

Preliminary Classification of Native, Low Elevation, Freshwater Wetland Vegetation in Western Washington

March 1994



WASHINGTON STATE DEPARTMENT OF
Natural Resources

Jennifer M. Belcher - Commissioner of Public Lands
Kaleen Cottingham - Supervisor

**Natural Heritage Program
Resource Protection**

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by
Linda M. Kunze



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Contents

1	INTRODUCTION
1	Literature Review
2	Washington Natural Heritage Program Approach to Classification
3	Regions
4	Kinds of Wetlands
5	Wetland Plant Community Types
6	Relationship with Cowardin et al.
6	Field Inventory
7	Taxonomic and Nomenclatural Considerations
9	NORTHERN PUGET TROUGH LOWLANDS
9	Introduction
10	Plant Community Type Classification
12	Plant Community Type Descriptions
12	Sphagnum Bogs
21	Minerotrophic Wetlands
37	SOUTHERN PUGET TROUGH AND LOWER COLUMBIA RIVER LOWLANDS
37	Introduction
39	Plant Community Type Classification
41	Plant Community Type Descriptions
41	Columbia River Gorge Wetlands
44	Overflow Plain Wetlands
54	Surge Plain Wetlands
61	WESTERN OLYMPIC PENINSULA AND SOUTHWEST WASHINGTON LOWLANDS
61	Introduction
62	Plant Community Type Classification
65	Plant Community Type Descriptions
65	Sphagnum Bogs
79	Minerotrophic Wetlands
95	Surge Plain Wetlands
101	GLOSSARY
104	REFERENCES
109	APPENDIX A: TRANSLATION TABLE BETWEEN WASHINGTON NATURAL HERITAGE PROGRAM AND COWARDIN ET AL. (1979)
119	APPENDIX B: UPDATED TAXONOMY
	LIST OF FIGURES AND TABLES
3	Figure 1: Western Washington Wetland Regions
9	Figure 2: Northern Puget Trough Region
37	Figure 3: Southern Puget Trough and Lower Columbia River Region
38	Figure 4: Lower Columbia River Zones
61	Figure 5: Western Olympic Peninsula and Southwest Washington Region
3	Table 1: Washington Natural Heritage Program Classification Hierarchy





Introduction

The Natural Area Preserves Act (chapter 79.70 R.C.W.) mandates the development and maintenance of a “classification of natural heritage resources” by the Washington Natural Heritage Program, Department of Natural Resources (WNHP). This classification is a critical step in the identification, inventory and protection of the natural heritage of the state.

Since its establishment, the Natural Heritage Program has worked to develop the classification of natural heritage resources by compiling and updating existing classifications of species and native ecosystems needing protection in the state. Where classifications did not exist, the Natural Heritage Program has worked to develop new ones. It contracted the development of a marine and estuarine habitat classification (Dethier 1990) and assisted in the inventory for, and development of, a provisional riparian and aquatic wetland plant community classification for the Columbia Plateau (Evans 1989).

The following preliminary classification is of native, undisturbed wetlands found in the lowlands of western Washington. It includes impounded, semi-impounded and tidal freshwater wetland plant communities. It is the result of ten years of wetland inventory and a review of the literature. It classifies and describes native wetland plant community types, provides references and includes an appendix translating it to the Cowardin *et al.* (1979) classification. Although designed to support the information management and protection efforts of the Natural Heritage Program, it also may aid in research and understanding of native wetland systems.

Literature Review

Wetland classification has been approached in many different ways. Authors have based classifications on chemistry, water source, wetland shape or topographic features, nutrient status, location within the landscape, hydrology, soils, morphology and pattern of the vegetation, etc. (Gore 1983a; National Wetlands Working Group 1988).

There are three general approaches to classification of freshwater wetlands in the Pacific Northwest. The first classifies wetland “types”. This classification scheme uses soils, hydrology, topography, wetland morphology, climate and vegetation to describe types of wetland systems. Categories such as topogenous bog, blanket bog, fen, marsh and swamp are common in this kind of classification. This is the approach of many European and some Canadian and United States researchers (Gore 1983a, 1983b; Damman 1986; Heinselman 1970).

The second approach uses select physical environmental characteristics and the structure of wetland vegetation to define wetland categories. This structural approach has been used for large scale mapping from aerial

photographs and is frequently used to characterize wildlife habitat. Cowardin *et al.* (1979) is an example of this kind of classification.

The third approach identifies biotic communities, community types or associations. Ordination techniques following detailed sampling are used to identify significant differences in species composition. This approach can be applied to vegetation data sets or a combination of physical environmental and vegetation data. This is the approach taken by Frenkel *et al.* (1986), Fitzgerald (1966), Lebednik and del Moral (1976) and U.S. Forest Service ecologists (Henderson *et al.* 1989; Topik *et al.* 1986; Kovalchik 1987, 1993).

Surprisingly little work has been done to classify native freshwater wetland plant communities in the lowlands of western Washington. Rigg (1922a, 1922b, 1925, 1940), Rigg and Richardson (1934), Osvald (1933) and Hansen (1941, 1943, 1944), studied peat and provided brief descriptions of the vegetation in some peat-forming wetlands. Fitzgerald (1966, 1977) and Lebednik and del Moral (1976) studied the vegetation and selected physical environmental parameters in a peat system in King County. Wiedemann (1984) classified coastal dune communities in Oregon and Washington, including deflation plain wetland communities. U.S. Forest Service ecologists, in developing forest classifications, included some forested wetland associations (Henderson *et al.* 1989; Topik *et al.* 1986).

Some studies from British Columbia are germane to the classification of native wetlands in the lowlands of western Washington. The National Wetlands Working Group (1988) classified and described wetlands in Canada, portions of which are pertinent to Washington. Hebda and Biggs (1981) described wetland communities in a large peat system on the Fraser River Delta. Orloci (1965) and Kojima and Krajina (1975) classified some tree and shrub-dominated wetland communities in the coastal western hemlock zone in British Columbia. Recently, Banner and Pojar, in a series of articles with others (1983, 1986, 1987a, 1987b), described wetland types which occur along the northern British Columbia coast.

There appear to be significant differences in wetland vegetation between western Washington and Oregon. The similarities in wetlands occur mostly along the Columbia River (Christy 1993; Christy and Putera 1993) and in *Fraxinus latifolia* communities in the southern Puget Trough of Washington and the Willamette Valley in Oregon (Frenkel and Heinitz 1987). There are some similarities between wetland communities in the Oregon Cascade Range and the lowlands and mountains of western Washington (Seyer 1979; Kovalchik 1987). Elsewhere in the western portions of the two states the wetlands are dissimilar.

WNHP Approach to Classification

The wetlands classification presented here has three tiers (Table 1). The first tier is **region**, reflecting major biological, geological and climatic characteristics. The second tier is **kind of wetland**, a coarse level that in freshwater wetlands generally corresponds with "elements" (Washington Department of Natural Resources 1991). The third tier is **plant community type** which is equivalent to the biotic communities described above.

TABLE 1:

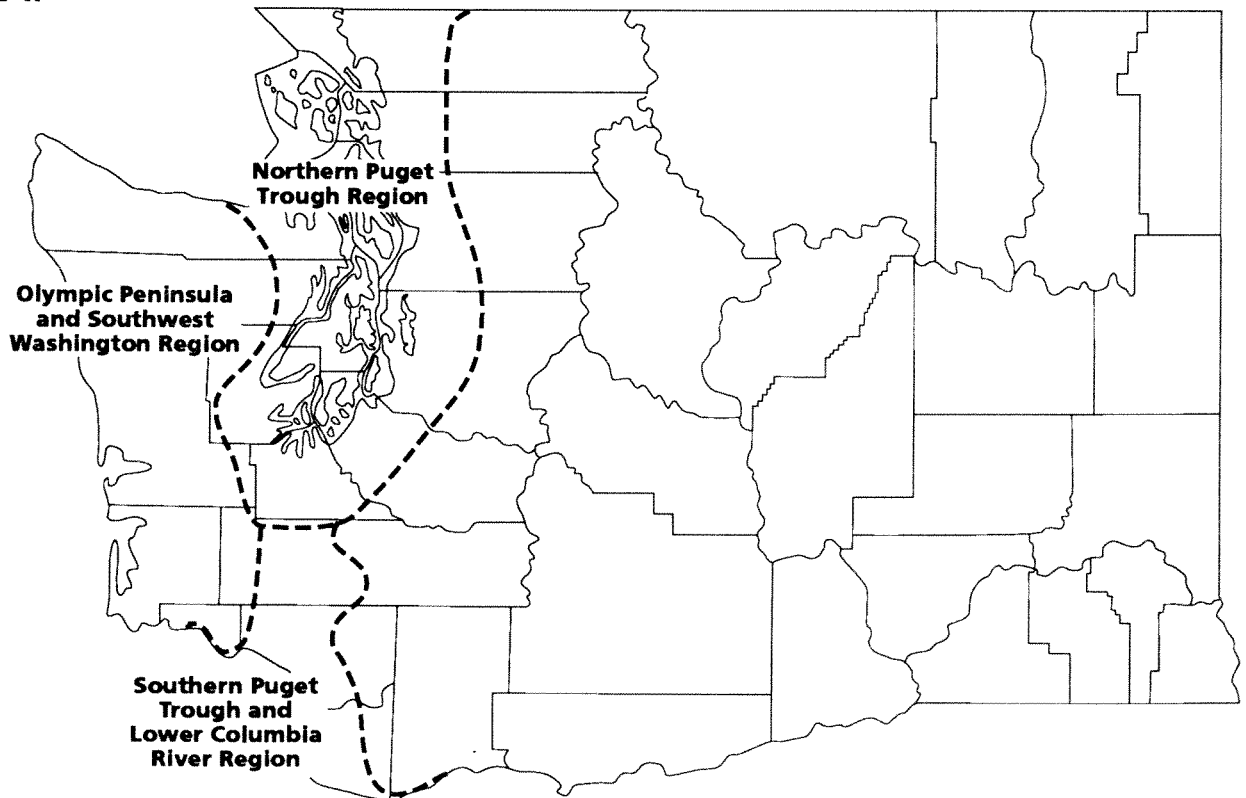
Washington Natural Heritage Program Classification Hierarchy

Regions	N. Puget Trough	S. Puget Trough & Columbia R.	Olympic Pen. & S.W. Wash
Kinds of Wetlands	Sphagnum Bog Minerotrophic	C. R. Gorge Overflow Plain Surge Plain	Sphagnum Bog Minerotrophic Surge Plain
Community Types	10 Sphagnum Bog 26 Minerotrophic	6 C. R. Gorge 20 Overflow Plain 15 Surge Plain	14 Sphagnum Bog 24 Minerotrophic 8 Surge Plain

Regions

Wetland inventory work by the Washington Natural Heritage Program and The Nature Conservancy suggests that freshwater wetlands are distinct in three regions of the western Washington lowlands: the northern Puget Trough region, the southern Puget Trough region and the west coast of the Olympic Peninsula (Figure 1). The wetlands along the southwest coast of Washington are so disturbed that it is difficult to identify their relationships with other areas. For the purposes of this classification, the western Olympic Peninsula and southwest Washington are treated as a single region.

FIGURE 1:



Kinds of Wetlands

Within each of the regions several kinds of wetlands are included: sphagnum bogs, impounded minerotrophic wetlands, Columbia River Gorge wetlands, overflow plain wetlands and surge plain wetlands. These general kinds of wetlands are distinguished by pH, nutrient availability and hydrologic dynamics. Each has many wetland plant community types with differing plant species composition and physical environmental characteristics.

Sphagnum bogs are peat wetlands which have a high percent cover of sphagnum moss species (*Sphagnum* spp.) and/or sphagnum peat soils. They are fed primarily by precipitation and are generally restricted to areas in which precipitation exceeds evapotranspiration (Gore 1983a; Damman 1986). Soils are generally saturated year-round and in some cases are seasonally flooded. Bogs have low pH and low nutrient availability. These conditions give rise to an unusual flora, many species of which are unique to sphagnum bogs. Sphagnum bogs as described here include an array of bog types such as ombrogenous, ombrotrophic, limnogenous, topogenous and soligenous (see glossary) (Damman 1986; Gore 1983a).

Impounded minerotrophic wetlands have no marine-derived salts and are fed by water which has been in contact with mineral soils (Damman 1986; Gore 1983a). They have very little sphagnum, either living or in the rooting zone, and include wetlands with either organic or mineral soils. The pH is generally greater than 5.5. They may be high or low nutrient systems. They include the range from impounded systems with no through-flow to partially impounded systems which have either seasonal flow or slow-moving water year-round. Minerotrophic wetlands as described here are equivalent to minerotrophic mires, fens, marshes and swamps from the European and Canadian literature (Gore 1983a).

Columbia River Gorge wetlands occur between Skamania and Bonneville Dam (river miles 140-145) (Christy and Putera 1993). They are riparian wetlands influenced by year-round or seasonally flowing water. They occur in an area of the river that has relatively high flow rates, at least historically. Substrates tend to be coarse sand and gravel. Generally, these are high-nutrient, well-oxygenated and high energy systems.

Overflow plain wetlands occur along the Columbia River between Longview and Skamania (river miles 65-140) (Christy and Putera 1993). This is a broad floodplain containing old channels, backwater areas, ponds and islands. The wetlands are influenced by year-round or seasonally flowing river water. Those that are isolated from river water seasonally range from permanently flooded to dry during the summer. Tidal freshwater influence is limited. Flow rates are moderate and substrates range from sand to silt to muck to peat.

Surge plain wetlands are tidal freshwater wetlands. They occur along the tidal reaches of large rivers. The water level in these wetlands rises and falls with the tides, but the water is almost always fresh (< 0.5 parts per thousand salt (ppt)). In addition, the water level is affected by river flow. Generally, these are high nutrient, high energy systems.

As with all natural systems, different kinds of wetlands intergrade and often are not easily distinguished. This is due to the complexity of gradients and topography within wetlands (Heinselman 1970; Vitt and Slack 1975; Karlin and Bliss 1984), the dynamic nature of some systems (National Wetlands Working Group 1988) and differences in individual species

amplitudes (Kenkel 1987; Vitt and Slack 1975). Kenkel's study of boreal wetlands, while identifying fairly discrete species ecological groups and vegetation types, also indicates intergradation between stands and overlap between vegetation types. Often a wetland site contains a mosaic of kinds of wetlands (National Wetlands Working Group 1988; Heinselman 1970; Karlin and Bliss 1984).

Wetland Plant Community Types

Wetland plant community types, which comprise each of the different kinds of wetlands, vary in their species composition, hydrology, elevation, substrates, nutrients, soil and water chemistry, and natural disturbance regimes (Vitt and Slack 1975; Karlin and Bliss 1984). Occasionally, sharp lines can be drawn in the field between different communities, but more often plant species with different amplitudes are distributed along complex spatial and temporal gradients making delineation of communities difficult. The abstracted community types reflect that complexity.

Frenkel *et al.* (1986) note that "The mire is often regarded a single 'community', but in actuality it is frequently comprised of many small communities. . . The commonly intuited richness of a mire. . . (is) from the small size of fairly distinct wetland communities packed into a limited area." Gradients tend to be compressed. In a few meters can be found two or more communities responding to changes in elevation, hydrology, soils or nutrient availability (Karlin and Bliss 1984; Vitt and Slack 1975).

The classification of wetlands is further complicated by high variability in species composition. Some communities, consistent in their species composition and physical characteristics, recur throughout a region. Others recur but are somewhat variable in their species composition or physical parameters. Yet others do not recur or are highly variable in their associated species or environmental characteristics.

Variability in species composition is related to a number of factors. Wetlands can be dynamic systems resulting in abrupt or gradual, patchy or widespread shifts in plant species composition. Some species persist after invasion of other species or communities obscuring distinctions between plant communities, e.g., the persistence of *Nuphar polysepalum*, *Lysichitum americanum**, *Juncus balticus* and *Typha latifolia* following invasion by *Sphagnum* spp. (Rigg 1925). Several species have overlapping habitat requirements and occur in a variety of combinations in wetlands. This variability is in response to differences in habitat and also differential dispersal and establishment of each species.

The wetland's classification presented here is of actual rather than potential vegetation. In some cases inference is made to succession, but in most cases sufficient data are not available for devising successional or dynamic models. Undoubtedly, some of the community types described here are seral.

Wetland community type descriptions provide information on the physical and floristic characteristics of each type, their range, variability and rarity. Included are species lists distinguishing the dominant or characteristic species ("Indicator Species") from the minor species ("Other Species"). Average percent cover or a range of cover values is given for the "indicator species". Numbers in parentheses are extreme values, not within the typical

* Updated taxonomy provided in Appendix B.

range of percent cover. The community type descriptions are given in the same order as the classification for each region.

Relationship with Cowardin *et al.*

This classification does not fit easily within the U.S. Fish and Wildlife Service classification (Cowardin *et al.* 1979). The two classifications use different approaches. The Cowardin classification is hierarchical and structurally based, using characteristics visible from aerial photographs and other remote sensing techniques. WNHP's classification is based on field data and looks at all strata simultaneously, including soils and other physical parameters which are not apparent through remote sensing.

Most of the wetland plant community types described herein occur within the Palustrine system of Cowardin *et al.* Some of the types dominated by rooted aquatic or emergent herbaceous vegetation are within the Riverine or Lacustrine systems. Others are within more than one of the Cowardin systems, depending on location. Generally, a community type from this classification can be fit into the Cowardin classification but not vice versa. Appendix A lists the WNHP wetland community types and gives the corresponding Cowardin classification to subclass.

Field Inventory

The Natural Heritage Program inventory focused on relatively undisturbed wetlands associated with impounded, partially impounded and tidal freshwater systems. Field inventory sites were identified through review of aerial photos and leads from researchers and land managers. Field work was conducted from 1982 through 1992.

John Christy, wetland ecologist with the Oregon Natural Heritage Program, inventoried Columbia River vegetation from Bonneville Dam to the river's mouth in 1992. His initial classification of current wetland vegetation in that area is included here.

Information was collected on the apparent physical characteristics and plant communities of each site. The communities were identified by: 1) dominant species, 2) presence or absence of key indicator species, and 3) observable differences in environmental conditions, such as soil characteristics and hydrology. Relevé data were collected, recording a range of percent cover for each of the dominant species and often for all observed species. Observations were made of soils, hydrology, topography and disturbance for each community. The amount and detail of information varied, depending on the accessibility of the site.

Taxonomic and Nomenclatural Considerations

Vascular plant taxonomy follows Hitchcock and Cronquist (1978). Updated taxonomy is provided in Appendix B. Species names followed by an asterisk (*) in the text are included in Appendix B.

The lack of identification of *Salix* species for this classification is regrettable. Information needed to key *Salix* species using Hitchcock and Cronquist (1978), generally, requires sampling two or more different times during the growing season, an opportunity field staff did not have. Hanners (1989) produced a vegetative key to the *Salix* species found in the lowlands of Whatcom and Skagit Counties. Unfortunately, most of the field work for this classification was completed prior to the key's publication, hence most *Salix* species have been lumped.

There is some confusion in identification between *Alnus incana* and *Alnus sinuata*. Both species appear to occur in the western Washington lowlands and distinctions in their respective habitats are not clear. Access to plants was difficult clouding identification of the species and descriptions of their communities. Human-caused disturbance further confused description of native communities. The *A. incana* community described in this classification was the only one in which species identification was certain.

Carex interior complex is composed of *Carex interior*, *Carex muricata* and *Carex phyllomanica*.

Peat types follow Rigg (1958).

The term "community" is used in reference to actual observed vegetation at a site. "Community type" refers to the abstracted classification unit derived from analysis of the observed communities.

Community types are named by their dominant species. Species are grouped by growth-forms: trees are listed first, then shrubs followed by herbaceous species and finally mosses. A slash (/) separates species in different growth-forms (i.e., trees from shrubs or shrubs from herbaceous species). A hyphen (-) separates species within each growth-form (i.e., different tree species or different herbaceous species). Species are listed in alphabetical order within each growth-form (i.e., *Picea sitchensis* then *Tsuga heterophylla*).



Native Freshwater Wetland Vegetation of the Northern Puget Trough Lowlands

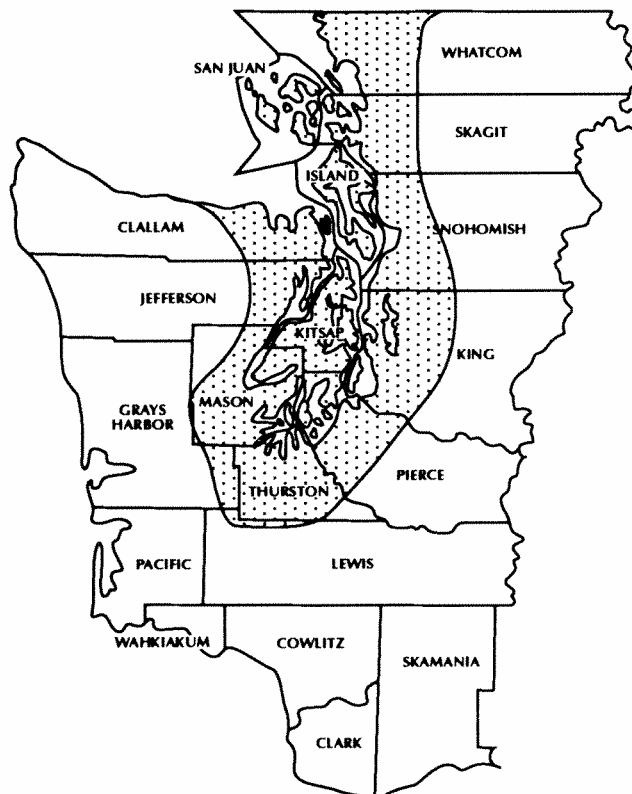
Introduction

The northern Puget Trough lowlands are the lands between the Olympic Mountains and Cascade Range, below 600 m elevation, that were overridden by continental glaciers (Figure 2). They extend from the Canadian border to southern Thurston County, Washington.

The northern Puget Trough region falls within the western hemlock zone of Franklin and Dyrness (1973), and the British Columbia coastal Douglas fir and coastal western hemlock zones (Klinka *et al.* 1991).

The northern Puget Trough wetlands are most similar to those in the Pacific Temperate Wetlands Region in Canada (National Wetlands Working Group 1988). The area has mild winters and warm summers with moderately high rainfall (< 1,524 mm/year). Forested wetlands are common. Bogs are generally restricted to topographic depressions. The northern Puget Trough differs from the Canadian Pacific Temperate Wetlands Region in having an abundance of fens.

FIGURE 2:



Little wetland classification work has been done in the Puget Trough lowlands. Fitzgerald (1966, 1977) and Lebednik and del Moral (1976) have done the most recent work, all on the same wetland. Previous descriptive work was done by Rigg (1922a, 1925, 1940), Hansen (1941, 1943) and Osvald (1933).

The following classification focuses on sphagnum bogs and impounded minerotrophic wetlands (see page 4). Few riparian areas have been surveyed. Those communities which occur both in riparian and impounded systems are included and are listed under minerotrophic wetlands.

Plant Community Type Classification

Low Elevation Sphagnum Bog Community Types (c.t.)

Herb Dominated

1. *Carex cusickii*/*Sphagnum* spp. c.t.
2. *Carex sitchensis**/*Sphagnum* spp. c.t.
3. *Eriophorum chamissonis*/*Sphagnum* spp. c.t.
4. *Rhynchospora alba*/*Sphagnum* spp. c.t.

Shrub-dominated

1. *Kalmia occidentalis**-*Ledum groenlandicum*/*Sphagnum* spp. c.t.
 - a. *Kalmia occidentalis**/*Sphagnum* spp. variant
 - b. *Kalmia occidentalis**-*Ledum groenlandicum*/*Xerophyllum tenax*/*Sphagnum* spp. variant
 - c. *Ledum groenlandicum*/*Sphagnum* spp. variant
 - d. *Ledum groenlandicum*-*Gaultheria shallon*/*Sphagnum* spp. variant
 - e. *Ledum groenlandicum*/*Carex rostrata**/*Sphagnum* spp. variant
2. *Spiraea douglasii*/*Sphagnum* spp. c.t.

Tree Dominated

1. *Pinus contorta*/*Ledum groenlandicum*/*Sphagnum* spp. c.t.
2. *Pinus monticola*/*Ledum groenlandicum*/*Sphagnum* spp. c.t.
3. *Tsuga heterophylla*/*Ledum groenlandicum*/*Sphagnum* spp. c.t.
4. *Tsuga heterophylla*/*Sphagnum* spp. c.t.

Low Elevation Minerotrophic Wetland Community Types (c.t.)

Permanently Flooded

1. *Brasenia schreberi* c.t.
2. *Hippuris vulgaris* c.t.
3. *Juncus balticus* c.t.
4. *Nuphar polysepalum* c.t.
5. *Potamogeton natans* c.t.
6. *Scirpus acutus* c.t.
7. *Scirpus subterminalis* c.t.
8. *Typha latifolia* c.t.

* Updated taxonomy provided in Appendix B.

Saturated Soils or Seasonally Flooded

Herb Dominated

1. *Carex cusickii* c.t.
2. *Carex lasiocarpa* c.t.
3. *Carex obnupta* c.t.
4. *Carex rostrata** c.t.
5. *Carex sitchensis** c.t.
6. *Carex vesicaria* c.t.
7. *Dulichium arundinaceum* c.t.

Shrub-dominated

1. *Alnus incana* c.t.
2. *Cornus stolonifera**-*Salix* spp.-*Spiraea douglasii* c.t.
3. *Myrica gale* c.t.
4. *Salix* spp. c.t.
5. *Spiraea douglasii* c.t.

Tree Dominated

1. *Alnus rubra*/*Lysichitum americanum* * c.t.
2. *Alnus rubra*/*Rubus spectabilis* c.t.
3. *Fraxinus latifolia*/*Carex obnupta* c.t.
4. *Fraxinus latifolia*/*Symphoricarpos albus* c.t.
5. *Pyrus fusca* * c.t.
6. *Thuja plicata*-*Tsuga heterophylla*/*Lysichitum americanum** c.t.

Plant Community Type Descriptions

Sphagnum Bogs

Sphagnum bogs (see page 4) in the lowlands of the northern Puget Trough tend to occur in depressions. They occur in glacial scours, kettles, isolated oxbows and old lake beds which are common in the area. They occur at or near the heads of drainages where surface water inflow is limited. There is usually an outflow stream. They also occur in small basins where there is no channeled inflow or outflow (so called "isolated wetlands") and as pockets within minerotrophic wetlands (usually either floating mats or islands). Bogs in this region include at least ombrogenous and topogenous types (Damman 1986).

The classic sphagnum bog in the Puget Trough consists of a deep depression with layers of different kinds of peat accumulated since the retreat of the continental glaciers. It is equivalent to the basin and shore bogs of the National Wetlands Working Group (1988). Typically, there is an area of open water but in some cases the basin is filled with peat and has no open water. Radiating landward from the open water or center of the basin are zones of vegetation progressing from a mixture of shrub and herbaceous species along the water's edge to low growing sedges on a quaking peat mat. This gives way to low growing ericaceous shrubs and then a mixture of shrubs and highly stunted coniferous trees. Near the upland are much taller but slow growing conifers. The communities and species composition of these zones is somewhat variable. Soils within one to two feet of the surface range from nearly pure sphagnum peat to mixed peat composed of *Sphagnum* species, other moss species, sedges, ericaceous shrubs and some woody material. Living *Sphagnum* spp. dominate the soil surface but can be intermixed with other moss species. In some cases, there is only minor percent cover of living *Sphagnum* spp., particularly in tall shrub-dominated or tree-dominated communities.

Between the bog and the upland often occurs a moat or lagg which is flooded to saturated year-round, receives high nutrient water from the surrounding uplands, has highly decomposed anoxic muck soils and has species found in high nutrient wetlands.

Bog islands, either anchored or adrift on lakes, have similar vegetation and zonation to the classic bog, except the vegetation zones progress from the water's edge towards the center of the island. If conifers occur, they are usually stunted.

In a few places, bogs occur within river flood plains or between braided channels of slowly moving streams. These bogs are composed of some of the community types and species found in classic bogs, but their relationship to the stream or river makes them unusual. Some of these bogs are flooded periodically with high nutrient stream or river water, and are richer in nutrients and better oxygenated than a classic bog.

In shallow scours and kettles in small drainage basins occur wetlands that are ecotonal between sphagnum bog and minerotrophic wetlands. They typically have no stream inflow and either no outflow or a small seasonal outflow. Peat soils are shallow over impermeable glacial till or outwash. These systems are seasonally flooded from precipitation and surface sheet flow. There may be scattered, small, shallow, permanent or seasonal ponds. The ponds have rooted aquatic and emergent vegetation zones typical of

minerotrophic wetlands. Raised above the ponds are peat terraces with an open overstory of low growing *Spiraea douglasii*, an understory dominated by *Carex* species, and a ground layer dominated by *Sphagnum* spp.

Sloping bogs are occasionally found in the foothills of the Cascade Range. These bogs are in contact with minerotrophic water from seeps, springs and surface sheet flow. They appear ecotonal between sphagnum bogs and minerotrophic wetlands and have mixtures of communities and species typical of high and low nutrient wetlands. Each of the three sloping bogs surveyed was distinct.

SPHAGNUM BOG COMMUNITY TYPES

***Carex cusickii*/ *Sphagnum* spp. community type**

This community type occurs throughout the northern Puget Trough lowlands. It commonly forms a narrow band along the edge of sphagnum mats adjacent to open water. Occasionally, it occurs as large floating mats over a pond or lake surface. Substrates are mostly sphagnum and fibrous peat, with some heath peat. The peat is saturated and usually is in contact with minerotrophic water.

The vegetation in this community type is a mixture of species typical of high and low nutrient wetlands. It is dominated by herbaceous plants but often includes low growing shrubs. Some of the species, particularly *Menyanthes trifoliata*, *Kalmia occidentalis** and *Potentilla palustris*, extend out into the open water and may provide a support structure around which *Sphagnum* spp. grow. *Typha* and *Scirpus* species can be either rooted in the peat or, more often, in the lake bottom and then emergent through the peat.

This community type is probably ecotonal between sphagnum bogs and minerotrophic wetlands. It is most similar to the minerotrophic *Carex cusickii* community type. It was described by Fitzgerald (1977) at Kings Lake as the Pioneer Zone extending from the bog mat out over the open water. Osvald (1933) described a *Menyanthes trifoliata*-*Sphagnum*-sociation in wet depressions and pools in bogs which is similar to pioneering communities around open water. The National Wetlands Working Group (1988) listed *Potentilla palustris* and *M. trifoliata* among the pioneer species.

Indicator species:

Agrostis scabra 1-5%
Carex cusickii 25-45%
Menyanthes trifoliata 0-10%
Potentilla palustris 2-20%
Sphagnum spp. 100%

Other species:

Angelica genuflexa
Carex interior complex
Carex leptalea
*Carex rostrata**
*Carex sitchensis**
Cicuta douglasii
Drosera rotundifolia
Eriophorum chamissonis
Galium trifidum
Hypericum anagalloides
*Kalmia occidentalis**

Ledum groenlandicum
Lycopus uniflorus
Mentha arvensis
Rhynchospora alba
Scirpus acutus
Spiraea douglasii
Typha latifolia
*Vaccinium oxycoccus**
Veronica scutellata
Viola cf palustris

***Carex sitchensis**/
Sphagnum spp.
community type**

This community type occupies very small areas throughout the northern Puget Trough region. It typically occurs on firm substrates, but also is found on quaking mats next to open water. It is wet year-round and can be seasonally flooded. Soils are a mixture of fibrous and sphagnum peat and are seasonally flooded.

This community type can be either dense stands of *Carex sitchensis** or species-rich swards. It is usually found intermixed with the *Carex cusickii* or *Spiraea douglasii* bog community types. It is probably ecotonal between sphagnum bogs and minerotrophic wetlands and is most similar to the *C. sitchensis* minerotrophic wetland community type.

Indicator species:

*Carex sitchensis** 30-70%
Carex cusickii 15-20%
Potentilla palustris 5-30%
Sphagnum spp. 100%

Other species:

<i>Equisetum fluviatile</i>	<i>Menyanthes trifoliata</i>
<i>Galium</i> sp.	<i>Nuphar polysepalum</i>
<i>Kalmia occidentalis</i> *	<i>Spiraea douglasii</i>
<i>Ledum groenlandicum</i>	<i>Vaccinium oxycoccos</i> *
<i>Lysichitum americanum</i> *	<i>Viola palustris</i>
<i>Mentha arvensis</i>	

***Eriophorum
chamissonis*/
Sphagnum spp.
community type**

This community type is uncommon in the northern Puget Trough lowlands. It occurs on very thin layers of floating sphagnum that give way when stepped on. The water level is at or slightly above the substrate surface. It occurs in depressions or around the pond margins of bogs.

This community type is dominated by *Eriophorum chamissonis* and *Sphagnum* spp. and has few other associated species.

Osvold (1933) described a *Eriophorum chamissonis*-*Sphagnum*-sociation in hollows in bogs. Rigg (1925) described *E. chamissonis* as a commonly occurring bog species but did not describe communities.

Indicator species:

Eriophorum chamissonis 30%
Sphagnum spp. 100%

Other species:

<i>Carex pauciflora</i>	<i>Vaccinium oxycoccos</i> *
<i>Rhynchospora alba</i>	

***Rhynchospora alba*/
Sphagnum spp.
community type**

This community type commonly occurs throughout the northern Puget Trough lowlands. It is typically found in a wide band along the quaking margin of a sphagnum mat, near open water or just inland of the *Carex cusickii* bog community type. Small pockets of this community type can also be found in wet depressions in firmer, dryer portions of sphagnum bogs. The substrate is sphagnum peat. Soils are saturated year-round.

The vegetation in this community type is low growing and dominated by *Rhynchospora alba*. *Vaccinium oxycoccos** is often abundant to codominant. Abundance of other plant species is variable. Shrub species, when found, have a short growth form. Reindeer lichen, *Cladina rangiferina*, often occurs on drier microsites within this community type. The vegetation in this zone is often highly trampled by wildlife and in some cases by humans.

This community type was described by Fitzgerald (1966, 1977) and Lebednik and del Moral (1976). Osvald (1933) described wet depressions dominated by *Rhynchospora alba*. Osvald's *Vaccinium oxycoccos**-*Sphagnum*-sociation may fit within this community type as well. Hebda and Biggs (1981) noted it as occurring in wet microsites within the wet sphagnum subtype of their heathland vegetation type. Vitt and Slack (1975) described *R. alba*'s distribution relative to moisture and shade. Slater and Agnew (1977) observed increased cover of *R. alba* with trampling.

Indicator species:

Cladina rangiferina 1-5%
Drosera rotundifolia 5-15%
*Kalmia occidentalis** 1-10%

Rhynchospora alba 15-60%
Sphagnum spp. 5-100%
*Vaccinium oxycoccos** 1-35%

Other species:

Carex leptalea
Carex pauciflora
*Carex rostrata**
Eriophorum chamissonis
Ledum groenlandicum

Lycopus uniflorus
*Lysichitum americanum**
Menyanthes trifoliata
*Tofieldia glutinosa**

***Kalmia occidentalis**-*Ledum groenlandicum*/*Sphagnum* spp. community type**

This is a very commonly occurring community type throughout the northern Puget Trough lowlands. It occurs on moderately quaking to firm bog mats. Well-developed hummocks are typical and create easily distinguishable microsites. The tops of the hummocks are relatively dry and exposed to sun and wind, while the inter-hummock areas are quite wet and shaded. Substrates are a mixture of sphagnum, fibrous and heath peat. Soil moisture varies from saturated year-round to seasonally relatively dry.

