USDA Natural Resources
Conservation Service

Ecological site R034BY026UT
Wet Saline Streambank (Coyote willow)

Last updated: 3/05/2022
Accessed: 05/04/2024

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.

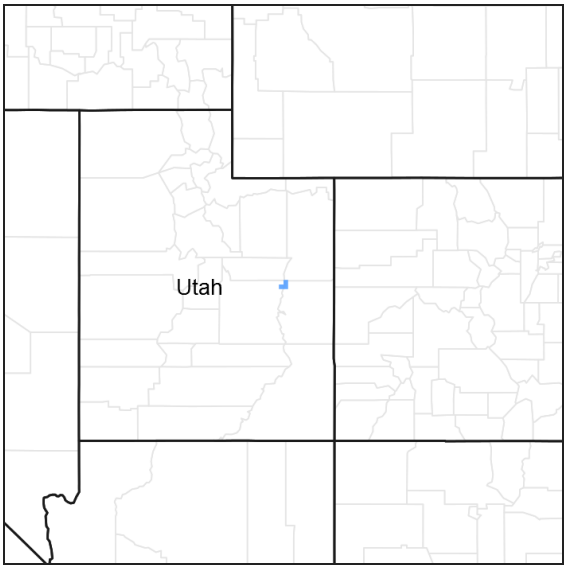


Figure 1. Mapped extent

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): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.

Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.

The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Ecological site concept

This site occurs on drainageways and flood plains. Slopes are mostly 0 to 3 percent. Elevations range from 4,000 feet to 6,500 feet. Characteristic soils in this site are very deep and poorly to moderately well drained. They formed in mixed alluvium derived mainly from sedimentary and quartzite parent materials. These soils are affected by salt (slightly to strongly alkaline) and have a watertable near the surface (within 50 cm.) throughout the plant growth period. Average annual soil loss in potential is negligible. Soil temperature regime is mesic and soil moisture regime is typic aridic to ustic aridic. Precipitation ranges from 5-12 inches annually.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Distichlis spicata* (2) *Sporobolus airoides*

Physiographic features

This site is occurs on floodplains and drainageways adjacent to streams. Slopes are mostly 0 to 3 percent. Elevations range from 4,000 feet to 6,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Drainageway
Runoff class	Low to medium
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None
Elevation	1,219–1,981 m
Slope	0–3%
Water table depth	0–51 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Average annual precipitation is 5 to 12 inches. Approximately 55 percent occurs as rain from March through May. On the average, June through October are the driest months and March through May are the wettest months. The mean annual air temperature is 7 Celsius and the soil temperatures are in the mesic regime. The average freeze-free period is 110 to 125 days. Most of the moisture for plant growth is obtained from a water table which is near the soil surface (within 50 cm.) through the plant growth period. In average years, plants begin growth around April 1 and end growth around October 20.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	110-125 days
Precipitation total (characteristic range)	127-305 mm

Influencing water features

Most of the moisture for plant growth is obtained from a water table which is within 20 inches (50 cm) of the soil surface.

Soil features

Characteristic soils in this site are very deep and poorly to moderately well drained. They formed in mixed alluvium derived mainly from sedimentary and quartzite parent materials. These soils are affected by salt (slightly to strongly alkaline) and have a water table near the surface (within 50 cm.) throughout the plant growth period. Average annual soil loss in potential is negligible. Soil temperature regime is mesic and soil moisture regime is typic aridic to ustic aridic. Precipitation ranges from 5-12 inches annually.

Modal Soil: Green River L, CB Substrata 0-2% – coarse-loamy, mixed (calcareous), mesic Aquic Ustifluvents

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock (2) Alluvium–quartzite
Surface texture	(1) Silt loam (2) Silty clay (3) Sandy clay loam (4) Loam
Family particle size	(1) Fine-silty (2) Coarse-loamy
Drainage class	Poorly drained to moderately well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	152 cm
Soil depth	152–203 cm
Surface fragment cover <=3"	0–8%
Surface fragment cover >3"	0–3%
Available water capacity (Depth not specified)	6.6–21.08 cm
Calcium carbonate equivalent (Depth not specified)	0–20%
Electrical conductivity (Depth not specified)	0–16 mmhos/cm

Sodium adsorption ratio (Depth not specified)	0–10
Soil reaction (1:1 water) (Depth not specified)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–8%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

State1: 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.

