Ecological site group R008XG650WA
Loamy, North Aspect, Grassland

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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): 8 – Columbia Plateau

LRU – Common Resource Areas (CRA):
8.1 - Channeled Scablands
8.2 - Loess Islands
8.3 - Okanogan Drift Hills
8.6 - Lower Snake and Clearwater Canyons

Site Concept Narrative:

Note: for MLRA 8 there are two ecological sites with the name ‘North Aspect’:
1. One specifically for grasslands on the Goldendale Prairie (Klickitat Co.)
2. One for other grassland areas in MLRA 8 including
a. SE portion of MLRA 8 includes portions of Adams, Franklin, Walla Wall, Asotin, Columbia and Garfield counties
b. Elevations about 2400 feet in northern Douglas county including Dyer Hill and Wilson Butte

Loamy, north aspect, grassland PES below is for other grassland areas in MLRA 8 including Adams, Franklin, Walla Walla, Columbia, Garfield and Douglas counties.

Diagnostics:

Loamy, north aspect, grassland occurs on north to northeast facing slopes on other grassland steppe regions of MLRA 8. This site is found on both stony and non-stony soils that are 20 inches and deeper. The most common textures are loam, silt loam and sandy loam.

Grassland steppe areas have not had sagebrush or bitterbrush for more than 50 years and are not expected to have either. Perennial bunchgrasses dominate the reference state. Fire-tolerant rabbitbrush is a minor presence in the reference state, while forbs fill the interspaces. The shrub layer is typically knee- to waist-high rabbitbrush.

Cool-season bunchgrasses form two distinct layers. On North Slope sites, Idaho fescue is the dominant species and bluebunch wheatgrass is sub-dominant in the top grass layer. Sandberg bluegrass is the major grass of the lower grass layer.

Principle Vegetative Drivers:

The vegetative expression of this productive site is driven by two factors: (1) moderately deep to deep soil depth provides unrestricted rooting for most species, and (2) the north aspect which has more effective precipitation. This ecological site has cooler temperatures year-round and longer lasting snow-pack than adjacent ecological sites. North Slope provides crucial water to the vegetation at the hottest time of the growing season allowing this ecological site more resilience when impacted by disturbances. Also, being wetter and cooler, North Slope supports a denser plant cover, more litter and more biological crusts than the Loamy 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

The Loamy, north aspect, grassland 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.

Physiographic Features:

The landscape is part of the Columbia basalt plateau. Loamy, north aspect, grassland sites are most commonly found on north to northeastern slopes of canyons, ridges, mountains and hills throughout the Columbia Plateau in Adams, Franklin, Walla, Walla, Asotin, Columbia, Garfield and Douglas counties. Topographic position may be more important than parent material in defining this site.

Physiographic Division: Intermontane Plateau
Physiographic Province: Columbia Plateau
Physiographic Sections: Walla Walla Plateau Section

Landscapes: Hills, canyons and plateaus
Landform: Sideslopes, terraces, escarpments terraces

Elevation: Dominantly 400 to 3,000 feet
Central tendency: 1,200 to 2,500 feet
Slope: Total range: 5 to 90 percent
Central tendency: 15 to 65 percent
Aspect: Dominantly occurs on northern aspects

Geology:

This MLRA is almost entirely underlain by Miocene basalt flows. Columbia River basalt is covered in many areas with as much as 200 feet of loess and volcanic ash. Small areas of sandstones, siltstones, and conglomerates of the Upper Tertiary Ellensburg Formation are along the western edge of this area. Some Quaternary glacial drift covers the northern edge of the basalt flows, and some Miocene-Pliocene continental sedimentary deposits occur south of the Columbia River, in Oregon.

A wide expanse of scablands in the eastern portion of this MLRA, in Washington, was deeply dissected about 16,000 years ago, when an ice dam that formed ancient glacial Lake Missoula was breached several times, creating catastrophic floods. The geology of the northernmost part of this MLRA is distinctly different from that of the rest of the area. Alluvium, glacial outwash, and glacial drift fill the valley floor of the Okanogan River and the side valleys of tributary streams. The fault parallel with the valley separates pre-Tertiary metamorphic rocks on the west, in the Cascades, from older, pre-Cretaceous metamorphic rocks on the east, in the Northern Rocky Mountains. Mesozoic

and Paleozoic sedimentary rocks cover the metamorphic rocks for most of the length of the valley on the west.

