USDA Natural Resources Conservation Service

Ecological site R002XN603WA
Bog or Fen

Accessed: 05/03/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 002X–Willamette and Puget Sound Valleys

Major Land Resource Area-[MLRA][LRU]: 002X N Willamette and Puget Sound Valleys, North Puget. The Land Resource Unit (LRU) is described in detail in the reference Washington NRCS Pasture TN-101 Forage Zones available on the eFOTG. For more information on MLRA's, refer to the following web site: http://www.essc.psu.edu/soil_info/soil_lrr/. Additional information on Common Resource Areas is available on the eFOTG for NRCS Washington: http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WA and the following website: http://soils.usda.gov/survey/geography/cra.html. This ecological site occurs in the following Common Resource Areas: 2.10 - Fraser Lowland; 2.11 - Eastern Puget Riverine Lowlands; 2.11 - Eastern Puget Mountain River Valleys; 2.12 - San Juan Islands; 2.13 - Olympic Rainshadow; 2.5 - Eastern Puget Uplands; and 2.6 - Central Puget Lowland

Table 1. Dominant plant species

Tree	(1) *Pinus contorta*
Shrub	(1) *Ledum groenlandicum*
Herbaceous	(1) *Carex*

Physiographic features

These plant communities typically occur in depressional areas with accumulations of undecomposed or partially decomposed organic matter and high water tables.

Table 2. Representative physiographic features

Landforms	(1) Depression
Flooding frequency	None
Ponding duration	Very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	6–152 m
Slope	0–2%
Ponding depth	10–41 cm
Water table depth	30–66 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 18 to 60 inches, although most areas range from 30 to 50 inches. Annual precipitation less than 30 inches occurs in the rainshadow of the Olympic Mountains along the western border of this area and in the San Juan Islands. Higher average annual precipitation, 50 to 60 inches, occurs next to the foothills of the surrounding mountains. Most of the precipitation occurs as low intensity, Pacific frontal storms. The distribution is 75% in the fall and winter, 15% in the spring and 10% in the summer. Rain turns to snow at the higher elevations, although accumulations are usually small and of short duration. The number of days with snow on the ground varies from 0 to 9, with an averge of 3 days. Summers are cool and dry. Recorded temperature extremes range from -1 degrees to 90 degrees fahrenheit. See the climate tables in this document for information on temperatures and frost-free periods.

Table 3. Representative climatic features

Frost-free period (average)	243 days
Freeze-free period (average)	302 days
Precipitation total (average)	1,524 mm

Influencing water features

These general kinds of bog and fen wetlands are distinguished by pH, nutrient availability and hydrologic dynamics. Fens have groundwater within the rooting zone of vascular plants, while bogs have built up peat above the influence of groundwater. The vegetation in true bogs are limited by the water available from precipitation and are only found in areas of high precipitation.

Soil features

The soils generally have a water table at or near the soil surface for much of the winter and spring, and the water table is often at or within a few feet of the soil surface for the remainder of the year. These soils are typically nutrient-poor and have an acidic pH. A soil series on which this site occurs is Semiahmoo.

