Ecological site R048AY010UT
Wet Fresh Streambank (Willow)

Last updated: 3/05/2024
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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): 048A–Southern Rocky Mountains

MLRA 48A makes up about 45,920 square miles (119,000 square kilometers) and is the southern part of the Rocky Mountains. The Southern Rocky Mountains lies east of the Colorado Plateau, south of the Wyoming Basin, west of the Great Plains, and north of the Rio Grande Rift. It is in western and central Colorado, southeastern Wyoming, eastern Utah, and northern New Mexico. The headwaters of major rivers such as the Colorado, Yampa, Arkansas, Rio Grande, North Platte and South Plate rivers are located here. This MLRA has numerous national forests, including the Medicine Bow National Forest in Wyoming; the Routt, Arapaho, Roosevelt, Pike, San Isabel, White River, Gunnison, Grand Mesa, Uncompahgre, Rio Grande, and San Juan National Forests in Colorado; the Carson National Forest and part of the Santa Fe National Forest in New Mexico. Rocky Mountain National Park also is in this MLRA.

MLRA 48A is the southern Rocky Mountains physiographic region. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. It is characterized by mountain ranges that were uplifted during the Laramide Orogeny and then had periods of glaciation. The ranges include the Sangre de Cristo Mountains, the Laramie Mountains, and the Front Range in the east and the San Juan Mountains and the Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and glaciers. Elevation typically ranges from 6,500 to 14,400 feet (1,980 to 4,390 meters) in this area. The part of this MLRA in central Colorado includes the highest point in the Rockies, Mount Elbert, which reaches an elevation of 14,433 feet (4,400 meters). More than 50 peaks in the part of the MLRA in Colorado are at an elevation of more than 14,000 feet (4,270 meters). Many small glacial lakes are in the high mountains.

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. This large MLRA can be subdivided into at least 4 large general divisions. First is the Rockies on the east side of this area are called the “Front Range,” which is a fault block that has been tilted up on edge and uplifted and is largely igneous and metamorphic geology. It was tilted up on the east edge, so there is a steep front on the east and the west side is more gently sloping and in the south east there are rocks exposed in the mountains are mostly Precambrian igneous and metamorphic rocks. Second is the tertiary rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area (San Juan Mountains Area). The third division is Northwest part of the MLRA is dominantly sedimentary rock from the cretaceous/tertiary and Permian/ Pennsylvanian periods. The fourth subset is the long and narrow Sangre de Cristos mountains uplifted in the Cenozoic are between the Rio Grande rift and the great plains. Many of the highest mountain ranges were reshaped by glaciation during the Pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are important sources of sand and gravel.

The average annual precipitation ranges predominantly from 12 to 63 inches. Summer rainfall commonly occurs as high-intensity, convective thunderstorms. About half of the annual precipitation occurs as snow in winter; this proportion increases with elevation. In the mountains, deep snowpacks accumulate throughout the winter and

generally persist into spring or early summer, depending on elevation. Some permanent snowfields and small glaciers are on the highest mountain peaks. In the valleys at the lower elevations, snowfall is lighter and snowpacks can be intermittent. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The freeze-free period averages 135 days and ranges from 45 to 230 days, decreasing in length with elevation. The climate of this area is strongly dependent upon elevation; precipitation is greater, and temperatures are cooler at the higher elevations. The plant communities vary with elevation, aspect and change in latitudes due to changing in precipitation kind and timing and temperature.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the area dominantly have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. Mineralogy is typically mixed, smectitic, or paramicaceous. In areas with granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on mountain slopes. Dystrocryepts (Leighcan and Mummy series) formed on mountain slopes and summits at the higher elevations. In areas of andesite and rhyolite bedrock, Dystrocryepts (Endlich and Whitecross series) formed in colluvium on mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on mountain slopes at low elevations and with low precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in colluvium on mountain slopes at high elevations.

