

Ecological site group R006XG126WA

Stony south aspect, 4000-6000 feet

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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

Land Resource Unit (LRU) – Common Resource Areas (CRA):

- 6.1 – North Cascades Subalpine/Alpine
- 6.2 – Pasayten/Sawtooth Highlands
- 6.3 – Okanogan Pine/Fir Hills
- 6.4 – Chelan Tephra Hills
- 6.5 – Chiwaukum Hills and Lowlands

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.

Stony south aspect, 4000-6000 feet is an upland site at mid elevations (4000-6000 feet) in the 18-25" precipitation zone of MLRA 6. This site is found on southeast and south to west aspects. Level areas and other aspects are forest. The soils are generally deep and stony. Sandy loam and loam are the main textures.

Stony south aspect, 4000-6000 feet Reference Community is a shrub steppe site. Bluebunch wheatgrass and Idaho fescue are co-dominant in the reference state while other grasses include prairie junegrass and needlegrass. Native forbs fill the interspaces.

Principle Vegetative Drivers:

The vegetative expression of this ecological site is driven by the combination of five factors:

- (1) Elevation between 4,000 and 6,000 feet
- (2) 18-30 inches of precipitation
- (3) The southeast and south, to west aspects
- (4) Moderately deep to deep soils provide unrestricted rooting for most species
- (5) Timing and amount of late-May and June precipitation

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 Loamy sites with water infiltrating into the soil. These sites are well drained and are saturated for only a short period.

Physiography of MLRA 6:

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

Landform: Sideslopes, shoulders, summits

Elevation: Dominantly 3,500 to 6,500 feet

Central tendency: 4,000 to 6,000 feet

Slope: Total range: 10 to 65 percent

Central tendency: 15 to 35 percent

Aspect: Dominantly southerly 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. The average annual precipitation for most of the East Slope of the Cascades is 16-50 inches. 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 Cascades. 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 - 30 inches

Central tendency: 18 – 22 inches

Soil moisture regime is xeric

Mean Annual Air Temperature:

Range: 39 to 45 degrees

Central tendency: 40 to 44 degrees

Soil temperature regime is frigid

Frost-free period (days)

Total range: 70 to 140

Central tendency: 90 to 120

The growing season is May to mid-August.

Soil features

Edaphic:

Stony south aspect, 4000-6000 feet ecological site commonly occurs with Shallow Stony 4000-6000 feet and Douglas fir ecological sites. This ecological site has moderately deep, well drained soils formed in loess.

Representative Soil Features:

This ecological site components are dominantly Vitrandic and Ultic taxonomic subgroups of Haploxerolls and Argixerolls great groups of the Mollisols. Soils are dominantly moderately deep or deeper. Average available water capacity of about 4.0 inches (10.2 cm) in the 0 to 40 inches (0-100 cm) depth range.

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

The associated soils are Pelican, Sapkin and similar soils.

Dominant soil surface is gravelly ashy loam to very cobbly 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: 10

Fragments within surface horizon \leq 3 inches (% Volume):

Minimum: 5

Maximum: 30

Average: 10

Subsurface fragments > 3 inches (% Volume):

Minimum: 5

Maximum: 40

Average: 15

Subsurface fragments \leq 3 inches (% Volume):

Minimum: 10

Maximum: 50

Average: 30

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: 20

Maximum: Greater than 60

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: 5.6 to 7.3

10 - 40 inches: 6.1 to 7.3

Available Water Capacity (inches, 0 – 40 inches depth):

Minimum: 3.5

Maximum: 5.0

Average: 4.0

Vegetation dynamics

Ecological Dynamics:

Stony south aspect, 4000-6000 feet produces about 500-1450 pounds/acre of biomass annually.

In the Reference Community bluebunch wheatgrass and Idaho fescue are dominant. Both species are long-lived, mid-sized bunchgrasses. Idaho fescue is shorter and has a dense clump of shoots, while bluebunch wheatgrass is taller and is less dense. Bluebunch has an awned spike seed head while Idaho fescue has an awned panicle seed head. The ratio of Idaho fescue to bluebunch wheatgrass plants on any site can vary due to aspect and elevation.

Both grasses provide 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.

The stability and resiliency of the reference communities is directly linked to the health and vigor of bluebunch wheatgrass. Refer to pages 8-9 for more details about bluebunch physiology. Research has found, on similar rangeland, that communities remain resistant to medusahead if sites maintain at least 0.8 mid-sized bunchgrass plant/sq. ft. (K. Davies, 2008). It is bluebunch that holds the system together. If we lose the bluebunch or Idaho fescue the ecosystem crashes or unravels.

