan, but is more common in the western portion of the forest. Tsuga heterophylla, Abies amabilis, and Thuja plicata are major climax species in the Mt. Baker National Forest (Henderson and Peter, 1985).

14. **Thuja plicata/Alnus rubra Forest** This community occurs at only a few very moist sites along Big Beaver Creek. Thuja plicata and Alnus rubra are codominant in the overstory, with a rich assemblage of shrub and herb species forming the understory community. Characteristic species include Acer circinatum, Oplopanax horridum, Athyrium filix-femina, and Maianthemum dilatatum. Maianthemum dilatatum was observed only in this habitat, although it is common throughout moist western Washington forests. The presence of mature Thuja plicata in the canopy and its seedlings in the understory indicates Thuja will eventually replace the shade-intolerant Alnus rubra and become the sole overstory dominant.

15. **Thuja plicata/Tsuga heterophylla Mature Forest** Large Thuja plicata and Tsuga heterophylla form the open overstory in these forests. The rich understory includes Acer circinatum, Vaccinium ovalifolium, Dryopteris expansa, and Tiarella unifoliata. Although Tiarella trifoliata is the usual western Washington species, Tiarella unifoliata is the common species in the valley and is widely distributed east of the Cascade crest.

16. **Thuja plicata Mature Forest** Old-growth Thuja plicata forms the open canopy, with Tsuga heterophylla an infrequent associate. Understory composition and cover varies from site to site, but includes Oplopanax horridum,

Acer circinatum, Smilacina stellata, Clintonia uniflora, Athyrium filix-femina, Dryopteris expansa, and Blechnum spicant. Large amounts of decaying woody material are characteristic of old-growth communities (Franklin et al., 1981). Figure 10 illustrates this characteristic.

Several Thuja-dominated associations have been reported from Big Beaver Valley and other areas in the North Cascades (Franklin and Dyrness, 1973; Miller and Miller, 1970). These include Thuja plicata-Tsuga heterophylla/Oplopanax horridum-Athyrium filix-femina on wet lower slopes and stream terraces, Thuja plicata/Lysichitum americanum on swampy sites, and Thuja plicata/Oplopanax horridum/Acer circinatum on deep soils in Big Beaver Valley.

17. **Tsuga heterophylla Immature Forest** A pure stand of regenerating Tsuga heterophylla forms a closed canopy at one site along Big Beaver Trail in the eastern half of the valley. The trees are of uniform height and age, and growing so densely that no understory vegetation has developed. Agee and Kertis (1986) refer to this type as the Tsuga heterophylla association, and mention it is only occasionally found in the North Cascades. Henderson and Peter (1985) report it from Mt. Baker-Snoqualmie National Forest.

18. **Pseudotsuga menziesii Immature Forest** Large areas on the south-facing slopes support stands of regenerating Pseudotsuga menziesii. These stands are probably a result of the 1926 fire that burned this portion of the valley. The stands are dense and the understory poorly developed.

19. **Pseudotsuga menziesii Mixed immature/mature Forest** These are regenerating stands of Pseudotsuga menziesii, similar to the class described above, but with scattered individuals that survived the 1926 fire. The understory is variable in these stands. In several areas, sparse to dense cover is provided by Pachistima myrsinites, with almost no other vascular plant species present. Elsewhere, common understory species include Ceanothus velutinus and Holodiscus discolor.

20. **Pseudotsuga menziesii Mature Forest** Mature, closed-canopy Pseudotsuga menziesii forests occur in two areas midslope on the north valley wall. These stands are surrounded by rock outcrop areas, and apparently have developed on isolated pockets of soil.

21. **Pseudotsuga menziesii Exposed Slopes** Large areas on the upper south-facing slopes support widely-scattered, mature Pseudotsuga menziesii separated by bare or sparsely vegetated rock outcroppings. Agee and Kertis (1986) suggested that open-canopy Pseudotsuga menziesii stands are early seral communities originating after disturbance. Given the location of these stands, it is likely they have developed following fires. Pseudotsuga menziesii and Pinus contorta are reproducing in the understory, but eventually Pseudotsuga menziesii will replace Pinus contorta in these mixed stands (Williams and Lillybridge, 1983). Pachistima myrsinites, Arctostaphylos uva-ursi, Symphoricarpos albus, Festuca occidentalis, and Calamagrostis rubescens are associated species. Pseudotsuga menziesii forests intergrade with rock outcrop areas, and many of the herbaceous species in the forest understory are also common in large openings between trees.

Figure 10. Logs are important components of old growth forest ecosystems, contributing nutrients and organic matter to soils, and providing wildlife habitat for a diversity of invertebrates and vertebrates.

22. **Pseudotsuga menziesii/Tsuga heterophylla Mature Forest** Dominated by Tsuga heterophylla or Pseudotsuga menziesii, this community is common on the lower slopes on both sides of the valley, and occupies the intermediate to moist portion of the moisture gradient. Tsuga heterophylla is regenerating in the understory, and will eventually be the overstory dominant. Smilacina stellata, Gymnocarpium dryopteris, and Linnaea borealis are associated species (Figure 11).

23. **Pseudotsuga menziesii/Thuja plicata/Tsuga heteropylla Mature Forest** Similar to the preceding class and including some of the same associations, these stands are further diversified by the presence of Thuja plicata in the canopy, and occupy slightly moister sites.

24. **Pinus contorta Mature Forest** Pure stands of Pinus contorta are present near the valley floor at the base of Pumpkin Mountain and increase in elevation westward into the valley. Understory shrubs and herbs in these stands include Arctostaphylos uva-ursi, Pachistima myrsinites, Trientalis latifolia, and Linnaea borealis.

25. **Pinus contorta/Pseudotsuga menziesii Mature Forest** This class is similar to the preceding class, with the addition of scattered old-growth Pseudotsuga menziesii, relicts of the 1926 fire. In his study of Pinus contorta in the upper Skagit Valley, Larson (1972) described stands of 45 year-old Pinus contorta with 400 year old Pseudotsuga menziesii individuals scattered throughout. He speculated successive fire-killed generations of young Pinus contorta occupied the openings beneath the older canopy, and only in the absence of fire has the Pinus community matured.

26. **Pinus contorta/Pseudotsuga menziesii Exposed Slopes** This cover type is similar to the Pseudotsuga menziesii/exposed slopes cover type, with the addition of Pinus contorta as a codominant in the canopy and reproducing in the understory. It is common on the middle and upper south-facing slopes at the east end of the valley.

This class also resembles the Pseudotsuga menziesii-Pinus contorta/Berberis nervosa-Spiraea betulifolia community described by Larson (1972) as typical of most Pinus contorta stands at middle elevations above Ross Dam.

27. **Abies amabilis/Tsuga heterophylla/Pseudotsuga menziesii Mature Forest** Abies amabilis-dominated stands with an admixture of Tsuga heterophylla and Pseudotsuga menziesii occur west of Thirtynine Mile Creek on both sides of the valley. Vaccinium alaskaense, Vaccinium membranaceum, Cornus candensis and Rubus pedatus are common associates (Figure 12). Agee and Kertis (1986) report Abies amabilis communities throughout the park complex at middle elevation, forming a vegetation zone intermediate between Tsuga heterophylla at lower elevations and Tsuga mertensiana at higher elevations. Furthermore, they report Abies amabilis communities are best developed in areas receiving more than 100 inches of rain per year, and with elevations of approximately 4000 feet. The Abies amabilis-dominated forests in Big Beaver Valley are restricted to the west end of the valley, where both the elevation and annual rainfall are much less than optimum. While these stands may not be as well

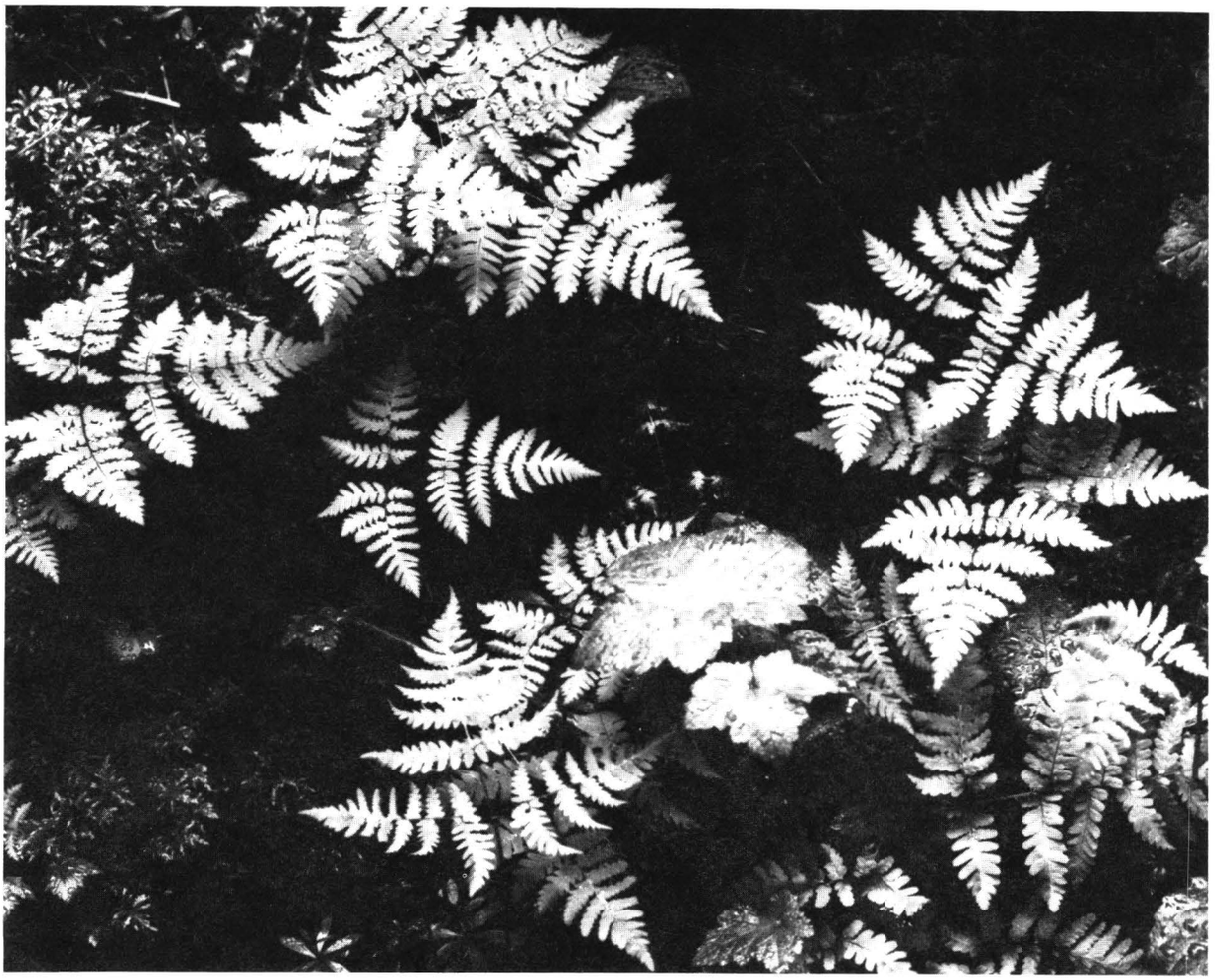

Figure 11. Gymnocarpium dryopteris is a common understory associate in forests dominated by Tsuga heterophylla, Thuja plicata, and Pseudotsuga menziesii.

Figure 12. Cornus canadensis and Rubus pedatus are common understory associates in Abies amabilis/Tsuga heterophylla communities.

developed as those on better sites, the Big Beaver stands comprise one of the larger concentrations in the park complex (Agee and Kertis, 1986).

28. **Populus trichocarpa/Acer macrophyllum Forest** This community was observed at a single location in the valley, along an unnamed creek corridor above 1900 feet elevation on the north wall. Populus trichocarpa and Acer macrophyllum, with some Alnus sinuata and Cornus stolonifera mixed in, form a dense thicket on either side of the stream channel. Agee and Kertis (1986) found this cover type in several river valleys in the North Cascades, although they appear to have over-estimated its extent in Big Beaver Valley. In the stands they examined, Rubus parviflorus, other Rubus spp., and Pteridium aquilinum were common understory species. In contrast, the cottonwood stand we explored is young and dense, with sparse understory cover provided only by Rubus ursinus.

Rare and Previously Unreported Species

Many organisms find optimum habitat in old-growth forests and wetlands, and some require these habitats to maintain viable populations. However, because these habitats are increasingly limited, species dependent on them are becoming rare. Three taxa with official rare plant status in Washington were observed in Big Beaver Valley. Lycopodium inundatum, Lycopodium dendroideum, and Carex paupercula are given Sensitive status by the Washington Natural Heritage Program (Washington Natural Heritage Program, 1987a). Fifteen species with official status in British Columbia also grow within the valley, but are not listed in Washington state.

Lycopodium inundatum (Figure 13) has a spotty distribution in western Washington, occurring in Clark, Pacific, King, Thurston, and Pierce Counties (Washington Natural Heritage Program, 1984). It has not previously been reported from the North Cascades.

Lycopodium dendroideum (Figure 13) was observed at two localities in Big Beaver Valley. At one location, approximately 10 stems were growing in the shade of an overhanging boulder. Lycopodium dendroideum spreads vegetatively by deep subterranean rhizomes, making it impossible to determine if the stems represented a single plant, or several individuals. Close associates included Lycopodium complanatum, Linnaea borealis, and Peltigera sp.

At a second location, 70-80 plants were growing on a rotting stump surrounded by shallow water. Here, associated species included Lycopodium annotinum, Sphagnum sp., Linnaea borealis, Cornus canadensis, Vaccinium parvifolium, and Menziesia ferruginea. Lycopodium dendroideum has a circumboreal distribution, ranging south into Western Washington in Whatcom and Skagit Counties (Washington Natural Heritage Program, 1987a). Lycopodium dendroideum superficially resembles Lycopodium obscurum, a taxon ranging widely in eastern North America (Lellinger, 1985).

Carex paupercula was observed at two locations in the valley. This taxon also has a circumboreal distribution, and ranges south into Washington in Whatcom, Okanogan, and Pend Oreille Counties (Washington Natural Heritage

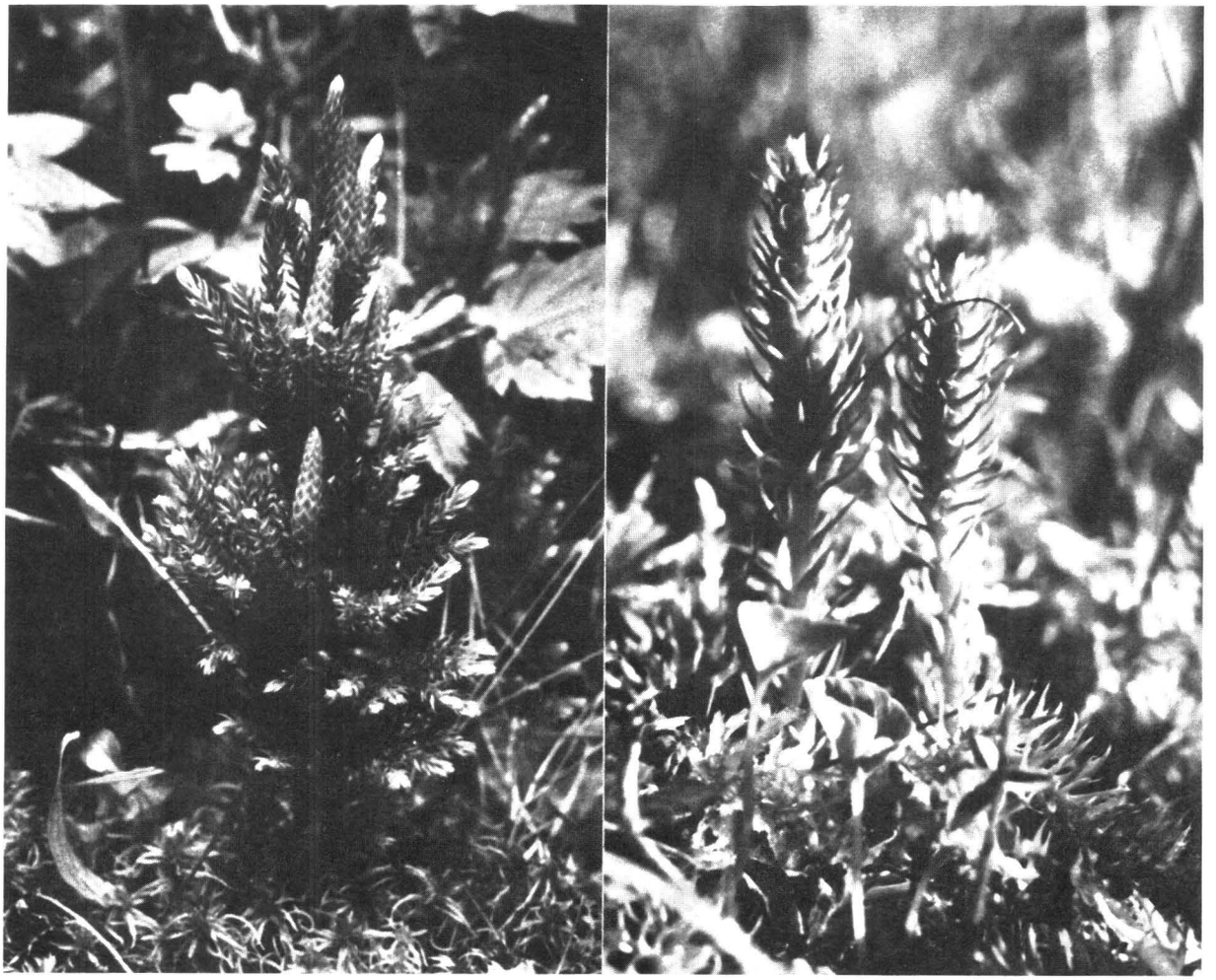

Figure 13. Lycopodium dendroideum (left) and Lycopodium inundatum (right) are state-listed Sensitive species.

Program, 1987a). This is the first reported sighting west of the Cascade crest.

Ten taxa are reported for the first time from the North Cascades (Table 3). Nine of the ten grow in wetland or aquatic habitats, while the tenth was observed in a dry forest understory on the slopes of Pumpkin Mountain.

Table 3. Additions to the North Cascade Checklist. The following species are previously unreported from North Cascades National Park. Sources checked include: Naas and Naas (1978, 1986), Alverson and Arnett (1986), Taylor (1986), Wagstaff and Taylor (1979), and St. John and Douglas (1986).

Species	Habitat
Bromus pacificus	gravel bars
Carex buxbaumii	marshes
Carex leptalea	bogs
Carex limosa	pond margins
Carex phyllomanica	pond margins
Carex pluriflora	meadow
Eriophorum gracile	sphagnum bog
Lycopodium inundatum	sphagnum bog
Senecio macounii	dry forest
Vallisneria americana	ponds

CONCLUSION

The purpose for designating Research Natural Areas is threefold: to preserve examples of all significant natural ecosystems for comparison with those influenced by man; to provide educational and research areas for ecological and environmental studies; and to preserve gene pools of typical and endangered plants and animals. Our observations and those of previous workers indicate Big Beaver Valley satisfies these criteria.

The Washington Natural Heritage Program has established a list of plant communities and species needing preservation, which they refer to as "elements", and a set of criteria for determining the protection priority of these elements (Washington Natural Heritage Program, 1987b). Several elements listed by the Washington Natural Heritage Program exist in Big Beaver Valley (Table 4).

Table 4. Elements represented in the proposed Big Beaver Valley RNA.

Element	Comments
Three sensitive plant species	total of five populations
Lodgepole pine forest	extensive
Low elevation freshwater wetland communities	marsh, swamp, and meadow
Low elevation Sphagnum bogs	two large and several small bogs
Low elevation permanent ponds and drainage systems	
Low elevation stream and riparian systems	

Each of the represented communities is large and undisturbed, and would fulfill the purpose of an RNA. In addition, the valley represents the best remaining example of plant communities that may have existed in the Skagit River Valley prior to its inundation by Ross Lake. Little Beaver Valley, the next drainage north, also provides an example of a low elevation North Cascade river valley, but lacks the extensive wetland communities that have developed in Big Beaver Valley. Because lowland wetlands in western Washington have largely been impacted by human activity, the extensive wetlands found in Big Beaver valley are ecologically significant.

As greater demands are placed upon National Forests for their timber resources, old-growth forests are rapidly diminishing. The old-growth stands along Big Beaver Creek are outstanding examples, and their significance increases as old-growth becomes scarcer outside National Park boundaries.

Finally, Big Beaver Valley is an excellent site for educational and research projects. It is accessible throughout the year, and provides undisturbed examples of a large variety of plant communities.

We hope our report, species list, and vegetation map will provide researchers with baseline information that will stimulate further research in Big Beaver Valley.

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APPENDIX I: CHECKLIST OF VASCULAR PLANTS IN BIG BEAVER VALLEY

The following vascular plant checklist was compiled during the 1986 field season and incorporates species previously reported in Big Beaver Valley by Joe and Margaret Miller (1971). Species abundance within the valley is characterized by the terms "common", "infrequent", and "rare". Taxa without occurrence and phenological information were not observed during our survey. Collection numbers are given for voucher specimens deposited in herbaria at North Cascades National Park Headquarters, Western Washington University, University of Washington, and Ohio University.

ACERACEAE Maple Family

Acer circinatum Pursh **Vine maple** Common; open sunlight to deep shade; forests, avalanche tracks, and boulder fields; flowers in April-early May.

Acer glabrum Torr. var. douglasii (Hook.) Dippel **Mountain maple** Common; dry, open forests; flowers in April-early May.

Acer macrophyllum Pursh **Big leaf maple** Common; moist river terraces to dry, open forests; flowers in April-early May.

APIACEAE (UMBELLIFERAE) Parsley Family

Angelica arguta Nutt. **Shining angelica**

Angelica genuflexa Nutt. **Kneeling angelica** Infrequent; marshes and shrub swamps; flowers June-July

Cicuta douglasii (DC.) Coult & Rose. **Water hemlock** Common; bogs and pond margins; flowers in late May-June.

Heracleum lanatum Michx. **Cow parsnip** Common; moist woods and meadowsalong stream; flowers in late June-July.

