

Ecological site R008XY001WA

Very Shallow

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General information

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.

MLRA notes

Major Land Resource Area (MLRA): 008X–Columbia Plateau

MLRA 8 encompasses about 50,100 square kilometers mainly in Washington and Oregon, with a small area in Idaho. This MLRA is characterized by loess hills, surrounding scablands, and alluvial deposits. This MLRA consists mostly of Miocene Columbia River Basalt covered with up to 200 feet of loess and volcanic ash. The dominant soil order in this MLRA is Mollisols. Soils in this MLRA dominantly have a mesic temperature regime, a xeric moisture regime, and mixed mineralogy.

Classification relationships

Major Land Resource Area (MLRA): 8 – Columbia Plateau

LRU – Common Resource Areas (CRA):

- 8.1 - Channeled Scablands
- 8.2 - Loess Islands
- 8.3 - Okanogan Drift Hills
- 8.4 - Moist Pleistocene Lake Basins
- 8.5 - Moist Yakima Folds
- 8.6 - Lower Snake and Clearwater Canyons
- 8.7 - Okanogan Valley

Ecological site concept

Diagnostics:

Very Shallow is a sparsely vegetated, low shrub and shortgrass, upland site on very

shallow soils (generally less than eight 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. One can stand with one foot on Very Shallow and the other foot on Stony or some other ecological site.

Occasionally the edge of Very Shallow is not so abrupt. This has been witnessed several times. The less than eight inches of soil depth has classic Very Shallow species, while eight to 13 inches is a narrow band of Thurber needlegrass (*Achnatherum thurberianum*), and greater than 13 inches soil depth is a bluebunch wheatgrass (*Pseudoroegneria spicata*) site.

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. On some but not all Very Shallow sites, there are a few micro-pockets of taller vegetation in association with bedrock fracturing.

The most common reference community is scabland sagebrush (*Artemisia rigida*), locally known as stiff sagebrush, and Sandberg bluegrass (*Poa secunda*). Sandberg bluegrass is the shortgrass in all instances, but the low shrub component is variable. Stiff sagebrush is the predominant low shrub, but one to several different *Eriogonum* species (*Eriogonum* spp.) are present on some sites, instead of, or with stiff sagebrush. While there are minor ecological differences between these low shrubs, they are considered functionally equivalent for this ecological site. These low shrubs have been combined into one site for several reasons: (1) the co-dominant shortgrass 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 species on the same site, and (4) the hydrologic and watershed characteristics are similar regardless of low shrub species.

According to Daubenmire, stiff sagebrush occurs on basalts with highly fractured parent material. *Eriogonum*s occupy various parent materials and may dominate on gravelly soils and granitic parent materials.

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 or Thurber needlegrass.

Associated sites

R008XY112WA	Shallow Stony sagebrush
R008XY120WA	Stony sagebrush
R008XY130WA	Loamy sagebrush sagebrush
R008XY153WA	Cool Loamy threetip sagebrush

Similar sites

R006XY001WA	Very shallow
R007XY001WA	Very Shallow
R009XY001WA	Very Shallow

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia rigida</i> (2) <i>Eriogonum thymoides</i>
Herbaceous	(1) <i>Poa secunda</i> (2) <i>Elymus elymoides</i>

Physiographic features

The landscape is part of the Columbia basalt plateau. Very shallow sites occur on ridgetops, shoulders, benches, mesas, and hillslopes.

Physiographic Division: Intermontane Plateau

Physiographic Province: Columbia Plateau

Physiographic Sections: Walla Walla Plateau Section

Table 2. Representative physiographic features

Geomorphic position, hills	(1) Side Slope
Landforms	(1) Hills (2) Canyonlands (3) Valley (4) Plateau (5) Terrace (6) Ridge (7) Bench
Flooding frequency	None
Ponding frequency	None

Elevation	152–1,524 m
Slope	0–65%
Water table depth	203 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The climate is characterized by moderately cold, wet winters, and hot, dry summers, with limited precipitation due to the rain shadow effect of the Cascades. Taxonomic soil climate is either xeric (12 to 16 inches of precipitation) or aridic moisture regimes (10 to 12 of precipitation) with a mesic temperature regime.

