USDA Natural Resources
Conservation Service

# Ecological site R007XY193WA
# Calcareous Loam

Last updated: 2/06/2025
Accessed: 05/14/2025

## 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): 007X–Columbia Basin

This MLRA is in the Walla Walla Plateau section of the Columbia Plateaus province of the Intermontane Plateaus. The Columbia River flows through this MLRA, and the Snake and Yakima Rivers join the Columbia River within it. This MLRA 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. The dominant soil orders in this MLRA are Aridisols and Entisols. The soils in the area dominantly have a mesic temperature regime, an aridic moisture regime, and mixed mineralogy. They generally are moderately deep to very deep and well drained to excessively drained.

## Classification relationships

Major Land Resource Area (MLRA): 007X – Columbia Basin

LRU – Common Resource Areas (CRA):
7.1 – Sandy Missoula Flood Deposits
7.2 – Silty Missoula Flood Deposits
7.3 – Dry Loess Islands
7.4 – Dry Yakima Folds
7.5 – Yakima Valley – Pleistocene Lake Basins

## Ecological site concept

Diagnostics:
The Calcareous Loam ecological site is very limited in extent. It is an upland site that occurs as small, sharply defined patches on the driest and hottest portion of MLRA 007X. This site is typically found on terraces, benches, gently sloping lake beds and steep sideslopes of highly dissected plateaus. The soils are shallow, highly calcareous silt loam to very fine sandy loam textures. The depth to carbonates can vary from the surface to a depth of 5 to 14 inches. Soils are moderately alkaline and have limited rock fragments (generally 10 percent or less) in the root-growing portions of the soil profile.

This low producing site has two distinct layers – a scattering of short, half-shrubs in the top layer, and a sparse herbaceous layer of short, small bunchgrasses underneath. The plant community is predominately winterfat and Sandberg bluegrass. The native plant community on the Calcareous Loam ecological site is more stable and intact than the plant community on the Dry Loamy ecological site.

Principle Vegetative Drivers:
The soil drives the vegetative expression of this low productive site – shallow to moderately deep, highly calcareous silt soils and having a hardpan within 20 inches of depth.

## Associated sites

| | |
|---|---|
| R007XY163WA | **Dry Loamy** |
| R007XY120WA | **Stony** |
| R007XY001WA | **Very Shallow** |
| R007XY143WA | **Sandy Loam** |
| R007XY449WA | **Sandy** |
| R007XY140WA | **Sands** |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Krascheninnikovia lanata* |
| Herbaceous | (1) *Poa secunda* |

## Physiographic features

The landscape is part of the Columbia basalt plateau. Calcareous loam occurs sites occur mostly on terraces, terrace escarpments, lake beds, and steep sideslopes of dissected plateaus.

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

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Basin<br>(2) Valley<br>(3) Terrace<br>(4) Escarpment<br>(5) Alluvial flat |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 122–305 m |
| Slope | 2–30% |
| Water table depth | 152 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 | 67–610 m |
| Slope | 0–60% |
| Water table depth | Not specified |

## Climatic features

MLRA 007X is the lowest, driest and hottest portions of the entire Columbia River region and the sagebrush-bluebunch wheatgrass zone. Calcareous Loam is confined to the driest and hottest portion of MLRA 007X (Benton, western Franklin, southern Grant and eastern Yakima counties.

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. For drier sites and lower elevations, precipitation that comes after March is not as effective for plant growth. But at higher elevations and higher precipitation, April and May rains make the difference between average and great production years. June through early-October is 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.

**Table 4. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | |
| Freeze-free period (characteristic range) | 150-180 days |
| Precipitation total (characteristic range) | 2,591-6,452 mm |
| Frost-free period (actual range) | |
| Freeze-free period (actual range) | 140-200 days |
| 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 condition remain aerobic or become saturated and anaerobic
3. How quickly the soil reaches the wilting point

With adequate cover of live plants and litter, there are no restrictions on the Calcareous Loam ecological sites with water infiltrating into the soil. These sites are well drained and are saturated for only a short period.