Table 4. Representative soil features

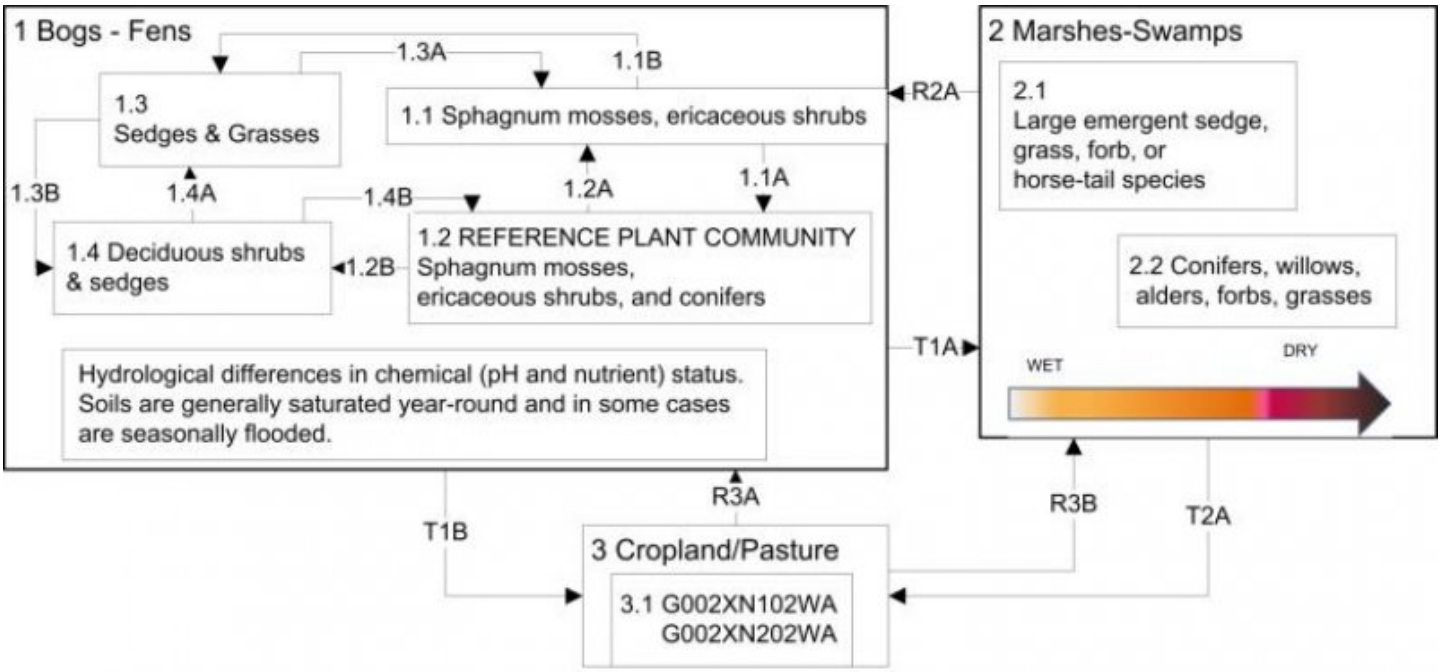
Surface texture	(1) Muck
Family particle size	(1) Loamy

Drainage class	Very poorly drained
Permeability class	Moderate to moderately slow
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	24.38–59.69 cm
Soil reaction (1:1 water) (0-101.6cm)	4–6
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

These areas may have historically been kept free of extensive brush and tree cover by burning. Typical native plant species include Labrador tea (*Ledum groenlandicum*), salal (Gaultheria shalon), spirea (*Spiraea douglasii*), sedges (Carex spp.), and minor amounts of shore pine (*Pinus contorta*).

State and transition model



LEGEND
1.1A, 2.1A, T2B =No Fire or Other Disturbance material
1.1B = Increased water
1.3A, 1.3B = Lack of disturbance, lowered fertility
1.4A = Brush control, increased water, fertility
1.4B = Restoration to original, lower water levels, lack of vegetative disturbance
1.2A, 2.3A, 2.4A, 2.2A, 2.3B = Fire or Brush Control or Other Disturbance
R2A, R3A, R3B = Restoration of water regime
T1A = Beaver dam/Impoundment, Dredging, Mining & Other increase in water flows
T1B, T2A = Drainage/Removal or reduction of water inflows & removal of woody