Table 3. Representative climatic features

Frost-free period (characteristic range)	110-160 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	254-406 mm
Frost-free period (actual range)	75-200 days
Freeze-free period (actual range)	
Precipitation total (actual range)	

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 conditions remain aerobic or become saturated and become anaerobic
3. Water drainage and how quickly the soil reaches the 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.

Soil features

Edaphic:

The Very Shallow ecological site commonly occurs with rock outcrop, Loamy, Shallow Stony, and Stony ecological sites. 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 can 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 to frost-heave, and then during the 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 of 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:

These ecological site components are dominantly lithic taxonomic subgroups of Haploxerolls, Argixerolls and Torriorthents great groups of the Mollisols taxonomic order, with Aridisols occurring as well. Soils are dominantly very shallow. Average available water capacity of about 0.8 inches (2.0 cm) in the 0 to 40 inches (0 to 100 cm) depth range.

Soil parent material is dominantly mixed loess, colluvium and possibly small amounts of ash over residuum.

The associated soils are Argabak, Bakeoven, Laric, Nevo, Onepennee, Rockly and similar soils.

Table 4. Representative soil features

Parent material	(1) Loess (2) Colluvium (3) Residuum
Surface texture	(1) Cobbly silt loam (2) Very cobbly loam

Family particle size	(1) Loamy (2) Loamy-skeletal
Drainage class	Well drained
Depth to restrictive layer	10–25 cm
Soil depth	25 cm
Surface fragment cover ≤3"	10%
Surface fragment cover >3"	5%
Available water capacity (0-101.6cm)	12.7 cm
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0–1 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (0-25.4cm)	6.1–8.4
Subsurface fragment volume ≤3" (Depth not specified)	25%
Subsurface fragment volume >3" (Depth not specified)	5%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover ≤3"	0–10%
Surface fragment cover >3"	0–35%
Available water capacity (0-101.6cm)	2.03–24.64 cm
Calcium carbonate equivalent (Depth not specified)	Not specified
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified

Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	0-60%
Subsurface fragment volume >3" (Depth not specified)	0-25%

Ecological dynamics

Very Shallow produces about 100 to 250 pounds per acre of biomass annually.

The Very Shallow ecological site in MLRA 8 has at least four different variations on the low shrub-shortgrass theme for the Reference community. Sandberg bluegrass is co-dominant in every variation:

1. Stiff sagebrush and Sandberg bluegrass
2. Stiff sagebrush, thyme-leaved buckwheat, rock buckwheat, and Sandberg bluegrass
3. Thyme-leaved buckwheat and Sandberg bluegrass
4. Narrowleaf goldenweed (*Stenotus* s.) and 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 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.

The Goldendale Prairie has more precipitation (14 to 20 inches) than anywhere else in MLRA 8 and, has been highly disturbed by farming practices. Thus, Very Shallow sites on the Goldendale Prairie are dominated by cheatgrass (*Bromus tectorum*), medusahead (*Taeniatherum caput-medusae*), North Africa grass (*Ventenata dubia*) or bulbous bluegrass (*Poa bulbosa*). Lomatium or other native forbs are prominent as well.

Very Shallow is resistant to most natural disturbances and ecologically stable. However, if this site does experience a major disturbance it is not resilient and may be extremely difficult to stabilize once altered. For example, vehicle traffic when the soil is saturated will leave ruts that remain for years to come.

