

Ecological site group R006XG430WA

Loamy, 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.

Loamy, 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 is found on all aspects except north. The soils are silt loam over gravelly clay loam and deeper than 40 inches. Prairie soils are not hydric.

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. Perennial bunchgrasses dominate the reference state. Cool-season bunchgrasses form two distinct layers. Bluebunch wheatgrass and Idaho fescue are co-dominant bunchgrass in the top grass layer, with Sandberg bluegrass the major grass of the lower grass layer. Native forbs fill the interspaces. At most shrubs are a very minor component.

Principle Vegetative Drivers:

The moderately deep to deep loam over clay loam soils and precipitation of 20-24 inches drive the vegetative expression of this productive site. Most species have unrestricted rooting and the precipitation ensures a longer growing season. Loamy Prairie has enough spring rains to provide plenty of moisture for Idaho fescue to assume a co-dominate role in the reference community.

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.

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, hills and till plains

Landform: Side-slopes, benches and moraines

Elevation: Dominantly 1,100 to 3,000 feet

Central tendency: 1,800 to 2,500 feet

Slope: Total range: 0 to 60 percent

Central tendency: 2 to 30 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. 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: 16-24 inches

Central tendency: 20-24 inches

Mean Annual Air Temperature:

Range: 46 to 54 degrees

Central tendency: 48 to 52 degrees

Soil moisture regime is xeric.

Frost-free Period (days):

Total range: 80 to 140

Central tendency: 100 to 130

The growing season for Prairie Loamy is March through mid-August.

Soil temperature regime is dominantly mesic.

Soil features

Edaphic:

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

Representative Soil Features:

This ecological site components are dominantly Pachic and Ultic taxonomic subgroups of Palexerolls and Argixerolls great groups of the Mollisols. Soils are moderately deep or deeper. Average available water capacity of about 6.0 inches (15.2 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly mixed loess and glacial till in the upper part of the soil over residuum.

The associated soils are Swauk, Qualla, Hyprairie and similar soils.

Dominant soil surface is silt loam to loam.

Dominant particle-size class is fine loamy.

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

Minimum: 0

Maximum: 0

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

Minimum: 0

Maximum: 5

Average: 0

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

Minimum: 0

Maximum: 10

Average: 5

Subsurface fragments > 3 inches (% Volume):

Minimum: 0

Maximum: 10

Average: 2

Subsurface fragments \leq 3 inches (% Volume):

Minimum: 0

Maximum: 20

Average: 10

Drainage Class: Dominantly well drained

Water table depth: Dominantly 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 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: 5.6 to 7.3
10 - 40 inches: 6.1 to 7.3

Available Water Capacity (inches, 0 – 40 inches depth):
Minimum: 4.1
Maximum: 8.1
Average: 6.0

Vegetation dynamics

Ecological Dynamics:

Loamy, prairie produces about 900-1300 pounds/acre of biomass annually.

In the reference condition bluebunch wheatgrass and Idaho fescue dominate the Loamy prairie ecological site. 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 both bluebunch wheatgrass and Idaho fescue. Refer to pages 8-9 for more details about bluebunch physiology.

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 drier 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 grassland steppe at 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. The perennial grasses thrive as the fire does not get into the crown. With adequate soil moisture Idaho fescue, bluebunch wheatgrass and prairie junegrass can make tremendous growth the year after the fire. Largely, the community is not affected by lower intensity fire.

A severe fire puts stress on the entire community. Bluebunch wheatgrass, a fire-resilient grass, will have weak vigor for a few years but generally survives. Reduced vigor of bluebunch allows weeds to become established. Some spots and areas can be completely sterilized. Idaho fescue plants are very much at risk with a severe burn coupled with wind. 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 considered. Bluebunch wheatgrass keeps the site resistant to change, while Idaho fescue makes the site more at risk.

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 or ventenata colonize the site
3. The site can become an invasive grass community

As grazing progressively thins the native perennials, the alien species take their place, finally becoming dominant.

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:

Loamy, prairie is associated with North Aspect, Shallow Stony and Very shallow ecological sites.

Similar Sites:

Loamy, prairie is similar to Loamy for the Goldendale Prairie in MLRA 8.

