Ecological site group R009XG626WA
Stony South Aspect

Last updated: 11/22/2023
Accessed: 04/24/2024

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:

Stony South Slope is an upland, bunchgrass-forb, grassland site occurring on south facing slopes. Soils are moderately deep (20-40”) and stony to extremely stony. Soils have a stony or cobbly surface and rock fragments (35% or more) throughout the profile. Soils are generally loam or silt loam over clay loam and clay.

Perennial bunchgrasses dominate the reference state while native forbs fill the interspecies. Shrubs are minor to nonexistent. Bluebunch wheatgrass is the dominant bunchgrass in the top grass layer, while Sandberg bluegrass is the major grass of the lower grass layer. Lupine, balsamroot, biscuitroot and phlox are common forbs.

Principle Vegetative Drivers:

The soil depth (20-40”) is not overly limiting to most plant roots. Stones throughout the profile limit water holding capacity some, but also make for good water drainage so this site doesn’t stay in an anaerobic condition very long which is good for a wide variety of upland plants.

The two big vegetative drivers are the south aspect and spring rains. This site receives a lot of solar radiation and is not very well suited for more mesic species such as Idaho fescue. The spring rain ensures that the vegetation production for this site is in excess of 1000 pounds annually.

Influencing Water Features:

A plant’s ability to grow on a site and overall plant production is determined by soil-water-plant relationships:
1. Whether rain and melting snow runs off-site or infiltrates into the soil
2. Whether soil condition remain aerobic or become saturated and become anaerobic
3. Water drainage and how quickly the soil reaches wilting point

With adequate cover of live plants and litter, there are no restrictions on this ecological site with water infiltrating into the soil. In some years Shallow Stony sites can become saturated due to the shallow soil depth, but with good drainage would remain anaerobic for only a short period of time. This site has an extremely restricted water holding capacity, so plant production is quite limited.

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. The landscape is part of the Columbia basalt plateaus and Northern Rocky foothills. Stony South Slope occurs on south facing hillslopes, mountain sideslopes and canyon walls.

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: 30 to 50 percent
Aspect: Dominantly southern 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
Central Tendency: 44 – 49 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 180
Central tendency: 100 to 140
The growing season for Stony South aspect is generally March through July.

Soil features

Edaphic:

The Stony South Aspect ecological site commonly occurs with rock outcrop, Shallow Stony, Very Shallow and one of the Loamy ecological sites. Soils are formed in loess and ash mixed with residuum, colluvium, alluvium and tuff weathered from basalt. Soils and both shallow and stony.

Representative Soil Features:

This ecological site components are dominantly Typic and Lithic taxonomic subgroups of Argixerolls and Haploxerolls great groups of the Mollisols. Soils are shallow to very deep. Average available water capacity of about 1.8 inches (4.6 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly loess and colluvium derived from basalt, possibly mixed with minor amounts of ash in the upper part of the soil.

The associated soils are Gwinly, Laufer, Limekiln and similar soils.

Dominate soil surface is gravelly silt loam to very stony loam.

Dominant particle-size class is loamy to clayey-skeletal.

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

Fragments within surface horizon > 3 inches (% Volume):
Minimum: 0
Maximum: 30
Average: 15

Fragments within surface horizon ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 30
Average: 15

Subsurface fragments > 3 inches (% Volume):
Minimum: 10
Maximum: 40
Average: 20

Subsurface fragments ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 30
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 to moderately low

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

Electrical Conductivity (dS/m):
Minimum: 0
Maximum: 10

Sodium Absorption Ratio:
Minimum: 0
Maximum: 10

Calcium Carbonate Equivalent (percent):
Minimum: 0
Maximum: 40

Soil Reaction (pH) (1:1 Water):
0 - 10 inches: 6.1 to 8.4
10 - 40 inches: 6.1 to 9.0

Available Water Capacity (inches, 0 – 40 inches depth):
Minimum: 0.9
Maximum: 2.7
Average: 1.8

Vegetation dynamics

Ecological Dynamics:

Stony South aspect produces about 750-1250 pounds/acre of biomass annually.

Stony South Slope is a bunchgrass-forb ecological site. The climax condition consists of bluebunch wheatgrass plants and vernal forbs, particularly in years of above-normal precipitation. Idaho fescue and shrubs have a minor role in this site. Six weeks fescue and Sandberg bluegrass are typical early spring species.