## Soil features

This ecological site soil components are dominantly Xeric taxonomic subgroup of Torriorthents, Haplocalcids great groups of the Entisols and Aridisols taxonomic orders. Soils are dominantly very deep. Average available water capacity of about 6.0 inches (15.3 cm) in the 0 to 40 inches (0 to 100 cm) depth range.

Soil parent material is dominantly alluvium derived from mixed sources with possibly minor amounts of ash in the upper part of the soil over lacustrine deposits.

The associated soils are Kennewick, Sagehill, Sagemoor, Kittitas and similar soils.

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium |
| Surface texture | (1) Silt loam<br>(2) Fine sandy loam |
| Family particle size | (1) Coarse-silty |
| Drainage class | Well drained |
| Depth to restrictive layer | 152 cm |
| Soil depth | 152 cm |
| Surface fragment cover <=3" | 2% |
| Surface fragment cover >3" | 0% |
| Available water capacity (Depth not specified) | 15.24 cm |

| | |
|---|---|
| Calcium carbonate equivalent (Depth not specified) | 5–30% |
| Electrical conductivity (Depth not specified) | 0–4 mmhos/cm |
| Sodium adsorption ratio (Depth not specified) | 0–5 |
| Soil reaction (1:1 water) (0-25.4cm) | 7.4–9.6 |
| Subsurface fragment volume <=3" (Depth not specified) | 5% |
| Subsurface fragment volume >3" (Depth not specified) | 1% |

**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" | 0–10% |
| Surface fragment cover >3" | 0–5% |
| Available water capacity (Depth not specified) | 4.32–21.08 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) | 0–15% |
| Subsurface fragment volume >3" (Depth not specified) | 0–5% |

## Ecological dynamics

Vegetation Dynamics:
The Calcareous Loam ecological site produces about 200 to 400 pounds per acre of biomass annually.

The Calcareous Loam ecological site has low species diversity (Daubenmire). Two species are dominant (winterfat and Sandberg bluegrass) and there are just a few more minor species in the community.

Stands of spiny hopsage and winterfat represent the northernmost outpost of species that are best represented in the vegetation of the Great Basin in Utah and Nevada.

Winterfat is a low-growing, long-lived, alkali tolerant half-shrub with a woody base, and numerous annual branchlets. It grows one to two feet tall. Leaves and stems are covered by dense, woolly, white hairs giving the plant a whiteish appearance.

Sandberg bluegrass is a shallow rooted, perennial bunchgrass, perfectly suited to Very Shallow ecological sites. It has short leaves and a green to purplish panicle seed head. On most sites Sandberg is an understory grass, but on the Calcareous Loam ecological site 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, trampling and fire.

Compared to other MLRA 007X ecological sites, Calcareous Loam is stable. The Calcareous Loam ecological site does not often burn as these sites produce little fine fuel. Winterfat sprouts following fire and Sandberg bluegrass is fire tolerant. Winterfat is highly palatable to deer, elk and cattle, but the plants persist remarkably well.

Grazing pressure can be defined as heavy grazing intensity, or frequent grazing during reproductive growth, or season-long grazing (the same plants are grazed more than once). As grazing pressure increases the plant community unravels in stages:
1. Winterfat is the first grazing focus of grazing animals but it persists quite well.
2. When winterfat plants become hedged, Sandberg bluegrass, the next focus of grazing animals, becomes heavily grazed and declines in vigor.
3. As Sandberg bluegrass continues to decline, cheatgrass and broadleaf weeds invades the community
4. With further decline, invasive species dominates the understory while most winterfat plants continue to survive.

Excessive grazing diminishes and eliminates the soil crust, alters composition, increases establishment of invasive and exotics (Daubenmire). As witnessed west of Yakima, repeated heavy grazing of Sandberg bluegrass by elk during spring is especially damaging.

Daubenmire noted that a small exclosure was erected on a stand that had been severely grazed. After 10 years Winterfat and Sandberg bluegrass made excellent recovery. Yearlong rest or light dormant-season grazing may give comparable results.

