Ecological site group R007XG449WA
Sandy

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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:
Sandy is an upland ecological site occurring on sandy loam textured soils that are moderately deep to deep. The soils on the Sandy ecological site have carbonates at or near the surface, so available water for plants is limited.

Whereas, the surrounding sites are shrub steppe, the Sandy ecological site stands out because it is a grassland site. The Sandy ecological site is almost a monoculture of needle and thread in the Reference State and a monoculture of cheatgrass in the altered state. Shrubs are virtually, nonexistent and forbs are a minor component.

The Sandy and Sandy Loamy ecological sites both have a sandy loam soil texture. The difference is that the Sandy ecological site has carbonates up to the surface, while on Sandy Loam ecological site, the carbonates are not encountered until a depth of 18 inches or greater. Sandy Loam ecological site supports a shrub steppe community of Wyoming big sagebrush, bluebunch wheatgrass and needle and thread. Sandy ecological site, on the other hand, has a grassland community dominated by needle and thread.

The line between Sandy and Sandy loam ecological sites is often sharp. It is possible to stand with one foot on Sandy ecological site and the other on Sandy Loam ecological site.

Principle Vegetative Drivers:
The carbonates at or near the surface limits available water for plants, and thus, drives the grassland vegetative expression of the Sandy ecological site.

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

Sandy ecological sites have less available water than Sandy loam ecological sites because the carbonates are at or near the soil surface. Soils are well drained and dry down quicker than adjacent Loamy ecological sites.

Physiographic features:
The landscape is part of the Columbia basalt plateau. The Sandy ecological site is commonly found on terraces and fan terraces, mesas, hillslopes, outwash plains, benches and plateaus.

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

Landscapes: Basin and valleys
Landform: Terraces, terraces escarpments and alluvial flats

Elevation:
Range: 300 to 1,800 feet
Central tendency: 300 to 1,200 feet

Slope:
Total range: 0 to 60 percent
Central tendency: 10 to 55 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

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. Seventy to seventy-five percent of the precipitation comes late-October through March as a mixture of rain and snow. Precipitation that comes after March is not as effective for plant growth. June through early-October can be 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. Winter fog is variable and often quite localized, as the fog settles on some areas but not others.

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 Sandy is March through mid-June.

Soil features

Edaphic:
The Sandy ecological site occurs with Sandy Loam, Sands and Shallow Stony Sand ecological sites.

REPRESENTATIVE SOIL FEATURES

This ecological site's soil components are dominantly Xeric taxonomic subgroup of Torriorthents and Haplocambids great groups of the Entisols and Aridisols taxonomic orders. Soils are dominantly very deep. Average available water capacity of about 3.5 inches (8.9 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly alluvium derived from mixed sources.

The associated soils are Finley, Neppel and similar soils.

Dominate soil surface is fine sandy loam to cobbly fine sandy loam.

Dominant particle-size class is coarse-silty and 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: 2

Fragments within surface horizon ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 25
Average: 10

Subsurface fragments > 3 inches (% Volume)
Minimum: 0
Maximum: 30
Average: 10

Subsurface fragments ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 35
Average: 25

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 and high
10 to 40 inches: Moderately high and high

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

Electrical Conductivity (dS/m)
Minimum: 0
Maximum: 2

Sodium Absorption Ratio
Minimum: 0
Maximum: 0

Calcium Carbonate Equivalent (percent):
Minimum: 10
Maximum: 30

Soil Reaction (pH) (1:1 Water):
0 - 10 inches: 7.4 to 9.6
10 - 40 inches: 7.4 to 9.6

Available Water Capacity (inches, 0 – 40 inches depth)
Minimum: 2.1
Maximum: 5.1
Average: 3.5

Vegetation dynamics

ECOLOGICAL DYNAMICS:
Vegetation Dynamics:
Sandy ecological site produces about 400 to 700 pounds per acre of biomass annually.

The Sandy ecological site is a grassland site with needle and thread as the dominant plant. Needle and thread is a very drought tolerant perennial bunchgrass. It prefers excessively drained sandy and coarse textured gravelly loam soils. Needle and thread produces erect, unbranched stems about three feet in height. The seeds have a four to five-inch long twisted awn, and with wetting and drying the seed drills itself into the ground. Thus, needle and thread is one of the best natural seeders of all the native species.

The stability and resiliency of the reference communities is directly linked to the health and vigor of needle and thread. Research has found that the community remains resistant to medusahead if the site maintains at least 0.8 plants per square foot of mid-sized bunchgrass (K. Davies, 2008). These two grasses help hold the system together. As needle and thread plants decline, the ecosystem begins to unravel.

The natural disturbance regime for grassland communities is periodic lightning-caused fires. The fire return intervals (FRI) listed in research for sagebrush steppe communities is quite variable. Ponderosa pine communities have the shortest FRI of about 10 to 20 years (Miller). The FRI increases as one moves to wetter forested sites or to dries shrub steppe
communities. Given the uncertainties and opinions or reviewers, a mean of 75 years was chosen for Wyoming big sagebrush communities (Rapid Assessment Model). This would place the historic FRI for grassland steppe around 30 to 50 years.