This community type is divided into five variants, each described below. The community type as a whole is characterized by the abundance of either or both *Kalmia occidentalis** and *Ledum groenlandicum*. *Sphagnum* spp. usually are also dominant and form well-developed hummocks.

Fitzgerald (1966, 1977) described a bog-shrub-tree zone consisting of this community type plus a *Tsuga heterophylla*/*Ledum groenlandicum*/*Sphagnum* spp. community. Lebednik and del Moral (1976) described three *Kalmia occidentalis**-*L. groenlandicum* dominated communities, each with a different dominant moss or lichen species. Osvald (1933) described several communities dominated by *L. groenlandicum*, each with different understory dominants: a *L. groenlandicum*-*Pleurozium parietinum*-sociation, a *L. groenlandicum*-*Cladonia rangiferina*-sociation, a *L. groenlandicum*-*Sphagnum fuscum*-sociation and a bare *L. groenlandicum*-sociation. Hebda and Biggs (1981) described one and possibly two *L. groenlandicum* communities, one in the wet subtype and the other in the dry subtype of their heathland type bog. Rigg (1925) described *L. groenlandicum* as one of the most common and abundant bog species but did not describe communities.

***Kalmia occidentalis**/*Sphagnum* spp. variant**

This variant can cover large areas or, more frequently, it forms a mosaic with the *Ledum groenlandicum*/*Sphagnum* spp. variant. It often occurs adjacent to, and inland from, the *Rhynchospora alba*/*Sphagnum* spp. community type. It is wetter than the following three variants below and drier than the last variant of this community type. Substrates vary from firm, relatively dry peat to saturated portions of quaking bog mats. Hummocks are well-developed.

The vegetation in this variant is low growing (typically < 1 m high) and diverse. *Kalmia occidentalis** and *Sphagnum* spp. codominate. *Vaccinium oxycoccus** is usually abundant. *Ledum groenlandicum* typically is less abundant than *K. occidentalis*.

Oswald's (1933) *Vaccinium oxycoccus*-Sphagnum*-sociation may fit within this variant.

Indicator species:

Drosera rotundifolia 1-5%
*Kalmia occidentalis** 25-45%
Ledum groenlandicum 1-25%
Sphagnum spp. 80-100%
*Vaccinium oxycoccus** 2-25%

Other species:

<i>Carex canescens</i>	<i>Pinus monticola</i>
<i>Carex cusickii</i>	<i>Potentilla palustris</i>
<i>Carex pauciflora</i>	<i>Pteridium aquilinum</i>
<i>Carex sitchensis*</i>	<i>Rhamnus purshiana</i>
<i>Cladina rangiferina</i>	<i>Rhynchospora alba</i>
<i>Eriophorum chamissonis</i>	<i>Spiraea douglasii</i>
<i>Gaultheria shallon</i>	<i>Trientalis arctica</i>
<i>Lysichitum americanum*</i>	<i>Tsuga heterophylla</i>
<i>Menyanthes trifoliata</i>	<i>Typha latifolia</i>
<i>Pinus contorta</i>	<i>Viola palustris</i>

***Kalmia occidentalis*-Ledum groenlandicum/Xerophyllum tenax/Sphagnum* spp. variant**

This is a dry variant which occurs in the southwestern portion of the northern Puget Trough lowlands and occasionally in western Jefferson and Clallam counties. It is seasonally saturated or flooded and then dry. Substrates are a mixture of heath, fibrous and sphagnum peat, and there is large woody material in some sites. Mineral soil is sometimes visible at the soil surface and there are often signs of past fire.

The vegetation in this variant is not lush. The shrubs are generally scrubby and form an open canopy 0.6 to 1.3 m tall. The variant is species-poor. *Kalmia occidentalis**, *Ledum groenlandicum* and *Xerophyllum tenax* are codominant. *Pteridium aquilinum* is always present and sometimes codominant. *Gaultheria shallon* is usually present but low growing and not codominant.

This variant is most similar to the *Ledum groenlandicum-Gaultheria shallon/Pteridium aquilinum/Sphagnum* spp. variant.

Indicator Species:

<i>Gaultheria shallon</i> 5-10%	<i>Pteridium aquilinum</i> 2-7(60)%
<i>Kalmia occidentalis*</i> (5)50-60%	<i>Sphagnum</i> spp. 2-3%
<i>Ledum groenlandicum</i> 15-50%	<i>Xerophyllum tenax</i> (5)35-40%

Other Species:

<i>Cladina rangiferina</i>	<i>Pinus contorta</i>
<i>Cornus canadensis*</i>	<i>Pyrus fusca*</i>
<i>Gentiana sceptrum</i>	<i>Trientalis arctica</i>
<i>Maianthemum dilatatum</i>	<i>Tsuga heterophylla</i>
<i>Picea sitchensis</i>	<i>Vaccinium oxycoccus*</i>

***Ledum
groenlandicum/
Sphagnum* spp.
variant**

This variant forms a dense tall shrub zone around the upland margins of some bogs or adjacent to forested bog communities. It is less commonly occurring than the *Kalmia occidentalis**/*Sphagnum* spp. and *Ledum groenlandicum*-*Gaultheria shallon*/*Sphagnum* spp. variants. It is tall (1.8 to 3 m), relatively dry, has high cover of *L. groenlandicum*, and has a lower number, or at least abundance, of associated species than does the *L. groenlandicum*-*G. shallon*/*Sphagnum* spp. variant. The canopy is nearly closed and *Sphagnum* spp. often have low percent cover. Hummocks often do not occur.

This variant appears similar to Hebda and Biggs (1981) *Ledum* dry subtype of their heathland type.

Indicator species:

Gaultheria shallon 1-50%
Ledum groenlandicum 50-90%
Sphagnum spp. 0-90%

Other species:

Picea sitchensis
Pinus contorta
Pinus monticola
Pteridium aquilinum
*Pyrus fusca**
Tsuga heterophylla
Vaccinium parvifolium

***Ledum
groenlandicum-
Gaultheria shallon/
Sphagnum* spp.
variant**

This variant can cover large areas and is often the primary bog vegetation at a site. It also can occur in mosaic with the *Kalmia occidentalis**/*Sphagnum* spp. variant. It typically occurs on firm peat which is saturated to seasonally relatively dry. Hummocks are well-developed.

This variant has a short growth form (< 1.2 m), has about 60 percent cover of *Ledum groenlandicum*, and has a large number of associated species. *Gaultheria shallon* is often a significant component of the vegetation. *Sphagnum* spp. can be dominant but often a variety of other moss species are abundant or dominant.

This variant resembles drier microsites dominated by *Ledum groenlandicum* within the wet sphagnum subtype of the heathland type of Hebda and Biggs (1981). It is the primary variant at Kings Lake Bog (Fitzgerald 1977; Lebednik and del Moral 1976).

Indicator Species:

Gaultheria shallon 1-50%
*Kalmia occidentalis** 0-10%
Ledum groenlandicum 50-90%
Sphagnum spp. 20-90%

Other species:

Carex canescens
Carex interior complex
Carex leptalea
Cladina rangiferina
Drosera rotundifolia
Empetrum nigrum
Eriophorum chamissonis
Picea sitchensis
Pinus contorta
Pteridium aquilinum
*Pyrus fusca**
Spiraea douglasii
Thuja plicata
Tsuga heterophylla
*Vaccinium oxycoccos**
Vaccinium parvifolium

***Ledum
groenlandicum/
Carex rostrata*/
Sphagnum spp.
variant***

This variant occurs in wet pockets and in the transition zone between sphagnum bogs and minerotrophic wetlands. It is saturated to permanently and shallowly flooded. It may be in contact with minerotrophic water. *Carex rostrata** can be the sole dominant, or it can be the overstory dominant with *Ledum groenlandicum* in the understory.

Indicator species:

*Carex rostrata** 10-30%
*Kalmia occidentalis** 1-15%
Ledum groenlandicum 5-90%
Sphagnum spp. 0-100%

Other species:

<i>Carex canescens</i>	<i>Drosera rotundifolia</i>
<i>Carex interior</i> complex	<i>Empetrum nigrum</i>
<i>Carex leptalea</i>	<i>Eriophorum chamissonis</i>
<i>Cladina rangiferina</i>	<i>Vaccinium oxycoccos*</i>

***Spiraea douglasii/
Sphagnum spp.
community type***

This community type is found mostly in the southwest portion of the northern Puget Trough lowlands. It occurs in shallow glacial scours or kettles which have small drainage basins. It occurs on terraces composed of a mixture of sphagnum, sedge, and heath peat. The terraces are typically elevated above a shallow pond and may be seasonally flooded. Soils are typically shallow and overlay glacial till or outwash. It probably is in contact with minerotrophic water seasonally and ecotonal between ombrotrophic and minerotrophic conditions.

This is an open, low growing, shrub-dominated community type. The vegetation is dominated by *Spiraea douglasii* and *Sphagnum* spp. *Spiraea douglasii* has a short growth form (0.6 to 1.2 m). The associated species composition is variable. *Nuphar polysepalum*, *Juncus balticus*, *Dulichium arundinaceum* are codominants with *S. douglasii* and *Sphagnum* spp. *Gentiana sceptrum* is often present. *N. polysepalum*, *J. balticus* and *D. arundinaceum* may be residual from previously occurring communities.

It can be difficult to distinguish this community type from *Spiraea douglasii* dominated bog assemblages resulting from human-caused disturbance. Disturbance history of the site and up-drainage basin, associated species (particularly exotic species) and shifts in nutrients, water or soil chemistry are some of the clues to distinguish between native and disturbance examples of this community type. The community type described here is not equivalent to *S. douglasii* dominated assemblages found in lags around sphagnum bogs.

Indicator species:

Sphagnum spp. (10)40-100%
Spiraea douglasii 50-90%

Other species:

<i>Carex obnupta</i>	<i>Kalmia occidentalis*</i>
<i>Carex rostrata*</i>	<i>Ledum groenlandicum</i>
<i>Carex sitchensis*</i>	<i>Menyanthes trifoliata</i>
<i>Carex vesicaria</i>	<i>Nuphar polysepalum</i>
<i>Dulichium arundinaceum</i>	<i>Potentilla palustris</i>
<i>Gentiana sceptrum</i>	<i>Pyrus fusca*</i>
<i>Hypericum anagalloides</i>	<i>Salix</i> spp.
<i>Juncus balticus</i>	<i>Trientalis arctica</i>

***Pinus contorta/
Ledum
groenlandicum/
Sphagnum spp.
community type***

This community type is found scattered throughout the northern Puget Trough lowlands. It typically occurs in relatively dry areas but is sometimes found in areas that are seasonally flooded. Substrates are a mixture of sphagnum, fibrous, heath and woody peat. Where trees are tall, peat soils may be thin and the trees in contact with underlying mineral soils.

This community type is easily identifiable by the presence of *Pinus contorta* as the dominant conifer species. It encompasses a range from open shrublands with low growing *Ledum groenlandicum* and scattered *P. contorta*, to very dense stands of *P. contorta* and tall *L. groenlandicum*. *Pinus contorta* is highly stunted in some areas and only slightly, if at all, stunted in others.

Dense stands of *Pinus contorta* are similar to the pine woodland type described by Hebda and Biggs (1981). The more open areas with stunted pine may be more similar to their heathland type. Rigg (1922a, 1925, 1940) noted *P. contorta* bogs. Osvald (1933) briefly described this community type as occurring in the zone between the bog and lagg. The National Wetlands Working Group (1988) noted *P. contorta* treed bogs with *Gaultheria shallon* and *Ledum groenlandicum*.

Indicator species:

Gaultheria shallon 2-20%
Ledum groenlandicum 30-75%
Pinus contorta 20-50%
Sphagnum spp. (0)50-90%

Other species:

<i>Cladina rangiferina</i>	<i>Pyrus fusca</i> *
<i>Drosera rotundifolia</i>	<i>Spiraea douglasii</i>
<i>Empetrum nigrum</i>	<i>Thuja plicata</i>
<i>Eriophorum chamissonis</i>	<i>Trientalis arctica</i>
<i>Kalmia occidentalis</i> *	<i>Tsuga heterophylla</i>
<i>Lysichitum americanum</i> *	<i>Vaccinium oxycoccos</i> *
<i>Pteridium aquilinum</i>	<i>Vaccinium parvifolium</i>

***Pinus monticola/
Ledum
groenlandicum/
Sphagnum spp.
community type***

This is a rare community type in the northern Puget Trough region, although it once may have been more common. Remnants of this community type are found mostly in the southern portion of the region. It seems to have been nearly eradicated through disease, timber harvest, and manipulation of its habitat.

This community type occurs on relatively dry sphagnum bogs. Soils are wet to saturated and composed of sphagnum, fibrous and heath peat with woody material.

Remnant examples of this community type have scattered *Pinus monticola* and a tall, but open, shrub layer dominated by *Ledum groenlandicum*. *Sphagnum* spp. are codominant.

Rigg (1925, 1940) noted *Pinus monticola* bogs. Peter (pers. comm.) observed two bogs on the west side of the Olympic Peninsula which contained *P. monticola*.

Indicator species:

Ledum groenlandicum 50-80%
Pinus monticola 10-15%
Sphagnum spp. 20-90%
Spiraea douglasii 5-10%

Other species:

Carex canescens
Eriophorum chamissonis
Gaultheria shallon
*Kalmia occidentalis**
*Lysichitum americanum**
Pinus contorta

Pseudotsuga menziesii
Pteridium aquilinum
Tsuga heterophylla
*Vaccinium oxycoccos**
Vaccinium parvifolium

***Tsuga heterophylla*/
Ledum
groenlandicum/
Sphagnum spp.
community type**

This is a common community type found throughout the northern Puget Trough lowlands. It can occur on saturated quaking bog mats or on relatively dry portions of bogs. Substrates are a mixture of sphagnum, fibrous, heath and woody peat.

The vegetation is characterized by the abundance of *Tsuga heterophylla*. Trees form an open overstory and generally are widely and irregularly spaced. The trees range from being highly stunted to moderately tall. The understory vegetation is similar to the *Kalmia occidentalis**-*Ledum groenlandicum*/*Sphagnum* spp. community type.

Both the stunted and tall tree forms of this community type occurred on a bog studied by Fitzgerald (1966, 1977) and Lebednik and del Moral (1976). Osvald (1933) described this community type occurring in pockets within a *Pinus contorta*/*Ledum groenlandicum* bog community. Rigg (1925) described invasion of bogs by *Tsuga heterophylla* and establishment of forested stands. The National Wetlands Working Group (1988) noted *T. heterophylla* treed bogs with *Gaultheria shallon* and *L. groenlandicum*.

Indicator species:

Gaultheria shallon 15%
Ledum groenlandicum 30-60%
Sphagnum spp. 0-90%
Tsuga heterophylla 15-20%

Other species:

Carex canescens
Cladina rangiferina
*Cornus canadensis**
*Kalmia occidentalis**
*Lysichitum americanum**
Maianthemum dilatatum
Menziesia ferruginea

Picea sitchensis
Pinus monticola
Pteridium aquilinum
Spiraea douglasii
Thuja plicata
Trientalis arctica
*Vaccinium oxycoccos**

***Tsuga heterophylla*/
Sphagnum spp.
community type**

This community type is rarely found in the northern Puget Trough lowlands. It occurs on deep sphagnum peat with the water table about 30 cm below the surface. These systems may be associated with raised bogs, where the peat extends above the surrounding ground level.

This community type is characterized by a dense, mature stand of *Tsuga heterophylla* on peat soils. The canopy is nearly closed. There is almost no understory except under breaks in the canopy. Trees that are 30 to 35 cm in diameter at breast height (DBH) may be over 300 years old.

This community type probably is a later successional stage of the *Tsuga heterophylla*/*Ledum groenlandicum*/*Sphagnum* spp. community type. Rigg (1925) referred to conifer forests as a late successional stage in bogs.

Indicator species:

Gaultheria shallon 2-5%
Ledum groenlandicum 2-5%

Sphagnum spp. 1-2%
Tsuga heterophylla 80-90%

Other species:

*Kalmia occidentalis**
Maianthemum dilatatum
Trientalis arctica

*Vaccinium oxycoccos**
Vaccinium parvifolium

Minerotrophic Wetlands

Impounded minerotrophic wetlands (see page 4) in the northern Puget Trough occur in depressions, old stream channels, oxbows and where there is a perched water table. They are at least partially impounded, either by topographic features or beaver dams. They generally have both an inflow and an outflow stream and occur in all parts of drainage basins. Some impounded minerotrophic wetlands have peat or muck soils and others have mineral soils with or without a veneer of organic material. Some of these wetlands, particularly those in kettles, have muck and some peat accumulation in the permanently flooded areas and mineral soils in some of the seasonally flooded areas.

Minerotrophic wetland vegetation is often difficult to classify. In some cases wetland plant communities are easily distinguished and have sharp boundaries, but often communities intergrade, either forming mosaics within areas with similar physical characteristics or reflecting microenvironmental difference. The systems tend to have complex and compressed gradients. Some are dynamic with shifting species distributions. Vegetation appears most highly correlated with water depth but is also correlated with hydro-period, soils, nutrients, chemistry and energy. Species composition also appears to be a function of competition and which species established first.

A classic depressional wetland has a landward progression from open water to upland vegetation. A zone with rooted aquatic vegetation occurs landward of the open water. Landward of the rooted aquatic vegetation is a zone with emergent herbaceous vegetation that is flooded year-round. Next is a zone that is seasonally flooded and dominated by herbaceous plant species. Landward of the herb dominated vegetation occurs a zone dominated by shrubs which is seasonally flooded. *Pyrus fusca** thickets often occur landward of the shrub zone. Often these wetland systems have an area of wet forest which has a variety of living conifer and shrub species as well as an abundance of snags. Each of these zones can be composed of one or more communities.

Exceptions to the "classic" depressional wetland occur frequently. Minerotrophic wetlands often appear as a mosaic of water levels, soils and vegetation. Water levels and duration of flooding often do not progress systematically from deep and permanently flooded to shallow and seasonally flooded. Natural disturbance due to high energy flooding and beaver activity play an important role in determining vegetation patterns. Secondary substrates such as large woody debris, upturned root wads, organic matter mounded around the bases of woody plants and floating sedge mats add to the diversity.

Some minerotrophic wetlands are floating fibrous mats with a variety of plant species. These mats can be small or cover large areas of water.

They are sometimes associated with floating logs or drowned forests with emergent snags.

Areas with flowing water (such as flood plains along stream channels, oxbows and wetlands associated with small braided streams and seeps) often have species-rich and dynamic wetland vegetation. This species-richness is due to natural disturbance caused by flooding, a greater diversity of microhabitats, greater compression of gradients, or higher oxygen or nutrient levels in contrast to more impounded systems. Wetlands in which beaver are active have similar characteristics but appear even more chaotic.

Permanently flooded thickets dominated by *Spiraea douglasii*, *Salix* spp., *Alnus incana* or other shrubby species either can be species-poor or rich. The water is quite deep at least seasonally and the soils tend to be very soft, deep muck. The woody bases of the shrubs provide a secondary substrate with compressed hydrologic gradients and support a diversity of species.

MINEROTROPHIC WETLAND COMMUNITY TYPES

***Brasenia schreberi* community type**

This community type is found throughout the northern Puget Trough lowlands. It occurs in shallow water, usually around the open water margins of lakes.

This community type needs additional study. It appears to be a monospecific with up to 60 percent cover of the water surface by *Brasenia schreberi*.

Christy (1993) listed a *Brasenia schreberi* community in Oregon.

Indicator species:

Brasenia schreberi 40-60%

Other species:

Nuphar polysepalum

***Hippuris vulgaris* community type**

This is a commonly occurring community type in the northern Puget Trough lowlands. It is usually found in shallow, permanently flooded areas. Soils most often are soft anoxic muck but the community type is also found on sand.

This community type often appears to be monospecific but detailed surveys have not been done.

Indicator species:

Hippuris vulgaris 50%

Other species:

Nuphar polysepalum

Sparganium emersum

***Juncus balticus* community type**

This community type is found in a few locations in the northern Puget Trough lowlands. It occurs in shallow water over silts or muck, or on fibrous peat mats. This community type usually occupies the inland-most portion of permanently flooded zones around ponds and lakes. It also occurs in seasonally flooded areas in ponds which are filling-in.

Juncus balticus is always abundant in this community type. Examples of the community type are usually species-poor, but a series of wetlands which have serpentine influence are moderately species-rich. Species found in serpentine examples of this community type are followed by (SW) in the list below. This community type intergrades with a variety of minerotrophic wetland and sphagnum bog community types.

Juncus balticus is a widespread species and likely dominates several community types or variants. Christy (1993) listed several references for a *J. balticus* community in Oregon.

Indicator species:

Juncus balticus 20%

Other species:

Carex cusickii

Carex obnupta

Carex oederi (SW)

Festuca rubra (SW)

Nuphar polysepalum

*Potentilla pacifica** (SW)

Triglochin maritimum (SW)

***Nuphar polysepalum*
community type**

This is a commonly occurring community type in the northern Puget Trough lowlands. It occurs in shallow, permanently flooded areas up to 2 m deep. It usually occurs in the rooted aquatic zone but extends into the emergent zone. It can occur in areas with high water level fluctuation where *Nuphar polysepalum* leaves are suspended a foot or more above the water's surface or even stranded on mud flats during the driest parts of the year (Ewing, pers. comm.). Soils appear to be soft anoxic muck but may be firmer sandy soils in some cases.

This community type usually is monospecific but can be composed of several aquatic plant species. Care must be taken to distinguish this community type from transitional areas where *Nuphar polysepalum* is either invasive or residual.

Christy (1993) listed several references for a *Nuphar polysepalum* community in Oregon. Kovalchik (1993) described a *N. polysepalum* association which appears similar to the landward margin and transition zone of the community type described here.

Indicator species:

Nuphar polysepalum 10-90%

Other species:

Equisetum fluviatile

Hippuris vulgaris

Juncus balticus

Potamogeton natans

Scirpus acutus/validus

Scirpus subterminalis

Sparganium emersum

Typha latifolia

Utricularia vulgaris

***Potamogeton natans*
community type**

This community type commonly occurs in the northern Puget Trough lowlands. It occurs in permanently flooded areas, either shallow lake margins or throughout shallow ponds.

This community type represents all rooted aquatic communities which have *Potamogeton natans* as a dominant species. It could probably be divided into several community types or variants with further study.

Christy (1993) listed a *Potamogeton natans* community in Oregon.

Indicator species:

Potamogeton natans 25-80%
Utricularia vulgaris 0-50%

Other species:

Ceratophyllum demersum *Lemna minor**
Glyceria occidentalis *Nuphar polysepalum*
Hippuris vulgaris

***Scirpus acutus*
community type**

This community type occurs throughout the northern Puget Trough lowlands. It is found in shallow water, about 1 m deep, on very soft silts and organic muck.

The community type occurs as almost pure stands of either *Scirpus acutus* or *Scirpus validus**. The two species are very similar morphologically and, because of the difficulty in access due to soft substrates, *S. acutus* is used for either species here.

Christy (1993) separately listed *Scirpus acutus* and *Scirpus validus** communities. Chadde *et al.* (1988) described a *S. acutus* association from Montana that appears similar to that observed in western Washington. Kovalchik (1993) gave plot data for a *S. validus* association which is somewhat similar to the upland margin of the community type described here.

Indicator species:

Scirpus acutus or *S. validus* 10-50%

Other species:

Nuphar polysepalum *Potentilla palustris*

***Scirpus subterminalis*
community type**

This community type is found in the western and southwestern portions of the northern Puget Trough lowlands. It occurs in very shallow permanent ponds, most frequently where there is large annual water level fluctuation. It occupies the landwardmost permanently flooded zone. Substrates are muck, fibrous peat, or a mixture of fibrous and sphagnum peat.

The community type is dominated by *Scirpus subterminalis*. It often intergrades with the waterward *Nuphar polysepalum* community type.

Osvold (1933) briefly described a *Scirpus subterminalis*-*Sphagnum cuspidatum*-society which occurs in seasonal ponds in a bog on the Fraser River Delta.

Indicator species:

Scirpus subterminalis 20-60%

Other species:

Dulichium arundinaceum *Puccinellia pauciflora**
Nuphar polysepalum *Utricularia vulgaris*

***Typha latifolia*
community type**

This community type is found throughout the Puget Trough lowlands. It typically occurs in shallow permanently flooded areas, but also occurs in seasonally flooded areas. It is mostly found on anoxic organic soils.

Typha latifolia often forms monospecific stands but also can occur with a large number of other species. Examples with a high diversity of species appear most often associated with natural disturbance, such as beaver-controlled systems. The community type is frequently located adjacent to other communities with which it merges, often forming complex ecotonal assemblages.

Typha latifolia increases with some kinds of human-caused disturbance and is often abundant, if not dominant, in disturbed wetlands. Care must be taken to distinguish between native and disturbed communities.

Typha latifolia dominated communities are common throughout the northwestern United States. Their similarities and differences need to be further studied. Christy (1993) listed several references for a *T. latifolia* community in Oregon. Kovalchik (1993) described a *T. latifolia* association from eastern Washington which is moderately similar to the community type described here.

Indicator species:

Typha latifolia 20-75%

Other species:

Alnus rubra
Carex cusickii
Carex obnupta
*Carex rostrata**
*Carex sitchensis**
Carex vesicaria
Galium trifidum
*Lemna minor**
Lonicera involucrata

Mimulus guttatus
Myosotis laxa
Oenanthe sarmentosa
Potamogeton natans
Potentilla palustris
Puccinellia palustris
Sparganium emersum
Spiraea douglasii
Veronica scutellata

***Carex cusickii*
community type**

This community type is found scattered throughout the northern Puget Trough lowlands. It occurs on floating saturated mats, usually around lake margins. The mats are composed of fibrous peat and can have woody material incorporated in them.

This community type is species-rich and often contains some *Sphagnum* spp. (< 6 percent cover) and sphagnum bog associated plant species. It is characterized by the abundance of *Carex cusickii*, the predominance of minerotrophic wetland species and the low cover of *Sphagnum* spp. It is similar to the *C. cusickii/Sphagnum* spp. community type.

Kovalchik (1993) described a similar association from the Colville National Forest in northeastern Washington.

Indicator species:

Carex cusickii 40-45%

Other species:

Agrostis scabra
Alnus rubra
Athyrium filix-femina
Carex interior complex
*Carex sitchensis**
Cicuta douglasii
Drosera rotundifolia
Epilobium sp.
Galium spp.
Juncus balticus
Lonicera involucrata

Mentha arvensis
Menyanthes trifoliata
Mimulus guttatus
Myosotis laxa
Nuphar polysepalum
Oenanthe sarmentosa
Potentilla palustris
Spiraea douglasii
Thuja plicata
Typha latifolia
*Veronica americana**

***Carex lasiocarpa*
community type**

This community type is uncommon in the northern Puget Trough lowlands. It is found in areas which are seasonally flooded, on firm substrates or on quaking mats. The substrate is typically either fibrous peat or a mixture of fibrous and sphagnum peat.

The community type is identified by high percent cover of *Carex lasiocarpa*. It is either monospecific or occurs with a rich association of species.

Kovalchik (1987, 1993) described *Carex lasiocarpa* associations in the southern Cascade Range of Oregon and at moderate elevations in eastern Washington, but the species compositions, elevations and climatic regimes differ from the community type described here. Vitt and Slack (1975) describe *C. lasiocarpa* as occurring on peat mats along the edge of alkaline lakes.

Indicator species:

Carex lasiocarpa 30-60%

Other species:

*Carex sitchensis**

Drosera rotundifolia

Dulichium arundinaceum

Hypericum anagalloides

*Lysichitum americanum**

Nuphar polysepalum

Potentilla palustris

Viola palustris

***Carex obnupta*
community type**

This community type is found throughout the northern Puget Trough lowlands. Although it does occur occasionally in full sun, it usually occurs in at least partial shade along the forested margins of wetlands. This community type is typically seasonally flooded but also occurs in permanently flooded areas. Substrates can be fibrous peat (often with woody material), sands, or muck. Where it occurs in permanently flooded areas, *Carex obnupta* often forms pedestaled bases.

This community type is often monospecific. It frequently intergrades with other community types, especially *Spiraea douglasii* and *Alnus rubra* wetland community types.

Christy (1993) listed several references for *Carex obnupta* communities in Oregon. He lists a *C. obnupta* and a *C. obnupta*-*Carex sitchensis** freshwater wetland community.

Indicator species:

Carex obnupta 60-90%

Other species:

Carex cusickii

Ledum groenlandicum

Mimulus guttatus

Nuphar polysepalum

Oenanthe sarmentosa

Spiraea douglasii

***Carex rostrata**
community type**

This community type commonly occurs throughout the northern Puget Trough lowlands. It is species-rich and occurs in either seasonally or permanently flooded areas. Substrates are typically fibrous peat but can contain some sphagnum.

This community type is recognized by the abundance of *Carex rostrata**. There are places where a mixture of *Carex* species codominate that could be ecotonal between this and other community types, notably *Carex sitchensis** and less often *Carex obnupta* and *Carex cusickii* community types.

Banner *et al.* (1986) noted a *Carex rostrata** marsh community. Christy (1993) listed a *C. rostrata* community in Oregon. His references suggested that there may be several *C. rostrata* communities. Seyer (1979) described a *C. rostrata* community from a montane mire near Crater Lake, Oregon, that could be similar to the community type described here. Kovalchik (1987, 1993) described a *C. rostrata* association in eastern Washington and central Oregon which is somewhat similar to the community type described here. Chadde *et al.* (1988) described a *C. rostrata* association - *C. rostrata* variant in Montana that appears similar to that found in western Washington. Padgett's (1982) beaked sedge riparian dominance type is somewhat similar to this.

Indicator species:

*Carex rostrata** 50-80%

Other species:

Angelica genuflexa
Calamagrostis canadensis
Carex cusickii
Carex obnupta
*Carex sitchensis**
Cicuta douglasii
Epilobium sp.
Galium spp.

Glyceria elata
Juncus balticus
Mimulus guttatus
Myosotis laxa
Oenanthe sarmentosa
Potentilla palustris
Puccinellia palustris

***Carex sitchensis**
community type**

This community type is commonly found throughout the northern Puget Trough lowlands. It occurs both in areas with flowing or impounded water. It is seasonally to permanently flooded. Where it occurs in seasonally flooded areas, the soils remain wet year-round. Where it occurs in permanently flooded areas, *Carex sitchensis** forms pedestaled bases. Soils are fibrous peat.

This community type can occur as monospecific stands of *Carex sitchensis** or species-rich swards dominated by *C. sitchensis*. It often seems to be intermixed with several other minerotrophic wetland community types: *Carex rostrata**, *Carex cusickii*, *Salix* spp. and *Spiraea douglasii* community types.

Banner *et al.* (1986) described *Carex sitchensis** and *C. sitchensis*-*Carex obnupta* communities. Christy (1993) listed several references for a *C. sitchensis* community in Oregon. Seyer (1979) described a *C. sitchensis* community, consisting of two variants, from a montane mire near Crater Lake, Oregon. Kovalchik (1987) described a *C. sitchensis* association in low-gradient flood plains and headwater basins in the Cascade Range in Oregon and a *Carex aquatilis* association from eastern Washington (Kovalchik, 1993) which are somewhat similar to the community type described here.

Indicator species:

*Carex sitchensis** 30-70%

Other species:

Carex cusickii
*Carex rostrata**
Juncus balticus
Menyanthes trifoliata

Nuphar polysepalum
Potentilla palustris
Spiraea douglasii

***Carex vesicaria*
community type**

This community type is found throughout the northern Puget Trough lowlands. It usually occupies a zone just landward of permanently flooded areas but also occurs in areas permanently flooded with shallow water. Ewing (pers. comm.) observed it in areas flooded two to four months per year. It seems most often associated with shallow ponds, either kettles or scours, but is occasionally found in association with slowly moving water. Substrates are typically muck or fibrous peat, either thin veneers over mineral soils or deeper organic layers.

This typically is a monospecific community type.

Osvald (1933) described a *Carex vesicaria*-society occurring in lags and burned areas around bogs. The community he described was drier than the community type described here and contained species more typical of bogs or poor fens. Christy (1993) listed references for a *C. vesicaria* community in Oregon. Kovalchik (1987) described a wide ranging *C. vesicaria* community in Oregon with a similar range of soils and habitats to the community type described here. Kovalchik (1993) lumped *C. vesicaria* and *Carex utriculata* into a *C. utriculata* association.

Indicator species:

Carex vesicaria 25-65%

Other species:

Dulichium arundinaceum
*Eleocharis palustris**
Glyceria occidentalis
Menyanthes trifoliata
Nuphar polysepalum

Potamogeton spp.
*Puccinellia pauciflora**
Ranunculus flammula
Sium suave
Sparganium spp.

***Dulichium*
arundinaceum
community type**

This community type is found throughout the northern Puget Trough lowlands. It occurs over mineral soils, fibrous peat or muck. In a few places it occurs adjacent to sphagnum peat. It occupies areas which are seasonally or permanently flooded with shallow water.

The community type is recognized by the abundance of *Dulichium arundinaceum* and is either monospecific or moderately species-rich.

Osvald (1933) described a *Dulichium arundinaceum*-society in wet depressions within sphagnum bogs. Christy (1993) listed one unpublished reference for a *D. arundinaceum* community in Oregon.

Indicator species:

Dulichium arundinaceum 10-75%

Other species:

Carex oederi
Carex vesicaria
*Eleocharis palustris**
Juncus balticus
Juncus supiniformis
Lycopus uniflorus
Mentha arvensis

Menyanthes trifoliata
Nuphar polysepalum
Potentilla palustris
Rhynchospora alba
Scirpus subterminalis
Spiraea douglasii
Utricularia vulgaris

***Alnus incana*
community type**

This community type occurs in the southern portion of the northern Puget Trough lowlands. Sites range from permanently flooded but with large seasonal water level fluctuation to areas in which it is flooded most of the year but dries to saturated soils in late summer. It is associated with low-gradient or partially impounded streams as well as impounded systems.

Soils are peat and muck. The bases of shrubs with accumulated organic matter form a secondary substrate with very steep hydrologic gradients.

This community type is a complex of microsites all under a canopy of *Alnus incana*. It is characterized by the abundance of *Alnus incana*. *Rhamnus purshiana*, *Salix* spp., *Oenanthe sarmentosa* and *Lysichitum americanum** occur in varying amounts in all surveyed sites. *Carex rostrata**, *Carex sitchensis**, *Carex cusickii* and *Calamagrostis canadensis* are variously codominant at different sites. With further study, this community type may be divided into several community types or variants.

The community type described here is not similar to the eastern Washington *Alnus incana* communities described by Evans (1989) or Padgett (1982). It is somewhat similar to some of Kovalchik's (1993) *A. incana* associations. Christy (1993) listed several *A. incana* communities occurring in riparian zones in Oregon.

