Ecological site group R009XG001WA
Very Shallow

Last updated: 11/22/2023
Accessed: 10/12/2024

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):
9.1 - Channeled Scablands
9.12 - Moist Loess Islands
9.2 - Palouse Hills
9.3 - Dissected Loess Uplands
9.4 - Deep Loess Foothills
9.5 - Warm Canyons and Dissected Uplands

Site Concept Narrative:
Diagnostics:

Very Shallow is a sparsely vegetated, upland site on very shallow soils (generally less than 8 inches deep). Very shallow sites are often found on windswept ridges and adjacent to exposed rocky ledges. Daubenmire writes that there appears to be no regular difference in either soils or vegetation between lithosols produced by glaciofluvial erosion or those on ridges where only wind and rain could have kept the basalt exposed.

Generally, there are sharp lines on the landscape between Very Shallow and the adjacent ecological site.

Very Shallow expresses itself in four different variations in MLRA 9, all with very low production. This site can be low shrub-short grass, short grass, short grass-short grass or mid grass-short grass. Only in the Channeled Scabland will the stiff sagebrush-Sandberg bluegrass community be found. The Sandberg bluegrass and Sandberg bluegrass-one-spike oatgrass variation are plant communities with mainly short grasses. Likely associated with fracturing in the basalt is the last variation, bluebunch wheatgrass-Sandberg bluegrass.

While there are minor ecological differences between these variations, they are considered functionally equivalent for the purposes of this ecological site. These variations have been combined into one ecological site for several reasons: (1) the co-dominant short grass is Sandberg bluegrass in all cases, (2) Very Shallow has low plant productivity and extreme site limitations. (3) it is common to find three or more of these low shrub or forb species on the same site, and (4) the hydrologic and watershed characteristics is similar regardless of low shrub.

According to Daubenmire, stiff sagebrush is limited to basalts with highly fractured parent material. On some but not all Very Shallow sites, are a few micro-pockets of taller vegetation in association with bedrock fracturing. Taller vegetation can be bluebunch wheatgrass for example.

Many Very Shallow sites in MLRA 9 have ventenata. During wet years Very Shallow can look like a sea of

ventenata, but in normal or dry years looks like classic Very shallow with only a thin scattering of ventenata.

Usually, there are abundant rock and soil biotic crust cover, in the interspaces between plants. The lichen and moss play a critical role in water infiltration and resistance to erosion. Because soil depth in minimal, Very Shallow can be seasonally saturated, and heavy traffic (or trailing) can form erosive ruts.

Principle Vegetative Drivers:

The very shallow soil depth and the fracturing of, or the lack of fracturing in the underlying basalt bedrock drive the vegetative expression of this site. Deep-rooted steppe species do not grow on very shallow because of the limited soil depth. The fracture system accounts for variation in the low shrub component and the occasional mid-sized bunchgrass such as bluebunch wheatgrass.

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 lower part of the soil profile of Very Shallow has high clay content. With winter rain and melting snow, water perches and creates saturated conditions.

In wet years during spring runoff, water runs on the surface of Very Shallow sites for a short period. Even more water runs beneath the surface to sites below. This increases the effective precipitation to the adjacent sites below.

Physiography:

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. The landscape is part of the Columbia basalt plateaus and Northern Rocky foothills. Did not come up with a convenient elevational line.

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

Physiographic Division: Intermontane Plateau and Northern Rocky Mountain System
Physiographic Province: Columbia Plateau and Northern Rocky Mountains
Physiographic Sections: Walla Walla Plateau and Blue Mountain Section

Landscapes: Hills, plateaus and mountains
Landform: Sideslopes, hillslopes, ridges

Elevation: Dominantly 1,000 to 5,500 feet
Slope: Total range: 0 to 90 percent
Central tendency: 20 to 50 percent
Aspect: Occurs on all 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

The climate across MLRA 9 is characterized by moderately cold, wet winters, and relatively dry summers.

Mean Annual Precipitation:
Range: 16 – 28 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: 40 to 52 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: 60 to 170
Central tendency: 100 to 140
The growing season for Very Shallow is generally October to mid-November and March through May.

