Ecological site group R009XG555WA
North Aspect, Dwarf Shrub, 18-24" ppt.

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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): 9 – Palouse and Nez Perce Prairie

LRU – Common Resource Areas (CRA):
9.2 - Palouse Hills
9.5 - Warm Canyons and Dissected Uplands

Site Concept Narrative:
Diagnostics:

North aspect, dwarf shrub, 18-24” ppt. is an upland grassland site in the Palouse Hills portion of MLRA 9 (Common Resource Areas 9.2 Palouse Hills). This site also occurs within Daubenmire’s Fescue-Snowberry and Fescue-Rose vegetative zones. Note that the Fescue-Rose zone is on the lee side of the Blue Mountains and represents a drier and shallower portion of the Palouse Hills and this ecological site.

The loamy and loamy skeletal soils are moderately deep (20-40”) to deep (40-60”). Silt loam is the most common texture. This site occurs only on 20% or greater north aspects. In the summer the soils dry down to 20 inches (50 cm), which limits conifers (Lichthardt and Mosely 1997).

The maximum species diversity of any shrub steppe or steppe site in eastern Washington is expressed on the Palouse Hills and Daubenmire’s Fescue-Snowberry zone. Daubenmire calls this site a meadow-steppe association to reflect the moisture, lushness and diversity of these communities. The plant community is predominantly herbaceous with many grass species and a great variety of forbs, with considerable variation in wildflowers present from stand to stand.

North aspect, dwarf shrub, 18-24” ppt. is a dense grass-forb site with dwarf shrubs. Idaho fescue is dominant while bluebunch wheatgrass and prairie junegrass are also important grasses in the reference state. Bluebunch wheatgrass is strongly rhizomatous on these north aspects. The rhizomatous bluebunch wheatgrass and the profusion of forbs gives the stand a uniform appearance.

The Palouse Hills and the Fescue-Snowberry zone have no sagebrush, no bitterbrush and no rabbitbrush. Shrubs on this site include rose, snowberry, spirea and chokecherry. Snowberry and rose, express themselves two different ways. First, there is an inconspicuous layer of solitary stems that is intermixed with the herbaceous species. The stems are sparingly branched and do not project above the herbs. Second, there is also a scattering of taller shrub thickets which gives a mosaic pattern across the landscape. The small and dense shrub thickets, range 4 meters to 25 meters across. Snowberry and rose are generally 0.5-1 meter tall. Some patches have 2-3 meters tall chokecherry in the center. Snowberry plants are mainly sterile with some fertile stems (Daubenmire 1970, p. 23).

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) The north aspect and (3) the highest precipitation in MLRA 9 favors Idaho fescue. Moisture storage is optimized on this ecological site with cooler temperatures year-round and longer lasting snowpack than the loess hills. Drifting snow also increases effective precipitation.

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, Palouse Hills North Slope supports a denser plant cover, more litter and more biological crusts than ecological sites in the loess hills.

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 North aspect, dwarf shrub, 18-24" ppt. 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:

MLRA 9 is south of the Okanogan Highlands and Spokane Valley, east of the Columbia Basin, includes only the wet end of the Channeled Scablands and forms a horseshoe around the Blue Mtns. Palouse Hills North slope sites are found on north slopes of hills and ridges throughout the Palouse Hills. Topographic position may be more important than parent material in defining this site.

MLRA 9 has three distinct geographical types:
(1) the Palouse Hills on the east side
(2) the loess hills to the south and west
(3) the Channeled Scabland-loess islands in the northwest

Note for MLRA 9 there are four ecological sites with "Loamy" in the name:
1. Cool loamy, channeled scabland occurs on the Channeled Scablands
2. Loamy, dwarf shrub, 18-24" ppt. occurs in the Palouse Hills
3. Loamy, bunchgrass, 15-18" ppt. occurs in the loess hills
4. Loamy Bottom occurs on bottomland sites

The rolling hills of the Palouse Prairie, as far as the eye could see, were once a lush grassland with native bunchgrasses, a dizzying array of wildflowers, thickets of snowberry, wild rose, serviceberry, ponderosa pine woodlands and seasonal wetlands with camas. Wetlands were extensive in this area. The loess dunes created complex and interconnected drainage channels with low gradients, which would have made for considerable wetland habitat.