Indicator species:

Alnus incana 40%
*Lysichitum americanum** 10-30%
Oenanthe sarmentosa 1-10%
Rhamnus purshiana 5%
Salix spp. 5-20%

Other species:

<i>Angelica genuflexa</i>	<i>Ledum groenlandicum</i>
<i>Athyrium filix-femina</i>	<i>Lemna minor</i> *
<i>Blechnum spicant</i>	<i>Lonicera involucrata</i>
<i>Calamagrostis canadensis</i>	<i>Lycopus uniflorus</i>
<i>Carex cusickii</i>	<i>Maianthemum dilatatum</i>
<i>Carex obnupta</i>	<i>Mentha arvensis</i>
<i>Carex rostrata</i> *	<i>Physocarpus capitatus</i>
<i>Carex sitchensis</i> *	<i>Potentilla palustris</i>
<i>Cornus stolonifera</i> *	<i>Rubus spectabilis</i>
<i>Epilobium watsonii</i> *	<i>Sparganium</i> sp.
<i>Galium cymosum</i> *	<i>Spiraea douglasii</i>
<i>Glyceria elata</i>	<i>Typha latifolia</i>
<i>Juncus balticus</i>	<i>Viola palustris</i>

***Cornus stolonifera**-
Salix spp.-*Spiraea
douglasii*
community type**

This community type is commonly found throughout the Puget Trough lowlands. It usually occurs in association with flowing water, but occasionally occurs as a dense shrub zone around the margins of impounded wetlands. It is typically found in areas which are permanently flooded and have soft muck soils. It occasionally occurs on seasonally flooded slopes of kettle wetlands on glacial till.

This community type generally occurs as a shrub thicket dominated by one or more species of *Salix*, *Spiraea douglasii* and *Cornus stolonifera**. Other shrub species are often present. Herbaceous species occur on elevated microsites where there is less than 100 percent cover of shrubs.

Kovalchik (1993) described a catch-all *Cornus stolonifera** association which is mostly quite different from the community type described here, with the possible exception of some of Kovalchik's plots taken around the margins of lakes and ponds.

Indicator species:

*Cornus stolonifera** 10-30%
Salix spp. 30-50%
Spiraea douglasii 30-60%

Other species:

<i>Carex obnupta</i>	<i>Physocarpus capitatus</i>
<i>Carex sitchensis*</i>	<i>Potentilla palustris</i>
<i>Lonicera involucrata</i>	<i>Puccinellia pauciflora*</i>
<i>Lysichitum americanum*</i>	<i>Rhamnus purshiana</i>
<i>Maianthemum dilatatum</i>	<i>Scirpus microcarpus</i>

***Myrica gale*
community type**

This community type is rarely found in good condition in the northern Puget Trough region. It was once more common as evidenced by the literature and the existence of relictual populations of *Myrica gale* (Cooke and Weinmann, pers. comm.). Substrates are saturated year-round and may be seasonally flooded. Soils are peat.

This community type is characterized by the presence of *Myrica gale*. It appears to be transitional between sphagnum bog and minerotrophic conditions and often has some *Sphagnum* spp. and *Ledum groenlandicum*.

Rigg (1925) noted *Myrica gale* bogs in the Puget Trough lowlands around King County. Communities dominated by *M. gale* with *Sphagnum* spp. were noted by Osvald (1933) and Hebda and Biggs (1981) as occurring in British Columbia near Vancouver. Kojima and Krajina (1975) described a *M. gale* and *Spiraea douglasii* community without *Sphagnum* spp. around a lake margin on the east side of Vancouver Island. *M. gale* communities occur commonly along the outer coast of Washington.

Indicator species:

Myrica gale 25%
Sphagnum spp. 5%

Other species:

<i>Alnus rubra</i>	<i>Potentilla palustris</i>
<i>Carex obnupta</i>	<i>Pyrus fusca*</i>
<i>Epilobium</i> sp.	<i>Rhamnus purshiana</i>
<i>Gaultheria shallon</i>	<i>Rubus spectabilis</i>
<i>Kalmia occidentalis*</i>	<i>Spiraea douglasii</i>
<i>Ledum groenlandicum</i>	<i>Tsuga heterophylla</i>
<i>Lonicera involucrata</i>	<i>Typha latifolia</i>
<i>Oenanthe sarmentosa</i>	<i>Vaccinium parvifolium</i>
<i>Picea sitchensis</i>	<i>Viola palustris</i>
<i>Pinus contorta</i>	

***Salix* spp.
community type**

All *Salix* dominated minerotrophic wetlands have been lumped into this one community type because of the difficulties in species identification (see page 7) and site surveys. With further work, it could be divided into more and better defined community types.

These wetlands are found throughout the Puget Trough lowlands. They are generally found in permanently flooded areas but also occur in areas that are seasonally flooded. Soils are muck with woody debris and some fibrous peat. Woody debris provides an elevated secondary substrate. Beaver are often active in this community type, changing the hydrology and pruning woody and herbaceous species.

The vegetation usually consists of several shrubby species forming a dense stand. One or more species of *Salix* is dominant. *Spiraea douglasii* is usually present and often co-dominant. There are several understory microenvironments related to water depth and substrate within the stands. These microhabitats support a variety of plant species.

The National Wetlands Working Group (1988) noted *Salix* spp.-*Spiraea douglasii* thickets in laggs around bogs. Although many *Salix* communities and associations have been described from eastern Washington, most are dominated by *Salix* spp. not found in western Washington. *Salix lasiandra** is a notable exception, but here too, associated species differ between eastern and western Washington examples.

Indicator species:

Salix spp. 20-60%
Spiraea douglasii 5-60%

Other species:

<i>Alnus incana</i>	<i>Nuphar polysepalum</i>
<i>Alnus rubra</i>	<i>Oenanthe sarmentosa</i>
<i>Alnus sitchensis</i>	<i>Physocarpus capitatus</i>
<i>Athyrium filix-femina</i>	<i>Pinus monticola</i>
<i>Carex cusickii</i>	<i>Potentilla palustris</i>
<i>Carex obnupta</i>	<i>Puccinellia pauciflora</i> *
<i>Carex rostrata</i> *	<i>Rhamnus purshiana</i>
<i>Carex sitchensis</i> *	<i>Sparganium emersum</i>
<i>Cornus stolonifera</i> *	<i>Typha latifolia</i>
<i>Glyceria elata</i>	<i>Vaccinium parvifolium</i>
<i>Glyceria grandis</i>	<i>Veronica americana</i> *
<i>Lonicera involucrata</i>	<i>Veronica scutellaria</i>
<i>Lysichitum americanum</i> *	<i>Viola palustris</i>
<i>Maianthemum dilatatum</i>	

***Spiraea douglasii* community type**

This community type commonly occurs throughout the Puget Trough lowlands in both impounded and semi-impounded systems. It can be either seasonally or permanently flooded. Soils are usually organic muck with some fibrous peat and woody material.

Spiraea douglasii typically forms dense, nearly monospecific stands, 1.8 to 3 m tall. Along the margins of dense stands, in less dense stands and in association with flowing water or beaver systems can be found a large number of associated species. This community type seems to intergrade with other minerotrophic and bog community types producing ecotonal vegetation.

Osvold (1933) and Fitzgerald (1977) described a *Spiraea douglasii* community occupying laggs around sphagnum bogs. Hebda and Biggs (1981) described a spirea brushland type in laggs around bogs. Banner *et al.* (1986) described a *S. douglasii*/*Carex sitchensis** community. Christy (1993) listed several references for a *S. douglasii* community in Oregon.

Indicator species:

Spiraea douglasii 20-100%

Other species:

<i>Alnus rubra</i>	<i>Ledum groenlandicum</i>
<i>Carex cusickii</i>	<i>Lycopus uniflorus</i>
<i>Carex obnupta</i>	<i>Myosotis laxa</i>
<i>Carex rostrata</i> *	<i>Oenanthe sarmentosa</i>
<i>Carex sitchensis</i> *	<i>Potentilla palustris</i>
<i>Carex vesicaria</i>	<i>Pyrus fusca</i> *
<i>Cicuta douglasii</i>	<i>Ranunculus flammula</i>
<i>Cornus stolonifera</i> *	<i>Salix</i> spp.
<i>Dulichium arundinaceum</i>	<i>Sparganium</i> spp.
<i>Glyceria elata</i>	<i>Sparganium emersum</i>
<i>Glyceria occidentalis</i>	<i>Typha latifolia</i>
<i>Juncus balticus</i>	<i>Viola palustris</i>

***Alnus rubra*/
Lysichitum
*americanum**
community type**

This community type is found throughout the northern Puget Trough lowlands. It occurs near wetland margins where soils are usually saturated and may be seasonally flooded. These are low energy systems often found in the flood plains of low-gradient streams. Soils are organic. Large woody debris provides a secondary elevated substrate.

Alnus rubra forms a nearly closed canopy. The understory has a species-rich herb component and always has high percent cover of *Lysichitum americanum**. This community type is related to the *A. rubra*/*Rubus spectabilis* community type but is wetter and has lower percent cover of *R. spectabilis*. It is probably progressing towards the *Thuja plicata*-*Tsuga heterophylla*/*L. americanum* community type.

Christy (1993) referenced *Alnus rubra*/*Lysichitum americanum** communities in Oregon within the *Thuja plicata*/*Lysichitum americanum** community.

Indicator species:

Alnus rubra 80%
Athyrium filix-femina 8-10%
*Lysichitum americanum** 35-60%
Rubus spectabilis 5%

Other species:

<i>Carex obnupta</i>	<i>Pteridium aquilinum</i>
<i>Cornus stolonifera</i> *	<i>Pyrus fusca</i> *
<i>Blechnum spicant</i>	<i>Thuja plicata</i>
<i>Impatiens capensis</i>	<i>Tiarella trifoliata</i>
<i>Lonicera involucrata</i>	<i>Tolmiea menziesii</i>
<i>Maianthemum dilatatum</i>	<i>Tsuga heterophylla</i>
<i>Oenanthe sarmentosa</i>	<i>Vaccinium parvifolium</i>
<i>Picea sitchensis</i>	

***Alnus rubra*/*Rubus*
spectabilis
community type**

This community type is found throughout the northern Puget Trough lowlands, although there are few remaining undisturbed examples. It typically occurs along the upland margin of wetlands and on the flood plains of streams and rivers. Soils range from alluvium to veneers of muck and peat. It may be seasonally flooded and soils are usually saturated year-round.

Alnus rubra forms a nearly closed canopy. *Rubus spectabilis* can be the only species in the understory. This community type is related to the *A. rubra*/*Lysichitum americanum** community type but appears drier. It is probably progressing towards the *Thuja plicata*-*Tsuga heterophylla*/*L. americanum* community type.

Hebda and Biggs (1981) described this community type on alluvium in previously logged areas. Douglas (1971) briefly described an *Alnus rubra*/*Rubus spectabilis* community on low elevation wet valley floors in the North Cascades of Washington. He also described an *A. rubra*/*Acer circinatum*-*R. spectabilis*/*Athyrium filix-femina* community which appears to fit this community type and is moving towards a *Thuja plicata* wet forest community type. Christy (1993) referenced *A. rubra*/*R. spectabilis* communities in Oregon within the *T. plicata*/*Lysichitum americanum** community. The community type described here is distinguished from upland successional *A. rubra*/*R. spectabilis* community by wetland hydrology and soils (Peter pers. comm.).

Indicator species:

Alnus rubra 40-80%
Rubus spectabilis 30-60%

Other species:

Athyrium filix-femina
Equisetum hyemale
Galium trifidum
Lonicera involucrata
*Lysichitum americanum**
Rhamnus purshiana
Ribes sp.

Rubus ursinus
Sambucus racemosa
Thuja plicata
Tiarella trifoliata
Tolmiea menziesii
Tsuga heterophylla

***Fraxinus latifolia*/
Carex obnupta
community type**

This community type is most common in the southern Puget Trough region but occasionally occurs in the southern portion of the northern Puget Trough. It occurs in two wetland settings, most commonly in flood plains association with streams and less commonly in kettle wetlands. Soils are flooded at least through the winter and in kettles they can be flooded through early summer. Soils typically are organic veneers over alluvium or glacial till/outwash.

The overstory is dominated by *Fraxinus latifolia* and the understory is dominated by *Carex obnupta* in both the riparian and impounded wetland examples of this community type. *Spiraea douglasii* occurs scattered in slightly more open areas of the community type and can be the adjacent waterward community type. *Rubus spectabilis* is scattered in the landward portions of this community type. Small patches of *Sphagnum* spp. occur around the landward margins of this community type where it occurs in kettles. The riparian examples appear to be more species-rich than the impounded wetland examples.

Frenkel and Heinritz (1987) described a *Fraxinus latifolia*/*Carex obnupta* community in association with a stream system in Oregon. Christy (1993) listed several references for a *F. latifolia*/*C. obnupta* community in Oregon.

Indicator species:

Carex obnupta (36)50-70%
Fraxinus latifolia 50-80%

Other species:

Alnus rubra
Maianthemum dilatatum
Oenanthe sarmentosa
*Pyrus fusca**
Rhamnus purshiana

Rubus spectabilis
Salix spp.
Sambucus racemosa
Sphagnum spp.
Spiraea douglasii

***Fraxinus latifolia*/
Symphoricarpos
albus
community type**

Most of the data and description for this community type are from Frenkel and Heinritz (1987). Undisturbed examples of this community type are difficult to find. Only disturbed examples were surveyed in Washington.

This community type is found most often in the southern portion of the northern Puget Trough region, becoming common in the southern Puget Trough region and the Willamette Valley, Oregon. It occurs primarily in riparian zones but also in glacial scours and kettles. Soils are alluvium but also glacial till and outwash. It is subirrigated and infrequently flooded.

Fraxinus latifolia is the dominant overstory species. *Symphoricarpos albus* and *Rubus ursinus* codominate the shrub layer. *Montia sibirica**, *Carex obnupta* and *Carex deweyana* are the most abundant species in the under-

story. It is higher and drier than the *F. latifolia*/*C. obnupta* community type. The description for this community type was adapted from Frenkel and Heinitz (1987), including mean cover values for the indicator species. Christy (1993) listed a *Fraxinus latifolia*/*Symphoricarpos albus*/*Urtica dioica* community in Oregon.

Indicator species:

Carex deweyana 10%
Carex obnupta 10%
Fraxinus latifolia 80%

*Montia sibirica** 14%
Rubus ursinus 22%
Symphoricarpos albus 26%

Other species:

Elymus glaucus
Eleocharis acicularis
Galium aparine
Galium trifidum
Lonicera involucrata
Luzula parviflora
Maianthemum dilatatum
Myosotis laxa
Oemleria cerasiformis
Oenanthe sarmentosa
Polystichum munitum

Populus tremuloides
*Populus trichocarpa**
*Pyrus fusca**
Quercus garryana
Rosa cf pisocarpa
Sambucus racemosa
Spiraea douglasii
Stachys cooleyae
Stellaria calycantha
Tellima grandiflora
Veronica scutellata

***Pyrus fusca**
community type**

This community type is found throughout the northern Puget Trough lowlands. It typically occurs along the upland edge of wetlands and is seasonally flooded. It often encircles sphagnum bogs and kettle wetlands. It occurs over glacial till or outwash with a thin organic layer, or on saturated muck and woody debris.

This community type is dominated by *Pyrus fusca** and has almost no understory. Understory species often reflect the composition of adjacent wetland communities. This community type is highly trampled and browsed in some areas by deer.

*Pyrus fusca** is common in upper portions of both freshwater and brackish wetlands. With further study, several community types or variants with *P. fusca* could probably be defined.

Christy (pers. comm.) observed this community type in the Willamette Valley, Oregon. Banner *et al.* (1986) described a *Malus fusca*-*Salix* spp./*Carex obnupta* community in British Columbia.

Indicator species:

*Pyrus fusca** 30-80%

Other species:

Alnus rubra
Carex obnupta
*Lysichitum americanum**
Maianthemum dilatatum

Rhamnus purshiana
Salix spp.
Spiraea douglasii
Trientalis arctica

***Thuja plicata*-*Tsuga heterophylla*/
*Lysichitum americanum**
community type**

This community type was once found throughout the northern Puget Trough lowlands but there are very few remaining undisturbed examples. It occurs on flat ground, in depressions, in flood plains and in association with small streams and seeps. Soils have a high organic content, either muck or peat. Fallen trees and upturned root wads provide a substrate elevated above the soil surface. The water level varies between being at, to slightly below, the soil surface and often there is standing water.

This community type is dominated by either or both *Thuja plicata* and *Tsuga heterophylla*. Conifers range from old, small diameter trees to fairly large ones. The understory varies from being relatively open to a dense shrub layer. *Lysichitum americanum** is always present and rooted in the soil. *Gaultheria shallon* and/or *Vaccinium alaskaense* are dominant on fallen logs and mounded soil. Some *Sphagnum* moss can be present.

This community type lumps *Tsuga heterophylla/Lysichitum americanum** and *Thuja plicata/L. americanum* community types. Hebda and Biggs (1981) described a mixed conifer woodland type which may fit in this community type. Douglas (1971) described a *T. plicata/Alnus rubra-Cornus stolonifera*/L. americanum-Smilacina stellata* community in seasonally flooded valley bottoms in the lowlands of the North Cascades, Washington. Topik *et al.* (1986) described a *T. heterophylla/L. americanum* association that fits within this community type. Fitzgerald (1977) described a transition zone forest in the lagg around Kings Lake Bog similar to this community type. Christy (1993) listed a *T. plicata/L. americanum* community, which included *A. rubra* communities, and a *T. heterophylla/Acer circinatum/L. americanum* community in Oregon that appear to fit within this community type. Daubenmire and Daubenmire (1968) described a *T. plicata/Oplopanax horridum* habitat type in which they lump *T. plicata* and *T. heterophylla* dominated sites stating that, other than the occurrence or dominance of the two conifer species, the sites and their species composition are identical. The National Wetlands Working Group (1988) described *T. plicata* and *L. americanum* dominated swamps that occurred in relationship to streams under moderate nutrient and semi-stagnant conditions. They also described *T. heterophylla/L. americanum* swamps that occurred under nutrient poor conditions and had stunted tree growth. The community type described here is similar to that described for the western Olympic Peninsula and southwest Washington region.

Indicator species:

Gaultheria shallon 20-50%
*Lysichitum americanum** 10-80%
Thuja plicata 5-80%
Tsuga heterophylla 10-50%

Other species:

<i>Acer circinatum</i>	<i>Maianthemum dilatatum</i>
<i>Alnus rubra</i>	<i>Menziesia ferruginea</i>
<i>Athyrium filix-femina</i>	<i>Picea sitchensis</i>
<i>Blechnum spicant</i>	<i>Rhamnus purshiana</i>
<i>Carex canescens</i>	<i>Rubus spectabilis</i>
<i>Cornus canadensis</i> *	<i>Salix</i> spp.
<i>Cornus stolonifera</i> *	<i>Spiraea douglasii</i>
<i>Galium</i> spp.	<i>Stellaria</i> sp.
<i>Glyceria elata</i>	<i>Tsuga heterophylla</i>
<i>Lonicera involucrata</i>	<i>Vaccinium alaskaense</i>
<i>Luzula</i> sp.	<i>Vaccinium parvifolium</i>



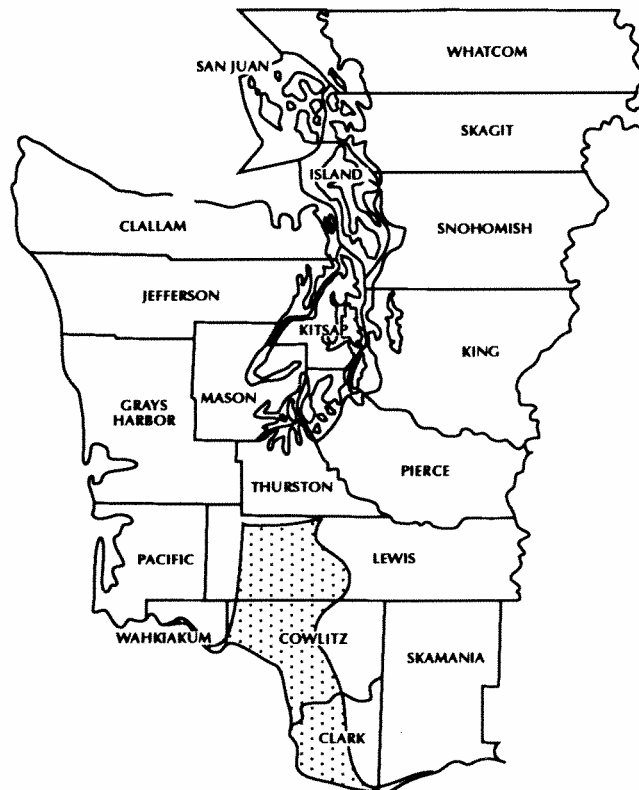
Native Freshwater Wetland Vegetation of the Southern Puget Trough and Lower Columbia River Lowlands

Introduction

The southern Puget Trough region extends from northern Lewis County south to the Columbia River (Figure 3). It extends east into the foothills of the Cascade Range and west to the crest of the Willapa and Black hills. The Columbia River, from Bonneville Dam to the eastern extent of Sitka spruce surge plain wetlands (approximately the line between Ranges 6 and 7 West, Willamette Meridian), is included in this region.

The southern Puget Trough and lower Columbia River region is mostly within the western hemlock zone (Franklin and Dyrness 1973) and includes a small portion of the Willamette Valley zone. It may include a portion of the coastal Douglas fir zone (Klinka *et al.* 1991). The upland vegetation tends towards species more typical of warmer or drier areas than the northern Puget Trough.

FIGURE 3:



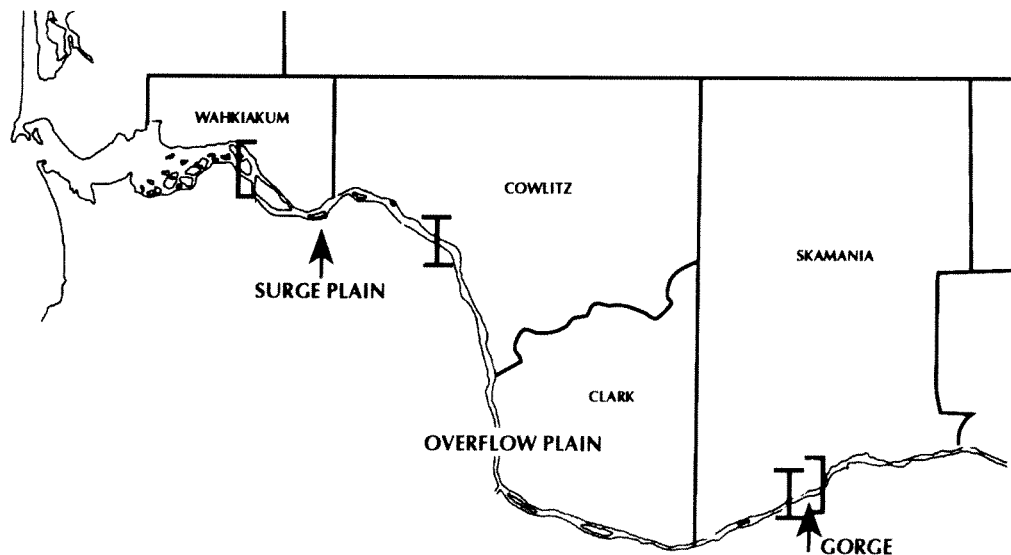
Riparian wetlands are abundant in the southern Puget Trough and along the included reaches of the Columbia River. This region includes portions of the Chehalis, Willapa, Cowlitz, Toutle, Coweeman, Kalama, Lewis, Washougal, Wind, Elochoman, Grays and Columbia rivers as well as a large number of smaller streams. Historically, most of these rivers were dynamic systems with large seasonal variations in flow. In the lowlands, where they weren't confined by bedrock, they produced wide flood plains and sinuous channels with oxbows and backwater areas. Gravel and sediment formed islands, spits and bars, particularly along the Columbia River. These flowing water systems had large and diverse wetlands associated with them.

Wetland systems in this region have been substantially altered since European settlement. Some of the rivers have been dammed changing water levels, timing of flows, flow energy and sediment transport. Wetlands have been diked, ditched, drained, filled, grazed, logged and invaded by non-native plant and animal species. This widespread and intensive alteration makes the identification of native wetland plant communities difficult.

The following classification focuses on the Columbia River. It describes the community types as they currently occur along the river and indicates where they occur elsewhere in the region. It describes community types which are dominated by native plant species and which appear less disturbed than most of the remaining wetland landscape. Included are surge plain, overflow plain and Columbia River Gorge wetlands (see page 4).

The Columbia River is tidal to within four miles of Bonneville Dam. Extending fifteen miles upriver from its mouth, saltwater mixes with freshwater and the wetland vegetation is typical of brackish conditions. The brackish plant community types are not included here. The Sitka spruce surge plain communities which occur in this area fall within the western Olympic Peninsula and southwest Washington region and are described later in that region's classification.

FIGURE 4:



Above the brackish zone are two tidal freshwater zones: the surge plain that has strong tidal influence, and the overflow plain that has less tidal influence and where water spreads into shallow backwater areas. Upstream of tidal influence is the relatively narrow and high energy zone of the river in the Columbia River Gorge. The wetland community types in each of these zones (Figure 4) are classified and described here.

The following Columbia River community types are from Christy and Putera (1993). Thomas (1980, 1984) conducted an inventory of plant species and broadly described the vegetation along the lower 40 miles of the Columbia River.

Plant Community Type Classification

Columbia River Gorge Community Types (c.t.)

Herb Dominated

1. *Artemisia lindleyana-Deschampsia cespitosa* c.t.
2. *Carex obnupta* c.t.
3. *Eleocharis palustris** c.t.
4. *Elodea canadensis* c.t.
5. *Lemna minor** c.t.

Shrub-dominated

1. *Salix fluviatilis-Salix lasiandra** c.t.

Overflow Plain Community Types (c.t.)

Herb Dominated

1. *Bidens cernua* c.t.
2. *Carex aperta* c.t.
3. *Carex obnupta* c.t.
4. *Eleocharis palustris** c.t.
5. *Elodea canadensis* c.t.
6. *Lemna minor** c.t.
7. *Ludwigia palustris-Polygonum hydropiperoides* c.t.
8. *Myriophyllum hippuroides* c.t.
9. *Paspalum distichum* c.t.
10. *Polygonum amphibium* c.t.
11. *Sagittaria latifolia* c.t.
12. *Scirpus validus** c.t.
13. *Solidago occidentalis** c.t.
14. *Sparganium emersum* c.t.

Shrub-dominated

1. *Salix fluviatilis-Salix lasiandra** c.t.
2. *Salix lasiandra*/Urtica dioica* c.t.
3. *Salix piperi*-Salix sitchensis* c.t.

Tree Dominated

1. *Fraxinus latifolia/Urtica dioica* c.t.
2. *Fraxinus latifolia-Populus trichocarpa*/Cornus stolonifera*/Urtica dioica* c.t.
3. *Fraxinus latifolia-Populus trichocarpa*/Symphoricarpos albus/Urtica dioica* c.t.

* Updated taxonomy provided in Appendix B.

Surge Plain Wetland Community Types (c.t.)

Herb Dominated

1. *Carex lyngbyei* c.t.
2. *Carex obnupta* c.t.
3. *Eleocharis palustris** c.t.
4. *Elodea canadensis* c.t.
5. *Equisetum fluviatile* c.t.
6. *Lemna minor** c.t.
7. *Lilaeopsis occidentalis*-*Tillaea aquatica** c.t.
8. *Myriophyllum hippuroides* c.t.
9. *Sagittaria latifolia* c.t.
10. *Scirpus acutus* c.t.
11. *Scirpus americanus* c.t.
12. *Sparganium emersum* c.t.
13. *Typha angustifolia*-*Typha latifolia* c.t.

Shrub-dominated

1. *Cornus stolonifera**-*Salix sitchensis* c.t.

Tree Dominated

1. *Populus trichocarpa**/*Cornus stolonifera**/*Impatiens capensis* c.t.

Plant Community Type Descriptions

Columbia River Gorge Wetlands

The Columbia River Gorge (see page 4) lies between Skamania and Bonneville Dam, between river miles 140 and 145 (Christy and Putera 1993). This short stretch of river is all that remains of a more extensive reach now inundated behind Bonneville Dam. This area of river is characterized by a coarse substrate (cobble and gravels) and relatively high flow rates. The Columbia River channel is confined by rock walls on both sides and the gradient is steeper than downstream reaches. There is very little flood plain and few wetlands.

Historically, flooding in this area was seasonal with large volumes of high energy water scouring the channel and flood plain. Seasonal flooding has been controlled by the dams and now there is less intense and more erratic flooding from dam releases. This has changed the hydrology and substrates along this portion of the Columbia River and resulted in substantial changes in the wetlands.

COLUMBIA RIVER GORGE WETLAND COMMUNITY TYPES

***Artemisia
lindleyana-
Deschampsia
cespitosa*
community type**

This community type is only known from the Washington shore of the Columbia River, downstream and within five miles of Bonneville Dam. It occurs on silt in cobble and gravel bars that are seasonally flooded. It is subject to the strong winds of the lower Columbia River Gorge.

This community type is dominated by *Artemisia lindleyana* and *Deschampsia cespitosa*. The cobbles and gravels are typically coated with dried algae, silt and a gray foliose lichen, *Dermatocarpon* sp. Landward this community type is replaced by the *Salix fluviatilis*-*Salix lasiandra** community type.

Examples of this community type are probably relicts of a once more widespread community in the Columbia River Gorge, now inundated by water behind Bonneville Dam.

Indicator species:

Artemisia lindleyana 20-25%
Deschampsia cespitosa 20-35%
Dermatocarpon sp. (lichen) 20-50%

Other species:

Coreopsis atkinsoniana
Gaillardia aristata
Salix fluviatilis

*Salix lasiandra**
Trifolium arvense
Xanthium strumarium

***Carex obnupta*
community type**

This community type occurs throughout the Gorge, overflow plain and surge plain segments of the Columbia River and other riparian systems in the region and Willamette Valley, Oregon. It is found in areas that are flooded seasonally or tidally with freshwater. Typically, examples along the Columbia River dry by early or mid-summer. In other areas it remains saturated year-round. Soils have high organic matter content.

This community type typically occurs as nearly monotypic stands of *Carex obnupta*.

Christy (1993) listed several references for *Carex obnupta* communities in Oregon.

Indicator species:

Carex obnupta 70-95%

Other species:

Oenanthe sarmentosa

Spiraea douglasii

***Eleocharis palustris**
community type**

This community type occurs throughout the Gorge, overflow plain and surge plain segments of the Columbia River. It occurs on either sands or silts along streams and at the margins of ponds and lakes. It is subject to seasonal or freshwater tidal flooding.

This community type is emergent and either nearly monotypic stands of *Eleocharis palustris** or dominated by *E. palustris* but with a large complement of other species.

Christy (1993) listed several references for an *Eleocharis palustris** community in Oregon. Dense stands of *E. palustris* were described on an alluvial bar and on mud flats in Washington (Kienholz 1931). Evans (1989) listed an *E. palustris* dominance type in the Columbia Plateau. Kovalchik (1987, 1993) described an *E. palustris* association which is quite different from the community type described here.

Indicator species:

*Eleocharis palustris** 50-90%

Other species:

Alisma plantago-aquatica

Bidens cernua

Callitriche spp.

Elatine spp.

Eleocharis acicularis

Elodea canadensis

Gratiola neglecta

Lilaeopsis occidentalis

Lindernia dubia

Ludwigia palustris

Limosella aquatica

Mimulus guttatus

Myriophyllum spicatum

Polygonum hydropiperoides

Sagittaria latifolia

*Tillaea aquatica**

Zannichellia palustris

***Elodea canadensis*
community type**

This community type occurs throughout the Gorge, overflow plain and surge plain segments of the Columbia River. It is submerged in shallow, flowing water and can occur in areas with freshwater tidal influence. It is restricted to mud and silt.

This community type occurs as nearly monotypic stands of *Elodea canadensis*.

Christy (1993) listed one reference for an *Elodea canadensis* community in Oregon.

Indicator species:

Elodea canadensis 50-95%

Other species:

Potamogeton spp.

***Lemna minor**
community type**

This community type occurs throughout the region on the surface of ponds, lakes and sloughs with little or no water movement.

The community type often forms nearly monotypic stands of *Lemna minor**.

*Lemna minor** is a commonly occurring species but communities characterized by it have seldom been described. Christy (1993) listed a *L. minor* community in Oregon, based on unpublished data.

Indicator species:

Azolla spp. 10-40%

*Lemna minor** 40-95%

Ricciocarpos natans (liverwort) 2-10%

Spirodela polyrhiza 2-30%

Other species:

Riccia fluitans (liverwort)

Wolffia spp.

***Salix fluviatilis*-
*Salix lasiandra**
community type**

This community type occurs along the banks of main channels in the overflow plain and Gorge segments of the Columbia River, especially above Vancouver. It occurs on sand and cobble beaches above the tidal zone. The community type is sometimes subject to drought and high temperatures in summer. It is scoured by winter high water and tolerant of flooding caused by releases from Bonneville Dam.

This community type is codominated by *Salix fluviatilis* and *Salix lasiandra**. The abundance of other species is low and drier portions of stands are subject to invasion by *Phalaris arundinacea*.

This community type has invaded areas formerly scoured by annual winter and spring floods, and forms dense stands on former sand flats. It also invades the landward side of the *Solidago occidentalis** community type on beaches, and the *Artemisia lindleyana*-*Deschampsia cespitosa* community type on gravel and cobble flats.

Christy (1993) listed two references for a *Salix fluviatilis*-*Salix lasiandra** community from the Willamette Valley, Oregon.

Indicator species:

Salix fluviatilis 20-40%

*Salix lasiandra** 20-40%

Other species:

Carex feta

Carex vulpinoidea

Overflow Plain Wetlands

The overflow plain segment of the Columbia River (see page 4) extends from Longview to Skamania, approximately from river miles 65 to 140 (Christy and Putera 1993). In this area, the floodplain broadens and, over the centuries, the river has meandered and deposited large quantities of sediments. The area is a complex of river and slough channels, sand islands, ridges, troughs, flats and shallow backwater areas. The substrates are mostly sand with some areas of sand bluffs and dunes. Backwater areas have finer sediments, silts and muck.

Historically, every year this area sustained both winter "rain floods" from west of the Cascades, and late spring or early summer "snowmelt floods" from the interior Columbia Basin. The timing and magnitude of flooding has changed drastically since the dams' construction. Seasonal flooding is now greatly reduced and a lesser degree of water level fluctuation is tied to irregular release of water from the dams. Some areas that once were seasonally flooded with river water now only receive water from precipitation and subsurface irrigation. Some areas are no longer flooded at all.

OVERFLOW PLAIN WETLAND COMMUNITY TYPES

***Bidens cernua* community type**

This community type occurs throughout the overflow plain of the Columbia River. It occurs in seasonally inundated depressions. Soils are mucky silts and silt loams.

This is a heterogeneous emergent community type. Although species composition is variable, *Bidens cernua* becomes dominant by mid-summer as it approaches flowering.

Christy (1993) listed a *Bidens cernua*-*Leersia oryzoides* community in Oregon, based on unpublished data.

