Ecological site group R007XG970WA
Alkali Terrace

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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:
In the upland setting ecological sites are often expansive, and thus, can be delineated and separated on aerial photos. But in the landscape position of bottoms, basins and depressions this is rarely the case as small changes in soil chemistry, the water table and elevation or aspect results in significant changes in plant community composition. In short distances there are often big swings of available water holding capacity, and soils can go from hydric to non-hydric, or from saline-sodic to not. So, in bottoms, riparian areas and depressions, ecological sites and community phases occur as small spots, strips and patches, or as narrow rings around vernal ponds. And generally, in a matter of steps one can walk across several ecological sites. On any given site location, two or more of these ecological sites occur as a patchwork – Loamy Bottom, Alkali Terrace, Sodic Flat, Herbaceous Wetland and Riparian Woodland. These ecological sites may need to be mapped as a complex when doing resource inventory.

Diagnostics:
Alkali Terrace ecological site is a grassland site featuring a dichotomy of two grasses. Scattered across a carpet of short warm-season sod-forming grass, are tall cool-season bunchgrasses. The overstory is tall, upright basin wildrye while the much shorter saltgrass fills the interspaces.

Alkali Terrace ecological site is part of the lentic (standing water) ecosystem. It occurs on moisture receiving sites such as terraces, bottoms, basins, fans and depressions. This site also occurs as a narrow zonal ring around ponds, lakes and vernal pools.

Soils are typically deep, ashy loam or clay loam texture and mostly have little rock fragments. Soils are moderately alkaline but not hydric. The sols are moderately saline-sodic and conspicuously bare between the vascular plants as there is no moss or lichen.

Occasionally one will find a subset of Alkali Terrace ecological site with saltgrass and no basin wildrye or shrubs. This version of the Alkali Terrace ecological site has much smaller acreage and much lower production than the more prevalent sites with basin wildrye and saltgrass.

Principle Vegetative Drivers:
Moderately saline-sodic soil conditions and deep soils drive the vegetative expression of the Alkali Terrace ecological site. Basin wildrye and saltgrass are both at home on this site. During the winter and spring there is a water table at 30 to 40 inches.

INFLUENCING WATER FEATURES
Alkali Terrace ecological site receives both surface runoff and discharging groundwater from nearby upland sites. The soils are deep, somewhat poorly to well drained and unrestricted, and thus, remain saturated for only a short period in late winter to early spring. With adequate cover of live plants and litter, there are no water infiltrating restrictions on the Alkali Terrace ecological site.

Physiographic features:
The landscape is part of the Columbia basalt plateau. The Alkali Terrace ecological site occurs on areas receiving moisture such as terraces, bottoms, basins, fans and depressions. Alkali terraces ecological site also occurs as fringes around ponds and lakes at elevations of 300 to 1,500 feet. In bottoms, riparian areas and depressions, ecological sites and community phases occur as small spots, strips and patches, or as narrow rings around vernal ponds.

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

Landscapes: basin and valleys
Landform: bottoms, floodplains and depressions

Elevation:
Range: 250 to 3,000 feet
Central tendency: 300 to 1,500 feet

Slope: Total range: 0 to 10 percent
Central tendency: 1 to 3 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

Climate:
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. This MLRA is the warmest and driest MLRA within the Columbia Plateau geographic area. Seventy to seventy-five percent of the precipitation comes late-October through March as a mixture of rain and snow. Precipitation that comes after March is not as effective for plant growth, but June through early-October can be 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.

Mean Annual precipitation
Range: 6 - 10 inches
Soil moisture regime is aquic or 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 is March through mid-July.

Soil features

Edaphic:
Soils are deep, formed in alluvium and have an ash influence at the surface. Alkali Terrace ecological site commonly occurs adjacent to Loamy Bottom, Sodic Flat, Riparian Woodland, and Herbaceous Wetland ecological sites. Alkali Terrace ecological site also occurs with upland sites such as Loamy, Stony, and Sandy Loam.

REPRESENTATIVE SOIL FEATURES
This ecological site soil components are dominantly Typic and Xeric taxonomic subgroup of Halaquepts, Haplocambids, Natrargids great groups of the Inceptisols 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 Ahtanum, Sagemoor, Sinloc, Umapine, White Swan and similar soils.

Dominate soil surface is silt loam to fine sandy loam.

Dominant particle-size class is dominantly coarse-loamy.