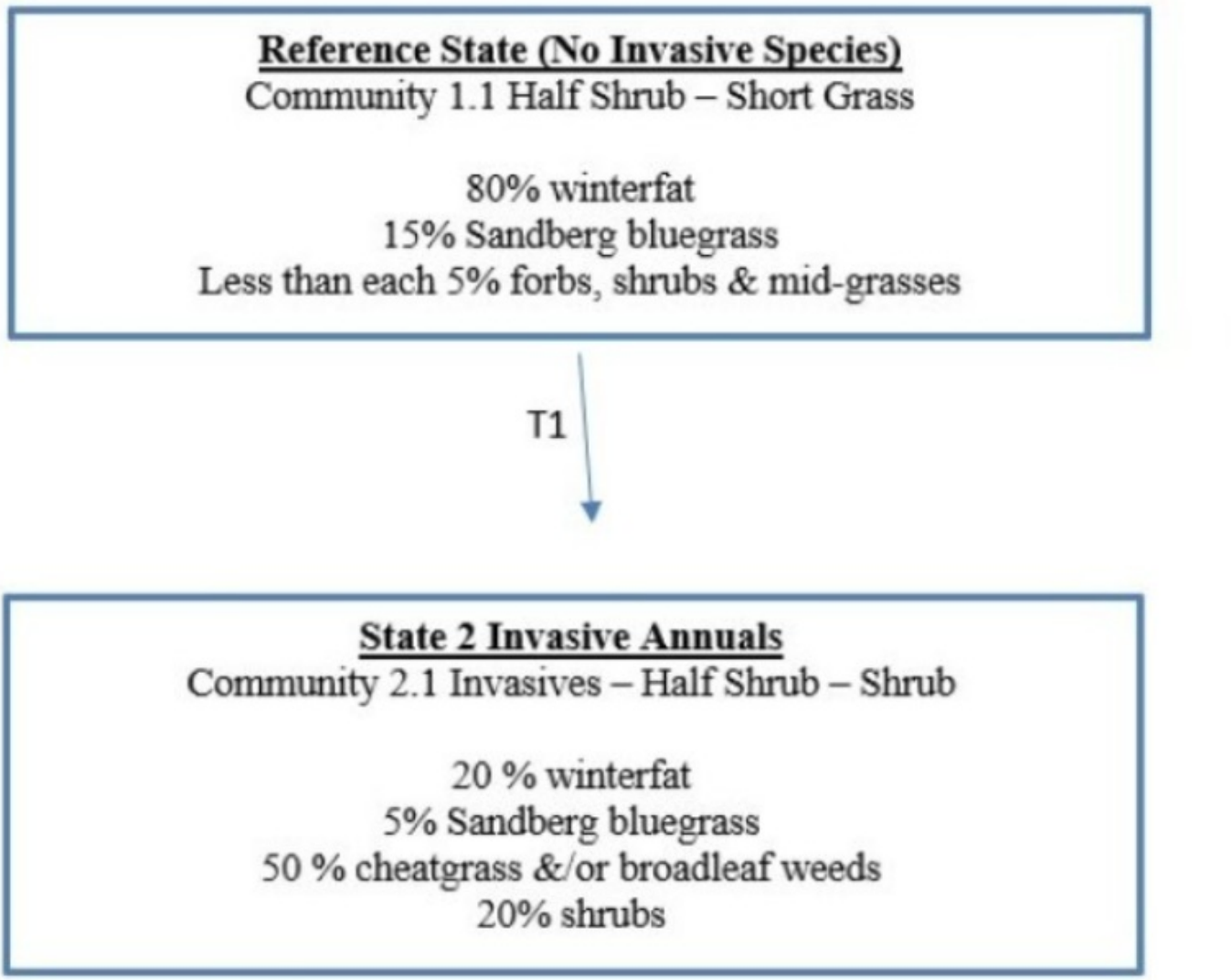
Grazing should be deferred until July 1 or later two out of every three years on native bunchgrass pastures. For spring grazing, it is important to monitor and maintain an adequate top growth of both Winterfat and Sandberg bluegrass: (1) to maintain good vigor in Winterfat and Sandberg bluegrass, (2) to optimize regrowth following spring grazing, and (3) to allow Winterfat and Sandburg bluegrass to make seed.

