

Ecological site group R006XG726WA

Stony, Dry Oak

Last updated: 09/21/2023
Accessed: 05/23/2025

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): 6 – Cascade Mountains, East Slope

LRU – Common Resource Areas (CRA):

6.6 – Yakima Plateau and Slopes

6.7 – Grand Fir Mixed Forest

6.8 – Oak-Conifer Eastern Cascades-Columbia Foothills

Site Concept Narrative

Diagnostics:

Stony, dry oak is a hot, dry site at the lower edge of conifer forest and woodland. This ecological site occurs at elevations below 3,000 feet, and often on south, east or west aspects. Soils are generally stony, droughty and less than 30 inches in depth.

This site is not considered forest. A tree canopy of 20-30% is a full canopy for this ecological site, which makes this a woodland site, and not a forest type. Stony, dry oak is the hottest and driest woodland habitat. The oak plants on this site can be described as shrubby, scrubby, or scraggly. The Oregon white oak on this site are scattered and patchy.

Oak is the only regenerating tree species, on this site. Other shrubs are absent to inconspicuous and the undergrowth is largely bunchgrass and forbs. Oregon white oak,

bluebunch wheatgrass, bottlebrush squirreltail and yarrow are the most common species in the reference condition.

Oak and bluebunch wheatgrass dominance are key vegetative indicators.

Here is a site comparison:

- Bitterbrush-bunchgrass with no trees = Stony Foothills ecological site
- Oak-pine-snowberry forest on adjacent river terraces = Oak-pine-snowberry ecological site
- Oak-pine-elk sedge forest on a more moderate site = Oak-pine-elk sedge ecological site
- Oak-wildrye occurs on more moderate sites.
- Ponderosa pine-bitterbrush-bluebunch wheatgrass and ponderosa pine-bluebunch occur on similar sites, but outside the range of oak.

Principle Vegetative drivers:

The rock fragments volume, aspect and soil depth limitations drive the vegetative expression of Stony, dry oak.

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

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

Physiographic Features:

Most of MLRA 6 is in the Northern and Middle Cascade Mountains. This mountainous area consists of sharp alpine summits with some higher volcanic cones to the west, and lower lying foothills to the east. Strongly sloping mountains and U-shaped valleys are dominant in the north, with eroded basalt plateaus more typical in the south. The East Slope of the Cascades is a transitional area between the moist, rugged Cascade Mountains to the west and the drier, lower lying Columbia Basalt Plateau to the east. MLRA 6 has some of the landforms typical of both mountains and plateaus.

Physiographic Division: Pacific Mountains

Physiographic Province: Cascade-Sierra Mountains

Physiographic Sections: Northern Cascade and Middle Cascade Mountains

Landscapes: Hills, canyons and plateaus

Landform: Summits, shoulders, sideslopes

Elevation: Dominantly 1,000 to 3,000 feet

Central tendency: 1,500 to 2,500 feet

Slope: Total range: 5 to 75 percent

Central tendency: 15 to 50 percent

Aspect: Dominantly on southerly aspect, but occurs on all aspects

Geology:

MLRA 6 consists of Pre-Cretaceous metamorphic rocks cut by younger igneous intrusives. Tilted blocks of marine shale, carbonate, and other sediments occur in the far north, and some younger continental, river-laid sediments occur around Leavenworth, WA. Columbia River basalt is dominant in the southern portion of the state. Alpine glaciation has left remnants of glacial till, debris, and outwash in the northern part of this MLRA.

Climate

The climate across MLRA 6 is characterized by moderately cold, wet winters, and hot, dry summers, with limited precipitation due to the rain shadow effect of the Cascades. The average annual precipitation for most of the East Slope of the Cascades is 16-50 inches. Seventy-five to eighty percent of the precipitation comes late October through March as a mixture of rain and snow. The lowest precipitation occurs along the eastern edge, then increasing with rising elevation to the west. Most of the rainfall occurs as low-intensity, Pacific frontal storms during the winter, spring and fall. Rain turns to snow at the higher elevations. All areas receive snow in winter. Summers are relatively dry. The East Slopes experience greater temperature extremes and receive less precipitation than the west side of the Cascades. The shortest freeze-free periods occur along the western edge and the northern end of this MLRA, which are mountainous. The longest freeze-free periods occur along the Columbia River Gorge.

Mean Annual Precipitation:

Range: 16-30 inches

Central tendency: 18 – 26 inches

Soil moisture regime is xeric

Mean Annual Air Temperature:

Range: 43 to 52 degrees

Central tendency: 46 to 50 degrees

Soil temperature regime is mesic

Frost-free Period (days):

Total range: 80 to 180

Central tendency: 100 to 140

The growing season is mid-March through mid-July.