Climate

Grasslands do not have shrubs because they receive more spring precipitation especially in March (Daubenmire). The micro-climate on the north facing slopes provides cooler temperatures and allows Idaho fescue to dominate. The climate is characterized by moderately cold, wet winters, and hot, dry summers, with limited precipitation due to the rain shadow effect of the Cascades. Taxonomic soil climate is either xeric (12 – 16 inches PPT) or aridic moisture regimes (10 – 12 inches PPT) with a mesic temperature regime.

Mean Annual Precipitation:
Range: 10 – 16 inches
Seventy to seventy-five percent of the precipitation comes late October through March as a mixture of rain and snow. June through early October is mostly dry.

Mean Annual Air Temperature:
Range: 46 to 54 F
Central Tendency: 48 – 52 F
Freezing temperatures generally occur from late-October through early-April. Temperature extremes are 0 degrees in winter and 110 degrees in summer. Winter fog is variable and often quite localized, as the fog settles on some areas but not others.

Frost-free Period (days):
Total range: 100 to 180
Central tendency: 110 to 160
The growing season for Loamy, north aspect, grassland is March through mid-July.

Soil features

Edaphic:

The Loamy, north aspect, grassland ecological site occurs with Loamy, Shallow Stony and Very Shallow ecological sites.

Representative Soil Features:

This ecological site components are dominantly Typic, Aridic and Calcic taxonomic subgroups of Haploxerolls, Haplocambids and Natrixerolls great groups of the Mollisols taxonomic order. Soils are moderately deep to very deep. Average available water capacity of about 7.0 inches (17.8 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly mixed loess and colluvium, with influence of volcanic ash possible.

The associated soils are Asotin, Chard, Magallon, Nansense, Oliphant, Ritzville, Walla Walla and similar soils.

Dominate soil surface is silt loam to loam, with ashy modifier sometimes occurring as well.

Dominant particle-size class is fine to sandy.

Fragments on surface horizon > 3 inches (% Volume):
Minimum: 0
Maximum: 2
Average: 0

Fragments within surface horizon > 3 inches (% Volume):
Minimum: 0
Maximum: 10
Average: 2

Fragments within surface horizon ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 20
Average: 5

Subsurface fragments > 3 inches (% Volume):
Minimum: 0
Maximum: 20
Average: 5

Subsurface fragments ≤ 3 inches (% Volume):
Minimum: 5
Maximum: 30
Average: 10

Drainage Class: Dominantly well drained
Water table depth: Greater than 60 inches

Flooding:
Frequency: None

Ponding:
Frequency: None

Saturated Hydraulic Conductivity Class:
0 to 10 inches: High to moderately high
10 to 40 inches: High to moderately high

Depth to root-restricting feature (inches):
Minimum: 20
Maximum: Greater than 60 inches

Electrical Conductivity (dS/m):
Minimum: 0
Maximum: 4

Sodium Absorption Ratio:
Minimum: 0
Maximum: 10

Calcium Carbonate Equivalent (percent):
Minimum: 0
Maximum: 30

Soil Reaction (pH) (1:1 Water):
0 - 10 inches: 6.1 to 9.0
10 - 40 inches: 6.1 to 9.0

Available Water Capacity (inches, 0 – 40 inches depth):
Minimum: 3.1
Maximum: 8.3
Average: 7.0

Vegetation dynamics

Ecological Dynamics:

Loamy, north aspect, grassland produces about 900-1600 pounds/acre of above-ground biomass annually

The line between sagebrush steppe and true grasslands has been discussed and debated for many years. Daubenmire states that the line has nothing to do with pre-settlement as native ungulates played no significant role in the evolution of ecotypes. He also says that there is no evidence that the distribution of vegetative types is related to fire. And he also says there is no useful correlation between soil classification and the line between grasslands and sagebrush steppe.

The ecotones between Daubenmire's vegetation types can be defined on the basis of consistent differences in climate and consistent differences in vegetation. Higher spring precipitation, especially in March, favors grasses over sagebrush. The grassland area of southeastern Adams and eastern Franklin counties have more precipitation in March. The same for the grasslands in Walla Walla, Asotin and Garfield counties. The Goldendale Prairie and the high elevation grassland above Coulee Dam in Douglas county also have higher spring precipitation. So, the grassland areas of MLRA 8 are consistent with Daubenmire's findings.