Ecological site concept

The soils of this site formed mostly in alluvium and/or slope alluvium derived from sedimentary rock. Surface soils are gravelly sandy clay loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are deep to very deep, moderately well-drained, and have moderately slow to moderate permeability. pH is neutral to slightly alkaline. Available water-holding capacity ranges from 3 to 4 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly aridic ustic and the soil temperature regime is frigid. Precipitation ranges from 12-16 inches annually.

This site is located adjacent to the water’s edge along stream corridors. Water table has to be close enough to the ground surface to support this community’s vegetation. The percent canopy cover is approximately 25% grasses & grasslikes, 10% forbs and 50% shrubs with a possible component of 5% trees. Some of the plants found in this site are: Grass & Grasslikes: Water sedge (10%), Blue wildrye (10%), Alpine timothy (3%), Forbs: Cow parsnip (3%), Scouring rush horsetail (3%), and Shrubs: Drummond willow (5%), Booth willow (5%), Redosier dogwood (5%).

Associated sites

R048AY005UT	**Semiwet Fresh Streambank (Narrowleaf Cottonwood)** Often adjacent to this site.

Similar sites

R048AY008UT	**Wet Fresh Meadow (Willow-Sedge)** Similar plant communities but occur on different landscape position.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix drummondiana* (2) *Salix boothii*
Herbaceous	(1) *Elymus glaucus ssp. glaucus*

Physiographic features

This site occurs at elevations between 6,200 and 9,100 feet. It is found on drainageways with slopes ranging from 2-8 percent. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	6,200–9,100 ft
Slope	2–8%
Water table depth	9–39 in
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is dry subhumid and semiarid. It is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation ranges from 12 to 16 inches. July, August, and October are typically the wettest months with June being the driest. The most reliable sources of moisture for plant growth are the snow that accumulates over the winter and spring rains. Summer thunderstorms are intermittent and sporadic in nature, and thus, are not reliable sources of moisture to support vegetative growth on this site. The soil moisture regime is mostly ustic and the soil temperature regime is frigid.

Table 3. Representative climatic features

Frost-free period (characteristic range)	90-110 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	12-16 in

Influencing water features

This site has a water table from 9-39 inches and is found along streams/drainageways.

Soil features

The soils of this site formed mostly in alluvium and/or slope alluvium derived from sedimentary rock. Surface soils are gravelly sandy clay loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are deep to very deep, moderately well-drained, and have moderately slow to moderate permeability. pH is neutral to slightly alkaline. Available water-holding capacity ranges from 3 to 4 inches of water in the upper 60 inches of soil.

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock (2) Slope alluvium–sedimentary rock
Surface texture	(1) Gravelly sandy clay loam
Family particle size	(1) Coarse-loamy
Drainage class	Moderately well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	60–100 in
Soil depth	60–100 in
Surface fragment cover <=3"	14–18%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	3–4 in

Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0–1 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.9–7.4
Subsurface fragment volume <=3" (Depth not specified)	22–26%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Reference State
Community Phase 1.1: willow shrub carr/ rich & productive understory
Without disturbance, the Reference State would have been dominated by woody plants. The proportion of woody plants in relation to herbaceous understory species would have been influenced by the time and type of natural of disturbance that most recently took place. Possible natural disturbances would have included beaver and/or moose consumption of willow, deciduous wood pathogens (i.e. insects) reducing particular species, wildfires, and extreme run-off causing flooding or diversion of existing drainages. Such disturbances would have temporarily decreased the woody component and allowed an increase in herbs. All of these influences tended to have very long return intervals. Without such disturbance, woody plants would have increased at the expense of the understory because of the overtopping shade they create.

T1a: Transition from State 1 to State 2 (Reference State to Willow Shrub Carr/ Diminished Understory State)
The simultaneous introduction of exotic species, both plants and animals, and possible extinctions of native flora and fauna, along with climate change, has caused State 1 to transition to State 2. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical.

