Ecological site group R006XG450WA
North aspect, 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):
6.5 – Chiwaukum Hills and Lowlands
6.6 – Yakima Plateau and Slopes
6.7 – Grand Fir Mixed Forest
6.8 – Oak-Conifer Eastern Cascades-Columbia Foothills

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.

North Aspect, 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. This site occurs on north-facing slopes. The soils are silt loam over gravelly clay loam and deeper than 40 inches. North Aspect Prairie soils are not hydric.

In the Reference State North aspect, prairie has a dense herbaceous layer with little bare ground and not much lichen-moss.

The High Prairie and the Swauk Prairie are grassland steppe and do not have sagebrush, nor bitterbrush, and no rabbitbrush. Bitterbrush may be found on adjoining ecological sites, however. Idaho fescue dominates the reference state in terms of cover and production. Other native bunchgrasses and native forbs fill the interspaces.

Principle Vegetative Drivers:

The vegetative expression of this productive site is driven by three factors: (1) moderately deep to deep soil depth provides unrestricted rooting for most species, (2) precipitation of 20-24 inches ensures a long growing season, and (3) the north aspect provides cooler temperatures year-round and longer lasting snowpack than adjacent ecological sites. North Slope provides crucial water to Idaho fescue at the hottest time of the growing season. Also, being wetter, North Slope supports a denser plant cover than the Loamy Prairie ecological site.

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

This ecological site is cooler and moister than surrounding sites due to microclimatic effects. North slopes have less direct solar radiation and reduced evapotranspiration than adjacent uplands or south facing slopes and may retain snow cover longer into the growing season. Deep soils on the north slopes and extensive subsurface root systems of the dominant grasses also provide greater soil moisture infiltration and retention compared with other areas.

Compared to other upland ecological sites, North Slope has more available soil moisture. The north and northeast slopes mean cooler temperatures. Closer spacing of plants mean less evaporation and less runoff. Idaho fescue is especially linked to the additional soil moisture on this ecological site. Bluebunch wheatgrass, is not as linked to the additional soil moisture.

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, summits and shoulders

Elevation: Dominantly 2,000 to 5,500 feet
Central tendency: 2,800 to 4,800 feet
Slope: Total range: 0 to 60 percent
Central tendency: 2 to 30 percent
Aspect: Dominantly northerly aspects, but 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. 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: 18-40 inches
Central tendency: 20-24 inches
Soil moisture regime is xeric.

Mean Annual Air Temperature:
Range: 43 to 48 degrees
Central tendency: 44 to 46 degrees
Soil temperature regime is mesic to frigid.

Frost-free period (days):
Total range: 40 to 130
Central tendency: 70 to 110
The growing season for North aspect, prairie is March through mid-August.

Soil features

Edaphic:

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

Representative Soil Features:

This ecological site components are dominantly Vitrandic and Ultic taxonomic subgroups of Argixerolls and Haplocryolls 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 loess and colluvium over residuum.

The associated soils are Sapkin and similar soils.

Dominate soil surface is loam to very stony loam.

Dominant particle-size class is loamy to loamy skeletal.

Fragments on surface horizon > 3 inches (% Volume):
Minimum: 0
Maximum: 5
Average: 1

Fragments within surface horizon > 3 inches (% Volume):
Minimum: 10
Maximum: 35
Average: 30

Fragments within surface horizon ≤3 inches (% Volume):
Minimum: 0
Maximum: 20
Average: 10

Subsurface fragments > 3 inches (% Volume):
Minimum: 5
Maximum: 30
Average: 20

Subsurface fragments ≤ 3 inches (% Volume):
Minimum: 10

Maximum: 30
Average: 15

Drainage Class: Dominantly well drained
Water table depth: Greater than 20 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 to low

Depth to root-restricting feature (inches):
Minimum: 30
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: 6.1 to 7.3
10 - 40 inches: 6.1 to 7.3

Available Water Capacity (inches, 0 – 40 inches depth):
Minimum: 1.3
Maximum: 5.0
Average: 4.0

Vegetation dynamics

Ecological Dynamics:

North Aspect, prairie produces about 1000-1400 pounds/acre of biomass annually

In the reference condition Idaho fescue dominates the North aspect, prairie ecological site. Idaho fescue is a long-lived shorter grass and has a dense clump of shoots. Idaho fescue has an awned panicle inflorescence.

Idaho fescue 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.

The stability and resiliency of the reference communities is directly linked to the health and vigor of Idaho fescue.

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). Idaho fescue holds the system together. If we lose either or both bunchgrass the ecosystem begins to unravel.