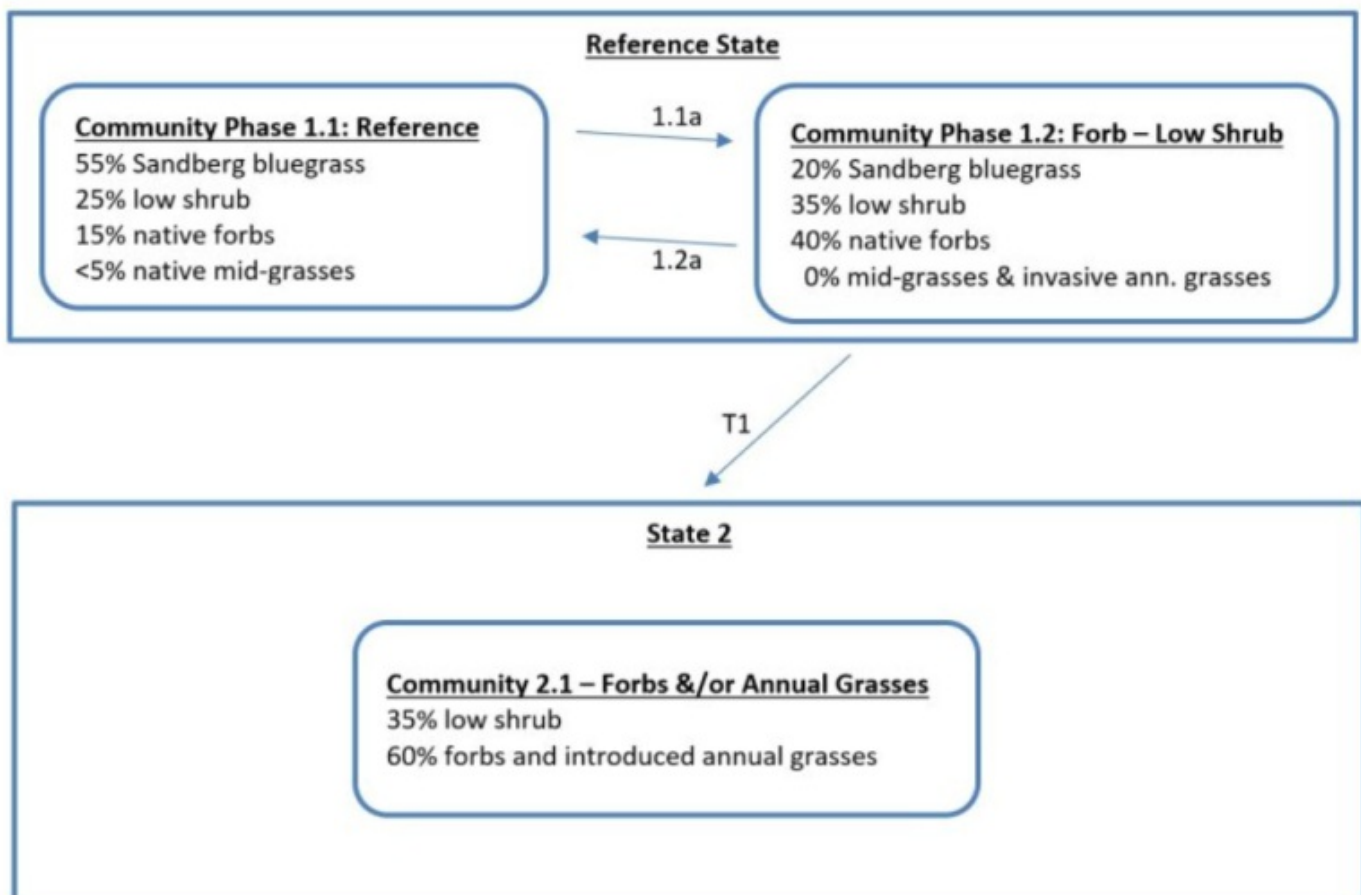
The vegetative cover is too low to carry fire, so these sites rarely burn. In many pastures, due to surface rocks and limited forage, Very Shallow sites are not attractive to grazing animals and so receive only incidental grazing. Based on inherent protection from both fire and grazing, most Very Shallow sites are stable.

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 most years, many bunchgrasses 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.

State and transition model

Very Shallow Ecological Site



State 1 Reference

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, receive minimal grazing. This ecological site is the most stable ecological site on the landscape. The Reference state has 2 communities: 1.1 Sandberg Bluegrass and Low Shrub and 1.2 Forb and Low Shrub. The Reference state species include Sandberg bluegrass, stiff sagebrush, and/or other low-shrub Eriogonum species 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 • Community 1.1 has a high Sandberg bluegrass cover and is thus, at lower risk of moving to State 2, Forb-Annual Grass • Community 1.2, has less Sandberg bluegrass cover and a high amount of forb cover, and is at considerable risk of moving to State 2

Community 1.1 Sandberg Bluegrass and Low Shrubs

Reference community 1.1 is the classic Very Shallow, dominated by Sandberg bluegrass with one or more low shrub species. The low shrub component may be stiff sage and/or one or more Eriogonum low-shrub species.