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

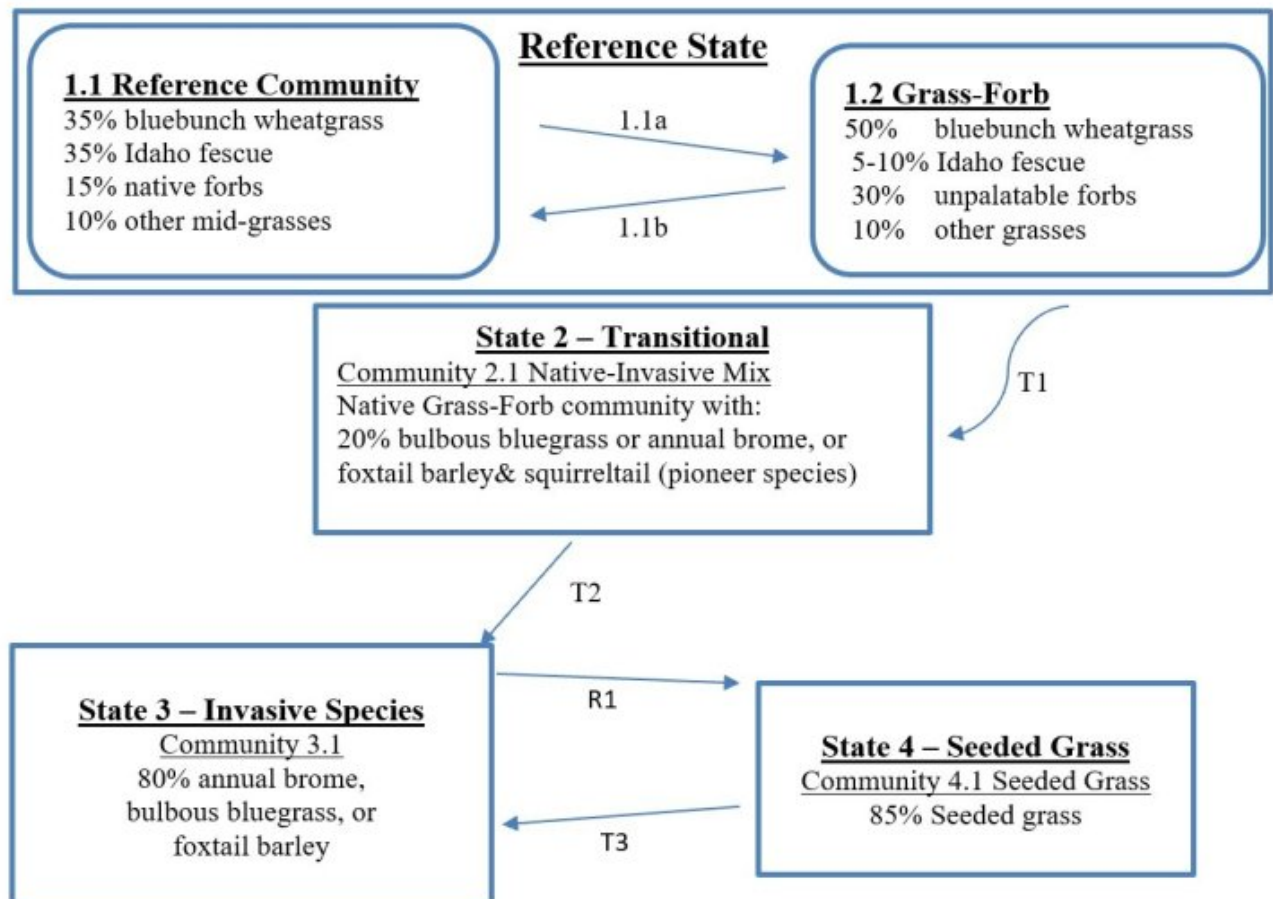
Contributors

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State and transition model

State and Transition Diagram for Loamy, 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 Loamy, 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		
Regenerating Tree – Trace			Sprouting Shrubs – Minor		
QUGA4	Oregon white oak	Trace	RIBES	currant	less than 5% 50 lbs.
			ROSA5	rose	
Dominant Mid-Size Bunchgrasses			Other Mid-Size Bunchgrasses – Minor		
		70% 925 lbs.			10% 150 lbs.
PSSP6	bluebunch wheatgrass		ELEL5	bottlebrush squirreltail	
FEID	Idaho fescue		ACTH7	Thurber needlegrass	
			HECO26	needle and thread	
			POCU3	Cusick's bluegrass	
			ACNE9	western/Nelson's needlegrass	
			KOMA	prairie junegrass	
Short Grass – Minor			Tall Grass – Minor		
		less than 5% 50 lbs.			less than 5% 50 lbs.
POSE	Sandberg bluegrass		LECI4	basin wildrye	
Native Forbs – Minor					
					15% 200 lbs.
BASA3	arrowleaf balsamroot		MICRO6	microseris	
LUPIN	lupine		ALLIU	wild onion	
CREPI	hawksbeard		CALOC	Mariposa lily	
PHLO2	longleaf phlox		ERIGE2	fleabane	
PHHO	spiny phlox		LOMAT	lomatium / biscuitroot	
LIPU11	granite gilia		ERI OG	buckwheat species	
ASTRA	milkvetch / locoweed		CASTI2	paintbrush	
ANDI2	low pussytoes		ACMI2	yarrow	
HIERA	hawkweed		COLLO	collomia	
DELPH	larkspur		PLPA2	woolly plantain	
LIRU4	stoneseed		FRPU2	yellow fritillary	
				Below	Normal
Estimated Production (pounds / acre)				900	1100
					Above
					1300

