

Ecological site group R006XG412WA

Shallow Stony, Prairie

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Key Characteristics

None specified

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.

Physiography

Hierarchical Classification

Major Land Resource Area (MLRA): 6 – Cascade Mountains, East Slope

LRU – Common Resource Areas (CRA):

6.4 – Chelan Tephra Hills

6.5 – Chiwaukum Hills and Lowlands

6.6 – Yakima Plateau and Slopes

6.7 – Grand Fir Mixed Forest

6.8 – Oak-Conifer Eastern Cascades-Columbia Foothills

For MLRA 6 four ecological site descriptions (ESD) use 'Shallow Stony' in the name:

1. Shallow Stony, prairie

2. Shallow Stony, 2,800 - 4,000 feet

3. Shallow Stony, 4,000 – 6,000 feet

4. Shallow Stony, 6,000 – 7,600 feet

The ESD below is for Shallow Stony, prairie.

Site Concept Narrative:

Diagnostics:

More than 80% of the landscape of MLRA 6 is forest. This site stands out because of a lack of trees.

Shallow Stony, prairie, is an upland ecological site on the prairie portion of MLRA 6 – the High Prairie in Klickitat County, and the Swauk Prairie in Kittitas County. High Prairie and Swauk Prairie are grassland steppe and do not have sagebrush of any kind, nor bitterbrush, and no rabbitbrush. Bitterbrush may be found on adjoining ecological sites, however. Perennial bunchgrasses dominate the reference state. Cool-season bunchgrasses form two distinct layers. Bluebunch wheatgrass is the dominant bunchgrass in the top grass layer, while Sandberg bluegrass is the major grass of the lower grass layer. Native forbs fill the interspaces.

It is a sparsely vegetated site occurring on soils that are both shallow (10-20" deep) and stony to extremely stony. Soils have a stony or cobbly surface and rock fragments (35% or more) throughout the profile. Soil textures loam, silt loam and clay loam are most common. The soil surface is mostly bare soil, soil biotic crust or rock. Prairie soils are not hydric.

Principle Vegetative Drivers:

The shallow soil depth, stones throughout the profile, and precipitation drive the vegetative expression of this site. The soil depth limits deep-rooted species, plus the soil depth and stones limit the water holding capacity in the profile. This site receives 20-24 inches of precipitation which has a big impact on production and composition.

Influencing Water Features:

A plant's ability to grow on a site and overall plant production is determined by soil-water-plant relationships

1. Whether rain and melting snow runs off-site or infiltrates into the soil
2. Whether soil condition remain aerobic or become saturated and become anaerobic
3. Water drainage and how quickly the soil reaches wilting point

With adequate cover of live plants and litter, there are no restrictions on this ecological site with water infiltrating into the soil. In some years Shallow Stony sites can become saturated due to the shallow soil depth, but with good drainage would remain anaerobic for only a short period of time. This site has an extremely restricted water holding capacity, so plant production is quite limited.

Physiographic Features:

Most of MLRA 6 is in the Northern and Middle Cascade Mountains. This mountainous area consists of sharp alpine summits with some higher volcanic cones to the west, and lower lying foothills to the east. Strongly sloping mountains and U-shaped valleys are dominant in the north, with eroded basalt plateaus more typical in the south. The East Slope of the Cascades is a transitional area between the moist, rugged Cascade Mountains to the west and the drier, lower lying Columbia Basalt Plateau to the east. MLRA 6 has some of the landforms typical of both mountains and plateaus.

Physiographic Division: Pacific Mountains

Physiographic Province: Cascade-Sierra Mountains

Physiographic Sections: Northern Cascade and Middle Cascade Mountains

Landscapes: Mountains and hills

Landform: Side-slopes, shoulders, summits and hillslopes

Elevation: Dominantly 1,100 to 3,000 feet

Central tendency: 1,800 to 2,500 feet

Slope: Total range: 0 to 90 percent

Central tendency: 20 to 60 percent

Aspect: Occurs on all aspects

Geology:

MLRA 6 consists of Pre-Cretaceous metamorphic rocks cut by younger igneous intrusives. Tilted blocks of marine shale, carbonate, and other sediments occur in the far north, and some younger continental, river-laid sediments occur around Leavenworth, WA. Columbia River basalt is dominant in the southern portion of the state. Alpine glaciation has left remnants of glacial till, debris, and outwash in the northern part of this MLRA.