Lomatium ambiguum (Nutt.) Coult. & Rose. **Swale desert parsley** Common; rock outcrops and open woodlands; flowers in May-early June, then again in August.

Osmorhiza chilensis H. & A. **Sweet cicely**

APOCYNACEAE Dogbane Family

Apocynum androsaemifolium L. var. adrosaemifolium **Dogbane** Common; dry, open forests; flowers in late June-July.

ARACEAE Arum or Calla-lily Family

Lysichitum americanum Hulten & St. John **Skunk cabbage** Common; saturated soils; deep shade to direct sunlight; forest clearings and open marshes; flowers in April-early June.

ARALIACEAE Gingseng Family

Oplopanax horridum (J. E. Smith) Miq. **Devil's club** Common; deep shade; moist, dense forests, often along river terraces; flowers in May-June.

ARISTOLOCHIACEAE Birthwort Family

Asarum caudatum Lindl. **Wild ginger** Common; deep shade; continuously moist seeps; flowers in May-June.

ASTERACEAE (COMPOSITAE) Sunflower Family

Achillea millefolium L. ssp. lanulosa (Nutt.) Piper var. lanulosa **Yarrow** Common; shallow soils; dry, open meadows and rock outcrops; flowers in May-July.

Adenocaulon bicolor Hook. **Trail plant** Common; filtered sunlight; moist forests; flowers in July-August.

Anaphalis margaritacea (L.) B. & H. **Pearly everlasting** Common; well-drained soils; gravel bars and rock outcrops; flowers in late June-July.

Antennaria neglecta Greene var. attenuata (Fern.) Cronq. **Pussytoes** Infrequent; dry, open forests on the south slope of Pumpkin Mountain; flowers in late May-June.

Antennaria neglecta Greene var. howellii (Greene) Cronq. **Pussytoes**

Arnica amplexicaulis Nutt. **Clasping arnica**

Arnica cordifolia Hook. var. cordifolia **Heart-leaf arnica** Infrequent; dry, open forests on the south slope of Pumpkin Mountain; flowers in late June-July.

Arnica latifolia Bong. var. latifolia **Broad-leaved arnica**

Artemisia michauxiana Bess. **Bicolored wormwood** Infrequent; rock outcrops and gravel bars; flowers in June.

Aster foliaceus Lindl. var. foliaceus **Leafy-bracted aster** Infrequent; moist meadows at head of Big Beaver Creek; flowers in mid August- September.

Aster modestus Lindl. **Great northern aster** Common; moist meadows and marshes; flowers in mid August-September.

Aster occidentalis (Nutt.) T. & G. var. intermedius Gray **Western aster**

Cirsium arvense (L.) Scop. var. horridum Wimm. & Grab **Canada thistle**

Cirsium edule Nutt. **Indian thistle** Infrequent; gravel and sand bars along Big Beaver Creek; flowers in June-July.

Eriophyllum lanatum (Pursh) Forbes var. lanatum **Woolly sunflower** Common; dry slopes, rock outcrops and gravel bars; flowers in June.

Hieracium albiflorum Hook. **White-flower hawkweed** Common; dry, open forests

Hieracium scouleri Hook. **Scouler's hawkweed**

Lactuca muralis (L.) Fresen. **Wall lettuce** Common; filtered sunlight; moist forests and gravel bars, often along trails and in campgrounds; flowers in July-August

Luina hypoleuca Benth. **Silver-back**

Senecio indecorus Greene **Rayless mountain butterweed** Rare; moist hummock in a marsh; flowers in late June-July.

Senecio macounii Greene **Puget butterweed** Infrequent; dry, forest margins; flowers in late June-July; 86-049 collected 5 July 1986, from the south slope of Pumpkin Mountain.

Taraxacum officinale Weber **Common dandelion** Infrequent; gravel bars; flowers in late May-August.

BERBERIDACEAE Barberry Family

Berberis aquifolium Pursh **Tall Oregon grape** Common; dry, open forests; flowers in late April-May.

Berberis nervosa Pursh **Long-leaved Oregon grape** Common; dry, open forests; flowers in late April-May.

Berberis repens Lindl. **Creeping Oregon grape**

BETULACEAE Birch Family

Alnus rubra Bong. **Red alder** Common; sandy soils; river terraces; flowers in April-early May.

Alnus sinuata (Regel) Rydb. **Thin-leaved alder** Common; moist north-facing slopes and avalanche tracks; flowers in April-early May.

Betula papyrifera Marsh. var. commutata (Regel) Fern. **Paper birch** Infrequent; moist forests; flowers in April-early May.

Corylus cornuta Marsh. var. californica (DC.) Sharp **Filbert** Infrequent; moist forests, often along river terraces; flowers in May.

BRASSICACEAE (CRUCIFERAE) Mustard Family

Arabis glabra L. Bernh. **Towermustard** Infrequent; gravel and sand bars along Big Beaver Creek; flowers in late May-June.

Arabis hirsuta (L.) Scop. var. glabrata T. & G. **Rock cress** Infrequent; gravel and sand bars; flowers in late May-June.

Arabis holboellii Hornem. var. retrofracta (Grah.) Rydb. **Holboell's rockcress** Rare; rock crevices; flowers in June-July.

Arabis lyrata L. var. kamchatica Fisch. **Lyre-leaved rockcress** Infrequent; gravel and sand bars; flowers in late May-June; 86-024 collected, 3 June 1986, from a gravel bar at confluence of Big Beaver and Thirty-nine Mile Creeks.

Athysanus pusillus (Hook.) Greene **Common sandweed** Rare; rock outcrops; flowers in May; 86-074 collected, 2 June 1986, from the south slope of Pumpkin Mt.

Barbarea orthoceras Ledeb. **Winter cress**

Capsella bursa-pastoris (L.) Medic. **Shepard's purse**

Cardamine pensylvanica Muhl. **Bitter cress** Common; gravel and sand; below the high water mark along Ross Lake; flowers in May-June.

Draba verna L. var. verna **Spring Whitlowgrass** Common; dry, sandy soils; campsites and trails in the vicinity of Big Beaver campground; flowers in March-April.

Rorippa curvisiliqua (Hook.) Bessey var. curvisiliqua **Western yellowcress** Common; gravel and sand; along Ross Lake; flowers in late May-June.

CAMPANULACEAE Harebell Family

Campanula rotundifolia L. **Harebell** Infrequent; gravel bars and creek canyons on south-facing slopes; flowers in July.

CAPRIFOLIACEAE Honeysuckle Family

Linnaea borealis L. var. longiflora Torr. **Twinflower** Common; filtered sunlight to deep shade; moist forests; flowers in June.

Lonicera ciliosa (Pursh) DC. **Orange honeysuckle** Common; forest openings; flowers in June.

Lonicera involucrata (Rich.) Banks ex Spreng. var. involucrata **Black twin-berry** Common; pond and stream margins; flowers in June.

Sambucus racemosa L. var. arborescens (T. & G.) ex Gray **Red elderberry** Common; moist forests, often along river terraces; flowers in May.

Symphoricarpos albus (L.) Blake var. laevigatus (Fern.) Blake **Snowberry**

Viburnum edule (Michx.) Raf. **Squashberry** Common; pond and stream margins; flowers in June.

CARYOPHYLLACEAE Pink Family

Arenaria macrophylla Hook. **Large-leaved sandwort** Common; dry forests and rock outcrops; flowers in late May-June.

Arenaria rubella (Wahlenb.) J. E. Smith **Reddish sandwort** Infrequent; well-drained soils; gravel bars and rock crevices; flowers in June-July.

Cerastium arvense L. **Mouse-ear chickweed** Common; well-drained soils; rock outcrops and gravel bars; flowers in May-early June.

Cerastium viscosum L. **Sticky chickweed** Common; gravel and sand; along Ross Lake, infootpaths, and campgrounds; flowers in May-June.

Cerastium vulgatum L. **Common chickweed** Infrequent; gravel and sand bars; flowers in May-Sept.

Sagina procumbens L. **Procumbent pearlwort** Infrequent; disturbed ground; gravel and sand bars, trails, and campsites; flowers in June-July.

Silene douglasii Hook. **Catchfly**

Stellaria calycantha (Ledeb.) Bong. var. bongardiana Fern. **Northern starwort** Infrequent; pond margins; flowers in June.

Stellaria crispa Cham. & Schlecht. **Crisped starwort** Infrequent; seeps; flowers in late May-June.

Stellaria nitens Nutt. **Shining chickweed** Infrequent; rock outcrops; flowers in April; 86-08 collected from a rock outcrop ca. 1 1/2 km west of Ross Lake.

CELASTRACEAE Staff-tree Family

Pachistima myrsinites (Pursh) Raf. **Mountain box** Common; dry, open forests; flowers in June.

CORNACEAE Dogwood Family

Cornus canadensis L. **Bunchberry** Common; deep shade to filtered sunlight; moist forests; flowers in late May-June.

Cornus stolonifera Michx. var. occidentalis (T. & G.) C. L. Hitchc. **Creek dogwood** Common; stream and pond margins; flowers in May.

CRASSULACEAE Stonecrop Family

Sedum lanceolatum Torr. var. lanceolatum **Narrow-leaved stonecrop**

Sedum lanceolatum Torr. var. rupicolum (Jones) Hitchc. **Narrow-leaved stonecrop** Infrequent; dry forest openings; flowers in June.

Sedum oreganum Nutt. **Oregon stonecrop** Common; shallow, well-drained soils; gravel bars, rock outcrops, and dry slopes; flowers June-July.

CUPRESSACEAE Cypress Family

Chamaecyparis nootkatensis (D. Don) Spach **Alaska cedar**

Juniperus communis L. var. montana Ait. **Common juniper**

Juniperus scopulorum Sarg. **Rocky Mountain juniper** Rare and restricted; forest openings on the south slope of Pumpkin Mountain.

Thuja plicata Donn. **Western redcedar** Common; forested valley bottom and lower slopes.

CYPERACEAE Sedge Family

Carex brunnescens (Pers.) Poir. **Brownish sedge** Common; pond margins and sphagnum bogs; flowers in June; 86-017 collected from a pond ca. 1 1/2 km west of Ross Lake; 86-021 collected from a sphagnum bog ca. 3/4 km east of Thirty-nine Mile Creek; 86-033

Carex buxbaumii Wahl. **Buxbaum's sedge** Infrequent; pond margins; flowers in June; 86-014 collected from a side channel of Big Beaver creek ca. 1 1/2 km west of Ross Lake.

Carex canescens L. **Gray sedge** Common; pond margins and sphagnum bogs; flowers in June; 86-010 collected from a pond ca. 1 1/2 km west of Ross Lake; 86-018 collected from a marsh ca. 1 1/2 km west of Ross Lake; 86-029 and 86-037 collected from a sphagnum bog ca. 3/4 km east of Thirty-nine Mile Creek

Carex cusickii Mack. **Cusick's sedge** Locally Common; pond margins and marshes; flowers in June; 86-035 collected from a marsh ca. 3/4 km east of Thirty-nine Mile Creek.

Carex deweyana Schw. **Dewey's sedge** Common; moist woods; flowers in June.

Carex diandra Schrank **Lesser panicled sedge** Infrequent; moist meadows, marshes; flowers in June; 86-026 collected from a marsh ca. 3/4 km east of Thirty-nine Mile Creek.

Carex disperma Dewey **Soft-leaved sedge** Infrequent; emergent in pond margins and sphagnum bogs; flowers in late May-June; 86-039 collected from a sphagnum bog ca. 3/4 km east of Thirty-nine Mile Creek.

Carex hoodii Boott. **Hood's sedge** Infrequent; dry, open forests; flowers in late May-June; 86-018 collected from the south slope of Pumpkin Mountain.

Carex laeviculmis Meinsh. **Smooth stem sedge** Infrequent and local; moist meadows; flowers in July; 86-076 collected from a meadow ca. 1 km east of McMillan Creek.

Carex lasiocarpa Ehrh. var. americana Fern. **Slender sedge** Infrequent and local; emergent, pond margins; flowers in June; 86-054 collected from a pond 1 1/2 km east of Ross Lake.

Carex lenticularis Michx. var. lenticularis **Sedge** Common and widespread; along shore of Ross Lake and margins of ponds; flowers in late May-June; 86-026 collected along Ross Lake.

Carex leptalea Wahl. **Bristle stalked sedge** Infrequent; pond margins; flowers in late June-July; 86-032 collected from a sphagnum bog ca. 3/4 km east of Thirty-nine Mile Creek.

Carex limnophila Hermann **Pond sedge** Rare and restricted to a moist meadow; flowers in July; 86-075 collected ca. 1 km east of McMillan Creek.

Carex limosa L. **Mud sedge** Common; emergent pond margins; flowers in July; 86-011 collected ca. 1 1/2 km west of Ross Lake; 86-036 collected from a sphagnum bog ca. 3/4 km east of Thirty-nine Mile Creek.

Carex mertensii Prescott **Merten's sedge** Common; gravel and sand bars; flowers in June; 86-025 collected from a gravel bar at the confluence of Big Beaver and Thirty-nine Mile Creeks.

Carex muricata L. **Sedge** Locally common; pond margins; flowers in June; 86-075 collected from a spaghnum bog ca. 3/4 km east of Thirty-nine Mile Creek.

Carex nigricans Retz. **Black alpine sedge** Locally common; moist meadow; flowers in late July-August.

Carex pachystachya Cham. **Thickheaded sedge** Rare; gravel bars along Big Beaver Creek; flowers in May-June.

Carex paupercula Michx. **Poor sedge** Rare and restricted; moist meadows and gravel bars; flowers in June.

Carex pensylvanica Lam. var. vespertina L. H. Bailey **Long-stolon sedge** Locally common; seasonally moist seeps and meadows; flowers in June; 86-04 collected from the south slope of Pumpkin Mountain.

Carex phyllomanica W. Boott **Coastal stellate sedge** Common; pond margins and sphagnum bogs; flowers in late May-June; 86-030 collected from a sphagnum bog ca. 3/4 km east of Thirty-nine Mile Creek.

Carex pluriflora Hulten **Several flowered sedge** Locally common; moist meadows; flowers in July; 86-068 collected from meadow ca. 1 km east of McMillan Creek.

Carex rossii Boott **Ross's sedge** Locally common; sandy, well- drained soils; forest openings; flowers in late May-June; 86-05, 86-015, and 86-020 collected from the south slope of Pumpkin Mountain; 86-012 collected near Big Beaver Campground.

Carex rostrata Stokes **Beaked sedge** Common and widespread; marshes and pond margins; flowers in June.

Carex sitchensis Prescott **Sitka sedge** Common; marshes and pond margins throughout Big Beaver Valley and along Ross Lake; flowers in late May-June; 86-013 collected along Ross Lake.

Carex spectabilis Dewey **Showy sedge** Infrequent; moist meadows; flowers in late July-early August; 86-071, 86-072, and 86-073 collected from a meadow ca. 1 km east of McMillan Creek.

Carex vesicaria L. var vesicaria **Inflated sedge** Common and widespread; marshes, pond margins, and along Ross Lake; flowers in late May-June.

Dulichium arundinaceum (L.) Britt. **Three-way sedge** Common and widespread throughout Big Beaver Valley; marshes and pond margins, often in standing water; flowers in late June-July.

Eleocharis palustris (L.) R. & S. **Common spikerush** Locally infrequent; emergent pond margins; flowers in late June-July; 86-055 collected from a pond ca. 1 1/2 km west of Ross Lake.

Eriophorum gracile Koch **Slender cotton grass** Common; bogs and pond margins; flowers in late May-June; 86-027 collected from a sphagnum bog 3/4 km east of Thirty-nine Mile Creek.

Eriophorum polystachion L. **Cotton grass** Common; pond margins; flowers in late May-June.

Rhynchospora alba (L.) Vahl **White beakrush** Locally common; marshes and sphagnum bogs; flowers in July-August; 86-059 collected from a sphagnum bog ca. 1/2 km east of Thirty-nine Mile Creek.

Scirpus microcarpus Presl **Bulrush** Common; pond margins; flowers in late May-June.

DROSERACEAE Sundew Family

Drosera rotundifolia L. **Sundew** Locally common; sphagnum bogs; flowers in late May-June.

ELAEAGNACEAE Oleaster Family

Shepherdia canadensis (L.) Nutt. **Buffalo berry**

EQUISETACEAE Horsetail Family

Equisetum arvense L. **Common horsetail** Common; moist woods and pond margins.

Equisetum hyemale L. var. affine (Engelm.) A. A. Eat. **Common scouring rush** Common; sandy soils in moist woods.

Equisetum fluviatile L. **Water horsetail** Common and widespread; pond margins; 86-010 collected from a pond ca. 1 1/2 km west of Ross Lake; 86-034 collected from a sphagnum bog ca. 3/4 km east of Thirty-nine Mile Creek.

ERICACEAE Heath Family

Allotropa virgata T. & G. ex Gray **Sugarstick** Rare; dry, south-facing, forested slopes; flowers in May-June.

Arctostaphylos uva-ursi (L.) Spreng. **Kinnikinnick** Common; dry, open forests; flowers in May-early June.

Chimaphila menziesii (Br.) Spreng. **Little prince's pine**

Chimaphila umbellata (L.) Bart. var. occidentalis (Rydb.) Blake **Pipsissewa**

Gaultheria ovatifolia Gray **Oregon wintergreen** Common; dry, open woodlands; flowers in June.

Gaultheria shallon Pursh **Salal** Common; dry forests; flowers in June.

Hemitomes congestum Gray **Gnome plant**

Hypopitys monotropa Crantz **American pinesap** Rare; forested slopes on the south side of the valley; flowers in late June-July.

Kalmia microphylla (Hook.) Heller **Alpine laurel** Infrequent and restricted; growing associated with Sphagnum and other characteristic bog plants; flowers in late July-August.

Menziesia ferruginea Smith var. ferruginea **Fool's huckleberry** Common; pond margins and moist forests; flowers in June.

Monotropa uniflora L. **Indian pipe** Rare; mature western hemlock/Douglas fir forest; flowers in July-August.

Phyllodoce empetriformis (Sw.) D. Don **Red mountain-heather** Rare; hummocks in bogs in the west half of the valley; flowers in July.

Phyllodoce glanduliflora (Hook.) Cov. **Yellow mountain-heather** Rare; marsh/talus ecotone; flowers in June.

Pterospora andromedea Nutt. **Pinedrops** Rare; mesic forests; flowers May--June.

Pyrola aphylla Smith **Leafless pyrola**

Pyrola asarifolia Michx. var. asarifolia **Large pyrola** Common; moist forests; flowers June-July.

Pyrola asarifolia Michx. var. purpurea (Bunge) Fern. **Large pyrola** Common; moist forests; flowers June-July.

Pyrola chlorantha Sw. **Greenish pyrola**

Pyrola dentata Smith **Toothed pyrola**

Pyrola picta Smith **White-veined pyrola** Infrequent; marshes and sphagnum bogs; flowers in late June-July.

Pyrola secunda L. var. secunda **One-sided wintergreen** Infrequent; dry forested slopes; flowers in July.

Vaccinium alaskaense Howell **Blueberry** Common and widespread; deep shade to filtered sunlight; moist, closed forests; flowers in May.

Vaccinium membranaceum Dougl. ex Hook. **Mountain huckleberry**
Common and widespread; deep shade to filtered sunlight; moist, closed forests; flowers in May.

Vaccinium ovalifolium Smith **Early huckleberry** Common and Widespread; deep shade to filtered sunlight; moist, closed forests; flowers in May.

Vaccinium parvifolium Smith **Red huckleberry** Common; filtered sunlight, open forests; flowers in May-June.

Vaccinium scoparium Leiberg **Grouseberry** Infrequent; filtered sunlight; dry, open forests; flowers in May.

FABACEAE (LEGUMINOSAE) Pea Family

Lupinus latifolius Agardh var. latifolius **Broad-leaved lupine** Infrequent; gravel bars and moist meadows; flowers in June.

Trifolium repens L. **White clover** Common; disturbed areas; flowers in May-August.

FUMARIACEAE Fumitory Family

Dicentra formosa (Andr.) Walpers **Bleeding heart** Common; deep shade to filtered sunlight; moist woods; flowers in May.

GROSSULARIACEAE Currant or Gooseberry Family

Ribes bracteosum Dougl. **Stink currant** Common; moist sandy soils especially stream terraces; flowers in late April-May.

Ribes lacustre (Pers.) Poir. **Swamp gooseberry** Common; moist woods; flowers in late April-May.

Ribes laxiflorum Pursh **Coast trailing currant** Infrequent; moist forests; flowers in late April-May.

Ribes sanguineum Pursh **Red flowering currant** Infrequent; filtered sunlight; forest openings; flowers in late April-May.

Ribes triste Pall. **Western red currant**

HIPPURIDACEAE Mares's-tail Family

Hippuris vulgaris L. **Common mare's-tail** Infrequent; marshes and shallow ponds; flowers in June.

HYDRANGEACEAE Hydrangea Family

Philadelphus lewisii Pursh **Mock orange** Locally common; dry, forest openings; flowers in late June-July.

HYDROCHARITACEAE Frog's-bit Family

Vallisneria americana Michx. Infrequent;ponds in the western half of the valley.

HYDROPHYLLACEAE Waterleaf Family

Hydrophyllum tenuipes Heller **Pacific waterleaf** Common; deep shade to filtered sunlight; moist forests; flowers in May.

Phacelia hastata Dougl. var. leptosepala (Rydb.) Cronq. **Silverleaf phacelia** Common; sand and gravel bars along Big Beaver Creek; flowers in June.

Phacelia heterophylla Pursh var. heterophylla **Varied-leaved phacelia**

Romanzoffia sitchensis Bong. **Sitka romanzoffia** Infrequent; gravel bars and creek canyons; flowers in June-July.

HYPERICACEAE St. John's-wort Family

Hypericum anagalloides C. &S. **Bog St. John's-wort** Restricted and infrequent; bogs; flowers May-June.

JUNCACEAE

Juncus articulatus L. **Jointed rush** Infrequent and local; emergent pond margins; flowers in July; 86-052 collected from a pond ca. 1 1/2 km west of Ross Lake.

Juncus ensifolius Wikst. var. ensifolius **Dagger-leaf rush** Common; pond margins; flowers in June.

Juncus filiformis L. **Threadrush** Rare; emergent around Ross Lake and pond margins; flowers in June; 86-057 collected from a pond ca. 1 1/2 km west of Ross Lake.