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 ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 10
Average: 3

Subsurface fragments > 3 inches (% Volume)
Minimum: 0
Maximum: 10
Average: 1

Subsurface fragments ≤ 3 inches (% Volume):
Minimum: 0
Maximum: 15
Average: 5

Drainage Class: Somewhat poorly to well drained.
Water table depth: 20 to greater than 60 inches

Flooding:
Frequency: None to occasional

Ponding:
Frequency: None

Saturated Hydraulic Conductivity Class:
0 to 10 inches: Moderately high and high
10 to 40 inches: Moderately high and moderately low

Depth to root-restricting feature (inches):
Minimum: Dominantly greater than 60 inches
Maximum: Greater than 60

Electrical Conductivity (dS/m)
Minimum: 4
Maximum: 20

Sodium Absorption Ratio
Minimum: 13
Maximum: 25

Calcium Carbonate Equivalent (percent):
Minimum: 5
Maximum: 30

Soil Reaction (pH) (1:1 Water):
0 - 10 inches: 7.4 to 11.0
10 - 40 inches: 7.4 to 11.0

Available Water Capacity (inches, 0 – 40 inches depth)
Minimum: 4.3
Maximum: 8.3
Average: 6.0

Vegetation dynamics

ECOLOGICAL DYNAMICS:
Vegetation Dynamics:
Alkali Terrace ecological site produces about 3000 pounds per acre of biomass annually.

Regarding saline-alkali soils Daubenmire (page 50) wrote, “It seems impossible to find areas where one can be confident that the vegetation has not been somewhat altered by domesticated animals.” Some areas were also manipulated by tillage or other farming practices.

Basin wildrye, also called Great Basin wildrye, and inland saltgrass are at the core of the Alkali Terrace ecological site and warrant a degree of understanding. Basin wildrye is a tall, cool-season bunchgrass and has coarse, robust stems and leaves. It grows 5 to 7 feet tall and sometimes exceeds 3 feet in diameter and, is one of the highest producing species. Basin wildrye is commonly found on loamy bottoms, saline-alkali soils and on the tops of loamy mounds. It tolerates alkaline soils and seasonal flooding but not anaerobic conditions. Basin wildrye is considered weakly rhizomatous.

Saltgrass is a short, warm-season, sod-forming grass that can form dense mats with its rhizomes and sometimes stolons. Saltgrass is one of the most common plants found on saline-alkaline soils. It is one of the most drought tolerant species. Being rhizomatous, saltgrass is tolerant of moderate to heavy grazing.

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 big sagebrush communities (Rapid Assessment Model).

Because basin wildrye produces a large amount of biomass, fire can burn and smolder in the crown of the plant for considerable time. This can leave basin wildrye plants much diminished. It can take years for basin wildrye to fully recover from the effects of fire. Saltgrass, being rhizomatous, is quite tolerant of fire, but due to limited fuel, often does not burn.

Grazing is another common disturbance that occurs in this ecological site. Grazing pressure can be defined as heavy grazing intensity, or frequent grazing during reproductive growth, or season-long grazing. As grazing pressure increases the plant community unravels in stages:
1. Basin wildrye plants produce fewer shoots and tillers and become smaller allowing saltgrass to expand
2. As the decline continues invasive species such as perennial pepperweed and cheatgrass colonize the site
3. With further decline the site can become an invasive weed community

Saltgrass is quite tolerant of grazing, and as a warm season grass it provides green forage a little longer than adjacent upland sites. Basin wildrye is not tolerant of heavy grazing especially in late spring when the growing points are elevated 4 to 6 inches above the soil surface. For the Loamy Bottom ecological site, basin wildrye should be the key species to manage and monitor.

Managing grasslands to improve the vigor and health of native bunchgrasses begins with an understanding of grass physiology. New growth for existing bunchgrasses begins each year from basal buds. Basin wildrye plants can expand via tillering, or new plants through natural reseeding. Regrowth from spring grazing comes mostly from photosynthesis.

During seed formation, the growing points of basin wildrye become elevated 4-6 inches and are vulnerable to damage or removal. Repeated grazing during late spring 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 through July 15). And each pasture should be rested the entire growing season every third year (approximately March 1through July 15).

Basin wildrye remains 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

In Washington, basin wildrye-saltgrass communities provide habitat for a variety of upland wildlife species.

Supporting Information

Associated Sites:
Alkali Terrace ecological site is associated with Loamy Bottom, Sodic Flat, Wetland Complex and Riparian Complex ecological sites. It is also associated with upland ecological sites such as Loamy and Stony.

Similar sites:
MLRA 008X Columbia Plateau has a comparable Alkali Terrace ecological site.

