USDA Natural Resources
Conservation Service

Ecological site R047XA004UT
Interzonal Cold Semi-wet Fresh Meadow (meadow sedge/tufted hairgrass)

Last updated: 2/05/2025
Accessed: 05/13/2025

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.

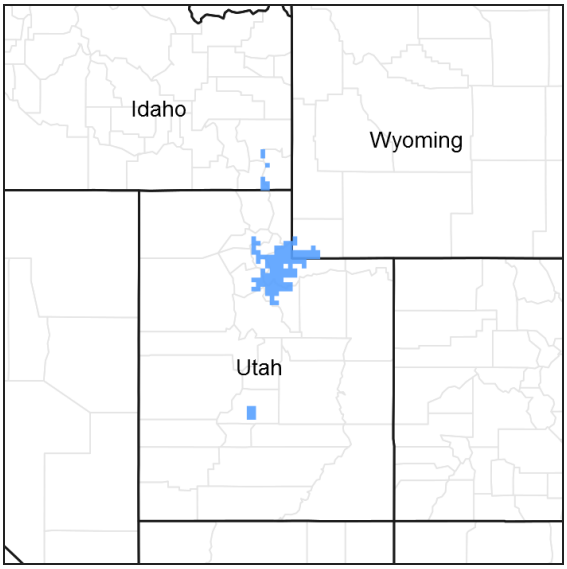

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 047X–Wasatch and Uinta Mountains

MLRA 47 occurs in Utah (86 percent), Wyoming (8 percent), Colorado (4 percent), and Idaho (2 percent). It encompasses approximately 23,825 square miles (61,740 square kilometers). The northern half of this area is in the Middle Rocky Mountains Province of the Rocky Mountain System. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area.
The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifers. An ancient shoreline of historic Bonneville Lake is evident on the footslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments.
The average precipitation is from 12 to 16 inches in the valleys and can range up to 73 inches in the mountains. Peak precipitation occurs in the winter months. The average annual temperature is 30 to 50 degrees Fahrenheit (-1 to 15 C). The freeze-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.
The dominant soil orders in this MLRA are Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. The soil moisture

regime is typically xeric. The minerology is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

This LRU includes the Wasatch Mountains which tend to run north and south. These steeply sloping, precipitous mountains have narrow crests and deep valleys. They are primarily fault blocks that have been tilted up. The alluvial fans located at the base of these mountains are important recharge zones for valley aquifers.

Ecological site concept

The soils of this site formed in alluvium derived from quartzite and various sedimentary rocks. These soils are deep and somewhat poorly-drained, and receive extra water from upland areas. Textures are loamy on the surface and become cobbly sandy loams or gravelly sandy loams at depths greater than two feet. Occasionally small rock fragments are present on the soil surface. Larger rock fragments may be present in the profile, but make up less than 35 percent of the soil volume. Water holding capacity ranges from 3.7 to 6.0 inches of water in the upper 40 inches of soil. Permeability is moderate to moderately rapid and pH ranges from 6.6 to 8.4. The soil moisture regime is xeric and aquic and the soil temperature regime can range from cryic, frigid, to mesic.

Associated sites

R047XA006UT	**Semi-wet Fresh Streambank (narrowleaf cottonwood)**
R047XA308UT	**Upland Loam (basin big sagebrush)**
R047XA430UT	**Mountain Loam (mountain big sagebrush)**
R047XA010UT	**Interzonal Wet Fresh Streambank (willow)**

Similar sites

R047XA008UT	**Interzonal Wet Fresh Meadow (sedge)** 008 is typically wetter than 004.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia cana* (2) *Rosa woodsii*
Herbaceous	(1) *Carex praticola* (2) *Deschampsia cespitosa*

Physiographic features

This site occurs most commonly on stream terraces, but also occurs on valley floors and flood plains. Depth to water table is 20 to 40 inches. Flooding may occasionally occur on this site for a brief duration. Runoff from this site is low to very low. Slopes range from 0 to 3 percent and elevation ranges from 5,200 to 8,000 feet. Ponding is not known to occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Flood plain
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	1,585–2,438 m

Slope	0–3%
Water table depth	51–102 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by cold winters and cool dry summers. The average annual precipitation is 14 to 44 inches. The important moisture supply for plant growth is from subirriagation or a moderately deep but fluctuation water table. The drop in water table during the latter part of the plant growth period affects the amount of herbage production and thus differs from the wet meadow site.