Climate

The climate across MLRA 6 is characterized by moderately cold, wet winters, and hot, dry summers, with limited precipitation due to the rain shadow effect of the Cascades. Soil moisture regime is xeric, while soil temperature regime is dominantly mesic or frigid. Seventy-five to eighty percent of the precipitation comes late October through March as a mixture of rain and snow. The lowest precipitation occurs along the eastern edge, then increasing with rising elevation to the west. Most of the rainfall occurs as low-intensity, Pacific frontal storms during the winter, spring and fall. Rain turns to snow at the higher elevations. All areas receive snow in winter. Summers are relatively dry. The east slopes experience greater temperature extremes and receive less precipitation than the west side of the Cascade Mountains. The shortest freeze-free periods occur along the western edge and the northern end of this

MLRA, which are mountainous. The longest freeze-free periods occur along the Columbia River Gorge.

Mean Annual Precipitation:

Range: 16-24 inches

Central tendency: 20-24 inches

Mean Annual Air Temperature:

Range: 42 to 52 degrees

Central tendency: 44 to 50 degrees

Frost-free Period (days):

Total range: 40 to 160

Central tendency: 60 to 110

The growing season for Prairie Shallow Stony is March through June.

Soil features

Edaphic:

Shallow stony, prairie commonly occurs with Loamy, prairie, North aspect, prairie and Very shallow ecological sites.

Representative Soil Features:

This ecological site components are dominantly Lithic taxonomic subgroups of Haploxerolls and Argixerolls great groups of the Mollisols. Soils are shallow or moderately deep. Average available water capacity of about 1.5 inches (3.8 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly loess and volcanic ash mixed with colluvium in the upper part of the soil over colluvium and residuum.

The associated soils are Borland, Milling, Wahoo and similar soils.

Dominate soil surface is loam to very cobbly ashy loam.

Dominant particle-size class is loamy-skeletal.

Fragments on surface horizon > 3 inches (% Volume):

Minimum: 0

Maximum: 2

Average: 0

Fragments within surface horizon > 3 inches (% Volume):

Minimum: 0

Maximum: 30

Average: 15

Fragments within surface horizon ≤ 3 inches (% Volume):

Minimum: 0

Maximum: 30

Average: 10

Subsurface fragments > 3 inches (% Volume):

Minimum: 5

Maximum: 40

Average: 20

Subsurface fragments ≤ 3 inches (% Volume):

Minimum: 0

Maximum: 50
Average: 25

Drainage Class: Well drained
Water table depth: Greater than 60 inches

Flooding:
Frequency: None

Ponding:
Frequency: None

Saturated Hydraulic Conductivity Class:
0 to 10 inches: Moderately high and high
10 to 40 inches: Moderately high and high

Depth to root-restricting feature (inches):
Minimum: 10
Maximum: 40

Electrical Conductivity (dS/m):
Minimum: 0
Maximum: 0

Sodium Absorption Ratio:
Minimum: 0
Maximum: 0

Calcium Carbonate Equivalent (percent):
Minimum: 0
Maximum: 0

Soil Reaction (pH) (1:1 Water):
0 - 10 inches: 6.1 to 7.3
10 - 40 inches: 6.1 to 7.3

Available Water Capacity (inches, 0 – 40 inches depth):
Minimum: .6
Maximum: 4.7
Average: 1.5

Vegetation dynamics

Ecological Dynamics:

Shallow Stony, prairie produces about 300-600 pounds/acre of biomass annually.

