Ecological site R008XY153WA
Cool Loamy
threetip sagebrush

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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 minerology.

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 8.7 - Okanogan Valley

Ecological site concept

Diagnostics: Cool Loamy, threetip sagebrush is an upland sagebrush steppe site occurring on 20 inches and deeper loamy soils. This ecological site occurs principally in two situations: (1) on flat sites at higher elevations and the northern region of MLRA 8, and (2) on north to northeast slopes elsewhere. These sites occur most commonly on silt loam, sandy loam and stony loam soils, but a wide variety of soils and landforms are possible. As one moves across MLRA 8, the landscape position for Cool Loamy, threetip sagebrush changes. At 10 inches of precipitation Cool Loamy, threetip sagebrush occurs only on the north to northeast slopes. But at 12 inches of precipitation Cool Loamy, threetip sagebrush occurs on all but the south to southwest slopes. Compared to other upland sites, Cool Loamy, threetip sagebrush has a shift in plant community composition, with threetip sagebrush and Idaho fescue the featured species. Fire tolerant, three-tip sage dominates the reference state shrub layer while Idaho fescue, with or without bluebunch wheatgrass, is dominant in the herbaceous understory. The shrub layer is knee-height three-tip sagebrush with a mix of other shrub species scattered throughout, including Wyoming or basin big sagebrush, rabbitbrush, and horsebrush. The cover of Wyoming and basin sagebrush will depend on how long it has been since the site burned. Daubenmire identified northern Douglas Co., southern Okanogan Co., northern and eastern portion of both Lincoln and Adams counties, for his threetip sagebrush-fescue vegetative zone. Principle Vegetative Drivers: The vegetative expression of this productive site is driven by two factors: (1) moderately deep to deep soil depth provides unrestricted rooting for most species, and (2) the microclimate which allows the shift in major plant species. With higher elevations or northerly facing slopes this ecological site has cooler temperatures year-round and longer lasting snow pack than other MLRA 8 ecological sites. This site provides crucial water to the vegetation at the hottest time of the growing season allowing the ecological site more resilience when impacted by disturbances. Also, being wetter and cooler, Cool Loamy supports a denser plant cover than the Loamy ecological site. Associated Sites: Cool Loamy, threetip sagebrush in MLRA 8 is associated with other sites in the Sagebrush Steppe area of MLRA 8 including, Loamy, Stony, Stony Foothills, Stony Foothills South Slope Similar Sites: Cool Loamy, threetip sagebrush in MLRA 8 has threetip sage with Idaho fescue and bluebunch wheatgrass. Cool Loamy in MLRA 7 Columbia Basin is similar but with less threetip sage and Idaho fescue. The Channel Scabland area on MLRA 9 Palouse Prairie also has a similar Cool Loamy ecological site.

Associated sites

R008XY130WA	**Loamy sagebrush sagebrush**

R008XY226WA	Stony Foothills South Aspect bitterbrush
R008XY516WA	Shallow Stony South Aspect Columbia Hills

Similar sites

R008XY402WA	Loamy Bottom 10-16 PZ
R007XY153WA	Cool Loamy

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tripartita* (2) *Artemisia tridentata ssp. wyomingensis*
Herbaceous	(1) *Festuca idahoensis* (2) *Pseudoroegneria spicata*

Physiographic features

The landscape is part of the Columbia basalt plateau. Cool loamy, threetip sagebrush sites are most commonly found on broad ridges, benches and plateaus, stream terraces, drier draw bottoms, north and northeast-facing hillslopes and in small basins.

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) Valley (3) Plateau (4) Terrace (5) Bench (6) Alluvial fan
Flooding frequency	None

Ponding frequency	None
Elevation	460 – 910 m
Slope	0 – 30 %
Water table depth	150 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	180 – 1,280 m
Slope	0 – 90 %
Water table depth	Not specified

Climatic features

Areas with threetip sagebrush and Idaho fescue when compared to Wyoming sagebrush-bluebunch wheatgrass regions, are cooler from late fall to early spring (October through April), and has higher P (precipitation) and P/T (precipitation-transpiration) for five months (September, November, December, January and March) (Daubenmire). 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 PPT) or aridic moisture regimes (10 to 12 inches PPT) with a mesic temperature regime.