Soil features

Edaphic:

The Stony, dry oak ecological site commonly occurs with Oregon White Oak-Ponderosa Pine-Elk Sedge-Bitterbrush and Oregon White Oak-Ponderosa Pine-Snowberry ecological sites.

Representative Soil Features:

This ecological site components are dominantly Ultic and Pachic taxonomic subgroups of Haploxerolls great groups of the Mollisols. Soils are dominantly moderately deep and deep. Average available water capacity of about 7.0 inches (17.8 cm) in the 0 to 40 inches (0-100 cm) depth range.

Soil parent material is dominantly mixed loess and colluvium in the upper part of the soil over colluvium and residuum.

The associated soils are Goldendale, Hyprairie and similar soils.

Dominate soil surface is loam to stony ashy silt loam.

Dominant particle-size class is fine-loamy to loamy-skeletal.

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: 10

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

Minimum: 0

Maximum: 20

Average: 10

Subsurface fragments > 3 inches (% Volume):

Minimum: 5

Maximum: 25

Average: 10

Subsurface fragments \leq 3 inches (% Volume):

Minimum: 5

Maximum: 35

Average: 20

Drainage Class: Well drained

Water table depth: Greater than 60 inches

Flooding:

Frequency: None

Ponding:

Frequency: None

Saturated Hydraulic Conductivity Class:

0 to 10 inches: Moderately high

10 to 40 inches: Moderately high

Depth to root-restricting feature (inches):

Minimum: 20

Maximum: Greater than 60 inches

Electrical Conductivity (dS/m):

Minimum: 0

Maximum: 3

Average: 0

Sodium Absorption Ratio:

Minimum: 0

Maximum: 3

Average: 0

Calcium Carbonate Equivalent (percent):

Minimum: 0

Maximum: 0

Soil Reaction (pH) (1:1 Water):

0 - 10 inches: 5.6 to 7.3

10 - 40 inches: 5.6 to 7.3

Available Water Capacity (inches, 0 – 40 inches depth):

Minimum: 4.3

Maximum: 8.3

Average: 7.0

Vegetation dynamics

Ecological Dynamics:

Oregon white oak is one of the tree species most tolerant of heat and drought in the northwest. Although widely distributed on the west side of the Cascades, Oregon white oak is limited on the east slope to a relatively small area north and south of the Columbia Gorge. The northernmost stand is separate and occurs on Swauk Creek between Ellensburg and Cle Elum. Cold temperatures seem to be the limiting factor in the northwest distribution of Oregon white oak east of the Cascades.

The key for Oak-bluebunch wheatgrass is greater than 5% bluebunch wheatgrass. Wenatchee National Forest calls Oak-bluebunch wheatgrass “Hot Mesic Shrub-Herb”. Other oak habitats include
Oak-pinegrass-elk sedge which occurs on more moderate sites
Oak-hazel-snowberry occurs on adjacent river terraces

Historical fire frequency is judged to be in the 5-30 -year range, with most being of low intensity. Oregon white oak is very fire tolerant because its foliage is relatively non-flammable and it will re-sprout should the above-ground stem be killed. Lack of fire or altered fire cycles in recent years have led to changes in floristic composition. Fire sensitive species are more common and fuel ladders have developed. Many stands are scrubby as a result of past logging and grazing and are more susceptible to stand-replacement fires. The ability of Oregon white oak to re-sprout after fire or cutting allows it to readily revegetate disturbed sites.

Over the years, Oregon white oak habitats have been heavily grazed by game animals and livestock. Heavy grazing reduces cover of bluebunch wheatgrass and Idaho fescue. The relative density of bunchgrasses to cheatgrass is a rough indication of the amount of past intensive grazing. The open nature of these stands leaves them very susceptible to noxious weeds after heavy grazing or other ground disturbing activity. Introduced grasses and forbs may persist for many years in these open environments.

Grazing pressure:

1. Bluebunch declines, oak increases (bitterbrush may as well) along with unpalatable forbs
2. With continued decline weeds (cheatgrass or noxious weeds) colonize the site
3. Site becomes Oak-bitterbrush-annual grass or noxious weeds
4. With fire becomes annual grass, then with re-sprouting becomes oak-annual grass

Stands of Oregon white oak are very important deer and elk winter ranges that remain clear of snow most of the winter.