The Palouse is also one of the best areas in the world for dryland agriculture and has been highly disturbed. Virtually every acre that could be farmed is now farmed. Wetlands were drained or filled. The Palouse Prairie Land Trust says that with less than 1% of the original habitat remaining, the native Palouse Prairie in the most endangered habitat in the continental United States. And there is a list of endangered plant species as well.

Today the Palouse Prairie exists in small patches of land that either were too rocky or too steep to plow for agriculture. These scattered "remnants" are often no larger than an acre or two in size, and isolated from each other by large swaths of farmland. Occasionally the remnants are altered with broadleaf herbicide drift.

Physiographic Division: Intermontane Plateau and Northern Rocky Mountain System

Physiographic Province: Columbia Plateau and Northern Rocky Mountains
Physiographic Sections: Walla Walla Plateau

Landscapes: hills and foothills
Landform: Dominantly loess hills, plateaus, hillslopes

Elevation: Dominantly 1,600 to 4,000 feet
Slope: Total range: 0 to 90 percent
Aspect: Dominantly north aspects

Geology:

MLRA 9 is almost entirely underlain by Miocene basalt flows. Columbia River basalts are covered by wind-blown loess and volcanic ash with a thickness up to 250 feet thick. The oldest layer of loess accumulated between 2 and 1 million years ago, while the uppermost layers of Palouse Loess accumulated between 15,000 years ago and modern times. The mid layers of loess were deposited episodically between 77,000 years and 16,000 years ago. During the Pleistocene era the channeled scablands, the northwest portion of MLRA 9, were scoured of topsoil by the Lake Missoula Floods about 15,000-17,000 years ago. Flows removed topsoil from exposed ridges and basalt rims in canyons.

Climate

Palouse Hills is in the wettest part of MLRA 9. It is cooler and wetter than the loess hills region of MLRA 9 and, warmer and wetter than the channel scabland. The climate across MLRA 9 is characterized by moderately cold, wet winters, and relatively dry summers.

Daubenmire (p. 25) makes the following points: The Fescue-Snowberry zone is cooler and wetter than the Agropyron-Fescue and Agropyron-Poa zones. Compared to the Threetip Sage-Fescue zone, the Fescue-Snowberry has a higher annual precipitation and is also warmer in December and January. These climatic differences affect community structure chiefly in the shrubby elements.

Mean Annual Precipitation:
Range: 18 – 24 inches
Winter precipitation, primarily snow, occurs during low-intensity, Pacific-frontal storms. During winter these storms produce occasional rains that fall on frozen or thawing ground surfaces. High intensity, convective thunderstorms produce some rain during the growing season. Precipitation is evenly distributed throughout fall, winter and spring.

Mean Annual Air Temperature:
Range: 42 to 52 F
Central Tendency: 46 to 50 F
Freezing temperatures generally occur from late-October through early-April. Temperature extremes are -10 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: 90 to 180
Central tendency: 110 to 150
The growing season for Palouse Hills North Slope is March through July / mid-August.

Soil features

Edaphic:

The North aspect, dwarf shrub, 18-24” ppt. ecological site occurs with Loamy, dwarf shrub, 18-24” ppt., Shallow Stony south aspect, Shallow Stony and Very Shallow ecological sites. Soils are principally formed in loess due to prevailing regional winds, with colluvial materials where basalt flows provide the underlying bedrock.

Representative Soil Features:

This ecological site components are dominantly Pachic, Ultic, and Typic taxonomic subgroups of Argixerolls and Haploxerolls taxonomic great group of the Mollisols taxonomic order with a minority of Calcic taxonomic subgroup. Soils are dominantly very deep but can range to moderately deep. Average available water capacity of about 6 inches (15.3 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly loess and colluvium derived from basalt, with minor amount of ash in limited surface horizons.

The associated soils are Athena, Geoconda, Matheny, Naff, Palouse, Thatuna, Tilma and similar soils.

Dominate soil surface is silt loam to silty clay loam.