Juncus mertensianus Bong. **Merten's rush** Infrequent; well-drained soils; gravel bars and moist meadows; flowers in August; 86-070 collected from a meadow ca. 1 km west of McMillan Creek.

Juncus parryi Engelm. **Parry's rush** Rare; streamside shrub thicket; flowers in May-June.

Juncus tenuis Willd. **Slender rush** Infrequent; marshes and moist areas along Big Beaver Trail; flowers in June-July.

Luzula campestris (L.) DC. var. multiflora (Ehrh.) Celak. **Field woodrush** Infrequent; dry, open slopes and rock outcrops; flowers in June.

Luzula parviflora (Ehrh.) Desv. **Smallflowered woodrush** Infrequent; moist woods; flowers in May.

LAMIACEAE (LABIATEAE) Mint Family

Lycopus uniflorus Michx. **Northern bugleweed** Infrequent; moss-covered decaying logs in marshes; flowers in late July-early August; 86-060 collected from a sphagnum bog ca. 1/2 km west of Thirty-nine mile creek.

Mentha arvensis L. var. glabrata (Benth.) Fern. **Field mint**

Prunella vulgaris L. var. lanceolata (Barton) Fern. **Self-heal** Infrequent; gravel bars; flowers in June-July.

LENTIBULARIACEAE Bladderwort Family

Pinguicula vulgaris L. **Butterwort**

Utricularia vulgaris L. **Bladderwort** Common, submerged in ponds; flowers in late June-July.

LILIACEAE Lily Family

Allium cernuum Roth **Nodding onion** Common; seasonally moist meadows and rock outcrops; flowers in April-early May.

Clintonia uniflora (Schult.) Kunth **Queen's cup** Common and widespread; moist, closed forests; flowers in June.

Disporum hookeri (Torr.) Nicholson var. oreganum (Wats.) Jones **Fairy bell** Common; moist forests; flowers in June.

Disporum smithii (Hook.) Piper **Fairy lantern**

Erythronium grandiflorum Pursh var. grandiflorum **Dogtooth violet** Common; rock outcrops; flowers May-June.

Fritillaria lanceolata Pursh **Checker lily** Common; rock outcrops; flowers in late April-May.

Lilium columbianum Hanson **Tiger lily** Common; forest margins; flowers in flowers in May-June.

Maianthemum dilatatum (Wood) Nels. & Macbr. **False lily-of-the-valley** Infrequent; Red alder forest adjacent to Big Beaver Creek; flowers in May.

Smilacina racemosa (L.) Desf. **False Solomon's seal** Common; moist woods; flowers in late May-June.

Smilacina stellata (L.) Desf. **Star-flowered Solomon's seal** Common and widespread; moist, closed forests; flowers in May.

Stenanthium occidentale Gray **Western stenanthium** Infrequent; seeps and creek banks in forest; flower in June.

Streptopus amplexifolius (L.) DC. var. americanus Schult. **Twisted stalk** Common; moist woodlands; flowers in May-early June.

Streptopus roseus Michx. var. curvipes (Vail) Fassett **Twisted stalk** Common; moist woodlands; flowers in May-early June.

Streptopus streptopoides (Ledeb.) Frye & Rigg var. brevipes (Baker) Fassett **Twisted stalk**

Tofieldia glutinosa (Michx.) Pers. var. brevistyla (Hitchc.) Hitchc. **Tofieldia** Common; bogs and pond margins; flowers in June.

Trillium ovatum Pursh **Trillium** Common; moist woods; flowers in late April-May.

Veratrum viride Ait. **False hellebore** Rare; red alder swamp; flowers in July-August.

Zigadenus venenosus Wats. var. venenosus **Death camas** Common; meadows and rock outcrops; flowers in late April-May.

LYCOPODIACEAE Clubmoss Family

Lycopodium annotinum L. **Stiff clubmoss** Common; moist closed forests.

Lycopodium clavatum L. **Ground pine** Common; moist forests.

Lycopodium complanatum L. **Ground cedar** Rare; growing in in deep shade on boulders associated with Lycopodium dendroideum.

Lycopodium dendroideum Michx. (L. obscurum L.) **Treelike clubmoss** Rare; deep shade; moist forests and pond margins; fertile August-September; 86-047 collected ca. 1 1/2 km west of Ross Lake.

Lycopodium inundatum L. **Bog clubmoss** Rare and restricted; fertile August through September.

Lycopodium selago L. **Fir clubmoss** Common; moist closed forests generally on moss-covered boulders.

MENYANTHACEAE Buckbean Family

Menyanthes trifoliata L. **Buck bean** Common and widespread; emergent, margins of ponds; flowers in May-early June.

NYMPHAEACEAE Water-lily Family

Nuphar polysepalum Engelm. **Yellow water lily** Common; ponds; flowers June-July.

ONAGRACEAE Evening-primrose Family

Circaea alpina L. **Enchanter's nightshade** Common; moist closed forests; flowers in late May-June.

Epilobium alpinum L. var. alpinum **Alpine willowherb**

Epilobium alpinum L. var. lactiflorum (Hausskn.) C. L. Hitchc. **Alpine willowherb**

Epilobium angustifolium L. **Fireweed** Common; gravel bars; flowers in June-August.

Epilobium glaberrimum Barbey **Smooth willowherb**

Epilobium latifolium L. **Broad-leaved willowherb** Common; gravel bars; flowers June-July.

Epilobium minutum Lindl. ex Hook. **Small-flowered willowherb**

Common; rock outcrops; flowers in June-July.

Epilobium watsonii Barbey var. occidentale (Trel.) C. L. Hitchc. **Western willowherb**

OPHIOGLOSSACEAE Adder's-tongue Family

Botrychium multifidum (Gmel.) Trevis. **Leathery grapefern** Infrequent; deep shade; marshes and shrub thickets; fertile July-August.

Botrychium virginianum (L.) Swartz **Grapefern** Infrequent; deep shade; moist forests; fertile late July-August.

ORCHIDACEAE Orchid Family

Calypso bulbosa (L.) Oakes **Fairy slipper** Common; old growth Douglas fir forests; flowers in May-early June.

Corallorhiza maculata Raf. **Spotted coral root** Infrequent; deep shade in forests; flowers in June.

Corallorhiza mertensiana Bong. **Western coral root**

Goodyera oblongifolia Raf. **Rattlesnake plantain** Common; forests; flowers in June-July.

Habenaria dilatata (Pursh) Hook. var. dilatata **Boreal bog orchid** Common; bogs and ponds margins; flowers in June.

Habenaria dilatata (Pursh) Hook. var. leucostachys (Lindl.) Ames **Boreal bog orchid** Common; bogs and pond margins; flowers in June.

Habenaria elegans (Lindl.) Boland. **Elegant rein orchid** Infrequent; rock outcrops; flowers in late July-August.

Habenaria hyperborea (L.) R. Br. **Green flowered bog orchid**

Habenaria orbiculata (Pursh) Torr. **Green flowered rein orchid** Infrequent; mature douglasfir forests; flowers July-August.

Habenaria saccata Greene **Slender bog orchid** Common; saturated soils; seeps along trail and pond margins; flowers in June.

Listera caurina Piper **Western twayblade** Common; deep shade; moist, closed forests; flowers in late May-June.

Listera cordata (L.) R. Br. **Heart leaved twayblade** Common; deep shade; moist, closed forests; flowers in late May-June.

Spiranthes romanzoffiana Cham. var. romanzoffiana **Ladies' tresses** Common; sphagnum bogs and rock outcrops; flowers in July-August.

OROBANCHACEAE Broomrape Family

Orobanche uniflora L. var. minuta (Suksd.) Beck **Naked broomrape** Rare; parasitizing Eriophyllum lanatum; rock outcrop on the south slope of Pumpkin Mountain; flowers in July-August.

PINACEAE Pine Family

Abies lasiocarpa (Hook.) Nutt. **Subalpine fir** Rare and restricted; sphagnum bogs near the confluence of Big Beaver and McMillan Creeks.

Abies amabilis (Dougl.) Forbes **Pacific silver fir** Common; moist forests.

Abies grandis (Dougl.) Forbes **Grand fir** Infrequent; moist forest margins, adjacent to ponds.

Pinus contorta Dougl. ex Loud. var. latifolia Engelm. **Lodgepole pine** Common; dry, forested slopes, especially where frequently burned.

Pinus monticola Dougl. ex D. Don **Western white pine** Infrequent; open forests.

Pseudotsuga menziesii (Mirbel) Franco var. menziesii **Douglas fir** Common and widespread; forests.

Tsuga heterophylla (Raf.) Sarg. **Western hemlock** Common and widespread; forests.

Tsuga mertensiana (Bong.) Carr. **Mountain hemlock**

PLANTAGINACEAE Plantain Family

Plantago lanceolata L. English plantain

POACEAE (GRAMINEAE) Grass Family

Agropyron spicatum (Pursh.) Scribn. & Smith var. spicatum **Bluebunch wheatgrass** Common; shallow soils; rock outcrops and forest openings; flowers in May-June; 86-047 collected from the south slope of Pumpkin Mountain.

Agrostis exarata Trin. var. exarata **Spike bentgrass**

Agrostis scabra Willd. **Rough bentgrass** Common; seasonally moist rock outcrops; flowers in late June-early July; 86-041 collected from the south slope of Pumpkin Mountain, 86-074 collected from a meadow ca. 1 km east of McMillan Creek.

Agrostis thurberiana Hitchc. **Thurber bentgrass** Common; seasonally moist rock outcrops; flowers in late June-early July; 86-053 collected from a pond ca. 1 1/12 km west of Ross Lake.

Aira caryophyllea L. **Silver hairgrass** Common; sandy, well-drained soils; disturbed ground adjacent trails and campsites; flowers in May; 86-011 collected near Big Beaver Campground.

Alopecurus aequalis Sobol. **Shortawn foxtail** Common; sand and gravel; below the high water line along Ross Lake; flowers in May-early June; 86-02 collected near Big Beaver Campground.

Bromus pacificus Shear **Pacific brome** Infrequent; gravel and sand bars; flowers in late June-July; 86-023 collected from a gravel bar at the confluence of Big Beaver and Thirty-nine Mile Creeks.

Calamagrostis canadensis (Michx.) Beauv. var. acuminata Vasey **Bluejoint reedgrass** Infrequent; moist meadows; flowers in late June-early July; 86-031 collected from the south slope of Pumpkin mountain, 86-066 collected from a wet meadow ca. 3/4 km east of Thirty-nine Mile Creek; 86-077 collected from a moist meadow ca. 1 km east of McMillan Creek.

Calamagrostis rubescens Buckl. **Pine grass** Locally common; shallow, well-drained soils; rock outcrops and forest openings; 86-045 collected from the south slope of Pumpkin Mountain.

Danthonia intermedia Vasey **Timber oatgrass** Infrequent; shallow, well-drained soils; rock outcrops; flowers in late June-July; 86-046 collected from the south slope of Pumpkin Mountain.

Danthonia californica Boland. **California oatgrass** Common; shallow, well drained soils; rock outcrops; flowers in late June-July; 86-043 collected from the south slope of Pumpkin Mountain; 86-062 collected from a meadow ca. 1 km east of McMillan Creek.

Deschampsia atropurpurea (Wahl.) Scheele var. latifolia (Hook.) Scribn. Infrequent; moist meadows; flowers in July; 86-065 collected from a meadow ca. 1 km east of McMillan Creek.

Deschampsia elongata (Hook.) Munro **Slender hairgrass**

Elymus glaucus Buckl. var. glaucus **Wild ryegrass** Infrequent; shallow, well-drained soils; dry, forested slopes and rock outcrops; flowers in July; 86-050 collected from the south slope of Pumpkin Mountain.

Festuca occidentalis Hook. **Western fescue** Common; dry, open woodlands; flowers in late May-June; 86-019 and 86-044 collected from the south slope of Pumpkin Mountain.

Festuca octoflora Walt. var. octoflora **Slender fescue** Common; shallow, well-drained soils; rock outcrops and disturbed ground adjacent trails and campsites; flowers in May, ripened fruits in June; 86-01 collected near Big Beaver campground; 86-03 and 86-042 collected from the south slope of Pumpkin Mountain.

Glyceria elata (Nash) M. E. Jones **Fowl mannagrass** Common; marshes and swamps; flowers in July; 86-026 collected along Big Beaver trail ca. 1 1/2 km west of Thirty-nine Mile Creek.

Hordeum brachyantherum Nevski. **Meadow barley** Infrequent; gravel bars; flowers July-August.

Phleum alpinum L. **Alpine timothy** Infrequent; moist meadows having late snow release and gravel bars; flowers in late July-August; 86-064 collected from a meadow ca. 1 km east of McMillan Creek.

Poa annua L. **Annual bluegrass** Common; sandy, well-drained soils, especially where disturbed; flowers in May-June; 86-013 collected from trail near Big Beaver Campground.

Poa bulbosa L. **Bulbous bluegrass** Locally common; dry, forest openings; especially where disturbed; reproduces asexually by bulblets; 86-039 collected at Big Beaver Campground.

Poa pratensis L. **Kentucky bluegrass** Infrequent; sand and gravel bars; flowers in June; 86-022 collected from a gravel bar at the confluence of Big Beaver and Thirty-nine Mile Creeks.

Poa sandbergii Vasey **Sandberg's bluegrass** Common; seasonally moist rock outcrops; flowers in June; 86-040 collected from the south slope of Pumpkin Mountain, 86-063 collected from a meadow ca. 1 km east of McMillan Creek.

Puccinellia pauciflora (Presl) Munz **Weak alkaligrass** Infrequent; marshes and shrub swamps; flowers in June-July.

Trisetum cernuum Trin. **Nodding trisetum** Common; moist forests; flowers in late June-July.

POLEMONIACEAE Phlox Family

Collomia heterophylla Hook. **Varied-leaved collomia** Infrequent; shallow sandy soils and rock outcrops; flowers in May-early June; 86-07 collected from a rock outcrop ca. 1 1/2 km west of Ross Lake.

Microsteris gracilis (Hook.) Greene var. gracilis **Microsteris** Common; shallow sandy soils and rock outcrops; flowers in May-early June.

Microsteris gracilis (Hook.) Greene var. humilior (Hook.) Cronq. **Microsteris** Infrequent; south-facing rock outcrops; flowers in June-July.

POLYGONACEAE Buckwheat Family

Oxyria digyna (L.) Hill **Mountain sorrel** Infrequent; gravel bars and in south-facing creek canyons, also locally abundant below a permanent snowfield on the south valley wall; flowers in July-August.

Polygonum douglasii Greene var. douglasii **Douglas' knotweed**

Polygonum douglasii Greene var. latifolium (Engelm.) Greene **Douglas' knotweed**

Polygonum minimum Wats. **Leafy knotweed**

Polygonum nuttallii Small **Nuttall's knotweed** Common; rock outcrops and dry, open forest; flowers in July-August.

Polygonum persicaria L. **Spotted ladysthumb** Common; gravel along shore of Ross Lake below high water; flowers in late May-June.

Polygonum phytolaccaefolium Meisn. ex Small **Limson knotweed**

Rumex acetosella L. **Sheep sorrel** Common; along trails, campgrounds and sand and gravel bars; flowers in late May-June.

POLYPODIACEAE Polypody or Common Fern Family

Adiantum pedatum L. **Maidenhair fern** Common; moist, deep forests generally along streams.

Aspidotis densa (Brackenr.) Lellinger **Podfern** Common; dry, exposed rock outcrops.

Athyrium distentifolium Tausch ex Opix var. americanum (Butters) Cronq. **Alpine lady fern** Locally common; moist meadow having late snow release; spore released late August-September.

Athyrium filix-femina (L.) Roth **Lady fern** Common and widespread; in open sunlight to deep shade where moist.

Asplenium trichomanes L. **Maidenhair spleenwort** Rare; in rock crevice.

Blechnum spicant (L.) Roth. **Deer fern** Common; filtered sunlight, moist woods.

Cryptogramma crispa (L.) R. Br. var. acrostichoides R Br. Clarke **Parsley fern** Common; rock outcrops, talus, and boulders.

Cystopteris fragilis (L.) Bernh. **Bladder fern** Common; moist rock crevices.

Dryopteris expansa (Presl.) Fraser-Jenkins & Jermy [= Dryopteris austriaca (Jacq.) Woynar] **Wood-fern** Common and widespread; rotten stumps in deep woods, margins of ponds, and bogs.

Dryopteris filix-mas (L.) Schott **Male fern** Common; moist deep woods often along streams.

Gymnocarpium dryopteris (L.) Newm. **Oak fern** Common and widespread; filtered sunlight, moist woods.

Polypodium glycyrrhiza D.C. Eat. **Licorice fern** Infrequent; in shade rock outcrops.

Polypodium hesperium Maxon **Licorice fern** Infrequent; in shade dry, rock outcrops.

Polystichum andersonii Hopkins **Anderson's shield fern** Common; in filtered sunlight, deep moist woods.

Polystichum lonchitis (L.) Roth **Holly fern** Infrequent; deep shade closed forests.

Polystichum munitum (Kaulf.) Presl var. munitum **Sword-fern** Common and widespread; forests.

Polystichum munitum (Kaulf.) Presl var. imbricans (D. C. Eat.) Maxon **Imbricate sword-fern** Locally common; rock crevices on open, south-facing slopes.

Pteridium aquilinum (L.) Kuhn var. pubescens Underw. **Bracken fern** Common and widespread; dry, open woods and meadows.

Woodsia scopulina D. C. Eat. **Rocky Mountain woodsia** Locally common; dry, rock crevices.

PORTULACACEAE Purslane Family

Montia parvifolia (Moc.) Greene var. parvifolia **Streambank spring beauty** Common; dry, rock outcrops; flowers in May.

Montia perfoliata (Donn) Howell **Miner's lettuce** Common; gravel along Ross Lake; flowers in May.

Montia sibirica (L.) Howell var. sibirica **Western spring beauty** Common; moist woods; flowers in May.

POTAMOGETONACEAE Pondweed Family

Potamogeton natans L. **Common floating pondweed** Common; ponds; flowers in June-July; 86-056 collected from a pond ca. 1 1/2 km west of Ross Lake.

Potamogeton illinoensis Morong **Illinois pondweed** Infrequent; submergent to emergent in open, standing water; flowers in July; 86-058 collected from a pond ca. 1 1/2 km west of Ross Lake.

PRIMULACEAE Primrose Family

Trientalis arctica Fisch. ex Hook. **Northern star-flower** Common; bogs and pond margins; flowers in May.

Trientalis latifolia Hook. **Broad-leaved star-flower** Common; moist woods; flowers in May.

RANUNCULACEAE Buttercup Family

Actaea rubra (Ait.) Willd. **Baneberry** Common; moist woods; flowers in May.

Anemone lyallii Britt. **Windflower** Rare; on moss-covered boulders in a forest opening; flowers in May.

Aquilegia formosa Fisch. **Columbine** Common; sand and gravel bars along forested streams; flowers in late May-June.

Delphinium nutallianum Pritz. var. nuttallianum **Upland larkspur** Infrequent; steep, dry, rock outcrops where moist early in season; flowers in late May-June.

Ranunculus aquatilis L. var. capillaceus (Thuill.) DC. **Water buttercup** Infrequent; submerged to emergent aquatic in ponds; flowers in May.

Ranunculus flammula L. **Creeping buttercup** Common; in mud and gravel along the shore of Ross Lake, also submerged in ponds; flowers in late May-early June.

Ranunculus macounii Britt. var. macounii **Macoun's buttercup**

Ranunculus uncinatus D. Don var. parviflorus (Torr.) Benson **Little buttercup** Common; moist woods; flowers in June.

Thalictrum occidentale Gray **Meadow rue** Common; moist woods and along streams; flowers in late May-June.

RHAMNACEAE Buckthorn Family

Ceanothus sanguineus Pursh **Buckthorn** Infrequent; open woods; flowers in June.

Ceanothus velutinus Dougl. ex Hook. var. laevigatus (Hook.) T. & G. **Sticky laurel** Infrequent; open woods; flowers in June.

Rhamnus purshiana DC. **Cascara** Infrequent; forest margins, swamps, and bogs; flowers in May.

ROSACEAE Rose Family

Amelanchier alnifolia Nutt. var. semiintegrifolia (Hook.) C. L. Hitchc. **Serviceberry** Common; open woods; flowers in May.

Aruncus sylvester Kostel. **Goatsbeard** Common; moist woods often along streams; flowers in June.

Fragaria virginiana Duchesne var. platypetala (Rydb.) Hall **Strawberry** Common; open woods and meadows; flowers in May.

Geum macrophyllum Willd. var. macrophyllum **Large-leaved avens** Common; moist woods; flowers in June.

Holodiscus discolor (Pursh) Maxim. **Ocean spray** Common; open woods, flowers in May.

Physocarpus capitatus (Pursh) Kuntze **Ninebark** Common; stream and pond margins; flowers in June.

Potentilla glandulosa Lindl. var. glandulosa **Sticky cinquefoil** Common; sand and gravel bars and rock outcrops; flowers in late May-June.

Potentilla palustris (L.) Scop. **Marsh cinquefoil** Common; bogs and pond margins; flowers in June.

Prunus emarginata (Dougl.) Walper var. emarginata **Bitter cherry** Common; forest openings; flowers in late April-May.

Pyrus fusca Raf. **Western crabapple** Common; wetlands and streamside thickets; flowers in June.

Rosa gymnocarpa Nutt. **Little wild rose** Common; open woods; flowers in May-June.

Rosa nutkana Presl var. nutkana **Nootka rose** Infrequent; open woods swamps, and shrub thickets; flowers in May.

Rubus idaeus L. var. gracilipes Jones **Red raspberry** Common; talus and boulders; flowers in May.

Rubus leucodermis Dougl. ex T. & G. **Black raspberry** Common; dry, open forests and gravel bars; flowers in May.

Rubus parviflorus Nutt. **Thimbleberry** Common; moist woods often streamside; flowers in late May-June.

Rubus pedatus J. E. Smith **Strawberry dwarf bramble** Common; moist woods; flowers in late May-June.

Rubus spectabilis Pursh **Salmonberry** Common, moist woods often streamside; flowers in May.

Rubus ursinus Cham. & Schlecht. var. macropetalus (Dougl.) Brown **Pacific blackberry** Common; forest openings; flowers in July.

Sanguisorba sitchensis C. A. Meyer **Broad-leaved burnet** Rare; pond margins; flowers in late July-August.