Table 4 Representative climatic features

Frost-free period (characteristic range)	120-160 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	250-410 mm
Frost-free period (actual range)	90-210 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 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

Cool Loamy has cooler temperatures and longer lasting snow than other MLRA 8 ecological sites. Thus, this site supports a denser plant cover and provides water crucial to vegetation when it becomes hot.

Soil features

This ecological site components are dominantly Typic, Calcic and Vitrandic taxonomic subgroups of Haploxerolls, Durixerolls, Argixerolls and Palexerolls great groups of the Mollisols taxonomic orders. Soils are moderately deep to very deep. Average available water capacity of about 6.0 inches (16.3 cm) in the 0 to 40 inches (0 to 100 cm) depth range.

Soil parent material is dominantly mixed loess, colluvium and residuum with influence of volcanic ash possible.

The associated soils are Anders, Badge, Bickleton, Conconully, Endicott, Lainand, Linville, Patron, Pushtay, Tanksel and similar soils.

Dominant soil surface is silt loam to very stony fine sandy loamy, with ashy modifier sometimes occurring as well.

Dominant particle-size class is fine to coarse-loamy

Table 5. Representative soil features

Parent material	(1) Loess (2) Colluvium (3) Residuum
Surface texture	(1) Silt loam (2) Very cobbly fine sandy loam
Family particle size	(1) Fine (2) Coarse-loamy
Drainage class	Well drained
Depth to restrictive layer	50 – 150 cm
Soil depth	150 cm
Surface fragment cover <=3"	10 %

Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	15.24 cm
Calcium carbonate equivalent (Depth not specified)	0 – 30 %
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (0-25.4cm)	5.6 – 10
Subsurface fragment volume <=3" (Depth not specified)	10 %
Subsurface fragment volume >3" (Depth not specified)	10 %

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	0 – 30 %
Surface fragment cover >3"	0 – 20 %

Available water capacity (0-101.6cm)	3.56 – 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 – 40 %
Subsurface fragment volume >3" (Depth not specified)	0 – 30 %

Ecological dynamics

Cool Loamy, threetip sagebrush produces about 800 to 1,200 pounds per acre of biomass annually

In the sagebrush steppe areas of MLRA 8, Wyoming sagebrush – bluebunch wheatgrass communities reign far and wide. But Cool Loamy, threetip sagebrush has a shift in plant community composition, with threetip sagebrush and Idaho fescue the featured species. Bluebunch wheatgrass and threadleaf sedge are also important species on this site.

Compared to other upland ecological sites, Cool Loamy, threetip sagebrush has more available soil moisture. This happens twofold: (1) there is more moisture (more spring rain, deeper snowpack, more fog), and (2) the precipitation is more effective (cooler temperatures, less runoff and less evaporation due to closer spacing of plants, and hence, more soil cover). Threetip sage and Idaho fescue are especially linked to the additional soil moisture on this ecological site. The third dominant species in the reference state, bluebunch wheatgrass, is not as linked to the additional soil moisture.

Threetip sagebrush is a short, shallow-rooted, evergreen shrub. Leaves are more deeply lobed than big sagebrush. Compared to big sagebrush, threetip sage grows on sites that are moister or at higher elevations. Threetip sagebrush has a very slow growth rate, reaching a height of one foot after twenty years. In Washington threetip sage generally sprouts following fire but it is not a big-time sprouter like rabbitbrush. It can take years for threetip sage to get back to pre-burn conditions.

Idaho fescue is shorter and has a dense clump of shoots, while bluebunch wheatgrass is taller and is less dense. Both species are long-lived bunchgrasses. Bluebunch has an awned or awnless seed head arranged in a spike, while Idaho fescue has an awned seed head arranged in a panicle. The ratio of Idaho fescue to bluebunch wheatgrass plants on any site can vary due to aspect and elevation.

Both grasses provide 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. These roots create a massive underground source to stabilize the soils, provide organic matter and nutrients inputs, and help maintain soil pore space for water infiltration and water retention in the soil profile. The extensive rooting system of mid-

sized bunchgrasses leave very little soil niche space available for invasion by other species. This drought resistant root can compete with, and suppress, the spread of exotic weeds.