Bluebunch wheatgrass is a long-lived, mid-sized bunchgrass with an awned or awnless seed head arranged in a spike. In healthy communities, bluebunch wheatgrass provides 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. This root-network stabilizes the soils, provides organic matter and nutrients, and helps to maintain soil pore space for water infiltration and retention un the soil profile. The extensive rooting system of mid-sized grasses leave very little space for invasion by other species. This drought resistant root mass 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 bluebunch wheatgrass. Refer to page 8 for more details about bluebunch physiology. Research has found, on similar rangeland, that communities remain resistant to medusahead if sites maintain at least 0.8 mid-sized bunchgrass plant/sq. ft. (K. Davies, 2008). The relationship between bunchgrasses and other invasive species should be similar. It is bluebunch that holds the system together. If we lose the bluebunch the ecosystem crashes or unravels.

Stony south aspect has some inherent protection from some disturbances but also has inherent vulnerability from other disturbances. The steep slopes and surface stones do provide a little protection from grazing as these are not the first sites selected by livestock and game animals. Fire can race uphill as the flames are always burning into

uphill foliage. All things considered Stony South Slope are less stable than Shallow Stony. Ecological sites

The natural disturbance regime for grassland communities is periodic lightning-caused fires. Ponderosa pine communities have the shortest Fire Return Interval (FRI) of about 10-20 years (Miller). The FRI increases as one moves to wetter forested sites or to drier shrub steppe communities. The FRI listed in research for sagebrush steppe communities is quite variable. Given the uncertainties and opinions of reviewers, a mean of 75 years was chosen for Wyoming sagebrush communities (Rapid Assessment Model). This would place the historic FRI for grassland steppe at 30-50 years perhaps, and even as short as 5-10 years in some locations.

The effect of fire on the community depends upon both the severity and season of the burn. See Vallentine's Range Improvement for more detail. With a light to moderate fire there can be a mosaic of burned and unburned patches. The perennial grasses thrive as the fire does not get into the crown. With adequate soil moisture bunchgrasses can make tremendous growth the year after the fire.

Even a fire that is severe on many ecological sites, may flash over a Stony South Slope hillside quickly. Also, most fires happen after the end of wildflower season, thus forbs are unaffected. So, these bluebunch wheatgrass communities with none to very little Idaho fescue, are largely unaffected by fire.

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. Bluebunch wheatgrass declines while Sandberg bluegrass and unpalatable forbs increase
2. With further decline invasive species such as cheatgrass, bulbous bluegrass and tarweed colonize the site
3. As the community of native perennials weaken the alien species take their place. This happens progressively until the invasive species dominate the site.

For more grazing management information refer to Range Technical Notes found in Section I Reference Lists of NRCS Field Office Technical Guide for Washington State.

In Washington, bluebunch wheatgrass communities provide habitat for a variety of upland wildlife species.

Supporting Information:

Associated Sites:
Stony South Aspect is associated with other ecological sites in MLRA 9, including Very Shallow, Shallow Stony, Loamy bunchgrass and North Aspect bunchgrass,

Similar Sites:
This MLRA 9 Stony South Aspect site extends into MLRA 43c the Blur mountains.

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

- R009XY626WA–Stony South Aspect

Stage

Provisional

Contributors

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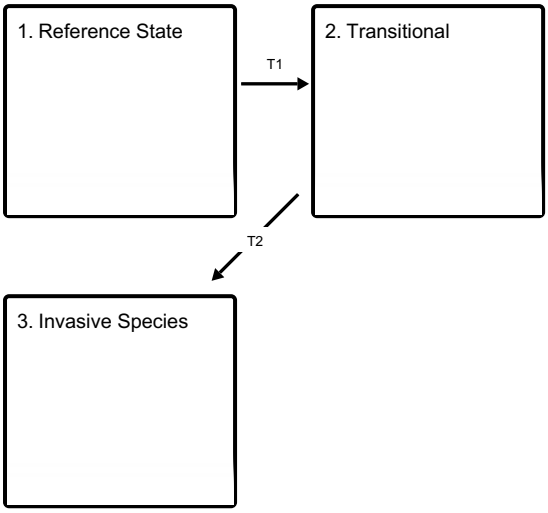
State and transition model