Soil Characteristics	Water Regime		Wetland Type	Vegetation Groups
> 40 cm (16 inches) fibric/ mesic peat	perennially saturated but local areas of surface drying are common	**+/- ombrotrophic environments (fed primarily by rainwater - hydrologically isolated) Nutrient poor Acidic: pH < 5.5**	Bogs	Sphagnum mosses, ericaceous shrubs, and conifers
			Poor Fens	
		minerotrophic environments (fed by surface water, or groundwater, or both) Groundwater-fed pH > 5.5	Fens	Deciduous shrubs, sedges, and brown mosses
Mineral soils or well-humified peat	Temporary shallow flooding (0.1–1.0 m) Significant water flow		Swamps	Conifers, willows, alders, forbs, grasses leafy mosses
	Temporary shallow flooding (0.1–1.0 m) or sub-irrigation		Meadows/ Wet Prairies	Sedge, grass, forb
	Protracted shallow flooding (0.1–2.0 m)		Marshes	Large emergent sedge, grass, forb, or horse-tail species
	Permanent deep flooding (0.5–2 m)		Shallow waters	Aquatic species Emergent vegetation < 10% cover

State 1
Bogs-Fens

These wetland plant communites occur in peatlands. These wetlands are usually occur as patch communites in river valleys, in depressions, around lakes and marshes, or on slopes. Near salt water these organic soils are characterized by an abundance of sodium cations from oceanic precipitation. Poor fens and bogs are the most

common type and are often intermixed. Sphagnum characterizes poor fens and bogs (pH <5.5), and the two are lumped here, while "brown mosses" and sedges characterize rich fens (pH >5.5). Mire profiles in may be flat, raised (domed), or sloping, but most occurrences in Washington are flat with only localized hummock development.

Community 1.1
Sphagnum moss mounds, ericaceous shrubs

The surface topography in this community consists of well developed hummocks and hollows that create a diverse array of drier hummock tops to wetter hollows. *Kalmia microphylla*, *Ledum groenlandicum*, and *Vaccinium oxycoccos* are often codominant.

Figure 5. Plant community growth curve (percent production by month). WA0225, Winter Water Table. Winter water table within ~12" of soil surface for significant period between Nov 1 - April 1.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	8	22	20	18	16	11	3	0	0

Community 1.2
REFERENCE PLANT COMMUNITY-Sphagnum mosses, ericaceous shrubs, and conifers

Figure 6. Reference Plant Community

These plant communities occur adjacent to open fens, peatlands and shrub-swamps. The tree layer is dominated by *Pinus contorta*. *Tsuga heterophylla* and/or *Thuja plicata* may be abundant in drier sites but is suppressed or killed in waterlogged soils. *Pinus contorta* is also killed by extended flooding. The dense shrub layer is comprised of *Gaultheria shallon* and *Ledum glandulosum*, *Vaccinium oxycoccos*, *Kalmia microphylla*, and *Empetrum nigrum*. Most trees and shrubs occur on elevated microsites such as decaying logs, stumps, and old root wads. The herb layer is dominated by *Carex obnupta*, *Blechnum spicant*, Pteridium aqulinum and *Sanguisorba officinalis*. Sphagnum mosses are conspicuous. Stands are usually stunted in stature but are subject to windthrow in severe winter storms but appear to be self-perpetuating in the absence of major disturbance.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Forb	336	448	560
Shrub/Vine	224	336	448
Grass/Grasslike	112	224	336
Total	**672**	**1008**	**1344**

Figure 8. Plant community growth curve (percent production by month). WA0225, Winter Water Table. Winter water table within ~12" of soil surface for significant period between Nov 1 - April 1.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	8	22	20	18	16	11	3	0	0

Community 1.3
Sedges & Grasses

Wetlands or the portion of wetlands dominated by emergent (mostly graminoid) species where standing water is seasonally or more typically semi-permanently present. Confined to limited areas in suitable floodplain or basin topography. Often found along the borders of ponds, lakes or reservoirs that have more open basins and a permanent water source throughout all or most of the year. Mostly semi-permanently flooded, but some marshes have seasonal hydrologic flooding. Water is at or above the surface for most of the growing season. Dominated by emergent herbaceous species, mostly grass-likes (Carex and grasses) but also some forbs. Grasses will be more abundant on the drier portions of the wetland.