Fire is not a major concern on this ecological site. There are no shrubs to lose to fire and burn severity is generally low to moderate because the Sandy ecological site is grassland. And needle and thread is pretty much fire tolerant as fire rarely burns into the crown of the plant.

Grazing is another common disturbance that occurs in 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 needle and thread is replaced by cheatgrass.

Managing grasslands to improve the vigor and health of needle and thread begins with an understanding of the needs. New growth each year begins from basal buds. Needle and thread also reproduces via seed and needs to produce viable seed on a regular basis.

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 1 through 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) so plants have enough energy to replace basal buds annually, (2) to optimize regrowth following spring grazing and (3) so needle and thread can produce viable seed.

Needle and thread remains competitive if:
(1) Basal buds are replaced annually,
(2) Enough top-growth is maintained for growth and seed production, 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, needle and thread-Indian ricegrass communities provide habitat for a variety of upland wildlife species.

Supporting Information:

Associated Sites:
Sandy ecological site is associated with Sandy Loam, Sands and Shallow Stony Sand ecological sites.

Similar sites:
Sandy is a grassland ecological site dominated by needle and thread. There are no similar sites in MLRAs 006X, 007X, 008X or 009X.

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

- R007XY449WA–Sandy

Stage

Provisional

Contributors

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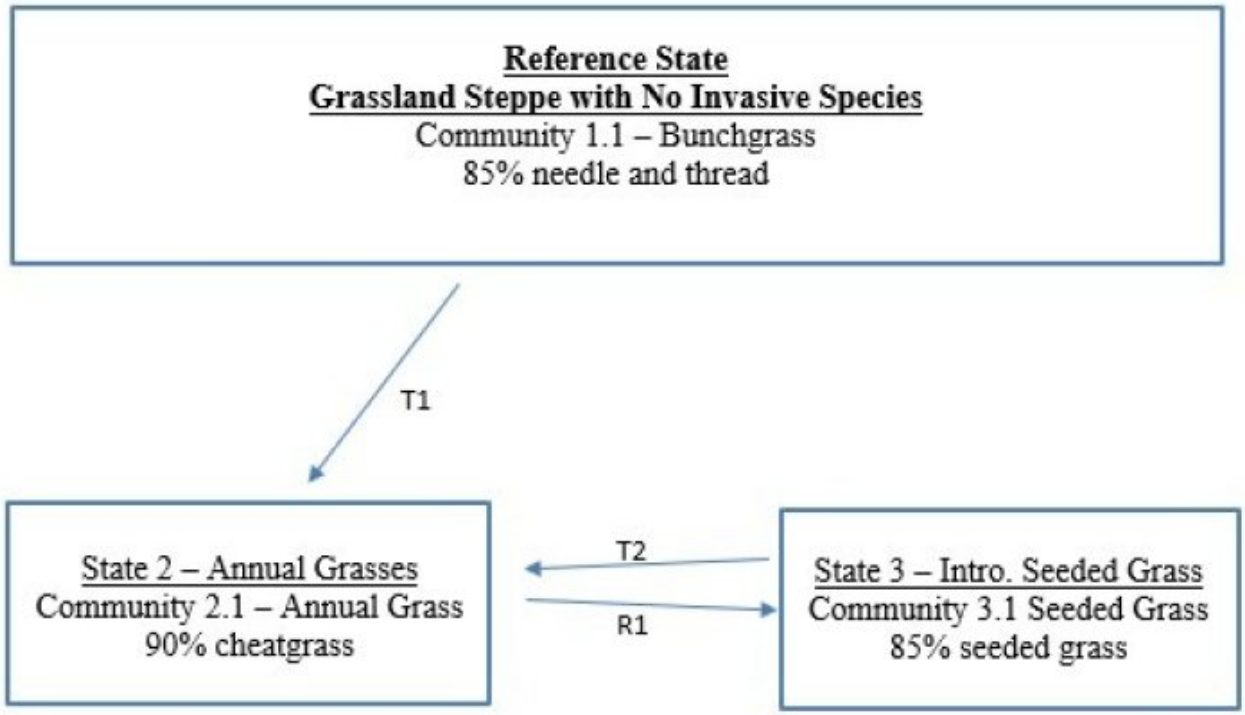
State and transition model

State and Transition Diagram for Sandy in MLRA 7:

This state and transition model (STM), explains the general ecological dynamics for the Stony Foothills South Slope ecological site. The STM illustrates the common plant communities that can occur on the site. Boxes around each state represent the ecological threshold, which if crossed, is not reversible without human intervention. Arrows within a state represent the pathway between plant communities, while the arrows between states represent the transition or recovery between the states. Plant species composition is represented as a percentage of total annual production (pounds). The composition of pristine sites can vary somewhat due to variations in site conditions.



Reference Community 1.1 for Sandy 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.

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.

Note: Sandy is a grassland site dominated by needle and thread.