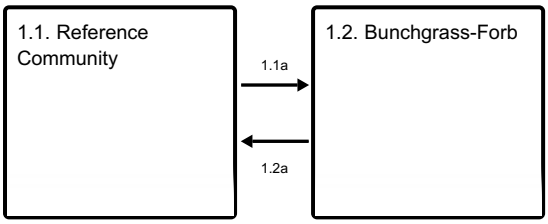
Ecosystem states



T1 - grazing pressure

T2 - grazing pressure

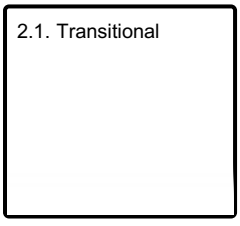
State 1 submodel, plant communities



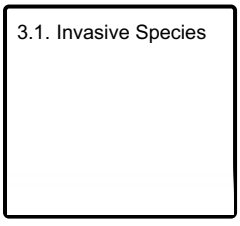
1.1a - grazing pressure

1.2a - improved grazing management

State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

State 1 Narrative: Reference State represents grassland with no invasive or exotic weed species. State 1 is dominated by bluebunch wheatgrass. Native forbs are well represented but shrubs have a minor role. All functional and structural groups are present. Stony South Slope is not as stable as Shallow Stony. Reference community 1.1 is dominated by bluebunch wheatgrass Reference State Community Phases: 1.1 Reference Bluebunch wheatgrass Dominant Reference State Species: Bluebunch wheatgrass At-risk Communities: • South slopes receive a lot of solar radiation and droughty at times. A host of weed species are at home in this environment, so the risk of invasion is high • Any community in the reference state is at risk of moving to State 2 as the seed source of cheatgrass and other invasive species is nearby and moving onto most sites annually.

Community 1.1
Reference Community

erence Community 1.1 for Stony South Aspect in MLRA 9

: species composition is represented as a percentage of total annual production (pounds). The osition of pristine sites can vary somewhat due to variations in site conditions. Pounds listed v are the maximum allowable for Similarity Index. Many numbers have been rounded to not more precision than our current state of knowledge.

Similarity Index			Similarity	
	Sprouting Shrubs – Minor		5%	65 lbs.
	CHVI8	yellow rabbitbrush		
	ERNA10	rubber rabbitbrush		
	ROSA5	rose		
ninant Mid-Size Bunchgrass	**Other Mid-Size Bunchgrasses – Minor**			
60% 750 lbs.			10%	125 lbs.
iP6 bluebunch wheatgrass	FEID	Idaho fescue		
	ELEL5	bottlebrush squirreltail		
	KOMA	prairie junegrass		
	PPGG	other perennial grasses		
rt Grasses – Minor				
5% 65 lbs.				
SE Sandberg bluegrass				
OC sixweeks fescue				
ive Forbs – Subdominant				
			20%	250 lbs.
PIN lupine	ACMI2	yarrow		
OG buckwheat	SEDUM	stonecrop		
DI2 low pussytoes	PHLOX	phlox		
LSA3 balsamroot	ASRE5	Blue Mountain milkvetch		
MAT lomatium / biscuitroot				
GE2 fleabane				

imated Production (pounds / acre)	Below	Normal	Above
	750	1000	1250

60% bluebunch wheatgrass 20% native forbs 10% other mid-size grasses 5% sprouting shrubs

Community 1.2
Bunchgrass-Forb

40% bluebunch wheatgrass 35% native forbs 15% other mid-size grasses 10% sprouting shrubs

Pathway 1.1a
Community 1.1 to 1.2

1.1a Result: shift from Reference Community 1.1 to Community 1.2 bunchgrass-forb. Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to bluebunch wheatgrass and other palatable species Ecological Process: consistent defoliation pressure to bluebunch wheatgrass results in poor vigor and shrinking crowns. The release of resources and niche space allows unpalatable forbs to increase via new seedlings. Indicators: decreasing cover and increased distance between bluebunch wheatgrass plants. Increased cover for forbs.