Willow Shrub Carr/ Diminished Understory State
State 2 is very similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of native species, and a different climate. State 2 is a description of the ecological site shortly following Euro-American settlement. This state can be regarded as the current potential. State 2 can fluctuate between two willow-dominated phases: one that is relatively undisturbed with a rich and productive understory (2.2), and another where the understory is reduced due to the heavy livestock grazing (2.1). Phase 2.1 is a willow (Salix spp.) stand with a reduced understory due to the heavy livestock grazing. This Phase was also produced by horses and mules belonging to early European settlers and travelers (2.2a). These areas usually have surface water available, an attractant to most animals in the vicinity, which tend to pass through these stands at least once daily to feed, get water, and find shade. Heavy use of this part of the landscape was common. Because of the high resilience of these sub-irrigated habitats, partial recovery of the understory was attained in many instances and accelerated soil erosion arrested. Sustainable use was approached in such instances (2.1a).

Community Phase 2.1: increased willows & unpalatable forbs/ diminished understory
Periods of heavy livestock and/or trailstock grazing of the herbaceous understory, along with near-extirpation of beaver and moose, causes this plant community to experience an increase in the proportion of woody plants at the expense of the herbaceous understory. Sedges, unpalatable forbs, and woody species are increased.

Community Pathway 2.1a:
A reduction in livestock numbers and limiting seasons of use allows the understory component to rejuvenate.

Community Phase 2.2: willow shrub carr/ rich & productive understory
This plant community has regained the understory components following a period of reduction in livestock use.

Community Pathway 2.2a:
Heavy continuous season long grazing by livestock reduces the palatable understory species. This occurred in the past when these sites were common places for travelers to feed and water their animals.

T2a: Transition from State 2 to State 3 (Willow Shrub Carr/ Diminished Understory State to Xerified Shrubland State)
Excessive season-long livestock (or trailstock use in the past) involves high intensities of forage utilization, trampling, and bedding. Salting was common on such locations. When ground cover is reduced, accelerated soil erosion is possible. These impacts, along with logging in the watersheds above, results in accelerated channel down-cutting, more extreme flooding, and changes in drainage patterns. The overall result is a xerification of the site and lignification of its vegetation (an increase in woody vegetation). The approach to this transition is indicated by changes in species composition – primarily an increase in woody vegetation. The trigger causing this transition is stream down-cutting due to extreme hydrologic events.

Xerified Shrubland State
Where control of grazing intensity isn't been achieved earlier and excessive use by livestock prevails, the vegetation takes on more of the character of that of drier sites at low elevations. As the water table is lowered, the stature of the willows and other riparian shrubs declines, allowing upland species such as rubber rabbitbrush (Ericameria nauseosus), Wyoming big sagebrush (*Artemisia tridentata* ssp. wyomingensis) to fill in these sites (3.2). Wildfire followed by continued heavy livestock grazing (3.2a) will temporarily remove the shrub and palatable herbaceous component, leaving annuals and biennials such as lesser burdock (*Arctium minus*), rough cocklebur (*Xanthium strumarium*), horehound (*Marrubium vulgare*), houndstongue (*Cynoglossum officinale*), stickseed (Hackelia spp.), Canada thistle (*Cirsium arvense*), and Scotch cottonthistle (*Onopordum acanthium*) to flourish (3.1). The recovery of moose and beaver puts more pressure on the remaining willows. However, if enough willow and other deciduous shrubs survive previous herbivory to allow beaver dam building, and thus re-ponding of these sites (R3a), it may be possible for the original mesic species to re-establish and for the site to return to State 2. A return to heavy livestock grazing and logging will negatively impact the resiliency of this State.

Community Phase 3.1: unpalatable annuals & biennials dominance
This plant community is dominated by assorted unpalatable annuals and biennials that gained dominance following wildfire and heavy continuous season long grazing. Some of the species may include burdock, cocklebur, horehound, houndstongue, stickseed, Canada thistle, and Scotch cottonthistle.

Community Pathway 3.1a:
Previous channelization and consequent lowering of the water table will over time lead to xerification of this site. This occurs because channelization moves water through the site rather than allowing it to infiltrate the soil and be retained for season-long plant growth.