Soil features

Edaphic:

The Very Shallow ecological site commonly occurs with rock outcrop, Shallow Stony or one of the Loamy or North Slope ecological sites. Soils are very shallow to bedrock. Typical soil surface has about 40 percent rock, 10 to 20 percent bare ground, 10 to 20 percent biotic crust and 30 percent vegetative cover. Sites with less than 10 percent vegetative cover can be considered rock outcrop.

Very Shallow sites are sensitive to soil disturbances. When the Very Shallow site is saturated and muddy, physical damage to the site – from vehicle ruts and hoof prints from cows, horses or deer for example – remain intact for many years.

Rocks or plants sitting on pedestals is called pedestaling. Two completely different processes cause the pedestaling. The first process is frost-heaving which pushes the plants upward and is evident across the entire site. The lower part of the soil profile has higher clay content. With winter rain and melting snow, water perches and creates saturated conditions. Freezing weather causes these saturated soils frost-heave, and then during spring thaw, the site becomes muddy. The second pedestaling process is erosion which washes soil away from plants and rocks but only in water flow patterns.

The degree of pedestaling on Very Shallow is quite variable. On many sites the soil surface is smooth and shows little to no evidence of pedestaling. But other sites show a high degree of pedestaling. The difference is presumed to be the amount of clay in the soil and the shrink-swell potential. In some years water runs on the surface and some erosion may occur. If a site has a high degree pedestaling, the observer must determine whether this process is natural or human-induced (water running off cropland onto the rangeland for example).

Representative Soil Features:

This ecological site components are dominantly Lithic taxonomic subgroups of haploxerolls great groups of the Mollisols. Soils are very shallow. Average available water capacity of about 0.6 inches (1.5 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly loess mixed with minor amounts of ash in the upper part of the soil over residuum derived from basalt.

The associated soils are Rockly and similar soils.

Dominate soil surface is very cobbly loam to extremely stony loam.

Dominant particle-size class is loamy-skeletal.

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

Fragments within surface horizon > 3 inches (% Volume):
Minimum: 0
Maximum: 40
Average: 25

Fragments within surface horizon ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 25
Average: 20

Subsurface fragments > 3 inches (% Volume):
Minimum: 10
Maximum: 50
Average: 30

Subsurface fragments ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 25
Average: 20

Drainage Class: Well drained
Water table depth: 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: 4
Maximum: 12

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

Sodium Absorption Ratio:
Minimum: 0
Maximum: 0

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

Soil Reaction (pH) (1:1 Water):
0 - 10 inches: 6.1 to 7.3
10 - 40 inches: 6.1 to 7.3

Available Water Capacity (inches, 0 – 40 inches depth):
Minimum: 0.4
Maximum: 1.0
Average: 0.6

Vegetation dynamics

Ecological Dynamics:

Very Shallow in MLRA 9 produces about 150-300 pounds/acre of biomass annually.
The Very Shallow ecological site in MLRA 9 has four different variations on the short grass theme for the Reference Community. Sandberg bluegrass is dominant in every variation:
1. Stiff sagebrush – Sandberg bluegrass (found only in the Channeled Scabland portion of MLRA 9)
2. Sandberg bluegrass
3. Sandberg bluegrass – one-spike oatgrass
4. Bluebunch wheatgrass – Sandberg bluegrass

In the spring this site has a rich diversity of native annual and perennial forbs on most sites. Very Shallow supports edible species that have been an important food source for the Native Americans for many generations. Bitterroot and biscuitroot are the main species harvested for food.

Sandberg bluegrass is a shallow rooted, perennial bunchgrass, perfectly suited to Very Shallow sites. It has short leaves and a green to purplish panicle seed head. On most sites Sandberg is an understory grass, but on Very Shallow it is the dominant grass. It begins growth in the fall then grows rapidly in the spring and sets seed before moisture is gone. Sandberg bluegrass is resistant to drought, grazing, trampling and fire.

Stiff sagebrush is a short, scraggly-looking and strongly scented with the characteristic sage odor. It is low and spreading with a conspicuously woody base. The base is often heaved from the soil by frost action. The trunk is very irregular, spreading above the base in a dense cluster of short, rigid, and rather brittle branches up to sixteen inches in length. Stiff sagebrush leaves are forked into three deep lobes like fingers. Unlike other sagebrush species, the leaves of stiff sage are deciduous, and by fall, all of the leaves have dropped. The ground under each plant will have a pile of dead leaves.