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

- R007XY970WA–Alkali Terrace

Stage

Provisional

Contributors

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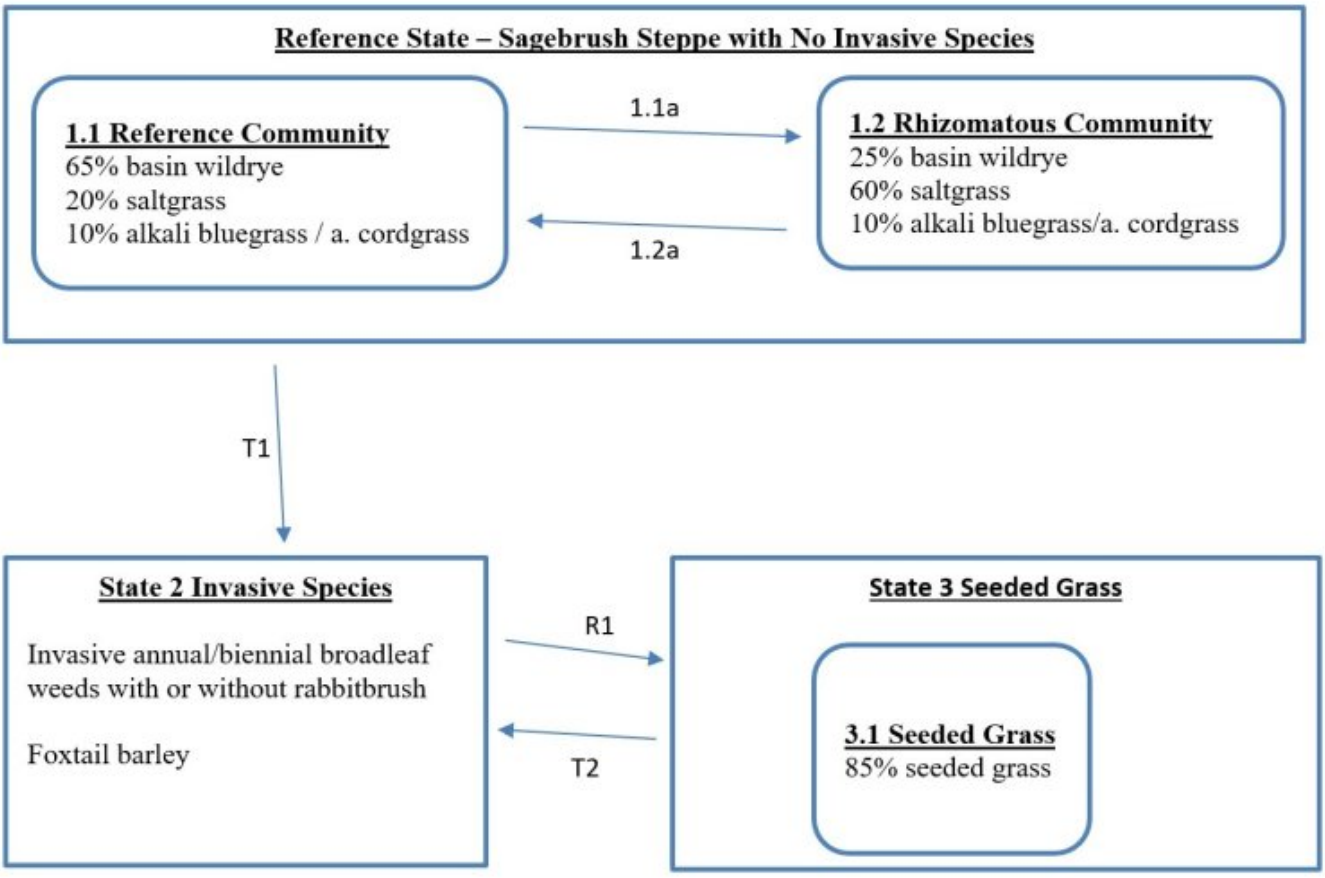
State and transition model

State and Transition Diagram for Alkali Terrace:

This state and transition model (STM) explains the general ecological dynamics for the Alkali Terrace 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 Alkali Terrace 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: Alkali Terrace is a grassland site.

	Similarity Index				Similarity Index		
				Sprouting Shrubs – Trace			
					Trace		
				CHRYS rabbitbrush			
				SAVE4 black greasewood			
Dominant Mid-Size Bunchgrasses				**Other Native Grasses – Minor**			
					10%	300 lbs.	
LECI4 basin wildrye		65%	2000 lbs.	POSEJU alkali bluegrass			
				SPGR alkali cordgrass			
Dominant Rhizomatous Warm Season Grass				**Grass-Like – Minor**			
					less than 5%	100 lbs.	
				CAPR clustered field sedge			
DISP inland saltgrass		20%	600 lbs.				
Native Forbs – Minor							
ACMI2 yarrow					less than 5%	100 lbs.	
					Below	Normal	Above
Estimated Production (pounds / acre)					1500	2500	3000

State 1
Reference State: Sagebrush Steppe Without Invasive Species

State 1 Narrative: State 1 represents grassland sites with no invasive or exotic species. All the functional, structural groups have one or more species. By cover saltgrass dominates the Reference Community By weight basin wildrye dominates the Reference Community Reference State Community Phases: 1.1 Reference Basin wildrye – Saltgrass 1.2 Rhizomatous Saltgrass – Basin wildrye Dominate Reference State Species: Basin wildrye, saltgrass At-risk Communities: • All communities in the reference state are at risk of invasive species. Annual or biennial weeds and annual grass seeds blow onto most sites annually