Sorbus sitchensis Roemer var. sitchensis **Western mountain ash**

Spiraea betulifolia Pall var. lucida (Dougl.) Hitchc. **White spiraea** Infrequent; dry, forest and rock outcops; flowers in June- July.

Spiraea douglasii Hook. var. menziesii (Hook.) Presl **Hardhack** Common; bogs and pond margins; flowers in May.

RUBIACEAE Madder Family

Galium triflorum Michx. **Bedstraw** Common; moist forest and gravel bars; flowers in June-July

Galium aparine L. var. echinospermum (Wallr.) Farw. **Cleavers** Common; moist woods; flowers in late May-June.

SALICACEAE Willow Family

Populus trichocarpa T. & G. ex Hook. **Black cottonwood** Infrequent in the valley bottom, but forms dense, creekside thickets on side slopes; flowers in late March-April.

Salix lasiandra Benth. var. lasiandra **Red willow** Infrequent; margins of streams and ponds; flowers in late March-April.

Salix scouleriana Barratt **Scouler's willow** Common; forest margins; flowers in late March-April.

Salix sitchensis Sanson **Sitka willow** Common and widespread; margins of streams and ponds; flowers in late March-April.

SAXIFRAGACEAE Saxifrage Family

Heuchera micrantha Dougl. ex. Lindl. var. diversifolia (Rydb.) R. B. & L. **Alumroot** Common; rock outcrops; flowers in late May-June.

Mitella breweri Gray **Brewer's mitrewort** Infrequent; moist shady forest; flowers in late May-June.

Mitella caulescens Nutt. **Leafy mitrewort** Common; moist forest; flowers in June.

Parnassia fimbriata Konig. var. fimbriata **Grass-of-Parnassus**

Saxifraga bronchialis L. var. austromontana (Wieg.) Jones **Matted saxifrage** Infrequent; south-facing, rock outcrops and cliff faces; flowers in June-July.

Saxifraga ferruginea Grah. var. macounii Engl. & Irmsch. **Rusty saxifrage** Rare; gravel bars; flowers in June-July.

Saxifraga integrifolia Hook. var. claytoniaefolia (Canby) Rosend. **Swamp saxifrage** Infrequent; moist meadow; flowers in late May- early June.

Saxifraga punctata L. var. cascadensis (Calder & Savile) Hitchc. **Summer saxifrage** Rare; cobble beneath permanent snowfield; flowers in August

Suksdorfia ranunculifolia (Hook.) Engl. **Suksdorfia** Common; rock outcrops where moist early in season; flowers in May.

Tellima grandiflora (Pursh) Dougl. **Fringe-cup** Common and widespread; moist woods; flowers in June.

Tiarella trifoliata L. **Foam flower** Rare; moist woods; flowers in June.

Tiarella unifoliata (Hook.) Kurtz. **Foam flower** Common and widespread; moist woods; flowers in June.

Tolmiea menziesii (Pursh) T. & G. **Youth-on-age** Common; moist woods; flowers in June.

SCHEUCHZERIACEAE Scheuchzeria Family

Scheuchzeria palustris L. var. americana Fern. **Scheuchzeria** Common; bogs and margins of ponds; flowers in May.

SCROPHULARIACEAE Figwort Family

Collinsia parviflora Lindl. **Blue-eyed Mary** Common; rock outcrops; flowers in May-early June.

Mimulus alsinoides Dougl. **Chickweed mimulus** Locally common; seeps among rocks and on rock outcrops where moist early in season; flowers in May-early June; 86-06 collected from the south slope of Pumpkin Mountain.

Mimulus guttatus DC. var. depauperatus (Gray) Grant **Common monkey-flower**

Mimulus lewisii Pursh **Lewis' monkey-flower** Infrequent; gravel bars and dry creek beds; flowers in June-July.

Mimulus moschatus Dougl. **Musk monkey-flower**

Pedicularis racemosa Dougl. ex Hook. var. alba (Pennell) Cronq. **Lousewort**

Penstemon davidsonii Greene var. menziesii (Keck) Cronq. **Creeping penstemon** Infrequent; rock outcrops; flowers in late May-June.

Penstemon serrulatus Menzies ex Smith **Spreading penstemon**

Veronica americana Schwein. ex Benth. **American speedwell**

Veronica peregrina L. var. xalapensis (H. B. K.) St. John & Warren **Purslane speedwell** Infrequent; rock outcrops; flowers in May; collected from a rock outcrop ca. 1 1/2 km wst of Ross Lake.

Veronica scutellata L. **Marsh skullcap** Infrequent; wetlands; flowers in June.

Veronica serpyllifolia L. var. serpyllifolia **Thyme-leaved speedwell** Common; trails and campgrounds; flowers in late May-June.

SELAGINELLACEAE Selaginella Family

Selaginella wallacei Hieron **Wallace's selaginella** Common; rock outcrops.

SPARGANIACEAE Bur-reed Family

Sparganium emersum Rehmann var. multipedunculatum (Morong.) Reveal **Simple-stem bur-reed** Infrequent; in the pond on the north side of Big Beaver Creek nearest Ross Lake; flowers late June-July.

Sparganium minimum Fries **Small bur-reed** Infrequent; in the pond on the north side of Big Beaver Creek nearest Ross Lake; flowers in late June-July.

TAXACEAE Yew Family

Taxus brevifolia Nutt. **Western yew** Infrequent; moist forests.

URTICACEAE Nettle Family

Urtica dioica L. ssp. gracilis (Ait.) Seland. var. lyalli (Wats.) C. L. Hitch. **Stinging nettle** Common; moist woods often along streams; flowers in May.

VALERIANACEAE Valerian Family

Valeriana scouleri Rydb. **Scouler's valerian** Infrequent; dry slopes, rock outcrops, and gravel bars; flowers in June.

Valeriana sitchensis Bong. **Northern valerian**

VIOLACEAE Violet Family

Viola glabella Nutt. **Woodland violet** Common; moist woods; flowers in May.

Viola palustris L. **Marsh violet** Common; moist woods and pond margins; flowers in May.

Viola sempervirens Greene **Evergreen violet** Common; moist woods; flowers in May.

VASCULAR PLANTS OF THE KETTLE RANGE, FERRY COUNTY, WASHINGTON

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ABSTRACT

The Kettle Range is located between Kettle Falls and Republic, approximately 85 miles northwest of Spokane in the Colville National Forest. The vascular flora consists of 61 families, 215 genera and 439 species and infraspecific taxa. The flora is dominated by plants with Rocky Mountain Region affinities (45%). Descriptions of the vegetation are given for eight plant associations and one general community. Eight sensitive and monitored species were found in the area. The annotated list of the vascular flora has descriptions of each taxon's relative abundance, habitat, and phytogeographic affiniity.

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INTRODUCTION

The Kettle Range is located between Kettle Falls and Republic, approximately 85 miles northwest of Spokane in the Colville National Forest. Our study area consists of two parts: the Kettle Crest above 1524 m (5,000 ft) and the adjacent Thirteenmile Creek Area (Fig. 1). The Kettle Crest lies in the Profanity and Bald-Snow proposed roadless areas. The Kettle Crest Trail (USFS trail #13) runs the length of the study area and passes 22 peaks from Tenasket Mt. in the north to White Mt. in the south. Copper Butte is the highest peak at 2175 m (7135 ft) and Snow Peak is the second tallest at 2165 m (7103 ft). The proposed Thirteenmile Creek roadless area encompasses Thirteenmile Mt., Granite Mt., Fire Mt., Seventeenmile Mt., the Thirteenmile Creek drainage and is bounded to the south by the Colville Indian Reservation. The total study area as outlined above covers 285 km^2 (110 mi^2).

The Kettle Crest is predominantly granitic intrusive rocks south of Copper Butte and primarily gneiss and schist to the north. Volcanic bedded andesite breccia with basalt flows are common south and west of Thirteenmile Mt. (Huntting, et al., 1961).

The climate of the Kettle Range is continental. Winters are long and cold, and snow is usually on the ground from early December until March (Zulauf and Starr 1979). Frequent weather changes in the winter are due to Pacific weather systems and occasional invasions of arctic air masses from Canada. Summers are generally sunny, warm, and dry with occasional hot days. The annual precipitation ranges from about 18 inches in the Thirteenmile Area to more than 25 inches on the mountain peaks. Two-thirds of the annual precipitation falls between October and March (Donaldson and Ruscha 1975) with much of it falling as snow during the winter months.

The intent of this study is to document the existing flora, describe the vegetation, interpret the phytogeographical relationships of the flora, and ascertain the status of the sensitive and monitored plants.

FLORISTICS

Floristic Composition

The vascular flora of the Kettle Range consists of 61 families, 215 genera, and 439 species and infraspecific taxa (Table 1). A numerical summary shows that the four largest families are: Poaceae (54 taxa), Asteraceae (53), Cyperaceae (27) and Rosaceae (23). The largest genus is *Carex* with 24 taxa.

Phytogeography

Changing climatic and geological conditions effect the continual sorting and redistribution of plant species. Each species responds individually to climatic changes. Approximately 15,000 BP the Cordilleran ice sheet advanced southward during the Fraser glaciation. In the Kettle Range the Sanpoil River sublobe and the Columbia River lobe covered the slopes with ice below 1500-2000 m leaving the mountain peaks exposed (Waitt and Thorson 1983). This glacial event removed the vascular plants from the lower elevations.

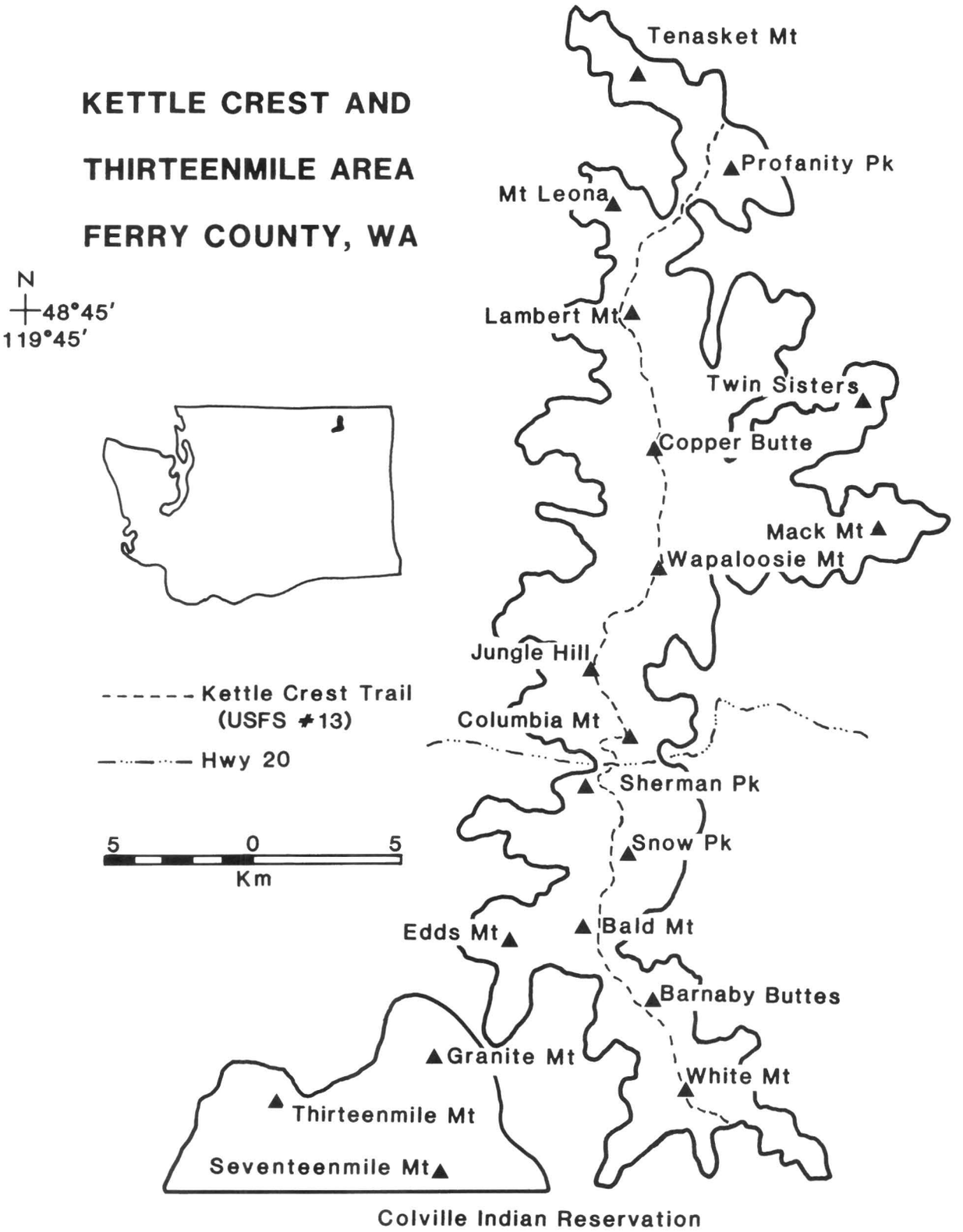

Fig. 1. Location of the Kettle Crest and Thirteenmile Area, Ferry County, Washington.

Table 1. Numerical summary of the vascular plants of the Kettle Range.

Division	Families	Genera	Taxa
Lycopodiophyta	2	2	3
Equisetophyta	1	1	4
Polypodiophyta	1	7	7
Pinophyta	2	6	8
Magnoliophyta			
Magnoliopsida	44	150	294
Liliopsida	11	49	123
Totals	61	215	439

Species composition of an area is based on the availability of seeds or dissemules and the existence of routes by which migration can take place. Once a seed is dispersed into an ecologically suitable area it must then become established. In recent geological times the Kettle Range has been floristically re-stocked. The present flora of the Kettle Range was re-established by plants that persisted largely to the south of the glacial boundaries.

Nine phytogeographical units were chosen to portray the floristic relationships of the Kettle Range flora (Table 2). To determine phytogeographical influences, each taxon was assigned to a phytogeographic unit based on its current center of distribution. Present plant distributions were determined from Hitchcock et al. 1969, Hitchcock and Cronquist 1973, Harrington 1954, and Munz and Keck 1968. The Rocky Mountain Region includes the Rocky Mountain Province and the Vancouverian Province (Cronquist 1982). The Rocky Mountain Province encompasses the Rocky Mountains in New Mexico northward to British Columbia and westward through eastern Oregon and Washington. The Vancouverian Province includes the Sierra Nevada, Cascades and Coastal Ranges from northern California to Alaska. Taxa with Rocky Mountain Region affinties appear to be the most important source of floral re-stocking in the Kettle Range during post Pleistocene times. Forty-five percent of the flora have present distributions throughout the Rocky Mountain Region. Eleven percent of the flora is restricted to the Rocky Mountain Province and one percent of the flora is restricted to the Vancouverian Province. *Castilleja elmeri*, *Festuca californica*, *Hieracium scouleri*, *Saxifraga integrifolia*, and *Thelypteris nevadensis* have Vancouverian affinities. In fact, *Festuca californica* is a new record for Ferry County and is the first inland collection of this species. Thirty-three percent of the flora is equally distributed in both the Vancouverian and Rocky Mountain Provinces. Five percent of the flora has affinity towards the Circumboreal Region which is found from the east coast of Canada to central Alberta and to Alaska (Cronquist 1982). Plants with Western North American affinities (17%) are found west of the Mississippi River and north to central British Columbia. Ten percent of the taxa have North American affinities. Twelve percent of the flora is widespread in North America and extend into the eastern portion of Asia, occasionally westward nearly to Europe. Two percent of the flora is considered Cosmopolitan because they are widespread species with broad ecological amplitudes. Introduced plants make up nine percent of the flora and have probably expanded their ranges with the activities of man.

Table 2. Floral elements in the Kettle Range. Abbreviations are used in the annotated list.

Phytogeographic unit	Abbreviation	Percent of taxa
Rocky Mountain Region	RMR	33%
Rocky Mountain Province	RMP	11%
Vancouverian Province	VP	1%
Circumboreal Region	CR	5%
Western North America	WNA	17%
North America	NA	10%
North America and Eurasia	NA/Eurasia	12%
Cosmopolitan	COS	2%
Introduced	I	9%

VEGETATION

Distinctive physiographic, climatic, and edaphic conditions in the Kettle Range, give rise to a complex pattern of vegetation. Each species or population of individuals has tolerance ranges which control its distribution within ecophysiological limits.

The vegetation classification of the Kettle Range is a synthesis of previous work by Alverson and Arnett (1986), Williams and Lillybridge (1985), Douglas and Bliss (1977), Franklin and Dyrness (1973), McLean (1970), Daubenmire (1970, 1978), Daubenmire and Daubenmire (1968), and two years of extensive field work in the study area by the authors. Eight well established associations are recognized and one general community, based on habitat preference is described (Table 3). The term "association" as used by the 1910 resolution of the International Botanical Congress, is defined as communities of definte floristic composition and uniform physiognomy when occurring in uniform habitat conditions. We use the definition of "plant community" from Oosting (1948) as "an aggregation of living organisms having mutual relationships among themselves and to their environment".

Table 3. Vegetation classification of the Kettle Range.

1. *Eriogonum douglasii/Poa secunda* Association
2. *Calamagrostis rubescens-Festuca idahoensis-Pseudoroegneria spicata* Association
3. *Pseudotsuga menziesii-Pinus ponderosa/Calamagrostis rubescens* Association
4. *Populus tremuloides/Calamagrostis rubescens* Association
5. *Artemisia tridentata/Festuca idahoesnis-Pseudoroegneria spicata* Association
6. *Pinus contorta/Vaccinium myrtillus* Association
7. *Abies lasiocarpa-Picea engelmannii/Phyllodoce empetriformis-Vaccinium scoparium* Association
8. *Pinus albicaulis-Abies lasiocarpa/Juncus parryi-Lupinus sulfureus* Association
9. Riparian Community

The nine vegetation types in this study represent existing vegetation in the Kettle Range and in no way reflect potential or past vegetation, although, they are very similar to those used by Williams and Lillbridge (1985) who described the forested plant associations of the Colville National Forest.

Soil characterizations for each association represent one to many series descriptions which are compiled from Zulauf and Starr (1979). Each association or community contains a general summary describing the substrate type, typical soil depth, range of elevation, physiographic position, and common or characteristic species.

1. **Eriogonum douglasii/Poa secunda Association**
   Douglas' buckwheat/Sandberg's bluegrass Association

This association occurs on loamy soils derived entirely from andesite bedrock and, to a lesser extent, volcanic ash and glacial till. Andesite is an extrusive igneous rock composed of 50-70% potassium aluminum silicate and between 30-50% calcium aluminum silicate. This particular combination of minerals is very atypical in the Kettle Range and therefore many interesting plants (*Allium robinsonii*, *Eriogonum compositum*, and *Talinum okanoganense*) are restricted to this association. Soils are typically shallow, between 15-50 cm in depth, with patches of exposed andesite bedrock common. The association is most prevalent between 900-1500 m and is resticted to south and southwest facing slopes on mountain ridges, knobs, and hilltops above Thirteenmile Creek (Fig. 2).

Eriogonum douglasii var. *douglasii*, the conspicuous lemon flowered buckwheat, is perhaps the visual dominant and has not been reported previously in Ferry County. Herbarium collection information at WS, WTU, WWB, and ID indicate that the next closest site is located near Badger Mt., Douglas County. *Poa secunda*, a morphologially variable species as interpreted by Kellogg (1985), is easily the most significant plant of this assocation.

Characteristic species of this association are:
Shrubs: *Artemisia tridentata* ssp. *vaseyana.*
Herbaceous perennials: *Arabis holboellii var. retrofracta, Arabis macrophylla, Balsamorhiza sagittata, Castilleja cervina, Crepis intermedia, Cystopteris fragilis, Delphinium nuttallianum* var. *nuttallianun, Erigeron linearis, Eriogonum compositum* var. *leianthum, Eriogonum douglasii* var. *douglasii, Eriogonum heracleoides* var. *angustifolium, Festuca idahoensis* var. *idahoensis, Fritillaria pudica, Lewisia rediviva, Lomatium ambiguum, Lomatium macrocarpum, Microseris nutans, Phlox caespitosa, Poa secunda, Pseudoroegneria spicata, Selaginella wallacei, Talinum okanoganense, Zygadenus venenosus* var. *gramineus.*
Annuals: *Bromus tectorum, Clarkia pulchella, Collinsia parviflora* var. *parviflora, Draba verna* var. *verna, Microsteris gracilis, Phacelia linearis, Ranunculus glaberrimus* var. *glaberrimus.*

2. **Calamagrostis rubescens-Festuca idahoensis-Pseuodoroegneria spicata Association**
   Pinegrass-Idaho fescue-Bluebunch wheatgrass Association

Fine sandy loam soils formed in glacial till, the upper part of which is mixed with volcanic ash, loess, and in some instances colluvium derived from siliceous rocks, are found in the upper 40-50 cm in this association. Precipitous rock outcrops and talus

slopes are typical in this open grassland association. This association typically occurs between 1370 to 2100 m on southerly facing slopes (Fig. 3).

The three dominants in this association, *Calamagrostis rubescens*, *Festuca idahoensis*, and *Pseudoroegneria spicata*, vary in their importance in accordance with altitudinal and edaphic factors. *Calamagrostis rubescens* predominates in the lower elevations and typically occurs near Douglas Fir (*Pseudotsuga menziesii*). At mid elevations and above, *Festuca idahoensis* predominates but not to the exclusion of *Calamagrostis* or *Pseudoroegneria*. Both the common "bunchgrass" form and the "rhizomatous" form of *Pseudoroegneria spicata* were found in this association. However, *Pseudoroegneria* is prevalent on more xeric sites than either *Festuca* or *Calamagrostis*. At higher elevations near Wapaloosie and Edds Mts., *Festuca scabrella* is a major dominant. *Festuca scabrella* is a large bunchgrass resembling the tussock fescues of South America and New Zealand. Perhaps these stands of *Festuca scabrella* are relicts of moister periods during the Holocene when this species was more widespread.