Threadleaf sedge is a sod-forming, densely tufted, native perennial graminoid. In nature threadleaf sedge seedlings are rare as it reproduces mainly from asexual tillers. Often threadleaf sedge is an increaser when other species in the community are in decline.

The stability and resiliency of the reference communities is directly linked to the health and vigor of Idaho fescue and bluebunch wheatgrass. Refer to page 8 for more details about bunchgrass physiology. Research has found that the community remains resistant to medusahead invasion if the site maintains at least 0.8 mid-sized bunchgrass plant/sq. ft. (K. Davies 2008). These two bunchgrasses hold the system together. If we lose either or both bunchgrass 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 of reviewers, a mean of 75 years and a range of 50 to 100 was chosen for Wyoming sagebrush communities (Rapid Assessment Model). Threetip sage-fescue areas should have a comparable fire return interval.

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

The effect of fire on the main species is mixed for the Cool Loamy site. Threetip sagebrush in Central Washington sprouts from lateral roots or the root crown following fire and bluebunch wheatgrass is fire tolerant. Threetip is also a vigorous, wind-dispersed seeder and in many cases, after fire, threetip will both re-sprout and disperse new seed from the surviving plants. Both species recover quickly. But Idaho fescue is much more sensitive to fire. Under windy conditions, a fire can burn into the crown of Idaho fescue, leaving behind “black holes” or nothing but ash. When a site loses its Idaho fescue, the holes will be filled by vigorous native species or exotic weeds. Threetip sage and bluebunch wheatgrass keeps the site resistant to change, while Idaho fescue makes the site more at risk.

A severe fire puts stress on the entire community. The sagebrush layer is completely removed. Spots or patches with heavy sagebrush are sterilized by the fire and must be seeded to prevent invasive species (annual grasses, tumble mustard) from totally occupying the site. Bluebunch wheatgrass and basin wildrye will have weak vigor for a few years but generally survive. Idaho fescue plants are very much at risk with a severe burn coupled with wind. The result can be “black holes” or ash 2 to 3 inches into the crown. The death of Idaho fescue plants creates holes in the community, and the opportunity for exotic species to colonize. Needle and thread is one native species that can increase via new seedlings.

Idaho fescue and bluebunch wheatgrass exhibit rapid tillering when there is light severity fires and favorable soil moisture. But, the longer the site goes without fire and the more grazing pressure added, the more threetip sagebrush cover increases and the bunchgrasses decline.

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. Cusick bluegrass is eliminated. Adjacent natives fill the void
2. Idaho fescue declines while bluebunch wheatgrass and threetip sage increase
3. Both Idaho fescue and bluebunch wheatgrass decline while threetip sage and threadleaf sedge increase
4. With further decline invasive species colonize the site
5. The site can become a threetip sage-threadleaf sedge community

Managing sagebrush steppe to improve the vigor and health of native bunchgrasses begins with an understanding of grass physiology. New growth each year begins from basal buds. Given the opportunity Idaho fescue readily produces new seedlings while bluebunch wheatgrass plants rely principally on tillering. During seed formation, the growing points of bluebunch wheatgrass become elevated and are vulnerable to damage or removal. Idaho fescue has weak stems and is much more sensitive to grazing than bluebunch wheatgrass.

If defoliated during the formation of seeds, bluebunch wheatgrass has limited capacity to tiller compared with other, more grazing resistant grasses (Caldwell et al., 1981). Repeated critical period grazing is especially damaging. Over several years each native bunchgrass pasture should be rested during the critical period two out of every three years (approximately April 15 to July 15). And each pasture should be rested the entire growing-season every third year (approximately March 1 to July 15).

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, (3) to protect the elevated growing points of bluebunch wheatgrass, and (4) to avoid excessing defoliation of Idaho fescue with its weak stems.

These grasses remain competitive if:
(1) Basal buds are replaced annually,

(2) Enough top-growth is maintained for growth and protection of growing points, and
(3) The timing of grazing and non-grazing is managed over a several-year period. Careful management of late spring grazing is especially critical

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

In Washington, threetip sagebrush – Idaho fescue/bluebunch wheatgrass communities provide habitat for a variety of upland wildlife species.

State and transition model

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 11. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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	05/07/2025
Approved by	
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:**

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

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

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

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

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

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

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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:

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

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

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

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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:

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17. **Perennial plant reproductive capability:**