On the Loamy, north aspect, grassland ecological site, Idaho fescue is dominant while bluebunch is sub-dominant. The presence and relative abundance of Idaho fescue is an indicator of the comparatively mesic environment for this site. Idaho fescue is shorter and has a dense clump of shoots, while bluebunch wheatgrass is taller and is less dense. Both species are long-lived bunchgrasses. 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 network 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 system 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 and bluebunch wheatgrass. Refer to page 8 for more details about bunchgrass physiology. Research has found that the community remains resistant to medusahead if the site maintains at least 0.8 mid-sized bunchgrass plant/sq. ft. (K. Davies, 2008). The relationship between bunchgrasses and other invasive species should be similar. These two bunchgrasses hold 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. The fire return intervals (FRI) listed in research for sagebrush steppe communities is quite variable. 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 grassland steppe around 30-50 years

The effect of fire on the community depends upon the severity of the burn. 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 and bluebunch wheatgrass exhibit rapid tillering when there is light severity fires and favorable soil moisture. Rabbitbrush and horsebrush are sprouting shrubs and may increase following fire. 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. Sterilized spots and dead Idaho fescue plants makes the site vulnerable to exotic invasive species. Seeding should be strongly be considered. Bluebunch wheatgrass and basin wildrye will have weak vigor for a few years but generally survive. Bluebunch wheatgrass keeps the site resistant to change, while 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. Cusick bluegrass is eliminated. Adjacent natives fill the void
2. Idaho fescue declines while bluebunch wheatgrass increases
3. Both Idaho fescue and bluebunch wheatgrass decline while threadleaf sedge increases
4. With further decline invasive species such as cheatgrass, chervil or yellow star-thistle colonize the site
5. With further decline the site can become a community dominated by invasive species

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. 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 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, and
(3) 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, grassland is associated with Loamy grassland. Very Shallow, Loamy Bottom and Riparian Complex may also be nearby.

Similar Sites:
North Aspect, grassland is dominated by Idaho fescue with bluebunch wheatgrass second. North Aspect Goldendale Prairie has a similar composition and production. Sagebrush Steppe Cool Loamy has threetip sage but otherwise is similar to North Aspect, grassland.

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 008X
Columbia Plateau

Subclasses

- R008XY650WA–Loamy North Aspect grassland

Stage

Provisional

Contributors

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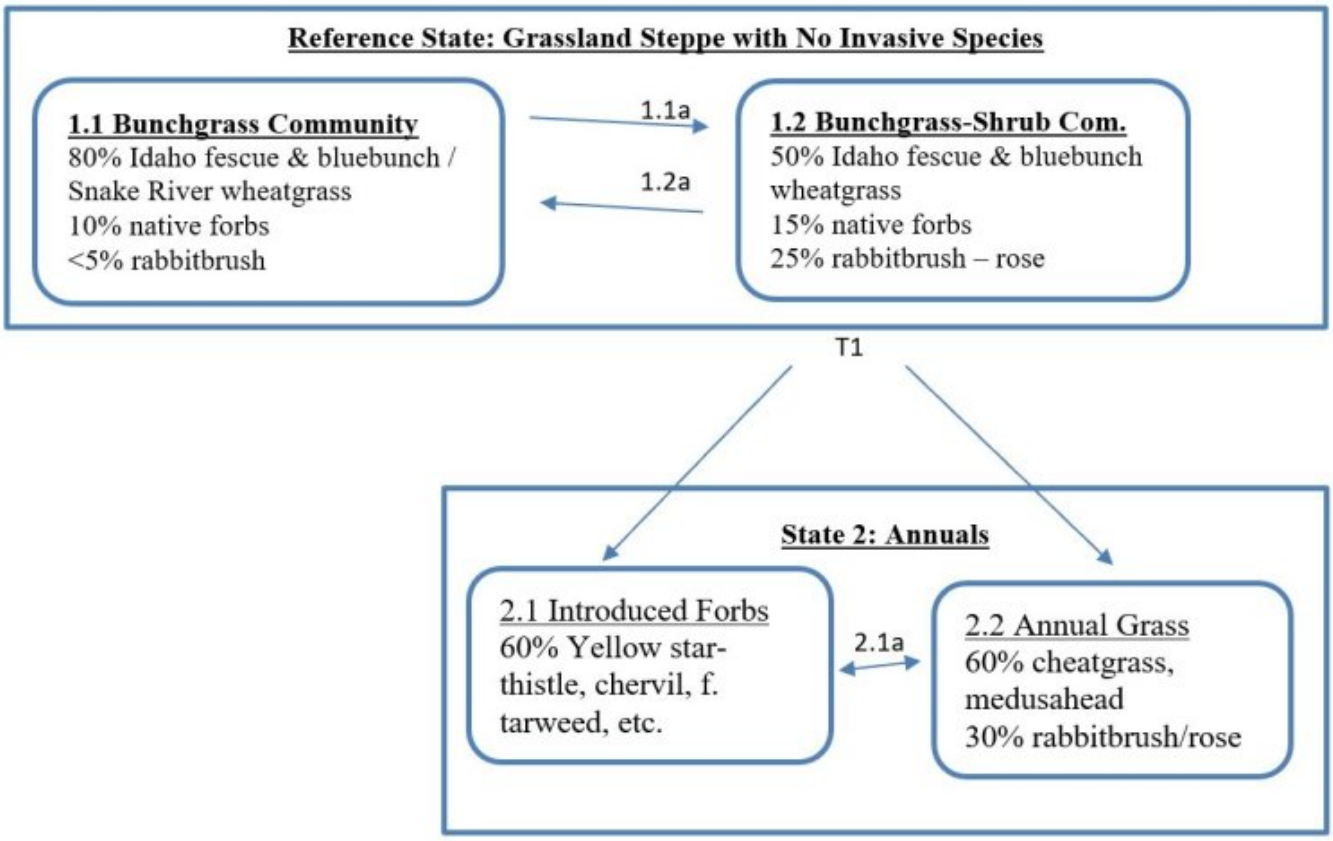
State and transition model