State 2: 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.

State 3: 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.

State 4: 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).

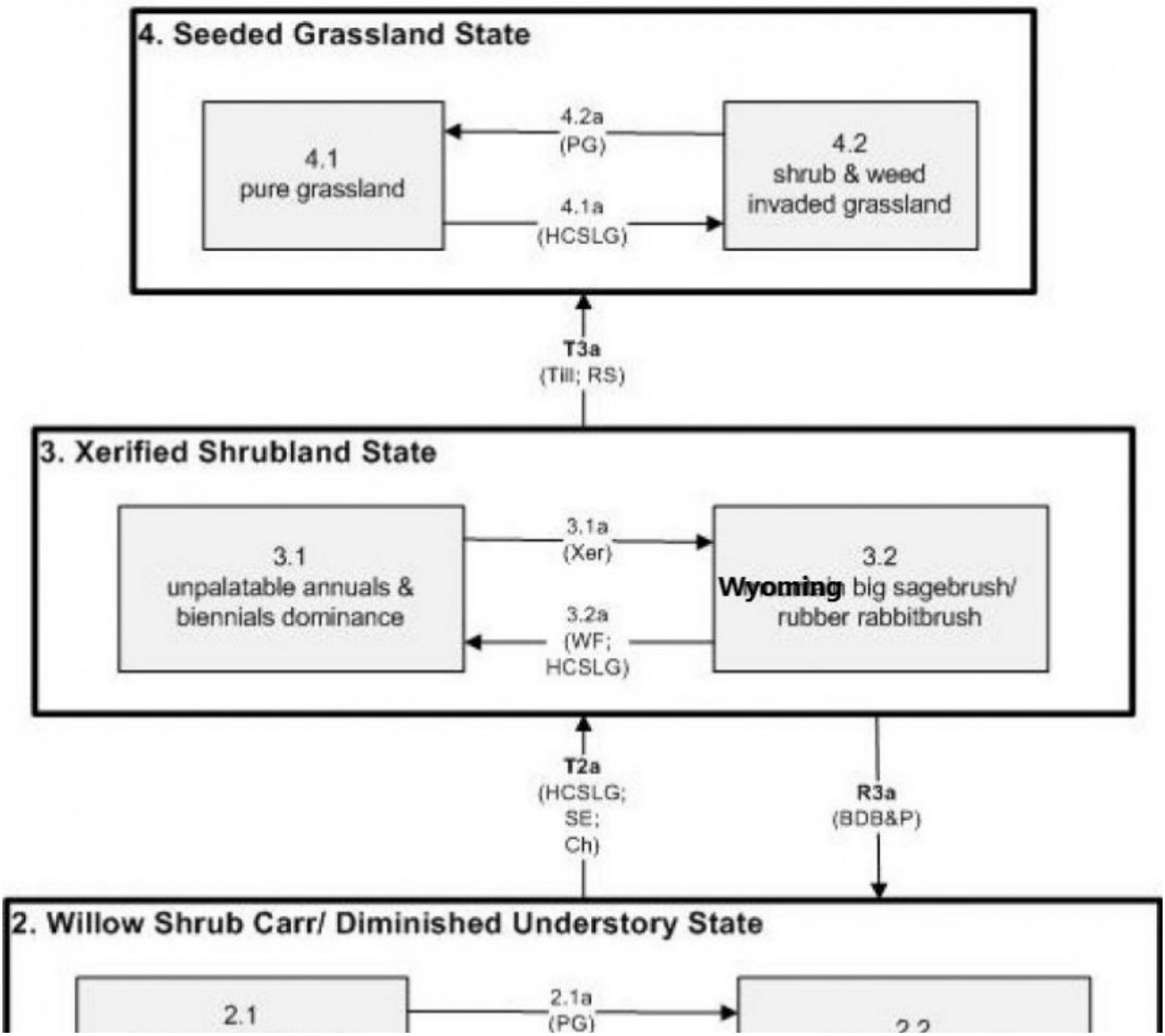
Community Phase 4.1 pure grassland
This plant community is dominated by a suite of seeded grass species used to increase forage production for livestock and stabilize streambanks.