Characteristic species of this association are:
Herbaceous perennials: *Achillea millefolium* ssp. *lanulosa*, *Anaphalis margaritacea*, *Antennaria microphylla*, *Arenaria capillaris* var. *americana*, *Artemisia ludoviciana*, *Calamagrostis rubescens*, *Carex hoodii*, *Carex phaeocephala*, *Carex raynoldsii*, *Castilleja miniata* var. *miniata*, *Erigeron peregrinus* ssp. *callianthemus*, *Eriogonum umbellatum* var. *subalpinum*, *Festuca idahoensis* var. *idahoensis*, *Geum triflorum* var. *triflorum*, *Heuchera cylindrica*, *Koeleria cristata*, *Lithophragma parviflora*, *Lupinus sericeus* var. *sericeus*, *Lupinus sulphureus* var. *subsaccatus*, *Melica spectabilis*, *Penstemon confertus*, *Phacelia hastata* var. *leptosepala*, *Poa nervosa* var. *wheeleri*, *Pseudoroegnaria spicata*, *Sedum lanceolatum* var. *lanceolatum*, *Senecio integerrimus*, *Trisetum spicatum*, *Zygadenus venenosus* var. *gramineus*.
Annuals: *Collinsia parviflora* var. *parviflora*, *Microsteris gracilis*.

3. **Pseudotsuga menziesii-Pinus ponderosa/Calamagrostis rubescens Association**
Douglas fir-Ponderosa pine/Pinegrass Association

Soils in this association are variable with depth to bed rock ranging from 40 cm to over 150 cm. Surface structure ranges from fine sandy loams to stony loams. The soils are formed in a mixture of volcanic ash, coarse granitic fragments, loess, glacial till, and colluvium derived from siliceous rocks. Open to occasionally closed forests are typically dominated by *Pseudotsuga mensiesii* and *Pinus ponderosa*. This association is well developed between 945 to 1615 m, predominately on south facing slopes (Fig. 2).

Ponderosa pine (*Pinus ponderosa*) is more prevalent at lower elevations whereas Douglas fir (*Pseudotsuga mensiesii*) dominates the association at higher elevations. *Calamagrostis rubescens* is more commonly associated with *Pseudotsuga menziesii* but still substantially contributes to the understory in *Pinus ponderosa* dominated stands. In fact, Williams and Lillybridge (1985) have sub-divided this association into two: where, *Pseudoroegneria spicata* replaces *Calamagrostis rubescens* at lower elevations and *Pinus ponderosa* is dropped from the higher elevation sites.

Characteristic species of this association are:
Trees: *Larix occidentalis*, *Pinus ponderosa*, *Pseudotsuga menziesii*.
Shrubs: *Holodiscus discolor*, *Pachistima myrsinites*, *Physocarpus malvaceous*, *Prunus emarginata* var. *emarginata*, *Symphoricarpos oreophilus* var. *utahensis*, *Spiraea betulifolia* var. *lucida*.

Fig. 2. Foreground, the *Eriogonum douglasii/Poa secunda* Association with outcrops of andesite bedrock; background the *Pseudotsuga menziesii-Pinus ponderosa/Calamagrostis rubescens* Association in an adjacent ravine.
Fig. 3. South facing slopes of Wapaloosie Mt. showing the typical *Calamagrostis rubescens-Festuca idahoensis-Pseudoroegneria spicata* Association.

Herbaceous perennial: *Achillea millefolium* ssp. *lanulosa*, *Antennaria luzuloides*, *Antennaria racemosa*, *Aquilegia flavescens*, *Arabis glabra*, *Arctostaphylos uva-ursi*, *Arnica cordifolia* var. *cordifolia*, *Berberis aquifolium*, *Calamagrostis rubescens*, *Carex raynoldsii*, *Carex rossii*, *Castilleja miniata* var. *miniata*, *Clintonia uniflora*, *Cornus canadensis*, *Delphinium nuttallianum* var. *nuttallianum*, *Dodecatheon pulchellum* var. *pulchellum*, *Elymus glaucus* var. *glaucus*, *Erigeron peregrinus* ssp. *callianthemus*, *Festuca idahoensis*, *Festuca occidentalis*, *Festuca viridula*, *Fragaria virginiana* var. *platypetala*, *Hieracium albiflorum*, *Koeleria cristata*, *Linnaea borealis* var. *longiflora*, *Lithophragma parviflora*, *Lupinus sericeus*, *Lupinus sulphureus* var. *subsaccatus*, *Luzula parviflora*, *Osmorhiza occidentalis*, *Pedicularis bracteosa* var. *bracteosa*, *Poa nervosa*, *Poa pratensis*, *Potentilla glandulosa*, *Pseudoroegneria spicata*, *Senecio integerrimus*, *Smilacina stellata*, *Thalictrum occidentale*, *Trautvetteria caroliniensis*, *Trisetum cernuum*.
Annuals: *Agoseris heterophylla* var. *heterophylla*, *Bromus carinatus*, *Collomia linearis*, *Linanthus septentrionalis*.

4. **Populus tremuloides/Calamagrostis rubescens Association**
Quaking aspen/Pinegrass Association

Soils in this association are generally deeper and richer than in adjacent sites and are developed on a mixture of glacial till, volcanic ash, loess, and colluvium derived from siliceous rocks. Closed stands of *Populus tremuloides*, with the exclusion of other arboreal species, is typical of this association. Due to the rhizomatous nature of *Populus tremuloides*, this association occurs as small "patches" or "clumps between 910 and 2075 m. *Calamagrostis rubescens* is the predominant understory.

Characteristic species of this association are:
Trees: *Populus tremuloides*.
Shrubs: *Ribes viscosissimum* var. *viscosissimum*, *Rosa gymnocarpa*, *Symphoricarpos oreophilus* var. *utahensis*, *Vaccinium membranaceum*.
Herbaceous perennials: *Agrostis stolonifera* var. *stolonifera*, *Aster conspicuus*, *Calamagrostis rubescens*, *Campanula rotundifolia*, *Carex petasata*, *Elymus glaucus* var. *glaucus*, *Erigeron speciosus* var. *speciosus*, *Fragaria vesca* var. *crinita*, *Hackelia floribunda*, *Ligusticum grayi*, *Luzula parviflora*, *Osmorhiza chilensis*, *Pyrola secunda var. secunda*, *Thalictrum occidentale*.
Annuals: *Bromus carinatus*.

5. **Artemisia tridentata/Festuca idahoensis-Pseudoroegneria spicata Association**
Big sagebrush/Idaho fescue-Bluebunch wheatgrass Association

Fine sandy loam soils formed in mixture of glacial till, volcanic ash, loess and colluvium derived from siliceous sediments are found in the upper 60-100 cm in this association. The shrub *Artemisia tridentata* ssp. *vaseyana* is the visual dominant with a rich understory of herbaceous perennials. South facing slopes of Wapaloosie and Columbia Mts. exhibit well developed stands of this assoication between 1645 and 2015 m (Fig. 4).

Festuca idahoensis and *Pseudoroegneria spicata* are the most conspicuous perennials. Daubenmire (1970) and McLean (1970) have found similar associations in Washington and southern British Columbia, respectively. They recognize two separate associations each with *Festuca* or *Pseudoroegneria* as the dominant.

Characteristic species of this association are:
Shrubs: *Artemisia tridentata* ssp. *vaseyana.*
Herbaceous perennials: *Achillea millefolium* ssp. *lanulosa, Agoseris glauca, Arenaria capillaris* var. *americana, Calamagrostis rubescens, Carex petasata, Carex raynoldsii, Castilleja cervina, Castilleja miniata* var. *miniata, Delphinium nuttallianum* var. *nuttallianum, Eriogonum umbellatum* var. *subalpinum, Festuca idahoensis var. idahoensis, Gilia aggregata* var. *aggregata, Hieracium albiflorum, Hieracium cynoglossoides, Lithophragma parviflora, Lupinus sulphureus* var. *subsaccatus, Melica spectabalis, Penstemon confertus, Poa pratensis, Pseudoroegneria spicata, Silene parryi, Stipa occidentalis* var. *occidentalis, Zigadenus venenosus* var. *gramineus.*
Annuals: *Collinsia parviflora, Microsteris gracilis, Nemophila breviflora.*

6. **Pinus contorta/Vaccinium myrtillus Association**
Lodgepole pine/Low bilberry Association

Soils in this association are primarily gravelly sandy loams to loams formed in volcanic ash over glacial till and granitic colluvium. Soil depth to bedrock is generally greater than 150 cm. Lodgepole pine (*Pinus contorta*), forms dense stands sometimes refered to as "dog hair" because of their thin girth and compact arrangement. Daubenmire and Daubenmire (1968) recognize *Pinus contorta* as a seral opportunist in the *Pseudotsuga menziesii* series and the *Abies lasiocarpa* series. Franklin and Dyrness (1973) suggest it deserves zonal status because of its dominance in northeastern Oregon on soils derived from volcanic ash and pumice, the product of recent volcanic eruptions, i.e., Mount Mazama ± 6,600 yrs BP. This association commonly occurs between 1375 m and 1950 m on all aspects in the study area.

The understory of this association can be composed entirely of needle duff, but usually is dominated by *Vaccinium myrtillus.*

Characteristic species of this association are:
Trees: *Pinus contorta.*
Shrubs: *Alnus sinuata, Lonicera utahensis, Pachistima myrsinites, Salix scouleriana, Spiraea betulifolia* var. *lucida, Vaccinium membranaceum.*
Herbaceous perennials: *Agrostis scabra, Anaphalis margaritacea, Antennaria microphylla, Antennaria racemosa, Arabis drummondii, Arctostaphylos uva-ursi, Arnica cordifolia* var. *cordifolia, Aster conspicuus, Calamagrostis rubescens, Erigeron acris* var. *debilis, Fragaria virginiana* var. *platypetala, Hieraceum albiflorum, Lupinus sulphureus* var. *subsaccatus, Thalictrum occidentale, Luzula parviflora, Trisetum cernuum, Vaccinium myrtillus.*
Annuals: *Spergularia rubra.*

7. **Abies lasiocarpa-Picea engelmannii/Phyllodoce empetriformis-Vaccinium scoparium Association**
Subalpine fir-Engelmann spruce/Red mountain heather-Grouseberry Association

Loamy soils derived from volcanic ash deposits over glacial till and granitic colluvium are typically deeper than 100 cm in this association. The association is best developed between 1700 m to 2165 m primarily on north facing slopes and in moist draws (Fig. 5). Ecologists in the past have recognized *Abies lasiocarpa* and *Picea englemannii* as forming climax forests together (Oosting and Reed 1952; Daubenmire and Daubenmire 1968).

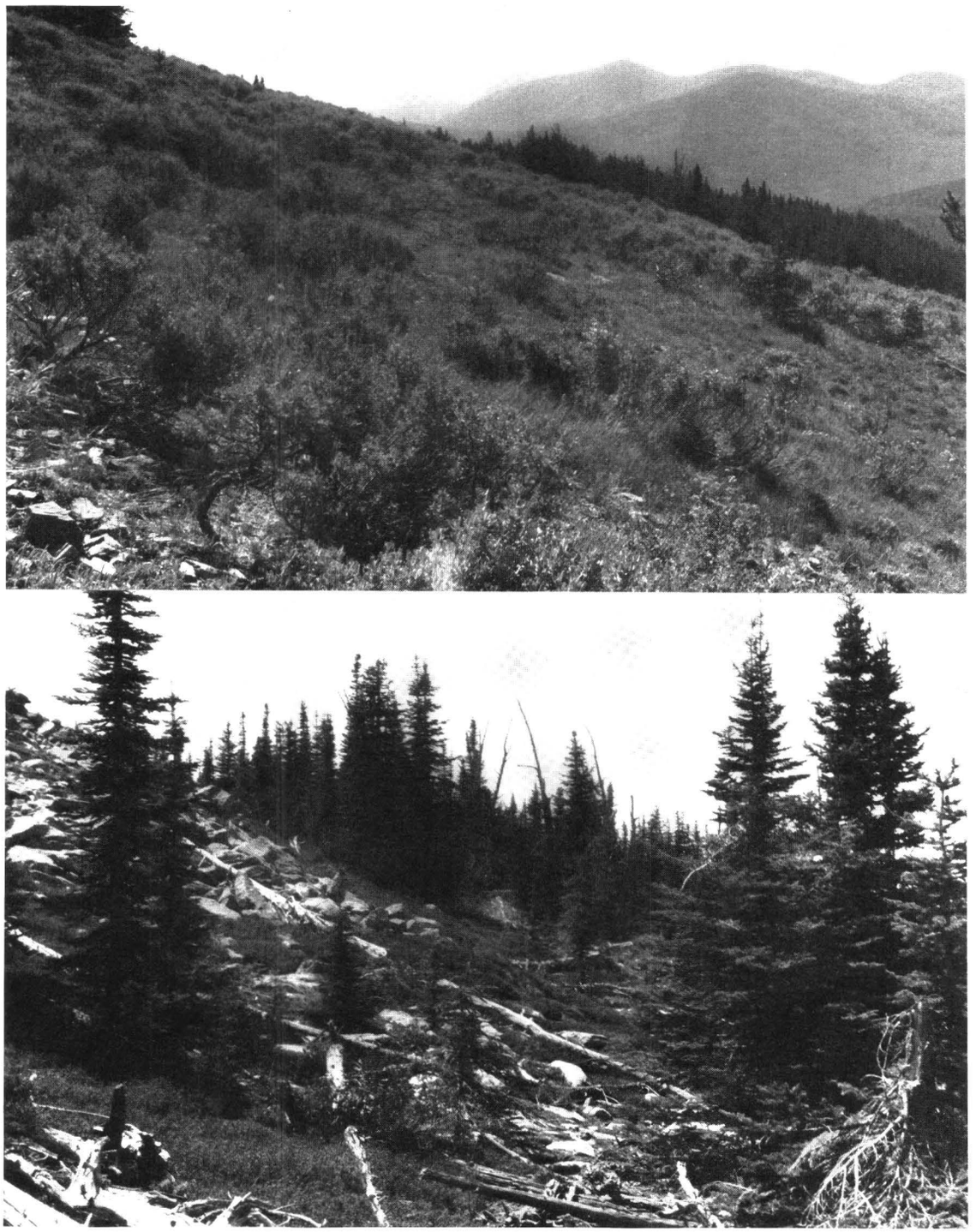

Fig. 4. The *Artemisia tridentata/Festuca idahoensis-Pseudoroegneria spicata* Association on a southerly exposure.
Fig. 5. The *Abies lasiocarpa-Picea englemannii/Phyllodoce empetriformis-Vaccinium scoparium* Association just below the skyline and to the right, broken up by a boulder outcrop.

The understory is dominated by *Phyllodoce empetriformis* and *Vaccinium scoparium*. These species form large "clumps" beneath the overstory sometimes excluding other characteristic perennials.

Characteristic species of this assocation are:
Trees: *Abies lasiocarpa, Picea engelmannii*
Shrubs: *Juniperus communis* var. *montana, Lonicera utahensis, Rhododendron albiflorum, Ribes lacustre.*
Herbacous perennials: *Antennaria microphylla, Aquilegia flavescens, Arenaria capillaris* var. *americana, Arennaria racemosa, Arnica cordifolia* var. *cordifolia, Carex microptera, Carex rossii, Castilleja miniata, Chimaphila menziesii, Chimaphila umbellata, Cryptogramma crispa* var. *acrostichoides, Erigeron peregrinus* ssp. *callianthemus, Erythronium grandiflorum* var. *grandiflorum, Juncus drummondii* var. *subtriflorus, Lupinus sulphureus* var. *subsaccatus, Mertensia paniculata* var. *borealis, Mitella trifida, Osmorhiza occidentalis, Pedicularis contorta* var. *contorta, Phyllodoce empetriformis, Pyrola secunda, Pyrola uniflora, Smilacina stellata, Trautvetteria caroliniensis* var. *occidentalis, Vaccinium myrtillus, Vaccinium scoparium, Valeriana sitchensis, Viola orbiculata.*
Annuals: *Collinsia parviflora, Descurainia pinnata* var. *filipes, Microsteris gracilis.*

8. **Pinus albicaulis-Abies lasiocarpa/Juncus parryi-Lupinus sulphureus Association**
White bark pine-Subalpine fir/Parry's rush-Sulfur lupine Association

In this association fine sandy loam to stony loam soils are derived in a mixture of volcanic ash, loess, granitic colluvium, and glacial till. The depth to bedrock is highly variable in this association, ranging from approximately 25 to over 150 cm deep with rock outcrops common. This association is charaterized by open parklands dominated by islands of *Pinus albicaulis-Abies lasiocarpa.* The association occurs above 1900 m and is well developed on most of the higher peaks and ridge tops (Copper Butte, Wapaloosie Mt., Columbia Mt., Snow Peak, and White Mt.) in the study area (Fig. 6). Daubenmire and Daubenmire (1968) recognized the *Pinus ablicaulis-Abies lasiocarpa* habitat type and described it as having a discontinuous ground cover between the trees or groves dominated by *Vaccinium scoparium, Carex* spp., *Luzula spicata*, and *Erigeron peregrinus.*

Juncus parryi and *Lupinus sulphureus* var. *subsaccatus* are the visual dominants in this association and occur as relatively homogeneous stands between the groves or "clumps" of trees.

Characteristic species of this association are:
Trees: *Pinus albicaulis, Abies lasiocarpa.*
Shrubs: *Juniperus communis* var. *montanus.*
Herbaceous perennials: *Achillea millefolium* ssp. *lanulosa, Agrostis scabra, Antennaria microphylla, Antennaria umbrinella, Arabis holboellii* var. *retrofracta, Arenaria capillaris var. americana, Arnica parryi, Calamagrostis rubescens, Carex phaeocephala, Carex raynoldsii, Carex rossii, Castilleja miniata* var. *miniata, Claytonia lanceolata* var. *lanceolata, Cystopteris fragilis, Danthonia intermedia, Elymus elymoides, Erigeron acris* var. *debilis, Erigeron peregrinus* ssp. *callianthemus, Erigeron subtrinervis, Eriogonum umbellatum* var. *subalpinum, Erythronium grandiflorum* var. *grandiflorum, Festuca saximontana var. purpusiana, Hieraceum cynoglossoides, Juncus parryi, Koeleria cristata, Lupinus sulphureus* var. *subsaccatus, Luzula spicata, Pedicularis contorta* var. *contorta,*

Penstemon fruticosus var. *scouleri*, *Phlox caespitosa*, *Phyllodoce empetriformis*, *Poa secunda*, *Sedum lanceolatum* var. *lanceolatum*, *Senecio integerrimus* var. *ochroleucus* and var. *exaltatus*, *Sibbaldia procumbens*, *Silene parryi*, *Trisetum spicatum*, *Vaccinium myrtillus*, *Vaccinium scoparium*.
Annuals: *Collinsia parviflora* var. *parviflora*, *Linanthus septentrionalis*.

9. **Riparian Community Community**

This community can be broken into two habitat types, one consisting of species that are characteristic of the waters edge, seeps or surrounding ponds or creeks and, two, consisting of fresh water aquatics, i.e. restricted to submersed and emersed environments. For convenience, these different habitat types will be treated under the single term "riparian" community which, by definition, pertains to the bank of a river, pond or small lake.

Hall Creek Ponds and Creek, Thirteenmile Ponds and Creek, Wapaloosie Pond, and Sherman Pond are sites where this community is well developed (Fig. 7). Sediments of the Hall Creek, Wapaloosie, and Sherman Ponds are formed from alluvial and colluvial deposits from surrounding granitic fragments and glacial till. Sediments of Thirteenmile Ponds and Creek are formed, in addition to granitic fragments and glacial till, from alluvial and colluvial deposits from surrounding andesitic fragments. This community can occur at any elevation within the study area.

Characteristic species of this community are:
Trees: *Picea engelmannii*, *Pinus contorta*, *Populus tremuloides*, *Populus trichocarpa*.
Shrubs: *Alnus sinuata*, *Cornus canadensis*, *Rubus parviflorus*, *Salix barclayi*, *Salix phylicifolia* ssp. *phylicifolia*, *Sorbus scopulina* var. *scopulina*.
Herbaceous perennial: *Aconitum columbianum var. columbianum*, *Alisma gramineum*, *Alopecurus aequalis*, *Angelica arguta*, *Carex canescens*, *Carex disperma*, *Carex lasiocarpa*, *Carex microptera*, *Carex rostrata*, *Carex vesicaria*, *Deschampsia elongata*, *Eleocharis palustris*, *Epilobium alpinum* var. *lactiflorum*, *Equisetum arvense*, *Galium triflorum*, *Geum macrophyllum* var. *perincisum*, *Glyceria elata*, *Habenaria dilatata*, *Habenaria saccata*, *Hippuris vulgaris*, *Juncus drummondii* var. *subtriflorus*, *Juncus mertensianus*, *Lemna minor*, *Lycopus uniflorus*, *Mertensia paniculata* var. *borealis*, *Mimulus guttatus* var. *guttatus*, *Mimulus moschatus* var. *moschatus*, *Mitella pentandra*, *Myriophyllum spicatum* var. *exalbescens*, *Nuphar polysepalum*, *Potamogeton nutans*, *Pyrola asarifolia*, *Ranunculus aquatilus* var. *capillaceus* and var. *hispidulus*, *Ranunculus uncinatus* var. *parviflorus*, *Rorippa sinuata*, *Senecio triangularis* var. *triangularis*, *Stelleria crispa*, *Trautvetteria caroliniensis* var. *occidentalis*, *Trifolium repens*, *Typha latifolia*, *Veronica americana*, *Veronica serpylliolia* var. *humifusa*, *Viola palustris*.

SENSITIVE AND MONITORED SPECIES

Three species (*Listera borealis*, *Phacelia franklinii*, and *Ribes cognatum*) are considered sensitive by the Washington Natural Heritage Program (1984). A sensitive plant is one that is not presently endangered or threatened but could be jeopardized if current land use practices continue. Five species (*Allium robinsonii*, *Carex raynoldsii*, *Castilleja cervina*, *Cypripedium montanum*, and *Talinum okanoganense*) are being monitored but have no proposed status at this time. Each of these eight species has been evaluated in terms of occurrence, habitat, associated species, and status in the Kettle Range.

Fig. 6. The *Pinus albicaulis-Abies lasiocarpa/Juncus* parryi-*Lupinus sulfureus* Association on top of Copper Butte.
Fig. 7. Lower Hall Creek Pond illustrates the Riparian Community.