State and Transition Diagram for Loamy, north aspect, grassland:

This state and transition model (STM), explains the general ecological dynamics for the Loamy, north aspect, grassland 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, north aspect, grassland

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
		Sprouting Shrubs – Minor	less than 5% 50 lbs.
		CHRYS rabbitbrush RIBES currant ROSA5 rose	
Dominant Mid-Size Bunchgrasses	**80%**	**Other Mid-Size Bunchgrasses – Minor**	less than 5% 50 lbs.
FEID Idaho fescue 900 lbs.	55%	POCU3 Cusick's bluegrass KOMA prairie junegrass LECI4 basin wildrye ACNE9 Nelson's needlegrass	
PSSP6 bluebunch / Snake River wheatgrass 400 lbs.	25%		
Short Grass – Minor	5% 80 lbs.	**Grass Like – Trace**	
POSE Sandberg bluegrass VUOC sixweeks fescue		CAFI threadleaf sedge	Trace
Native Forbs – Minor			10% 160 lbs.
ACMI2 yarrow BASA3 arrowleaf balsamroot LUPIN lupine CREPI hawksbeard PHLO2 longleaf phlox PHHO spiny phlox LOMAT lomatium / biscuitroot ASTRA milkvetch / locoweed ANDI2 low pussytoes COLLO collomia PLPA2 woolly plantain		FRPU2 yellowbells MICRO6 microseris ALLIU wild onion CALOC Mariposa lily ERIGE2 fleabane LIPU11 granite gilia ERIOG buckwheat CASTI2 paintbrush HIERA hawkweed DELPH larkspur LIRU4 stoneseed	

	Below	Normal	Above
Estimated Production (pounds / acre)	900	1200	1600

State 1
Reference State

State 1 Narrative: State 1 represents grassland steppe with no invasive or exotic weed species. Grassland sites have no sagebrush and no bitterbrush. Rabbitbrush is present but a minor species in the reference State. All the functional, structural groups have one or more native species present. Reference State Community Phases: 1.1 Bunchgrass Idaho fescue – bluebunch wheatgrass 1.2 Bunchgrass – Shrub Idaho fescue – bluebunch wheatgrass – rabbitbrush – rose Community 1.1 , the reference Community is stable with a high cover of Idaho fescue/bluebunch wheatgrass and low cover of rabbitbrush. Community 1.2 happens when the dominant bunchgrasses exhibit lower cover. As the bunchgrasses decline the rabbitbrush increases. Dominant Reference State Species: Idaho fescue with bluebunch wheatgrass as sub-dominant At-risk Communities: • All communities in the reference state are at risk of moving to State 2. The seed source of cheatgrass, chervil and other invasive species is nearby and blowing onto most sites annually • Any community becomes at-risk of moving to State 3

when Idaho fescue and bluebunch have low vigor and annual bromes have colonized the site • Any Loamy North Aspect community is at risk when fire kills Idaho fescue plants. The holes could quickly be filled by annual grass or invasive forbs.