Indicator species:

Bidens cernua 35-60%
*Eleocharis palustris** 5-20%
Leersia oryzoides 10-20%
Ludwigia palustris 2-15%
Sagittaria latifolia 5-20%

Other species:

<i>Alisma plantago-aquatica</i>	<i>Mimulus guttatus</i>
<i>Callitriche</i> spp.	<i>Polygonum hydropiperoides</i>
<i>Elodea canadensis</i>	<i>Scirpus acutus</i>
<i>Juncus oxymeris</i>	<i>Scirpus validus</i> *

***Carex aperta* community type**

This community type was once widespread but is rarely found now. Its historic distribution was the overflow plain of the Columbia River, between Longview and Skamania, and similar habitat along the lower reaches of the river's major tributaries. It occurs in low-lying areas with prolonged seasonal inundation. Soils are primarily silt-loams.

This community type is characterized by nearly monotypic stands of *Carex aperta*.

Carex aperta probably occurred in open riparian forests in the past, as well as open marshlands. Now it is much reduced by grazing and flood control, and displaced by the introduced *Phalaris arundinacea*. The sedge itself is not rare and can be found mixed with *P. arundinacea* in many areas, but it is never plentiful.

Gorman (1926) and Piper and Beattie (1915) described the historic occurrence of *Carex aperta* marshes.

Indicator species:

Carex aperta 70-95%

Other species:

Agrostis spp.
Bidens cernua
Bidens frondosa

Ludwigia palustris
Polygonum amphibium

***Carex obnupta*
community type**

This community type occurs throughout the Gorge, overflow plain and surge plain segments of the Columbia River and other riparian systems in the region and Willamette Valley, Oregon. It is found in areas that are flooded seasonally or tidally with freshwater. Typically, examples along the Columbia River dry by early or mid-summer. In other areas it can remain saturated year-round. Soils have high organic matter content.

This community type typically occurs as nearly monotypic stands of *Carex obnupta*.

Christy (1993) listed several references for *Carex obnupta* communities in Oregon.

Indicator species:

Carex obnupta 70-95%

Other species:

Oenanthe sarmentosa

Spiraea douglasii

***Eleocharis palustris**
community type**

This community type occurs throughout the Gorge, overflow plain and surge plain segments of the Columbia River. It occurs on either sands or silts along streams and at the margins of ponds and lakes. It is subject to seasonal or freshwater tidal flooding.

This community type is emergent and either nearly monotypic stands of *Eleocharis palustris** or dominated by *E. palustris* but with a large complement of other species.

Christy (1993) listed several references for a *Eleocharis palustris** community in Oregon. Dense stands of *E. palustris* were described on an alluvial bar and on mud flats in Washington (Kienholz 1931). Evans (1989) listed a rarely occurring *E. palustris* dominance type in the Columbia Plateau.

Indicator species:

*Eleocharis palustris** 50-90%

Other species:

Alisma plantago-aquatica
Bidens cernua
Callitriche spp.
Elatine spp.
Eleocharis acicularis

Ludwigia palustris
Limosella aquatica
Mimulus guttatus
Myriophyllum spicatum
Polygonum hydropiperoides

Elodea canadensis
Gratiola neglecta
Lilaeopsis occidentalis
Lindernia dubia

Sagittaria latifolia
*Tillaea aquatica**
Zannichellia palustris

***Elodea canadensis* community type** This community type occurs throughout the Gorge, overflow plain and surge plain zones of the Columbia River. It is submerged in shallow, flowing water and can occur in areas with freshwater tidal influence. It is restricted to mud and silt.

This community type occurs as nearly monotypic stands of *Elodea canadensis*.

Christy (1993) listed one reference for an *Elodea canadensis* community type in Oregon.

Indicator species:

Elodea canadensis 50-95%

Other species:

Potamogeton spp.

***Lemna minor** community type** This community type occurs throughout the region on the surface of ponds, lakes and sloughs with little or no water movement.

This community type often forms nearly monotypic stands of *Lemna minor**.

Christy (1993) listed a *Lemna minor** community in Oregon, based on unpublished data.

Indicator species:

Azolla spp. 10-40%

*Lemna minor** 40-95%

Ricciocarpos natans (liverwort) 2-10%

Spirodela polyrhiza 2-30%

Other species:

Riccia fluitans (liverwort)

Wolffia spp.

***Ludwigia palustris*-
Polygonum
hydropiperoides
community type** This community type only occurs in the overflow plain along the Columbia River, between Longview and Skamania. It occupies seasonally-flooded depressions that dry by early to mid-summer. Soils are silts.

This community type typically forms dense mats, but bare mud patches are occasional to frequent. Species composition varies from nearly equal codominance by *Ludwigia palustris* and *Polygonum hydropiperoides* to dominance by one species or the other. If seasonal inundation is prevented, examples of this community type are susceptible to invasion and replacement by *Phalaris arundinacea*.

Christy (1993) listed one reference for a *Ludwigia palustris*-*Polygonum hydropiperoides* community in Oregon.

Indicator species:

Eragrostis hypnoides 2-5%
Gratiola neglecta 2-10%
Lindernia dubia 2-40%
Ludwigia palustris 30-90%
Polygonum hydropiperoides 30-90%

Other species:

<i>Alopecurus aequalis</i>	<i>Juncus bufonius</i>
<i>Bidens cernua</i>	<i>Leersia oryzoides</i>
<i>Cyperus</i> spp.	<i>Paspalum distichum</i>
<i>Eleocharis ovata</i>	<i>Sagittaria latifolia</i>

***Myriophyllum
hippuroides*
community type**

This community type occurs in the surge plain and overflow plain segments of the Columbia River and throughout the interior valleys west of the Cascade Range in Oregon and Washington. It occurs within the tidal zone and in ponds and lakes with little or no water circulation. In ponds and lakes, the community type is submerged year-round or until late summer when some of the ponds dry out. Soils are muds and silts.

This community type is dense, nearly monotypic mats of *Myriophyllum hippuroides*.

Indicator species:

Myriophyllum hippuroides 40-90%

Other species:

<i>Alisma plantago-aquatica</i>	<i>Polygonum hydropiperoides</i>
<i>Elodea canadensis</i>	<i>Polygonum amphibium</i>
<i>Ludwigia palustris</i>	<i>Sagittaria latifolia</i>
<i>Nuphar polysepalum</i>	<i>Scirpus validus</i> *
<i>Paspalum distichum</i>	<i>Sparganium emersum</i>

***Paspalum distichum*
community type**

This community type is found in the overflow plain along the Columbia River between Longview and Skamania. It occurs along the edges of ponds and lakes, often in areas that dry out by early to mid-summer. Soils are muds and silt-loams.

This community type is dominated by *Paspalum distichum*. If seasonal inundation is prevented, it may be invaded and replaced by *Phalaris arundinacea*.

Indicator species:

Paspalum distichum 40-95%

Other species:

<i>Alopecurus aequalis</i>	<i>Leersia oryzoides</i>
<i>Bidens cernua</i>	<i>Lindernia dubia</i>
<i>Eleocharis palustris</i> *	<i>Ludwigia palustris</i>
<i>Eragrostis hypnoides</i>	<i>Polygonum hydropiperoides</i>
<i>Gratiola neglecta</i>	<i>Sagittaria latifolia</i>
<i>Juncus bufonius</i>	

***Polygonum
amphibium*
community type**

This community type is found in the overflow plain along the Columbia River between Longview and Skamania. It occurs in shallow ponds and lakes that are either permanently flooded or dry-out by mid- to late summer. Soils are mucks and silt-loams.

This community type is characterized by extensive, usually monotypic beds of *Polygonum amphibium*. Prolonged inundation appears to exclude *Phalaris arundinacea* from examples of the community type.

This community type also may have occurred on higher elevation sites, above ponds and lakes. *Phalaris arundinacea* appears to have displaced it to such an extent on these sites that only scattered individuals of *Polygonum amphibium* are seen.

Christy (1993) listed a *Polygonum amphibium* community along the Columbia and Willamette rivers in Oregon, based on unpublished data.

Indicator species:

Polygonum amphibium 30-95%

Other species:

Azolla spp.

*Lemna minor**

Potamogeton natans

Riccia fluitans (liverwort)

Ricciocarpos natans (liverwort)

Spirodela polyrhiza

Wolffia spp.

***Sagittaria latifolia*
community type**

This community type occurs in ponds, lakes, backwater areas and along slow-moving streams in the overflow plain of the Columbia River and its larger tributaries in western Washington and Oregon. It occurs in seasonally inundated areas and tolerates some drying but not total desiccation. Soils are silts and muck.

Although *Sagittaria latifolia* is widespread along the lower Columbia River, it usually occurs in low numbers in communities dominated by other species. This community type is dominated by *S. latifolia*.

Examples of the community type have declined throughout its range through a combination of depredation by settlers' hogs, introduced carp, the invasion of *Phalaris arundinacea*, and changes in riparian hydrology resulting from flood control. *Sagittaria latifolia* was a staple food for Native Americans and may have been planted widely.

Christy (1993) listed one reference for a *Sagittaria latifolia* community in Oregon.

Indicator species:

Alisma plantago-aquatica 2-5%

Bidens cernua 35%

Elatine spp. 2-20%

Eleocharis ovata 5-25%

Leersia oryzoides 20%

Sagittaria latifolia 30-85%

Other species:

Ceratophyllum demersum

Eleocharis acicularis

*Eleocharis palustris**

Elodea canadensis

Eragrostis hypnoides

Gratiola neglecta

Juncus bufonius

Lindernia dubia

Ludwigia palustris

Paspalum distichum

Polygonum hydropiperoides

*Scirpus validus**

Sparganium emersum

***Scirpus validus**
community type**

This community type occurs on the overflow plain along the Columbia River up-river from Longview. It occurs in ponds and lakes and is flooded year-round. Soils are silts and muck.

This community type is characterized by extensive, nearly monotypic stands of *Scirpus validus**, but can also have a large number of associated species. It occupies the same niche as *Scirpus acutus* and appears to replace *S. acutus* on the river above Longview.

Christy (1993) listed several references for a *Scirpus validus** community in Oregon. Evans (1989) listed a *S. validus* dominance type in the Columbia Plateau and indicated uncertainty about its distribution and prevalence due to the species' similarity to *Scirpus acutus*.

Indicator species:

*Scirpus validus** 30-80%

Other species:

Alisma plantago-aquatica
*Eleocharis palustris**
Ludwigia palustris
Myriophyllum hippuroides
Paspalum distichum
Polygonum amphibium

Polygonum hydropiperoides
Potamogeton spp.
Sagittaria latifolia
Sparganium emersum
Typha latifolia

***Solidago
occidentalis**
community type**

This community type is confined to the banks of main channels in the overflow plain area of the Columbia River, especially above Vancouver. This is a strand community type, occurring on beaches and bars composed of sand or sandy-loam. Cottonwood drift logs and other debris are common. It is above the tidal zone and subject to drought and high temperatures in summer. It is inundated by high flows and subject to scouring.

The community type's composition is variable and contains a high diversity of weedy annual species, including many natives. It is dominated by *Solidago occidentalis** which blooms in mid- to late summer. Frequently, there is a black mat of cyanobacteria, fungi and small weedy mosses.

There has probably been a net increase in the range of this community type since settlement times. New habitat has been created downstream from Vancouver through natural accretion of sand and deposition of dredge spoils. However, in the absence of annual flooding due to flood control, habitat has been lost landward by invasion of the *Salix fluviatilis-Salix lasiandra** community type.

Indicator species:

Cyperus acuminatus 2-5%
Cyperus erythrorhizos 2-5%
Gnaphalium palustre 2-5%
Helenium autumnale 2-5%

Mentha spp. 2-5%
*Solidago occidentalis** 5-30%
Xanthium strumarium 2-5%

Other species:

Coreopsis atkinsoniana
Eleocharis acicularis
*Eleocharis palustris**
Equisetum arvense
Ricciocarpos natans (liver wort)
Juncus spp.
Lindernia dubia
Ludwigia palustris

Marsilea vestita
Paspalum distichum
*Populus trichocarpa**
Rorippa curvisiliqua
Rratiola neglecta
Salix fluviatilis
*Salix lasiandra**

***Sparganium
emersum*
community type**

This community type occurs on banks of tidal streams and embayments on the surge plain and overflow plain segments of the Columbia River. It occurs on muds subject to daily freshwater tidal immersion.

This community type typically occurs as a monotypic stand of *Sparganium emersum*, but a variety of other herbaceous species occasionally occur.

Christy (1993) listed a *Sparganium emersum* community for Oregon, based on unpublished data.

Indicator species:

Sparganium emersum 20-75%

Other species:

Alisma plantago-aquatica

Bidens cernua

Elatine spp.

Elodea canadensis

Eleocharis acicularis

*Eleocharis palustris**

Equisetum arvense

Gratiola neglecta

Limosella aquatica

Mimulus guttatus

Sagittaria latifolia

*Scirpus validus**

Zannichellia palustris

***Salix fluviatilis-
Salix lasiandra**
community type**

This community type occurs along the banks of main channels in the overflow plain and Gorge segments of the Columbia River, especially above Vancouver. It occurs on sand and cobble beaches above the tidal zone. The community type is sometimes subject to drought and high temperatures in summer. It is scoured by winter high water and tolerant of flooding caused by releases from Bonneville Dam.

This community type is codominated by *Salix fluviatilis* and *Salix lasiandra**. The abundance of other species is low, and drier portions of stands are subject to invasion by *Phalaris arundinacea*.

This community type has invaded areas formerly scoured by annual winter and spring floods and forms dense stands on former sand flats. It also invades the landward side of the *Solidago occidentalis** community type on beaches, and the *Artemisia lindleyana-Deschampsia cespitosa* community type on gravel and cobble flats.

Christy (1993) listed two references for a *Salix fluviatilis-Salix lasiandra** community along the Columbia and Willamette rivers in Oregon.

Indicator species:

Salix fluviatilis 20-40%

*Salix lasiandra** 20-40%

Other species:

Carex feta

Carex vulpinoidea

***Salix lasiandra**/
Urtica dioica
community type**

This community type occurs in the overflow plain segment of the Columbia River and similar habitats in the northern Willamette Valley, Oregon. It occurs on flood plains behind natural levees and on low-lying islands. It is most common around the margins of shallow lakes, ponds, inlets and lagoons. The community type may be seasonally flooded or subirrigated and can tolerate summer drying. It does not tolerate year-round flooding. Silt stains and algal mats are common indicating seasonal flooding regimes.

This community type is characterized by *Salix lasiandra** in the overstory and *Urtica dioica* in the understory. Stands range from dense to open, and can be heavily cropped by beaver. Trees reach diameters of about two feet before senescing. This community type probably is an earlier seral stage for the *Fraxinus latifolia*/*U. dioica* community type.

This community type is in poor condition throughout its range. It has been degraded by clearing, grazing and invasion of *Phalaris arundinacea*. *Urtica dioica* is generally considered an indicator of disturbance. Historical records are scanty and the presettlement composition of the understory is unknown. Before the construction of flood control dams, these sites were inundated for up to two months each year and the understory may have been minimal.

Christy (1993) listed a *Salix lasiandra** community in Oregon, based on unpublished data.

Indicator species:

*Salix lasiandra** 60-80%
Urtica dioica 1-35%

Other species:

Athyrium filix-femina
Bidens frondosa
Carex aperta
Carex feta
Carex retrorsa
Carex vesicaria
Carex vulpinoidea
Climacium dendroides (moss)
*Cornus stolonifera**
Equisetum arvense
Fraxinus latifolia
Geum macrophyllum

Helenium autumnale
Impatiens capensis
Juncus tenuis
Leersia oryzoides
Ludwigia palustris
Mentha spp.
Myosotis laxa
Polygonum amphibium
Polygonum hydropiperoides
Salix fluviatilis
Scutellaria spp.

***Salix piperi**-*Salix sitchensis*
community type**

This community type occurs in the overflow plain segment of the Columbia River. It also occurs in the low elevation interior valleys of western Oregon and the southern Puget Trough of Washington. It occurs on silts in depressions and is seasonally flooded.

This community type is a dense shrub thicket codominated by *Salix piperi** and *Salix sitchensis*. Adventitious roots emerging in clusters from the willow stems give the appearance of prop roots. Mats of green algae are typical.

Christy (1993) listed a *Salix piperi**-*Salix sitchensis* community in Oregon, based on unpublished data.

Indicator species:

*Salix piperi** 20-60%
Salix sitchensis 20-60%

Other species:

*Cornus stolonifera**
Dichelyma uncinatum (moss)
Fontinalis antipyretica (moss)
Polygonum amphibium

Populus tremuloides
Scirpus cyperinus
Typha latifolia

***Fraxinus latifolia*/
Urtica dioica
community type**

This community type occurs in the overflow plain segment of the Columbia River, the southern Puget Trough lowlands and the northern Willamette Valley in Oregon. It occurs on floodplains between natural riverside levees and overflow lakes and ponds. It is often dissected by small tidal streams and sloughs, and flooded seasonally. Surface water dries by mid-summer but the community type is probably subirrigated. Driftwood, silt stains and algal mats are common, indicating seasonal flooding regimes. Soils are silt-loams.

This community type is dominated by *Fraxinus latifolia* and has few or no *Populus trichocarpa**. The understory is open and sometimes bare of herbaceous vegetation. The most common understory species is *Urtica dioica*. Almost all stands are second-growth, but hollow old-growth trees up to six feet in diameter can be seen occasionally.

Examples of this community type are in poor condition throughout its range, having been degraded by clearing, grazing and invasion of *Phalaris arundinacea*. *Urtica dioica* is generally considered an indicator of disturbance. Historical records are scanty and the presettlement composition of the understory is unknown. Before the construction of flood control dams, these sites were inundated for up to two months each year and the understory may have been minimal.

This community type may be related to the *Fraxinus latifolia*/*Carex obnupta* community described by Heinitz (1982) and Frenkel and Heinitz (1987).

Indicator species:

Carex deweyana 2-25%
Carex obnupta 2-20%
Fraxinus latifolia 60-85%
Urtica dioica 1-35%

Other species:

<i>Carex aperta</i>	<i>Polystichum munitum</i>
<i>Carex retrorsa</i>	<i>Populus trichocarpa</i> *
<i>Carex vesicaria</i>	<i>Rubus ursinus</i>
<i>Cornus stolonifera</i> *	<i>Sambucus racemosa</i>
<i>Leersia oryzoides</i>	<i>Symphoricarpos albus</i>
<i>Ludwigia palustris</i>	<i>Scutellaria</i> spp.
<i>Oemleria cerasiformis</i>	<i>Salix lasiandra</i> *
<i>Polygonum hydropiperoides</i>	

***Fraxinus latifolia*-
Populus
*trichocarpa**/*Cornus*
*stolonifera**/
Urtica dioica
community type**

This community type occurs in the overflow plain segment of the Columbia River, from Puget Island to the Gorge. It also occurs along all major streams in the southern Puget Trough and the Willamette Valley, Oregon. This community type occupies slightly higher topographic positions on floodplain terraces and natural levees along river channels. Portions receive seasonal flooding. Most of the stands, especially up-river from Longview, appear to be located above the bottomlands that would have been flooded for prolonged periods prior to flood control dams. Soils are silt-loams.

This community type is characterized by the codominance of *Fraxinus latifolia* and *Populus trichocarpa**. The relative dominance of the two tree species is highly variable. *Cornus stolonifera** typically dominates the shrub layer but is sometimes replaced by *Sambucus racemosa*. In most stands, the understory has been degraded by grazing and the introduced *Phalaris arundinacea* making it difficult to determine the original understory components. All stands are second-growth, except for a few scattered individual old-growth trees.

This community type occurs on sites wetter than those occupied by the *Fraxinus latifolia*-*Populus trichocarpa**/*Symphoricarpos albus*/*Urtica dioica* community type.

Indicator species:

Carex deweyana 1-40%
*Cornus stolonifera** 5-90%
Fraxinus latifolia 5-80%
*Populus trichocarpa** 10-85%

Rubus ursinus 2-30%
Sambucus racemosa 2-90%
Urtica dioica 3-95%

Other species:

Athyrium filix-femina
Alnus rubra
Carex obnupta
Crataegus douglasii
*Epilobium watsonii**
Equisetum hyemale
Equisetum telmateia
Impatiens capensis
Maianthemum dilatatum

Oemleria cerasiformis
Polystichum munitum
*Pyrus fusca**
Ribes spp.
Rubus spectabilis
Scutellaria spp.
Spiraea douglasii
Symphoricarpos albus
Stachys mexicana

***Fraxinus latifolia*-
Populus
*trichocarpa**/
Symphoricarpos
albus/*Urtica dioica*
community type**

This community type occurs along the Columbia River above Longview, as well as along other major streams and rivers in the southern Puget Trough and Willamette Valley, Oregon. It occupies drier, slightly higher portions of floodplain terraces and natural levees along river channels. Stands appear to be located above the bottomlands that would have been flooded for prolonged periods prior to flood control dams. Soils are silt-loams. Subirrigation is probably minor.

The relative dominance of *Fraxinus latifolia* and *Populus trichocarpa** is highly variable in this community type. *Symphoricarpos albus* is the dominant shrub species. In most stands, the understory has been degraded by grazing and the introduced *Phalaris arundinacea* making it difficult to determine the original understory. All stands are second-growth, except for a few scattered individual old-growth trees.

This community type occurs on sites drier than those occupied by the *Fraxinus latifolia*-*Populus trichocarpa**/*Cornus stolonifera**/*Urtica dioica* community type. It is very similar to the *F. latifolia*/*Symphoricarpos albus* community type of the northern Puget Trough region (Frenkel and Heinritz 1987). Christy (1993) listed three additional references for a *F. latifolia*/*S. albus*/*U. dioica* community in Oregon.

Indicator species:

Carex deweyana 1-10%
*Cornus stolonifera** 1-20%
Crataegus douglasii 5-10%
Fraxinus latifolia 20-50%
*Populus trichocarpa** 25-80%

Symphoricarpos albus 50-90%
Urtica dioica 1-25%
Rubus ursinus 2-20%
Sambucus racemosa 4-40%

Other species:

Athyrium filix-femina
Oemleria cerasiformis

Polystichum munitum
*Pyrus fusca**

Surge Plain Wetlands

Surge plain wetlands (see page 4) along the Columbia River extend from about the Astoria Bridge to Longview, about river miles 15 to 65 (Christy and Putera 1993). Tidal influence actually extends upriver nearly to Bonneville Dam but is not considered a primary influence on the wetland vegetation upstream from Longview. The surge plain west of Skamokawa is included in the Olympic Peninsula and Southwest Washington region and includes the Sitka spruce surge plain community types.

The flood plain in this area has low relief and is typically flooded or subirrigated during high tides. Dendritic and meandering tidal sloughs extend through the islands and flats. Historically, this area was inundated with low energy water during spring floods. Soils are fine textured silts, clay and muck with high organic matter content. Drift logs and *in situ* large woody debris are abundant.

SURGE PLAIN WETLAND COMMUNITY TYPES

***Carex lyngbyei* community type**

This community type occurs along the lower Columbia River, as far upriver as Fisher Island near Longview. It occurs on floodplains subject to daily freshwater tidal inundation and is typically laced with sinuous tidal creeks. The substrate is mud.

This is a heterogeneous community type dominated by *Carex lyngbyei*. It forms narrow bands or extensive marsh flats. In some places examples of this community type have been degraded by grazing and invasion of *Phalaris arundinacea*, but in most cases it appears to be below the line of *Phalaris arundinacea* invasion. With further study this community type may be split into separate *C. lyngbyei* and *Bidens cernua* dominated community types.

This community type is most similar to the *Carex lyngbyei* community type which occurs in the surge plain in southwestern Washington and is distinct from the *C. lyngbyei* community type that occurs in salt marshes. Christy (1993) listed several references for a freshwater tidal *C. lyngbyei* community in Oregon.

Indicator species:

Bidens cernua 15%
Boltonia asteroides 20%
*Caltha asarifolia** 5%
Carex lyngbyei 25-70%
Deschampsia cespitosa 1-25%
*Eleocharis palustris** 3-5%

Equisetum fluviatile 5-10%
Juncus oxymeris 3-20%
Sagittaria latifolia 2-20%
Sium suave 10%
Typha angustifolia 10%

Other species:

Alisma plantago-aquatica
Aster subspicatus
Callitriche spp.
Elodea canadensis
Impatiens capensis
Leersia oryzoides
Lilaeopsis occidentalis
Lupinus polyphyllus
Ludwigia palustris

*Lysichitum americanum**
Mimulus guttatus
Oenanthe sarmentosa
Polygonum hydropiperoides
*Potentilla pacifica**
Scirpus acutus
Scirpus americanus
*Scirpus validus**
Sparganium eurycarpum

***Carex obnupta*
community type**

This community type occurs throughout the Gorge, overflow plain and surge plain segments of the Columbia River and other riparian systems in the southern Puget Trough and Willamette Valley, Oregon. It is found in areas that are flooded seasonally or tidally with freshwater. Typically these areas along the Columbia River dry by early or mid-summer. In other areas soils remain saturated to flooded year-round. Soils have high organic matter content, usually fibrous peat or muck.

This community type typically occurs as nearly monotypic stands of *Carex obnupta*.

Christy (1993) listed several references for a *Carex obnupta* community in Oregon.

Indicator species:

Carex obnupta 70-95%

Other species:

Oenanthe sarmentosa

Spiraea douglasii

***Eleocharis palustris**
community type**

This community type occurs in the freshwater tidal zone between Grays Bay and Longview as well as the overflow plain and Gorge segments of the Columbia River. In the surge plain it is emergent along stream and river channels and is flooded during most high tides. The soil remains wet to flooded year-round. It is found on both sandy and silty substrates.

This community type often occurs as nearly monotypic stands of *Eleocharis palustris**.

Christy (1993) listed several references for an *Eleocharis palustris** community in Oregon. Dense stands of *E. palustris* were described on an alluvial bar and on mud flats in Washington (Kienholz 1931). Evans (1989) listed a rarely occurring *E. palustris* dominance type in the Columbia Plateau.

Indicator species:

*Eleocharis palustris** 10-60%

Other species:

Alisma plantago-aquatica

Bidens cernua

Callitriche spp.

Elatine spp.

Eleocharis acicularis

Elodea canadensis

Gratiola neglecta

Lilaeopsis occidentalis

Lindernia dubia

Ludwigia palustris

Limosella aquatica

Mimulus guttatus

Myriophyllum spicatum

Polygonum hydropiperoides

Sagittaria latifolia

*Tillaea aquatica**

Zannichellia palustris

***Elodea canadensis*
community type**

This community type occurs throughout the Gorge, overflow plain and surge plain zones of the Columbia River. It is submerged in shallow, flowing water and can occur in areas with freshwater tidal influence. It is restricted to mud and silt.

This community type occurs as nearly monotypic stands of *Elodea canadensis*.

Christy (1993) listed one reference for an *Elodea canadensis* community in Oregon.

Indicator species:

Elodea canadensis 50-95%

Other species:

Potamogeton spp.

***Equisetum fluviatile*
community type**

This community type occurs in the surge plain segment of the Columbia River, down river from Longview. It occurs along river and slough channels on sand and silt substrates. It is an emergent community type that is flooded with freshwater during most high tides.

This community type is characterized by mixed to pure stands dominated by *Equisetum fluviatile*. Examples have been degraded in places by invasion of *Phalaris arundinacea*.

Christy (1993) listed one reference for an *Equisetum fluviatile* community in Oregon. Thomas (1984) noted extensive areas of *E. fluviatile* in the lower 40 miles of the Columbia River. An *E. fluviatile* community occurs around Lake Ozette on the Olympic Peninsula but has a very different species composition than this community type.

Indicator species:

Equisetum fluviatile 40-80%

Other species:

Aster subspicatus
Bidens cernua
*Caltha asarifolia**
Carex lyngbyei
Deschampsia cespitosa
*Eleocharis palustris**
*Habenaria dilatata**
Impatiens capensis
Leersia oryzoides

Lupinus polyphyllus
Lycopus americanus
Myosotis laxa
*Potentilla pacifica**
Sagittaria latifolia
Scirpus acutus
Sium suave
Typha angustifolia
Mentha arvensis

***Lemna minor**
community type**

This community type occurs throughout the region on the surface of ponds, lakes and sloughs with little or no water movement.

The community type often forms nearly monotypic stands of *Lemna minor**.

Christy (1993) listed a *Lemna minor** community in Oregon, based on unpublished data.

Indicator species:

Azolla spp. 10-40%
*Lemna minor** 40-95%
Ricciocarpos natans (liverwort) 2-10%
Spirodela polyrhiza 2-30%

Other species:

Riccia fluitans (liverwort) *Wolffia* spp.

***Lilaeopsis
occidentalis-Tillaea
aquatica**
community type**

This community type appears limited to the Columbia River surge plain down river from Longview. It occurs in protected areas on muds. It is an emergent community type subject to daily freshwater tidal inundation.

This community type is characterized by the codominance of *Lilaeopsis occidentalis* and *Tillaea aquatica**. Although *L. occidentalis* occurs as far

upriver as Vancouver and *T. aquatica* as far as Bonneville Dam, their co-occurrence is limited to the surge plain below Longview.

Indicator species:

Callitriche spp. 1-5%
Elatine spp. 3-5%
Eleocharis acicularis 10%
*Eleocharis palustris** 5-10%

Lilaeopsis occidentalis 20-35%
Limosella aquatica 10%
*Tillaea aquatica** 3-35%

Other species:

Alisma plantago-aquatica
Bidens cernua
Carex lyngbyei
Ceratophyllum demersum
Elodea canadensis
Gratiola neglecta
Juncus oxymeris

Mimulus guttatus
Potamogeton spp.
Sagittaria latifolia
Scirpus acutus
Scirpus americanus
Zannichellia palustris

***Myriophyllum
hippuroides*
community type**

This community type occurs in the surge plain and overflow plain segments of the Columbia River and in the interior valleys west of the Cascade Range in Oregon and Washington. It occurs within the tidal zone and in ponds and lakes with little or no water circulation. In ponds and lakes, the community type is submerged year-round or until late summer when some of the ponds dry out. Soils are muds and silts.

The community type is characterized by dense, nearly monotypic mats of *Myriophyllum hippuroides*.

Indicator species:

Myriophyllum hippuroides 40-90%

Other species:

Alisma plantago-aquatica
Elodea canadensis
Ludwigia palustris
Nuphar polysepalum
Paspalum distichum

Polygonum hydropiperoides
Polygonum amphibium
Sagittaria latifolia
*Scirpus validus**
Sparganium emersum

***Sagittaria latifolia*
community type**

This community type occurs in the overflow plain and infrequently in the surge plain reaches of the Columbia River. It is inundated with freshwater seasonally or during high tides and occurs on mud.

The community type is characterized by the dominance of *Sagittaria latifolia*. It is wetter and has fewer species than the *S. latifolia* community type of the overflow plain segment upriver.

Christy (1993) listed one reference for a *Sagittaria latifolia* community in Oregon.

Indicator species:

Alisma plantago-aquatica 3%
Bidens cernua 35%
Elatine spp. 3%
Sagittaria latifolia 60%

Other species:

Ceratophyllum demersum
Eleocharis acicularis
Eleocharis ovata
*Eleocharis palustris**
Elodea canadensis

Gratiola neglecta
Leersia oryzoides
Lindernia dubia
Ludwigia palustris
Scirpus acutus

***Scirpus acutus*
community type**

This community type occurs in the surge plain segment of the Columbia River, down river from Longview. It occurs along river and slough channels and in interior portions of tidal terraces. It is flooded perennially or diurnally. It occurs on sand, silt and muck substrates. Those stands with tidal flooding usually are laced with meandering tidal streams.

This community type often occurs as extensive, nearly monotypic stands of *Scirpus acutus*. Occasionally, *S. acutus* is intermixed with *S. validus* and above Longview it is replaced by *S. validus*.

Christy (1993) listed several references for a *Scirpus acutus* community in Oregon.

Indicator species:

Athyrium filix-femina 0-25%
Scirpus acutus 20-80%

Other species:

Aster subspicatus
Cicuta douglasii
Deschampsia cespitosa
Eleocharis acicularis
*Eleocharis palustris**
Juncus effusus
Juncus oxymeris

*Lysichitum americanum**
Oenanthe sarmentosa
*Potentilla pacifica**
Samolus parviflorus
Scirpus microcarpus
Typha angustifolia

***Scirpus americanus*
community type**

This community type occurs in the surge plain segment of the Columbia River, as far upriver as Longview. It is flooded diurnally and occurs on both muds and sands.

This community type is dominated by *Scirpus americanus* but is composed of a number of other species.

This community type is distinct from the *Scirpus americanus* salt marsh community type. Christy (1993) listed three references for a freshwater *S. americanus* community in Oregon.

Indicator species:

Alisma plantago-aquatica 1-5%
Bidens cernua 5-25%
Eleocharis acicularis 1-5%

Lilaeopsis occidentalis 1-10%
Limosella aquatica 1-3%
Scirpus americanus 20-60%

Other species:

Carex lyngbyei
*Eleocharis palustris**
Elodea canadensis

Sagittaria latifolia
Scirpus acutus
*Tillaea aquatica**

***Sparganium
emersum*
community type**

This community type occurs in the surge plain and overflow plain segments of the Columbia River on the banks of tidal sloughs and embayments. It occurs on muds subject to daily freshwater tidal immersion.

This community type typically occurs as monotypic stands of *Sparganium emersum* and is often associated with the *Sagittaria latifolia* community type.

Christy (1993) listed a *Sparganium emersum* community in Oregon, based on unpublished data.

Indicator species:

Sparganium emersum 40-80%

Other species:

Alisma plantago-aquatica
Bidens cernua
Carex lyngbyei
Deschampsia cespitosa
Elatine spp.
Elodea canadensis
Eleocharis acicularis
*Eleocharis palustris**

Equisetum arvense
Gratiola neglecta
Lilaeopsis occidentalis
Limosella aquatica
Mimulus guttatus
Sagittaria latifolia
Scirpus acutus
Zannichellia palustris

***Typha angustifolia*-
Typha latifolia
community type**

This community type occurs in the surge plain segment of the Columbia River, extending upriver to just above Puget Island. It is subject to daily tidal inundation. Soils are muds and silts.

This community type forms extensive mixed stands dominated by *Typha angustifolia* and *Typha latifolia*. In some areas there are nearly pure stands of *T. angustifolia*.

Typha angustifolia may be an adventive species in this area. It is native to the eastern and mid-western portions of the U.S. If it proves to be adventive, this community type will be deleted from this classification.

Indicator species:

Typha angustifolia 20-80%
Typha latifolia 20-80%

Other species:

Deschampsia cespitosa
Elatine spp.
Eleocharis acicularis
*Eleocharis palustris**
Juncus oxymeris

Oenanthe sarmentosa
Potamogeton spp.
Scirpus acutus
Zannichellia palustris

***Cornus stolonifera**-
Salix sitchensis
community type**

This community type occurs in the surge plain segment of the Columbia River, extending upriver nearly to Longview. It occupies sites topographically intermediate between the herbaceous and forested surge plain community types. It occurs along river and tidal channels and in low-lying areas in the interior of islands. It also occurs in depressions within forested surge plain areas. It occurs on muck soils subject to seasonal and freshwater tidal flooding.