Proper grazing is - no more than 60 percent of current year’s growth of winterfat, and no more than 50 percent of top growth for Sandberg bluegrass.

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, Wyoming big sagebrush – bluebunch wheatgrass communities provide habitat for a variety of upland wildlife species.

## State and transition model




**State 1**
**Reference**

State 1 represents a native community with no invasive or exotic weed species. Calcareous Loam ecological site has low species diversity with winterfat, Sandberg bluegrass and not much else. At-risk Communities: • Any Calcareous Loam community is at risk when Sandberg bluegrass cover is declining and cheatgrass or broadleaf weeds have colonized the site. The seed source of invasive species is nearby and blowing onto most sites annually

**Community 1.1**
**Winterfat and Sandberg Bluegrass**

80% winterfat 15% Sandberg bluegrass Less than 5% forbs, shrubs, and mid-grasses

**State 2**
**Annual Invasive Species**

State 2 represents plant communities that have crossed a threshold to an altered state. Invasive species have colonized the site and have become dominant.

**Community 2.1**

### Winterfat and Cheatgrass

20% winterfat 5% Sandberg bluegrass 50% cheatgrass and broadleaf weeds 20% other shrubs

## Transition T1A
## State 1 to 2

Transitions from State to State T1 Result: transition from Reference State to State 2 Annual Invasive Species. Primary Trigger: under heavy grazing pressure winterfat plants become hedged but persist remarkably well. Then Sandberg bluegrass becomes heavily grazed but does not fare well and invasive species invade. Secondary Trigger: high moisture year that causes a micro-flush of cheatgrass Ecological process: with consistent defoliation pressure winterfat plants become hedged while Sandberg bluegrass plants decline with poor vigor, shrinking crowns and mortality. Colonization by invasive species: a high moisture year that causes a micro-flush of cheatgrass and broadleaf weeds and is the principle means of colonization. Most sites in the Reference State receive invasive weed seed annually. This 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 invasive species. In normal and dry years invasive species are all but nonexistent. Expansion of invasive species: as Sandberg bluegrass continue to decline invasive species become co-dominant and then dominant. It is the declining Sandberg bluegrass cover that ensures invasive species will colonize successfully and expand. Indicators: The occurrence of invasive species on sites where they had been absent. Declining cover and increasing distance between Sandberg bluegrass plants.

## Additional community tables

**Table 7. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Shrub/Vine** | | | | | |
| 1 | | | | 364 | |
| | winterfat | KRLA2 | *Krascheninnikovia lanata* | – | – |
| 2 | | | | – | |
| | Wyoming big sagebrush | ARTRW8 | *Artemisia tridentata ssp. wyomingensis* | – | – |
| | rabbitbrush | CHRYS9 | *Chrysothamnus* | – | – |
| **Grass/Grasslike** | | | | | |
| 3 | | | | 17 | |
| | squirreltail | ELEL5 | *Elymus elymoides* | – | – |
| | Indian ricegrass | ACHY | *Achnatherum hymenoides* | – | – |
| 4 | | | | 67 | |
| | Sandberg bluegrass | POSE | *Poa secunda* | – | – |
| **Forb** | | | | | |
| 5 | | | | 17 | |
| | woolly plantain | PLPA2 | *Plantago patagonica* | – | – |
| | fleabane | ERIGE2 | *Erigeron* | – | – |
| | milkvetch | ASTRA | *Astragalus* | – | – |
| | spring draba | DRVE2 | *Draba verna* | – | – |
| | sagebrush mariposa lily | CAMA5 | *Calochortus macrocarpus* | – | – |

## Inventory data references

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

## Other 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

## Approval

Kirt Walstad, 2/06/2025

## 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 | 01/29/2025 |
| Approved by | Kirt Walstad |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

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

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

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

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

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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:**

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