Bluebunch wheatgrass is at the core of the Shallow stony, prairie ecological site and warrants a degree of understanding. This perennial is a long-lived, mid-sized bunchgrass with an awned or awnless inflorescence arranged in a spike. Bluebunch provides a crucial and extensive network of roots to the upper portions (up to 48" deep in soils with no root-restrictive horizons) of the soil profile. These roots create a massive underground source to stabilize the soils, provide organic matter and nutrients inputs, and help maintain soil pore space for water infiltration and water retention in the soil profile. The extensive rooting system of mid-sized bunchgrasses leave very little soil niche space available for invasion by other species. This drought resistant root can compete with, and, suppress the spread of exotic weeds.

Compared to rangeland pastures elsewhere, the High Prairie and Swauk Prairie have a smaller pasture size. Grazing animals are less selective and Shallow Stony, Prairie receives more grazing than Shallow Stony sites

elsewhere.

The vegetative cover is too low to carry fire, so these sites rarely burn. However, if this site does experience a major disturbance it is not resilient and may be extremely difficult to stabilize once altered. For example, vehicle traffic when the soil is saturated will leave ruts that remain for years to come.

For more grazing management information refer to Range Technical Notes found in Section I Reference Lists of NRCS Field Office Technical Guide for Washington State.

In Washington, bluebunch wheatgrass communities provide habitat for a variety of upland wildlife species.

Supporting Information:

Associated Sites:

Shallow Stony, prairie is associated with other prairie ecological sites in MLRA 6 including Loamy, North Aspect and Very shallow.

Similar Sites:

Shallow Stony, prairie is similar to other Shallow Stony sites in MLRA 6 (Shallow Stony 2800-4000 feet, Shallow Stony 4000-6000 feet, Shallow Stony 6000-7600 feet). Shallow Stony sites in other MLRAs are also somewhat similar as they are all sparsely vegetated.

Inventory Data References (narrative):

Data to populate Reference Community came from several sources: (1) NRCS ecological sites from 2004, (2) Soil Conservation Service range sites from 1980s and 1990s, (3) Daubenmire's habitat types, and (4) ecological systems from Natural Heritage Program

Major Land Resource Area

MLRA 006X

Cascade Mountains, Eastern Slope

Stage

Provisional

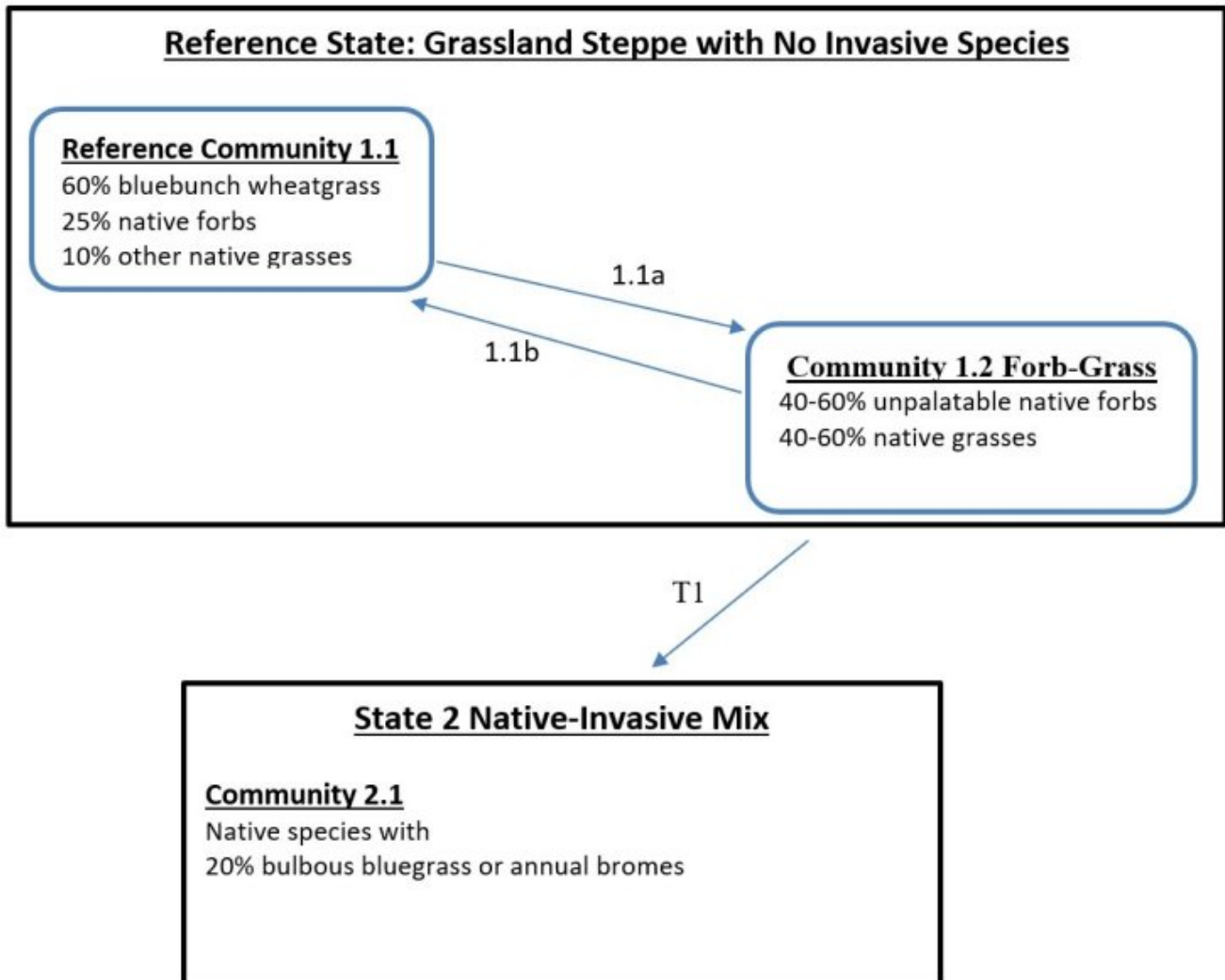
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State and transition model