This community type occurs as nearly impenetrable stands dominated by *Cornus stolonifera** and *Salix sitchensis*. Other shrub species can be abundant and, in places, codominant. Some stands have been degraded by invasive *Phalaris arundinacea* and *Iris pseudacorus*.

Similar vegetation was described around Goose Lake in Washington by Kienholz (1931). Thomas (1984) briefly described a *Salix sitchensis* and *Lysichitum americanum** dominated community between Columbia River miles 17 and 40 which appears similar to this community type.

Indicator species:

<i>Cornus stolonifera</i> * 5-70%	<i>Rosa nutkana</i> 2-5%
<i>Impatiens capensis</i> 1-20%	<i>Rubus spectabilis</i> 0-5%
<i>Lysichitum americanum</i> * 2-4%	<i>Salix lasiandra</i> * 0-10%
<i>Physocarpus capitatus</i> 3-5%	<i>Salix sitchensis</i> 10-25%
<i>Pyrus fusca</i> * 0-5%	<i>Spiraea douglasii</i> 3-25%

Other species:

<i>Adiantum pedatum</i>	<i>Picea sitchensis</i>
<i>Athyrium filix-femina</i>	<i>Populus trichocarpa</i> *
<i>Acer circinatum</i>	<i>Rhamnus purshiana</i>
<i>Alnus rubra</i>	<i>Rubus parviflorus</i>
<i>Carex obnupta</i>	<i>Rubus ursinus</i>
<i>Carex stipata</i>	<i>Sorbus sitchensis</i>
<i>Equisetum fluviatile</i>	<i>Symphoricarpos albus</i>
<i>Lonicera involucrata</i>	<i>Thuja plicata</i>
<i>Oenanthe sarmentosa</i>	

***Populus trichocarpa**/*Cornus stolonifera**/*Impatiens capensis* community type**

This community type occurs in the surge plain segment of the Columbia River and was observed as far upriver as Longview. Soils are subirrigated muck and silt, and stands may be inundated by high winter storm surges or freshwater tides. It is cut frequently by tidal streams.

This community type has a somewhat open canopy dominated by *Populus trichocarpa**. The shrub layer is dominated by a closed canopy of *Cornus stolonifera**. *Impatiens capensis* dominates areas of exposed wet soil.

Examples of this community type have been degraded through logging, grazing and invasive *Phalaris arundinacea*. Some stands have been degraded by invasive *Iris pseudacorus* and *Solanum dulcamara*.

This community type is similar to, and wetter than, the *Fraxinus latifolia*-*Populus trichocarpa**/*Cornus stolonifera**/*Urtica dioica* community type. Christy (1993) listed several references for *P. trichocarpa*/C. *stolonifera*-*Salix* spp. communities in Oregon. Most appeared to have *Phalaris arundinacea*, but may be similar to this community type.

Indicator species:

<i>Athyrium filix-femina</i> 2-5%	<i>Lysichitum americanum</i> * 2-20%
<i>Carex obnupta</i> 2-5%	<i>Populus trichocarpa</i> * 30-75%
<i>Cornus stolonifera</i> * 20-60%	<i>Salix lasiandra</i> * 0-15%
<i>Impatiens capensis</i> 25-50%	

Other species:

<i>Carex deweyana</i>	<i>Rosa nutkana</i>
<i>Crataegus douglasii</i>	<i>Rubus spectabilis</i>
<i>Fraxinus latifolia</i>	<i>Rubus ursinus</i>
<i>Oenanthe sarmentosa</i>	<i>Salix sitchensis</i>
<i>Physocarpus capitatus</i>	<i>Scutellaria lateriflora</i>
<i>Pyrus fusca</i> *	

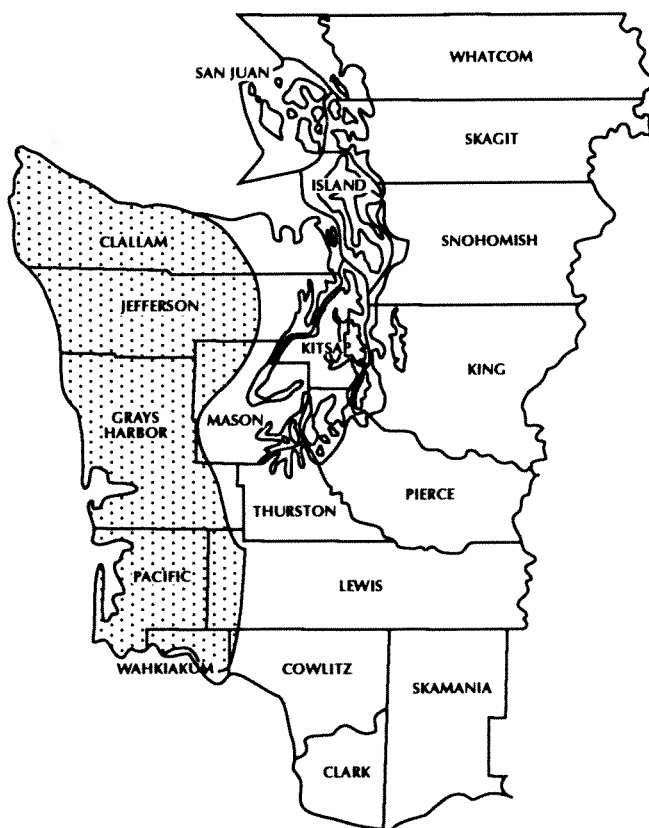
Native Freshwater Wetland Vegetation of the Western Olympic Peninsula and Southwest Washington Lowlands

Introduction

The western Olympic Peninsula and southwest Washington lowlands occur below 457 meters along the coast of Washington, between the Strait of Juan de Fuca and the Columbia River. The area extends east to Joyce along the north side of the Olympic Peninsula and to the crest of the Black and Willapa hills in southwestern Washington (Figure 5).

The western Olympic Peninsula and southwest Washington region falls within the Sitka spruce zone of Franklin and Dyrness (1973). In Henderson *et al.* (1989) the portion of this region on the west side of the Olympic Peninsula contains the Sitka spruce zone but also a portion of the western hemlock zone. The portion of this region south of Grays Harbor contains coastal Sitka spruce and western hemlock zones that are considered different from those along the west side of the Olympic Peninsula (Crawford pers. comm.).

FIGURE 5:



In general, the wetland vegetation along the outer coast of Washington is most similar to the Pacific Oceanic Wetlands Region of Canada (National Wetlands Working Group 1988). The area has high precipitation (> 1950 mm/year) and mild climate, giving rise to an abundance of peat forming wetlands even on flat and sloping surfaces. There are a number of plant species common to these two areas that are not generally found farther south in Oregon or inland in the Puget Trough region in Washington (e.g., *Myrica gale*, *Nephrrophyllidium crista-galli*, *Sanguisorba officinalis* and *Carex livida*). There are, however, several plant species which figure prominently in the British Columbia wetland flora which do not extend south into Washington or are rare (e.g., *Chamaecyparis nootkatensis*, *Juniperus communis*, *Andromeda polifolia*, *Scirpus caespitosus*, *Carex anthozanthea* and *Carex pluriflora*).

Wetlands south of Grays Harbor have been greatly altered since European settlement making it difficult to identify native wetland communities. This alteration has obscured similarities and differences between the wetland vegetation south of Grays Harbor and that along the west coast of the Olympic Peninsula, the Puget Trough lowlands and the northern Oregon coast.

Most of the classification work that has been done in this region is related to forest communities. In general, the non-forested communities have not been well described. The Canadian literature is more inclusive of wetland classification and descriptions. *Wetlands of Canada* (National Wetlands Working Group 1988) provides an overview and references for wetlands' classification along the British Columbia coast. Often non-forested areas have not been broken into communities and vegetation data for several communities has been lumped. For instance, Pojar (1974a, 1974b) gives species composition data for two bogs on the west coast of Vancouver Island, but treats each bog as a single community.

Some work has been done on coastal dune communities in Oregon which is applicable to this region (Wiedemann 1984).

The following classification includes sphagnum bog, impounded minerotrophic and surge plain wetlands (see page 4).

Plant Community Type Classification

Low Elevation Sphagnum Bog Community Types (c.t.)

Herb Dominated

1. *Carex livida*/*Sphagnum* spp. c.t.
2. *Carex rostrata**/*Sphagnum* spp. c.t.
3. *Carex rostrata**-*Carex sitchensis**-*Sanguisorba officinalis*/*Sphagnum* spp. c.t.
4. *Eriophorum chamissonis*/*Sphagnum* spp. c.t.
5. *Juncus supiniformis*/*Sphagnum* spp. c.t.
6. *Rhynchospora alba*/*Sphagnum* spp. c.t.

Shrub-dominated

1. *Kalmia occidentalis**-*Ledum groenlandicum*/*Sphagnum* spp. c.t.
 - a. *Kalmia occidentalis**-*Ledum groenlandicum*/*Carex rostrata**/*Sphagnum* spp. variant

* Updated taxonomy provided in Appendix B.

- b. *Kalmia occidentalis**-*Ledum groenlandicum*/*Xerophyllum tenax*/*Sphagnum* spp. variant
- c. *Kalmia occidentalis**-*Ledum groenlandicum*-*Gaultheria shallon*/*Pteridium aquilinum*/*Sphagnum* spp. variant
- d. *Kalmia occidentalis**-*Ledum groenlandicum*-*Vaccinium oxycoccos**/*Sphagnum* spp. variant
- 2. *Ledum groenlandicum*-*Myrica gale*/*Sphagnum* spp. c.t.
- 3. *Myrica gale*/*Sanguisorba officinalis*/*Sphagnum* spp. c.t.
 - a. *Myrica gale*/*Carex rostrata**-*Nephrophyllidium crista-galli*-*Sanguisorba officinalis*/*Sphagnum* spp. variant
 - b. *Myrica gale*/*Carex sitchensis**-*Sanguisorba officinalis*/*Sphagnum* spp. variant
 - c. *Myrica gale*/*Deschampsia cespitosa*-*Sanguisorba officinalis*/*Sphagnum* spp. variant
- 4. *Myrica gale*-*Spiraea douglasii*/*Sphagnum* spp. c.t.

Tree Dominated

- 1. *Pinus contorta*/*Ledum groenlandicum*/*Sphagnum* spp. c.t.
- 2. *Pinus contorta*-*Thuja plicata*/*Myrica gale*/*Sphagnum* spp. c.t.
- 3. *Thuja plicata*-*Tsuga heterophylla*/*Gaultheria shallon*/*Lysichitum americanum**/*Sphagnum* spp. c.t.
- 4. *Tsuga heterophylla*/*Ledum groenlandicum*/*Sphagnum* spp. c.t.

Low Elevation Minerotrophic Wetland Community Types (c.t.)

Permanently Flooded

- 1. *Brasenia schreberi* c.t.
- 2. *Equisetum fluviatile* c.t.
- 3. *Nuphar polysepalum* c.t.
- 4. *Scirpus acutus* c.t.
- 5. *Sparganium eurycarpum* c.t.

Saturated Soils or Seasonally Flooded

Herb Dominated

- 1. *Carex obnupta* c.t.
- 2. *Carex obnupta*-*Juncus nevadensis*-*Ranunculus flammula* c.t.
- 3. *Carex rostrata** c.t.
- 4. *Carex rostrata**-*Carex sitchensis** c.t.
- 5. *Carex sitchensis** c.t.
 - a. *Carex sitchensis**-*Potentilla palustris* variant
- 6. *Juncus falcatus*-*Juncus nevadensis* c.t.

Shrub-dominated

- 1. *Myrica gale*/*Aster* sp.-*Boykinia major*-*Deschampsia cespitosa* c.t.
- 2. *Myrica gale*/*Carex rostrata** c.t.
- 3. *Myrica gale*/*Carex sitchensis** c.t.
- 4. *Myrica gale*/*Carex sitchensis**-*Sanguisorba officinalis* c.t.
- 5. *Myrica gale*/*Lysichitum americanum** c.t.
- 6. *Myrica gale*-*Spiraea douglasii*/*Boykinia* sp.-*Carex obnupta* c.t.
- 7. *Salix* spp.-*Spiraea douglasii*/*Carex obnupta* c.t.
- 8. *Salix hookeriana* c.t.
 - a. *Salix hookeriana*/*Carex obnupta* variant
 - b. *Salix hookeriana*-*Spiraea douglasii* variant
- 9. *Spiraea douglasii* c.t.
- 10. *Spiraea douglasii*/*Carex sitchensis** c.t.

Tree Dominated

1. *Picea sitchensis*-*Alnus rubra*/*Lysichitum americanum** c.t.
2. *Pyrus fusca** c.t.
 - a. *Pyrus fusca**/*Calamagrostis canadensis* variant
 - b. *Pyrus fusca**/*Carex obnupta* variant
 - c. *Pyrus fusca**-*Salix hookeriana*/*Carex obnupta* variant
3. *Thuja plicata*-*Tsuga heterophylla*/*Lysichitum americanum** c.t.

Surge Plain Wetland Community Types (c.t.)**Herb Dominated**

1. *Athyrium filix-femina* c.t.
2. *Caltha asarifolia**-*Lysichitum americanum** c.t.
3. *Carex lyngbyei* c.t.
4. *Lilaeopsis occidentalis*-*Oenanthe sarmentosa* c.t.
5. *Typha latifolia* c.t.

Shrub-dominated

1. *Salix* spp./*Lysichitum americanum** c.t.

Tree Dominated

1. *Alnus rubra*/*Rubus spectabilis*/*Carex obnupta*-*Lysichitum americanum** c.t.
2. *Picea sitchensis*-*Alnus rubra*/*Rubus spectabilis*/*Carex obnupta* c.t.

Plant Community Type Descriptions

Spagnum Bogs

Sphagnum bogs (see page 4) on the west side of the Olympic Peninsula are floristically most similar to wetlands within the coastal zone of British Columbia (National Wetlands Working Group 1988; Rigg 1925; Pojar 1974a, 1974b; Banner *et al.* 1986). Although there are striking similarities, a comparison of plant species lists indicates that several species found in British Columbia mires are rare or absent in Washington coastal mires (see page 62).

Sphagnum bogs in the lowlands on the west side of the Olympic Peninsula seem to fall into four general categories, those that occur in basins, on slopes, on flat to rolling ground and along low-gradient streams.

Bogs which occur in basins generally surround ponds or lakes, or fill shallow basins. Bands of vegetation are parallel to, and progress landward from, the center of the basin or from the pond or lake margin. A narrow margin of sedges or a mixture of sedges, herbaceous species and ericaceous shrubs typically occurs adjacent to the open water. This narrow zone quickly gives way to a quaking, saturated peat mat dominated by low growing sedges and often *Vaccinium oxycoccos**. This in turn gives way to sphagnum hummocks with ericaceous shrubs which are increasingly tall and dense landward. Landward, dwarf to merely stunted conifers join this ericaceous shrub zone. A minerotrophic *Tsuga heterophylla*, *Thuja plicata* or *Picea sitchensis* forested wetland or shrub-dominated lagg is often found landward of the true bog. In basins filled with peat, vegetation of pond edges and the sedge dominated zones may be missing.

Sloping bogs occur in areas, such as the west side of the Olympic Peninsula, that have high precipitation/evaporation ratios. These sloping bogs are probably in contact with some minerotrophic water (water that has been in contact with mineral soil) and have higher nutrient levels than bogs fed exclusively by rain water (Damman 1986; National Wetlands Working Group 1988). Typically, shallow peat veneers cover mineral soils. These veneers are usually saturated year-round and may contain small seasonal or perennial pools. The pools are often only a few square meters in size and are oblong with the long axis perpendicular to the slope. The pools are probably related to peat development, wallowing activity of elk or the topography of the underlying ground.

The vegetation in sloping bogs seems to be related to moisture gradients but may also be related to peat depth (National Wetlands Working Group 1988). Pools either are not vegetated or have small emergent *Juncus* or *Scirpus* species. Adjacent to these, or in very wet peat areas, the vegetation is dominated by *Rhynchospora alba*. In slightly drier areas the vegetation is dominated by sedges, usually *Carex livida*, and other herbaceous species. In this area mounds often occur, either sphagnum hummocks or mounded bases around dwarfed conifers. These mounds are dominated by dwarfed conifers and low growing ericaceous shrubs. This sedge dominated zone containing mounds grades into a slightly drier zone dominated by ericaceous shrubs and stunted conifers. This zone grades into a wet forest community with stunted but not dwarfed trees and a large number of snags. This in turn gives way to wet forests with large trees.

Bogs on flat or rolling topography have shallow peat veneers over impermeable mineral soils, usually glacial till. Mineral soil and rocks often can be seen at the bog surface. They are often locally referred to as “prairies” and although they are flooded in the winter, they can be quite dry in the summer. These wetlands are fed by precipitation and some surface sheet flow from the immediate area. They may or may not have an outflow but never have a channeled inflow. Depressions and troughs within these “prairies” are seasonally flooded and then saturated through the growing season.

Most of these “prairie” areas are dominated by very low growing ericaceous shrubs, including *Empetrum nigrum*. *Xerophyllum tenax* is common in some. Depressions and troughs are dominated by sedges, cottongrass and other herbaceous plant species. These bogs can be surrounded by laggs dominated by *Spiraea douglasii* or *Pyrus fusca**. They can shift landward to wet forest communities or intergrade with upland shrub or forest communities depending on the topography.

Within this region, along the coastal plain, are nearly flat drainages with well defined stream channels bordered by broad peat terraces. These are limnogenous peatlands (Damman 1986) and have a mosaic of sphagnum bog and minerotrophic wetland communities. They are typically flooded during the winter and early spring and then saturated the remainder of the year. Seasonally, the terraces receive minerotrophic water but then are fed by precipitation. Most of the limnogenous bogs in this region are characterized by the presence of low growing *Myrica gale*.

Sphagnum Bog Community Types

***Carex livida*/ *Sphagnum* spp. community type**

This community type occurs mostly in western Jefferson and Clallam counties. It occurs on saturated peat along seeps and seasonal drainages. Soils are a mixture of sphagnum, fibrous and heath peat, and often contain some woody material. It occurs in all four bog types, but particularly in limnogenous and sloping bogs.

This community type is characterized by at least 15 percent cover of *Carex livida*. Cover of vascular plants is often sparse and woody species are highly stunted. *Sphagnum* spp. are the only consistently dominant species in the community type. *Kalmia occidentalis**, *Ledum groenlandicum*, *Vaccinium oxycoccos**, *Sanguisorba officinalis* and *Carex interior* complex all occur in most stands but with wide ranging cover values. *Carex obnupta* and *Rhynchospora alba* are frequent associated species. *Habenaria dilatata**, *Tofieldia glutinosa** and *Gentiana douglasiana* have high fidelity to this community type but have low percent cover values and are not always present. Within this community type occur small hummocks dominated by woody species (*Thuja plicata*, *L. groenlandicum*, *K. occidentalis* and *Gaultheria shallon* among others). These hummocks are not considered part of the community type.

Carex livida was listed as a common species in the wettest portions of sloping bogs in coastal British Columbia (National Wetlands Working Group 1988), but no communities bear its name. *Carex livida* was found in two bogs in the foothills of the western Cascade Range in Washington.

Indicator species:

Carex interior complex 0-15%
Carex livida 15-50%
*Kalmia occidentalis** 1-5%
Ledum groenlandicum 1-5%

Sanguisorba officinalis 0-25%
Sphagnum spp. 80-100%
*Vaccinium oxycoccos** 1-20%

Other species:

Agrostis sp.
Agrostis aequivalvis
Agrostis oregonensis
Agrostis scabra
Anemone oregana var. *felix*
Blechnum spicant
Boykinia spp.
Calamagrostis nutkaensis
Camassia sp.
Carex obnupta
Carex pluriflora
*Carex rostrata**
Cladina rangiferina
Deschampsia cespitosa
Drosera rotundifolia
Eriophorum chamissonis

Gentiana douglasiana
Gentiana sceptrum
*Habenaria dilatata**
Hypericum anagalloides
Juncus ensifolius
Juncus supiniformis
*Lysichitum americanum**
Menyanthes trifoliata
Nephrophyllidium crista-galli
*Panicum occidentale**
Rhynchospora alba
Spiranthes romanzoffiana
*Tofieldia glutinosa**
Trientalis arctica
Trisetum canescens
Viola palustris

***Carex rostrata**/
Sphagnum spp.
community type**

This community type occurs in western Jefferson and Clallam counties, mostly in sloping and basin bogs. It occurs on mixed sphagnum and fibrous peat soils which are permanently flooded with a few centimeters of water, or are saturated.

This is a low growing, species-rich community type dominated by *Carex rostrata** and *Sphagnum* spp. *Thuja plicata* are scattered and highly stunted, usually reaching only about a meter tall.

This community type intergrades with the *Carex livida*/*Sphagnum* spp. community type. It is easily distinguished from the latter by the predominance of *Carex rostrata**.

Indicator species:

*Carex rostrata** 25-65%
Sphagnum spp. 100%

Other species:

Agrostis sp.
Agrostis scabra
Anemone oregana var. *felix*
Blechnum spicant
Boykinia cf *elata*
Camassia sp.
Carex interior complex
Carex livida
Deschampsia cespitosa
Drosera rotundifolia
Gentiana sceptrum
Hypericum anagalloides
*Kalmia occidentalis**

Ledum groenlandicum
Linnaea borealis
Nephrophyllidium crista-galli
Pinus contorta
Pinus monticola
Pteridium aquilinum
Rhamnus purshiana
Rhynchospora alba
Sanguisorba officinalis
Thuja plicata
Trientalis arctica
*Vaccinium oxycoccos**
Viola sp.

***Carex rostrata**-
*Carex sitchensis**-
*Sanguisorba
officinalis*/
Sphagnum spp.
community type**

This is a typical community type in bogs along the coast of Grays Harbor and Pacific counties. It mostly occurs in basin and limnogenous bogs. The community type is often associated with slow, seasonally flowing water and may be affected by minerotrophic water. It is wet year-round and seasonally flooded. Soils are a mixture of sphagnum and fibrous peat.

The vegetation is lush and forms tall dense stands dominated by sedges. *Carex rostrata** is always a dominant species. *Carex sitchensis** is usually codominant but occasionally can have very low percent cover. *Gentiana sceptrum*, *Sanguisorba officinalis* and *Sphagnum* spp. are usually present and can be codominant. A few stands have an abundance of *Carex obnupta*. This community type typically occurs in a mosaic with *Myrica gale* communities.

This community type is similar to the *Myrica gale*/*Carex sitchensis**-*Sanguisorba officinalis*/*Sphagnum* spp. variant of the *M. gale*/*S. officinalis*/*Sphagnum* spp. community type. It differs in having almost no *M. gale* and in being less species-rich.

Indicator species:

*Carex rostrata** 10-75%
*Carex sitchensis** 10-30%
Sanguisorba officinalis 2-50%
Sphagnum spp. 25-100%

Other species:

<i>Carex obnupta</i>	<i>Juncus balticus</i>
<i>Deschampsia cespitosa</i>	<i>Myrica gale</i>
<i>Drosera rotundifolia</i>	<i>Nephrophyllidium crista-galli</i>
<i>Eriophorum chamissonis</i>	<i>Trientalis arctica</i>
<i>Gentiana sceptrum</i>	<i>Vaccinium oxycoccos*</i>

***Eriophorum
chamissonis*/
Sphagnum spp.
community type**

This community type rarely occurs in this region. It occurs in basin bogs on floating sphagnum peat mats that sink when stepped on. The water level is at the soil surface year-round.

This community type is characterized by high percent cover of *Eriophorum chamissonis*. *Ledum groenlandicum* is common but is scrubby and less than 30 cm tall.

This community type is related to the *Rhynchospora alba*/*Sphagnum* spp. community type but occurs in wetter areas. It is similar to the *Eriophorum chamissonis*/*Sphagnum* spp. community type in the northern Puget Trough region.

Indicator species:

Eriophorum chamissonis 20%
Sphagnum spp. 90%

Other species:

<i>Carex pluriflora</i>	<i>Lysichitum americanum*</i>
<i>Ledum groenlandicum</i>	<i>Vaccinium oxycoccos*</i>

***Juncus supiniformis*/
Sphagnum spp.
community type**

This community type occurs in western Jefferson and Clallam counties. It occurs in basin and sloping bogs in small seasonally flooded depressions or ponds. The depressions and ponds may be elk wallows. The surface layer of peat dries during the summer in most cases but the underlying peat is saturated. The substrate is a mixture of partially decomposed fibrous and sphagnum peat.

This community type is clearly identified by the abundance of *Juncus supiniformis* and lack of other vegetation. *Carex livida* and *Rhynchospora alba* typically occur around the margins of this community type. Although the depressions/ponds occur within sphagnum peat, there is seldom any living *Sphagnum* spp. present.

Indicator species:

Juncus supiniformis 10-30%

Other species:

Carex livida
*Carex rostrata**

Hypericum anagalloides
Rhynchospora alba

***Rhynchospora alba*/
Sphagnum spp.
community type**

This community type occurs north of Grays Harbor in this region. It occurs mostly in basin and sloping bogs and occasionally in flat bogs. It is typically found in a band along the quaking margin of sphagnum mats adjacent to open water, in wet depressions or along seeps. Soils are saturated sphagnum peat and may be seasonally flooded. The substrate is soft and often sinks when stepped on.

Rhynchospora alba is dominant in this community type. *Kalmia occidentalis** and *Vaccinium oxycoccos** frequently occur. Shrub species, when found, have a short growth form, usually not exceeding 0.6 m. Frequently there are no living *Sphagnum* spp. Along seeps, this community type is usually in a mosaic with other communities.

This community type is most similar to the *Carex livida*/*Sphagnum* spp. community type, but is easily distinguished by its dominance by *Rhynchospora alba*. *Rhynchospora alba* was listed as commonly occurring in the wettest portions of sloping bogs in coastal British Columbia (National Wetlands Working Group 1988). Vitt and Slack (1975) described *R. alba*'s distribution relative to moisture and shade. Slater and Agnew (1977) observed increased cover of *R. alba* with trampling. This community type is similar to the *R. alba*/*Sphagnum* spp. community type in the northern Puget Trough region.

Indicator species:

Rhynchospora alba 25-40%
Sphagnum spp. (5)85-100%
*Vaccinium oxycoccos** (0)15-40%

Other species:

Agrostis sp.
Agrostis scabra
Boykinia cf major
Carex interior complex
Carex livida
*Carex rostrata**
Drosera rotundifolia
Empetrum nigrum
Eriophorum chamissonis
Gentiana sceptrum

Juncus acuminatus
*Kalmia occidentalis**
Ledum groenlandicum
*Lysichitum americanum**
Nephrophyllidium crista-galli
Nuphar polysepalum
Sanguisorba officinalis
Thuja plicata
*Tofieldia glutinosa**

***Kalmia occidentalis**-*Ledum groenlandicum*/
Sphagnum spp.
community type**

This is a very commonly occurring community type throughout the western Olympic Peninsula and southwest Washington region. It occurs in all four bog types. Hummocks are well-developed in many sites. The tops of the hummocks are relatively dry and exposed to sun and wind while the inter-hummock areas are quite wet and shaded. Substrates are a mixture of sphagnum, fibrous and heath peat. Soil moisture varies from saturated to

seasonally relatively dry. In some cases the community type is seasonally flooded.

This community type is divided into four variants, each described below. The community type as a whole is characterized by the abundance of either or both *Kalmia occidentalis** and *Ledum groenlandicum*, and the lack of *Myrica gale*. *Sphagnum* spp. usually are dominant as well and form well-developed hummocks.

***Kalmia occidentalis**-*Ledum groenlandicum*/*Carex rostrata**/*Sphagnum* spp. variant**

This wet variant occurs in southwestern Washington and northern Grays Harbor County. It is wet year-round and can be seasonally flooded. In some cases it is in seasonal contact with minerotrophic water. Soils are a mixture of sphagnum, fibrous and heath peat.

This variant is codominated by *Ledum groenlandicum*, *Kalmia occidentalis**, *Carex rostrata** and *Sphagnum* spp. *Sanguisorba officinalis* can be codominant.

Indicator species:

*Carex rostrata** 35-45%
*Kalmia occidentalis** 25-35%
Ledum groenlandicum 25-40%
Sanguisorba officinalis 10-25%
Sphagnum spp. 80-90%

Other species:

Agrostis sp.
Blechnum spicant
*Carex sitchensis**
*Cornus canadensis**
Gentiana sceptrum
Linnaea borealis
Maianthemum dilatatum
Trientalis arctica
*Vaccinium oxycoccos**

***Kalmia occidentalis**-*Ledum groenlandicum*/*Xerophyllum tenax*/*Sphagnum* spp. variant**

This is a dry variant which occurs in the southwestern portion of the northern Puget Trough lowlands and occasionally in western Jefferson and Clallam counties. It is seasonally saturated or flooded and then dry. Substrates are a mixture of heath, fibrous and sphagnum peat, and there is large woody material in some sites. Mineral soil is sometimes visible at the soil surface and there are often signs of past fire.

The vegetation in this variant is not lush and is species-poor. The shrubs are generally scrubby and form an open canopy 0.6 to 1.3 m tall. *Kalmia occidentalis**, *Ledum groenlandicum* and *Xerophyllum tenax* are codominant. *Pteridium aquilinum* is always present and sometimes codominant. *Gaultheria shallon* is usually present but low-growing and not codominant.

This variant is most similar to the *Kalmia occidentalis**-*Ledum groenlandicum*-*Gaultheria shallon*/*Pteridium aquilinum*/*Sphagnum* spp. variant. Peter (pers comm.) observed this community type on lands recently transferred from the Olympic National Forest to the Quinault Tribe.

Indicator species:

Gaultheria shallon 5-10%
*Kalmia occidentalis** (5)50-60%
Ledum groenlandicum 15-50%
Pteridium aquilinum 27(60)%
Sphagnum spp. 2-3%
Xerophyllum tenax (5)35-40%

Other species:

Cladina rangiferina
*Cornus canadensis**
Gentiana sceptrum
Pinus contorta
*Pyrus fusca**
Trientalis arctica

Maianthemum dilatatum
Picea sitchensis

Tsuga heterophylla
*Vaccinium oxycoccos**

***Kalmia
occidentalis*-Ledum
groenlandicum-
Gaultheria shallon/
Pteridium
aquilinum/Sphag-
num* spp. variant**

This variant is found in western Clallam County, mostly on slopes or ridges in "prairies". It occurs in areas that are seasonally saturated but relatively dry during the summer. Soils are sphagnum, fibrous and woody peat. Peat soils tend to be very thin, overlaying mineral soil. It is possible that the community type is associated with past burning.

The vegetation in this variant is typically stunted, but the shrub layer can be tall and dense. There are scattered somewhat stunted *Thuja plicata* and *Tsuga heterophylla* and sometimes *Picea sitchensis*. *Ledum groenlandicum* is always a dominant species. *Kalmia occidentalis**, *Gaultheria shallon*, *Pteridium aquilinum*, *Blechnum spicant* and *Sphagnum* spp. are usually codominant.

This variant is most similar to the *Tsuga heterophylla/Ledum groenlandicum/Sphagnum* spp. community type.

Indicator species:

Blechnum spicant 25-40%
Calamagrostis nutkaensis (0)5(30)%
Gaultheria shallon 15-30%
*Kalmia occidentalis** 15-45%

Ledum groenlandicum 10-60%
Pteridium aquilinum 5-20(60)%
Sphagnum spp. 10-60%

Other species:

Agrostis spp.
Carex interior complex
Carex livida
Carex obnupta
Cladina rangiferina
*Cornus canadensis**
Danthonia spicata
Drosera rotundifolia
Empetrum nigrum
Gentiana douglasiana
Gentiana sceptrum
Hypericum anagalloides
Linnaea borealis

Lycopodium clavatum
Maianthemum dilatata
Panicum occidentale
Picea sitchensis
*Pyrus fusca**
Sanguisorba officinalis
Spiraea douglasii
Thuja plicata
*Tofieldia glutinosa**
Trientalis arctica
Tsuga heterophylla
Vaccinium ovatum
*Vaccinium oxycoccos**

***Kalmia
occidentalis*-Ledum
groenlandicum-
Vaccinium
oxycoccos*/Sphag-
num* spp. variant**

This variant occurs throughout this region, typically in basin bogs, but also wet portions of "prairies". It is wet to saturated year-round and often seasonally flooded. Substrates are a mixture of heath, fibrous and sphagnum peat and often have some woody debris. Peat hummocks often are well-developed within this variant.

This variant is species-rich. Shrubs are moderately low-growing, reaching about 1.3 m tall and forming an open canopy. *Kalmia occidentalis**, *Ledum groenlandicum* and *Sphagnum* spp. are codominant. *Vaccinium oxycoccos** is abundant to co-dominant. Wetter examples of this variant have *Carex livida* and/or *Carex obnupta*.

This variant appears most similar to the flat and domed bogs described in British Columbia (National Wetlands Working Group 1988). Banner and Pojar (1987) described a topogenous bog that is somewhat similar to this community type.

Indicator species:

Carex obnupta 0-50%
*Kalmia occidentalis** 20-40%
Ledum groenlandicum 10-40%
Sphagnum spp. 80-100
*Vaccinium oxycoccos** 5-25%

Other species:

Agrostis sp.
Agrostis aequivalvis
Agrostis scabra
Anemone oregana var. *felix*
Blechnum spicant
Boykinia spp.
Calamagrostis canadensis
Calamagrostis nutkaensis
Camassia sp.
Carex canescens
Carex cusickii
Carex interior complex
Carex livida
Carex pluriflora
*Carex rostrata**
*Carex sitchensis**
Cladina rangiferina
*Cornus canadensis**
Deschampsia cespitosa
Drosera rotundifolia
Empetrum nigrum
Eriophorum chamissonis
Gaultheria shallon
Gentiana sceptrum
*Habenaria dilatata**
Hypericum anagalloides
Juncus acuminatus

Juncus ensifolius
Linnaea borealis
Lycopus uniflorus
*Lysichitum americanum**
Maianthemum dilatatum
Nephrophyllidium crista-galli
Nuphar polysepalum
Picea sitchensis
Pinus contorta
Pinus monticola
Potentilla palustris
Pteridium aquilinum
*Pyrus fusca**
Rhamnus purshiana
Rhynchospora alba
Sanguisorba officinalis
Spiraea douglasii
Spiranthes romanzoffiana
Thuja plicata
*Tofieldia glutinosa**
Trientalis arctica
Tsuga heterophylla
Vaccinium uliginosum
Veratrum sp.
Veronica scutellata
Xerophyllum tenax

***Ledum groenlandicum-Myrica gale/Sphagnum* spp. community type**

This community type occurs throughout this region, typically in limnogenous bogs but also some basin bogs. It occurs in areas that are wet year-round and seasonally flooded. The community type may be influenced seasonally by minerotrophic water. Soils are a mixture of sphagnum, fibrous and heath peat.

The vegetation in this community type is lush. *Myrica gale*, *Ledum groenlandicum* and *Sphagnum* spp. are codominant. Associated species composition is variable.

The tall shrub type, shallow phase of the slope bogs in British Columbia may be similar to this community type (National Wetlands Working Group 1988).