The natural disturbance regime for grassland communities is periodic lightning-caused fires. Ponderosa pine communities have the shortest FRI of about 10-20 years (Miller). The FRI increases as one moves to wetter forested sites or to dries shrub steppe
communities. Given the uncertainties and opinions of reviewers, a mean of 75 years was chosen for Wyoming sagebrush communities (Rapid Assessment Model). This would place the historic FRI for prairies around 30-50 years perhaps, and even as short as 5-10 years in some locations.

The effect of fire on the community depends upon both the severity and season of the burn. See Vallentine's Range Improvement for more detail. With a light to moderate fire there can be a mosaic of burned and unburned patches. Bunchgrasses thrive as the fire does not get into the crown. Idaho fescue can exhibit rapid tillering when there is light severity fires and favorable soil moisture. Largely, the community is not affected by lower intensity fire

A severe fire puts stress on the entire community. Some spots and areas can be completely sterilized. Under windy conditions, a fire can burn into the crown of Idaho fescue, leaving behind "black holes" or nothing but ash where fescue plants were incinerated. Sterilized spots and dead Idaho fescue plants makes the site vulnerable to exotic invasive species, so seeding should be strongly be considered. Idaho fescue makes the site more at risk.

Spring burning can be especially damaging to Idaho fescue.

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 declines while bluebunch wheatgrass and unpalatable forbs increase
2. All grasses decline while unpalatable forbs continue to increase. Invasive species such as bulbous bluegrass, annual bromes and ventenata colonize the site
3. The site can become an invasive grass community

Managing grassland to improve the vigor and health of native bunchgrasses begins with an understanding of grass physiology. New growth each year begins from basal buds. Given the opportunity Idaho fescue readily produces new seedlings while bluebunch wheatgrass plants rely principally on tillering. During seed formation, the growing points of bluebunch wheatgrass become elevated and are vulnerable to damage or removal. Idaho fescue has weak stems and is much more sensitive to grazing than bluebunch wheatgrass.

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 excessing defoliation of Idaho fescue with its weak stems.

These grasses 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, Idaho fescue – bluebunch wheatgrass communities provide habitat for a variety of upland wildlife

species.

Supporting Information:

Associated Sites:
North Aspect, prairie is associated with Loamy prairie, Shallow Stony prairie and Very Shallow ecological sites.

Similar Sites:
North Aspect, prairie is similar to North Aspect in MLRA 8 for the Goldendale Prairie

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

Contributors

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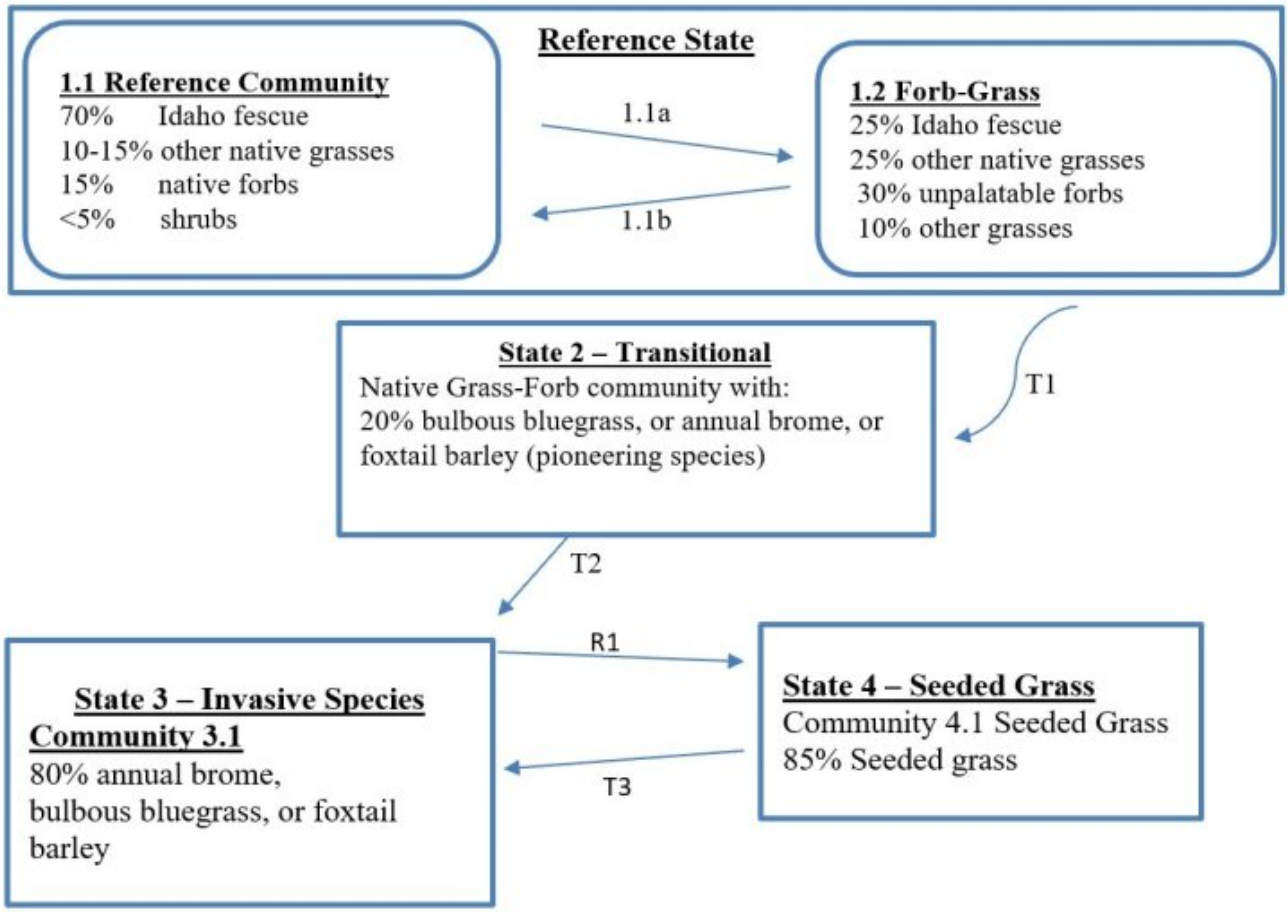
State and transition model

