

Ecological site group R007XG163WA

Dry Loamy

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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): 007X – Columbia Basin

LRU – Common Resource Areas (CRA):

7.1 – Sandy Missoula Flood Deposits

7.5 – Yakima Valley – Pleistocene Lake Basins

Site Concept Narrative:

Diagnostics:

Dry Loamy ecological site is an upland shrub steppe site that occurs on the driest and hottest portion of MLRA 007X including elevations below 1,000 feet, precipitation less than 7 inches, or south-facing slopes. This site occurs on terraces and hillslopes. The soils are moderately deep to deep silt loam and very fine sandy loam textures and have limited rock fragments (generally 10 percent or less) in the root-growing portions of the soil profile.

Between 4 and 7 inches of precipitation, the Dry Loamy ecological site is often extensive. But above 7 inches of precipitation, the Dry Loamy ecological site is much more limited in extent to south facing slopes. The Dry Loamy ecological site is much more extensive than the Calcareous Loam ecological site.

Dry Loamy ecological site has low species diversity. Spiny hopsage is a marker for MLRA 007X and identifies the Dry Loamy ecological site.

Principle Vegetative Drivers:

High temperatures coupled with low precipitation or dry, south slopes drive the vegetative expression on Dry Loamy ecological site. Annual production is quite limited.

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 run off-site or infiltrate into the soil
2. Whether soil condition remain aerobic or become saturated and anaerobic
3. How quickly the soil reaches the wilting point

With adequate cover of live plants and litter, there are no restrictions on the Dry Loamy ecological site with water infiltrating into the soil. These sites are well drained.

Physiographic features:

The landscape is part of the Columbia basalt plateau. Dry Loamy ecological sites occur mostly on terraces, terrace escarpments and hillslopes.

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

Landscapes: Plateaus and hills
Landform: Terraces, hillslopes and structural benches

Elevation:
Range: 400 to 1,500 feet
Central tendency: 400 to 1,000 feet

Slope:
Total range: 0 to 30 percent
Central tendency: 2 to 15 percent

Aspect: Occurs on all aspects

Geology:
This is almost entirely underlain by Miocene basalt flows. Columbia River basalt is covered in most areas with as much as 200 feet of eolian, lacustrine, and alluvial deposits. This basin generally corresponds to the vast temporary lakes created by floodwaters from glacial Lakes Missoula and Columbia. Most of the fluvial and lacustrine sediments were deposited about 16,000 years ago, when an ice dam on the ancient Columbia River burst and when glacial Lake Missoula periodically emptied, creating catastrophic floods.

Climate

MLRA 007X is the lowest, driest and hottest portions of the entire Columbia River region and the sagebrush-bluebunch wheatgrass zone. The Dry Loamy ecological site is generally in the driest and hottest portion of MLRA 007X (Benton, western Franklin, southern Grant and eastern Yakima counties).

The climate across MLRA 007X 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 is between 4 and 10 inches. Seventy to seventy-five percent of the precipitation comes late October through March as a mixture of rain and snow. For drier sites and lower elevations, precipitation that comes after March is not as effective for plant growth. But at higher elevations and higher precipitation, April and May rains make the difference between average and great production years. June through early October is dry. Freezing temperatures generally occur from late-October through early-April. Temperature extremes are -10 degrees Fahrenheit in winter and 110 degrees Fahrenheit in summer.

Mean Annual precipitation
Range: 4 - 10 inches
Soil moisture regime is aridic.

Mean Annual Air Temperature
Range: 48 to 54 F
Central Tendency: 50 – 52 F
Soil temperature regime is mesic.

Frost-free period (days)
Total range: 140 to 200
Central tendency: 150 to 180
The growing season for Dry Loamy is March through mid-May.

Soil features

Edaphic:
Dry Loamy ecological site commonly occurs with Calcareous Loam, Sandy Loam, Sandy and Sands ecological sites.

REPRESENTATIVE SOIL FEATURES

This ecological site components are dominantly Xeric and Aridic taxonomic subgroups of Haplargids, Haplocambids and Petrocambids great groups of the Aridisols taxonomic order. Soils are dominantly deep and deeper. Average available water capacity of about 6.0 inches (15.3 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly loess and alluvium derived from mixed sources over residuum.