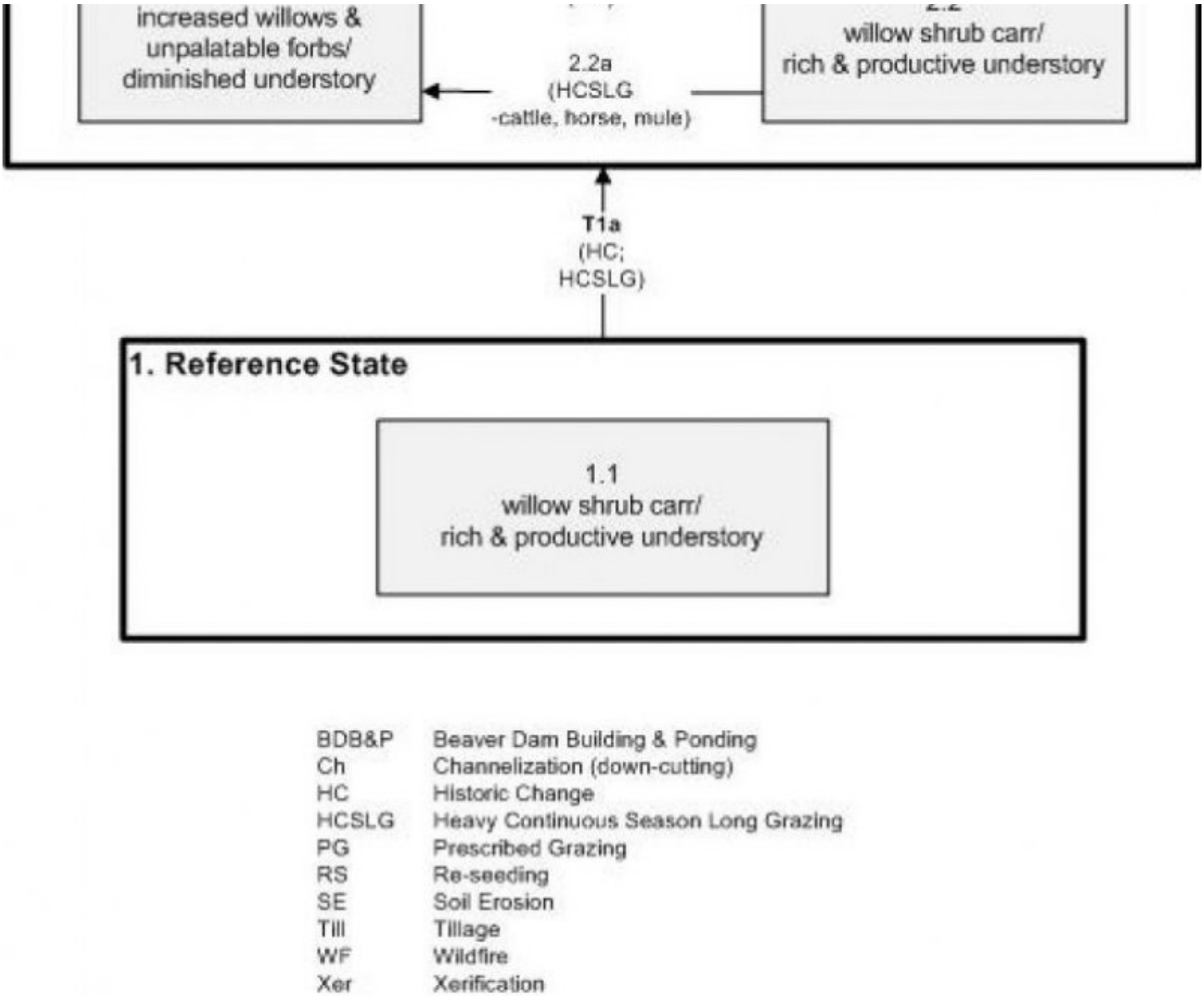
Community Pathway 4.1a:
Heavy continuous season long grazing will deplete the seeded grasses, allowing shrubs and other invasive species to re-establish.