Community 1.1
Reference Community

Basin wildrye – Saltgrass

Community 1.2
Rhizomatous Community

Saltgrass – Basin wildrye

Pathway P1.1a
Community 1.1 to 1.2

1.1a Result: Shift from Reference Community 1.1 (bunchgrass-rhizomatous grass) to Community 1.2 (rhizomatous grass). Basin wildrye declines while saltgrass makes a corresponding increase. Also, alkali bluegrass declines and

alkali cordgrass increases. Primary Trigger: Excessive grazing pressure (heavy grazing intensity, season long grazing or frequent late spring grazing) to basin wildrye. Ecological process: with consistent defoliation pressure basin wildrye and has low vigor, shrinking crowns and some mortality. Saltgrass rhizomes move into the areas vacated by basin wildrye and new saltgrass shoots become established.

Pathway P1.2a
Community 1.2 to 1.1

1.2a Result: Shift from rhizomatous grass community 1.2 back to Reference Community 1.1 with more bunchgrasses. Primary Trigger: Light to moderate grazing especially during dormant season, coupled with favorable moisture years allows basin wildrye to expand. Ecological process: Given the opportunity (good vigor and adequate soil moisture) basin wildrye plants gain the competitive edge and re-establishes dominance via tillering and new seedlings.

State 2
Invasive Species – Annual / Biennial Weeds or Annual Grasses

State 2 Narrative: State 2 represents the Alkali Terrace ecological site where invasive broadleaf weeds and invasive annual grasses have prominence. Basin wildrye is all but missing and saltgrass remains as a patchwork of spots and clumps. State 2 can have two variations both with or without rabbitbrush: 1. Broadleaf annual or biennial weeds with saltgrass patches 2. Annual grasses with saltgrass patches Community Phases for State 2: Invasive broadleaf annual or biannual weeds with patches of saltgrass Invasive annual grasses with patches of saltgrass Some Invasive Species in State 2: cheatgrass slender cinquefoil rabbitsfoot grass foxtail barley pepperweed .

State 3
Seeded Grass

State 3 Narrative: State 3 represents a site that has been seeded to desirable grasses such as basin wildrye, beardless wildrye, tall wheatgrass, or western wheatgrass. Community Phases for State 3: 3.1 Seeded Grass 3.2 Shrub – Seeded Grass Pathways within State 3 3.1a Result: Shift from Community 3.1 seeded grasses to community 3.2 shrub-seeded grasses. Primary Trigger: Grazing pressure (heavy intensity, season long grazing, frequent late spring grazing) to desirable seeded grasses. Ecological Process: With consistent grazing pressure, seeded grasses have poor vigor, shrinking crowns and some mortality. Rabbitbrush seed which blows onto the site establishes a crop of seedlings. Rabbitbrush cover expands as the shrubs grow.

Transition T1
State 1 to 2

T1 Result: Shift from Reference State to State 2 with invasive species Primary Trigger: Grazing pressure (heavy intensity, season long grazing, frequent late spring grazing) to basin wildrye. Ecological process: with consistent grazing pressure basin wildrye has poor vigor, shrinking crowns and mortality. Initially, saltgrass increases but then declines with further grazing pressure. Invasive species colonize and as the deterioration continues, eventually dominate the site. Indicators: Increasing gaps between basin wildrye plants, decreasing cover of saltgrass and increasing cover of invasive species.

Restoration pathway R1
State 2 to 3

R1 Transition from State 2, a community dominated by invasive annual species, to State 3, which is predominately desirable seeded grasses. Species selection for the seeding is critical as the site is moderately saline-sodic. 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. It may take two years or longer to kill invasive annual species and remaining saltgrass, and to exhaust the seedbank of invasive weed seeds. 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 a very shallow depth (about 1/8 inch is desired). Basin wildrye, beardless wildrye, tall wheatgrass, and western wheatgrass are typical species seeded on Alkali Terrace ecological site. Proper grazing management is essential to maintain the stand post-seeding. The actual transition occurs when the seeded

species have successfully established and are outcompeting the annual species for cover and dominance of resources.

Transition T2
State 3 to 2

T2 Result: Shift from State 3 seeded grasses to State 2 with invasive species Primary Trigger: Grazing pressure (heavy intensity, season long grazing, frequent late spring grazing) to desirable seeded grasses. Ecological Process: with consistent grazing pressure desirable grasses have poor vigor, shrinking crowns and mortality. This allows invasive species to colonize and then expand to a position of dominance. Indicators: increasing gaps between basin wildrye plants, increasing cover of invasive species

Citations