The associated soils are Clenage, Matson, Scooteney and similar soils.

Dominant soil surface is silt loam to very gravelly loam.

Dominant particle-size class is coarse-silty or coarse-loamy.

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

Minimum: 0

Maximum: 2

Average: 0

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

Minimum: 0

Maximum: 25

Average: 5

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

Minimum: 0

Maximum: 30

Average: 15

Subsurface fragments > 3 inches (% Volume)

Minimum: 0

Maximum: 25

Average: 10

Subsurface fragments \leq 3 inches (% Volume):

Minimum: 0

Maximum: 35

Average: 20

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

10 to 40 inches: Moderately high

Depth to root-restricting feature (inches):

Minimum: Dominantly 40 inches

Maximum: Greater than 60

Electrical Conductivity (dS/m)

Minimum: 0

Maximum: 4

Sodium Absorption Ratio

Minimum: 0

Maximum: 5

Calcium Carbonate Equivalent (percent):

Minimum: 0

Maximum: 5

Soil Reaction (pH) (1:1 Water):

0 - 10 inches: 6.6 to 8.8

10 - 40 inches: 6.6 to 9.0

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

Minimum: 2.3

Maximum: 8.3

Average: 6.0

Vegetation dynamics

ECOLOGICAL DYNAMICS:

Vegetation Dynamics:

Dry Loamy ecological site produces about 300 to 550 pounds per acre of biomass annually.

Stands of spiny hopsage and winterfat represent the northernmost outpost of species that are best represented in the vegetation of the Great Basin in Utah and Nevada. In the Great Basin spiny hopsage occurs in the transition between big sagebrush and shadscale.

The Dry Loamy ecological site has low species diversity. In the Reference State, Wyoming big sagebrush and spiny hopsage are the shrub layer while bluebunch wheatgrass and Sandberg bluegrass are layers two and three. Stands of Wyoming big sagebrush, spiny hopsage and Sandberg bluegrass are common (Daubenmire).

Dry Loamy ecological site tips easily to an Altered State and most Dry Loamy ecological sites in Washington have already crossed the threshold to communities dominated by cheatgrass and Russian thistle with an overstory of Wyoming big sagebrush and spiny hopsage. These sites are a fire waiting to happen.

Spiny hopsage is a one to four foot high salt desert shrub with small, paddle-shaped leaves. Stems are reddish brown with spiny, pointed ends. This shrub sheds its leaves and flowers by summer and becomes a woody gray thicket.

The stability and resiliency of the reference communities is directly linked to the health and vigor of bluebunch wheatgrass. More details about bluebunch physiology occur later. Research has found that the community remains resistant to medusahead invasion if the site maintains at least 0.8 plants per square foot of mid-sized bunchgrass (K. Davies, 2008). It is bluebunch wheatgrass that holds the system together. If bluebunch wheatgrass is lost, the ecosystem crashes or unravels.

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 to 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 and a range of 50 to 100 was chosen for Wyoming big sagebrush communities (Rapid Assessment Model).

Some fires are spotty or do not burn hot enough to fully remove the sagebrush. Fires with light severity will remove less sagebrush and open smaller patches for grass and forb recovery, whereas the more severe fires will remove almost all the sagebrush and leave vast areas open to return to bunchgrass dominance. This is how the patchy distribution occurs. Rabbitbrush and horsebrush are sprouting shrubs and may also increase following fire.

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 of sagebrush. Sagebrush can return to pre-burn conditions quickly. Bunchgrasses thrive as the fire does not get into the crown. With adequate soil moisture Idaho fescue and bluebunch wheatgrass can make tremendous growth the year after the fire. Other than impacting the sagebrush layer, the community is not affected.

A severe fire puts stress on the entire community. The sagebrush layer is completely removed. Spots or patches with heavy sagebrush are sterilized by the fire and must be seeded to prevent invasive species (annual grasses, tumble mustard) from totally occupying the site. Bluebunch wheatgrass and basin wildrye will have weak vigor for a few years but generally survive. Needle and thread is one native species that can increase via new seedlings.