Community 1.4
Deciduous shrubs & sedges

Figure 9. Fen with spirea, carex and skunk cabbage

Figure 10. Fen with dense spirea

Figure 11. Deciduous shrub fen with carex and skunk cabbage

Pathway 1.1A
Community 1.1 to 1.2

Lack of fire or other disturbances allows cover of shrubs and trees to increase.

Pathway 1.1b
Community 1.1 to 1.3

Change in water regime to one with more inflow and outflow from the site, or increased water depth. Causes may include beaver dam impoundment, dredging, mining activity, or changes in local surface hydrology.

Pathway 1.2A
Community 1.2 to 1.1

Fire, woody harvest, or other disturbance that removes conifers.

Pathway 1.2B
Community 1.2 to 1.4

REFERENCE PLANT COMMUNITY-Sphagnum mosses, ericaceous shrubs, and conifers

Deciduous shrubs & sedges

Change in water regime to one with more inflow and outflow from the site, or increased water depth. Causes may include beaver dam impoundment, dredging, mining activity, or changes in local surface hydrology.

Pathway 1.3A
Community 1.3 to 1.1

Restoration of lower water levels and reduction in water moving into and out of the site. Also, reduction of disturbance, either by fire or mechanical means. Reduction of fertility through reduction in water flows or added fertilizer.

Pathway 1.3B
Community 1.3 to 1.4

Sedges & Grasses **Deciduous shrubs & sedges**

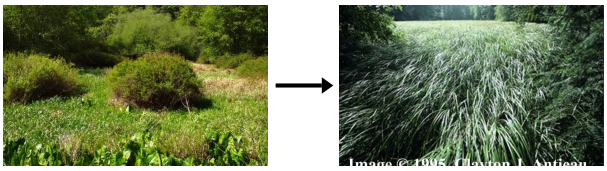
Limited restoration of lower water levels and reduction in water moving into and out of the site. Also, limited reduction of disturbance, which allows the shrub layer to reestablish. Limited reduction of fertility through reduction in water flows or added fertilizer.

Pathway 1.4B
Community 1.4 to 1.2

Deciduous shrubs & sedges **REFERENCE PLANT COMMUNITY-Sphagnum mosses, ericaceous shrubs, and conifers**

Restoration of lower water levels and reduction in water moving into and out of the site. Also, reduction of disturbance, either by fire or mechanical means. Reduction of fertility through reduction in water flows or added fertilizer.

Pathway 1.4A
Community 1.4 to 1.3



Deciduous shrubs & sedges **Sedges & Grasses**

This shift may be caused by increases in disturbance, water levels, or site fertility. Change in water regime may include one with more inflow and outflow from the site, or increased water depth. Causes may include beaver dam impoundment, dredging, mining activity, or changes in local surface hydrology. Disturbance to vegetation may occur through fire or mechanical disturbance. Fertility may be increases through the chemical composition of the increased waterflow, or decomposition of vegetation.

State 2
Marshes-Swamps

The major agents of wetland disturbances have been beavers, floods, landslides, tsunamis, windthrow, fire, and

people. People affect the water regime with impoundments, drainage systems and cropping, road building, dredging, mining and other changes. These wetland disturbance agents shape the development of different types of vegetation by mediating the supply, movement, and chemistry of water and sediments.

Community 2.1
Large emergent sedge, grass, forb, or horse-tail species

Wetlands or the portion of wetlands dominated by emergent (mostly graminoid) species where standing water is seasonally or more typically semi-permanently present. Depending on the water regime, these plant communities are dominated by emergent herbaceous species, mostly graminoids (Carex, Scirpus and/or Schoenoplectus, Eleocharis, Juncus, *Typha latifolia*) but also some forbs. The most serious invasive species of emergent marsh and wet prairie are *Phalaris arundinacea* (reed canarygrass), *Agrostis stolonifera* (redtop or creeping bentgrass), *Poa pratensis* (Kentucky bluegrass), and *Alopecurus pratensis* (meadow foxtail).