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

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

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

Subsurface fragments > 3 inches (% Volume):
Minimum: 0
Maximum: 15
Average: 5

Subsurface fragments ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 40
Average: 15

Drainage Class: Dominantly well drained, with limited moderately well drained
Water table depth: Dominantly greater than 60 inches, but can range to 40 inches

Flooding:
Frequency: None

Ponding:
Frequency: None

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

Depth to root-restricting feature (inches):
Minimum: Dominantly greater than 60, but bedrock can occur up to 30 inches occurrences
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: dominantly 0
Some soils with calcic horizons have been included in this site. In those cases, the range for $CaCO_3$ would be 0-35

Soil Reaction (pH) (1:1 Water):
0 - 10 inches: 5.1 to 8.4
10 - 40 inches: 5.6 to 9.0

Available Water Capacity (inches, 0 – 40 inches depth):
Minimum: 2.8
Maximum: 9.3
Average: 6.0

Vegetation dynamics

Ecological Dynamics:

North aspect, dwarf shrub, 18-24” ppt. produces about 1600-2400 pounds/acre of above-ground biomass annually

In the reference condition the Palouse Hills, with the highest mean precipitation, exhibit the maximum species diversity, the densest, and most productive plant communities. While the grass component was quite diverse, the vast array of wildflowers was stunning and extraordinary, easily the largest forb component in Eastern Washington. And there is considerable variation in wildflowers from stand to stand.

The dwarf shrubs express themselves two different ways: (1) as an inconspicuous layer of solitary stems, same height as herbs, that is intermixed with the herbaceous species, and (2) as a scattering of taller shrub thickets which give the landscape a mosaic pattern. The small and dense shrub patches range from 4 meters to 25 meters across. These patches of deciduous shrubs can be simple to more complex. A smaller patch will be a single species of snowberry or rose. Larger thickets can be half-meter tall snowberry at the edge and 1 meter rose in the center. Even more complex patches can have 2-3 meters tall chokecherry at the core, surrounded by belts of rose and snowberry. Snowberry has predominantly sterile stems with some fertile stems. (Daubenmire 1970, p. 23 Snowberry phase).

Below ground the Palouse plant community provided a network of roots – shallow to deep, fibrous to taproot. The deep loamy soils have no root-restrictive horizons so, to a depth of 48”, this root-network from wildflowers, grasses and shrubs stabilized the soils, provided organic matter and nutrients, and maintained soil pore space for water infiltration and retention in the soil profile.

The stability and resiliency of the reference state is directly linked to the health and vigor of the entire community – grasses, wildflowers and shrubs. In healthy communities there is great resistance to invasion. But in the presence of disturbance, some species weaken. If natives are set back enough Kentucky bluegrass colonizes instead of cheatgrass. Once well-established, Kentucky bluegrass become persistent and the community will stabilize at a lower ecological level. This process can continue until the stand is dominated by Kentucky bluegrass. Quackgrass, Canadian thistle, medusahead and ventenata are other invasive species.

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 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. Snowberry is a rhizomatous sprouter after fire. Largely, the community is not affected by lower intensity fire.

A severe fire puts stress on the entire community. Rabbitbrush is likely to increase by crown sprouting. Bluebunch wheatgrass and prairie junegrass, both fire-resilient grasses, will have weak vigor for a few years but generally survive. Reduced vigor of these grasses allows weeds to become established. 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 considered to prevent invasive such as Kentucky bluegrass from totally occupying the site. Prairie junegrass and bluebunch wheatgrass keeps the site resistant to change, while Idaho fescue makes the site more at risk.

The distribution of hawthorn is related to fire. In the historic fire patterns, hawthorn is a minor component. But with fire suppression hawthorn increases and shrub thickets with snowberry also increase. Shrubs can take over dominance.

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 goes through a series of community changes:
1. Idaho fescue, shrubs and palatable forbs such as balsamroot decline while, bluebunch wheatgrass prairie junegrass, yarrow and other unpalatable forbs increase.
2. All native grasses, shrubs and palatable forbs decline, while unpalatable forbs continue to increase. Invasive species such as Kentucky bluegrass, quackgrass, ventenata and Canadian thistle colonize the site.
3. As grazing progressively thins the native perennials, Kentucky bluegrass and other alien species take their place, finally becoming dominant.