The longer the site goes without fire and the more grazing pressure added, the more sagebrush and spiny hopsage cover increases, and the more bunchgrasses decline. As sagebrush cover increases bluebunch wheatgrass cover declines but individual plants may persist underneath the sagebrush. And, the dense sagebrush community phase is more vulnerable to outside pressures. Invasive species take advantage of available soil rooting spaces. The once extensive grass roots are largely absent. Soils are no longer receiving the organic inputs, and there is less surface cover by grass litter. Both water infiltration into the soil, and water percolation through the soil, are affected, leaving open soil space that is drier and more vulnerable to wind and water erosion, and invasion by undesirable species. Once these undesirable species have colonized, the site is at high risk of crossing a threshold if a disturbance such as fire were to occur.

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 plant grazed more than once). As grazing pressure increases the plant community unravels in stages:

1. Bluebunch wheatgrass declines while Sandberg bluegrass, needle and thread and sagebrush increase
2. Needle and thread declines along with bluebunch wheatgrass
3. As the bunchgrasses continue to decline, invasive species such as cheatgrass and knapweed colonize the site
4. With further decline the site can become a sagebrush-cheatgrass community

Managing sagebrush steppe 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–June 30). And each pasture should be rested the entire growing-season every third year (approximately March 1 – June 30).

In the spring each year it is important to monitor and maintain an adequate top growth:

- (1) to replace basal buds annually, (2) to optimize regrowth following spring grazing, and (3) to protect the elevated growing points of bluebunch wheatgrass.

Bluebunch wheatgrass remains 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, Wyoming sagebrush – bluebunch wheatgrass communities provide habitat for a variety of upland wildlife species.

Supporting Information:

Associated Sites:

Dry Loamy ecological site in MLRA 007X commonly occurs with Calcareous Loam, Sandy Loam, Sandy, Sands, Stony and Very Shallow ecological sites.

Similar sites:

There is no ecological site similar to Dry Loamy ecological site as it occurs in the driest and hottest portion of Washington state.