One-spike oatgrass is a low, densely tufted plant with fuzzy, dull green leaves. The sheath covering the stem has long, dense hairs. At the tip of the stem is one, or occasionally two spikelets.

Impacts of fire and grazing on Very Shallow:
Fire: The vegetative cover is too low to carry fires, so these sites rarely burn
Grazing: In many pastures the Very Shallow sites are not attractive to grazing animals and so are rarely if ever grazed.

Frequent heavy grazing in April & May can be hard on Sandberg bluegrass and the community can become dominated by forbs (native and introduced). To counter this situation, a year of complete rest may be necessary.

Based on inherent protection from both fire and grazing, most Very Shallow sites are stable and in excellent condition. But this is not always the case. In MLRA 8 Very Shallow ridges were hammered by horses or migrating elk.

Many Very Shallow sites in MLRA 9 have ventenata. During wet years Very Shallow can look like a sea of ventenata, but in normal or dry years look like classic Very shallow with only a thin scattering of ventenata.

In many years most grasses remain dormant in the fall. Sandberg bluegrass, however, greens up every year. And so, from late fall through winter and into early spring these Very Shallow sites provide important green forage for deer, elk and upland birds. But these sites also dry up sooner than adjoining sites due to the very shallow soil

depth. Grasses are dry from May through September.

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.

Supporting Information:

Associated Sites:
Very Shallow in MLRA 9 is associated with rock outcrop, Shallow Stony, Stony South Slope, Stony Foothills, Loamy bunchgrass, and Loamy dwarf shrub. It is common for Very Shallow sites to transition back and forth with rock outcrop or any of these ecological sites.

Similar Sites:
MLRA 8 Palouse Prairie Very Shallow extends into MLRA 43C Blue Mountains.

Most MLRAs in Eastern Washington has a comparable Very Shallow ecological site:
MLRA 6 East Slope Cascades
MLRA 7 Columbia Basin
MLRA 8 Columbia Plateau