Major Land Resource Area

MLRA 006X

Cascade Mountains, Eastern Slope

Stage

Provisional

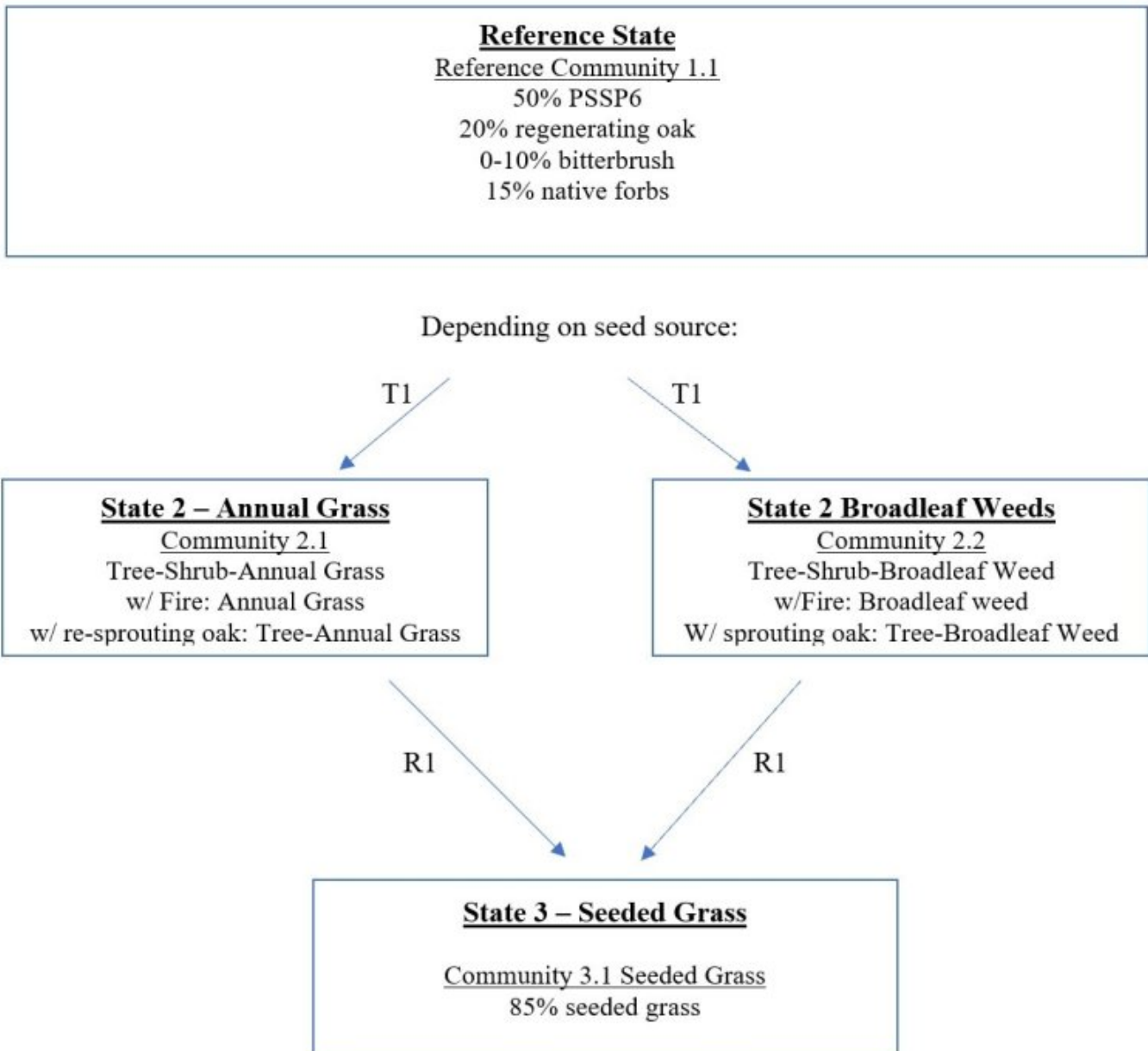
Contributors

Provisional Site Author: Kevin Guinn Technical Team: R. Fleenor, K. Bomberger, K. Paup-Lefferts

State and transition model

State and Transition Diagram: Stony, dry oak (MLRA 6)

This state and transition model (STM), explain the general ecological dynamics for the Stony, dry oak 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 Stony Dry Oak (MLRA 6):

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.