State and Transition Diagram for North Aspect, prairie in 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 North Aspect, prairie (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
Trees – Trace	Trace	**Sprouting Shrubs – Minor**	less than 5% 50 lbs.
QUGA4 Oregon white oak PIPO ponderosa pine PSME Douglas fir		RIBES currant ROSA5 rose	
Dominant Mid-Size Bunchgrasses	70% 1050 lbs.	**Other Mid-Size Bunchgrasses – Minor**	10% 150 lbs.
FEID Idaho fescue		PSSP6 bluebunch wheatgrass POCU3 Cusick's bluegrass ACNE9 western/Nelson's needlegrass KOMA prairie junegrass	
Short Grass – Minor	less than 5% 50 lbs.	**Tall Grass – Minor**	less than 5% 50 lbs.
POSE Sandberg bluegrass		LECI4 basin wildrye	
Native Forbs – Minor			15% 225 lbs.
BASA3 arrowleaf balsamroot LUPIN lupine CREPI hawksbeard PHLO2 longleaf phlox PHHO spiny phlox LIPU11 granite gilia ASTRA milkvetch / locoweed ANDI2 low pussytoes HIERA hawkweed DELPH larkspur LIRU4 stoneseed		ALLIU wild onion CALOC Mariposa lily ERIGE2 fleabane LOMAT lomatium / biscuitroot ERIOG buckwheat species CASTI2 paintbrush ACMI2 yarrow COLLO collomia PLPA2 woolly plantain FRPU2 yellow fritillary	

	Below	Normal	Above
Estimated Production (pounds / acre)	1000	1300	1500

State 1
Reference State

State 1 Narrative: State 1 represents grassland steppe with no invasive or exotic species. All the native functional, structural groups have one or more species. Reference State Community Phases: 1.1 Reference Idaho fescue-bluebunch wheatgrass 1.2 Forb-Grass Unpalatable forbs-Idaho fescue-bluebunch wheatgrass Reference Community is stable with a high cover of Idaho fescue and moderate cover of forbs. But when the dominant bunchgrasses exhibit low vigor and decline, unpalatable forbs increase. Dominate Reference State Species: Idaho fescue, bluebunch wheatgrass. At-risk Communities: • All communities in the reference state are at risk of invasive species and moving to State 2. The seed source of invasive species is nearby and moving onto most sites annually. • Any community is at risk when fire kills Idaho fescue plants. The holes could quickly be filled by invasive grass or weeds • A community has moved to State 2 Transitional when cheatgrass or broadleaf weeds have colonized the site • Any community becomes at-risk of moving to State 3 when Idaho fescue and bluebunch have low cover and cheatgrass or broadleaf weeds have colonized the site

Community 1.1
Reference Community

Idaho fescue-bluebunch wheatgrass

Community 1.2
Forb-Grass

Unpalatable forbs-Idaho fescue-bluebunch wheatgrass

Pathway 1.1a
Community 1.1 to 1.2

1.1a Result: pathway from bunchgrass dominated Reference Community 1.1 to Forb-Grass Community 1.2 Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to Idaho and other palatable species. Ecological process: consistent defoliation pressure to Idaho fescue and other palatable species results in poor vigor, shrinking crowns and plant mortality. This releases resources and niche space. As Idaho fescue declines, forbs and other native grasses gain the competitive edge. Forbs establish new seedlings while other grasses increase via new seedlings and tillering. Indicators: declining cover of Idaho fescue and increasing cover of forbs and other native grasses.