Community 1.1
Reference Plant Community: Bunchgrass

Community 1.1 , the reference Community is stable with a high cover of Idaho fescue/bluebunch wheatgrass and low cover of rabbitbrush.

Community 1.2
Shrub – grass

Community 1.2 happens when the dominant bunchgrasses exhibit lower cover. As the bunchgrasses decline the rabbitbrush increases.

Pathway P1.1a
Community 1.1 to 1.2

1.1a Result: shift from reference or bunchgrass community to bunchgrass-shrub community. Moderate reduction in bunchgrasses and a moderate increase in rabbitbrush, rose and native forbs Primary Trigger: Grazing pressure causes the bunchgrasses to decline, while shrubs gain the competitive edge. Grazing pressure is defined as heavy grazing intensity, season long grazing or frequent late spring grazing Ecological process: consistent defoliation pressures on bluebunch wheatgrass cause poor vigor and shrinking crowns. With more and more of the upper rooting surface open, rabbitbrush and rose take advantage of the available niche space and set new seedlings Indicators: increasing canopy gaps between dominant bunchgrasses and increasing shrub canopy.

Pathway P1.2a
Community 1.2 to 1.1

1.2a Result: shift from bunchgrass – shrub community to reference (bunchgrass) community. Rabbitbrush declines while bunchgrasses increase Primary Trigger: periodically some unknown vector (disease, insects) causes a major rabbitbrush die-off. Ecological process: mortality to rabbitbrush leaves available niche space in the soil. With good vigor Idaho fescue and other bunchgrasses expand via tillering and new seedlings into the open space. Indicators: canopy gaps between dominant bunchgrasses decrease while rabbitbrush canopy increase.

State 2
Shrub – Annual Species

State 2 Narrative: Based on opportunity, State 2 is dominated by either introduced forbs or invasive annual grasses. Opportunity refers to what seed in the seedbank and moisture available from year to year. Soil disturbances by rodents or badgers allow invasive species to colonize. In State 2 bunchgrasses which were dominant in the reference state are virtually missing and the other native, functional-structural groups have been altered. Community Phases for State 2: 2.1 Introduced Forb - Shrub Yellow star-thistle, etc. – Rabbitbrush 2.2 Annual Grass – Shrub Cheatgrass, etc. – Rabbitbrush Dominant Species in State 2: Annual bromes, yellow star-thistle, chervil, rabbitbrush Pathways within State 2 Result: there is a natural fluctuation between communities 2.1 and 2.2. Primary Trigger: drier years favor the annual grasses while wetter years favor the introduced forbs/weeds Ecological process: in State 2 the seedbank of annual grasses and introduced forbs/weeds is full. In any given year one or more invasive species will have the opportunity to expand to become dominant or co-dominant. The next year a different species may have a similar opportunity.

Community 2.1
Introduced Forb - Shrub

Community 2.2
Annual Grass – Shrub

Transition T1
State 1 to 2

T1 The transition from Reference State to State 2 can go two different directions. Depending on seed in the seedbank and precipitation, either annual grasses or introduced forbs can dominate the site. Also, in State 2 rabbitbrush and rose make a significant increase. Primary Trigger: Heavy grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to Idaho fescue and bluebunch wheatgrass. Ecological process. Consistent defoliation pressure to Idaho fescue and bluebunch wheatgrass cause poor vigor and shrinking crowns. This creates opportunity for invasive species and rabbitbrush. The seedbank of annual grass seed and introduced weed seed is full. In any given year one or more invasive species will have the opportunity to expand to become dominant or co-dominant with rabbitbrush. The next year a different invasive species may have a similar opportunity. Drier years favor annual grasses and wetter years favor invasive forbs. Indicators: increasing gaps between dominant bunchgrasses (Idaho fescue and bluebunch wheatgrass). Invasive species first become established on disturbed areas and then expand to become dominant.

Restoration pathway R1
State 2 to 1

Seeding is not an option for Loamy, north aspect, grassland as most locations are too steep to seed. 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