Table 3. Representative climatic features

Frost-free period (characteristic range)	30-90 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	406-1,118 mm
Frost-free period (average)	60 days
Freeze-free period (average)	
Precipitation total (average)	762 mm

Influencing water features

This site occurs most commonly on stream terraces, but also occurs on valley floors and flood plains. Depth to water table is 20 to inches. Flooding may occasionally occur on this site for a brief duration. Runoff from this site is low to very low. Slopes range from 0 to 3 percent and elevation ranges from 5,200 to 8,000 feet. Ponding is not known to occur on this site.

Wetland description

Further review is required.

Soil features

The soils of this site formed in alluvium derived from quartzite and various sedimentary rocks. These soils are deep and somewhat poorly-drained, and receive extra water from upland areas. Textures are loamy on the surface and become cobbly sandy loams or gravelly sandy loams at depths greater than two feet. Occasionally small rock fragments are present on the soil surface. Larger rock fragments may be present in the profile, but make up less than 60 percent of the soil volume. Water holding capacity ranges from 3.7 to 6.0 inches of water in the upper 40 inches of soil. Permeability is moderate to moderately rapid and pH ranges from 6.6 to 8.4. The soil moisture regime is xeric and aquic and the soil temperature regime is typically cryic or frigid.

Table 4. Representative soil features

Parent material	(1) Alluvium–metamorphic and sedimentary rock
Surface texture	(1) Loam
Family particle size	(1) Fine-loamy
Drainage class	Somewhat poorly drained to poorly drained
Permeability class	Moderate to moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	3–5%

Available water capacity (0-152.4cm)	9.4–15.24 cm
Calcium carbonate equivalent (0-152.4cm)	0–15%
Electrical conductivity (0-152.4cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0
Soil reaction (1:1 water) (0-152.4cm)	6.6–8.4
Subsurface fragment volume <=3" (0-152.4cm)	3–34%
Subsurface fragment volume >3" (0-152.4cm)	0–25%

Ecological dynamics

It is impossible to determine in any quantitative detail the Historic Climax Plant Community (HCPC) for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). However, up to the 1870s the Shoshone Indians, prevalent in northern Utah and neighboring states, grazed horses and set fires to alter the vegetation for their needs (Parson 1996). In the 1860s, Europeans brought cattle and horses to the area, grazing large numbers of them on unfenced parcels year-long (Parson 1996). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.