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

State Correlation: Washington

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

Site Development and Testing Plan

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Major Land Resource Area

MLRA 007X

Columbia Basin

Subclasses

- R007XY163WA–Dry Loamy

Stage

Provisional

Contributors

Provisional Site Author: Kevin Guinn

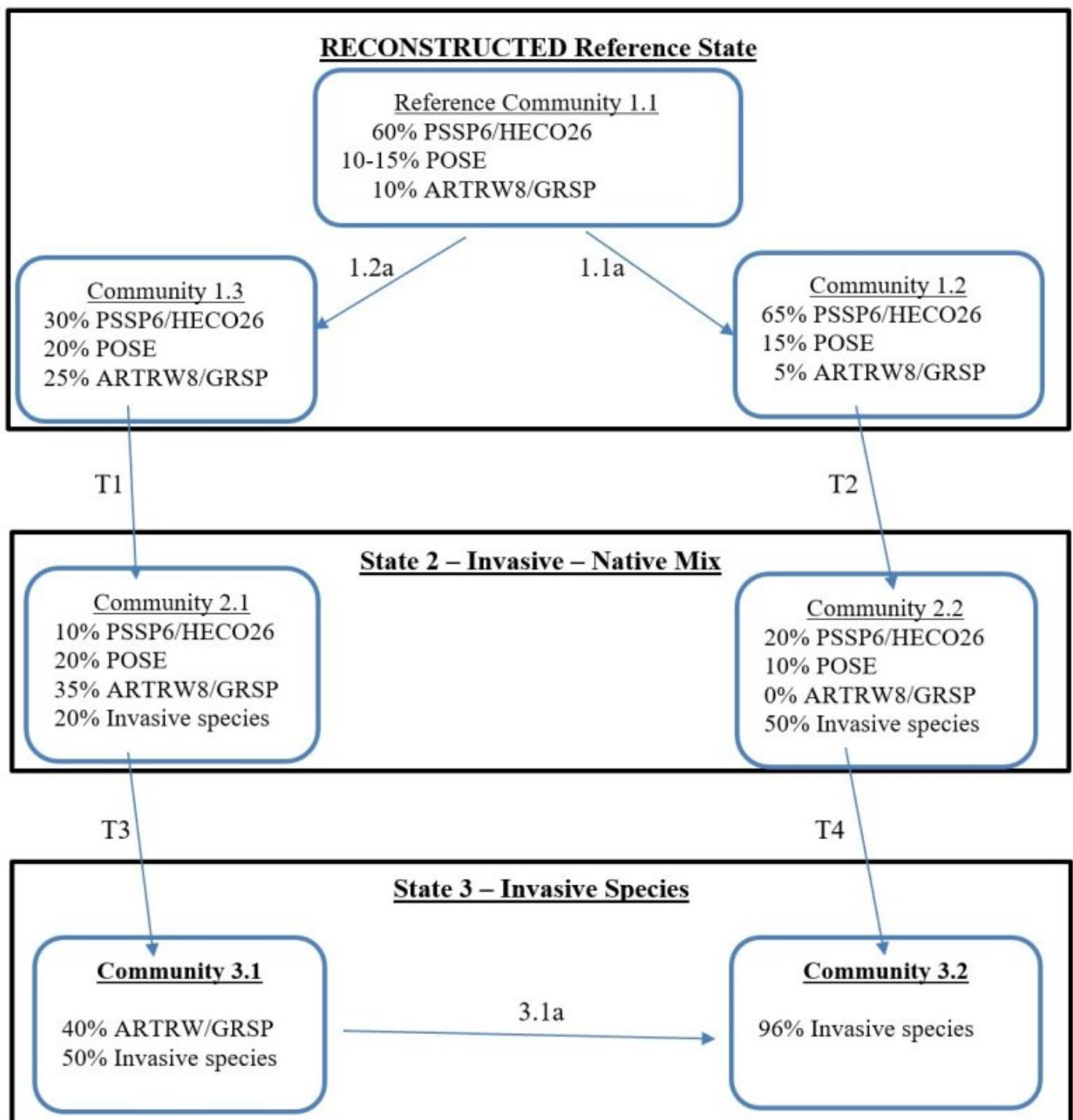
Technical Team: R. Fleenor, W. Keller, K. Bomberger, K. Paup-Lefferts

State and transition model

State and Transition Diagram for Dry Loamy:

This state and transition model (STM), explains 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.

Site is hot & dry (4-7" ppt., less than 1000 feet, or south slope). This site tips easily and there may be no example of Reference State in Washington.



RECONSTRUCTED Reference Community 1.1 for Dry Loamy in MLRA 7

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.

This site has low species diversity – Daubenmire. It is possible that EVERY Dry Loamy site has already crossed a threshold.

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.

Index	Similarity Index	Similarity
Non-Sprouting Shrubs – Subdominant 10% 55 lbs. ARTRW8 Wyoming sagebrush GRSP spiny hop sage		Sprouting Shrubs – Minor 5% 30 lbs. ERNA10 gray rabbitbrush CHVI8 green rabbitbrush TECA2 horsebrush
Dominant Mid-Size Bunchgrasses 60% 350 lbs. PSSP6 bluebunch wheatgrass HECO26 needle and thread		Other Mid-Size Bunchgrasses – Minor less than 5% 20 lbs. ELEL5 bottlebrush squirreltail ACHY Indian ricegrass
Short Grasses – Subdominant 10-15% 85 lbs. POSE Sandberg bluegrass VUOC sixweeks fescue		Grass Like
Native Forbs – Minor 10% 55 lbs. SPMU2 globemallow PLPA2 woolly plantain ERIGE2 fleabane LOMAT lomatium / biscuitroot ASTRA milkvetch / locoweed HECU2 Cusick's sunflower NEST5 haplopappus / narrowleaf goldenweed BRODI brodiaea ERIOG buckwheat		
		Below Normal Above
Estimated Production (pounds / acre)		300 400 550