| | | Similarity Index | | | | Similarity Index | | |
|---|------------------------|------------------|----------|---|--------------------------|------------------|----------|-------|
| Non-Sprouting Shrubs – Minor | | | | Regenerating Trees – Subdominant (tree canopy 10-30%) | | | | |
| | | 0-10% | 50 lbs. | | | 20% | 125 lbs. | |
| PUTR2 | bitterbrush | | | QUGA4 | Oregon white oak | | | |
| Dominant Mid-Size Bunchgrass | | | | Other Mid-Size Bunchgrasses – Minor | | | | |
| | | 50% | 300 lbs. | | | 5-10% | 50 lbs. | |
| PSSP6 | bluebunch wheatgrass | | | ELEL5 | bottlebrush squirreltail | | | |
| | | | | ACLE8 | Lemmon needlegrass | | | |
| Short Grass – Minor | | | | | | | | |
| | | 5% | 25 lbs. | | | | | |
| POSE | Sandberg bluegrass | | | | | | | |
| Native Forbs – Minor | | | | | | | | |
| | | | | | | 15% | 100 lbs. | |
| ACMI2 | yarrow | | | COLLO | collomia | | | |
| LUPIN | lupine | | | DELPH | larkspur | | | |
| LOMAT | lomatium / biscuitroot | | | CLPU | clarkia | | | |
| BASA3 | arrowleaf balsamroot | | | EPILO | willowherb | | | |
| PHLOX | phlox | | | | | | | |
| | | | | | | Below | Normal | Above |
| Estimated Production (pounds / acre) | | | | | | 300 | 450 | 600 |

**State 1
Reference State**

State 1 Narrative: State 1 represents woodland with no invasive or exotic weed species. Each native functional, structural group is represented by one or more native species. Reference State Community Phases: Reference Community 1.1 has a tree overstory with native grasses and native forbs. Shrubs may or may not be present. Oregon white oak is the only tree species. Bluebunch wheatgrass dominates the understory with a variety of native forbs present. At-risk Communities: • Different communities have different degrees of risk • All communities in the reference state are at risk of invasion and moving to State 2. The seed source of invasive species is nearby and moving onto most sites annually. • A community has moved to State 2 when cheatgrass or broadleaf weeds have colonized the site

Community 1.1

Oregon white oak dominates the overstory and bluebunch wheatgrass the understory

State 2

Annual Grass or Broadleaf Weeds

State 2 Narrative: State 2 represents communities which are dominated by invasive species. Depending on seed source State 2 is either annual grasses or broadleaf weeds. Community Phases: Community 2.1 has been invaded by and is dominated by annual grasses while Community 2.2 is mainly broadleaf weeds. Dominate Reference State Species: annual grasses or broadleaf weeds

Community 2.1

Annual Grass

Community 2.1 is Tree-Shrub-Annual Grass but becomes annual grasses after fire. With oak sprouting Community 2.1 returns to a Tree-Annual Grass community and shrubs may also return.

Community 2.2

Broadleaf Weeds

Community 2.2 is Tree-Shrub-Broadleaf Weed but becomes broadleaf weeds after a fire. With oak sprouting Community 2.2 returns to a Tree-Broadleaf Weed community and shrubs may also return.

State 3

Seeded Grass

State 3 Narrative: State 3 represents a site that has been seeded to desirable grasses such as intermediate wheatgrass. State 3 is stable if 0.8 plant per sq. ft. or greater of the desired bunchgrasses is maintained. Community Phases for State 3: Seeded Grasses

Community 3.1

Seeded Grass

Dominate State 3 Species: Desirable seeded grasses with or without legumes

Transition T1

State 1 to 2

T1 Result: transition from Reference State with no invasive species to State 2 which is dominated by invasive species. Depending on seed source this transition happens in one of two directions – to annual grasses or to broadleaf weeds. Primary Trigger: grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to bluebunch wheatgrass and other palatable species. Ecological Process: consistent defoliation pressure to palatable species results in poor vigor, shrinking crowns and plant mortality. As the cover of bluebunch wheatgrass and other palatable species decline this

releases resources and niche space. In a series of retrogressions, invasive species take advantage of the opportunity to colonize and expand until they dominate the site. In the end dominant native species are all but eliminated. Indicators: declining cover of bluebunch wheatgrass and other native species. Increasing cover of invasive species.

Restoration pathway R1 State 2 to 3

Stony Dry Oak sites are marginal for seeding. With a soil depth less than 30 inches and rocks throughout the profile this site is droughty. Also, due to surface stones Stony Dry Oak has equipment limitations. Recovery R1 Transition from State 2 (a community dominated by invasive annual species) to State 3, which is predominately desirable seeded grasses. 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. Snake River wheatgrass, Sherman big bluegrass, Sandberg bluegrass, and intermediate wheatgrass are possible seeding options. The actual transition occurs when the seeded species have successfully established and are outcompeting the annual species for cover and dominance of resources. 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 T. John, D. Tart, R. Clausnitzer, Forest Plant Associations of the Yakima Indian Reservation, Draft Field guide, May 1988 T. Lillybridge, B. Kovalchik, C. Williams, B. Smith, PNW-GTR-359 Field Guide for Forested Plant Associations of the Wenatchee National Forest, October 1995 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. 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

Citations