Allium robinsonii

Occurrence: Found on south and southwest facing slopes on ridges, knobs, and hilltops above Thirteenmile Creek.
Habitat: Restricted to thin andesite soils in the *Eriogonum douglasii/Poa secunda* Association. Grows on balds, road cuts, and areas that were reforested in 1970.
Associates: *Collinsia parviflora* var. *parviflora*, *Festuca idahoensis* var. *idahoensis*, *Lewisia rediviva*, *Montia perfoliata*, *Pseudoroegneria spicata*, *Ranunculus glaberrimus*, *Selaginella wallacei*, *Talinum okanoganense*, *Lomatium ambiguum*.
Status: Abundant within its habitat. During peak flowering (May to June) of 1986 its flowers turned the hillside pink.

Carex raynoldsii

Occurrence: Frequent on open slopes of Columbia Mt., Edd's Mt., Midnight Mt., Copper Butte, and Wapaloosie Mt.
Habitat: Open grasslands which make up the *Calamagrostis rubescens-Festuca idahoensis-Pseudoroegneria spicata* Association. Also among granite rocks which surround the pond one mile southwest of Wapaloosie Mt.
Associates: *Abies lasiocarpa*, *Artemisia tridentata* var. *vaseyana*, *Calamagrostis rubescens*, *Carex canescens*, *Carex disperma*, *Festuca idahoensis*, *Juncus parryi*, *Lupinus sulphureus* var. *subsaccatus*, *Luzula parviflora*, *Pseudoroegneria spicata*, *Pseudotsuga menziesii* var. *menziesii*.
Status: Frequent and widespread in the Kettle Range.

Castilleja cervina

Occurrence: Balds on south and southeast facing slopes above Thirteenmile Creek, 0.5 miles north of Jungle Hill, and ridge south of Wapaloosie Mt.
Habitat: The balds of *Eriogonum douglasii/Poa secunda* Association, open grassy slopes of the *Calamagrostis rubescens-Festuca idahoensis-Pseudoroegneria spicata* Association and sagebrush slopes of the *Artemisia tridentata/Festuca idahoensis-Pseudoroegneria spicata* Association.
Associates: *Abies lasiocarpa*, *Artemisia tridentata* ssp. *vaseyana*, *Eriogonum douglassii* var. *douglassii*, *Festuca idahoensis* var. *idahoensis*, *Lomatium ambiguum*, *Poa secunda*, *Pseudoroegneria spicata*, *Selaginella wallacei*.
Status: Infrequent thoughout the Kettle Range.

Cypripedium montanum

Occurrence: One plant found near the Hall creek Ponds.
Habitat: Deeply shaded forests.
Associates: *Abies lasiocarpa*, *Larix occidentalis*, *Pinus contorta*, *Pseudotsuga menziesii* var. *menziesii*, *Rosa gymnocarpa*.
Status: Rare in the Kettle Range. Habitat could be threatened by logging.

Listera borealis

Occurrence: Small population found 0.5 miles north of Jungle Hill at 1830 m.
Habitat: Needle duff in dense *Picea engelmannii* forest.
Associates: *Abies lasiocarpa* and *Picea engelmannii*.
Status: Found in one location. This is the first known population in Ferry County. Could be threatened by logging, however, the habitat is not threatened under current land management.

Phacelia franklinii

Occurrence: South facing slopes 0.5 miles northwest of Lambert Mt., trail junction between Midnight Mt. and Copper Butte and east of Copper Butte near road at 1645-1830 m.
Habitat: Disturbed areas, such as: open grassy south facing slopes that are grazed, margins of talus slopes, rock outcrops, trailsides, and clearcut areas.
Associates: *Abies lasiocarpa, Calamagrostis rubescens*, *Festuca idahoensis*, *Pedicularis bracteosa* var. *bracteosa*, *Picea engelmannii*, *Pinus contorta*, *Pseudoroegneria spicata*, *Vaccinium myrtillus*.
Status: Three small populations and one population that appears to be flourishing. These are the first sightings for Ferry County, however, this species does well in disturbed sites and with more field work will probably prove to be more common throughout the county.

Ribes cognatum

Occurrence: Small population found at the upper pond (1295 m) in the Thirteenmile drainage.
Habitat: Growing at edge of pond in moist forest.
Associates: *Picea engelmannii*, *Pinus contorta* and *Pseudotsuga menziesii* var. *menziesii*.
Status: Found in one location which has been recommended as a Natural Research Area.

Talinum okanoganense

Occurrence: Found on south and southeast facing slopes on ridges, knobs, and hilltops above Thirteenmile Creek.
Habitat: Restricted to thin andesite soils and bedrock in the *Eriogonum douglasii/Poa secunda* Association in areas of low cover.
Associates: *Allium robinsonii, Festuca idahoensis*, *Lewisia rediviva*, *Lomatium ambiguum*, *Pseudoroegneria spicata*, *Selaginella wallacei*.
Status: Infrequent within its restricted habitat. Under current grazing and logging practices no threats are invisioned.

ANNOTATED LIST

The following list includes all the species collected or seen by the authors in the Kettle Range. Over 1,000 collections of the vascular flora were made between May and August of 1985 and 1986. These are housed at the Marion Ownbey Herbarium, Washington State University.

The annotated list is organized alphabetically by family, genus and species within phylogenetically arranged divisions and classes. The classification system and nomenclature largely follows the Flora of the Pacific Northwest by Hitchcock and Cronquist (1973), unless a more recent name appears in the literature. Synonyms used by Hitchcock and Cronquist (1973) and literature citations are given in brackets. Common names, frequency of occurence, and habitat preference are given for each species. Phytogeographical units are abbreviated as in Table 2. Species documented only in the Thirteenmile Area are designated by #.

VASCULAR PLANTS OF THE KETTLE RANGE, FERRY COUNTY, WASHINGTON

Lycopodiophyta Lycopod Division

Lycopodiaceae Clubmoss Family

Lycopodium annotinum L. Stiff clubmoss; infrequent; moist coniferous woods; CR.

Selaginellaceae Selaginella Family

Selaginella densa Rydb. var. *scopulorum* (Maxon) Tryon. Compact selaginella; frequent; rock outcrops and open woods; WNA.

Selaginella wallacei Hieron. Wallaces' selaginella; frequent; exposed rocky sites and balds; RMR.

Equisetophyta Horsetail Division

Equisetaceae Horsetail Family

Equisetum arvense L. Field horsetail; infrequent; moist meadows and ponds; NA/Eurasia.

Equisetum fluviatile L. Water horsetail; infrequent; marshy ponds; CR.

Equisetum laevigatum A. Br. Smooth scouring-rush; infrequent; moist edge of ponds; NA.

Equisetum palustre L. Marsh horsetail; infrequent; moist soil near springs; CR

Polypodiophyta Fern Division

Polypodiaceae Common Fern Family

Athyrium filix-femina (L.) Roth. Lady-fern; infrequent; spring seepages; WNA.

Cryptogramma crispa (L.) R. Br. var. *acrostichoides* (R. Br.) Clarke. Rock-brake; frequent; open woods and rock outcrops; CR.

Cystopteris fragilis (L.) Bernh. Brittle bladder-fern; common; rocky-talus slopes and balds; NA/Eurasia.

Gymnocarpium dryopteris (L.) Newm. Oak-fern; infrequent; streamsides; WNA.

Pteridium aquilinum (L.) Kuhn. var. *pubescens* Underw. Bracken; infrequent; wooded slopes and disturbed sites; COS.

Thelypteris nevadensis (Baker) Clute. Sierra wood-fern; infrequent; rock outcrops around ponds; VP.

Woodsia scopulina D. C. Eat. Rocky mountain woodsia; common; rock crevices; NA.

Pinophyta Conifer Division

Cupressaceae Cypress Family

Juniperus communis L. var. *montana* Ait. Common juniper; common; rocky slopes and open woods; NA/Eurasia.

Pinaceae Pine Family

Abies lasiocarpa (Hook.) Nutt. Subalpine fir; common; subalpine forests; RMR.

Larix occidentalis Nutt. Tamarack; common; forests; RMP.

Picea engelmannii Parry. Engelmann spruce; common; subalpine forests and draws; RMR.

Pinus albicaulis Engelm. White bark pine; frequent; summits and ridge tops; RMR.

Pinus contorta Dougl. var. *latifolia* Engelm. Lodgepole pine; common; forms dense closed forests and invades moist habitats; WNA.

Pinus ponderosa Dougl. Ponderosa pine; common; forms open to occasionally closed forests; WNA.

Pseudotsuga menziesii (Mirbel) Franco var. *menziesii*. Douglas fir; common; open forests and south facing slopes; WNA.

Magnoliophyta Flowering Plants

Magnoliopsida Dicots

Aceraceae Maple Family

Acer glabrum Torr. var. *douglasii* (Hook.) Dippel. Douglas' maple; common; forests; RMR.

Apiaceae Parsley Family

Angelica arguta Nutt. Sharptooth angelica; infrequent; wet meadows; RMR.

Heracleum lanatum Michx. Cow-parsnip; infrequent; open slopes, swales and seeps; NA.

Ligusticum grayi Coult. & Rose. Gray's ligusticum; frequent; open slopes; RMR.

Lomatium ambiguum (Nutt.) Coult. & Rose. Swale desert-parsley; frequent; open rocky slopes, flats and balds; RMP.

Lomatium dissectum (Nutt.) Math. & Const. var. *multifidum* (Nutt.) Math. & Const. Fern-leaved lomatium; infrequent; open forests and balds; RMP.

Lomatium farinosum (Hook.) Coult. & Rose. Coeur d'Alene lomatium; infrequent; open mixed forests; RMP.

Lomatium geyeri (Wats.) Coult. & Rose. Geyer's lomatium; infrequent; open forests and slopes; RMP.

Lomatium macrocarpum (Nutt.) Coult. & Rose. Large-fruit lomatium; infrequent; balds and open mixed forests; WNA.

Lomatium triternatum (Pursh) Coult. & Rose ssp. *triternatum* var. *triternatum*. Nine-leaf lomatium; frequent; dry meadows,open slopes and forests; RMP.

Osmorhiza chilensis H. & A. Mountain sweet-cicely; infrequent; aspen groves; NA.

Osmorhiza occidentalis (Nutt.) Torr. Western sweet-cicely; common; open slopes and woods; RMR.

Osmorhiza purpurea (Coult. & Rose) Suksd. Purple sweet-cicely; common; areas disturbed by logging and open slopes; not always easily distinquished from *O. chilensis* or *O. depauperata* Phil.; RMR.

Asteraceae Aster Family

Achillea millefolium L. ssp. *lanulosa* (Nutt.) Piper var. *alpicola* (Rydb.) Garrett. Common yarrow; infrequent; open slopes; WNA.

Achillea millefolium L. ssp. *lanulosa* (Nutt.) Piper var. *lanulosa*. Common; on rocky soils and disturbed habitats; WNA.

Agoseris aurantiaca (Hook.) Greene var. *aurantiaca*. Orange agoseris; infrequent; grassy slopes, meadows and open woods; RMP.

Agoseris glauca (Pursh) Raf. var. *agrestis* (Osterh.) Q. Jones. Short-beaked agoseris; infrequent; grassy slopes with sagebrush; RMP.

Agoseris glauca (Pursh) Raf. var. *dasycephala* (T. & G.) Jeps. Frequent; open grassy slopes and disturbed trailsides; RMP.

Agoseris heterophylla (Nutt.) Greene var. *heterophylla.* Annual agoseris; infrequent; open rocky slopes; RMR.

Anaphalis margaritacea (L.) B. & H. Pearly-everlasting; infrequent; disturbed areas near springs; NA/Eurasia.

Antennaria anaphaloides Rydb. Tall pussy-toes; frequent; open woods and grassy meadows; RMR.

Antennaria luzuloides T. & G. Woodrush pussy-toes; infrequent; open slopes with rocky soil; RMR.

Antennaria microphylla Rydb. Rosy pussy-toes; common; open grassy slopes, forests and wet seepage areas; RMR.

Antennaria racemosa Hook. Raceme pussy-toes; frequent; open woods to rock outcrops; RMR.

Antennaria umbrinella Rydb. Umber pussy-toes; infrequent; open slopes; WNA.

Arnica cordifolia Hook. var. *cordifolia.* Heart-leaf arnica; common; forests and wet meadows; RMP.

Arnica cordifolia Hook. var. *pumila* (Rydb.) Maguire. Frequent; wooded areas; RMP.

Arnica diversifolia Greene. Sticky arnica; infrequent; rocky canyons and talus slopes; RMR.

Arnica mollis Hook. Hairy arnica; infrequent; moist soil surrounding ponds; RMR.

Arnica parryi Gray var. parryi. Nodding arnica; infrequent; moist open slopes; RMR.

Arnica sororia Greene. Twin arnica; infrequent; open grassy slopes; RMR.

Artemisia ludoviciana Nutt. var. *incompta* (Nutt.) Cronq. Western mugwort; frequent; open slopes; RMR.

Artemisia ludoviciana Nutt. var. *ludoviciana.* Frequent; open slopes; WNA.

Artemesia tridentata Nutt. ssp. *vaseyana* (Rydb.) Beetle. Big sagebrush; common; south facing slopes; WNA.

Aster conspicuus Lindl. Showy aster; infrequent; open woods; RMP.

Aster modestus Lindl. Few-flowered aster; infrequent; woods and rocky slopes; RMR.

Balsamorhiza sagittata (Pursh) Nutt. Arrowleaf balsamroot; infrequent; open slopes; WNA.

Cirsium undulatum (Nutt.) Spreng. Wavy-leaved thistle; infrequent; dry open rocky sites; WNA.

Cirsium vulgare (Savi) Tenore. Common thistle; infrequent; open slopes and disturbed sites; I.

Crepis intermedia Gray. Gray hawksbeard; infrequent; open slopes with shallow rocky soils; RMR.

Erigeron acris L. var. *debilis* Gray. Bitter fleabane; frequent; rocky slopes, near summits and along dry drainages; RMR.

Erigeron compositus Pursh var. *glabratus* Macoun. Cut-leaved daisy; frequent; open slopes with shallow rocky soils and rock outcrops; CR.

Erigeron divergens T. & G. var. *divergens.* Diffuse fleabane; infrequent; open slopes; WNA.

Erigeron linearis (Hook.) Piper. Line-leaf fleabane; infrequent; balds; RMR.

Erigeron peregrinus (Pursh) Greene ssp. *callianthemus* (Greene) Cronq. var. *eucallianthemus* Cronq. Fleabane; common; open woods and grassy slopes; RMR.

Erigeron speciosus (Lindl.) DC. var. *speciosus.* Showy fleabane; infrequent; open woods and dry meadows; WNA.

Erigeron subtrinervis Rydb. var. *conspicuus* (Rydb.) Cronq. Three-veined fleabane; infrequent; open slopes; WNA.

Eriophyllum lanatum (Pursh) Forbes var. *integrifolium* (Hook.) Smiley. Common eriophyllum; infrequent; open slopes with rocky soil; RMR.

Hieracium albiflorum Hook. White-flowered hawkweed; frequent; open woods; WNA.

Hieracium cynoglossoides Arv.-Touv. Houndstongue hawkweed; infrequent; dry open places and disturbed areas; RMR.
Hieracium gracile Hook. Slender hawkweed; frequent; open woods and slopes; NA.
Hieracium scouleri Hook. Woolly-weed; infrequent; open slopes; VP.
Leontodon autumnalis L. Fall dandelion; infrequent; open woods and disturbed sites; I.
Madia minima (Gray) Keck. Small-head tarweed; infrequent; open slopes; RMR.
Matricaria matricarioides (Less.) Porter. Pineapple weed; infrequent; disturbed and heavily grazed areas; NA.
Microseris nutans (Geyer) Schultz-Bip. Nodding microseris; frequent; open and moist slopes and forests; RMR.
Microseris troximoides Gray. False-agoseris; infrequent; forests, rocky slopes and balds; RMR.
Petasites sagittatus (Banks) Gray. Arrowleaf; rare; moist soil surrounding ponds; CR.
Senecio integerrimus Nutt. var. *exaltatus* (Nutt.) Cronq. Western groundsel; frequent; rocky open slopes and balds; RMR.
Senecio integerrimus Nutt. var. *ochroleucus* (Gray) Cronq. Frequent; rocky open slopes and streamsides; RMR.
Senecio pseudaureus Rydb. var. *pseudaureus*. Streambank butterweed; infrequent; wet meadows and moist woods; RMR.
Senecio triangularis Hook. var. *triangularis*. Arrowleaf; infrequent; moist soil near ponds and seeps; RMR.
Taraxacum officinale Weber. Common dandelion; frequent; disturbed sites and open slopes; I.
Taraxacum laevigatum (Willd.) DC. Red-seeded dandelion; infrequent; disturbed sites and open slopes; I.
Tragopogon dubius Scop. Yellow salsify; infrequent; disturbed sites and open slopes with shallow rocky soil; I.
Tragopogon pratensis L. Meadow salsify; rare; disturbed sites; I.

Berberidaceae Barberry Family

Berberis aquifolium Pursh. Shining oregongrape; infrequent; open slopes; RMP.
Berberis repens Lindl. Creeping oregongrape; frequent; open woods; RMR.

Betulaceae Birch Family

Alnus sinuata (Regel) Rydb. Sitka alder; frequent; moist woods, slopes, ponds and springs; RMR.

Boraginaceae Borage Family

Cryptantha affinis (Gray) Greene. Slender cryptantha; infrequent; rock outcrops and woods; RMR
Cryptantha torreyana (Gray) Greene. Torrey's cryptantha; infrequent; rock outcrops and sparsely wooded slopes; RMR.
Cynoglossum officinale L. Common hound's-tongue; infrequent; disturbed moist soil; I.
Hackelia floribunda (Lehm.) Johnst. Many-flowered stickseed; frequent; moist to dry open slopes; RMR.
Mertensia longiflora Greene. Long-flowered bluebells; infrequent; open grassy slopes, disturbed sites and balds; RMP.
Mertensia paniculata (Ait.) G. Don var. *borealis* (Macbr.) Williams. Tall bluebells; frequent; wooded areas and streamsides; RMP.
Myosotis micrantha Pall. Blue scorpion-grass; infrequent; open slopes and balds; I.
Plagiobothrys scouleri (H. & A.) Johnst. var. *penicillatus* (Greene) Cronq. Scouler's plagiobothrys; frequent; rock outcrops, open slopes and disturbed sites; CR.

Brassicaceae Mustard Family

Arabis divaricarpa Nels. var. *divaricarpa.* Spreadingpod rockcress; frequent; open forests and grassy slopes; NA.

Arabis drummondii Gray. Drummond's rockcress; infrequent; open grassy slopes and mountain ridges; NA.

Arabis glabra (L.) Bernh. Towermustard; infrequent; open forest; I.

Arabis holboellii Hornem var. *retrofracta* Grah. Rydb. Holboell's rockcress; common; open grassy slopes and granitic rock outcrops; NA.

Arabis microphylla Nutt. Littleleaf rockcress; infrequent; ridges and rock outcrops; RMP.

Capsella bursa-pastoris (L.) Medic. Shepherd's purse; infrequent; disturbed trailsides; I.

Cardamine oligosperma Nutt. Little western bittercress; infrequent; spring areas; RMR.

Cardamine pensylvanica Muhl. Pennsylvanian bittercress; infrequent; wet marshy meadows, ponds and streamsides; NA.

Descurainia pinnata (Walt.) Britt. var. *filipes* (Gray) Peck. Western tansymustard; infrequent; disturbed trailsides; RMP.

Descurainia richardsonii (Sweet) Schulz var. *viscosa* (Rydb.) Peck. Mountain tansymustard; infrequent; spring seepages; RMR.

Descurainia sophia (L.) Webb. Flixweed; infrequent; open slopes; I.

Draba stenoloba Ledeb. var. *nana* (Schulz) Hitchc. Slender draba; frequent; moist meadows, spring seepages and disturbed trailsides; RMR.

Draba verna L. var. *verna.* Spring whitlow-wort; frequent; balds and disturbed open slopes; NA.

Rorippa sinuata (Nutt.) Hitchc. Spreading yellowcress; infrequent; edge of ponds; WNA.

Thlaspi arvense L. Fanweed; infrequent; disturbed trailsides; I.

Campanulaceae Harebell Family

Campanula rotundifolia L. Scotch bellflower; common; open, usually south facing slopes with sagebrush; NA/Eurasia.

Caprifoliaceae Honeysuckle Family

Linnaea borealis L. var. *longiflora* Torr. Western twinflower; infrequent; woods; CR.

Lonicera involucrata (Rich.) Banks var. *involucrata.* Black twin-berry; frequent; open slopes and rocky canyons; WNA.

Lonicera utahensis Wats. Utah honeysuckle; frequent; moist woods and open slopes; RMR.

Sambucus racemosa L. ssp. *pubens* (Michx.) House var. *melanocarpa* (Gray) McMinn. Black elderberry; infrequent; woods and clearcut areas; RMR.

Symphoricarpos oreophilus Gray var. *utahensis* (Rydb.) A. Nels. Mountain snowberry; common; open woods; WNA.

Caryophyllaceae Pink Family

Arenaria capillaris Poir. var. *americana* (Mag.) Davis. Thread-leaved sandwort; common; open to rocky slopes; RMR.

Arenaria lateriflora L. Bluntleaf sandwort; infrequent; moist soil surrounding ponds and spring seepages; NA/Eurasia.

Cerastium nutans Raf. Cerastium; frequent; moist disturbed areas; NA.

Cerastium vulgatum L. Common chickweed; infrequent; disturbed sites; I.

Sagina saginoides (L.) Britt. Alpine pearlwort; infrequent; moist soil near springs; NA/Eurasia.

Silene menziesii Hook. var. *menziesii.* Menzies' silene; infrequent; forests, rocky canyons, talus slopes and disturbed sites; WNA.