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

Subclasses

- R009XY301WA–Very Shallow 16-24 PZ

Stage

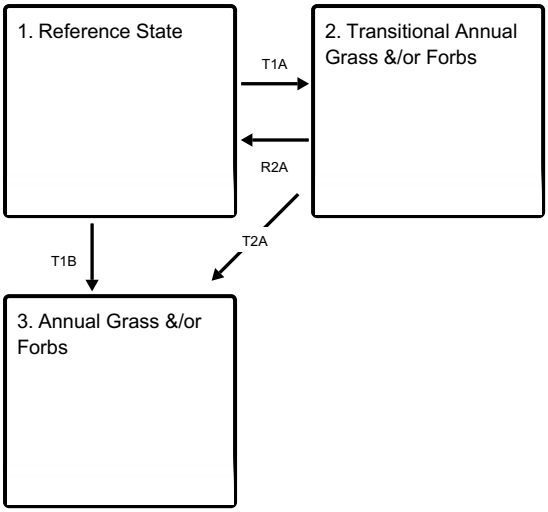
Provisional

Contributors

K. Guinn, Technical Team: C. Smith, R. Fleenor, K. Paup-Lefferts

State and transition model

Ecosystem states



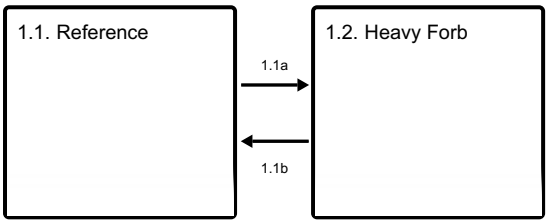
T1A - precipitation

T1B - Extensive spring grazing with heavy use

R2A - precipitation

T2A - Extensive spring grazing

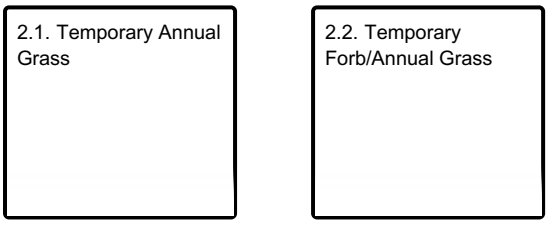
State 1 submodel, plant communities



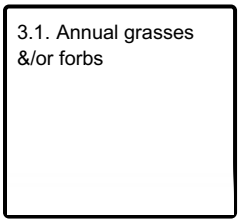
1.1a - Extensive spring grazing

1.1b - improved grazing management or complete rest

State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

State 1 Narrative: The Reference State represents non-invaded communities composed of native species. Invasive annual grasses are not present. Very Shallow sites rarely burn, and in most cases, receives minimal grazing. This ecological site is the most stable ecological site on the landscape. Reference Community 1.1 is one of four classic Very Shallow communities. Sandberg bluegrass-stiff sagebrush (only in the Channeled Scabland) Sandberg

bluegrass Sandberg-bluegrass-one-spike oatgrass Sandberg bluegrass-bluebunch wheatgrass So, Community 1.1 is mostly very stable. remaining in State 1 regardless of climate or management. Similarity Index scores are typically higher on Very Shallow than other ecological sites on the landscape. Community 1.2 represents the heavy forb which is caused by heavy grazing to Sandberg bluegrass and quite rare in MLRA 9. The species are native, but Sandberg bluegrass has a diminished presence and forbs are more prominent. Community 1.2 still has enough Sandberg bluegrass present, to shift back to reference community 1.1, given a change in management. Reference State Community Phases: 1.1 Reference Short grass – low shrub – mid-grass (variations) 1.2 Heavy Forb Forb – low shrub Dominant Reference State Species: Sandberg bluegrass in all variations. One-spike oatgrass, stiff sagebrush or blue bunchgrass on some sites. At-risk Communities: • All communities in the reference state are at risk of moving to State 2. The seed source of cheatgrass and/or ventenata is nearby and blowing onto most sites annually • Community 1.1 has a high cover of Sandberg bluegrass or with one-spike oatgrass, stiff sagebrush or bluebunch wheatgrass, and is thus, at low risk of moving to State 2, Forb-Annual Grass • Community 1.2 with less Sandberg bluegrass and more forb cover is more at risk of invasion

Community 1.1
Reference

show more precision than our current state of knowledge.

Similarity Index	Similarity Index
Shrubs – Missing to Dominant ARRI2 stiff sagebrush 0-25% 75 lbs.	
Dominant Grass POSE Sandberg bluegrass 45-75%. 225 lbs. **Missing to Dominant Mid-Size Bunchgrass** PSSP6 bluebunch wheatgrass 0-30% 90 lbs.	**Mid-Size Bunchgrasses – Minor** 5-15% 45 lbs. DAUN one-spike danthonia ELEL5 bottlebrush squirreltail PPGG other perennial native grasses
Annual Grass – Trace VUOC sixweeks fescue Trace	
Other Native Forbs - Subdominant 20% 60 lbs. BASE2 serrate balsamroot SELA stonecrop CASTI2 Indian paintbrush ACMI2 yarrow ALLIU wild onion PHLOX phlox	TRMA3 largehead clover NOTR2 sagebrush false dandelion ANDI 2 low pussytoes ERIGE2 fleabane LOMAT lomatium / biscuitroot ERIOG buckwheat

Short grass – low shrub – mid-grass (variations) Sandberg bluegrass Sandberg bluegrass - One-spike oatgrass Sandberg bluegrass - scabland sagebrush Sandberg bluegrass - bluebunch bluegrass

Community 1.2
Heavy Forb

Forb – low shrub Reduced Sandberg bluegrass Increased unpalatable forbs

Pathway 1.1a
Community 1.1 to 1.2

1.1a Result: Shift from Reference Community 1.1 to Heavy Forb Community 1.2. Sandberg bluegrass has declined, and unpalatable native forbs have increased. Primary Trigger: Extensive spring grazing with heavy use to Sandberg bluegrass or bluebunch wheatgrass. The grazing pressure can come from elk, cattle or horses. Ecological process: with consistent defoliation pressure Sandberg bluegrass or bluebunch wheatgrass have poor vigor, shrinking crowns and plant mortality. Unpalatable forbs take advantage of the release of resources and niche space and have increased cover.