Community 1.2 Native Forbs and Low Shrubs

Community 1.2 represents a phase that is quite rare in most of MLRA 8. The species are native, but Sandberg bluegrass has a diminished presence while forbs are more prominent. Community 1.2 still has enough Sandberg bluegrass present, to shift back to Reference community 1.1.

Pathway 1.1A Community 1.1 to 1.2

Result: Shift from Reference Community (Sandberg Bluegrass and Low Shrub) to Community 1.2 (Native Forbs and Low Shrubs). Sandberg bluegrass has been much reduced but remains in the community. The native forb component has increased. There may be a few invasive forbs. Primary Trigger: heavy spring grazing pressure (heavy to severe grazing intensity) to Sandberg bluegrass. The grazing pressure can come from elk, cattle or feral horses. Ecological process: consistent spring defoliation pressure on Sandberg bluegrass causes poor vigor, shrinking crowns and mortality. Grass roots begin to die, and this opens the soil for native forbs to increase via seedlings. The hoof action by large ungulates can disturb the soil surface enough to make them vulnerable to annual grass and forb invasion. Indicators: decreasing Sandberg bluegrass cover and increasing cover of native forbs.

Pathway 1.2A

Community 1.2 to 1.1

Result: Shift from Native Forbs and Low Shrubs community back to the Reference Community. Sandberg bluegrass reestablishes dominance over the native annual forb component as it exerts competitive advantage for resources and space. So, Sandberg bluegrass displaces the forbs to become co-dominant with the low shrub component. Primary Trigger: Defoliation pressures are removed, allowing Sandberg bluegrass to recover and reestablish dominance over the forb component. Ecological process: With reduced grazing pressure Sandberg bluegrass experiences increased plant vigor and root production, expanding its size and competitive abilities through seedlings and tillering. Soils stabilize with the removal of the hoof action and increased volume of roots.

State 2

Forbs and/or Annual Grass

Narrative: This state represents the ecological changes that occur when there is a shift from dominance by perennial native grasses to forbs or annual grass dominance in the herbaceous layer. The shrub components generally remain in the overstory. Most Very Shallow sites never cross the threshold into State 2 as they are not attractive to grazing animals and rarely burn (limited forage values and surface rocks). The exception being chronic heavy grazing in the spring from migrating elk, feral horses or livestock. As the cover of Sandberg bluegrass significantly declines the site becomes open to invasion by invasive annuals, however. Invasive annual grasses, which are common & frequently dominant on adjacent Loamy ecological sites, do not often compete as well on Very Shallow sites. However, the cheatgrass seed blows onto Very Shallow sites annually and can become a minor component. In a year with heavy snowfall and early spring rain, such as 2017, the site had far more moisture than the plant community could utilize. This is the perfect opportunity for cheatgrass seed, which is capable of rapid germination and growth to establish in significant amounts across the site. In the following years when moisture is normal or below normal, native species will utilize most of the available moisture and cheatgrass seed will not germinate or make viable plants. Therefore, in most cases, these micro-bursts of cheatgrass tend to be episodic and mostly a temporary condition on Very Shallow sites. However, due to long-term disturbances and higher precipitation, Very Shallow sites in the Goldendale Prairie portion of MLRA 8 are now dominated by cheatgrass, medusahead, ventenata, or bulbous bluegrass. Sites have been significantly impacted by heavy grazing pressure from livestock that have removed much of the native grass components, leaving niches for these invasive annuals to take hold. Native forbs such as Lomatium may be prominent, but the grass component has shifted completely. A reduction in Sandberg bluegrass cover allows annual grasses 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 is greatly diminished as well. State 2 may exhibit either a significant decrease in pedestaling due to