Silene parryi (Wats.) Hitchc. & Mag. Parry's silene; frequent; forests and open ridges; RMR.
Spergularia rubra (L.) Presl. Red sandspurry; frequent; woods, open slopes and disturbed sites; I.
Stellaria calycantha (Ledeb.) Bong. var. *bongardiana* Fern. Northern starwort; frequent; moist meadows, springs and ponds; RMR.
Stellaria calycantha (Ledeb.) Bong. var. *sitchana* (Steud.) Fern. Infrequent; wet meadows and near ponds; RMR.
Stellaria crispa Cham. & Schlecht. Crisped starwort; frequent; spring seepages and wet meadows; RMR.
Stellaria longipes Goldie var. *altocaulis* (Hulten) Hitchc. Longstalk starwort; infrequent; open slopes with sagebrush; NA/Eurasia.
Stellaria longipes Goldie var. *longipes*. Infrequent; open slopes with sagebrush; Anthers of this variety (Peterson & Annable 3695) are white ca. 0.2 mm long and the ovary has 4 styles. Anthers for *S. longipes* var. *altocaulis* (Peterson & Annable 3696) are red ca. 0.8 mm long, and the ovary has 3 styles. These two varieties appear to be separate species; NA.
Stellaria nitens Nutt. Shining chickweed; infrequent; open slopes and balds; WNA.
Stellaria obtusa Engelm. Bluntsepaled starwort; infrequent; springs; RMR.

Celastraceae Staff-tree Family

Pachistima myrsinites (Pursh) Raf. Mountain lover; common; woods; RMR.

Chenopodiaceae Goosefoot Family

Chenopodium fremontii Wats. var. *atrovirens* (Rydb.) Fosberg. Fremont's goosefoot; infrequent; disturbed sites near springs; WNA.
Monolepis nuttalliana (Schultes) Greene. Patata; infrequent; disturbed trailsides; NA/Eurasia.

Clusiaceae St. John's-wort Family

Hypericum perforatum L. Klamath weed; infrequent; disturbed sites; I.

Cornaceae Dogwood Family

Cornus canadensis L. Bunchberry dogwood; infrequent; moist woods; NA/Eurasia.
Cornus stolonifera Michx. var. *occidentalis* (T. & G.) Hitchc. Red-osier dogwood; frequent; forests and along drainages; RMR.

Crassulaceae Stonecrop Family

Sedum lanceolatum Torr. var. *lanceolatum*. Lanceleaved stonecrop; common; shallow rocky soils and open woods; RMR.
Sedum stenopetalum Pursh. Wormleaf stonecrop; infrequent; forests; RMR.

Elaeagnaceae Oleaster Family

Shepherdia canadensis (L.) Nutt. Canadian buffalo-berry; common; open and wooded areas; NA.

Ericaceae Heath Family

Arctostaphylos uva-ursi (L.) Spreng. Kinnikinnick; common; open grassy slopes and forests; NA/Eurasia.
Ledum glandulosum Nutt. var. *glandulosum*. Mountain labrador-tea; infrequent; moist soil, forests and lake margins; RMP.
Phyllodoce empetriformis (Sw.) D. Don. Red mountain-heather; common; forests; RMR.
Pterospora andromedea Nutt. Woodland pinedrops; infrequent; forests; WNA.

Rhododendron albiflorum Hook. White rhododendron; frequent; moist forests; RMR.
Vaccinium caespitosum Michx. Dwarf huckleberry; infrequent; grassy slopes; CR.
Vaccinium membranaceum Dougl. Tall bilberry; common; forests and mountain slopes; RMR.
Vaccinium myrtillus L. Low bilberry; common; wet meadows, open slopes and forests; NA/Eurasia.
Vaccinium scoparium Leiberg. Grouseberry; common; springs and moist forests; RMR.

Fabaceae Pea Family

Astragalus alpinus L. Alpine milk-vetch; infrequent; springs and moist forests; CR.
Astragalus canadensis L. var. *mortonii* (Nutt.) Wats. Canadian milk-vetch; infrequent; moist forests; RMP.
Astragalus miser Dougl. var. *miser*. Weedy milk-vetch; infrequent; rocky open slopes; RMP.
Lupinus polyphyllus Lindl. var. *burkei* (Wats.) Hitchc. Bigleaf lupine; infrequent; open slopes and disturbed areas; RMP.
Lupinus sericeus Pursh var. *sericeus*. Silky lupine; common; open grassy slopes and shallow rocky soil; RMR.
Lupinus sulphureus Dougl. var. *subsaccatus* (Suks.) Hitchc. Sulfur lupine; frequent; shallow rocky soils and open slopes; RMP.
Medicago lupulina L. Black medic; infrequent; forests and roadsides; I.
Trifolium agrarium L. Yellow clover; infrequent; clearcuts and disturbed areas; I.
Trifolium hybridum L. Alsike clover; infrequent; forests, clearcuts and disturbed areas; I.
Trifolium pratense L. Red clover; infrequent; forests and disturbed trailsides; I.
Trifolium repens L. White clover; frequent; moist disturbed areas, springs, ponds, clearcuts and forests; I.
Vicia americana Muhl. var. *truncata* (Nutt.) Brew. American vetch; infrequent; forests; NA.

Gentianaceae Gentain Family

Gentiana amarella L. Northern gentain; frequent; moist open slopes and forests; NA/Eurasia.

Grossulariaceae Currant or Gooseberry Family

Ribes cereum Dougl. var. *cereum*. Squaw currant; infrequent; moist slopes; WNA.
Ribes cognatum Greene. Umatilla gooseberry; rare; moist soil near ponds; RMP.
Ribes hudsonianum Richards. Stinking currant; infrequent; moist soil surrounding ponds and in forests; WNA
Ribes lacustre (Pers.) Poir. Prickly currant; common; moist woods to drier forest slopes and subalpine ridges; NA.
Ribes viscosissimum Pursh var. *viscosissimum*. Stickly currant; frequent; open or heavily timbered, moist to dry slopes; RMR.

Haloragaceae Water-milfoil Family

Myriophyllum spicatum L. var. *exalbescens* (Fern.) Jeps. Spiked water-milfoil; infrequent; submerged in ponds; NA/Eurasia.

Hippuridaceae Mare's-tail Family

Hippuris vulgaris L. Common mare's-tail; infrequent; ponds; COS.

Hydrangeaceae Hydrangea Family

Philadelphus lewisii Pursh. Syringa; infrequent; rock cliffs; RMR.

Hydrophyllaceae Waterleaf Family

Hydrophyllum capitatum Dougl. var. *capitatum.* Wool breeches; frequent; open grassy slopes; RMR.

Nemophila breviflora Gray. Great Basin nemophila; infrequent; dry slopes; RMR.

Phacelia franklinii (R. Br.) Gray. Franklin's phacelia; infrequent; open grassy slopes and disturbed sites; WNA.

Phacelia hastata Dougl. var. *leptosepala* (Rydb.) Cronq. Silverleaf phacelia; infrequent; springs and seepages; RMR.

Phacelia linearis (Pursh) Holz. Threadleaf phacelia; frequent; open grassy slopes and balds; RMR.

Lamiaceae Mint Family

Agastache urticifolia (Benth.) Kuntze var. *urticifolia.* Giant-hyssop; frequent; open slopes and draws; RMR.

Lycopus uniflorus Michx. Northern bugleweed; infrequent; margin of ponds; NA.

Monardella odoratissima Benth. var. *discolor* (Greene) St. John. Mountain monardella; infrequent; open slopes; RMR.

Prunella vulgaris L. Seal-heal; infrequent; moist disturbed trailsides; NA/Eurasia.

Menyanthaceae Buck-bean Family

Menyanthes trifoliata L. Buck-bean; rare; margins of ponds; NA/Eurasia.

Nymphaeaceae Water-lily Family

Nuphar polysepalum Engelm. Indian pond lily; infrequent; Ponds; RMR.

Onagraceae Evening-primrose Family

Circaea alpina L. Circaea; infrequent; moist woods; NA/Eurasia.

Clarkia pulchella Pursh. Pink fairies; infrequent; open slopes; RMP.

Epilobium alpinum L. var. *alpinum.* Alpine willow-weed; frequent; moist springs and meadows; NA/Eurasia.

Epilobium alpinum L. var. *lactiflorum* (Hausskn.) Hitchc. Common; moist disturbed areas and forests; RMR.

Epilobium alpinum L. var. *nutans* (Hornem.) Hook. Infrequent; moist disturbed areas surrounding springs; NA/Eurasia.

Epilobium angustifolium L. Fireweed; infrequent; forests; NA/Eurasia.

Epilobium glandulosum Lehm. var. *tenue* (Trel.) Hitchc. Common willow-weed; infrequent; wet meadows; RMR.

Epilobium minutum Lindl. Small-flowered willow-weed; infrequent; open rocky slopes; RMR.

Gayophytum diffusum T. & G. Spreading gayophytum; infrequent; disturbed trailsides and roadsides; WNA.

Orobanchaceae Broomrape Family

Orobanche fasciculata Nutt. Clustered broomrape; infrequent; open forests, probably parasitizing *Symphoricarpa oreophilus* var. *utahensis*; WNA.

Orobanche uniflora L. var. *purpurea* (Heller) Achey. Naked broomrape; rare; rocky slopes; RMR.

Polemoniaceae Phlox Family

Collomia grandiflora Dougl. Large-flowered collomia; infrequent; open forests; WNA.

Collomia linearis Nutt. Narrow-leaf collomia; frequent; rocky soils, rock outcrops and forests; WNA.

Gilia aggregata (Pursh) Spreng. var. *aggregata.* Scarlet gilia; infrequent; open woods, rocky slopes and dry meadows; RMR.
Linanthus septentrionalis Mason. Northern linanthus; infrequent; forest openings, dry meadows and rock outcrops; RMR.
Microsteris gracilis (Hook.) Greene var. *gracilis.* Pink microsteris; infrequent; swales, ridges and open slopes; RMR.
Microsteris gracilis (Hook.) Greene var. *humilior* (Hook.) Cronq. Frequent; open forests slopes and rock outcrops; RMP.
Phlox caespitosa Nutt. Tufted phlox; common; open, rocky slopes and ridges; RMR.
Polemonium pulcherrimum Hook. var. *calycinum* (Eastw.) Brand. Showy polemonium; infrequent; montane slopes and balds; RMR.
Polemonium pulcherrimum Hook. var. *pulcherrimum.* Frequent; subalpine rocky slopes and ridges; RMR.

Polygonaceae Buckwheat Family

Eriogonum compositum Dougl. var. *leianthum* Hook. Northern buckwheat; infrequent; balds and open slopes; RMP.
Eriogonum douglasii Benth. var. *douglasii.* Douglas' buckwheat; infrequent; balds; RMR.
Eriogonum heracleoides Nutt. var. *angustifolium* (Nutt.) T. &.G. Wyeth buckwheat; infrequent; open slopes with shallow rocky soils; RMR.
Eriogonum umbellatum Torr. var. *subalpinum* (Greene) Jones. Sulfur buckwheat; common; rocky slopes, rock outcrops and open forests; RMP.
Eriogonum umbellatum Torr. var. *umbellatum.* Infrequent; open slopes; RMR.
Polygonum aviculare L. Prostrate knotweed; infrequent; disturbed soils and near springs; NA/Eurasia.
Polygonum douglasii Greene var. *latifolium* (Engelm.) Greene. Mountain knotweed; infrequent; disturbed soil near springs and trails; WNA.
Polygonum kelloggii Greene. Kellogg's knotweed; infrequent; slopes; RMR.
Rumex acetosella L. Sour weed; frequent; disturbed open and wooded slopes; I.
Rumex crispus L. Curly dock; infrequent; distrubed areas near springs; I.
Rumex salicifolius Weinm. ssp. *triangulivalvis* Danser var. *triangulivalvis.* Narrow-leaved dock; rare; forests; NA/Eurasia.

Portulacaceae Purslane Family

Claytonia lanceolata Pursh var. *lanceolata.* Lanceleaf springbeauty; frequent; rocky slopes and moist woods; RMR.
Lewisia pygmaea (Gray) Robins. Dwarf lewisia; infrequent; wet meadows; WNA.
Lewisia rediviva Pursh. Bitterroot; infrequent; shallow rocky soils and open slopes; RMR.
Montia linearis (Dougl.) Greene. Narrow-leaved montia; infrequent; open rocky slopes; WNA.
Montia perfoliata (Donn) Howell. Miner's lettuce; infrequent; forests, open areas and balds; WNA.
Talinum okanoganense English. Okanogan talinum; infrequent; shallow soil of balds and andesite rock outcrops; RMP.

Primulaceae Primrose Family

Dodecatheon cusickii Greene. Cusick's shooting star; frequent; slopes, rocky ridge tops and wet meadows; RMP.
Dodecatheon pulchellum (Raf.) Merrill var. *pulchellum.* Dark throat shooting star; infrequent; wet seepage areas; WNA.

Pyrolaceae Wintergreen Family

Chimaphila menziesii (R. Br.) Spreng var. *occidentailis*. Little pipsissewa; frequent; understory of coniferous forests; RMR.

Chimaphila umbellata (L.) Bart. Prince's-pine; common; woods especially under conifers; NA/Eurasia.

Pyrola asarifolia Michx. Infrequent; moist soil and surrounding ponds; WNA.

Pyrola chlorantha Sw. Infrequent; moist coniferous forests; NA/Eurasia.

Pyrola minor L. Lesser wintergreen; common; moist soil surrounding ponds and seepage areas; NA/Eurasia.

Pyrola secunda L. var. *secunda*. One-sided wintergreen; frequent; forests; NA/Eurasia.

Pyrola uniflora L. Woodnymph; infrequent; understory of moist coniferous forests; WNA.

Ranunculaceae Buttercup Family

Aconitum columbianum Nutt. var. *columbianum*. Monkshood; infrequent; moist soil surrounding ponds and springs; RMR.

Actaea rubra (Ait.) Willd. Baneberry; frequent; moist woods; NA.

Aquilegia flavescens Wats. Yellow columbine; infrequent; moist moutain meadows and alpine slopes; RMP.

Clematis columbiana (Nutt.) T. & G. var. *columbiana*. Columbia clematis; infrequent; wooded, open areas and talus slopes; RMP.

Delphinium burkei Greene. Burke's larkspur; infrequent; wet meadows and moist meadows; RMP.

Delphinium nuttallianum Pritz. var. *nuttallianum*. Upland larkspur; frequent; open forests, slopes and balds; RMR.

Ranunculus aquatilis L. var. *capillaceus* (Thuill.) DC. Water crowfoot; infrequent; ponds; NA.

Ranunculus aquatilis L. var. *hispidulus* Drew. Infrequent; ponds; WNA.

Ranunculus eschscholtzii Schlecht. Subalpine buttercup; infrequent; meadows and talus slopes; RMR.

Ranunculus glaberrimus Hook. var. *glaberrimus*. Sagebrush buttercup; infrequent; open slopes and balds; RMR.

Ranunculus gmelinii DC. var. *hookeri* (G. Donn) Benson. Small yellow water-buttercup; infrequent; ponds; CR.

Ranunculus uncinatus D. Don var. *parviflorus* (Torr.) Benson. Little buttercup; frequent; marshy ponds, seepage areas and disturbed sites; RMR.

Thalictrum occidentale Gray. Western meadowrue; common; moist soil surrounding ponds, seepage areas, and open slopes; RMR.

Trautvetteria caroliniensis (Walt.) Vail var. *occidentalis* (Gray) Hitchc. False bugbane; common; moist soil surrounding ponds, drainages and forests; RMR.

Rhamnaceae Buckthorn Family

Ceanothus velutinus Dougl. var. *velutinus*. Tobacco-brush; infrequent; rocky slopes; WNA.

Rhamnus alnifolia L'Her. Alder buckthorn; infrequent; moist soil surrounding ponds; CR.

Rosaceae Rose Family

Amelanchier alnifolia Nutt. var. *alnifolia*. Western service berry; frequent; forests slopes and granitic rock outcrops; WNA.

Fragaria vesca L. var. *crinita* (Rydb.) Hitchc. Wood strawberry; frequent; moist woods; RMR.

Fragaria virginiana Duchesne var. *platypetala* (Rydb.) Hall. Broadpetal strawberry; frequent; forests and rock outcrops; RMR.

Geum macrophyllum Willd. var. *perincisum* (Rydb.) Raup. Largeleaved avens; frequent; moist soil near streams, springs, seepages, ponds and forests; RMP.

Geum triflorum Pursh var. *triflorum.* Prairie smoke; frequent; wet seepage areas and open grassy slopes; CR.

Holodiscus discolor (Pursh) Maxim. Creambush ocean-spray; frequent; open slopes; WNA.

Physocarpus malvaceus (Greene) Kuntze. Mallow ninebark; common; rocky hillsides and woods; RMP.

Potentilla diversifolia Lehm. var. *diversifolia.* Diverse-leaved cinquefoil; frequent; rock outcrops, rocky slopes and meadows; WNA.

Potentilla glandulosa Lindl. var. *glandulosa.* Gland cinquefoil; infrequent; forests; RMR.

Potentilla glandulosa Lindl. var. *pseudorupestris* (Rydb.) Breit. Common; rocky slopes, outcrops and forests; RMP.

Potentilla gracilis Dougl. var. *flabelliformis* (Lehm.) Nutt. Cinquefoil; infrequent; forests; RMR.

Potentilla palustris (L.) Scop. Purple cinquefoil; rare; wet meadows surrounding ponds; NA.

Prunus emarginata (Dougl.) Walp. var. *emarginata.* Bittercherry; common; open forest slopes and moist woods; RMP.

Prunus virginiana L. var. *melanocarpa* (Nels.) Sarg. Common chokecherry; infrequent; rocky slopes; RMR.

Rosa gymnocarpa Nutt. Little wild rose; common; woods and streamsides; RMR.

Rosa nutkana Presl var. *hispida* Fern. Bristly nootka rose; infrequent; open hillsides and roadsides; WNA.

Rubus idaeus L. var. *gracilipes* Jones. Red raspberry; frequent; moist woods, granitic rock outcrops and talus slopes; NA/Eurasia.

Rubus parviflorus Nutt. Thimbleberry; frequent; open moist forests; NA.

Rubus pubescens Raf. Dwarf red blackberry; infrequent; moist woods; CR.

Sanguisorba occidentalis Nutt. Annual burnet; infrequent; distrurbed sites; RMR.

Sibbaldia procumbens L. Creeping sibbaldia; infrequent; open subalpine slopes and meadows; CR.

Sorbus scopulina Greene var. *scopulina.* Cascade mountain-ash; frequent; open woods and seepages; WNA.

Spiraea betulifolia Pall. var. *lucida* (Dougl.) Hitchc. Shiny-leaf spiraea; common; pond margins and wooded slopes; NA/Eurasia.

Rubiaceae Madder Family

Galium aparine L. Cleavers; infrequent; rocky cliffs; NA/Eurasia.

Galium bifolium Wats. Thinleaf bedstraw; infrequent; disturbed areas near trails; RMR.

Galium trifidum L. var. *pacificum* Wieg. Small bedstraw; infrequent; near ponds and moist places; NA.

Galium triflorum Michx. Sweetscented bedstraw; frequent; spring seepages, wet meadows and moist woods; NA/Eurasia.

Salicaceae Willow Family

Populus tremuloides Michx. Quaking aspen; common; forms open to dense stands on slopes; NA.

Populus trichocarpa T. & G. Black cottonwood; infrequent; moist slopes and streamsides; WNA.

Salix barclayi Anderrs. Barclay's willow; infrequent; wet meadows and moist soil surrounding ponds; RMR.
Salix bebbiana Sarg. Bebb willow; infrequent; margins of ponds and creeks; NA/Eurasia.
Salix phylicifolia L. ssp. *planifolia* (Pursh) Breitung. Tea-leaved willow; infrequent; wet meadows and moist soil surrounding ponds; RMR.
Salix scouleriana Barratt. Scouler willow; frequent; wooded slopes and draws; WNA.

Saxifragaceae Saxifrage Family

Heuchera cylindrica Dougl. var. *alpina* Wats. Roundleaf alumroot; frequent; shallow rocky soils, open slopes, rocky canyon walls and talus slopes; RMR.
Heuchera cylindrica Dougl. var. *cylindrica.* Frequent; balds, rocky soils, cliffs and talus slopes; RMR.
Lithophragma bulbifera Rydb. Bulbiferous woodlandstar; infrequent; balds and open forests; RMR.
Lithophragma parviflora (Hook.) Nutt. Smallflowered woodlandstar; frequent; balds, wet seepages and rocky slopes; WNA.
Mitella caulescens Nutt. Star-shaped mitrewort; infrequent; streamsides; RMR.
Mitella pentandra Hook. Five-stamened mitrewort; frequent; moist woods, springs, drainages and margins surrounding ponds; RMR.
Mitella trifida Grah. Three-toothed mitrewort; infrequent; deep forests and moist montane slopes; RMR.
Parnassia fimbriata Konig. var. *fimbriata.* Fringed grass-of-Parnassus; rare; wet meadows; RMR.
Saxifraga bronchialis L. var. *austromontana* (Wieg.) Jones. Spotted saxifrage; frequent; rocky canyon walls and talus slopes; RMR.
Saxifraga integrifolia Hook. var. *integrifolia.* Swamp saxifrage; infrequent; grassy subalpine slopes and wet banks; VP.
Saxifraga occidentalis Wats. var. *allenii* (Small) Hitchc. Western saxifrage; infrequent; granitic rock outcrops; RMR.
Suksdorfia ranunculifolia (Hook.) Engl. Buttercup-leaved suksdorfia; infrequent; wet rocky slopes and seepages; RMR.
Tiarella trifoliata L. var. *unifoliata* (Hook.) Kurtz. Foamflower; frequent; moist forests, grassy slopes and meadows; RMR.

Scrophulariaceae Figwort Family

Castilleja cervina Greenm. Deer paintbrush; infrequent; balds and open grassy slopes with sagebrush; RMP.
Castilleja elmeri Fern. Elmer's paintbrush; infrequent; forests; VP.
Castilleja miniata Dougl. var. *miniata.* Scarlet paintbrush; common; open grassy slopes, meadows, rock outcrops, and disturbed areas; RMR.
Collinsia parviflora Lindl. var. *parviflora.* [see Ganders and Krause 1986]. Small-flowered blue-eyed Mary; frequent; disturbed areas near trails, grassy slopes and open forests; WNA.
Mimulus breweri (Greene) Rydb. Brewer's monkey-flower; infrequent; disturbed trailsides, sandy roadsides and rock outcrops; RMP.
Minulus guttatus DC. var. *depauperatus* (Gray) Grant. Yellow monkey-flower; infrequent; seeps; WNA.
Mimulus guttatus DC. var. *guttatus.* Frequent; moist soil near springs and seeps; WNA.
Mimulus moschatus Dougl. var. *moschatus.* Musk-flower; frequent; moist soil near springs and disturbed habitats; RMR.
Pedicularis bracteosa Benth. var. *bracteosa.* Bracted lousewort; infrequent; moist forests; RMP.