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





State 1
Reference State

Community 1.1
Reference State

The dominant aspect of this plant community is skunkbush sumac and coyote willow (narrowleaf willow) with saltgrass understory. The composition by air-dry weight is approximately 50 percent perennial grasses, 5 percent forbs, and 45 percent shrubs. Of note, there are sparse, scattered Fremont cottonwood trees on this site, but not enough to consider the site a woodland. Also, salt cedar (an introduced tree) has become permanently established in this site and is therefore considered a part of the present and future potential natural plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	532	813	1093
Shrub/Vine	480	731	983
Forb	53	82	110
Total	**1065**	**1626**	**2186**

Table 6. Ground cover

Tree foliar cover	4-6%
Shrub/vine/liana foliar cover	29-31%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	29-31%	–	–
>4 <= 12	4-6%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrub**			370–673	
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	168–252	–
	narrowleaf willow	SAEX	*Salix exigua*	168–252	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	17–84	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	17–84	–
3	**Sub-Dominant Shrubs**			185–336	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	84–168	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	50–84	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	50–84	–
Grass/Grasslike					
0	**Dominant Grasses**			588–1009	
	saltgrass	DISP	*Distichlis spicata*	336–504	–
	alkali sacaton	SPAI	*Sporobolus airoides*	168–336	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	84–168	–
1	**Sub-Dominant Grasses**			101–168	
	Grass, annual	2GA	*Grass, annual*	50–84	–
	Grass, perennial	2GP	*Grass, perennial*	50–84	–
Forb					
2	**Sub-Dominant Forbs**			151–319	
	Forb, annual	2FA	*Forb, annual*	50–84	–
	Forb, perennial	2FP	*Forb, perennial*	50–84	–
	silverscale saltbush	ATAR2	*Atriplex argentea*	17–50	–
	redwool plantain	PLER	*Plantago eriopoda*	17–50	–

Animal community

This site provides proper grazing for horses and cattle during the spring and summer seasons.

This site provides food and cover for wildlife. Wildlife using this site include deer, elk, moose, coyote, rabbit, muskrat, beaver, and many birds including raptors.

Hydrological functions

The soil is in hydrologic group C. The runoff curve numbers are 74 through 86 depending on the watershed condition.

Recreational uses

This site provides hiking and hunting opportunities and may have panoramic vistas.

Wood products

None

Type locality

Location 1: Uintah County, UT

Township/Range/Section	T3S R1E S30
General legal description	SW ¼; SE ¼; NW ¼;

Contributors

Jim Brown

Approval

Kirt Walstad, 3/05/2022

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.

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Date	05/30/2012
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rill are not normally present where this site is found in its most stable community phases. However, frequent flooding can cause highly variable conditions to exist with their associated soil scouring and deposition activities. Where rills are present they should be less than 1 inch deep, somewhat widely spaced (10 to 15 feet), and may be connected. They will often run the length of the streambank to a point of depositional interruption. An increase in rill development may be observed following large storm events or spring runoff periods. Rill development may also increase where the site is adjacent to other sites that produce large amounts of runoff (i.e. steeper sites, slickrock, etc.)