Community Phase 3.2: Wyoming big sagebrush/ rubber rabbitbrush
This plant community is dominated by Wyoming big sagebrush and rubber rabbitbrush due to a lowering of the water table and subsequent xerification of the site.

Community Pathway 3.2a:
In the event of wildfire followed by heavy grazing pressure by livestock the site will convert to one dominated by assorted unpalatable annual and biennial forbs.

T3a: Transition from State 3 to State 4 (Xerified Shrubland State to Seeded Grassland State)
If managers are dissatisfied with the levels of productivity and/or the dominance of undesirable and noxious weeds present in State 3, the location is suitable, and finances are available, they could till and re-seed with a suite of montane grasses that would not only increase forage but may help to stabilize streambanks as well.

R3a: Restoration Pathway from State 3 to State 2 (Xerified Shrubland State to Willow Shrub Carr/ Diminished Understory State)
It may be possible for this site to recover to a willow-dominated system where beaver populations and activity have been restored. The ponding caused by construction of beaver dams helps raise the water table, creating a less favorable environment for the upland species that moved in and allows the original mesic species to re-occupy the site.

Seeded Grassland State

A seeded grassland state is possible if the site is tilled and re-seeded to increase forage for livestock and to stabilize walls of streambanks. Levels of grazing will have to be controlled (4.2a) or the initially pure grassland (4.1) will quickly be re-invaded by rabbitbrush, sagebrush, willow, or other mesic shrubs (4.2), along with the noxious understory forbs such as burdock, cocklebur, horehound, houndstongue, stickseed, and a variety of thistles. Heavy continuous season long grazing would deplete the seeded grasses, giving an advantage to shrubs and other invasive species (4.1a).

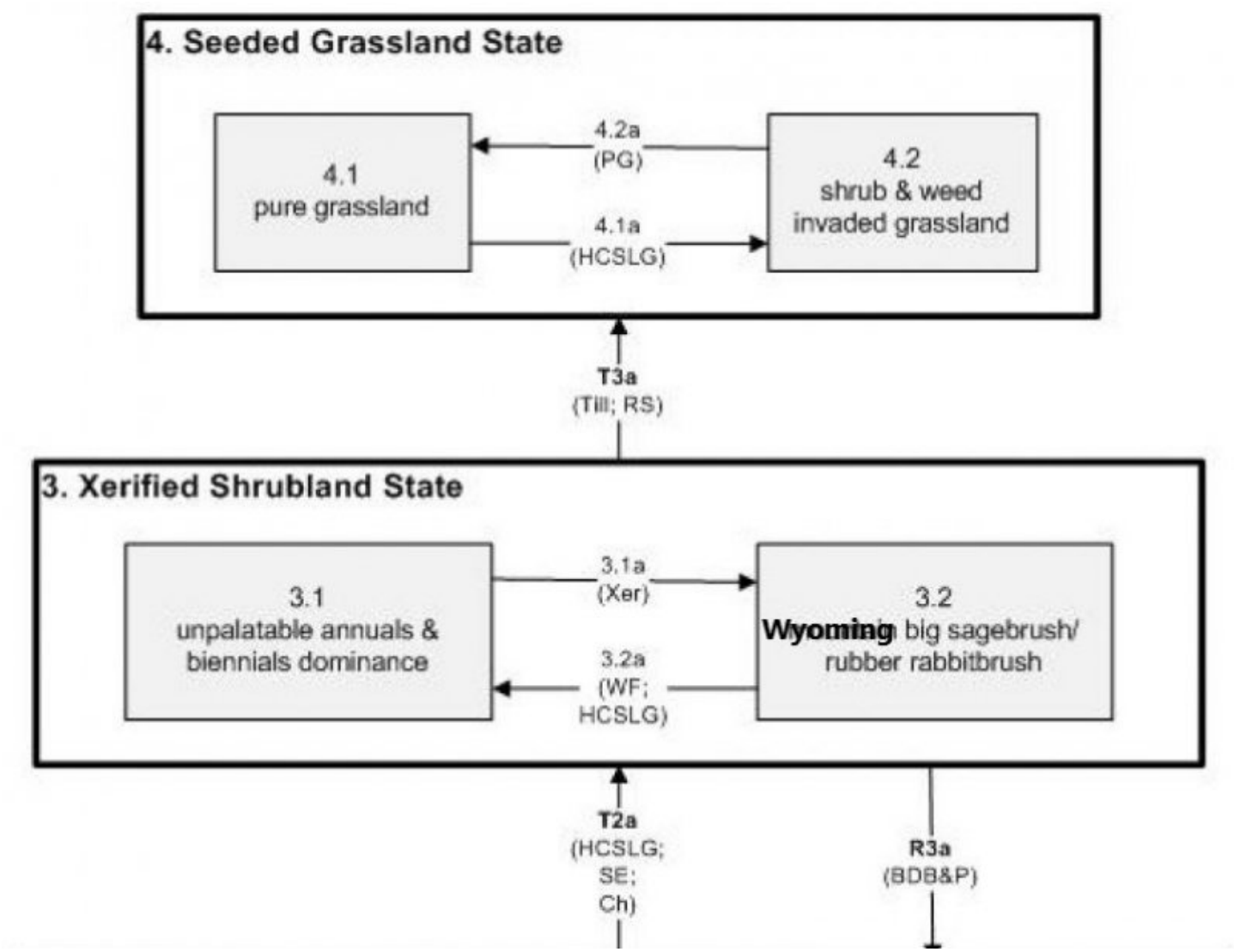
Community Phase 4.1 pure grassland
This plant community is dominated by a suite of seeded grass species used to increase forage production for livestock and stabilize streambanks.