Pathway 1.1b
Community 1.2 to 1.1

1.1b Result: shift from Heavy Forb Community back to the Reference Community. Sandberg bluegrass or bluebunch wheatgrass replaces the forbs to become dominant or codominant with the low shrub. Primary Trigger: improved grazing management or complete rest Ecological process: with defoliation pressure eliminated Sandberg bluegrass attains increased vigor and increased cover via new seedlings and tillering. Indicators: increasing cover for Sandberg bluegrass or bluebunch wheatgrass, and decreased cover for forbs.

State 2
Transitional Annual Grass &/or Forbs

State 2 Narrative: This state represents a community that is dominated by invasive annual grasses, broadleaf weeds and unpalatable native forbs. State 2 is quite rare as most Very Shallow sites never cross the threshold into State 2. They stay at climax or near climax condition, as these sites generally receive limited grazing pressure and rarely burn. The situation below has been witnessed on a couple of ridgetops west of Yakima in MLRAs 6 & 8. Chronic heavy grazing in the spring from migrating elk, feral horses or livestock could cause the following: • Near elimination of Sandberg bluegrass, resulting in • A plant community dominated almost exclusively by annual forbs &/or annual grasses. • Annual grasses were rare in the situations witnessed west of Yakima The amount of ventenata ebbs and flows depending on precipitation. Ventenata is hardly noticeable during years with below to average precipitation but, dominates the site in the years with above average precipitation. Higher precipitation Very Shallow sites have been altered by heavy grazing pressure and are dominated by ventenata, medusahead, or bulbous bluegrass. Lomatium or another native forb can be prominent as well. A reduction to Sandberg bluegrass cover allows ventenata and other invasive species the opportunity to colonize and invade on a more permanent basis. Heavy grazing use disrupts the soil surface and the moss-lichen layer via animal hooves, which in turn, causes loss of both soil structure and biological crust. When this happens site resistance to erosional forces are greatly diminished. State 2 will likely have much less or much more pedestaling than the reference condition. Trampling by livestock or game animals can obliterate pedestals and terracettes. Or, erosion in water flow patterns can cause much more pedestaling than reference condition.

Community 2.1
Temporary Annual Grass

This plant community represents a temporarily dominated by annual grasses. During wet years the site is dominated by ventenata. During dry or normal years, the community reverts back to Reference Community 1.1. 60% ventenata

Community 2.2
Temporary Forb/Annual Grass

This plant community represents a community temporarily dominated by unpalatable native forbs and annual grasses. During wet years the site becomes a forb-ventenata community. During dry or normal years, the community reverts back to Heavy Forb Community 1.2. 40% unpalatable native forbs 20-40% ventenata

State 3
Annual Grass &/or Forbs

State 2 Narrative: This state represents a community that is dominated by invasive annual grasses, broadleaf weeds and unpalatable native forbs. State 2 is quite rare as most Very Shallow sites never cross the threshold into State 2. They stay at climax or near climax condition, as these sites generally receive limited grazing pressure and rarely burn. The situation below has been witnessed on a couple of ridgetops west of Yakima in MLRAs 6 & 8. Chronic heavy grazing in the spring from migrating elk, feral horses or livestock could cause the following: • Near elimination of Sandberg bluegrass, resulting in • A plant community dominated almost exclusively by annual forbs &/or annual grasses. • Annual grasses were rare in the situations witnessed west of Yakima The amount of ventenata ebbs and flows depending on precipitation. Ventenata is hardly noticeable during years with below to average precipitation but, dominates the site in the years with above average precipitation. Higher precipitation Very Shallow sites have been altered by heavy grazing pressure and are dominated by ventenata, medusahead, or bulbous bluegrass. Lomatium or another native forb can be prominent as well. A reduction to Sandberg bluegrass cover allows ventenata and other invasive species the opportunity to colonize and invade on a more permanent basis. Heavy grazing use disrupts the soil surface and the moss-lichen layer via animal hooves, which in turn, causes loss of both soil structure and biological crust. When this happens site resistance to erosional forces are greatly diminished. State 2 will likely have much less or much more pedestaling than the reference condition. Trampling by livestock or game animals can obliterate pedestals and terracettes. Or, erosion in water flow patterns can cause much more pedestaling than reference condition.