When available, data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

State and transition model

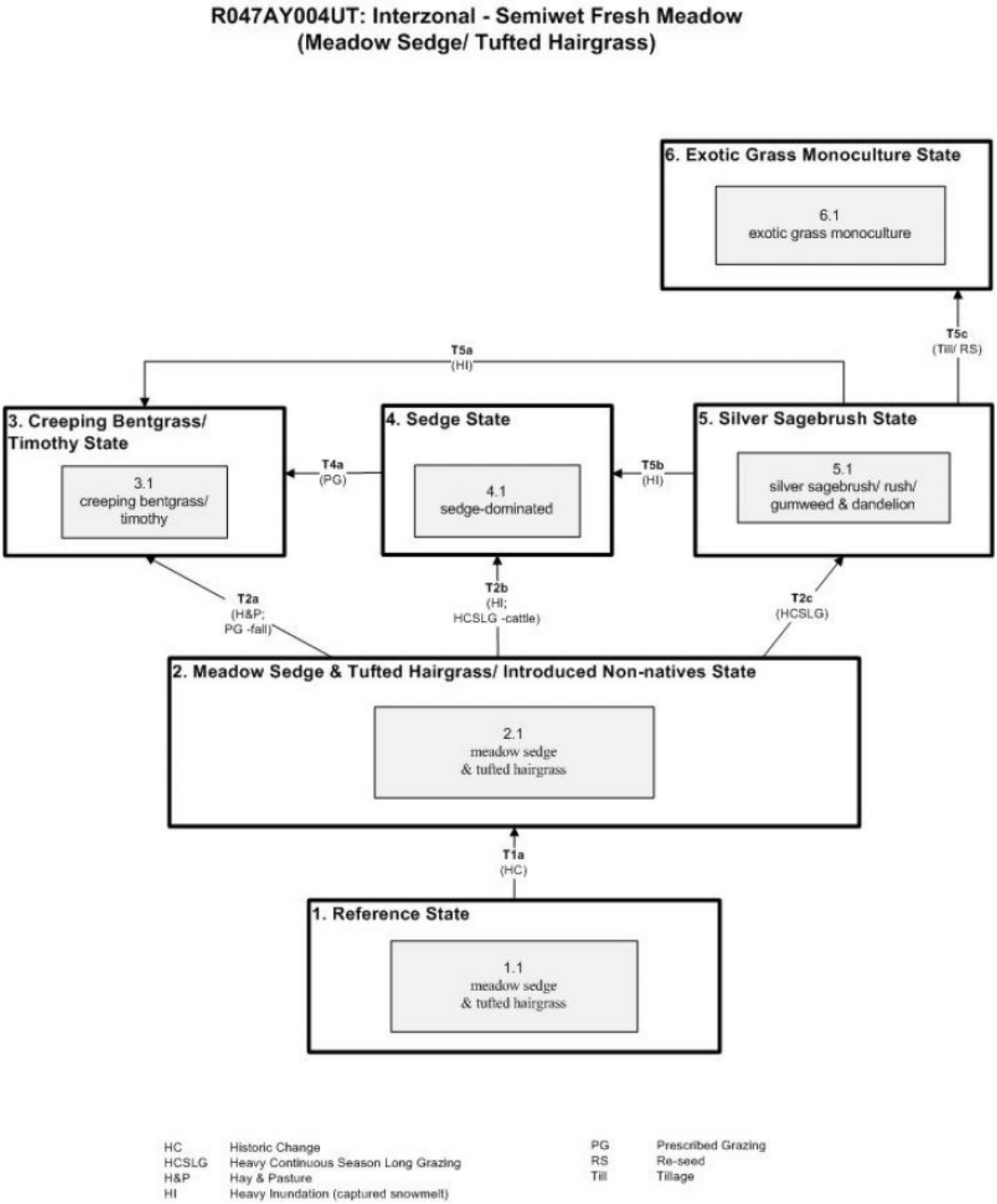

Figure 4. State and Transition Model

State 1
Reference State

The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. The pre-settlement climax

plant community (1.1) would have been a grassland (meadow) dominated by a rich mixture of native grasses and grass-likes such as meadow sedge (*Carex praticola*), tufted hairgrass (*Deschampsia cespitosa*), timothy (*Phleum pratense*), slender wheatgrass (*Elymus trachycaulus*), mountain brome (*Bromus marginatus*), and muttongrass (*Poa fendleriana*). Minor amounts (less than 15 percent) of forage production was due to native perennial forbs. Mesic shrubs such as silver sagebrush (*Artemisia cana* ssp. viscidula) and Woods' rose (*Rosa woodsii*) were only minor components in the Reference State. A more complete list of species by lifeform for the Reference State is available in accompanying tables in the "Plant Community Composition by Weight and Percentage" section of this document.

Community 1.1
Meadow sedge & tufted hairgrass

The Reference State would have been dominated by assorted grasses and grass-likes with a very minor component of mesic shrubs. Grasses and grass-likes would have included meadow sedge, tufted hairgrass, timothy, slender wheatgrass, mountain brome, and muttongrass.