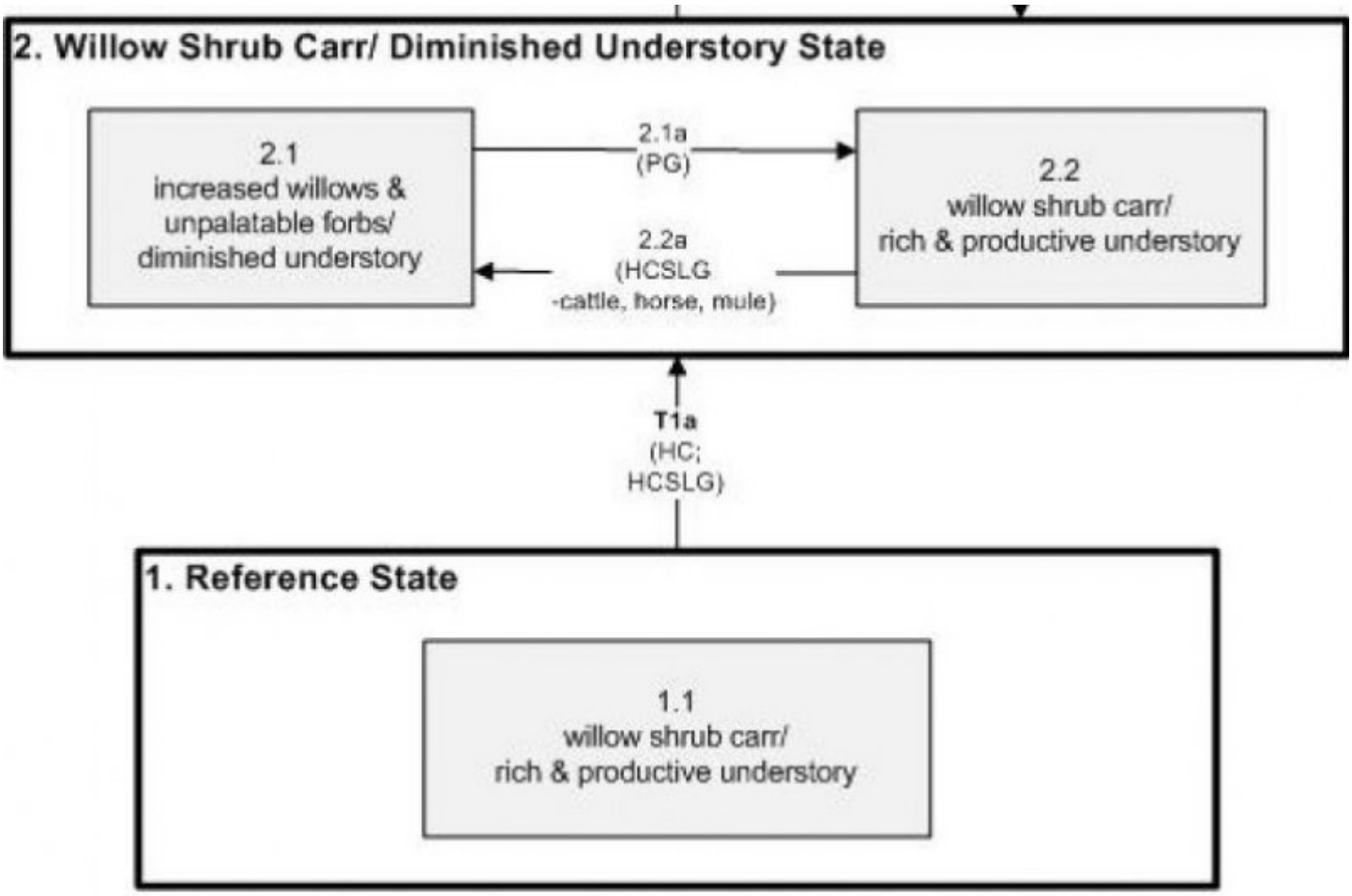
Community Pathway 4.1a:
Heavy continuous season long grazing will deplete the seeded grasses, allowing shrubs and other invasive species to re-establish.