At each level of retrogression, the community stabilizes but at a lower ecological level. Once retrogression allows Kentucky bluegrass there seems to be no reversal when grazing pressure is reduced or eliminated. Dwarf snowberry and rose are highly palatable and decline simultaneously with the herbs.

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, dwarf shrub, 18-24" ppt. is associated with other sites in the MLRA 9 including, Loamy, dwarf shrub, 18-24" ppt., Very Shallow and Shallow Stony

Similar Sites:
North aspect, dwarf shrub, 18-24" ppt. and Loam dwarf shrub are unique as they have a high species diversity and dense stand of Idaho fescue, many native forb species and dwarf shrubs.

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 009X
Palouse and Nez Perce Prairies

Stage

Provisional

Contributors

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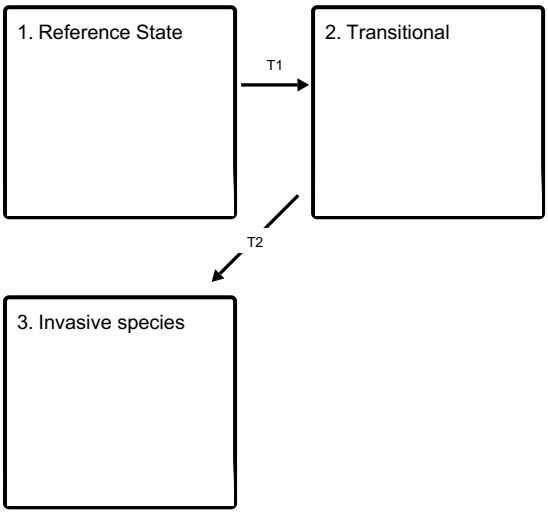
State and transition model

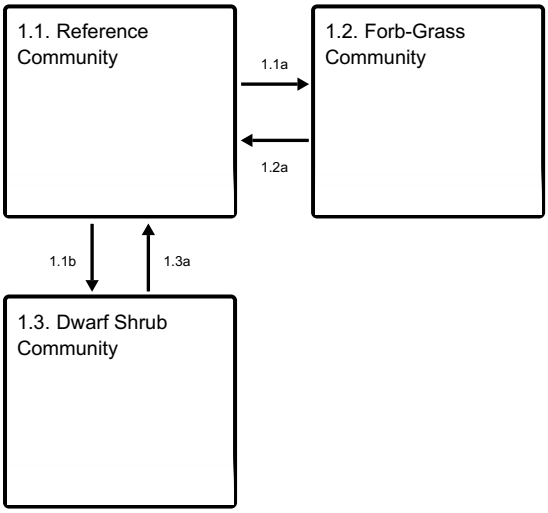
Ecosystem states



T1 - grazing pressure

T2 - grazing pressure

State 1 submodel, plant communities



1.1a - grazing pressure

1.1b - fire suppression

1.2a - improved grazing management

1.3a - moderate-severity fire

State 2 submodel, plant communities

2.1. Native to Invasive Transition

State 3 submodel, plant communities

3.1. Sodforming Grass

3.2. Annual Grass – Broadleaf Weed

State 1
Reference State

State 1 Narrative: State 1 represents native grass-forb-dwarf shrub stands with no invasive or exotic weed species. The Palouse Hills have no sagebrush and no bitterbrush. All the functional, structural groups have one or more native species present. Reference State Community Phases: 1.1 Reference Idaho fescue 1.2 Forb – Grass unpalatable native forbs – native grasses 1.3 Dwarf Shrub snowberry – rose Dominant Reference State Species: Idaho fescue and a wide variety of forbs At-risk Communities: • Different communities have different degrees of risk • All communities in the reference state are at risk of invasive species • All communities in the reference state are at risk of moving to State 2. The seed source of invasive species is nearby and moving onto most sites annually. Also, Kentucky bluegrass is aggressive with rhizomes or seed • 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 Kentucky bluegrass has colonized the site • Any community becomes at-risk of moving to State 3 when Idaho fescue and bluebunch have low vigor and Kentucky bluegrass has colonized the site