State 1

Reference State

State 1 Narrative: State 1 represents grassland with no invasive or exotic weed species. Each native functional, structural group has one or more native species. The prairies of MLRA 6 have no sagebrush or bitterbrush, and no rabbitbrush. Reference State Community Phases: 1.1 Reference Idaho fescue – bluebunch wheatgrass 1.2 Grass-Forb Bluebunch wheatgrass – Unpalatable Forbs Dominate Reference State Species: Idaho fescue and bluebunch wheatgrass At-risk Communities: • Different communities have different degrees of risk • 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 when annual grasses 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 annual grasses or broadleaf weeds have colonized the site

Community 1.1

Reference Community

Idaho fescue – bluebunch wheatgrass

Community 1.2

Grass-Forb

Bluebunch wheatgrass – Unpalatable Forbs

Pathway 1.1a

Community 1.1 to 1.2

1.1a Result: shift from Reference Community 1.1 to Grass-Forb Community 1.2. Primary trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to Idaho fescue. Ecological process: consistent defoliation pressure to Idaho fescue results in poor vigor, shrinking crowns and plant mortality. As the stand of Idaho fescue weakens forbs and bluebunch wheatgrass gain the competitive edge. Forbs establish new seedlings and bluebunch wheatgrass expands via tillering. Indicators: declining cover of Idaho fescue and increasing cover of forbs and bluebunch wheatgrass.

Pathway 1.1b

Community 1.2 to 1.1

1.1b Result: pathway from Grass-Forb Community 1.2 to Reference Community 1.1. Primary trigger: improved grazing management Ecological process: with grazing pressure removed from Idaho fescue, good vigor returns and it expands via tillering and new seedlings. Idaho fescue can be aggressive on favorable sites such as Loamy, Prairie. Indicators: increasing cover of Idaho fescue, decreasing cover of forbs and bluebunch wheatgrass.

State 2

Transitional

State 2 Narrative: State 2 represents the transition between State 1 and State 3. State 2 is 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

Community 2.1

Native-Invasive Mix

State 3

Invasive Species

State 3 represents sites dominated by invasive species and has crossed a biological threshold. As State 1 and State 2 unravel 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 or foxtail barley Dominate State 3 Species: bulbous bluegrass, annual bromes or foxtail barley

Community 3.1

Invasive species

bulbous bluegrass, annual bromes or foxtail barley

State 4

Seeded Grasses

State 4 Narrative: State 4 represents a site that has been seeded to desirable grasses such as intermediate wheatgrass, smooth brome or orchardgrass. 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 Grasses

Desirable seeded grasses with or without legumes

Transition T1

State 1 to 2

T1 Result: shift from Reference State to State 2 (grassland steppe w/ some annuals). State 2 has the same communities but with minor additions of invasive annual grasses such as annual bromes. Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to Idaho fescue, bluebunch wheatgrass and other palatable species. Soil disturbances (rodents, badgers) create openings in the community and encourage weed germination. Loss of soil biological crusts contributes to the invasion. Ecological process: consistent grazing pressure to native bunchgrasses results in poor vigor, shrinking crowns and plant mortality. This releases resources and niche space. Most sites in the Reference State have some scattered annual grass seed that has moved onto the site. This seed is waiting for enough moisture to germinate and to compete with the native species for space, light and moisture. Indicators: The occurrence of annual grasses on sites where they had been absent. Decreasing cover of Idaho fescue, bluebunch wheatgrass and other native species.

Transition T2

State 2 to 3

T2 Result: Transition from State 2 a native community with some invasive species to State 3 which is dominated by annuals. This transition occurs once the cover of bluebunch wheatgrass-Idaho fescue declines to less than 10% while invasive species cover is at least 40%. Primary Trigger: grazing pressure (heavy grazing, season long grazing or frequent late spring grazing) to Idaho fescue, bluebunch wheatgrass and other palatable native species. Ecological Process: consistent defoliation pressure to palatable species results in poor vigor, shrinking crowns and plant mortality. Native species are all, but eliminated and invasive species have the competitive advantage. In a series of retrogressions, the cover of native species declines while weeds take advantage of the release of resources and available niche space to colonize and expand. The site has lost its primary species that stabilize and protect the soil from wind and water erosion and has also lost the ability to retain sufficient soil moisture for many of the native perennial species. Indicators: Decreasing cover of bluebunch wheatgrass and increasing cover of invasive annual species. Increasing distance between perennial species. Decreasing soil organic matter, soil water retention, limited water infiltration and percolation in the soil profile.

Transition R1

State 3 to 4

R1 Transition 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, smooth brome, orchardgrass and meadow brome are well adapted to Loamy, Prairie 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 seeded grass State 4 to State 3 which is dominated by invasive annual species. Primary Trigger: grazing pressure (heavy grazing, season long grazing or frequent late spring grazing) to seeded grasses. Ecological Process: with consistent defoliation pressure seeded grasses exhibit poor vigor, shrinking crowns and plant mortality. This releases resources and niche space which opportunistic invasives take most of. Little of the resources remain for the desirable species. Indicators: decreasing cover of seeded grasses, increasing caps gaps between seeded grasses, increasing cover by 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. 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