

Ecological site group R007XG193WA

Calcareous Loam

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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

7.2 – Silty Missoula Flood Deposits

7.3 – Dry Loess Islands

7.4 – Dry Yakima Folds

7.5 – Yakima Valley – Pleistocene Lake Basins

Site Concept Narrative:

Winterfat is a marker for MLRA 007X and identifies the Calcareous Loam ecological site.

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.

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.

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

Landscapes: Basin and valleys

Landform: Terraces, terraces escarpments and alluvial flats

Elevation:

Range: 220 to 2,000 feet

Central tendency: 400 to 1,000 feet

Slope:

Range: 0 to 60 percent

Central tendency: 2 to 30 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

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.

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 the Calcareous Loam ecological site is March through end of June.

Soil features

Edaphic:

The Calcareous Loam ecological site commonly occurs with Dry Loamy, Stony, Very Shallow, Sandy Loam, Sandy and Sands ecological sites.

REPRESENTATIVE 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.

Dominate soil surface is silt loam to fine sandy loam.

Dominant particle-size class is coarse-silty.

Fragments on surface horizon > 3 inches (% Volume):

Minimum: 0

Maximum: 2

Average: 0

Fragments within surface horizon > 3 inches (% Volume):

Minimum: 0

Maximum: 5

Average: 0

Fragments within surface horizon \leq 3 inches (% Volume):

Minimum: 0

Maximum: 10

Average: 2

Subsurface fragments > 3 inches (% Volume)

Minimum: 0

Maximum: 5

Average: 1

Subsurface fragments \leq 3 inches (% Volume):

Minimum: 0

Maximum: 15

Average: 5

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: 4

Sodium Absorption Ratio

Minimum: 0

Maximum: 5

Calcium Carbonate Equivalent (percent):

Minimum: 5

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: 1.7

Maximum: 8.3

Average: 6.0

Vegetation dynamics

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 enclosure 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.

Supporting Information:

Associated Sites:

Calcareous Loam ecological site is associated with other ecological sites in MLRA 007X, including Dry Loamy, Stony, Very Shallow, Sandy Loam, Sandy and Sands ecological sites.

Similar sites:

There are no similar ecological sites to Calcareous Loam in MLRA 008X or in other MLRAs.

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

- R007XY193WA–Calcareous Loam

Stage

Provisional

Contributors

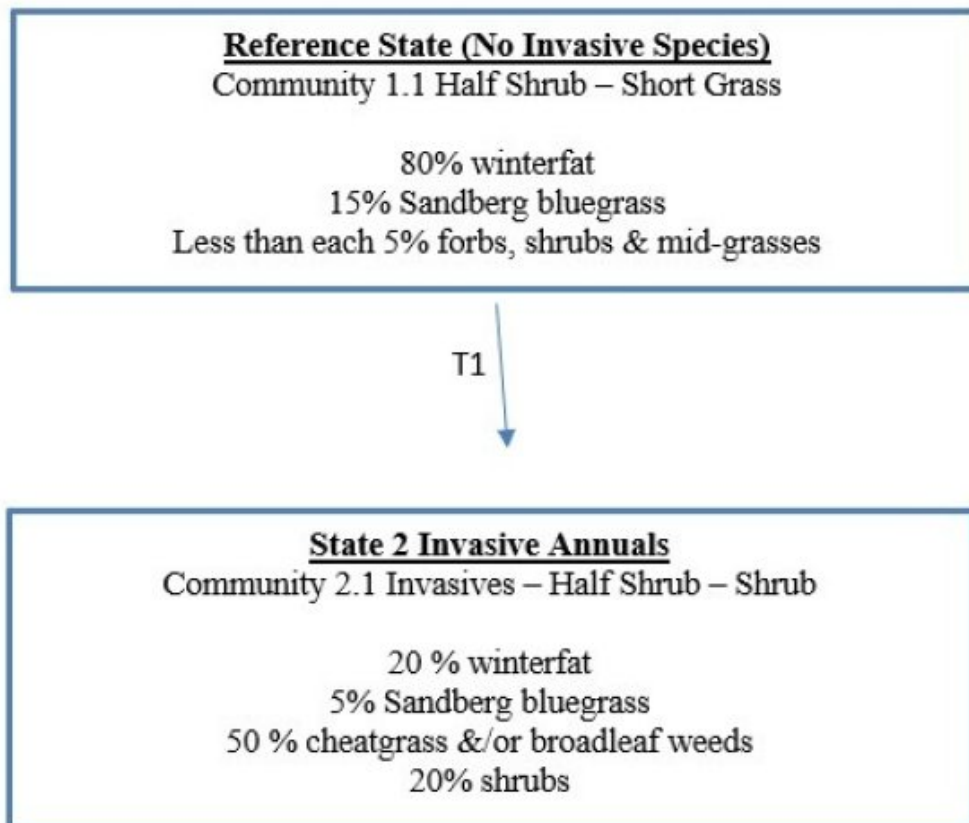
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State and transition model

State and Transition Diagram for Calcareous Loam:

This state and transition model (STM), explains the general ecological dynamics for the Loamy 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 Calcareous Loam 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 that Calcareous Loam has very low species diversity (Daubenmire).

Calcareous loam is basically a winterfat-Sandberg bluegrass site.

Similarity Index		Similarity Index	
Dominant Half-Shrub		Shrubs – Trace	
KRLA2	winterfat	80%	325 lbs.
		Trace	
		ARTRW8	Wyoming sagebrush
		CHRY5	rabbitbrush
		Mid-Size Bunchgrasses – Minor	
		less than 5% 15 lbs.	
		ELEL5	bottlebrush squirreltail
		ACHY	Indian ricegrass
Short Grass – Subdominant			
POSE	Sandberg bluegrass	15%	60 lbs.
Native Forbs – Minor			
		less than 5% 15 lbs.	
PLPA2	woolly plantain	DRVE	spring draba
ERIGE2	fleabane	CAMA	mariposa lily
ASTRAG	milkvetch		
		Below	Normal
		Above	
Estimated Production (pounds / acre)		200	300
			400

State 1

Reference State

State 1 Narrative: 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. Reference State Community Phases: Reference Community Winterfat – Sandberg bluegrass Dominate Reference State Species: Winterfat, Sandberg bluegrass 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

State 2

Annual Invasive Species

State 2 Narrative: 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 Phases for State 2: Invasive annual grass / broadleaf weeds – half shrub – shrub Dominate State 2 Species: Annual grasses and broadleaf weeds dominate the understory. Winterfat persists in the overstory.

Transition T1

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.

Restoration pathway R1

State 2 to 1

Recovery State 2 is considered non-reversible on Calcareous Loam. This site has very low precipitation and harsh calcareous soil chemistry.

Citations