Indicator species:

*Kalmia occidentalis** 0-35%
Ledum groenlandicum 20-75%
Myrica gale 25-40%
Sphagnum spp. 10-35%

Other species:

Blechnum spicata
Carex canescens
Carex interior complex
Carex lasiocarpa
*Carex rostrata**
*Carex sitchensis**

Maianthemum dilatatum
Menyanthes trifoliata
Pinus contorta
Pinus monticola
Potentilla palustris
Pteridium aquilinum

*Cornus canadensis**
Drosera rotundifolia
Dulichium arundinaceum
Gaultheria shallon
Gentiana sceptrum
Linnaea borealis
Lycopus uniflorus
*Lysichitum americanum**

*Pyrus fusca**
Rhamnus purshiana
Rubus pedatus
Sanguisorba officinalis
Spiraea douglasii
Tsuga heterophylla
Trientalis arctica
*Vaccinium oxycoccos**

***Myrica gale/*
Sanguisorba
officinalis/
Sphagnum spp.
community type**

This community type occurs along the west side of the Olympic Peninsula from northern Grays Harbor County to the Strait of Juan de Fuca. It occurs mostly in limnogenous bogs. It is flooded seasonally with minerotrophic water. Soils remain wet year-round and are composed of sphagnum, fibrous and heath peat.

Myrica gale and *Sphagnum* spp. are dominant. *Sanguisorba officinalis* is always present and has high percent cover. There appear to be three variants of this community type, one in which *Carex rostrata** is abundant to codominant, a second in which *Carex sitchensis** is abundant to codominant and the third in which *Deschampsia cespitosa* is abundant to codominant. There are a few associated species which primarily occur in only one variant, but most occur in all three variants.

***Myrica gale/Carex*
*rostrata**-
Nephrophyllidium
crista-galli-
Sanguisorba
officinalis-/Sphag-
num spp. variant**

This variant mostly occurs in northwestern Grays Harbor County but extends north to Clallam County. It occurs on peat benches along low-gradient streams and sloughs. It is seasonally flooded with minerotrophic water and the soils remain wet year-round. Soils are a mixture of fibrous, heath and sphagnum peat.

Myrica gale and *Sphagnum* spp. are codominant in this variant. *Sanguisorba officinalis* is present to codominant and *Carex rostrata** is abundant to codominant. *Nephrophyllidium crista-galli* is usually present and has high fidelity to this variant. This variant has two growth forms easily distinguished by the height of *M. gale*. *Myrica gale* is less than 1.3 m tall in the low growth form and 1.5 to 2 m tall in the tall growth form.

A somewhat similar community occurred at Whyac Lake on Vancouver Island (National Wetlands Working Group 1988).

Indicator species

*Carex rostrata** (5)15-40%
Myrica gale (15)30-90%
Nephrophyllidium crista-galli 0-10%
Sanguisorba officinalis 1-40%
Sphagnum spp. 25-100%

Other species

Agrostis sp.
Agrostis scabra
Carex interior complex
Carex livida
*Carex sitchensis**
Deschampsia cespitosa
Gentiana douglasiana
Gentiana sceptrum
Hypericum anagalloides

Juncus ensifolius
*Kalmia occidentalis**
Ledum groenlandicum
*Pyrus fusca**
Rhynchospora alba
Rubus pedatus
Thuja plicata
Trientalis arctica

***Myrica gale/Carex
sitchensis*
Sanguisorba
officinalis/Sphag-
num spp. variant***

This variant occurs occasionally in northwestern Grays Harbor County and western Clallam County. It occurs on terraces along sloughs and in ground-water discharge areas. It is wet year-round and seasonally flooded with minerotrophic water. Soils are a mixture of fibrous, heath and sphagnum peat.

Myrica gale and *Sphagnum* spp. are codominant in this variant. *Carex sitchensis** and *Sanguisorba officinalis* are abundant to usually codominant. This variant has two growth forms easily distinguishable by the height of *M. gale*. One has low growing *M. gale*, typically less than 30 cm tall. The other is dominated by *M. gale* at least 1.3 m tall. The low growth form is more species-rich than the tall growth form.

Banner *et al.* (1986) listed a *Myrica gale/Carex sitchensis** shrub fen which may be similar to this.

Indicator species:

*Carex sitchensis** 15-50%
Myrica gale (15)25-50%
Sanguisorba officinalis 10-60%
Sphagnum spp. (10)40-100%

Other species:

Agrostis aequivalvis
Carex interior complex
Carex livida
*Carex rostrata**
Deschampsia cespitosa
Dodecatheon jeffreyi
Drosera rotundifolia
Gentiana douglasiana
*Kalmia occidentalis**
Juncus nevadensis

Ledum groenlandicum
*Lysichitum americanum**
Nuphar polysepalum
Picea sitchensis
Rhynchospora alba
Thuja plicata
Trientalis arctica
*Vaccinium oxycoccos**
Viola palustris

***Myrica gale/
Deschampsia
cespitosa-
Sanguisorba
officinalis/Sphag-
num spp. variant***

This variant occurs in northwestern Grays Harbor County on terraces along low-gradient streams. It is flooded seasonally with minerotrophic water and soils remain wet year-round. Soils are sphagnum, fibrous and heath peat.

Myrica gale is low growing and abundant to dominant in this variant. *Sphagnum* spp. are dominant and *Sanguisorba officinalis* is abundant. *Deschampsia cespitosa* is abundant to codominant. *Carex livida* is always present and abundant. *Gentiana sceptrum* is always present but has very low percent cover.

This variant intergrades with the *Carex livida/Sphagnum* spp. community type.

Indicator species:

Carex livida 3-10%
Deschampsia cespitosa 10-25%
Gentiana sceptrum <1-2%

Myrica gale 5-60%
Sanguisorba officinalis 5-20%
Sphagnum spp. 15-50%

Other species:

*Carex rostrata**
Juncus ensifolius
*Kalmia occidentalis**

Nephrophyllidium crista-galli
Rhynchospora alba

***Myrica gale-Spiraea douglasii/Sphagnum* spp. community type**

This community type occurs in western Clallam County. It is found on peat around lakes and sloughs. It is wet year-round and, in some cases, is seasonally flooded with minerotrophic water. Soils are sphagnum, fibrous and heath peat.

The vegetation in this community type is dense and lush. *Myrica gale* and usually *Sphagnum* spp. are codominant. *Spiraea douglasii* is abundant to codominant. *Trientalis arctica* is always present and usually abundant. Other species found in the community type are variable.

Indicator species:

Myrica gale 60-80%
Sphagnum spp. (5)40-60%
Spiraea douglasii 10-30%
Trientalis arctica (1)5-20%

Other species:

<i>Aster</i> sp.	<i>Kalmia occidentalis</i> *
<i>Blechnum spicant</i>	<i>Ledum groenlandicum</i>
<i>Boykinia</i> cf <i>major</i>	<i>Lycopus uniflorus</i>
<i>Calamagrostis canadensis</i>	<i>Lysichitum americanum</i> *
<i>Carex interior</i> complex	<i>Picea sitchensis</i>
<i>Carex rostrata</i> *	<i>Plantago macrocarpa</i>
<i>Carex sitchensis</i> *	<i>Potentilla pacifica</i> *
<i>Deschampsia cespitosa</i>	<i>Potentilla palustris</i>
<i>Dodecatheon jeffreyi</i>	<i>Prunella vulgaris</i>
<i>Galium</i> sp.	<i>Pyrus fusca</i> *
<i>Gaultheria shallon</i>	<i>Ranunculus flammula</i>
<i>Gentiana sceptrum</i>	<i>Sanguisorba officinalis</i>
<i>Hypericum anagalloides</i>	<i>Tofieldia glutinosa</i> *
<i>Juncus nevadensis</i>	<i>Viola</i> cf <i>palustris</i>

***Pinus contorta/ Ledum groenlandicum/ Sphagnum* spp. community type**

This community type occurs throughout this region, mostly in basins including old coastal dune troughs in Grays Harbor and Pacific counties. It typically occurs in seasonally dry areas and, in some cases, where there are signs of past fire. Substrates are a mixture of sphagnum and heath peat with woody debris and can overlay sand or other mineral soils.

This community type varies from open shrublands with low-growing *Kalmia occidentalis**, *Ledum groenlandicum* and scattered stunted *Pinus contorta*, to stands of pole-sized *P. contorta* with *L. groenlandicum* and *Gaultheria shallon*. Where there are signs of fire, there is little or no living *Sphagnum* spp. and there is high cover of *Pteridium aquilinum*.

A variant of the tall shrub type bog with stunted *Pinus contorta* was described in British Columbia (National Wetlands Working Group 1988). Banner *et al.* (1986) described a raised topogenous bog with *P. contorta*, *Ledum groenlandicum*, *Thuja plicata*, *Juniperus communis*, *Carex* spp. and *Sphagnum* spp. Banner *et al.* (1987) described a bog woodland along the coast in British Columbia which is similar to this community type. Hebda and Biggs (1981) described a woodland lagg that is somewhat similar to this community type. This community type occurs on lands recently transferred from the Olympic National Forest to the Quinault Tribe (Peter pers. comm.). Peter suggests that this community type may be a result of fire and successional to *Tsuga heterophylla/L. groenlandicum/Sphagnum* spp. community type. This community type is similar to the *P. contorta/L. groenlandicum/Sphagnum* spp. community type in the northern Puget Trough region.

Indicator species:

Gaultheria shallon 5-60%
*Kalmia occidentalis** 1-30%
Ledum groenlandicum 10-40%

Pinus contorta 25-50%
Pteridium aquilinum 10-35%
Sphagnum spp. 20-85%

Other species:

Agrostis scabra
Anemone oregana var. *felix*
Blechnum spicant
Boykinia spp.
Carex interior complex
*Carex rostrata**
Cladina rangiferina
*Cornus canadensis**
Drosera rotundifolia
Empetrum nigrum
Eriophorum chamissonis
Gentiana sceptrum
Hypericum anagalloides
Linnaea borealis
*Lysichitum americanum**
Maianthemum dilatatum

Myrica californica
Myrica gale
Nephrophyllidium crista-galli
Picea sitchensis
Pinus monticola
Rhamnus purshiana
Rubus pedatus
Sanguisorba officinalis
Thuja plicata
Trientalis arctica
Tsuga heterophylla
Vaccinium sp.
Vaccinium ovatum
*Vaccinium oxycoccos**
Xerophyllum tenax

***Pinus contorta*-
Thuja plicata/*Myrica*
gale/
Sphagnum spp.
community type**

This community type occurs in Grays Harbor County, western Clallam County and probably western Jefferson County. It occurs in sloping, basin and limnogenous bogs. The water table is from slightly below to slightly above the soil surface year-round and probably it is seasonally flooded. Some areas have ground water discharge. Soils are a mixture of fibrous, heath, woody and sphagnum peat. There is some woody debris which provides an elevated substrate for typically upland species.

This community type has an open canopy and is species-rich. Trees are stunted, generally not exceeding 8 m tall. *Thuja plicata*, *Pinus contorta*, *Myrica gale* and *Sphagnum* spp. are codominant in most cases. *Ledum groenlandicum*, *Gaultheria shallon*, *Lysichitum americanum** and *Tsuga heterophylla* occur in all or most stands and are sometimes codominant.

This community type may be ecotonal between *Myrica gale* community types and the *Thuja plicata*-*Tsuga heterophylla*/*Gaultheria shallon*/*Lysichitum americanum**/*Sphagnum* spp. community type. Banner *et al.* (1983), Banner *et al.* (1986), Banner *et al.* (1987) and Pojar (1974a, 1974b) described *Pinus contorta* bog wetlands from coastal British Columbia. Banner and Pojar (1987) described a blanket bog and a pine-cypress-cedar bog woodland association that are somewhat similar to this community type. The British Columbia communities differ somewhat, particularly in the presence of *Chamaecyparis nootkatensis*.

Indicator species:

Gaultheria shallon 0-40%
Ledum occidentale 1-40%
*Lysichitum americanum** 10-25%
Myrica gale 15-70%

Pinus contorta 10-35%
Sphagnum spp. 10-100%
Thuja plicata 10-30%
Tsuga heterophylla 0-20%

Other species:

Agrostis aequalis
Agrostis exarata
Athyrium filix-femina
Blechnum spicant
Boykinia spp.
Calamagrostis nutkaensis
Carex interior complex
Carex leptalea
Carex livida
Carex obnupta
*Carex rostrata**
*Carex sitchensis**
*Cornus canadensis**
Deschampsia cespitosa
Dodecatheon jeffreyi
Drosera rotundifolia
Gentiana douglasiana
Gentiana sceptrum
*Habenaria dilatata**
Juncus ensifolius

*Kalmia occidentalis**
Linnaea borealis
Maianthemum dilatatum
Oenanthe sarmentosa
Picea sitchensis
Pteridium aquilinum
*Pyrus fusca**
Rhamnus purshiana
Rhynchospora alba
Rubus pedatus
Rubus ursinus
Sanguisorba officinalis
Senecio triangularis
Spiraea douglasii
Trientalis arctica
Vaccinium ovalifolium
Vaccinium ovatum
*Vaccinium oxycoccos**
Vaccinium parvifolium

***Thuja plicata-Tsuga heterophylla/Gaultheria shallon/Lysichitum americanum*/Sphagnum* spp. community type**

This community type occurs throughout this region in basin and sloping bogs. The ground ranges from being saturated to covered with shallow standing water. The soil is a combination of sphagnum, fibrous and heath peat and woody material. Large woody debris and fallen trees are typical and provide an elevated substrate that supports upland species.

This community type has an open canopy and at least some living *Sphagnum* spp. Conifers reach large diameters but often have broken tops. The mid- and understories are a mosaic of wetland and upland species, the wetland species typically rooted in the soil and the upland species typically rooted on fallen trees and mounded soil. The community type is codominated by *Thuja plicata*, *Tsuga heterophylla* and *Gaultheria shallon*. *Rhamnus purshiana*, *Lysichitum americanum**, *Blechnum spicant*, *Pyrus fusca**, *Picea sitchensis*, *Menziesia ferruginea* and *Vaccinium* spp. are abundant. *G. shallon*, *M. ferruginea* and *Vaccinium* spp. are typically rooted on fallen trees and mounded soil.

This community type is most similar to the *Pinus contorta-Thuja plicata/Myrica gale/Sphagnum* spp. community type. A similar community was described from Bamfield Bog, British Columbia (National Wetlands Working Group 1988). Banner and Pojar (1987) described a cedar-cypress-pine bog forest that is somewhat similar to the community type described here.

Indicator species:

Blechnum spicant 2-10(40)%
Gaultheria shallon 2-45%
*Lysichitum americanum** 5-10%
Menziesia ferruginea 1-5%
Rhamnus purshiana 2-5%

Sphagnum spp. (1) 15-35 (90)%
Thuja plicata 15-50%
Tsuga heterophylla 2-45%
Vaccinium spp. 4-15%

Other species:

Abies amabilis
Agrostis sp.
Agrostis oregonensis
Anemone oregana var. *felix*
*Boykinia elata**
Calamagrostis canadensis
Camassia sp.
Carex interior complex
Carex livida

Maianthemum dilatatum
Oenanthe sarmentosa
Picea sitchensis
Polystichum munitum
Pseudotsuga menziesii
Pteridium aquilinum
*Pyrus fusca**
Rhynchospora alba
Rubus pedatus

Carex obnupta
*Cornus canadensis**
Deschampsia cespitosa
Drosera rotundifolia
Gentiana sceptrum
Hypericum anagalloides
Juncus ensifolius
Juncus supiniformis
*Kalmia occidentalis**
Ledum groenlandicum
Linnaea borealis
Luzula sp.

Rubus spectabilis
Rubus ursinus
Sanguisorba officinalis
Spiraea douglasii
Spiranthes romanzoffiana
Trientalis arctica
Trisetum canescens
Vaccinium ovatum
Vaccinium oxycocco
Vaccinium parvifolium
Veratrum sp.
Viola palustris

Tsuga heterophylla/
Ledum
groenlandicum/
***Sphagnum* spp.**
community type

This community type occurs in western Clallam County within this region, typically in basin bogs but also flat bogs. Substrates are wet year-round and may never be flooded. The substrate is composed of sphagnum, other mosses, heath and woody peat.

The trees are highly stunted and the canopy is open in this community type. The shrub layer is moderately dense and usually between 0.6 to 1.3 m tall. *Ledum groenlandicum*, *Sphagnum* spp. and highly stunted *Tsuga heterophylla* are consistently dominant in this community type. *Kalmia occidentalis**, *Pteridium aquilinum*, *Gaultheria shallon* and *Blechnum spicant* usually occur and are often dominant species.

This community type is most similar to the *Kalmia occidentalis*-Ledum groenlandicum-Gaultheria shallon/Pteridium aquilinum/Sphagnum* spp. variant of the *K. occidentalis-L. groenlandicum/Sphagnum* spp. community type. It is similar to the *Tsuga heterophylla/L. groenlandicum/Sphagnum* spp. community type in the northern Puget Trough region.

Indicator species:

Gaultheria shallon 10-40%
Ledum groenlandicum (15) 35-40 (60)%
Sphagnum spp. 25-90%
Tsuga heterophylla 20-50%
Thuja plicata (0)15-35%

Other species:

Blechnum spicant
Carex interior complex
Carex obnupta
*Carex rostrata**
Cladina rangiferina
*Cornus canadensis**
Drosera rotundifolia
Gentiana sceptrum
*Kalmia occidentalis**
Linnaea borealis
*Lysichitum americanum**
Maianthemum dilatata

Menziesia ferruginea
Picea sitchensis
Pteridium aquilinum
*Pyrus fusca**
Rhamnus purshiana
Spiraea douglasii
Trientalis arctica
Vaccinium sp.
Vaccinium ovatum
*Vaccinium oxycoccos**
Vaccinium parvifolium

Minerotrophic Wetlands

Impounded or semi-impounded minerotrophic wetlands (see page 4) in the lowlands on the west side of the Olympic Peninsula typically occur in basins, glacial scours or old oxbows. In Grays Harbor County they typically occur in shallow depressions and flat ground along low-gradient streams, in oxbows, depressions and old dune troughs. In Pacific County they mostly occur in old dune troughs. Minerotrophic wetlands in the region typically receive water from surface sheet flow and small streams, and have perennial stream outflows. Some of these wetlands are groundwater-fed.

Most of the shallow depressional, dune trough and oxbow minerotrophic wetlands show strong vegetation zonation apparently related to hydrology. Shallow permanent ponds have *Nuphar polysepalum* or a rich assemblage of rooted aquatic plant species. Seasonally flooded areas typically are dominated by one or more sedge communities. Slightly higher and drier areas which also are seasonally flooded are dominated by *Spiraea douglasii*. Areas that are slightly upslope of the later zone are typically dominated by *Pyrus fusca**, have saturated to wet soils year-round and can be flooded in the winter. The *P. fusca* zone may abut upland vegetation or a forested wetland community.

Along slow-moving streams and the margin of Lake Ozette are mosaics of wetland communities. These wetlands are often dominated by *Myrica gale* but have a diversity of other sedge, shrub and forested wetland communities. These communities often intergrade with sphagnum bog communities. *M. gale* is described as a minerotrophic wetland species by the National Wetlands Working Group (1988).

Forested wetlands are common on the west side of the Olympic Peninsula. *Thuja plicata*, *Tsuga heterophylla*, *Picea sitchensis*, *Pinus contorta* and *Alnus rubra* are the most commonly occurring tree species. *P. sitchensis* and *A. rubra* appear most common in alluvial systems. *T. plicata*, *T. heterophylla* and *P. contorta* are more common in areas where water pools or seeps. Forested wetlands along the west side of the Olympic Peninsula appear very similar to those along the coast of British Columbia except that *Chamaecyparis nootkatensis* is a significant component of those in British Columbia and doesn't occur in Washington bogs (Banner and Pojar 1987; Banner *et al.* 1986).

As a result of logging related activities, agriculture and the introduction and spread of *Phalaris arundinacea*, there are very few undisturbed minerotrophic wetlands in the Olympic Peninsula and southwest Washington region.

MINEROTROPIC WETLAND COMMUNITY TYPES

***Brasenia schreberi* community type**

This community type is known from one site in western Clallam County and one in northwestern Grays Harbor County, but is more common elsewhere in western Washington. This community type is not well studied. It occurs in shallow, permanently flooded portions of lakes, often waterward of peat wetlands.

Within this region, it is found in proximity to *Sphagnum* spp. mats and adjacent to the *Nuphar polysepalum* community type.

Christy (1993) listed a *Brasenia schreberi* community along the Oregon coast. This community type is similar to the *B. schreberi* community type in the northern Puget Trough region.

Indicator species:

Brasenia schreberi 20%

Other species:

Dulichium arundinaceum
Nuphar polysepalum

Scirpus subterminalis

***Equisetum fluviatile*
community type**

This community type occurs around the margin of Lake Ozette, Clallam County. It occurs in areas that are permanently flooded with water less than 1 m deep during the summer months. Substrates are mostly sandy but there are areas with silt or cobble-gravel substrates.

This community type is sparsely populated. *Equisetum fluviatile* is the indicator and most consistently occurring species. This is the primary habitat for *Lobelia dortmanna*, a state listed Threatened plant species (Washington Natural Heritage Program 1994). In places it is codominant with *E. fluviatile*.

This community type intergrades with the *Scirpus acutus* and *Sparganium eurycarpum* community types. Christy (1993) listed a *Equisetum fluviatile* community in Oregon. Thomas (1984) described large patches of *E. fluviatile* in the freshwater tidal zone of the Columbia River. Banner *et al.* (1986) noted *E. fluviatile* as a dominant species fringing lakes and streams.

Indicator species:

Equisetum fluviatile 20%

Other species:

Isoetes bolanderi
Lobelia dortmanna
Polygonum sp.
Potamogeton epihydrus

Ranunculus aquatilis
Ranunculus flammula
Sparganium eurycarpum

***Nuphar polysepalum*
community type**

This community type occurs throughout the region. It occurs in shallow, permanently flooded areas in the rooted aquatic zone but extends into the emergent zone. It can occur in areas with large water level fluctuation (Ewing pers. comm.). Soils tend to be anoxic muck or peat.

This community type can be either monospecific or composed of several aquatic plant species. In all cases, *Nuphar polysepalum* is a dominant species. Care must be taken to distinguish this community type from transitional areas where *N. polysepalum* is either invasive or residual.

Christy (1993) listed a *Nuphar polysepalum* community in Oregon. This community type is similar to the *N. polysepalum* community type in the northern Puget Trough region.

Indicator species:

Nuphar polysepalum 40-60%

Other species:

Brasenia schreberi
*Carex sitchensis**
Elodea sp.
Juncus supiniiformis

Menyanthes trifoliata
Potamogeton natans
Potentilla palustris
Sparganium emersum

***Scirpus acutus*
community type**

This community type occurs around Lake Ozette, Clallam County. It occurs in the permanently flooded zone in water < 1 m deep during the summer. Soils are mostly firm sand with some organic material and pockets of soft silts. Wave action is reduced within the stand by the *Scirpus acutus* stems.

This community type is clearly identified by the presence of *Scirpus acutus* which forms large circular colonies. There appear to be energy, substrate and species composition gradients which run through the community type from the open water towards the shore. Energy and particle size decrease shoreward as species-richness increases.

The understory of this community type is similar to the *Equisetum fluviatile* community type but has *Utricularia intermedia* and more *Ranunculus flammula*. Shoreward, on soft silty soils, this community type intergrades with the *Carex sitchensis**-*Potentilla palustris* variant of the *C. sitchensis* community type. Christy (1993) listed a *Scirpus acutus* community in Oregon.

Indicator species:

Ranunculus flammula 1-50%
Scirpus acutus 35%

Other species:

<i>Carex sitchensis</i> *	<i>Ludwigia palustris</i>
<i>Carex vesicaria</i>	<i>Menyanthes trifoliata</i>
<i>Dulichium arundinaceum</i>	<i>Nuphar polysepalum</i>
<i>Eleocharis palustris</i> *	<i>Potentilla palustris</i>
<i>Equisetum fluviatile</i>	<i>Utricularia intermedia</i>
<i>Isoetes bolanderi</i>	

***Sparganium eurycarpum*
community type**

This community type occurs mostly in bays around Lake Ozette, Clallam County. It was not surveyed well because of the water depth and soft substrates. It occurs in water at least 30 cm deep. The substrates are usually soft silt and organic debris or muck. The soft substrates sometimes overlay sand.

This community type is easily identified by prominent stands of *Sparganium eurycarpum*. Associated species were not well surveyed except in the rare cases where the community type occurred in shallow water and on firm substrates.

In places, this community type forms a mosaic with the *Nuphar polysepalum* community type. On firm substrates, the community type has associated species similar to the *Equisetum fluviatile* community type. Christy (1993) listed a *Sparganium eurycarpum* community in Oregon.

Indicator species:

Sparganium eurycarpum 25-50%

Other species:

<i>Equisetum fluviatile</i>	<i>Nuphar polysepalum</i>
<i>Lobelia dortmanna</i>	<i>Ranunculus flammula</i>

***Carex obnupta*
community type**

This community type occurs occasionally in western Clallam County and southwest Washington. It occurs in areas that are flooded year-round or nearly year-round. Soils are sands, muck or fibrous peat. This community type seems most common in at least partial shade.

This community type often is solely composed of *Carex obnupta*. The vegetation is lush. Where it is flooded year-round, *C. obnupta* forms pedestaled bases.

This community type intergrades with several other communities forming mosaics or ecotonal vegetation. Communities which commonly intergrade with this one are dominated by *Carex rostrata**, *Carex sitchensis**, *Spiraea douglasii*, *Pyrus fusca**, *Alnus rubra* and *Picea sitchensis*.

Banner *et al.* (1986) listed a *Carex sitchensis**-*Carex obnupta* community which may be similar to this community type. They also described *C. obnupta* as a dominant species along lake and stream sides. Christy (1993) listed several references for a *C. obnupta* community in Oregon. This community type is similar to the *C. obnupta* community type in the northern Puget Trough region.

Indicator species:

Carex obnupta 60-90%

Other species:

*Carex rostrata**
*Carex sitchensis**
Carex vesicaria

Nuphar polysepalum
Oenanthe sarmentosa
Spiraea douglasii

***Carex obnupta*-
Juncus nevadensis-
Ranunculus
flammula
community type**

This community type occurs around the margin of Lake Ozette, Clallam County. It is located along the waterward edge of the seasonally flooded zone, usually on a low bench up to 60 cm above the lake bed. Soils remain wet year-round. It is seasonally flooded and waves carry water over the community year-round. It is abraded by waves. Substrates are sandy with some fibrous peat.

An apparent variant of this community type occurs in coastal dunes in deflation areas that are flooded year-round. Soils are sands with organic material.

The vegetation is low growing, somewhat mat forming, and is immediately recognizable within the landscape. It lies between the permanently flooded lake bed and shrub-dominated communities of the seasonally flooded lake shore wetlands. The most prevalent species are *Juncus nevadensis*, *Carex obnupta* and *Ranunculus flammula*. Additional indicator species include *Equisetum fluviatile*, *Mentha arvensis* and *Carex lenticularis*. Species which are sometimes abundant but not indicators are *Carex sitchensis**, low growing *Myrica gale*, low growing *Salix* spp. and *Potentilla palustris*. Species only found in the coastal dune variant are followed by (cd) in the list below. Those species found in both the main type and variant are followed by (both).

This community type is very similar to the *Carex sitchensis**-*Potentilla palustris* variant of the *C. sitchensis* community type. Wiedemann (1984) described a *Carex obnupta*-*Potentilla pacifica** community in deflation plain wetlands which is flooded four to six months of the year.

Indicator species:

Carex lenticularis 5-15%
Carex obnupta (both) 5-15%
Equisetum fluviatile 0-3%

Juncus nevadensis (both) 5-20%
Mentha arvensis 2-3%
Ranunculus flammula (both)
(1)15-20%

Other species:

<i>Aster</i> sp.	<i>Lobelia dortmanna</i>
<i>Carex hindsii</i> (cd)	<i>Lycopodium inundatum*</i> (cd)
<i>Carex sitchensis*</i>	<i>Lycopus uniflorus</i>
<i>Carex vesicaria</i>	<i>Myosotis laxa</i>
<i>Deschampsia cespitosa</i>	<i>Potentilla pacifica*</i> (both)
<i>Drosera rotundifolia</i>	<i>Potentilla palustris</i>
<i>Eleocharis palustris*</i>	<i>Salix</i> spp.
<i>Gentiana sceptrum</i> (both)	<i>Spiranthes romanzoffiana</i>
<i>Juncus balticus</i>	<i>Utricularia intermedia</i>
<i>Juncus covillei</i>	<i>Veronica scutellata</i>
<i>Juncus supiniformis</i>	<i>Viola palustris</i>

***Carex rostrata**
community type**

This community type is scattered along the outer coast of Washington, mostly in dune troughs and limnogenous peatlands. It is either seasonally or permanently flooded. Substrates are typically fibrous peat but can contain some sphagnum. The community type may be ecotonal between low and high nutrient conditions.

This community type is dominated by *Carex rostrata** which is also the only consistently occurring species. Associated species are highly variable. It is usually either in a mosaic with *Myrica gale* communities, in which case some *Sphagnum* spp. are usually present, or it is in a mosaic with *Carex sitchensis** dominated vegetation.

Banner *et al.*, (1986) noted *Carex rostrata** as a dominant species along lakes and streams. Christy (1993) listed several references for a *C. rostrata* community in Oregon. The recent determination that *C. rostrata* in Washington is mostly *C. utriculata* (Griffiths 1989) makes comparisons more complex.

Indicator species:

*Carex rostrata** 50-80%

Other species:

<i>Alnus rubra</i>	<i>Nephrophyllidium crista-galli</i>
<i>Angelica genuflexa</i>	<i>Nuphar polysepalum</i>
<i>Athyrium filix-femina</i>	<i>Oenanthe sarmentosa</i>
<i>Carex obnupta</i>	<i>Picea sitchensis</i>
<i>Carex sitchensis*</i>	<i>Potentilla palustris</i>
<i>Deschampsia cespitosa</i>	<i>Rhamnus purshiana</i>
<i>Epilobium</i> sp.	<i>Sanguisorba officinalis</i>
<i>Galium trifidum</i>	<i>Scirpus microcarpus</i>
<i>Gentiana sceptrum</i>	<i>Sphagnum</i> spp.
<i>Glyceria elata</i>	<i>Spiraea douglasii</i>
<i>Hypericum anagalloides</i>	<i>Thuja plicata</i>
<i>Juncus balticus</i>	<i>Tsuga heterophylla</i>
<i>Lycopus uniflorus</i>	<i>Typha latifolia</i>
<i>Lysichitum americanum*</i>	<i>Veronica americana*</i>
<i>Myosotis laxa</i>	<i>Veronica scutellata</i>
<i>Myrica gale</i>	<i>Viola palustris</i>

***Carex rostrata**-
*Carex sitchensis**
community type**

This community type occurs throughout this region. It can be permanently flooded or seasonally flooded and then saturated the rest of the year. It is associated with ponded water or slow-moving streams. Soils are mostly fibrous peat and muck and can be very soft.

The vegetation in this community type is lush but often composed of few species. Only one stand was found which was species-rich. *Carex sitchensis** and *Carex rostrata** are codominant but the remaining species composition is variable.

This community type is most similar to the *Carex rostrata** and *Carex sitchensis** community types.

Indicator species:

*Carex rostrata** 25-50%
*Carex sitchensis** 25-50%

Other species:

<i>Alnus rubra</i>	<i>Picea sitchensis</i>
<i>Athyrium filix-femina</i>	<i>Potentilla palustris</i>
<i>Calamagrostis canadensis</i>	<i>Sanguisorba officinalis</i>
<i>Carex cusickii</i>	<i>Scirpus microcarpus</i>
<i>Carex obnupta</i>	<i>Sparganium</i> sp.
<i>Galium trifidum</i>	<i>Spiraea douglasii</i>
<i>Gentiana sceptrum</i>	<i>Stellaria longipes</i>
<i>Juncus balticus</i>	<i>Veronica americana</i> *
<i>Lysichitum americanum</i> *	<i>Viola palustris</i>
<i>Myrica gale</i>	

***Carex sitchensis**
community type**

This community type occurs throughout the western Olympic Peninsula and southwest Washington region. It occurs in areas that are permanently flooded along the margins of ponds or slowly flowing water. Soils are composed of fibrous peat and muck. Logs and the pedestaled bases of the sedges provide elevated substrates for typically upland species.

The vegetation is lush and is dominated by *Carex sitchensis**. *Oenanthe sarmentosa* is codominant along some stream channels. *Potentilla palustris* is codominant along some pond margins.

Banner *et al.* (1986) listed a *Carex sitchensis** community. They also listed *C. sitchensis-Deschampsia cespitosa* and *C. sitchensis-Carex obnupta* communities. Christy (1993) listed several references to a *C. sitchensis* community in Oregon.

Indicator species:

*Carex sitchensis** (40)60-90%

Other species:

<i>Agrostis exarata</i>	<i>Lysichitum americanum</i> *
<i>Alnus rubra</i>	<i>Oenanthe sarmentosa</i>
<i>Angelica genuflexa</i>	<i>Physocarpus capitatus</i>
<i>Athyrium filix-femina</i>	<i>Picea sitchensis</i>
<i>Epilobium</i> sp.	<i>Potentilla palustris</i>
<i>Equisetum fluviatile</i>	<i>Spiraea douglasii</i>
<i>Galium</i> spp.	<i>Stellaria calycantha</i>
<i>Glyceria elata</i>	<i>Veronica americana</i> *
<i>Lonicera involucrata</i>	<i>Veronica scutellata</i>

***Carex sitchensis**-
Potentilla palustris
variant**

This variant occurs around Lake Ozette, Clallam County. It is located on the lake margin, in some embayments and in small backwater ponds. It occurs along the lakeward edge of the seasonally flooded zone. It is seasonally to permanently flooded and receives water from waves year-round. Generally, soils are silty with fibrous peat. In the backwater areas, soils are soft silt and muck. The variant sometimes occurs as closely spaced hummocks in the ecotone between permanently and seasonally flooded areas. The sedge hummocks provide a peat substrate elevated above the permanently flooded zone.

This variant is dominated by lush *Carex sitchensis**. *Potentilla palustris* is consistently present and occasionally is codominant. *Equisetum fluviatile* is

usually present. *Carex vesicaria* and *Dulichium arundinacea* are often present.

This variant is closely related to the *Carex obnupta*-*Juncus nevadensis*-*Ranunculus flammula* community type. It occurs in slightly more protected areas or slightly inland of the latter. It is clearly dominated by tall sedges as opposed to the low mat-like growth form of the latter.

Indicator species:

*Carex sitchensis** 40%
Carex vesicaria 5-40%
Equisetum fluviatile 2-3%
Potentilla palustris 10-15%

Other species:

<i>Aster</i> sp.	<i>Ludwigia palustris</i>
<i>Boykinia</i> cf <i>major</i>	<i>Mentha arvensis</i>
<i>Carex lasiocarpa</i>	<i>Menyanthes trifoliata</i>
<i>Carex lenticularis</i>	<i>Myosotis laxa</i>
<i>Carex obnupta</i>	<i>Myrica gale</i>
<i>Carex oederi</i>	<i>Nuphar polysepalum</i>
<i>Deschampsia cespitosa</i>	<i>Ranunculus flammula</i>
<i>Dulichium arundinaceum</i>	<i>Salix</i> sp.
<i>Eleocharis palustris</i> *	<i>Utricularia intermedia</i>
<i>Juncus nevadensis</i>	<i>Veronica scutellata</i>
<i>Juncus supiniiformis</i>	<i>Viola palustris</i>

***Juncus falcatus*-
*Juncus nevadensis***

This community type occurs in coastal dunes in southwestern Washington. It is a deflation plain community type which occurs in areas that are typically flooded through early summer. Soils are sands with organic material.