Pathway 1.1b
Community 1.2 to 1.1

1.1b Result: shift from Forb-Grass Community 1.2 to bunchgrass dominated Reference Community 1.1. Primary Trigger: improved grazing management Ecological process: with defoliation pressure removed, Idaho fescue gains the competitive edge, exhibits good vigor and expands via tillering and new seedlings. On favorable sites such as North Aspect Prairie, Idaho fescue can become aggressive Indicators: increasing cover of Idaho fescue, decreasing forb cover

State 2
Transitional

State 2 Narrative: State 2 represents a moderate invasion by invasive species. Native species are present and dominant, but invasive species have gained a foothold that they do not relinquish. Grazing pressure weakens the stand of native species allowing the invasive species to colonize and establish themselves in the community. The invasion can be bulbous bluegrass, annual bromes or foxtail barley. Dominate State 2 Species: unpalatable forbs and native bunchgrasses

Community 2.1
Native Grass-Forb community

State 3
Invasive Species

State 3 Narrative: State 3 represents sites dominated by invasive annual species and has crossed a biological threshold. As State 1 or State 2 unravels the dominant bunchgrasses decline while invasive grasses become more and more prominent. Virtually all the native functional, structural groups are missing in State 3. Community Phases for State 3: 3.1 Invasive species bulbous bluegrass, annual bromes, foxtail barley Dominate State 3 Species: bulbous bluegrass, annual bromes or foxtail barley

Community 3.1
Invasive species

State 4

Seeded Grass

State 4 Narrative: State 4 represents a site that has been seeded to desirable grasses such as intermediate wheatgrass or smooth brome. State 4 is stable if 0.8 plant per sq. ft. or greater of the desired bunchgrasses is maintained. Community Phases for State 4: 1.1 Seeded Grasses Dominate State 4 Species: Desirable seeded grasses with or without legumes

Community 4.1
Seeded Grass

Seeded Grasses

Transition T1
State 1 to 2

T1 Result: transition from Reference State (grassland with no invasive species) to Transitional State 2 (grassland with some invasive species). The Reference State does not have invasive species. State 2 has the same communities but with minor additions of invasive species such as bulbous bluegrass or annual bromes, or pioneering species such as foxtail barley. Primary Trigger: improper grazing (heavy grazing intensity, season long grazing or frequent late spring grazing) to Idaho fescue and other palatable species Ecological process: consistent defoliation pressure to Idaho fescue results in poor vigor, shrinking crowns and plant mortality. This releases resources and niche space. Unpalatable forbs and invasive species gain the competitive advantage. Forbs establish new seedlings. Invasive species colonize the site and increase cover. Indicators: declining Idaho fescue cover and the occurrence of invasive species on sites where they had been absent.

Transition T2
State 2 to 3

T2 Result: Transition from Transitional State 2 to State 3 which is dominated by invasive species. Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to Idaho fescue and other palatable species. This transition occurs once the cover of Idaho fescue-bluebunch wheatgrass decline to less than 10% while invasive species cover is 40% or more. Ecological process: consistent defoliation pressure to Idaho fescue results in poor vigor, shrinking crowns and plant mortality. This releases resources and niche space. In a series of retrogressions Idaho fescue and other native species are weakened, and the invasive species increase to fill the void. After each retrogression the stand stabilizes but at a lower ecological level. Finally, the stand is dominated by invasive species rather than natives. Unpalatable forbs and invasive species gain the competitive advantage. Forbs establish new seedlings. Invasive species colonize the site and increase cover. Indicators: decreasing cover of native species and increasing cover of invasive species

Transition R1
State 3 to 4

R1 Result: Shift from State 3 (a community dominated by invasive annual species) to State 4, which is predominately desirable seeded grasses. This restoration transition does not occur without significant time and inputs to control weeds, prepare a seedbed, seed desirable species, and post-seeding weed control and management. This requires a commitment of two years or more for weed control. Care must be taken to maintain soil structure so that the seedbed has many safe sites for the seed. Seed placement must be managed to achieve seed-soil contact at very shallow depth (about 1/8 inch is desired). Proper grazing management is essential to maintain the stand post-seeding. Intermediate wheatgrass and smooth brome are typical species seeded on Prairie North Slope ecological site. The actual transition occurs when the seeded species have successfully established and are outcompeting the annual species for cover and dominance of resources.

Restoration pathway T3
State 4 to 3

T3 Result: shift from State 4 seeded grass to State 3 which is dominated by invasive annual species. Primary trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to seeded grasses Ecological Process: consistent defoliation pressure to seeded grasses results in poor vigor, shrinking

crowns and plant mortality. Invasive species colonize the site and then expand to take advantage of released resources and niche space. Indicators: decreasing cover of desirable grasses and increasing cover of invasive species. 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. Pages 156-161 Inter-Mountain Basin Big Sagebrush. 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