The natural disturbance regime for grassland communities is periodic lightning-caused fires. Ponderosa pine communities have the shortest fire return interval (FRI) of about 10-20 years (Miller). The FRI increases as one moves to wetter or higher elevation sites.

Stony South Aspect, 4000-6000 feet does not regularly burn in August and September as it is normally quite green during fire season. However, the mountain sagebrush, which tend to increase over time, is quite susceptible to a sudden sharp drop in temperatures in late fall or early winter if not covered by snow. These events, very temperature dependent, will reduce a stand of mountain sagebrush to less than 5% canopy

Grazing is another common disturbance that occurs to this ecological site. Grazing pressure can be defined as heavy grazing intensity, or frequent grazing during reproductive growth, or season-long grazing (the same plants grazed more than once). As grazing pressure increases the plant community unravels in stages:

1. Idaho fescue and bluebunch wheatgrass have slight to moderate decline while shrubs and unpalatable native forbs increase
2. With further decline Canada/Kentucky bluegrass colonizes the site
3. The site can become dominated by Canada/Kentucky bluegrass

Managing grasslands to improve the vigor and health of native bunchgrasses begins with an understanding of grass physiology. New growth each year begins from basal buds. Bluebunch wheatgrass plants rely principally on tillering, rather than establishment of new plants through natural reseeding. During seed formation, the growing points become elevated and are vulnerable to damage or removal.

If defoliated during the formation of seeds, bluebunch wheatgrass has limited capacity to tiller compared with other, more grazing resistant grasses (Caldwell et al., 1981). Repeated critical period grazing (boot stage through seed formation) is especially damaging. Over several years each native bunchgrass pasture should be rested during the critical period two out of every three years (approximately April 15–July 15). And each pasture should be rested the entire growing-season every third year (approximately March 1 – July 15).

In the spring each year it is important to monitor and maintain an adequate top growth: (1) so plants have enough energy to replace basal buds annually, (2) to optimize regrowth following spring grazing, (3) to protect the elevated growing points of bluebunch wheatgrass, and (4) to avoid excessive defoliation of Idaho fescue with its weak stems.

Bluebunch wheatgrass and Idaho fescue remain competitive if:

- (1) Basal buds are replaced annually,
- (2) Enough top-growth is maintained for growth and protection of growing points,
- (3) Idaho fescue makes viable seed and
- (4) The timing of grazing and non-grazing is managed over a several-year period. Careful management of late spring grazing is especially critical

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:

Stony South Aspect, 4000-6000 feet is associated with Shallow Stony 4000-6000 feet, Very Shallow and Douglas fir ecological sites.

Similar Sites:

Stony South Aspect, 6,000 – 7,600 feet in MLRA 6 is similar in some respects and different in other respects.