Community Phase 4.2 shrub & weed invaded grassland
This plant community is a product of heavy grazing on seeded grass species. Seeded grasses are diminished and an encroachment of woody species including willow, sagebrush, or rabbitbrush has occurred.

Community Pathway 4.2a:
Moderation of grazing is required to sustain a purely grassland phase.

State and transition model





BDB&P	Beaver Dam Building & Ponding
Ch	Channelization (down-cutting)
HC	Historic Change
HCSLG	Heavy Continuous Season Long Grazing
PG	Prescribed Grazing
RS	Re-seeding
SE	Soil Erosion
Till	Tillage
WF	Wildfire
Xer	Xerification

Inventory data references

Data to support ecological site gathered from historic surveys by USDA range professionals.

Other references

Alexander, R. R. 1985. Major habitat types, community types, and plant communities in the Rocky Mountains. USDA- Forest Service Rocky Mountain Forest and Range Experiment Station. General technical report RM-123. 105p.

Alexander 1988. Forest vegetation on National Forests in the Rocky Mountain and Intermountain Regions: Habitat types and community types. USDA- Forest Service Rocky Mountain Forest and Range Experiment Station. General technical report RM-162. 47p.

Galatowitsch, S.M. 1990. Using the original land survey notes to reconstruct pre-settlement landscapes in the American West. Great Basin Naturalist: 50(2): 181-191. Keywords: [Western U.S., conservation, history, human impact]

Parson, R. E. 1996. A History of Rich County. Utah State Historical Society, County Commission, Rich County, Utah. Keywords: [Rich County, Utah, Historic land use, European settlements]

USDA-NRCS. 2003. National Range and Pasture Handbook. in USDA, editor, USDA-Natural Resources Conservation Service-Grazing Lands Technology Institute. Keywords: [Western US, Federal guidelines, Range pasture management]

Western Regional Climate Center, Western U.S. Climate Historical Summaries. Available at: http://www.wrcc.dri.edu/summary/Climsmut.html. Accessed 15 June 2009.

Web Soil Survey, Official Soil Series Descriptions. Available at: http://soils.usda.gov/technical/classification/osd/index.html. Accessed 15 June 2009.

Contributors

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Approval

Kirt Walstad, 3/05/2024

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	05/10/2025
Approved by	Kirt Walstad
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:**