Pedicularis contorta Benth. var. *contorta.* White coiled-bead lousewort; frequent; open grassy slopes and rocky subalpine slopes; RMR.
Penstemon confertus Dougl. Yellow penstemon; frequent; balds, rocky slopes and grassy slopes with sagebrush; RMP.
Penstemon fruticosus (Pursh) Greene var. *scouleri* (Lindl.) Cronq. Shrubby penstemon; common; rocky slopes, rock outcrops and grassy slopes with sagebrush; RMP.
Rhinanthus crista-galli L. Yellow rattle; infrequent; moist places and grassy slopes; CR.
Verbascum thapsus L. Common mullein; frequent; disturbed habitats and clearcuts; I.
Veronica americana Schwein. American brookline; frequent; wet meadows, springs and ponds; NA.
Veronica serpyllifolia L. var. *humifusa* (Dickson) Vahl. Thyme-leaved speedwell; frequent; wet meadows, springs and disturbed habitats; I.

Urticaceae Nettle Family

Urtica dioica L. ssp. *gracilis* (Ait.) Seland. Stinging nettle; frequent; moist soil surrounding ponds and open grassy slopes; NA.

Valerianaceae Valerian Family

Valeriana sitchensis Bong. Sitka valeriana; common; moist, open and wooded slopes; RMR.

Violaceae Voilet Family

Viola canadensis L. var. *rugulosa* (Greene) Hitchc. Canadian violet; frequent; moist forest slopes; WNA.
Viola glabella Nutt. Stream violet; infrequent; moist woods and near ponds; NA/Eurasia.
Viola nephrophylla Greene var. *nephrophylla.* Bog violet; infrequent; open forests; NA.
Viola orbiculata Geyer. Round-leaved violet; frequent; forests; RMR.
Viola palustris L. Marsh violet; frequent; open forests and moist soil near ponds; WNA.

Liliopsida Monocots

Alismataceae Water-plantain Family

Alisma gramineum Gmel. Narrowleaf water-plantain; infrequent; submerged in ponds; NA.
Alisma plantago-aquatica L. American water-plantain; infrequent; ponds; COS.

Cyperaceae Sedge Family

Carex arcta Boott. North clustered sedge; infrequent; ponds; CR.
Carex athrostachya Olney; Slenderbeaked sedge; infrequent or Rare; ponds; WNA.
Carex aurea Nutt. Golden sedge; infrequent; ponds; NA.
Carex brunnescens (Pers.) Poir. Brownish sedge; infrequent; ponds and streamside; CR.
Carex canescens L. Gray sedge; frequent; marshy meadows and surrounding ponds; CR.
Carex concinnoides Mack. Northwest sedge; infrequent; forests and rocky canyons; RMR.
Carex deweyana Schw. Dewey's sedge; infrequent; forests and streamsides; NA/Eurasia.
Carex disperma Dewey. Soft leaved sedge; frequent; streamsides, raised humicks surrounding ponds and dry rocky drainages; CR.
Carex hoodii Boott. Hood's sedge; infrequent; open rocky slopes and grassy slopes; WNA.
Carex laeviculmis Meinsh. Smooth-stem sedge; infrequent; wet meadows; RMR.
Carex lasiocarpa Ehrh. Slender sedge; frequent; surrounding ponds; CR.
Carex lenticularis Michx. Infrequent; moist disturbed areas and streamside; NA/Eurasia.

Carex leporinella Mack. Sierra-hare sedge; infrequent; rocky talus slopes and rock outcrops; RMP.
Carex limosa L. Shore sedge; infrequent; surrounding ponds; CR.
Carex mertensii Prescott. Mertens' sedge; infrequent; dry water courses of forests; RMR.
Carex microptera Mack. Small-winged sedge; frequent; ponds, springs, disturbed sites and dry rocky drainages of forests; WNA.
Carex petasata Dewey. Liddon's sedge; frequent; shallow rocky soils on open slopes, ridges and rock outcrops; RMP.
Carex phaeocephala Piper. Mountain hare sedge; common; open grassy slopes, rocky talus slopes, rock outcrops and ridge tops; RMR.
Carex praticola Rydb. Meadow sedge; infrequent; open slopes; NA.
Carex raynoldsii Dewey. Raynold's sedge; frequent; open grassy slopes with sagebrush; RMR.
Carex rossii Boott. Ross sedge; common; understory of coniferous forests and grassy openings in forests; WNA.
Carex rostrata Stokes. Beaked sedge; frequent; in standing water or marshy meadows surrounding ponds; CR.
Carex tenera Dewey. Slender sedge; infrequent; ponds; CR.
Carex vesicaria L. Inflated sedge; frequent; marshy meadows surrounding ponds; CR.
Eleocharis palustris (L.) R. & S. Common spike-rush; frequent; marshy ponds; COS.
Eriophorum gracile Koch. Slender cotton-grass; rare; marshy meadows surrounding ponds; CR.
Scirpus microcarpus Presl. Small-fruit bulrush; infrequent; moist disturbed sites; NA.

Juncaceae Rush Family

Juncus bufonius L. Toad rush; infrequent; moist soils near springs; NA/Eurasia.
Juncus drummondii E. Meyer var. *subtriflorus* (Meyer) Hitchc. Drummond's rush; frequent; moist sites surrounding ponds and springs; WNA.
Juncus effusus L. var. *compactus* Lejeune & Court. Common rush; infrequent; wet disturbed sites and marshy meadows; COS.
Juncus ensifolius Wikst. var. *ensifolius*. Dagger-leaf rush; infrequent; wet meadows in disturbed sites; WNA.
Juncus mertensianus Bong. Mertens' rush; frequent; wet meadows surrounding ponds, springs and moist disturbed sites; NA/Eurasia.
Juncus parryi Engelm. Parry's rush; common; Granitic rock outcrops and subalpine slopes; RMR.
Luzula campestris (L.) DC. var. *multiflora* (Ehrh.) Celak. Field woodrush; infrequent; open forests; NA.
Luzula parviflora (Ehrh.) Desv. Smallflowered woodrush; frequent; moist woods, drainages and marshy ponds; NA/Eurasia.
Luzula spicata (L.) DC. Spiked woodrush; frequent; open slopes and forests, rock outcrops and springs; NA/Eurasia.

Lemnaceae Duckweed Family

Lemna minor L. Water lentil; frequent; ponds; COS.
Spirodela polyrhiza (L.) Schleid. Great duckweed; infrequent; ponds; COS.

Liliaceae Lily Family

Allium cernuum Roth. Nodding onion; infrequent; grassy slopes and rocky outcrops; NA.
Allium robinsonii Hend. Robinson's onion; frequent; balds and slopes with thin soil; RMP.
Calochortus macrocarpus Dougl. Sagebrush mariposa; infrequent; open forests; RMR.

Clintonia uniflora (Schult.) Kunth. Queen's cup; infrequent; moist forests; RMR.
Erythronium grandiflorum Pursh var. *grandiflorum.* Glacier-lily; infrequent; moist meadows; RMR.
Fritillaria pudica (Pursh) Spreng. Fritillary; infrequent; balds; RMR
Lilium columbianum Hanson. Tiger lily; infrequent; moist woods and streamsides; WNA.
Smilacina racemosa (L.) Desf. Western false Solomon's seal; frequent; moist woods; NA.
Smilacina stellata (L.) Desf. Star-flowered false Solomon's seal; frequent; moist woods; NA.
Streptopus amplexifolius (L.) DC. var. *chalazatus* Fassett. Clasping-leaved twisted-stalk; infrequent; moist woods; NA.
Veratrum californicum Durand. False hellebore; rare; seeps; RMR.
Zigadenus venenosus Wats. var. *gramineus* (Rydb.) Walsh. Deadly zigadenus; frequent; open grassy slopes and rocky outcrops; RMP.

Orchidaceae Orchid Family

Calypso bulbosa (L.) Oakes. Fairy-slipper; rare; moist forests; NA/Eurasia.
Corallorhiza maculata Raf. Spotted coral-root; infrequent; moist forests and streamsides; NA.
Corallorhiza trifida Chat. Yellow coral-root; infrequent; humus beneath dense forests; NA/Eurasia.
Cypripedium montanum Dougl. Mountain lady's slipper; rare; moist forests; RMR.
Goodyera oblongifolia Raf. Western rattlesnake-plantain; infrequent; dry forests; WNA.
Habenaria dilatata (Pursh) Hook. var. *dilatata.* Bog-candle; infrequent; spring seepages and moist forests surrounding ponds; RMR.
Habenaria dilatata (Pursh) Hook. var. *leucostachys* (Lindl.) Ames. Frequent; moist soil surrounding springs and ponds; RMR.
Habenaria saccata Greene. Slender bog-orchid; frequent; wet meadows surrounding ponds and small drainages; RMR.
Listera borealis Morong. Northern twayblade; rare; humus beneath dense forests; NA.
Listera caurina Piper. Western twayblade; rare; moist forests; RMR.
Spiranthes romanzoffiana Cham. var. *romanzoffiana.* Hooded ladies-tresses; infrequent; wet open disturbed habitats; WNA.

Poaceae Grass Family

Agrostis exarata Trin. ssp. *minor* (Hook.) Hitchc. Spike bentgrass; infrequent; forests; RMR.
Agrostis scabra Willd. Winter bentgrass; common; open forests, grassy slopes, meadows, rocky canyon walls and talus slopes; NA.
Agrostis stolonifera L. var. *palustris* (Huds.) Farw. [= *A. alba* L. var. *palustris* (Huds.) Pers., see Cronquist et al. 1977]. Creeping bentgrass; infrequent; forests; I.
Agrostis stolonifera L. var. *stolonifera* [= *A. alba* L. var. *stolonifera* (L.) J. E. Smith., see Cronquist et al. 1977.]. Fiorin; frequent; aspen groves, open slopes and forests; I.
Agrostis thurberiana Hitchc. Thurber bentgrass; frequent; moist soil near springs; RMR.
Agrostis variabilis Rydb. Variant bentgrass; infrequent; open slopes; WNA.
Alopecurus aequalis Sobol. Shortawn foxtail; infrequent; marshy ponds; NA/Eurasia. Although anthers are 1.2 mm long, the lemma's are short awned from just below the middle.
Anthoxanthum odoratum L. Sweet vernalgrass; rare; disturbed logged areas; I.
Bromus carinatus H. & A. California Brome; common; open forests and grassy slopes; WNA.
Bromus inermis Leys. ssp. *inermis.* Smooth brome; frequent; grassy slopes with sagebrush and forests; I.
Bromus mollis L. Soft brome; infrequent; rock outcrops and sandy roadsides; I.

Bromus tectorum L. Cheat grass; infrequent; open forests; I.
Calamagrostis canadensis (Michx.) Beauv. Bluejoint reedgrass; infrequent; margins of ponds; NA.
Calamagrostis neglecta (Ehrh.) G. M. & S. [= *C. inexpansa* Gray, see Cronquist et al. 1977]. Slimstem reedgrass; infrequent; wet meadows; NA.
Calamagrostis purpurascens R. Br. Purple reedgrass; infrequent; rock outcrops and ridges; NA/Eurasia.
Calamagrostis rubescens Buckl. Pinegrass; common; open slopes and forests; WNA.
Dactylis glomerata L. Orchard grass; infrequent; disturbed sites and moist meadows; I.
Danthonia intermedia Vasey. Timber danthonia; infrequent; shallow soils on open slopes; NA.
Danthonia unispicata (Thurb.) Munro. Onespike danthonia; infrequent; open slopes with shallow soils; WNA.
Deschampsia danthonioides (Trin.) Munro. Annual hairgrass; infrequent; rock outcrops and sandy roadsides; NA.
Deschampsia elongata (Hook.) Munro. Slender hairgrass; infrequent; wet meadows marshy ponds and disturbed sites; NA.
Elymus caninus (L.) L. [= *Agropyron caninum* (L.) Beauv., see Dewey 1984]. Western wheatgrass; rare; wooded slopes; I.
Elymus elymoides (Rafin.) Swezey [= *Sitanion hystrix* (Nutt.) J. G. Smith, see Dewey 1984]. Bottlebrush; common; open slopes and forests margins; WNA.
Elymus glaucus Buckl. var. *glaucus*. Western rye-grass; frequent; forests and springs; WNA.
Festuca arundinacea Schreb. Tall fescue; infrequent; roadsides; I.
Festuca bromoides L. Six-week fescue; infrequent; rock outcrops and sandy roadsides; I.
Festuca californica Vasey. California fescue; rare; open slopes; Completely out of range, collars villous hirsute, lemma's awned, anthers > 4.5 mm long.; VP.
Festuca idahoensis Elmer var. *idahoensis*. Idaho fescue; common; open grassy slopes, springs and open woods; RMR.
Festuca occidentalis Hook. Western fescue; frequent; forests, rocky canyons and talus slopes; RMR.
Festuca rubra L. var. *rubra*. Red fescue; infrequent; open slopes and roadsides; NA/Eurasia.
Festuca saximontana Rydb. var. *purpusiana* (Saint-Yves) Frederiksen & Pavlick [= *F. ovina* L., see Frederiksen 1982.]. Sheep fescue; infrequent; rocky slopes and ridges; NA/Eurasia.
Festuca scabrella Torr. Rough fescue; frequent; grassy slopes; WNA.
Festuca viridula Vasey. Green fescue; frequent; open forests and grassy slopes; RMP.
Glyceria borealis (Nash) Batch. Northern mannagrass; infrequent; margins of ponds; NA.
Glyceria elata (Nash) Jones. Tall mannagrass; frequent; ponds, wet meadows and slopes; NA.
Koeleria cristata Pers. Koeler's grass; common; shallow soils and open slopes; NA/Eurasia.
Melica spectabilis Scribn. Showy oniongrass; frequent; grassy or rocky slopes and wet seepages; RMR.
Melica subulata (Griseb.) Scribn. var. subulata. Alaskian oniongrass; infrequent; open woods and forests; RMR.
Pascopyrum smithii (Rydb.) Love. [= *Agropyron smithii* Rydb., see Dewey 1984]. Bluestem wheatgrass; common; open slopes and swales; WNA.
Phleum pratense L. Common timothy; infrequent; moist meadows and disturbed sites; I.
Poa annua L. Annual bluegrass; infrequent; distrubed areas; I.
Poa bulbosa L. Bulbous bluegrass; infrequent; disturbed sites; I.

Poa compressa L. Canadian bluegrass; infrequent; roadsides; NA/Eurasia.
Poa leptocoma Trin. var. *leptocoma*. Bog bluegrass; rare; wet meadows surrounding ponds; WNA.
Poa nervosa (Hook.) Vasey var. *wheeleri* (Vasey) Hitchc. Wheeler's bluegrass; infrequent; open forests, grassy slopes and balds; RMR.
Poa palustris L. Fowl bluegrass; infrequent; margins of ponds and open slopes; I.
Poa pratensis L. Kentucky bluegrass; frequent; open forests and slopes; I.
Poa secunda Presl [=*P. sandbergii* Vasey, see Kellogg 1985]. Sandberg's bluegrass; common; open forests, balds, rocky slopes and granite rock outcrops; WNA. Two specimens had flat leaf blades up to 3.5 mm broad - a different growth form in this highly variable complex as interpreted by Kellogg.
Pseudoroegneria spicata (Pursh) Love [= *Agropyron spicatum* (Pursh) Scribn. & Smith "*inerme*", see Dewey 1984]. Bluebunch wheatgrass; common; open slopes; WNA.
Stipa nelsonii Scrib. ssp. *dorei* Maze & Barkworth [= *S. occidentalis* Thurb. var. *minor* (Vasey) Hitchc., see Barkworth and McNeill 1979]. Small needlegrass; infrequent; forests and streamsides; WNA.
Stipa occidentalis Thurb. var. *occidentalis*. Westen needlegrass; frequent; open slopes and wooded areas; WNA.
Trisetum canescens Buckl. Tall trisetum; frequent; forests and open slopes; RMR.
Trisetum cernuum Trin. Nodding trisetum; infrequent; rocky slopes; RMR.
Trisetum spicatum (L.) Richter. Spike trisetum; common; rocky slopes, rock outcrops and disturbed sites; COS.

Potamogetonaceae Pondweed Family

Potamogeton gramineus L. Grass-leaved pondweed; infrequent; submerged in ponds; NA/Eurasia.
Potamogeton natans L. Float-leaved pondweed; frequent; submerged in ponds; NA/Eurasia.
Potamogeton pusillus L. Small pondweed; infrequent; ponds; NA/Eurasia.

Scheuchzeriaceae Scheuchzeria Family

Scheuchzeria palustris L. var. *americana* Fern. Scheuchzeria; rare; margins of ponds; NA/Eurasia.

Sparganiaceae Bur-reed Family

Sparganium angustifolium Michx. Narrowleaf bur-reed; infrequent; submerged in ponds; NA.

Typhaceae Cat-tail Family

Typha latifolia L. Common cat-tail; infrequent; margins of ponds; NA/Eurasia.

Plants seen by members of WNPS field trip July 19 to 22, 1985 (Egger 1985) and not collected by the authors.

Carex pachystachya Cham.
Corylus cornuta Marsh
Cryptantha simulans Greene
Epilobium watsonii Barbey
Erigeron acris L. var *asteroides* (Andrz.) DC.
Gaillardia aristata Pursh
Habenaria unalascensis (Spreng.) Wats.

Hackelia micrantha (Eastw.) J. L. Gentry
Ligusticum canbyi Coult. & Rose
Luina nardosmia (Gray) Cronq.
Melica bulbosa Geyer
Phleum alpinum L.
Pinus monticola Dougl.
Sagina procumbens L.
Scrophularia lanceolata Pursh
Symphoricarpos albus (L.) Blake var. *albus*
Thuja plicata Donn
Tsuga heterophylla (Raf.) Sarg.
Tsuga mertensiana (Bong.) Carr.

SUMMARY

The Kettle Range is located in the Colville National Forest. Our study area of 285 km^2 (110 mi^2) encompasses the Kettle Crest above 1524 m (5000 ft) and the adjacent Thirteenmile Creek Area. The elevation ranges from 1005 m (3300 ft) in the Thirteenmile drainage to 2175 m (7135 ft) on Copper Butte.

The vascular flora of the Kettle Range includes 61 families, 215 genera, and 439 species and infraspecific taxa. An annotated list of the vascular plants gives common names, frequency of occurence, habitat preference, and phytogeographic affinities for each taxon. Forty-five percent of the flora has a strong alliance with the Rocky Mountain Region, this includes the Rocky Mountain and Vancouverian Provinces. Taxa with Western North American distributions ranked second at 17% of the total flora. Taxa occuring in North America and Eurasia (12%) ranked third followed by North America (10%), Introduced (9%), Circumboreal Region (5%), and Cosmopolitan (2%).

Nine vegetation types (1. *Eriogonum douglasii/Poa secunda* Association, 2. *Calamagrostis rubescens-Festuca idahoensis-Pseudoroegneria spicata* Association, 3. *Pseudotsuga menziesii-Pinus ponderosa/Calamagrostis rubescens* Association, 4. *Populus tremuloides/Calamagrostis rubescens* Association, 5. *Artemisia tridentata/Festuca idahoensis-Pseudoroegneria spicata* Association, 6. *Pinus contorta/Vaccinium mrytillus* Association, 7. *Abies lasiocarpa-Picea engelmannii/Phyllodoce empetriformis-Vaccinium scoparium* Association, 8. *Pinus albicaulis-Abies lasiocarpa/Juncus parryi-Lupinus sulfureus* Association, 9. Riparian Community) are described in terms of substrate type, range of elevation, and charateristic or common species.

Three species (*Listera borealis*, *Phacelia franklinii* and *Ribes cognatum*) are considered sensitive by the Washington Natural Heritage Program (1984). Five species (*Allium robinsonii*, *Carex raynoldsii*, *Castilleja cervina*, *Cypripedium montanum* and *Talinum okanoganense*) are being monitored but have no proposed status at this time. None of the populations of these species are threatened under current land management but could be affected if there are changes in logging and/or grazing practices.

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Washington Native Plant Society

Skagit Environmental Endowment Commission

BIG BEAVER VALLEY

Vegetation Cover

WESTON SOLUTIONS

GraphiColor

Financial support for the production of this map was provided by Roy F. Weston, Inc., Seattle, Washington, which was responsible for map development and publication. Printing services were provided by Graphicolor, Seattle, Washington.

Vegetation Cover

Wetlands

1. **Marsh**
2. **Bog**

Swamp

3. *Salix/Spiraea* swamp
4. *Salix/Carex* swamp
5. *Thuja/Salix/Carex* swamp
6. *Alnus rubra* swamp

7. **Pond/Lake**
8. **Big Beaver Creek**

Shrub Communities

Shrubthickets

9. *Acer circinatum/Cornus stolonifera*
10. *Acer circinatum/Alnus sinuata*

Nonforested Upland Areas

11. **Talus**
12. **Rock outcrop**
13. ***Carex* meadow**

Forest Communities

Western Red Cedar/Western Hemlock Forest

14. *Thuja plicata/Alnus rubra*
15. *Thuja plicata/Tsuga heterophylla* mature
16. *Thuja plicata* mature
17. *Tsuga heterophylla* immature

Douglas Fir

18. *Pseudotsuga menziesii* immature
19. *Pseudotsuga menziesii* immature/mature mixed
20. *Pseudotsuga menziesii* mature
21. *Pseudotsuga menziesii* exposed slopes
22. *Pseudotsuga menziesii/Tsuga heterophylla* mature
23. *Pseudotsuga menziesii/Thuja plicata/Tsuga heterophylla* mature

Lodgepole Pine

24. *Pinus contorta* mature
25. *Pinus contorta/Pseudotsuga menziesii* mature
26. *Pinus contorta/Pseudotsuga menziesii* exposed slopes

Silver Fir

27. *Abies amabilis/Tsuga heterophylla/Pseudotsuga menziesii* mature

Broadleaf Forest

28. *Populus trichocarpa/Acer macrophyllum*

Map produced in 1988 by Roy F. Weston, Inc., Seattle, Washington from information compiled and interpreted by Washington Native Plant Society.
Base map adapted from USGS 1:24,000 scale maps; Mt. Prophet 1969 and Pumpkin Mtn. 1969.

Scale 1:24,000

0 .5 1 mile

0 .5 1 kilometer