Community 3.1
Annual grasses &/or forbs

80% Annual grasses &/or forbs (weeds, native)

Transition T1A
State 1 to 2

T1A Temporary transition from Reference Community 1.1 to a Temporary Annual Grass Community 2.1. Included is the temporary transition from Heavy Forb Plant Community 1.2 to a Temporary Forb-Annual Grass Plant Community 2.2. Primary Trigger: years with above average precipitation. Ecological process: wetter years allow ventenata to dominate the site. Ventenata seed moves onto these sites annually waiting to exploit the next opportunity

Transition T1B
State 1 to 3

Transitions from State to State T1B This transition is quite rare. This has been witnessed only a couple of times. Result: Shift from Reference State to State 3 dominated by annual grasses & forbs Primary Trigger: Extensive spring grazing with heavy use to Sandberg bluegrass or bluebunch wheatgrass. Heavy livestock trailing or trampling of Very Shallow soils by grazing animals could also trigger transition to State 3. Ecological process: with consistent defoliation pressure Sandberg bluegrass has poor vigor, shrinking crowns and plant mortality. As resources and niche space are released unpalatable forbs increase and invasive species colonize the site. The decline continues until invasive species dominate the site and Sandberg bluegrass has been all but eliminated. The soil is more open to evaporation, to wind and water erosion, and facilitates plant community changes from State 1 to State 3. Indicators: Declining cover of Sandberg bluegrass, declining soil biotic crust and, increasing gaps between perennial species. Recovery State 3 is considered non-reversible. Restoration of Sandberg bluegrass, the low shrub component, native forbs and the soil biotic crust would be very problematic at best on Very Shallow. Seeds must germinate. Seedlings and plugged plants need soil moisture and time to become established. In most years, seeds and plugs may not have a chance as site conditions on Very Shallow can change quickly. Drying winds and bright sun can turn a snowy or muddy site into a hard crust before plants are established. So, the timing of all recovery efforts would have an extremely narrow window of opportunity on Very Shallow. 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 Vallentine, John F. 1971. Range Development and Improvement. BYU Press, Provo, Utah

Restoration pathway R2A
State 2 to 1

R2A Transition from Temporary Plant Community 2.1 back to Reference Community 1.1. Also includes transition back to Degraded Forb Plant Community 1.2 from Plant Community 2.2. Primary Trigger: years with average and below average precipitation. Ecological process: native grasses, forbs and shrubs regain competitive advantage and utilize almost all available soil moisture. Ventenata is hardly noticeable.

Transition T2A
State 2 to 3

T2A This transition is a completion of the transition to an invaded state. Result: Shift from the transitional state of

Reference to State 3 dominated by annual grasses & forbs Primary Trigger: Extensive spring grazing with heavy use to Sandberg bluegrass or bluebunch wheatgrass. Heavy livestock trailing or trampling of Very Shallow soils by grazing animals could also trigger transition to State 3. Ecological process: with consistent defoliation pressure Sandberg bluegrass has poor vigor, shrinking crowns and plant mortality. As resources and niche space are released unpalatable forbs increase and invasive species colonize the site. The decline continues until invasive species dominate the site and Sandberg bluegrass has been all but eliminated. The soil is more open to evaporation, to wind and water erosion, and facilitates plant community changes from State 2 to State 3. Indicators: Declining cover of Sandberg bluegrass, declining soil biotic crust and, increasing gaps between perennial species. Recovery State 2 is considered non-reversible. Restoration of Sandberg bluegrass, the low shrub component, native forbs and the soil biotic crust would be very problematic at best on Very Shallow. Seeds must germinate. Seedlings and plugged plants need soil moisture and time to become established. In most years, seeds and plugs may not have a chance as site conditions on Very Shallow can change quickly. Drying winds and bright sun can turn a snowy or muddy site into a hard crust before plants are established. So, the timing of all recovery efforts would have an extremely narrow window of opportunity on Very Shallow.

Citations