State and Transition Diagram for Shallow Stony, prairie for MLRA 6

This state and transition model (STM) explain the general ecological dynamics for the Shallow Stony ecological site. The STM illustrates the common plant communities that can occur on the site. Boxes around each state represent the ecological threshold, which if crossed, is not reversible without human intervention. Arrows within a state represent the pathway between plant communities, while the arrows between states represent the transition or recovery between the states. Plant species composition is represented as a percentage of total annual production (pounds). The composition of pristine sites can vary somewhat due to variations in site conditions.



Reference Community 1.1 for Shallow Stony, prairie in MLRA 6

Plant species composition is represented as a percentage of total annual production (pounds). The composition of pristine sites can vary somewhat due to variations in site conditions. Pounds listed below are the maximum allowable for Similarity Index. Many numbers have been rounded to not show more precision than our current state of knowledge.

Index	Similarity Index	Similarity
	Sprouting Shrubs – Minor	5% 50 lbs.
	ERSP7 rock buckwheat	
Dominant Mid-Size Bunchgrass	60% 375 lbs.	Other Mid-Size Bunchgrasses – Minor
PSSP6 bluebunch wheatgrass		5% 30 lbs.
		FEID Idaho fescue
		ELEL5 bottlebrush squirreltail
		ACTH7 Thurber needlegrass
		HECO26 needle and thread
		HOJU foxtail barley
Short Grasses – Minor	5% 50 lbs.	
POSE Sandberg bluegrass		
VUOC sixweeks fescue		
Native Forbs – Dominant		25% 150 lbs.
BALSA balsamroot		PHHO spiny phlox
LIPU11 granite gilia		NEST5 narrowleaf goldenweed
ERNI2 snow buckwheat		ERHE2 parsnipflower buckwheat
LOMAT lomatium / biscuitroot		ALLIU wild onion
ERIGE2 fleabane		ASTRA milkvetch / locoweed
ANDI2 low pussytoes		PLPA2 woolly plantain
ACMI2 yarrow		PENST penstemon
LUPIN lupine		PHLOX phlox
ERIOG buckwheat		
		Below Normal Above
Estimated Production (pounds / acre)		300 450 600