Community 2.2
Conifers, willows, alders, forbs, grasses

Shrub swamps and wetlands are dominated by shrubs.They occur on floodplains and basins, and most tolerate a variable water regime. Plant community structure ranges from scattered shrubs with intervening herbaceous component, to dense and impenetrable stands of Salix, *Cornus sericea*, and *Spiraea douglasii*. Depending on water regime and disturbances this plant community is seral to alder and conifer forests.

State 3
Cropland/Pasture

These cropped systems are managed primarily with drainage systems and agronomically practices, including increased inputs of nutrients.

Community 3.1
G002XN102WA or G002XN202WA Forage Suitability Group

The forage suitability group is determined by the effectiveness of drainage and removal of water inflows.

Transition 1A
State 1 to 2

Change in water regime to one with more inflow and outflow from the site, or increased water depth. Causes may include beaver dam impoundment, dredging, mining activity, or changes in local surface hydrology.

Transition 1B
State 1 to 3

Drainage of site to lower the water table to the level necessary to grow the selected crop. Practices may include ditching, tile drainage, diversion of water inflows and/or removal of woody material.

Restoration pathway 2A
State 2 to 1

Restoration of water regime through management of depth control structures and/or management of water inflows and outflows.

Transition 2A
State 2 to 3

Drainage of site to lower the water table to the level necessary to grow the selected crop. Practices may include ditching, tile drainage, diversion of water inflows and/or removal of woody material.

Restoration pathway 3A
State 3 to 1

Restoration of water regime through depth control structures and/or management of water inflows and outflows.

Restoration pathway 3B
State 3 to 2

Restoration of water regime through depth control structures and/or management of water inflows and outflows.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**Ericaceous Shrubs**			112–224	
	bog Labrador tea	LEGR	*Ledum groenlandicum*	–	45–75
	alpine laurel	KAMI	*Kalmia microphylla*	–	18–30
	black crowberry	EMNI	*Empetrum nigrum*	–	12–20
	small cranberry	VAOX	*Vaccinium oxycoccos*	–	8–12
	great burnet	SAOF3	*Sanguisorba officinalis*	–	2–4
	American skunkcabbage	LYAM3	*Lysichiton americanus*	–	2–4
Forb					
2	**Forbs**			11–45	
	great burnet	SAOF3	*Sanguisorba officinalis*	–	2–4
	deer fern	BLSP	*Blechnum spicant*	–	1–2
	American skunkcabbage	LYAM3	*Lysichiton americanus*	–	1–2
Grass/Grasslike					
3	**Grasses and Grasslike**			112–224	
	sedge	CAREX	*Carex*	–	8–16

Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**Ericaceous and other shrubs**			224–448	
	bog Labrador tea	LEGR	*Ledum groenlandicum*	–	45–75
	alpine laurel	KAMI	*Kalmia microphylla*	–	18–30
	black crowberry	EMNI	*Empetrum nigrum*	–	10–14
	small cranberry	VAOX	*Vaccinium oxycoccos*	–	8–12
	salal	GASH	*Gaultheria shallon*	–	3–7
Forb					
2	**Forbs**			336–560	
	western brackenfern	PTAQ	*Pteridium aquilinum*	–	16–26
	great burnet	SAOF3	*Sanguisorba officinalis*	–	11–17
	deer fern	BLSP	*Blechnum spicant*	–	8–16
	western cordilleran bunchberry	COUN	*Cornus unalaschkensis*	–	1–3
	false lily of the valley	MADI	*Maianthemum dilatatum*	–	1–3
Grass/Grasslike					
3	**Grasses and Grasslike**			112–336	
	slough sedge	CAOB3	*Carex obnupta*	–	13–21
Tree					
4	**Conifers**			–	
	lodgepole pine	PICO	*Pinus contorta*	–	0–12
	western redcedar	THPL	*Thuja plicata*	–	0–12
	western hemlock	TSHE	*Tsuga heterophylla*	–	0–12

Contributors

Martha Chaney

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**