The vegetation is composed of low growing herbaceous plants and is characterized by the occurrence of *Juncus falcatus* and *Juncus nevadensis*.

Wiedemann (1984) described a *Juncus falcatus*-*Trifolium wormskjoldii* community from the deflation plain in areas that are flooded one to three months during the winter.

Indicator species:

Juncus falcatus
Juncus nevadensis

Other species:

<i>Agrostis</i> spp.	<i>Epilobium franciscanum</i>
<i>Aster chilensis</i>	<i>Sisyrinchium californicum</i>
<i>Centaurium umbellatum</i> *	<i>Trifolium wormskjoldii</i>

***Myrica gale*/*Aster*
sp.-*Boykinia major*-
Deschampsia
cespitosa
community type**

This community type occurs around Lake Ozette, Clallam County. It occurs near the landward end of the seasonally flooded zone around the lake margin. It is seasonally flooded. Substrates are mostly sand with some heath and fibrous peat.

Most species within this community type are stunted. The shrub layer is usually less than 0.3 m tall but can be as much as 1.3 m high and have an open canopy. The herb layer is unusually species-rich and is composed of many species which have high fidelity to the community type. It contains some species typical of sphagnum bogs.

This community type is easily distinguished from the surrounding vegetation by its low growth form. It intergrades with the *Myrica gale*-*Spiraea douglasii*/*Boykinia* sp.-*Carex obnupta* community type which is located waterward of it.

Indicator species:

Aster sp. 1-10(25)%
Boykinia cf *major* 2-15%
Carex obnupta 3-10(15)%

Deschampsia cespitosa 2-15(20)%
Myrica gale 5-40%
*Panicum occidentale** 1-5%

Other species:

Agrostis alba
Agrostis oregonensis
Agrostis scabra
Athyrium filix-femina
Botrychium multifidum
Calamagrostis canadensis
*Calamagrostis crassiglumis**
Carex buxbaumii
Carex interior complex
Carex lenticularis
Carex livida
Carex oederi
*Carex sitchensis**
Dodecatheon jeffreyi
Drosera rotundifolia
Dulichium arundinaceum
Equisetum fluviatile
Galium sp.
*Habenaria dilatata**
Gentiana sceptrum
Hypericum anagalloides
Juncus balticus
Juncus covillei
Lonicera involucrata

*Lycopodium inundatum**
Lycopus uniflorus
Maianthemum dilatatum
Mentha arvensis
Physocarpus capitatus
Plantago macrocarpa
*Potentilla pacifica**
Prunella vulgaris
Pteridium aquilinum
*Pyrus fusca**
Ranunculus flammula
Rhynchospora alba
Rosa nutkaensis
Salix spp.
Sanguisorba officinalis
Sisyrinchium sp.
Sphagnum spp.
Spiraea douglasii
Spiranthes romanzoffiana
*Tofieldia glutinosa**
Trientalis arctica
Vaccinium uliginosum
Viola palustris

***Myrica gale*/*Carex rostrata**
community type**

This community type occurs in northwestern Grays Harbor County. Soils are wet year-round and seasonally flooded. It may be seasonally isolated from minerotrophic water. Soils are fibrous and heath peat.

The vegetation is dominated by *Myrica gale*. *Carex rostrata** is abundant to codominant. *Sanguisorba officinalis* is usually present and sometimes abundant. *Sphagnum* spp. are often present although with low percent cover.

This community type is related to the *Myrica gale*/*Carex rostrata**-*Nephrophyllidium crista-galli*-*Sanguisorba officinalis*-/*Sphagnum* spp. variant of the *Myrica gale*/*Sanguisorba officinalis*/*Sphagnum* spp. community type.

Indicator species:

*Carex rostrata** (5)10-25%
Myrica gale 60-95%
Sanguisorba officinalis 0-25%
Sphagnum spp. 0-5%

Other species:

Deschampsia cespitosa
Gentiana sceptrum
Hypericum anagalloides
Juncus ensifolius
*Kalmia occidentalis**
Ledum groenlandicum
Picea sitchensis

Pinus contorta
*Pyrus fusca**
Rhamnus purshiana
Spiraea douglasii
Thuja plicata
Viola cf palustris

***Myrica gale/Carex
sitchensis**
community type**

This community type occurs in Clallam and northern Grays Harbor counties. It occurs in basins, around lake margins and along low-gradient streams. It is wet year-round and flooded seasonally. Soils are muck, and fibrous and heath peat.

The community type is codominated by *Myrica gale* and *Carex sitchensis**. *Spiraea douglasii*, *Salix* spp., *Carex obnupta* and *Potentilla palustris* are always present.

Indicator species:

Carex obnupta 1-5%
*Carex sitchensis** 20-50%
Myrica gale 30-80%

Potentilla palustris <1-5%
Salix spp. 2-10%
Spiraea douglasii <1-15%

Other species:

Boykinia sp.
Carex vesicaria
*Cornus stolonifera**
Juncus nevadensis

*Lysichitum americanum**
Mentha arvensis
Physocarpus capitatus
Ranunculus flammula

***Myrica gale/Carex
sitchensis*-
Sanguisorba
officinalis*
community type**

This community type occurs in northern Grays Harbor County. It occurs in areas with ground water discharge and surface run-off. It is wet year-round and probably seasonally flood. Soils are fibrous and heath peat.

This community type is a *Myrica gale* thicket. *Carex sitchensis** is usually codominant and *Sanguisorba officinalis* is abundant to codominant.

This community type is related, and may be intermediate, to the *Myrica gale/Lysichitum americanum** and the *M. gale/Carex sitchensis*-Sanguisorba officinalis/Sphagnum* spp. community types. The National Wetlands Working Group (1988) noted a *M. gale/C. sitchensis* association along sloughs, slow-moving streams and the margins of brackish tidelands. Banner *et al.* (1986) noted a *M. gale/C. sitchensis* shrub fen.

Indicator species:

*Carex sitchensis** 15-20%
Myrica gale 70-80%
Sanguisorba officinalis 10-30%

Other species:

Hypericum anagalloides
Juncus ensifolius
*Kalmia occidentalis**
Ledum groenlandicum
*Lysichitum americanum**

Pinus contorta
Sphagnum spp.
Spiraea douglasii
Thuja plicata
Tsuga heterophylla

***Myrica gale/
Lysichitum
americanum**
community type**

This community type occurs in northwestern Grays Harbor County. It is associated with springs, seeps and very slow-moving streams. It is seasonally to permanently flooded. Soils are a mixture of fibrous and heath peat.

This is a lush community type codominated by *Myrica gale* and *Lysichitum americanum**. *Myrica gale* is 1.3 to 2.5 m tall. *Spiraea douglasii* is usually present and is codominant in places. Scrubby *Picea sitchensis* individuals are often scattered through the community type. *Pyrus fusca**, *Lonicera involucrata* and *Gaultheria shallon* are common. One stand is codominated by *Typha latifolia*.

This community type is most similar to, and intergrades with, the *Myrica gale/Carex sitchensis*-Sanguisorba officinalis* community type.

Indicator species:

Gaultheria shallon 0-10(30)%
Lonicera involucrata 0-2%
*Lysichitum americanum** (15)25-60%
Myrica gale 50-90%

Picea sitchensis 0-15%
*Pyrus fusca** 0-10%
Spiraea douglasii 0-40%

Other species:

Blechnum spicant
Carex obnupta
*Carex sitchensis**
Epilobium sp.
Ledum groenlandicum
Lonicera involucrata
Menziesia ferruginea
Oenanthe sarmentosa

Physocarpus capitatus
Rubus ursinus
Salix sp.
Thuja plicata
Tsuga heterophylla
Typha latifolia
Vaccinium ovatum

***Myrica gale-Spiraea
douglasii/Boykinia
sp.-Carex obnupta
community type***

This community type occurs around Lake Ozette, Clallam County. It is seasonally flooded and receives water from, and is abraded by, waves year-round. The substrate is mostly sand and there is some heath and fibrous peat.

This community type is the dense, tall *Myrica gale* zone that dominates the seasonally flooded wetlands around Lake Ozette. The shrub layer is 1.3 to 2 m tall and forms a nearly closed canopy. There is a gradient through the community type from the permanently flooded waterward edge to higher and drier areas shoreward. The waterward side that is constantly scoured by waves is dominated by *M. gale* and has low abundance of other species. The landward side is less often affected by wave action, tends to have more soil development, and has greater species-richness. *Myrica gale* is dominant. *Spiraea douglasii* is abundant and often codominant. *Boykinia* sp. and *Carex obnupta* are always present and usually abundant on the landward side.

Waterward, this community type intergrades with the *Carex obnupta-Juncus nevadensis-Ranunculus flammula* community type and *Carex sitchensis*-Potentilla palustris* variant of the *C. sitchensis* community type. Landward, it intergrades with the *Myrica gale/Aster* sp.-*Boykinia major-Deschampsia cespitosa* community type.

Kojima and Krajina (1975) described an association dominated by *Myrica gale*, *Spiraea douglasii* and *Carex sitchensis** which is somewhat similar to this community type.

Indicator species:

Boykinia cf major (1)10-75%
Carex obnupta (1)5-30%
Myrica gale 20-75%
Spiraea douglasii 15-35%

Other species:

Agrostis scabra
Aster sp.
*Calamagrostis crassiglumis**
*Carex sitchensis**
Carex vesicaria
Deschampsia cespitosa
Equisetum fluviatile
Gentiana sceptrum
Hypericum anagaloides
Lonicera involucrata

Maianthemum dilatata
Mentha arvensis
*Potentilla pacifica**
Prunella vulgaris
*Pyrus fusca**
Rosa nutkaensis
Salix spp.
Sanguisorba officinalis
Vaccinium uliginosum
Viola cf palustris

***Salix* spp.-*Spiraea douglasii*/*Carex obnupta* community type**

This community type occurs in northwestern Grays Harbor and western Clallam counties. It occurs in areas that are seasonally to permanently but shallowly flooded. Water can be standing or very slow-moving. The soils are very soft muck and organic material with large organic debris. Beaver activity is common. There is considerable microtopographic diversity including networks of stream channels, woody debris and mounded ground.

Salix spp. generally form an open canopy under which occur *Spiraea douglasii* and a species-rich herbaceous understory. *Carex obnupta* is always present and can be codominant. *Pyrus fusca** is usually present.

This community type is difficult to traverse and is poorly surveyed. This and other willow dominated communities will be revised as better information becomes available.

Indicator species:

Carex obnupta 5-50%
*Pyrus fusca** <1-10%
Salix spp. (10)20-50(75)%
Spiraea douglasii 10-20(80)%

Other species:

Agrostis scabra
Alnus rubra
Athyrium filix-femina
Carex cusickii
*Carex sitchensis**
Carex vesicaria
*Cornus stolonifera**
Equisetum fluviatile
Galium sp.
Gaultheria shallon
Ledum groenlandicum
Lonicera involucrata
Lycopus uniflorus
*Lysichitum americanum**

Menyanthes trifoliata
Oenanthe sarmentosa
Physocarpus capitatus
Picea sitchensis
Pinus contorta
Polypodium glycyrrhiza
Potentilla palustris
Rhamnus purshiana
Sparganium sp.
Sphagnum spp.
Tsuga heterophylla
Vaccinium sp.
*Veronica americana**
Veronica scutellata

***Salix hookeriana* community type**

This community type occurs along the outer coast of Washington, typically in deflation plains, dune troughs and around the margins of coastal lakes and ponds. It also occurs in freshwater areas around bays. The community type is flooded year-round to seasonally and is often in contact with groundwater. Soils are muck or peat, typically over sand.

This community type has two variants described below. In each variant, *Salix hookeriana* is dominant in the overstory. *Carex obnupta* is abundant to co-dominant.

***Salix hookeriana*/
Carex obnupta
variant**

This variant occurs along the coast in Grays Harbor and Pacific counties, mostly in the deflation plain and older dune troughs. There is standing water year-round which is a few decimeters to 2 m deep. Soils are sand, often with a soft, anoxic muck layer.

The vegetation is dominated by *Salix hookeriana* in the overstory and *Carex obnupta* in the understory. There can be high percent cover of *Myrica californica*, and *Alnus rubra* is usually present.

Wiedemann (1984) described a *Salix hookeriana*-*Myrica californica* shrub community from deflation plain areas where water stands most of the year.

Indicator species:

Salix hookeriana 30-80%
Carex obnupta 10-80%

Other species:

Alnus rubra *Myrica californica*
*Lysichitum americanum**

***Salix hookeriana*-
Spiraea douglasii
variant**

This variant occurs mostly in Grays Harbor and Pacific counties. It occurs in depressions or along the edge of coastal lakes and dune troughs. It is flooded year-round or during the winter and is subirrigated. Soils are fibrous and woody peat.

This variant forms dense to open stands. *Salix hookeriana* and *Spiraea douglasii* are codominant. *Carex obnupta* and *Lysichitum americanum** are always present and usually abundant.

This is probably a seral stage of the *Pyrus fusca**-*Salix hookeriana*/*Carex obnupta* variant of the *P. fusca* community type.

Indicator species:

Carex obnupta 2-10%
*Lysichitum americanum** 10-15%
Salix hookeriana 40-65%
Spiraea douglasii 40-50%

Other species:

Alnus rubra *Oenanthe sarmentosa*
Athyrium filix-femina *Typha latifolia*

***Spiraea douglasii*
community type**

This community type occurs throughout the western Olympic Peninsula and southwest Washington region. It can be either seasonally or permanently flooded. Soils are organic muck, fibrous peat and heath peat.

Spiraea douglasii typically forms dense nearly monospecific stands, 2 to 3 m tall. In some areas the community type is less dense and has a variety of herbaceous species in the understory.

Examples of this community type appear to intergrade with many different communities resulting in high variation, particularly in the understory. The two community types most similar are the *Salix* spp.-*Spiraea douglasii*

Carex obnupta and *S. douglasii*/*Carex sitchensis**. Christy (1993) listed a *S. douglasii* community in Oregon.

Indicator species:

Spiraea douglasii 50-100%

Other species:

Carex obnupta
*Carex rostrata**
Gaultheria shallon
*Lysichitum americanum**
Oenanthe sarmentosa
Physocarpus capitatus

Picea sitchensis
*Pyrus fusca**
Rhamnus purshiana
Salix spp.
Thuja plicata
Tsuga heterophylla

***Spiraea douglasii*/
*Carex sitchensis**
community type**

This community type occurs all along the outer coast of Washington. It is wet year-round and can be seasonally flooded. Soils are fibrous and heath peat and muck.

The vegetation is dominated by *Spiraea douglasii*. *Carex sitchensis** is always present and usually codominant. *Lysichitum americanum** is codominant where it occurs, but only occurred in about one third of the surveyed sites.

The National Wetlands Working Group (1988) noted a *Spiraea douglasii*/*Carex sitchensis** association along sloughs and slow moving streams in British Columbia. Banner *et al.* (1986) noted a *S. douglasii*/*C. sitchensis* shrub fen.

Indicator species:

*Carex sitchensis** 5-75%
*Lysichitum americanum** 0-70%
Spiraea douglasii 10-90%

Other species:

Alnus rubra
Angelica genuflexa
Athyrium filix-femina
Carex canescens
Carex obnupta
*Carex rostrata**
*Galium cymosum**
Galium trifidum
Gaultheria shallon
Ledum groenlandicum
Lonicera involucrata
Lycopus uniflorus

Oenanthe sarmentosa
Physocarpus capitatus
Picea sitchensis
Potentilla palustris
*Pyrus fusca**
Salix spp.
Scirpus microcarpus
Sphagnum spp.
Typha latifolia
Thuja plicata
Tsuga heterophylla
Veronica scutellata

***Picea sitchensis*-
Alnus rubra/
Lysichitum
*americanum**
community type**

This community type occurs throughout this region. It occurs on nearly flat, poorly drained ground associated with low-gradient streams or seeps. Soils are wet year-round and, in places, are permanently flooded. Fallen trees and soil mounds provide drier microsites. Soils are organic, ranging from soft muck to firm fibrous, heath and woody peat.

This community type has an open canopy with *Picea sitchensis* generally the most abundant conifer, although in a few sites *Thuja plicata* has the same cover value. *Alnus rubra* is generally present. Microtopographic differences are correlated with differences in hydrology and understory plant species composition. Depressions are usually permanently flooded and dominated by *Carex obnupta* and *Oenanthe sarmentosa*. Seasonally flooded areas usually have high percent cover of *Pyrus fusca**, *Rubus spectabilis*,

Lonicera involucrata, *Salix* spp., *Lysichitum americanum** and *C. obnupta*. Dry microsites are dominated by *Gaultheria shallon*.

Banner *et al.* (1986) described a Sitka spruce swamp and Banner and Pojar (1987) described a skunk cabbage swamp forest, spruce subassociation which appear similar to the community type described here. Christy (1993) listed a similar *Picea sitchensis*/*Rubus spectabilis*/*Lysichitum americanum** community from central Oregon. The community type described here should not be confused with the *P. sitchensis* riparian wetland communities which are well drained, higher nutrient and do not have peat or muck soils.

Indicator species:

Alnus rubra 0-25%
Athyrium filix-femina 0-10%
Carex obnupta 0-50%
Gaultheria shallon 0-70%
*Lysichitum americanum** 10-30%

Oenanthe sarmentosa 1-15%
Picea sitchensis 15-35%
*Pyrus fusca** 0-15%
Rubus spectabilis 0-10%
Tsuga heterophylla 0-15%

Other species:

Agrostis exarata
Angelica genuflexa
Blechnum spicant
Botrychium multifidum
Calamagrostis nutkaensis
*Carex rostrata**
*Carex sitchensis**
Carex vesicaria
*Cornus canadensis**
*Cornus stolonifera**
Epilobium sp.
Galium sp.
Glyceria elata
Hypericum anagalloides
Juncus balticus
Ledum groenlandicum
Lonicera involucrata
Maianthemum dilatata
Menziesia ferruginea
Myrica gale

Nuphar polysepalum
Physocarpus capitatus
Polygonum sp.
Puccinellia sp.
Rhamnus purshiana
Rubus ursinus
Salix spp.
Salix hookeriana
*Salix lasiandra**
Scirpus microcarpus
Sparganium emersum
Sphagnum spp.
Spiraea douglasii
Typha latifolia
Vaccinium alaskaense
Vaccinium ovatum
Vaccinium parvifolium
*Veronica americana**
Viburnum edule
Viola palustris

***Pyrus fusca**
community type**

This community type occurs throughout this region. It typically forms the uppermost edge of wetlands. It is seasonally flooded and then soils are either saturated or wet the rest of the year. Soils range from black anoxic muck, to peat, to sand with organic matter.

The species composition of this community type varies with the composition of the adjacent wetland community but is always dominated by *Pyrus fusca**. *Pyrus fusca** forms a closed to nearly-closed canopy. Understory vegetation is either absent or sparser than the adjacent associated community. Three variants are described.

***Pyrus fusca**/
Calamagrostis
canadensis variant**

This variant is rare and occurs in western Clallam County. It occurs on a low rise and is wet year-round. It may be flooded seasonally and is possibly fed by both surface and groundwater. Soils are fibrous and woody peat over sand.

*Pyrus fusca** forms an open canopy over a dense understory of *Calamagrostis canadensis*.

Indicator species:

Calamagrostis canadensis 25%
*Pyrus fusca** 50%

Other species:

Agrostis oregonensis
Blechnum spicant
Boykinia cf major
Carex obnupta
*Carex rostrata**

*Carex sitchensis**
Gentiana scepstrum
Lycopus uniflorus
Myrica gale
Trisetum canescens

***Pyrus fusca**/*Carex obnupta* variant**

This variant occurs all along the outer coast of Washington. It is wet year-round and usually seasonally flooded. Soils are muck, fibrous peat and woody peat.

The vegetation is dominated by *Pyrus fusca** and *Carex obnupta*. *Boykinia* spp. are present to codominant where the community type occurs in Clallam County. The canopy is dense but open.

This variant appears to be transitional to a *Picea sitchensis* dominated wet forest. Banner *et al.* (1986) listed a *Malus fusca*-*Salix* spp./*Carex obnupta* shrub fen which may be similar to this.

Indicator species:

Boykinia spp. 0-40%
Carex obnupta 20-60(80)%
*Pyrus fusca** 25-75%

Other species:

Alnus rubra
Athyrium filix-femina
*Cornus stolonifera**
*Galium cymosum**
Gaultheria shallon
Lonicera involucrata
*Lysichitum americanum**
Maianthemum dilatatum

Menziesia ferruginea
Physocarpus capitatus
Picea sitchensis
Rhamnus purshiana
Rosa nutkensis
Salix spp.
Spiraea douglasii
Vaccinium parvifolium

***Pyrus fusca**-*Salix hookeriana*/*Carex obnupta* variant**

This variant occurs along the southwest coast of Washington, in Grays Harbor and Pacific counties. It occurs in depressions and along the edges of coastal lakes and dune troughs. Soils are fibrous peat, often overlying sand. It is wet year-round and can be flooded during the winter. It is often in contact with groundwater.

The shrubs form a dense canopy 4 to 6 m tall. Stands appear to be maintained by windfall, beaver pruning and vigorous resprouting.

Banner *et al.* (1986) noted a *Malus fusca*-*Salix* spp./*Carex obnupta* shrub fen which may be similar to this. Christy (1993) listed the community described here as occurring along the Oregon coast.

Indicator species:

Carex obnupta 40-70%
*Lysichitum americanum** 25-60%
*Pyrus fusca** 15-30%

Salix hookeriana 40-75%
Salix sitchensis 20-40%
Spiraea douglasii 5-40%

Other Species:

Gaultheria shallon
Ledum groenlandicum
Lonicera involucrata
Oenanthe sarmentosa

Picea sitchensis
Pinus contorta
Vaccinium parvifolium

***Thuja plicata-Tsuga heterophylla/Lysichitum americanum** community type**

This community type occurs throughout this region. The water table is slightly above to slightly below the soil surface. It is found on flats or depressional areas which are poorly drained and in which the soil is poorly aerated. It occurs in areas with perched water tables, groundwater discharge, headwater areas or adjacent to small, low-gradient streams. Soils are organic. Large woody debris, root wads, soil hummocks, and fallen logs provide substrates elevated above the soil surface.

This community type is characterized by relatively large *Tsuga heterophylla* and candelabra-shaped *Thuja plicata*. *Alnus rubra* can be codominant. *Sphagnum* spp. may be present but don't exceed 15 percent cover. Microtopographic differences are correlated with differences in hydrology and plant species composition. Depressions are permanently flooded to saturated and have high percent cover of *Lysichitum americanum**. *Gaultheria shallon*, *Vaccinium alaskaense*, *Menziesii ferruginea* and *Rubus spectabilis* are the dominant shrub species, the first three primarily occurring on raised ground or fallen logs.

This community type intergrades with the *Thuja plicata-Tsuga heterophylla/Gaultheria shallon/Lysichitum americanum*/Sphagnum* spp. community type. It appears to be influenced by higher nutrient water and the trees tend to be larger than the latter community type. The two community types seem to intergrade and may prove to be different forms of the same community type.

The community type described here lumps *Thuja plicata/Lysichitum americanum** and *Tsuga heterophylla/L. americanum* community types and associations. It is described by Kojima and Krajina (1975) and Henderson *et al.* (1989). Banner *et al.* (1986) described a red-cedar swamp and Banner and Pojar (1987) described a skunk cabbage swamp forest, cedar-hemlock subassociation which are similar to the community type described here. It is similar to the *T. plicata-L. americanum* and *T. plicata/Coptis* spp. associations described by Orloci (1965). Christy (1993) listed a *T. heterophylla/Acer circinatum/L. americanum* community in Oregon. It is similar to the *T. plicata-T. heterophylla/L. americanum* community type in the lowlands of the northern Puget Trough region.

Indicator species:

Gaultheria shallon (10)25-30(90)%
*Lysichitum americanum** 5-50%
Menziesii ferruginea 0-5%
Rubus spectabilis 0-10%

Thuja plicata 10-35%
Tsuga heterophylla 20-60%
Vaccinium alaskaense 0-20%

Other species:

Abies amabilis
Acer circinatum
Agrostis aequivalvis
Alnus rubra
Athyrium filix-femina
Blechnum spicant
Boykinia major
Calamagrostis nutkaensis
Carex interior complex
Carex obnupta

Ledum groenlandicum
Maianthemum dilatatum
Myrica gale
Oenanthe sarmentosa
Picea sitchensis
*Pyrus fusca**
Rhamnus purshiana
Rubus ursinus
Sambucus racemosa
Sphagnum spp.

Coptis asplenifolia
Coptis trifolia
*Cornus canadensis**
*Dryopteris austriaca**
Equisetum arvense

Spiraea douglasii
Tiarella trifoliata
Vaccinium ovalifolium
Vaccinium ovatum
Vaccinium parvifolium

Surge Plain Wetlands

Surge plain wetlands (see page 4) in the western Olympic Peninsula and southwest Washington region occur along the tidal reaches of large rivers. They typically occur in relatively broad floodplains with braided and distributary channels. During incoming tides, freshwater backs-up in the river and slough channels and spills over the islands and adjacent floodplain. Typically the overflow water is fresh (< 0.5 parts per thousand salt). Occasionally, there is some salt water influence, particularly along channels. During low tides, water drains from the floodplain and sloughs. Within the surge plain, there is topographic relief. There can be braided channels of the main river, stream channels bringing runoff from adjacent uplands, slough channels with dendritic branches extending upriver and inland, natural levees along the river and major slough channels, shallow basins inland of the levees, large woody debris and mounded areas formed by the bases and roots of upturned trees. Correlated with this topographic relief are differences in hydrology and vegetation.

Along the outer coast of Washington, the surge plain falls within the Sitka spruce zone (Franklin and Dyrness 1973). Franklin and Dyrness mention Sitka spruce tidal wetlands but do not describe them. The predominant tree in these surge plains is *Picea sitchensis* and it is used to distinguish this kind of surge plain from that found further up-river along the Columbia River. The Sitka spruce surge plain is composed of several plant communities, some herb dominated, others shrub or tree dominated. Different communities are inundated for different lengths of time and at least some are salt tolerant. Herbaceous communities tend to occur along slough and river channels and in the low areas back from the channels. Shrub-dominated communities occur in the low areas back from the channels and along channels just above the herb dominated communities. Forested communities tend to occur along the natural levees but also along well drained lower areas, usually along small channels.

SURGE PLAIN WETLAND COMMUNITY TYPES

Athyrium filix-femina community type

This community type occurs on surge plain terraces mostly on the downstream side and in the interior of islands. The terraces are inundated with freshwater at most high tides. They are dissected by sloughs, which are often dammed by beavers, creating areas that are permanently flooded. Soils are a mixture of clay, silt and organic matter.

This is a broad category including most herbaceous surge plain meadows in this region. The vegetation is lush. Most of the meadows are dominated by *Athyrium filix-femina*. Some areas are dominated by *Carex obnupta*, *Aster* sp., *Scirpus microcarpus* and/or *Scirpus acutus*. *Typha latifolia* can codominate.

Christy (1993) listed this community from along the Oregon coast.

Indicator species:

Athyrium filix-femina 15-80%

Other species:

<i>Agrostis exarata</i>	<i>Lysichitum americanum*</i>
<i>Alnus rubra</i>	<i>Mentha arvensis</i>
<i>Angelica genuflexa</i>	<i>Menyanthes trifoliata</i>
<i>Aster</i> sp.	<i>Myosotis laxa</i>
<i>Calamagrostis canadensis</i>	<i>Oenanthe sarmentosa</i>
<i>Calamagrostis nutkaensis</i>	<i>Physocarpus capitatus</i>
<i>Caltha asarifolia*</i>	<i>Picea sitchensis</i>
<i>Carex lyngbyei</i>	<i>Poa palustris</i>
<i>Carex obnupta</i>	<i>Potentilla pacifica*</i>
<i>Carex stipata</i>	<i>Pyrus fusca*</i>
<i>Deschampsia cespitosa</i>	<i>Rubus spectabilis</i>
<i>Eleocharis palustris*</i>	<i>Rubus ursinus</i>
<i>Epilobium</i> sp.	<i>Rumex occidentalis</i>
<i>Equisetum</i> sp.	<i>Salix</i> spp.
<i>Galium aparine</i>	<i>Scirpus microcarpus</i>
<i>Galium cymosum*</i>	<i>Scirpus validus*</i>
<i>Habenaria dilatata*</i>	<i>Sidalcea hendersonii</i>
<i>Heracleum lanatum</i>	<i>Spiraea douglasii</i>
<i>Impatiens</i> sp.	<i>Thuja plicata</i>
<i>Lathyrus palustris</i>	<i>Typha latifolia</i>
<i>Lonicera involucrata</i>	<i>Veratrum californicum</i>

***Caltha asarifolia**-
*Lysichitum
americanum**
community type**

This community type occurs in surge plain sloughs. It occupies the second to the lowest intertidal zone dominated by macrophytic vegetation and is inundated during every high tide. It occurs on slopes on anoxic clay soils. Tidal water may be brackish on occasion, but is typically fresh.

The vegetation is scattered, with as little as 25% cover. *Caltha asarifolia** and *Lysichitum americanum** are the most abundant species.

Indicator species:

*Caltha asarifolia** 5-10%
*Lysichitum americanum** 5-20%

Other species:

Bidens cernua
Glyceria grandis
Sium suave

***Carex lyngbyei*
community type**

This community type occurs in surge plains along main river channels and sloughs. It is the most extensive of the surge plain slough communities. It is inundated during every high tide, usually with freshwater but occasionally with brackish water. It occurs on silts, clays and gravelly outwash.

This is a lush, generally monospecific community type. It intergrades with communities found higher and lower in the intertidal.

Christy (1993) listed a *Carex lyngbyei* community from freshwater tidal wetlands in Oregon.

Indicator Species:

Carex lyngbyei 35-90%

Other Species:

Carex stipata
Deschampsia cespitosa
Oenanthe sarmentosa
Poa palustris

*Galium cymosum**
*Habenaria dilatata**
Mimulus guttatus

Rumex occidentalis
Sidalcea hendersonii
Sparganium sp.

***Lilaeopsis
occidentalis-
Oenanthe
sarmentosa*
community type**

This community type occurs in surge plain sloughs. It occupies the lowest intertidal zone dominated by macrophytic vegetation and is inundated during every high tide. Tidal water may be brackish on occasion. Soils are anoxic clays.

The vegetation is sparse and composed of very few species. *Lilaeopsis occidentalis* and *Oenanthe sarmentosa* are the most abundant species.

Indicator species:

Lilaeopsis occidentalis 10-15%
Oenanthe sarmentosa 10-25%

Other species:

Alisma plantago-aquatica *Callitriche* sp.

***Typha latifolia*
community type**

This community type covers large areas of surge plain meadow but is difficult to access. It occurs on surge plain terraces, mostly in low interior areas and less frequently along slough channels. Sloughs carry freshwater to the areas during each high tide and water can be slow to drain away during low tides. Beavers have dammed some of the sloughs, permanently flooding some areas.

The community type is identified by the abundance of *Typha latifolia*. *Typha latifolia* can form monotypic stands, but more often is the dominant species in species-rich stands in the surge plain.

Indicator species:

Typha latifolia 10-50%

Other species:

Alnus rubra *Mentha arvensis*
Angelica genuflexa *Oenanthe sarmentosa*
Aster sp. *Picea sitchensis*
Athyrium filix-femina *Potentilla pacifica**
Calamagrostis nutkaensis *Pyrus fusca**
Caltha sp. *Rubus spectabilis*
Carex obnupta *Salix* spp.
Heracleum lanatum *Scirpus microcarpus*
Impatiens sp. *Scirpus validus**
Lathyrus palustris *Spiraea douglasii*
Lonicera involucrata *Veratrum californicum*
*Lysichitum americanum**

***Salix* spp./
*Lysichitum
americanum**
community type**

This is a shrub-dominated community type found throughout freshwater surge plains. It is flooded with freshwater at most high tides via sloughs. Beavers have dammed some of the sloughs, creating areas which are permanently flooded. Soils are a mixture of clay, silt and organic matter.

This is a dense, but not impenetrable shrub-dominated wetland community type. The shrub layer is tall forming a nearly closed canopy. The understory is patchy.

Thomas (1984) briefly described a *Salix sitchensis* and *Lysichitum americanum** dominated wetland community between river miles 17 and 40 on the Columbia River.

Indicator Species:

Athyrium filix-femina 0-75%
*Cornus stolonifera** 0-60%
*Lysichitum americanum** 3-25%

Physocarpus capitatus <1-20%
Salix spp. 25-45%
Spiraea douglasii 0-40%

Other Species:

Alnus rubra
Carex obnupta
Gaultheria shallon
Lathyrus palustris
Lonicera involucrata
Picea sitchensis

Polystichum munitum
*Pyrus fusca**
Rosa sp.
Rubus parviflorus
Rubus spectabilis

***Alnus rubra*/*Rubus spectabilis*/*Carex obnupta*-*Lysichitum americanum**
community type**

This is a relatively dry surge plain community type occurring on levees or other relatively high ground. Sloughs are widely spaced and only some areas are very often flooded during high tides. Soils are a mixture of clay, silt and organic matter. There are microtopographic differences within the community type correlated with differences in hydrology and understory plant species composition.

The community type is identified by the dominance of *Alnus rubra*, *Carex obnupta* and *Rubus spectabilis*. Depressions have high cover of *C. obnupta* and elevated areas have a higher cover of *R. spectabilis*. There are scattered conifers.

Indicator species:

Alnus rubra 20-80%
Carex obnupta 0-60%
*Lysichitum americanum** 0-60%
Rubus spectabilis 1-80%

Other species:

Acer circinatum
Athyrium filix-femina
Calamagrostis nutkaensis
Epilobium sp.
Equisetum sp.
Gaultheria shallon
Glyceria grandis
Impatiens sp.
Lonicera involucrata
Maianthemum dilatatum
Oenanthe sarmentosa
Picea sitchensis
Polystichum munitum

*Puccinellia pauciflora**
*Pyrus fusca**
Rhamnus purshiana
Rubus ursinus
Salix spp.
Sambucus sp.
Scirpus microcarpus
Spiraea douglasii
Thuja plicata
Tolmiea menziesii
Tsuga heterophylla
Typha latifolia
Vaccinium parvifolium

***Picea sitchensis*-
Alnus rubra/*Rubus spectabilis*/*Carex obnupta*
community type**

This community type occurs along major river and slough channels, on natural levees and on portions of surge plain terraces. It can be flooded during most high tides or only occasionally but seems to always occur in areas with good surface drainage. Soils are a mixture of clay, silt and organic matter, including large woody debris. It is flooded more frequently than the *Alnus rubra* community type.

This appears to be the climax surge plain wetland community type along the outer coast of Washington. It is identified by the abundance of *Picea sitchensis*. Understory dominance shifts with microtopography. *Carex obnupta* and *Lysichitum americanum** occur in the wetter microsites, *Rubus spectabilis* on slightly drier microsites and *Gaultheria shallon* on dry microsites, usually mounded ground or woody debris.