Similarity Index	Similarity Index
Dominant Mid-Size Bunchgrass 85% 600 lbs. HECO26 needle and thread	**Other Mid-Size Bunchgrasses – Minor** 5% 35 lbs. DAUN one-spike oatgrass SPCR sand dropseed PSSP6 bluebunch wheatgrass ELEL5 bottlebrush squirreltail ACTH7 Thurber needlegrass ACHY Indian ricegrass
Short Grasses – Minor 5% 35 lbs. POSE Sandberg bluegrass VUOC sixweeks fescue	Grass like
Native Forbs – Minor 5% 35 lbs. SPMU2 globemallow ERIGE2 fleabane ERIOG buckwheat ORTHO owl clover CHDO Douglas dusty-maiden ACMI2 yarrow	 BACA3 Carey's balsamroot LOMAT Lomatium / biscuitroot ASTRA milkvetch / locoweed ANDI2 low pussytoes PLPA2 woolly plantain

Estimated Production (pounds / acre)	Below	Normal	Above
	400	600	700

State 1
Reference State: Grassland Steppe Without Invasive Species

State 1 Narrative: State 1 represents grassland steppe with no invasive or exotic weed species. All the functional, structural groups are represented by one or more native species. The Reference Community 1.1 is dominated by needle and thread. Sandy mostly has no shrubs and forbs are a minor component. Reference State Community

Phases: 1.1 Reference Needle and thread Dominate Reference State Species: needle and thread At-risk Communities: All communities in the Reference State are at risk on invasion by cheatgrass. Cheatgrass seeds blow onto most sites annually awaiting an opportunity to colonize the site.

State 2
Annual Grasses

State 2 Narrative: State 2 represents sites dominated by invasive annual species and has crossed a biological threshold. As State 1 begins to unravel needle and thread declines while invasive grasses become more and more prominent. Virtually all the native functional, structural groups are missing in State 2. Community Phases for State 2: 2.1 Annual Grass Cheatgrass Dominate State 2 Species: Annual grasses such as cheatgrass. Other common species can include Russian thistle, mustard, prickly lettuce and diffuse knapweed.

State 3
Introduced Seeded Grass

State 3 Narrative: State 3 represents a site that has been seeded to desirable grasses such as Siberian wheatgrass, crested wheatgrass and needle and thread. State 3 is stable if 0.8 plant per square foot or greater of the desired bunchgrasses is maintained. Dominate Species for State 3: Desirable seeded grass species Community Phases for State 3: 3.1 Seeded Grass

Transition T1
State 1 to 2

T1 Result: shift from Reference State (all native species) to State 2 which is dominated by annual grasses. This transition occurs once the cover of needle and thread declines to less than 10 percent and invasive species cover is greater than 40 percent. Primary Trigger: grazing pressure (heavy grazing, season long grazing or frequent late spring grazing) to needle and thread. In Washington, chronic season-long grazing caused more acres of State 2 than anything else. Repeated fire, another trigger, is a much more common event in south Central Washington than elsewhere. Ecological process: 1. Colonization of invasive species: Cheatgrass seed blows onto most site annually. As opportunity presents itself, cheatgrass colonizes a site. Secondary trigger of colonization is soil disturbances (rodents, badgers), or a high moisture year causes a micro-burst of cheatgrass and is the principle means of colonization. 2. Expansion of invasive species: consistent defoliation pressure to needle and thread causes low vigor, low production of viable seed, fewer seedlings and reduced cover of needle and thread. As the grazing pressure continues, annual grasses become dominate. Indicators: The occurrence of annual grasses on sites where there has been none. Decreasing vigor and cover of needle and thread and increasing cover of invasive annual species. Increasing distance between perennial species. Decreasing soil organic matter, soil water retention, limited water infiltration and percolation in the soil profile.

Restoration pathway R1
State 2 to 3

Recovery R1 Result: shift from State 2 dominated by annual grasses to State 3 desirable seeded grasses. This soils on this site are highly calcareous. Species selection is a critical consideration. This restoration transition does not occur without significant time and inputs to control weeds, prepare a seedbed, seed desirable species, and post-seeding weed control and management. This requires a commitment of two years or more for weed control. Care must be taken to maintain soil structure so that the seedbed has many safe-sites for the seed. Seed placement must be managed to achieve seed-soil contact at very shallow depth (about 1/8 inch is desired). Proper grazing management is essential to maintain the stand post-seeding. The actual transition occurs when the seeded species have successfully established and are outcompeting the annual species for cover and dominance of resources.

Transition T2
State 3 to 2

T2 Result: Transition from State 3 seeded grass to State 2 annual grasses. This transition occurs when the desirable seeded grasses become minor to the dominant annual grasses. Primary trigger: grazing pressure (heavy grazing intensity, season long grazing and frequent late spring grazing) to the seeded grasses reduce the vigor and

density of desirable seeded grasses. Ecological process: consistent defoliation pressure to desirable seeded grasses results in poor vigor, shrinking crowns and plant mortality. As the seeded grass community unravels, invasive annual grasses colonize the site and become more and more dominant with the loss of each bunchgrass. Indicators: reduced cover and mortality of desirable species, increasing caps gaps between perennial species, increasing cover by annual grasses.

Citations