State 1

Reference State

State 1 Narrative: State 1 represents sagebrush steppe with no invasive or exotic weed species. All the functional, structural groups have one or more native species. A diverse native perennial community is more resistant to invasive annual species such as cheatgrass. Reference Community 1.1 is dominated by bluebunch wheatgrass with some sagebrush. Community 1.2 is even more strongly bunchgrass dominated. Community 1.3 has a heavy sage canopy but bluebunch remains a vital component in the community. Communities 1.1, 1.2 and 1.3 have enough

bluebunch wheatgrass to shift to the other two communities and back again. These three community phases have high amounts of bunchgrass cover and are at low risk of moving to State 3 Reference State Community Phases:

1.1 Reference Bluebunch wheatgrass – Wyoming sagebrush / spiny hopsage 1.2 Bunchgrass Bluebunch wheatgrass 1.3 Heavy sage Wyoming sagebrush/ spiny hopsage-bluebunch wheatgrass Dominate Reference State Species: bluebunch wheatgrass and Wyoming big sagebrush with spiny hopsage and Sandberg bluegrass At-risk Communities: • All communities in the reference state are at risk of moving to State 2. The seed source of cheatgrass is nearby and blowing onto most sites annually • Any community is at risk when shrub cover is high (40percent or more) and there is little to no bluebunch

Community 1.1 Reference

Bluebunch wheatgrass-Wyoming big sagebrush Reference Community 1.1 is dominated by bluebunch wheatgrass with some sagebrush.

Community 1.2 Bunchgrass

Bluebunch wheatgrass Community 1.2 is even more strongly bunchgrass dominated.

Community 1.3 Heavy sagebrush

Wyoming big sagebrush-bluebunch wheatgrass Community 1.3 has a heavy sagebrush canopy but bluebunch wheatgrass remains a vital component in the community.

Pathway P1.1a Community 1.1 to 1.2

1.1a Result: Shift from Reference Community 1.1 to bunchgrass community 1.2. Shrub cover is all but eliminated, while bluebunch wheatgrass has a moderate increase in cover. Neither community have invasive species. Primary Trigger: Moderate-severity fire is complete enough and hot enough to remove most of the sagebrush. Fire is not hot enough to affect the soil conditions. The fire removes surface vegetation but has no impact on the crown of bunchgrasses. So, bunchgrasses and forbs return post-fire with good vigor. Post-fire the bunchgrasses are now more susceptible to grazing damage. Burned rangeland pastures will need two growing seasons recovery prior to resuming grazing, or to be lightly grazed but only during dormant season the first two years post-fire. Beyond two years for the bunchgrasses to expand, moderate grazing intensity, and both critical period and growing season deferments must be implemented on burned pastures. Ecological process: Fire kills most of the shrubs and this releases resources. Bluebunch wheatgrass and other bunchgrasses have good vigor post-fire and expand via tillering and new seedlings.

Pathway P1.2a Community 1.1 to 1.3

1.2a Result: shift from reference community 1.1 to heavy sage community 1.3. There is a moderate increase in shrubs while bluebunch wheatgrass has a moderate corresponding decrease. Bluebunch wheatgrass, Wyoming big sagebrush/spiny hopsage and Sandberg bluegrass are co-dominant. Neither community have invasive species. Primary Trigger: grazing pressure (heavy grazing intensity, season-long grazing or frequent late-spring grazing) to bluebunch wheatgrass. Ecological process: consistent defoliation to bluebunch wheatgrass results in poor vigor and shrinking crowns. Spots with soil disturbances from badgers and rodents allow shrub seed to attain seed-soil contact to enable germination and establishment of new seedlings.

State 2 Invasive & Native Species Mix

State 2 Narrative: State 2 represents a gradation along the transition between Reference State and State 3. State 2 is sagebrush steppe with the inclusion of invasive annuals such as cheatgrass, Russian thistle and mustard. Most of

the native functional, structural groups are still represented by one or more species. Invasive species seed blows onto most sites annually seeking an opportunity to invade and colonize. With each loss of a native perennial plant, the site becomes less and less resistant to invasion. When cheatgrass and other invasives make seed for the next generation, the site has been colonized and will likely remain a component of the community. The loss of biological soil crusts is also a contributing factor to the invasion. Communities 2.1 and 2.2 have significant amounts of native and invasive species. Once a community has been invaded by cheatgrass the chance of going back to State 1 is small. This state can occur with or without sagebrush. Community Phases for State 2: Community 2.1 Shrub – invasive species – native grass Community 2.2 Invasive annual grass and broadleaf weed Dominate State 2 Species: Invasive species, Wyoming big sagebrush/spiny hopsage