This community type is most similar to riparian vegetation found along the Black River in Thurston County and above tidal influence along the Chehalis River. Talor (1976) and Thomas (1980, 1984) described this community type and its distribution along the lower Columbia River. Christy (1993) listed a community along the coast of Oregon that may be similar to this.

Indicator species:

Alnus rubra <1-50%
Carex obnupta 0-50%
Gaultheria shallon 0-20%

*Lysichitum americanum** <1-35%
Picea sitchensis 10-70%
Rubus spectabilis <1-40%

Other species:

Acer circinatum
Acer macrophyllum
Adiantum pedatum
Athyrium filix-femina
Betula glandulosa
Carex deweyana
*Cornus stolonifera**
Fraxinus latifolia
Galium sp.
Gaultheria shallon
Glyceria sp.
Heracleum lanatum
Impatiens sp.
Lathyrus palustris
Lonicera involucrata
Maianthemum dilatatum
Myosotis laxa
Oemleria cerasiformis
Oenanthe sarmentosa
Physocarpus capitatus

Polystichum munitum
*Populus trichocarpa**
Pseudotsuga menziesia
*Pyrus fusca**
Rhamnus purshiana
Rosa sp.
Rosa nutkana
Rubus parviflorus
Rubus ursinus
Salix spp.
Salix sitchensis
Sambucus sp.
Scirpus microcarpus
Selaginella oregana
Spiraea douglasii
Thuja plicata
Tiarella trifoliata
Tsuga heterophylla
Vaccinium parvifolium
Vaccinium sp.





Glossary

Association: Potential or climax plant communities (Henderson *et al.* 1989).

Bog: A peat wetland with high percent cover of *Sphagnum* moss and/or predominantly sphagnum peat in the rooting zone, low nutrient availability, low pH and resulting distinctive flora.

Carr: Shrub dominated, minerotrophic wetland.

CF: Compare. Cf is used to indicate that the plant identification is in question and is used before the genus or species name in question. The name given is the species most similar to the collection.

Cover: Amount or percent of an area over which a plant species extends.

Deflation Plain: An area immediately leeward of a dune that has been eroded down to the water table.

Dominant: A plant species which covers at least 20 percent of an area.

Element: A basic unit of Washington's biologic and geologic environment identified as a needed component of a system of natural areas and defined in the Natural Heritage Plan. Elements can be plant or animal species, wetland types, aquatic communities, terrestrial plant communities or geologic features.

Emergent: Rooted vegetation which grows in shallow water and extends upright into the air. This is different than the use of the term by the U.S. Fish and Wildlife Service (Cowardin *et al.*, 1979).

Exotic: A non-native species.

Fen: A minerotrophic wetland having peat soils and dominated by herbaceous vegetation, usually sedges. *Sphagnum* spp. are not present or have minor occurrence both in the peat and the current flora.

Fibrous Peat: Peat composed of the remains of herbaceous plants, mostly sedges. It contains little, if any *Sphagnum* spp.

Forested Wetland: A wetland dominated by trees which are greater than 6 meters tall.

Frequency: The number of individuals of a plant species which occur in a given area.

Freshwater: Water with less than 0.5 parts per thousand of marine derived salt.

Heath Peat: Peat composed predominantly of the remains of shrubs.

Hummock: A small mound. Hummocks in bogs refer to small mounds, usually composed of *Sphagnum* moss.

Impounded: Backed-up or accumulated behind an obstruction. An impounded wetland is one in which there is no outflow or a partially blocked outflow, for instance, blockage caused by a sill or a beaver dam.

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- Lagg:** The mineral-rich drainage area between a sphagnum bog and the adjacent upland.
- Limnogenous Peatland:** Peat area developed along a flowing water system.
- Marsh:** In herb dominated wetland which has little or no peat accumulation.
- Minerotrophic Wetland:** A wetland fed by water which has been in contact with mineral soil.
- Minor Occurrence:** A plant species which covers less than 5 percent of a given area.
- Mire:** A generic name for peat wetlands dominated by sedges and mosses. It can refer to either nutrient rich or nutrient poor conditions and includes bogs and fens among other wetland types.
- Muck:** Peat decomposed to such a degree that plant parts can not be distinguished.
- Native:** Occurring in Washington prior to European influence.
- Natural Heritage Information System:** The body of information relating to natural heritage resources stored in the data system of the Natural Heritage Program.
- Oligotrophic:** Nutrient poor.
- Ombrogenous Peatland:** An area of peat in which the border is influenced by mineral soil water (runoff or groundwater) and the raised center is only influenced by precipitation.
- Ombrotrophic:** Rainwater fed as opposed to fed by ground or surface water.
- Peat:** The poorly decomposed remains of plants which have accumulated in water or in wet places.
- Poor fen:** A low nutrient, graminoid dominated, minerotrophic wetland. It can be intermediate between a fen and a bog.
- Pristine:** Having never been disturbed or altered by humans from pre-European settlement condition.
- Riparian Wetland:** A wetland along a stream or river which is affected by flowing water.
- Rooted Aquatic Zone:** A permanently flooded area that is dominated by plants that are rooted and either suspended in the water column or extending to and floating on the water's surface.
- Sloping Bog:** A peatland which has developed on a slope and is influenced by both mineral soil water and precipitation.
- Sociation:** A unit of actual vegetation, similar to "plant community", used by European researchers (Osvold 1933).
- Soligenous Peatland:** A peatland developed on a slope. They form in areas with an excess of moisture and are fed by both precipitation and surface water. See sloping bog.
- Sphagnum Bog:** A wetland with a high percent cover of *Sphagnum* moss and/or predominantly sphagnum peat in the rooting zone, low nutrient availability, low pH, and resultant distinctive flora.
- Sphagnum Peat:** Peat composed primarily of *Sphagnum* spp.
- Surge Plain:** An area flooded with freshwater by tidal action. Usually the lower reaches of large rivers.

Swamp: A forested, minerotrophic wetland.

Topogenous Bog: A peatland which has developed in a topographic depression.

Variant: Subunit of a wetland community type distinguished by differences in species composition.

Wetland: Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands are either at least periodically vegetated with hydrophytes, the substrate is predominantly undrained hydric soil or the substrate is nonsoil and is saturated with water or covered by shallow water during a significant portion of the growing season of each year.

Woody Peat: Peat composed of particles of partially decomposed wood.



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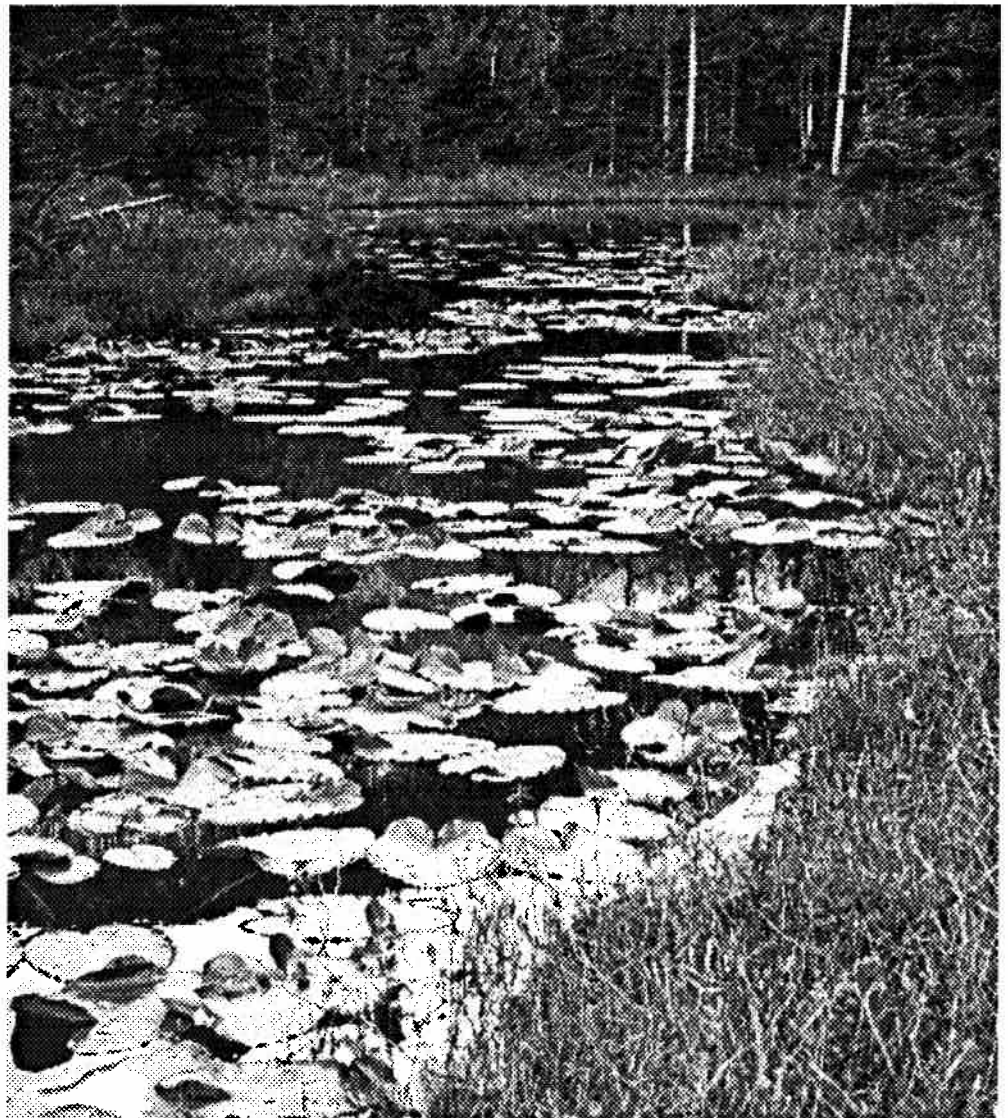
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Appendix A

Translation table between Washington Natural Heritage Program and Cowardin *et al.* (1979)

The following table lists the Washington Natural Heritage Program (WNHP) wetland community types (and variants) and the units in the Cowardin *et al.* (1979) classification in which each falls. The table is ordered in the same way as the WNHP classification. For each WNHP community type (or variant) is listed the corresponding Cowardin classification System, Subsystem, Class and Subclass. Some WNHP community types can be classified in more than one way in the Cowardin classification, in which case all options are given.



NATURAL HERITAGE

COWARDIN ET AL.

NORTH PUGET TROUGH

LOW ELEVATION SPHAGNUM BOG

Herb Dominated

	System	Subsystem	Class	Subclass
1. <i>Carex cusickii</i> / <i>Sphagnum</i> spp. community type	Palustrine		Emergent	Persistent
2. <i>Carex sitchensis</i> */ <i>Sphagnum</i> spp. community type	Palustrine		Emergent	Persistent
3. <i>Eriophorum chamissonis</i> / <i>Sphagnum</i> spp. community type	Palustrine		Emergent Moss-Lichen	Nonpersistent Nonpersistent
4. <i>Rhynchospora alba</i> / <i>Sphagnum</i> spp. community type	Palustrine		Emergent Moss-Lichen	Nonpersistent Nonpersistent

Shrub-Dominated

1. <i>Kalmia occidentalis</i> *- <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. community type	Palustrine		Scrub-Shrub Emergent	Broad-leaved Evergreen Persistent
a. <i>Kalmia occidentalis</i> */ <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub	Broad-leaved Evergreen
b. <i>Kalmia occidentalis</i> *- <i>Ledum groenlandicum</i> / <i>Xerophyllum tenax</i> / <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub	Broad-leaved Evergreen
c. <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub	Broad-leaved Evergreen
d. <i>Ledum groenlandicum</i> - <i>Gaultheria shallon</i> / <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub	Broad-leaved Evergreen
e. <i>Ledum groenlandicum</i> / <i>Carex rostrata</i> */ <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub Emergent	Broad-leaved Evergreen Persistent
2. <i>Spiraea douglasii</i> / <i>Sphagnum</i> spp. community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous

Tree Dominated

1. <i>Pinus contorta</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. community type	Palustrine		Forested Scrub-Shrub	Needle-leaved Evergreen Broad-leaved Evergreen
2. <i>Pinus monticola</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. community type	Palustrine		Forested Scrub-Shrub	Needle-leaved Evergreen Broad-leaved Evergreen
3. <i>Tsuga heterophylla</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. community type	Palustrine		Forested Scrub-Shrub	Needle-leaved Evergreen Broad-leaved Evergreen
4. <i>Tsuga heterophylla</i> / <i>Sphagnum</i> spp. community type	Palustrine		Forested	Needle-leaved Evergreen

Permanently Flooded

1. *Brasenia schreberi* community type

2. *Hippuris vulgaris* community type

3. *Juncus balticus* community type

4. *Nuphar polypetalum* community type

5. *Potamogeton natans* community type

6. *Scirpus acutus* community type

7. *Scirpus subterminalis* community type

8. *Typha latifolia* community type

Saturated Soils or Seasonally Flooded

Herb Dominated

1. *Carex cusickii* community type

2. *Carex lasiocarpa* community type

3. *Carex obnupta* community type

4. *Carex rostrata** community type

5. *Carex sitchensis** community type

6. *Carex vesicaria* community type

7. *Dulichium arundinaceum* community type

System

Subsystem

Class

Subclass

Palustrine

Littoral

Aquatic Bed

Rooted Vascular

Palustrine

Littoral

Aquatic Bed

Rooted Vascular

Palustrine

Littoral

Emergent

Nonpersistent

Palustrine

Littoral

Aquatic Bed

Rooted Vascular

Palustrine

Littoral

Aquatic Bed

Rooted Vascular

Palustrine

Littoral

Emergent

Persistent

Palustrine

Littoral

Aquatic Bed

Rooted Vascular

Palustrine

Littoral

Emergent

Persistent

Palustrine

Littoral

Emergent

Persistent

Palustrine

Littoral

Emergent

Nonpersistent

Palustrine

Littoral

Emergent

Persistent

Palustrine

Littoral

Emergent

Persistent

Palustrine

Littoral

Emergent

Nonpersistent

Palustrine

Littoral

Emergent

Nonpersistent

NATURAL HERITAGE

Shrub-Dominated

1. *Alnus incana* community type
2. *Cornus stolonifera**-*Salix* spp.-*Spiraea douglasii* community type
3. *Myrica gale* community type
4. *Salix* spp. community type
5. *Spiraea douglasii* community type

Tree Dominated

1. *Alnus rubra*/*Lysichitum americanum** community type
2. *Alnus rubra*/*Rubus spectabilis* community type
3. *Fraxinus latifolia*/*Carex obnupta* community type
4. *Fraxinus latifolia*/*Symphoricarpos albus* community type
5. *Pyrus fusca** community type
6. *Thuja plicata*-*Tsuga heterophylla*/*Lysichitum americanum** community type

COWARDIN ET AL.

System	Subsystem	Class	Subclass
	Palustrine	Scrub-Shrub	Broad-leaved Deciduous
	Palustrine	Scrub-Shrub	Broad-leaved Deciduous
	Palustrine	Scrub-Shrub	Broad-leaved Deciduous
	Palustrine	Scrub-Shrub	Broad-leaved Deciduous
	Palustrine	Scrub-Shrub	Broad-leaved Deciduous
	Palustrine	Forested	Broad-leaved Deciduous
	Palustrine	Forested	Broad-leaved Deciduous
	Palustrine	Forested	Broad-leaved Deciduous
	Palustrine	Forested	Broad-leaved Deciduous
	Palustrine	Forested	Broad-leaved Deciduous
	Palustrine	Forested	Needle-leaved Evergreen
	Palustrine	Emergent	Persistent
	Palustrine	Emergent	Persistent
	Riverine Palustrine	Upper Perennial Emergent	Emergent Nonpersistent Nonpersistent
	Riverine Palustrine	Upper Perennial	Aquatic Bed Aquatic Bed Rooted Vascular Rooted Vascular
	Riverine Palustrine	Upper Perennial	Aquatic Bed Aquatic Bed Floating Vascular Floating Vascular
	Palustrine	Scrub-Shrub	Broad-leaved Deciduous

SOUTHERN PUGET TROUGH

COLUMBIA RIVER GORGE

Herb Dominated

1. *Artemisia lindleyana*-*Deschampsia cespitosa* community type
2. *Carex obnupta* community type
3. *Eleocharis palustris** community type
4. *Elodea canadensis* community type
5. *Lemna minor** community type

Shrub-Dominated

1. *Salix fluviatilis*-*Salix lasiandra** community type

NATURAL HERITAGE

**OVERFLOW PLAIN
Herb Dominated**

1. *Bidens cernua* community type

2. *Carex aperta* community type

3. *Carex obnupta* community type

4. *Eleocharis palustris** community type

5. *Elodea canadensis* community type

6. *Lemna minor** community type

7. *Ludwigia palustris*-*Polygonum hydropiperoides* community type

8. *Myriophyllum hippuroides* community type

9. *Paspalum distichum* community type

10. *Polygonum amphibium* community type

11. *Sagittaria latifolia* community type

12. *Scirpus validus** community type

13. *Solidago occidentalis** community type

14. *Sparganium emersum* community type

COWARDIN ET AL.

System	Subsystem	Class	Subclass
Riverine	Tidal	Emergent	Nonpersistent
Riverine	Lower Perennial	Emergent	Nonpersistent
Palustrine		Emergent	Nonpersistent
Palustrine		Emergent	Persistent
Palustrine		Emergent	Persistent
Riverine	Tidal	Emergent	Nonpersistent
Riverine	Lower Perennial	Emergent	Nonpersistent
Palustrine		Emergent	Nonpersistent
Riverine	Tidal	Aquatic Bed	Rooted Vascular
Riverine	Lower Perennial	Aquatic Bed	Rooted Vascular
Palustrine		Aquatic Bed	Rooted Vascular
Riverine	Tidal	Aquatic Bed	Floating Vascular
Riverine	Lower Perennial	Aquatic Bed	Floating Vascular
Palustrine		Aquatic Bed	Floating Vascular
Riverine	Tidal	Emergent	Nonpersistent
Riverine	Lower Perennial	Emergent	Nonpersistent
Palustrine		Emergent	Nonpersistent
Riverine	Tidal	Aquatic Bed	Rooted Vascular
Riverine	Lower Perennial	Aquatic Bed	Rooted Vascular
Palustrine		Aquatic Bed	Rooted Vascular
Palustrine		Emergent	Nonpersistent
Palustrine		Aquatic Bed	Rooted Vascular
Riverine	Tidal	Emergent	Nonpersistent
Riverine	Lower Perennial	Emergent	Nonpersistent
Palustrine		Emergent	Nonpersistent
Palustrine		Emergent	Persistent
Riverine	Lower Perennial	Emergent	Nonpersistent
Palustrine		Emergent	Nonpersistent
Riverine	Tidal	Emergent	Nonpersistent
Riverine	Lower Perennial	Emergent	Nonpersistent
Palustrine		Emergent	Nonpersistent

NATURAL HERITAGE

COWARDIN ET AL.

	System	Subsystem	Class	Subclass
Shrub -Dominated				
1. <i>Salix fluviatilis-Salix lasiandra</i> * community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
2. <i>Salix lasiandra*Urtica dioica</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
3. <i>Salix piperi*-Salix sitchensis</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
Tree Dominated				
1. <i>Fraxinus latifolia/Urtica dioica</i> community type	Palustrine		Forested	Broad-leaved Deciduous
2. <i>Fraxinus latifolia-Populus trichocarpa/Cornus stolonifera*/Urtica dioica</i> community type	Palustrine		Forested	Broad-leaved Deciduous
3. <i>Fraxinus latifolia-Populus trichocarpa/Symphoricarpos albus/ Urtica dioica</i> community type	Palustrine		Forested	Broad-leaved Deciduous
SURGE PLAIN WETLANDS				
Herb Dominated				
1. <i>Carex lyngbyei</i> community type	Riverine Palustrine	Tidal	Emergent Emergent	Nonpersistent Nonpersistent
2. <i>Carex obnupta</i> community type	Palustrine		Emergent	Persistent
3. <i>Eleocharis palustris</i> * community type	Riverine	Tidal	Emergent	Nonpersistent
4. <i>Elodea canadensis</i> community type	Riverine	Tidal	Aquatic Bed	Rooted Vascular
5. <i>Equisetum fluviatile</i> community type	Riverine	Tidal	Emergent	Nonpersistent
6. <i>Lemna minor</i> * community type	Riverine Palustrine	Tidal	Aquatic Bed Aquatic Bed	Floating Vascular Floating Vascular
7. <i>Lilaeopsis occidentalis-Tillaea aquatica</i> * community type	Riverine	Tidal	Emergent	Nonpersistent
8. <i>Myriophyllum hippuroides</i> community type	Riverine	Tidal	Aquatic Bed	Rooted Vascular
9. <i>Sagittaria latifolia</i> community type	Riverine Palustrine	Tidal	Emergent Emergent	Nonpersistent Nonpersistent
10. <i>Scirpus acutus</i> community type	Palustrine		Emergent	Persistent
11. <i>Scirpus americanus</i> community type	Riverine Palustrine	Tidal	Emergent Emergent	Nonpersistent Nonpersistent
12. <i>Sparganium emersum</i> community type	Riverine	Tidal	Emergent	Nonpersistent
13. <i>Typha angustifolia-Typha latifolia</i> community type	Palustrine		Emergent	Persistent

NATURAL HERITAGE

COWARDIN ET AL.

Shrub-Dominated

1. *Cornus stolonifera**-*Salix sitchensis* community type

Palustrine

Scrub-Shrub

Broad-leaved Deciduous

Tree Dominated

1. *Populus trichocarpa**/*Cornus stolonifera*/*Impatiens capensis* community type

Palustrine

Forested

Broad-leaved Deciduous

**OLYMPIC PENNINSULA AND
SOUTHWEST WASHINGTON**

LOW ELEVATION SPHAGNUM BOG

Herb Dominated

1. *Carex livida*/*Sphagnum* spp. community type

Palustrine

Emergent

Nonpersistent

2. *Carex rostrata**/*Sphagnum* spp. community type

Palustrine

Emergent

Persistent

3. *Carex rostrata**-*Carex sitchensis**-*Sanguisorba officinalis*/*Sphagnum* spp. community type

Palustrine

Emergent

Persistent

4. *Eriophorum chamissonis*/*Sphagnum* spp. community type

Palustrine

Emergent
Moss-Lichen

Nonpersistent
Nonpersistent

5. *Juncus supiniformis*/*Sphagnum* spp. community type

Palustrine

Emergent
Moss-Lichen

Nonpersistent
Nonpersistent

6. *Rhynchospora alba*/*Sphagnum* spp. community type

Palustrine

Emergent
Moss-Lichen

Nonpersistent
Nonpersistent

Shrub-Dominated

1. *Kalmia occidentalis**-*Ledum groenlandicum*/*Sphagnum* spp. community type

Palustrine

Scrub-Shrub

Broad-leaved Evergreen

- a. *Kalmia occidentalis**-*Ledum groenlandicum*/*Carex rostrata**/*Sphagnum* spp. variant

Palustrine

Scrub-Shrub

Broad-leaved Evergreen

- b. *Kalmia occidentalis**-*Ledum groenlandicum*/*Xerophyllum tenax*/*Sphagnum* spp. variant

Palustrine

Scrub-Shrub

Broad-leaved Evergreen

- c. *Kalmia occidentalis**-*Ledum groenlandicum*-*Gaultheria shallon*/*Pteridium aquilinum*/*Sphagnum* spp. variant

Palustrine

Scrub-Shrub

Broad-leaved Evergreen

- d. *Kalmia occidentalis**-*Ledum groenlandicum*-*Vaccinium oxycoccos**/*Sphagnum* spp. variant

Palustrine

Scrub-Shrub

Broad-leaved Evergreen

NATURAL HERITAGE

COWARDIN ET AL.

	System	Subsystem	Class	Subclass
2. <i>Ledum groenlandicum</i> - <i>Myrica gale</i> / <i>Sphagnum</i> spp. community type	Palustrine		Scrub-Shrub	Broad-leaved Evergreen
3. <i>Myrica gale</i> / <i>Sanguisorba officinalis</i> / <i>Sphagnum</i> spp. community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
a. <i>Myrica gale</i> / <i>Carex rostrata</i> *- <i>Nephrophyllidium crista-galli</i> - <i>Sanguisorba officinalis</i> / <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
b. <i>Myrica gale</i> / <i>Carex sitchensis</i> *- <i>Sanguisorba officinalis</i> / <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
c. <i>Myrica gale</i> / <i>Deschampsia cespitosa</i> - <i>Sanguisorba officinalis</i> / <i>Sphagnum</i> spp. variant	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
4. <i>Myrica gale</i> - <i>Spiraea douglasii</i> / <i>Sphagnum</i> spp. community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
Tree Dominated				
1. <i>Pinus contorta</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. community type	Palustrine	Forested Scrub-Shrub		Needle-leaved Evergreen Broad-leaved Evergreen
2. <i>Pinus contorta</i> - <i>Thuja plicata</i> / <i>Myrica gale</i> / <i>Sphagnum</i> spp. community type	Palustrine	Forested		Needle-leaved Evergreen
3. <i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> / <i>Lysichitum americanum</i> / <i>Sphagnum</i> spp. community type	Palustrine		Forested	Needle-leaved Evergreen
4. <i>Tsuga heterophylla</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum</i> spp. community type	Palustrine		Forested Scrub-Shrub	Needle-leaved Evergreen Broad-leaved Evergreen
LOW ELEVATION MINEROTROPHIC WETLANDS				
Permanently Flooded				
1. <i>Brasenia schreberi</i> community type	Palustrine Lacustrine	Littoral	Aquatic Bed Aquatic Bed	Rooted Vascular Rooted Vascular
2. <i>Equisetum fluviatile</i> community type	Lacustrine		Emergent	Nonpersistent
3. <i>Nuphar polysepalum</i> community type	Palustrine Lacustrine	Littoral	Aquatic Bed Aquatic Bed	Rooted Vascular Rooted Vascular
4. <i>Scirpus acutus</i> community type	Palustrine		Emergent	Persistent
5. <i>Sparganium eurycarpum</i> community type	Lacustrine		Emergent	Nonpersistent

NATURAL HERITAGE

COWARDIN ET AL.

Saturated Soils or Seasonally Flooded

Herb Dominated

	System	Subsystem	Class	Subclass
1. <i>Carex obnupta</i> community type	Palustrine		Emergent	Persistent
2. <i>Carex obnupta</i> - <i>Juncus nevadensis</i> - <i>Ranunculus flammula</i> community type	Palustrine		Emergent	Persistent
3. <i>Carex rostrata</i> * community type	Palustrine		Emergent	Persistent
4. <i>Carex rostrata</i> *- <i>Carex sitchensis</i> * community type	Palustrine		Emergent	Persistent
5. <i>Carex sitchensis</i> * community type	Palustrine		Emergent	Persistent
6. <i>Carex sitchensis</i> *- <i>Potentilla palustris</i> variant	Palustrine		Emergent	Persistent
7. <i>Juncus falcatus</i> - <i>Juncus nevadensis</i> community type	Palustrine		Emergent	Nonpersistent

Shrub-Dominated

1. <i>Myrica gale</i> / <i>Aster</i> sp.- <i>Boykinia major</i> - <i>Deschampsia cespitosa</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
2. <i>Myrica gale</i> / <i>Carex rostrata</i> * community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
3. <i>Myrica gale</i> / <i>Carex sitchensis</i> * community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
4. <i>Myrica gale</i> / <i>Carex sitchensis</i> *- <i>Sanguisorba officinalis</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
5. <i>Myrica gale</i> / <i>Lysichitum americanum</i> * community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
6. <i>Myrica gale</i> - <i>Spiraea douglasii</i> / <i>Boykinia</i> sp.- <i>Carex obnupta</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
7. <i>Salix</i> spp.- <i>Spiraea douglasii</i> / <i>Carex obnupta</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
8. <i>Salix hookeriana</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
a. <i>Salix hookeriana</i> / <i>Carex obnupta</i> variant	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
b. <i>Salix hookeriana</i> - <i>Spiraea douglasii</i> variant	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
9. <i>Spiraea douglasii</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous
10. <i>Spiraea douglasii</i> / <i>Carex obnupta</i> community type	Palustrine		Scrub-Shrub	Broad-leaved Deciduous

System

Tree Dominated	1. <i>Picea sitchensis</i> - <i>Alnus rubra</i> /Lysichitum americanum* community type
	2. <i>Pyrus fusca</i> * community type
	a. <i>Pyrus fusca</i> */ <i>Calamagrostis canadensis</i> variant
	b. <i>Pyrus fusca</i> */ <i>Carex obnupta</i> variant
	c. <i>Pyrus fusca</i> *- <i>Salix hookeriana</i> / <i>Carex obnupta</i> variant
	3. <i>Thuja plicata</i> - <i>Tsuga heterophylla</i> /Lysichitum americanum* community type
Herb Dominated	1. <i>Athyrium filix-femina</i> community type
	2. <i>Caltha asarifolia</i> *-Lysichitum americanum community type
	3. <i>Carex lyngbeyi</i> community type
	4. <i>Lilaeopsis occidentalis</i> - <i>Oenanthe sarmentosa</i> community type
	5. <i>Typha latifolia</i> community type
Shrub-Dominated	1. <i>Salix</i> spp./Lysichitum americanum* community type
Tree Dominated	1. <i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Carex obnupta</i> -Lysichitum americanum* community type
	2. <i>Picea sitchensis</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Carex obnupta</i> community type

System

Palustrine	Palustrine	Forested	Needle-leaved Evergreen
Palustrine	Palustrine	Forested	Broad-leaved Deciduous
Palustrine	Palustrine	Forested	Broad-leaved Deciduous
Palustrine	Palustrine	Forested	Broad-leaved Deciduous
Riverine	Riverine	Tidal	Nonpersistent
Riverine	Riverine	Tidal	Nonpersistent
Riverine	Riverine	Tidal	Nonpersistent
Riverine	Riverine	Tidal	Nonpersistent
Palustrine	Palustrine	Emergent	Nonpersistent
Palustrine	Palustrine	Emergent	Nonpersistent
Palustrine	Palustrine	Emergent	Persistent
Palustrine	Palustrine	Scrub-Shrub	Broad-leaved Deciduous
Palustrine	Palustrine	Forested	Broad-leaved Deciduous
Palustrine	Palustrine	Forested	Needle-leaved Evergreen

Subclass

Appendix B Updated Taxonomy

Plant names used in this classification follow Hitchcock and Cronquist (1978). Updated taxonomy is provided in this appendix based on the following publications with preference given in the order listed: Flora of North America Editorial Committee (1993), Douglas, Straley and Meidinger (1989, 1990, 1991) and Hickman (1993). An asterisk (*) following a species name in the text indicates that updated taxonomy is provided in this appendix.

Name In Hitchcock and Cronquist	Updated Taxonomy
<i>Adiantum pedatum</i> * L.	<i>Adiantum aleuticum</i> (Rupr.) Paris
<i>Boykinia elata</i> * (Nutt.) E. Greene	<i>Boykinia occidentalis</i> Torr�y & A. Gray
<i>Calamagrostis crassiglumis</i> * Thurb.	<i>Calamagrostis stricta</i> (Timm) Koeler ssp. <i>inexpansa</i> (A. Gray) C.W. Greene
<i>Caltha asarifolia</i> * DC.	<i>Caltha palustris</i> L. ssp. <i>asarifolia</i> (DC.) Hult.
<i>Carex rostrata</i> * Stokes	mostly <i>Carex utriculata</i> Boott in WA
<i>Carex sitchensis</i> * Prescott	<i>Carex aquatilis</i> Wahlenb. var. <i>dives</i> (Holm) L. Standley
<i>Centaurium umbellatum</i> * Gilib.	<i>Centaurium erythraea</i> Raf.
<i>Cornus canadensis</i> * L.	a hybrid of <i>C. canadensis</i> and <i>C. suecica</i> L. has been treated as <i>C. unalaschkensis</i> Lebed.
<i>Cornus stolonifera</i> * Michx.	<i>Cornus sericea</i> L. ssp. <i>sericea</i>
<i>Dryopteris austriaca</i> * (Jacq.) Woyнар	<i>Dryopteris carthusiana</i> (Vil.) H.P. Fuchs
<i>Eleocharis palustris</i> * (L.) R. & S.	<i>Eleocharis macrostachya</i> Britton in part
<i>Epilobium watsonii</i> * var. <i>watsonii</i> Barbey	<i>Epilobium ciliatum</i> Raf. ssp. <i>watsonii</i> (Barbey) Hoch & Raven
<i>Galium cymosum</i> * Wieg.	<i>Galium trifidum</i> L.
<i>Habenaria dilatata</i> * (Pursh) Hook.	<i>Platanthera dilatata</i> (Pursh) Lindl.
<i>Kalmia occidentalis</i> * Small	<i>Kalmia microphylla</i> (Hook.) Heller ssp. <i>occidentalis</i> (Small) Taylor & MacBryde
<i>Lemna minor</i> * L.	<i>Lemna minuscula</i> Herter

<i>Lycopodium inundatum</i> * L.	<i>Lycopodiella inundata</i> (L.) Holub
<i>Lysichiton americanum</i> * Hulten & St. John	<i>Lysichiton americanum</i> Hulten & St. John
<i>Montia sibirica</i> * (L.) Howell	<i>Claytonia sibirica</i> L.
<i>Panicum occidentale</i> * Scribn.	<i>Panicum acuminatum</i> Sw.
<i>Populus trichocarpa</i> * T. & G.	<i>Populus balsamifera</i> L. ssp. <i>trichocarpa</i> (Torrey & A.Gray) Brayshaw
<i>Potentilla pacifica</i> * Howell	<i>Potentilla anserina</i> L.
<i>Puccinellia pauciflora</i> * (Presl) Munz	<i>Torreyochloa pallida</i> (J. Presl) Church var. <i>pauciflora</i> (J. Presl) J.I. Davis
<i>Pyrus fusca</i> * Raf.	<i>Malus fusca</i> (Raf.) Schneid.
<i>Salix lasiandra</i> * Benth.	<i>Salix lucida</i> Muhl. ssp. <i>lasiandra</i> (Benth.) E. Murray
<i>Salix piperi</i> * Bebb	<i>Salix hookeriana</i> Hook.
<i>Scirpus validus</i> * Vahl	<i>Scirpus tabernaemonti</i> C. Gmelin
<i>Solidago occidentalis</i> * (Nutt.) T. & G.	<i>Euthamia occidentalis</i> Nutt.
<i>Sparganium cf minimum</i> * Fries	<i>Sparganium natans</i> L.
<i>Tanacetum douglasii</i> * DC.	<i>T. bipinnatum</i> (L.) Schultz-Bip. ssp. <i>horonense</i> (Nutt.) Breiting
<i>Tillaea aquatica</i> * L.	<i>Crassula aquatica</i> (L.) Schonl.
<i>Tofieldia glutinosa</i> * Pers.	cf <i>Tofieldia occidentalis</i> S. Watson
<i>Vaccinium oxycoccos</i> * L.	<i>Oxycoccus oxycoccos</i> (L.) MacM.
<i>Veronica americana</i> * Schwein.	<i>Veronica beccabunga</i> L. ssp. <i>americana</i> (Raf.) Sellers