State 2
Meadow Sedge & Tufted Hairgrass/ Introduced Non-natives State

State 2 is identical 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. Grasses and grass-likes would have included meadow sedge, tufted hairgrass, timothy, slender wheatgrass, mountain brome, and muttongrass. These meadows were key in the agricultural development of the lowlands. A very high percentage of these sites were homesteaded and altered by having livestock pasturage, haying, leveling, and irrigation. Native species more tolerant of disturbance (e.g. curlycup gumweed (*Grindelia squarrosa*), foxtail barley (*Hordeum jubatum*), Rocky Mountain iris (*Iris missouriensis*), bull thistle (*Cirsium vulgare*), sedges (Carex spp.), and timothy increased relative to the less grazing tolerant and palatable grasses and grass-likes such as meadow sedge and tufted hairgrass. Additionally, exotics such as common dandelion (*Taraxacum officinale*), timothy, Kentucky bluegrass (*Poa pratensis*), and meadow fescue (*Schedonorus pratensis*) increased. In general, species richness declined and species equitability became more concentrated in fewer dominants. The single most important impact was whether irrigation took place to supplement the hydrologic input. In the cold temperatures of Rich County, where crop maturation has been a problem (Parson 1996), haying and pasturing have been the more sustainable pattern. Early flooding at the time of peak snowmelt in the watersheds above (May-June) has been the usual pattern. When a single hay crop is taken in August and the subsequent crop aftermath is grazed by livestock in the fall (T2a), the resulting vegetation becomes dominated by creeping bentgrass (*Agrostis stolonifera*) and timothy (State 3). If the land use pattern is a single spring flood irrigation followed by heavy growing season livestock grazing (T2b), this results in a sward more dominated by sedges (State 4). If these areas become fenced and heavily grazed season-long (T2c), the more palatable herbs are lost, and mesic shrubs such as silver sagebrush and white sagebrush (*Artemisia ludoviciana*), and the less palatable grass-likes, especially rushes (Juncus spp.), and forbs such as common dandelion and curlycup gumweed come to prevail (State 5). With subsequent intensified management (e.g. mowing, hay making, fertilization) State 5 can be turned into either State 3 (T5a) or State 4 (T5b). State 4, with deferred grazing during the growing season (T4a), can turn into State 3. Since there are now many exotics present and irrigation systems are unlikely to be dismantled (to restore the original hydrologic regime), a return to the Reference State is not thought possible. Although it would be possible to plow and reseed State 5 with improved exotic forage grasses without subsequent irrigation (T5c), this alternative (State 6) would probably stand up to economic scrutiny or social acceptability for public land.

Community 2.1
Meadow sedge & tufted hairgrass

This plant community is dominated by assorted grasses and grass-likes with a very minor component of mesic shrubs. Grasses and grass-likes include meadow sedge, tufted hairgrass, timothy, slender wheatgrass, mountain brome, and muttongrass.

State 3
Creeping Bentgrass/ Timothy State

The native grasses creeping bentgrass and timothy are the dominants of this plant community. This plant community is encouraged by fall livestock grazing.

Community 3.1
creeping bentgrass/ timothy

Creeping bentgrass and timothy are the dominant species in this plant community.

State 4
Sedge State

Sedges, particularly meadow sedge, will dominate this plant community. This plant community is encouraged by spring flooding (either naturally or by irrigation) followed by heavy growing season livestock grazing. Heavy growing season grazing following flooding encourages the stability of this State. Changes in season of use or levels of use will reduce the stability of this State (i.e. will encourage transition to another State).

Community 4.1
Sedge-dominated

A single spring flood irrigation followed by heavy growing season livestock grazing results in a sward more dominated by sedges.

State 5
Silver Sagebrush State

Mesic shrubs such as silver sagebrush and white sagebrush, and the less palatable grass-likes, especially rushes, and forbs such as common dandelion and curlycup gumweed will dominate this plant community. These plant communities are produced when these areas are fenced and heavily grazed season-long. This stability of this State is maintained by continued season-long utilization of the relatively palatable species, leaving the less palatable species. A reduction of growing season utilization and/or a switch to non-growing season use will reduce the stability of this State (i.e. will encourage transition to another State).

Community 5.1
Silver sagebrush/ rush/ gumweed & dandelion

This Phase is dominated by less palatable species such as silver sagebrush, rushes, common dandelion and curlycup gumweed.

State 6
Exotic Grass Monoculture State

Monocultures of exotic grasses such as meadow foxtail, tall oatgrass, colonial bentgrass, bluejoint, or slimstem reedgrass are found at sites where plowing and re-seeding has taken place to improve forage for livestock.

Community 6.1
Exotic grass monoculture

This plant community is a monoculture of an exotic grass such as foxtail, tall oatgrass, colonial bentgrass, bluejoint, or slimstem reedgrass.

Transition T1a
State 1 to 2

The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, and 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.