State 1

Reference State: Grassland Steppe With no Invasive Species

State 1 Narrative: State 1 represents grassland steppe with no invasive or exotic weed species. Each functional, structural group would have one or more native species. The prairies of MLRA 6 have no sagebrush or bitterbrush, and no rabbitbrush. The Reference Community is dominated by bluebunch wheatgrass with native forb species prominent. Reference State Community Phases: 1.1 Reference Bluebunch wheatgrass – Native Forbs 1.2 Forbs Native forbs – Bluebunch Wheatgrass At-risk Communities: • Different communities have different degrees of risk • All communities in the reference state are at risk of invasive species • All communities in the reference state are at risk of moving to State 2. The seed source of invasive species is nearby and moving onto most sites annually.

Community 1.1

Reference Community

Bluebunch wheatgrass – Native Forbs

Community 1.2

Forb-Grass

Native forbs – Bluebunch Wheatgrass

Pathway 1.1a

Community 1.1 to 1.2

1.1a Result: Pathway from Reference Community 1.1 (bluebunch wheatgrass dominated) to Community 1.2 with less bluebunch wheatgrass, more other native grasses & native forbs. Primary Trigger: Grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to bluebunch wheatgrass or heavy livestock trailing. Ecological Process: consistent defoliation pressure to bluebunch wheatgrass and other palatable species results in poor vigor and shrinking crowns. As bluebunch wheatgrass declines, other native grasses and native forbs take advantage of released resources and niche space and, increase via new seedlings. Indicators: declining cover of bluebunch wheatgrass and increasing cover of native forbs and other native grasses.

Pathway 1.1b

Community 1.2 to 1.1

1.1b Result: Pathway from Community 1.2 native grass dominated to Reference Community 1.1 with more bluebunch wheatgrass and less forbs. Primary Trigger: improved grazing management (proper grazing intensity and timing) to bluebunch wheatgrass. Ecological Process: with defoliation pressure removed, bluebunch wheatgrass has improved vigor and increases via tillering and possibly new seedlings. Indicators: increasing cover of bluebunch wheatgrass and declining cover of native forbs and other grasses

State 2

Native-Invasive Mix

State 2 represents grassland steppe with the inclusion of invasive species such as bulbous bluegrass, annual bromes or foxtail barley. Native species are present and dominant, but invasive species have gained a foothold that they do not easily relinquish. All the native functional, structural groups are still represented by one or more species. Grazing pressure weakens the stand of native species allowing the invasive species to colonize and establish themselves in the community. Invasive species are a minor component in State 2. But once a community has been invaded by invasive species the chance of going back to State 1 is small. Dominate State 2 Species: unpalatable native forbs and native bunchgrasses

Transition T1

State 1 to 2

T1 Result: shift from Community 1.2 in State 1 (with no invasive species) to State 2 Native-Invasive Mix. Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing and frequent late spring grazing) to bluebunch wheatgrass and other palatable species. Ecological Process: with consistent defoliation pressure palatable native species exhibit poor vigor, shrinking crowns and plant mortality. This releases resources and niche space that invasive species take advantage of to colonize the site. Native species are still present and dominant but invasives have gained a foothold that they do not easily give up. Indicators: decreasing cover of Idaho fescue, bluebunch wheatgrass and other native species. Presence of invasive species on site where they had been absent. References: Boling M., Frazier B., Busacca, A., General Soil Map of Washington, Washington State University, 1998 Daubenmire, R., Steppe Vegetation of Washington, EB1446, March 1968 Davies, Kirk, Medusahead Dispersal and Establishment in Sagebrush Steppe Plant Communities, Rangeland Ecology & Management, 2008 Environmental Protection Agency, map of Level III and IV Ecoregions of Washington, June 2010 Miller, Baisan, Rose and Pacioretty, "Pre and Post Settlement Fire regimes in mountain Sagebrush communities: The Northern Intermountain Region Natural Resources Conservation Service, map of Common Resource Areas of Washington, 2003 Rapid Assessment Reference Condition Model for Wyoming sagebrush, LANDFIRE project, 2008 Rocchio, Joseph & Crawford, Rex C., Ecological Systems of Washington State. A Guide to Identification. Washington State

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Citations