Community 1.1
Reference Community

in MLRA 9

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	
Dwarf Sprouting Shrubs – Minor		15%	**Other Sprouting Shrubs – Minor**		less than 5%
SYAL	snowberry	360 lbs.	RIBES	currant	100 lbs.
ROSA5	rose		PRVI	chokecherry	
			MARE11	Oregon grape	
			SPBE2	white spirea	
			AMAL2	serviceberry	
			CRDO2	hawthorn	
Dominant Mid-Size Bunchgrass		40%	**Other Mid-Size Bunchgrasses – Minor**		15%
FEID	Idaho fescue	1000 lbs.	PSSP6	bluebunch wheatgrass	360 lbs.
			POSEJ	big bluegrass	
			ELGL	blue wildrye	
			ACNE9	Nelson's needlegrass	
			KOMA	prairie junegrass	
			FECA4	rough fescue	
Short Grass – Minor			**Grass-Like – Trace**		
POSE	Sandberg bluegr.	<15% 100 lbs.	CAREX	sedge	Trace
Native Forbs – Subdominant					25%
ACMI2	yarrow		WYAM	mule's ears	600 lbs.
BASA3	arrowleaf balsamroot		MINU	microseris	
LUPIN	lupine		ALLIU	wild onion	
CREPI	hawksbeard		CALOC	Mariposa lily	
PHLOX	phlox		ERIGE2	fleabane	
LOMAT	lomatium / biscuitroot		ERIOG	buckwheat	
ASTRA	milkvetch / locoweed		CASTI2	paintbrush	
ANDI2	low pussytoes		HIERA	hawkweed	
COLLO	collomia		DELPH	larkspur	
PLPA2	woolly plantain		LIRU4	stoneseed	
FRPU2	yellow bells		TRGRG2	large-flowered brodia	
BERU	red besseya		GEUM	old man's whiskers	
GAAR	blanket-flower		IRMI	Rocky Mtn. iris	
POTEN	cinquefoil		ZIVE	death camas	
SENEC	ragwort		PENST	penstemon	
RANUN	buttercup		CLARK	Clarkia	
DELPH	larkspur		DOPU	shooting star	
ASTER	aster		VIOLA	violet	

Idaho fescue 55% Idaho fescue & other native grasses 25% native forbs 15% dwarf shrubs: snowberry, rose Community 1.1 with a high cover of Idaho fescue, other native grasses & forbs

Community 1.2
Forb-Grass Community

unpalatable native forbs – native grasses 50% native grasses 40% unpalatable forbs 10% dwarf shrubs Community 1.2 with grazing pressure unpalatable forbs increase

Community 1.3
Dwarf Shrub Community

snowberry – rose 35% bluebunch wheatgrass 25% forbs 40% dwarf shrubs Community 1.3 with fire suppression shrubs increase (hawthorn, snowberry, rose)

Pathway 1.1a
Community 1.1 to 1.2

1.1a Result: shift from Reference Community 1.1 (bunchgrass) to forb-grass Community 1.2. Moderate reduction in bunchgrasses and a moderate increase in shrubs and unpalatable forbs Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) Ecological Process: with consistent defoliation pressure Idaho fescue has poor vigor, shrinking crowns and some mortality. Unpalatable forbs gain the competitive edge and increase via new seedlings. Indicators: decreasing cover for Idaho fescue and increasing cover for unpalatable forbs.

Pathway 1.1b
Community 1.1 to 1.3

1.1b Result: shift from Reference Community (bunchgrass) to dwarf shrub Community 1.3. Primary Trigger: fire

suppression allows hawthorn to colonize the site, and for snowberry and rose to increase Ecological process: new hawthorn and rose plants start from seed while snowberry increases from crown sprouting. Indicators: increasing shrub canopy

Pathway 1.2a
Community 1.2 to 1.1

1.2a Result: transition from Community 1.2 (forb-bunchgrass) to Reference Community (Idaho fescue) Primary Trigger: improved grazing management restores plant vigor for Idaho fescue Ecological process: with decreased defoliation pressure, Idaho fescue and other bunchgrasses have much improved vigor. Idaho fescue sets new seedlings while bluebunch wheatgrass expands via tillering. Perennial grasses can readily out-compete annual native forbs. Indicators: increasing cover of Idaho fescue and bluebunch wheatgrass and decreasing cover of forbs.