Transition T2a
State 2 to 3

The Meadow Sedge & Tufted Hairgrass/ Introduced Non-natives State will transition to the Creeping Bentgrass/ Timothy State with haying and pasturing followed by prescribed grazing of cattle during fall months. The approach to this transition is indicated by changes in species composition (i.e. increases in creeping bentgrass and timothy, and decreases in meadow sedge and tufted hairgrass). The trigger causing this transition is fall livestock grazing.

Transition T2b
State 2 to 4

The Meadow Sedge & Tufted Hairgrass/ Introduced Non-natives State will transition to the Sedge State where single spring flood irrigation is followed by heavy growing season livestock grazing. The approach to this transition is indicated by changes in species composition (i.e. an increase in sedges, and a decrease in tufted hairgrass. The trigger causing this transition is single spring flood irrigation followed by heavy growing season livestock grazing.

Transition T2c
State 2 to 5

The Meadow Sedge & Tufted Hairgrass/ Introduced Non-natives State will transition to the Silver Sagebrush State when fencing is minimal and the area is heavily grazed season long. The approach to this transition is indicated by changes in species composition (i.e. an increase in unpalatable species such as silver sagebrush, rushes, curlycup gumweed, and common dandelion). The trigger causing this transition is heavy continuous growing season long grazing.

Transition T4a
State 4 to 3

The Sedge State will transition to the Creeping Bentgrass/ Timothy State when growing-season grazing is deferred. This takes place due to differences in the palatability of the species dominating each State. The approach to this transition is indicated by changes in species composition (i.e. an increase in creeping bentgrass and timothy, and a decrease in sedges). The trigger causing this transition is the change in grazing regime.

Transition T5a
State 5 to 3

The Silver Sagebrush State transition to the Creeping Bentgrass/ Timothy State will be triggered when sites are inundated by flood or sprinkler irrigation followed by fall livestock utilization. The approach to this transition is indicated by a change in relative abundance of different species (i.e. an increase in creeping bentgrass and timothy and a decrease in unpalatable herbs and silver sagebrush).

Transition T5b
State 5 to 4

The Silver Sagebrush State transition to the Sedge State will be triggered when sites are inundated by flood or sprinkler irrigation followed by growing season long livestock utilization. The approach to this transition is indicated by a change in relative abundance of different species (i.e. an increase in sedges and a decrease in unpalatable herbs and silver sagebrush).

Transition T5c
State 5 to 6

The Silver Sagebrush State will transition to the Exotic Grass Monoculture State when the site is plowed and reseeded with improved exotic forage grasses such as meadow foxtail (*Alopecurus pratensis*), tall oatgrass (*Arrhenatherum elatius*), colonial bentgrass (*Agrostis capillaris*), bluejoint (*Calamagrostis canadensis*), or slimstem reedgrass (*Calamagrostis stricta*) without subsequent irrigation.

Additional community tables

Animal community

This site produces a large volume of forage and a variety of grasses and forbs. To control soil erosion and degradation of the plant community, this site may be properly grazed early in the growing season with the animals being removed early to allow key plants to go ungrazed during the last part of the growing season. A stubble height of 4 to 6 inches should be adhered to.

It is good all around habitat for upland game including pheasants, cottontail rabbits as well as songbirds. It provides feed for elk and deer and brood rearing areas for sage grouse.

Hydrological functions

Soils in this site are grouped mainly into b, c and d hydrologic groups. They have moderately low, moderately high and high runoff potentials. When the vegetation is in climax (potential) the hydrologic curves for b group soils is 60 to 63; for c group, 73 to 75 and for d group, 84 to 86. Refer to scs national engineering handbook, section 4, to determine runoff quantities by use of these curves. Where range condition has declined from climax, field investigation is needed to determine hydrologic curve numbers. Use form ut-range-2 for this purpose.

Recreational uses

This site has good values for aesthetics and natural beauty. It has forbs and grasses, which have flowers in bloom throughout the summer and into the fall. It has little or no possibilities for screening and only slight value as camping and picnicking areas from a vegetation standpoint. Hunting for upland game birds, snowshoe rabbits, elk and mule deer is fair to good on the site. Fishing can be good in streams through and adjacent to this site.

Wood products

None

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used.

Other references

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 22 June 2009.