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

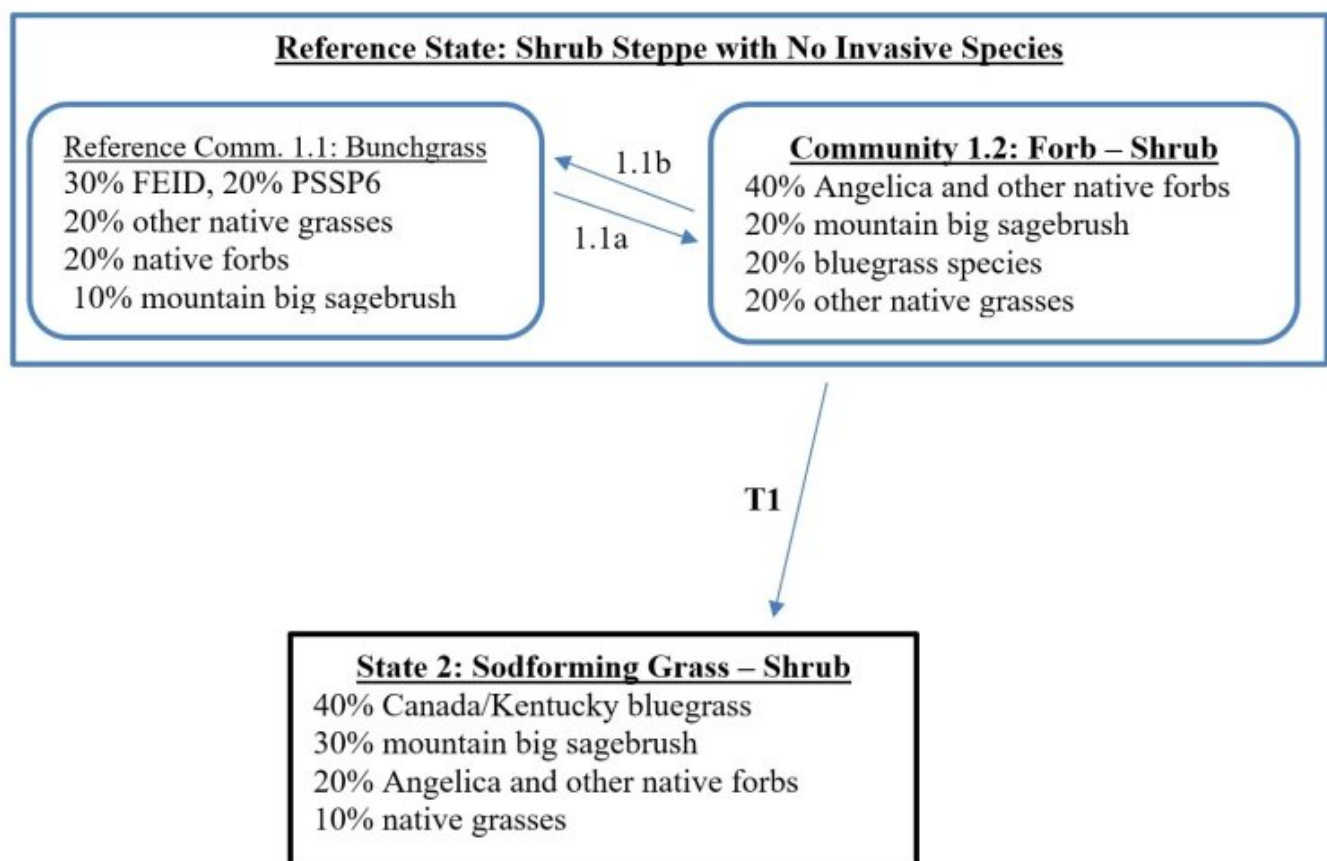
Contributors

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State and transition model

State and Transition Diagram for Stony south aspect, 4000-6000 feet (MLRA 6):

This state and transition model (STM) explain the general ecological dynamics for the Loamy 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 Stony South Aspect, 4000-6000 feet

(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.

Similarity Index		Similarity Index	
Non-Sprouting Shrubs – Subdominant (3-7% canopy)		Trees – Trace	
	10% 150 lbs.	PSME Douglas fir	Trace
ARTRV mountain big sagebrush			
Dominant Mid-Size Bunchgrass 50%		Other Mid-Size Grasses – Minor 10% 150 lbs.	
FEID Idaho fescue	30% 425 lbs.	KOMA prairie junegrass (5-15%)	
PSSP6 bluebunch wheatgrass	20% 300 lbs.	STIPA needlegrass	
		MEBU oniongrass	
		PSSP6 bluebunch wheatgrass	
		ELEL5 bottlebrush squirreltail	
		ELTR slender wheatgrass	
		POAM big bluegrass	
Short Grasses – Minor 5% 75 lbs.		Rhizomatous Grass - Subdominant 0-10% 150 lbs.	
POA bluegrass species 2x		CARU pinegrass	
		Grass-Like less than 5% 50 lbs.	
		CAREX sedge species	
Native Forbs – Subdominant 20% 300 lbs.			
BASA3 arrowleaf balsamroot		CALOC lily – mariposa, sego	
LUPIN lupine		ORTHO owl clover	
ACMI2 yarrow		CASTI2 paintbrush	
ERIOG buckwheat species		ASTRA milk vetch / locoweed	
ERIGE2 fleabane		GEUM prairie smoke	
ANTEN pussytoes		ALLIU onion	
PENST penstemon		ARNIC arnica	
AGGL pale agoseris		LIRU4 stoneseed	
HIERA hawkweed		COLLO collomia	
DELPH larkspur		POTEN cinquefoil	
CREPI hawksbeard		PHLO2 longleaf phlox	
PHHO spiny phlox		LOMAT lomatium / biscuitroot	
LIPU11 granite gilia		PLPA2 woolly plantain	
FRPU2 yellow fritillary		ANAR angelica	
		Below	Normal
Estimated Production (pounds / acre)		500	850
			Above
			1400