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2. **Presence of water flow patterns:** Water flow patterns are common. They may be stright and/or sinuous and wind around perennial plant bases. They may be long (15 to 25 feet), 1 to 3 feet wide, and spaced from 5 to 20 feet apart. They should become somewhat stable between flooding events. This site will often act as a soil filter and trap large amounts of sediment. These become ideal locations for the establishment of new riparian vegetation.

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3. **Number and height of erosional pedestals or terracettes:** Plants are expected to show some pedestalling where they are adjacent to water flow patterns. Exposed roots may be present where scouring has occurred. Terracettes are also typically present following flooding events. They often develop behind debris such as twigs and tree branches that act as dams within water flow patterns.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not**

bare ground): Bare ground is variable on this site, but should range from 10 to 15%. Bare ground openings should be < 1 foot in size and may be connected as flow channels. Adapted rhizomatous riparian vegetation will often re-populate these opening between flood events.

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5. **Number of gullies and erosion associated with gullies:** None at site level. Widely scattered landscape level gully channels, however, are a normal component of desert environments. Where landscape gullies are present, they should be stable, partially vegetated on their sides and bottoms, with little 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.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter accumulates in place at the base of plant canopies between flood events. Following significant flood events, litter is expected to be transported downstream by water. Considerable accumulation is observed behind obstructions such as rocks and woody debris.

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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):** This sites soil stability rating is highly variable. A rating of 4 to 5 should occur on areas with stable soils, with a rating of 2 to 4 on depositional materials. The average should be a 3 or 4. Surface textures will typically vary from sands and gravels in depositional areas to sandy loams, loams and clay loams on stable soils.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Wyasket Soil surface is typically 0 to 9 inches deep. Surface texture is a loam and structure is moderate very fine subangular blocky. The A-horizon color is dark grayish brown (10YR 4/2). Soils have an Ochric epipedon that extends 9 inches into the soil profile. The A horizon is normally deeper and better developed on the more stable portions of the streambank. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation helps anchor streambanks, reducing soil scouring and increasing deposition. Good spatial distribution of plants also 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.

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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):** None. This site will normally have textural variation within its' soil profile. These should not be mistaken for compaction layers.

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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: Sprouting Shrubs (Coyote willow, skunkbush sumac) >> Perennial Grasses (alkali sacaton, saltgrass) >> Perennial Forbs (fireweed).

Sub-dominant: Sprouting Shrubs (greasewood, green rabbitbrush) > Rhizomatous Grasses (alkali muhly) >> Perennial Forbs (silverscale, redwood plantain).

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 seasonal flooding, insects, and infrequent fire. Temporal variability can be caused by fires, droughts, insects, etc. Spatial variability can be caused by periodic flooding, soil pH, and topography. Following a recent disturbance such as drought, or flooding damage that removes woody vegetation, forbs and perennial grasses and grasslikes may dominate the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase on the site, reducing herbaceous species. Yearly variations in flow and large floods that scour vegetation and deposit sediment on floodplains are ideal microsites for willow and cottonwood seedlings. These conditions may reflect community phases within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There should be no mortality or decadence in either shrubs or grasses during years with average to above average precipitation. During severe (multi-year) droughts that affect groundwater levels, up to 5% of the shrubs may die. Minor mortality of perennial grasses and grasslikes may also occur during these drought periods. There may be partial mortality of individual grasses, grasslikes and shrubs during less severe droughts.

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14. **Average percent litter cover (%) and depth (in):** Litter cover is highly variable on this site and ranges from 25 to 35%. Depth should be 1 inch thickness in the interspaces and up to 3 inches under perennial plant canopies.

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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 1400 to 1500 pounds per acre on an average year. Production could vary from 900 to 2000 pounds per acre during drought or above-average years.

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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:** Tamarisk, knapweed species, Russian thistle, mustard species, filarie, other non-native annual forbs and grasses.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years. Rhizomatous plants including rushes and sedges are often the first to re-establish following flooding, coyote willow and skunkbush sumac seedlings and saplings should also be present.