the lack of bunchgrass cover and heavy use trampling by ungulates, or there will be a significant increase in pedestaling due to increased erosion from water flows around the remaining bunchgrasses. Communities for State 2: Community 2.1: dominated by native forbs and/or invasive annual grasses. Forbs that increase in the altered conditions and are competitive with invasive grasses, can include lomatium, fleabane (*Erigeron* sp.), willowherb (*Epilobium* sp.), yarrow (*Achillea millefolium*), and onion (*Allium* sp.). Typical invasive grasses may include annual bromes, medusahead, and sixweeks fescue (*Vulpia octoflora*). State 2 is considered non-reversible. Restoration of Sandberg bluegrass, the low shrub component, native forbs, and the soil biotic crust would be extremely difficult, labor intensive, and costly. Seedlings and plugged plants need soil moisture and time to germinate and become established. In most years, seeds and plugs may not have a chance as site conditions on Very Shallow can change quickly and the non-native species are much more adaptable under these conditions. Drying winds and bright sun can turn a snowy or muddy site into a hard crust before plants are established. Timing of all recovery efforts would have an extremely narrow window of opportunity on these altered sites of Very Shallow.

Community 2.1

Forbs and Annual Grasses

Community 2.1: dominated by native forbs and/or invasive annual grasses. Forbs that increase in the altered conditions and are competitive with invasive grasses, can include lomatium, fleabane (*Erigeron* sp.), willowherb (*Epilobium* sp.), yarrow (*Achillea millefolium*), and onion (*Allium* sp.). Typical invasive grasses may include annual bromes, medusahead, and sixweeks fescue (*Vulpia octoflora*).

Transition T1A

State 1 to 2

Result: Shift from Reference Community Phase 1.1 to State 2 Community Phase 2.1, resulting in the shift in functional groups to forbs and non-native annual grass dominance. Primary Trigger: Extensive spring grazing with heavy use to Sandberg bluegrass. The grazing pressure can come from elk, cattle or feral horses. Secondary Trippers: a micro-burst of cheatgrass could put Community 1.2 at risk. The trampling of Very Shallow soils, displacing and disturbing the surface soil structure by grazing animals could also trigger transition to State 2. A micro-burst of annual grasses could allow even pristine sites to be invaded. Community 1.2 is the community most at risk and is also the pathway for crossing the threshold from State 1 to State 2. Ecological process: consistent spring defoliation pressure to Sandberg bluegrass causes poor vigor, shrinking crowns and plant mortality. Most or all Sandberg bluegrass plants are lost from the community, and this allows native forbs to increase and invasive annuals (forbs and grasses) to colonize and expand. This facilitates plant community changes from Community 1.2 to Community 2.1. Indicators: Declining vigor and cover of Sandberg bluegrass, declining soil biotic crust and, increasing gaps between perennial bunchgrasses.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	Dominant Low Shrubs			73	
	scabland sagebrush	ARRI2	<i>Artemisia rigida</i>	–	–
	thymeleaf buckwheat	ERTH4	<i>Eriogonum thymoides</i>	–	–
	rock buckwheat	ERSP7	<i>Eriogonum sphaerocephalum</i>	–	–
2	Other Low Shrubs - Minor			11	
	purple sage	SADOI	<i>Salvia dorrii</i> ssp. <i>dorrii</i> var. <i>incana</i>	–	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	–	–
	Douglas' buckwheat	ERDO	<i>Eriogonum douglasii</i>	–	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	–	–
Grass/Grasslike					
3	Dominant Short Grass			168	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	–	–
4	Mid-Size Bunchgrasses - Minor			11	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	–	–
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	–	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	–	–
5	Annual Grass - Trace			–	
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	–	–
Forb					
6	Native Forbs - Subdominant			45	
	narrowleaf mock goldenweed	NEST5	<i>Nestotus stenophyllus</i>	–	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	–	–
	granite prickly phlox	LIPU11	<i>Linanthus pungens</i>	–	–
	desertparsley	LOMAT	<i>Lomatium</i>	–	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	–	–

sagebrush violet	VIVAV	<i>Viola vallicola var. vallicola</i>	–	–
onion	ALLIU	<i>Allium</i>	–	–
fleabane	ERIGE2	<i>Erigeron</i>	–	–
bitter root	LERE7	<i>Lewisia rediviva</i>	–	–
snow buckwheat	ERNI2	<i>Eriogonum niveum</i>	–	–
beardtongue	PENST	<i>Penstemon</i>	–	–
woollypod milkvetch	ASPU9	<i>Astragalus purshii</i>	–	–
snowball cactus	PENI5	<i>Pediocactus nigrispinus</i>	–	–

Other references

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	02/27/2025
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**