Pathway 1.2a
Community 1.2 to 1.1

1.2a Result: shift from Community 1.2 bunchgrass-forb to Reference Community 1.1 Primary Trigger: improved grazing management Ecological Process: when defoliation pressure is removed bluebunch wheatgrass has improved vigor and increases its cover via tillering. Perennial bunchgrasses can readily compete with annual native forbs. Indicators: increasing cover for bluebunch wheatgrass and declining cover for forbs

State 2
Transitional

State 2 Narrative: State 2 represents grassland with some invasive species. Native species are present and dominant, but invasive species have gained a foothold that they do not easily relinquish. State 2 is transitional because unless management changes and weed suppression occurs, State 2 will transition onto State 3 (dominated by invasive species). The invasion can be either annual bromes, bulbous bluegrass, or broadleaf weeds. The invasion can be either cheatgrass, bulbous bluegrass, or a broadleaf weeds such as tarweed. Community Phases for State 2: 2.1 Native Grassland w/ Invasive Species Bluebunch wheatgrass – Forbs – Invasive species Dominant Species in State 2: bluebunch wheatgrass

Community 2.1
Transitional

Native Grassland w/ Invasive Species Bluebunch wheatgrass – Forbs – Invasive species 20% bluebunch wheatgrass 30% native forbs 20% sprouting shrubs 10% other mid-size bunchgrasses 10% invasive species

State 3
Invasive Species

State 3 Narrative: State 3 represents sites that are dominated by invasive species and has crossed a biological threshold. The invasive species can include cheatgrass, bulbous bluegrass, prickly lettuce and tarweed. In State 3 native 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 3: Invasive species Dominant Species in State 3: Invasive annual grasses, broadleaf weeds, or short-lived perennial cool season grass

Resilience management. State 3 is considered non-reversible. Due to steep slopes, the hot, south slope and stones (surface rock and rock within the soil profile), and the equipment limitations thereof, seeding is not practical for the Stony South Slope ecological site. Restoration of bluebunch wheatgrass, native forbs and the soil biotic crust would be very problematic at best on Stony South Slope. 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 Shallow Stony 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 Stony South Slope. Perhaps the only avenue for recovery would be to plant plugs of native species which is a very costly and risky proposition.

Community 3.1
Invasive Species

90% invasive species (annual bromes, bulbous bluegrass, etc.)

Transition T1
State 1 to 2

T1 Transition from Reference State with no invasive species to State 2 a with a mixed stand of native plants and 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, bulbous bluegrass, tarweed or cheatgrass enter the stand of native species. Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to bluebunch wheatgrass and other palatable species. Ecological

process: consistent defoliation pressure to bluebunch wheatgrass and other palatable species results in poor vigor, shrinking crowns and plant mortality. This allow native forbs to increase and invasive species to colonize. Most sites in the Reference State have cheatgrass seed as the seed blows onto the sites annually. Cheatgrass is a prolific seeder and the 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: decreasing cover of bluebunch wheatgrass and other palatable native species and the occurrence of invasive species on sites where they had been absent.

Transition T2
State 2 to 3

T2 Result: shift from State 2 native species with some invasive plants to State 3 which is dominated by invasive species. This transition occurs once the cover of invasive species is dominate and the cover of bluebunch wheatgrass is minor. Primary Trigger: grazing pressure (heavy grazing intensity, season-long grazing, or late spring grazing) to bluebunch wheatgrass and other palatable species. Ecological process: consistent defoliation pressure to bluebunch wheatgrass and other palatable species results is poor vigor, shrinking crowns and plant mortality. In a series of retrogressions palatable species are weakened, and the invasive species increase to fill the void. This continues until the stand is dominated by invasive species rather than natives. The site has lost its primary species that stabilize and protect the soil from wind and water erosion and has also lost the ability to retain adequate soil moisture for many of the native perennial species. Indicators: Decreasing cover of bluebunch wheatgrass and increasing cover of invasive annual species. Increasing distance between bluebunch wheatgrass plants. State 3 is considered non-reversible. Due to steep slopes, the hot, south slope and stones (surface rock and rock within the soil profile), and the equipment limitations thereof, seeding is not practical for the Stony South Slope ecological site. Restoration of bluebunch wheatgrass, native forbs and the soil biotic crust would be very problematic at best on Stony South Slope. 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 Shallow Stony 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 Stony South Slope. Perhaps the only avenue for recovery would be to plant plugs of native species which is a very costly and risky proposition. 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 Liston, A, B.L. Wilson, W.A. Robinson, P.S. Doescher, N.R. Harris, and T. Svejar. 2003. The Relative Importance of Sexula 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 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 Vallentine, John F. 1971. Range Development and Improvement. BYU Press, Provo, UT.

Citations