Web Soil Survey, Official Soil Series Descriptions. Available at: http://soils.usda.gov/technical/classification/osd/index.html. Accessed 22 June 2009.

Contributors

David J. Somerville, Tim Watson
Dr. R. Douglas Ramsey, USU
Dr. Neil E. West, USU
Dr. Leila Shultz, USU
John Lowry, USU
Lisa Langs Stoner, USU
Kate Peterson, USU
Samuel Rivera, USU

Approval

Kendra Moseley, 2/05/2025

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)	V. Keith Wadman, NRCS Retired.
Contact for lead author	shane.green@ut.usda.gov
Date	10/05/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. A very slight amount of rill development may be observed following large storm events or spring runoff periods, but they should heal within the following growing season. Slight rill development may also be observed where the site is adjacent to ecological sites that produce large amounts of runoff (i.e. steeper sites, slickrock, etc.).

---

2. **Presence of water flow patterns:** None to very rare. Any flow patterns present should be sinuous and wind around perennial plant bases. They should be short (5 to 10 feet), < one foot wide, and spaced from 20 to 30 feet apart. They should be stable with only minor evidence of deposition. This site is periodically inundated with runoff water from adjacent sites. It also acts as a filter and trap sediment.

---

3. **Number and height of erosional pedestals or terracettes:** None to very rare. A few plants may show very minor pedestalling where they are adjacent to any water flow patterns present, but there will be no exposed roots. Terracettes are not present.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 10% bare ground. Any bare ground openings present should be < 1 foot in size and should not be connected.

5. **Number of gullies and erosion associated with gullies:** None at site level. Where landscape gullies are present, they should be inactive and stable, vegetated on both sides and bottoms, with no evidence of head-cutting. Some slight increase in disturbance may be evident following significant weather events or when gullies convey considerable runoff from higher elevation rocky or naturally eroding areas.

6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of wind generated soil movement. Wind scoured (blowouts) and depositional areas are not present.

7. **Amount of litter movement (describe size and distance expected to travel):** The majority of litter accumulates in place at the base of plant canopies. Slight movement of the finest material (< 1/4 inch) may move 1 to 2 feet downslope when transported by water. Little accumulation is observed behind obstructions.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 5 to 6. Surface textures typically vary from sandy loams to loams.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Wanship Soil surface is typically 0 to 8 inches deep. Surface texture is a loam with a 2 inch root mat on the surface, and structure is weak fine granular. The A-horizon color varies from black, 10YR 2/1 to dark gray, (10YR 4/1). Soils have an Mollic epipedon that extends 20 to 30 inches into the soil profile. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation breaks raindrop impact and reduces splash erosion. Dense distribution of plants slows runoff by obstructing surface flows, allowing time for increased infiltration. With the physiographic location of this site being in low lying areas, it often acts as a terminal accumulation site for runoff. The amount of sodium in the soil can affect infiltration and facilitate puddling on the surface.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. This site will normally have textural changes within its' profile. These should not be mistaken for compaction layers.

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: Perennial Grasses and grass-likes (northern meadow sedge, tufted hairgrass, redtop) > Perennial Forbs (Rocky Mountain iris, curly dock).

    Sub-dominant: Sprouting Shrubs (silver sage, woods rose > Rhizomatous Grasses and grasslikes (arctic rush, slender wheatgrass) >> Perennial Forbs (field horsetail).

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same

as the native species in the reference state. Biological soil crust is variable in its' expression where present on this site and is measured as a component of ground cover. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

Additional: Disturbance regimes include insects, infrequent fire, and flooding. Temporal variability can be caused by fires, droughts, insects, etc. Spatial variability can be caused by runoff, soil pH, and topography.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be no mortality or decadence in either perennial grasses or grasslikes. During severe (multi-year) droughts that affect groundwater levels, up to 10% of the perennial plants may die. There may be partial mortality of individual grasses and grasslikes during less severe droughts.

---

14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 50 to 60%. Depth should be 1 inch thickness in any interspaces and from 2 to 2.5 inches under perennial plant canopies.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 2400 to 2500 pounds per acre on an average year. Production could vary from 1650 to 4200 pounds per acre during drought or above-average years.

---

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:** Phragmites, kochia, smotherweed, whitetop, tamarisk and other non-native forbs and grasses.

---

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.