Pathway 1.3a
Community 1.3 to 1.1

1.3a Result: shift from Community 1.3 dwarf shrub to Reference Community 1.1 Primary Trigger: moderate-severity fire Ecological Process: fire kills most but not all shrubs. This releases resources and niche space. Idaho fescue expands via new seedlings. Indicators: decreased shrub cover and increased Idaho fescue cover.

State 2
Transitional

State 2 represents transition between State 1 with no invasive species and State 3 which is dominated by invasive species. State 2 has a moderate invasion by invasive species, but native species are still present and dominant. Invasive species have gained a foothold that they do not easily 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 either Kentucky bluegrass or a combination of invasive annual grasses (annual bromes, ventenata) and broadleaf weeds (Russian knapweed, Canadian thistle). Once retrogression allows Kentucky bluegrass there seems to be no reversal when grazing pressure is reduced or eliminated.

Community 2.1
Native to Invasive Transition

Native grasses with: 20% Kentucky bluegrass, or 20% annual bromes/broadleaf weeds

State 3
Invasive species

State 3 represents the situation where invasive species dominate the plant community. Retrogression begins with a weakened State 1 and then in State 2 the introduction and establishment of invasive species. The community stabilizes but at a lower ecological level. When the native species are further weakened the invasive species increase again. After a series of retrogressions, the stand becomes dominated by alien species. Community 3.1 is mostly Kentucky bluegrass Community 3.2 is either annual bromes or broadleaf weeds such as Russian thistle or Canadian thistle depending on seed source Indicators: the occurrence of invasive species where there has been none.

Community 3.1
Sodforming Grass

Community 3.1 is mostly Kentucky bluegrass 70% Kentucky bluegrass 20% broadleaf weeds

Community 3.2
Annual Grass – Broadleaf Weed

Community 3.2 is either annual bromes or broadleaf weeds such as Russian thistle or Canadian thistle depending on seed source. 40% annual brome, ventenata 40% Russian knapweed, Canada thistle

Transition T1
State 1 to 2

T1 Result: Transition from Reference State with no invasive species to State 2 with a stand of native plants with some invasive species. Previously the stand has not had alien species. The result of this transition is the presence of invasive species. Depending on seeds in the soil bank and what is growing nearby, either Kentucky bluegrass or invasive annual grasses and broadleaf weeds enter the stand of native species. Primary trigger: grazing pressure (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, bluebunch wheatgrass and other palatable species results in poor vigor, shrinking crowns and plant mortality. This gives invasive species such as Kentucky bluegrass, Russian knapweed and Canadian thistle the opportunity to colonize and establish. Indicators: decreasing cover of Idaho fescue, bluebunch wheatgrass, and other palatable species, and the presence of invasive species where there have been none.

Transition T2
State 2 to 3

T2 Transition from State 2 with some invasive species to State3 which is dominated by invasive species Primary trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) Idaho fescue and other palatable species. Ecological process: consistent defoliation pressure to Idaho fescue, bluebunch wheatgrass and other palatable species results in poor vigor, shrinking crowns and plant mortality. This releases resources and niche space that invasives take advantage of. The transition can go two directions – to Kentucky bluegrass or to broadleaf weeds and annual bromes. This transition takes place in a series of retrogressions. The palatable 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. Indicators: decreasing cover of Idaho fescue and other native species and, increasing cover of invasive species. Recovery Seeding is not an option for North Slope 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, 1970 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 Lichthardt, Juanita and Mosely, Robert K., 1997 Status and Conservation of the Palouse Grassland in Idaho. Idaho Fish and Game, Boise, ID. USFS Purchase Order 14420-S-0395 Liston, A, B.L. Wilson, W.A. Robinson, P.S. Doescher, N.R. Harris, and T. Svejar. 2003. The Relative Importance of Sexual Reproduction Versus Clonal Spread in an Arid Bunchgrass. Oecologia 137:216-225 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

Citations