Community 2.1

Shrub – invasive species – native grass

Community 2.2

Invasive annual grass and broadleaf weed

Dominate State 2 Species: Invasive species, Wyoming big sagebrush/spiny hopsage

State 3

Invasive Species

State 3 Narrative: State 3 represents invasive annual species and has crossed a biological threshold. Virtually all the native functional, structural groups are missing. This state can occur with or without sagebrush. Community Phases for State 3: 3.1 Shrub – Annual Grass Sagebrush – cheatgrass 3.2 Annual Grass Cheatgrass Dominate State 3 Species: Cheatgrass with or without sagebrush and other shrubs The main species can include cheatgrass, Japanese brome, medusahead, ventenata, mustard, prickly lettuce and diffuse knapweed. This state can occur with or without sagebrush.

Community 3.1

Shrub – Annual Grass - Sagebrush – cheatgrass

Community 3.2

Annual Grass - Cheatgrass

Pathway P3.1a

Community 3.1 to 3.2

3.1a Result: shift from Community 3.1 shrub-cheatgrass to Community 3.2 cheatgrass. Primary Trigger: Moderate intensity fire Ecological Process: fire kills remaining sagebrush and spiny hopsage plants. Cheatgrass and other invasive species fully occupy the site.

Transition T1 & T2

State 1 to 2

T1 Result: transition from Community 1.3 in the Reference State with no invasive species to Community 2.1 in State 2 which is a mix of invasive and native species. This is a continuation of the decline that started with Pathway 1.2a. In Community 2.1 shrubs, native bunchgrasses and invasive species are co-dominant. Primary Trigger: grazing pressure to bluebunch wheatgrass. A secondary trigger would be a year with high moisture and a micro-flush of cheatgrass and other invasive species Ecological process. Consistent defoliation pressure to bluebunch wheatgrass results in poor vigor, shrinking crowns and some mortality. Most sites in the Reference State have some scattered cheatgrass seed as the seed blows onto most site annually. This seed is waiting for enough moisture to germinate and to compete with the native species for space, light and moisture. When the right year happens even pristine communities in the Reference State are susceptible to colonization by cheatgrass. Indicators: The occurrence of annual grasses on sites where they had been absent. Reduced cover and distance between bluebunch wheatgrass plants. T2 Result: shift from Community 1.2 in Reference State with no invasives species to community 2.2 in State 2 with a mix of native and invasive species. This is a continuation of the decline that started with Pathway 1.1a. This transition occurs when invasive species have colonized the site and are successfully reproducing. Primary Trigger:

a repeat of moderate-severity fire. Repeated fire is more common in south Central Washington than elsewhere in MLRA 007X. Ecological Process: fire kills remaining sagebrush and spiny hopsage plants. This second fire is also detrimental to bluebunch wheatgrass plants and the exhibit poor vigor, shrinking crowns and mortality. Primary Trigger: moderate-severity fire happens again.

Transition T3 & T4 State 2 to 3

T3 Result: shift from Community 2.1 (mix of native and invasive species) in State 2 to Community 3.1 (shrub-invasive species) in State 3. This is a continuation of the chain of decline which started with Pathway 1.2a and Transition T1. This transition occurs when the cover of native bunchgrasses is less than 10 percent and invasive species cover is at least 40 percent. Primary Trigger: heavy grazing pressure (heavy grazing intensity, season-long grazing or frequent late-spring grazing) to bluebunch wheatgrass and the entire community. Ecological Process: defoliation pressure continues and remaining bluebunch wheatgrass suffer mortality. Invasive species and shrubs expand via new seedlings to assume shared a position of codominance. T4 Result: Shift from Community 2.2 (native and invasive species mix) in State 2 to Community 3.2 (cheatgrass dominated) in State 3. Primary Trigger: moderate-severity fire happens again. Repeated fire is more common in south Central Washington than elsewhere in MLRA 007X. Ecological process: the last vestiges of native species are replaced by cheatgrass and other invasive species.

Citations