State 1

Reference State: Shrub Steppe with No Invasive Species

State 1 Narrative: State 1 represents shrub steppe with no invasive or exotic weed species. Each functional, structural group has one or more native species. Dominate Reference State Species: Bluebunch wheatgrass and Idaho fescue

Community 1.1

Reference Community

Bluebunch wheatgrass-Idaho fescue

Community 1.2

Grass-Forb-Shrub

Bluebunch wheatgrass-Native Forbs

Pathway 1.1a

Community 1.1 to 1.2

1.1a Result: pathway from bunchgrass dominated Reference Community 1.1 to forb – shrub Community 1.2. Primary Trigger: Cattle grazing pressure (heavy grazing intensity, season long grazing or frequent critical period grazing) to Idaho fescue, prairie junegrass and bluebunch wheatgrass or heavy livestock trailing. Ecological Process: with consistent defoliation pressure Idaho fescue, bluebunch wheatgrass and prairie junegrass exhibit poor vigor and shrinking crowns. Unpalatable forbs and shrubs gain the competitive edge and take advantage of released resources and niche space. New forb and shrub seedlings establish. Indicators: declining cover of Idaho fescue, bluebunch wheatgrass, prairie junegrass and increasing cover of forbs and shrubs

Pathway 1.1b

Community 1.2 to 1.1

1.1b Result: pathway from Forb – Shrub Community 1.2 to bunchgrass dominated reference Community 1.1. Primary Trigger: In late fall to early winter with limited snow cover and a sudden drop in temperature, sagebrush experiences a lot of mortality. Improved grazing management (proper intensity and timing) is necessary for native bunchgrasses to have a positive response. Ecological Process: The low temperatures kill the unprotected sagebrush and shrub canopy cover is reduced to less than 5%. Sound grazing management promotes improved vigor in the native bunchgrasses. Idaho fescue and prairie junegrass set new seedlings while bluebunch wheatgrass establishes new shoots via tillering Indicators: increasing cover of prairie junegrass, Idaho fescue and bluebunch wheatgrass, and declining cover of forbs and shrubs.

State 2

Sodforming Grass – Shrub

State 2 Narrative: State 2 represents an altered state. Native grasses, dominant in State 1, are now a minor component. Mountain big sagebrush has increased and is in a dominant position. Native forbs are mainly Angelica and other unpalatable forb species. Invasive sodforming grasses (Canada/Kentucky bluegrass) have invaded and increased to a position of dominance. Once the invasive sodforming grasses colonizes a site, the chance of going back to State 1 is small. Dominate State 2 Species: Canada/Kentucky bluegrass, mountain big sagebrush. Community Phases for State 2: Sodforming grass – Shrub Canada/Kentucky bluegrass – mountain big sagebrush

Community 2.1

20% PSSP6, 5% FEID 15% other grasses 25% ARTRV 10% Kentucky bluegrass

Bluebunch wheatgrass – Native Forbs – Mountain big sagebrush – Kentucky bluegrass

Transition T1

State 1 to 2

Transitions from State to State T1 Result: transition from Reference State to State 2 The Reference State does not have invasive species while State 2 has the invasive Canada/Kentucky bluegrass. Primary Trigger: Grazing pressure from livestock (heavy grazing intensity, season long grazing or frequent critical period grazing) to native grasses (Idaho fescue, bluebunch wheatgrass and other palatable species). Ecological process: defoliation pressure to native grasses results in poor vigor, shrinking crowns and plant mortality, and this releases resources and niche space. Mountain big sagebrush makes a moderate increase. Invasive sodforming grasses invade the site

and expand to a dominant position in the community. Indicators: The occurrence of Canada or Kentucky bluegrass on sites where it had been absent. The cover of native bunchgrasses has declined to a minor position in the community

Constraints to recovery. Recovery We do not have experience in trying to restore these sites. 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 Department of Natural Resources, October 2015. Rouse, Gerald, MLRA 8 Ecological Sites as referenced from Natural Resources Conservation Service-Washington FOTG, 2004 Soil Conservation Service, Range Sites for MLRA 8 from 1980s and 1990s Tart, D., Kelley, P., and Schlafly, P., Rangeland Vegetation of the Yakima Indian reservation, August 1987, YIN Soil and Vegetation Survey

Citations