USDA Natural Resources
Conservation Service

Ecological site R028AB222UT
Semidesert Sand (Four-Wing Saltbush)

Accessed: 05/06/2024

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.

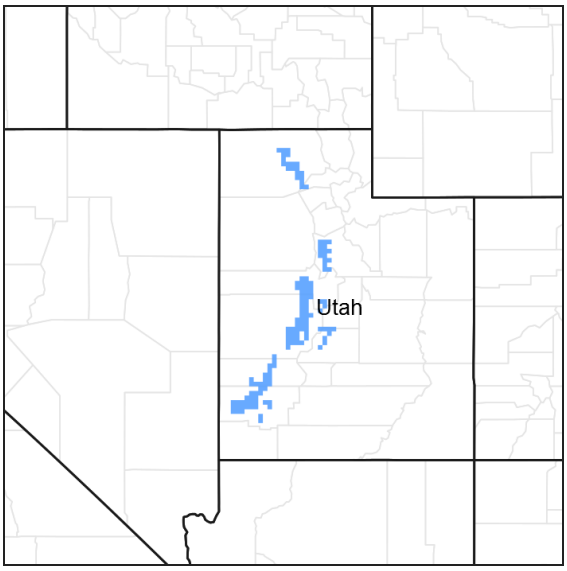


Figure 1. Mapped extent

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): 028A–Ancient Lake Bonneville

MLRA 28A occurs in Utah (82%), Nevada (16%), and Idaho (2%). It encompasses approximately 36,775 square miles (95,246 square kilometers). A large area west and southwest of Great Salt Lake is a salty playa. This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet (1,204 to 2000 meters) in the basins and from 6,560 to 11,150 feet (1996 to 3398 meters) in the mountains. Much of the MLRA has alluvial valley fill and playa lakebed deposits at the surface from pluvial Lake Bonneville, which dominated this MLRA 13,000 years ago. A level line of remnant lake terraces on some mountain slopes indicates the former extent of this glacial lake. The Great Salt Lake is what remains of the pluvial lake.

Mountains in the interior of this MLRA consist of tilted blocks of marine sediments from Cambrian to Mississippian age with scattered outcrops of Tertiary continental sediments and volcanic rocks. The average annual precipitation is 5 to 12 inches (13 to 30 cm) in the valleys and ranges up to 49 inches (124 cm) in the mountains. Most of the rainfall in the southern LRU occurs as high-intensity, convective thunderstorms during the growing season (April through September). The driest period is from midsummer to early autumn in the northern LRU. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 °F (4 to 12 °C). The freeze-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with increasing elevation. The dominant

soil orders in this MLRA are Aridisols, Entisols, and Mollisols. Soils are dominantly in the mesic or frigid soil temperature regime, aridic or xeric soil moisture regime, and mixed mineralogy. They generally are well drained, loamy or loamy-skeletal, and very deep.

Land Resource Unit (LRU): Basin and Range South

Notes: The Basin and Range South LRU has mountain ranges that are about 40 percent sedimentary/metasedimentary (limestone/quartzite dominant) and about 40 percent Tertiary volcanics. The basin floors are generally higher in the southern LRU than in the north LRU between 4,900 and 6,100 feet (1493 to 1859 meters) in elevation. The Basin and Range South LRU also exhibits patterns of summers with a greater relative amount of precipitation in July and August coming from convective storms (ustic trending pattern). Pinyon and juniper ecological sites have a great percentage of pinyon pine (Pinus edulis or monophylla) than Utah juniper (Juniperus osteosperma), with pinyon pine up to 50 percent of the tree composition in the semidesert zones and more than 50 percent in upland zones. Warm season grasses, such as James' galleta (*Pleuraphis jamesii*) or blue grama (Bouteloua gracilis), are present within the plant community, and can make up a large portion of the subdominant grass composition. Bristlecone pine (Pinus longaeva) and cliffrose (Purshia sp.) are also present and dominant on some ecological sites in the southern LRU, while they are sparse or absent in the northern LRU.

Classification relationships

MLRA: 28A Great Salt Lake> LRU> Basin and Range South> Ecological Zone> Semidesert> Ecological Site> Semidesert Sand (Four-wing Saltbush)

EPA Ecoregion: North American Deserts> Cold Deserts> Central Basin and Range> Shadscale-Dominated Saline Basins, Sagebrush Basins and Slopes, Woodland- and Shrub-Covered Low Mountains

Ecological site concept

This ecological site occurs on deep sandy soils found on dunes, lake terraces, alluvial fans and lake plains. Fourwing saltbush (Atriplex canescens), Wyoming sagebrush (Artemisia tridentata spp wyomingensis) and Indian ricegrass (Achnatherum hymenoides) are typically the dominant plants in reference condition. Fourwing saltbush is typically found in mounded, depositional areas with other vegetation; while the interspaces may have few perennial plants. The dominant feature defining this ecological site is the dynamic nature of dunes.

Associated sites

R028AY226UT	**Semidesert Sandy Loam (Wyoming Big Sagebrush)** Occurs adjacent to the ecological site and will not have active dunes, but a loamy textured soil.

Similar sites

R028AY005NV	**SANDY 8-10 P.Z.** This site has similar soils and plant community dynamics.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens*
Herbaceous	Not specified

Physiographic features

This site occurs at elevations between 4500 to 5500 feet on dunes, lake terraces, alluvial fans, fan terraces and lake plains. Slopes on this site are typically between 0 to 10 percent by can go up to 30 percent. There is no flooding or ponding on this site and the water table is deeper than 60 inches.

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Lake terrace (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,372–1,676 m
Slope	0–10%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by cold snowy winters and warm dry summers. The average annual precipitation is between 9 and 13 inches. March through May are typically the wettest months while June and July are the driest months. This site typically receives some moisture from summer convective thunderstorms beginning in late July through September. Higher precipitation and temperatures in the summer months cause warm season plants to be a part of the plant community.

Mean Annual Air Temperature: 45-52
Mean Annual Soil Temperature: 47-54

Table 3. Representative climatic features

Frost-free period (average)	148 days
Freeze-free period (average)	121 days
Precipitation total (average)	254 mm

Influencing water features

Soil features

The soils on this site are typically deep sand from alluvium and lacustrine deposits derived from sandstone and igneous rocks. Some soils are also eolian deposits originating from lacustrine materials deposited by the ancient Lake Bonneville. There are typically no rocks found within the sandy profile, but can have up to 5 percent gravels in the subsurface profile. The soil is somewhat excessively to excessively drained.
The soils associated with this site are: Berent (UT626, UT634); Biblesprings (UT626)

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone
Surface texture	(1) Loamy fine sand (2) Loamy sand (3) Fine sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Rapid to moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.84–9.91 cm

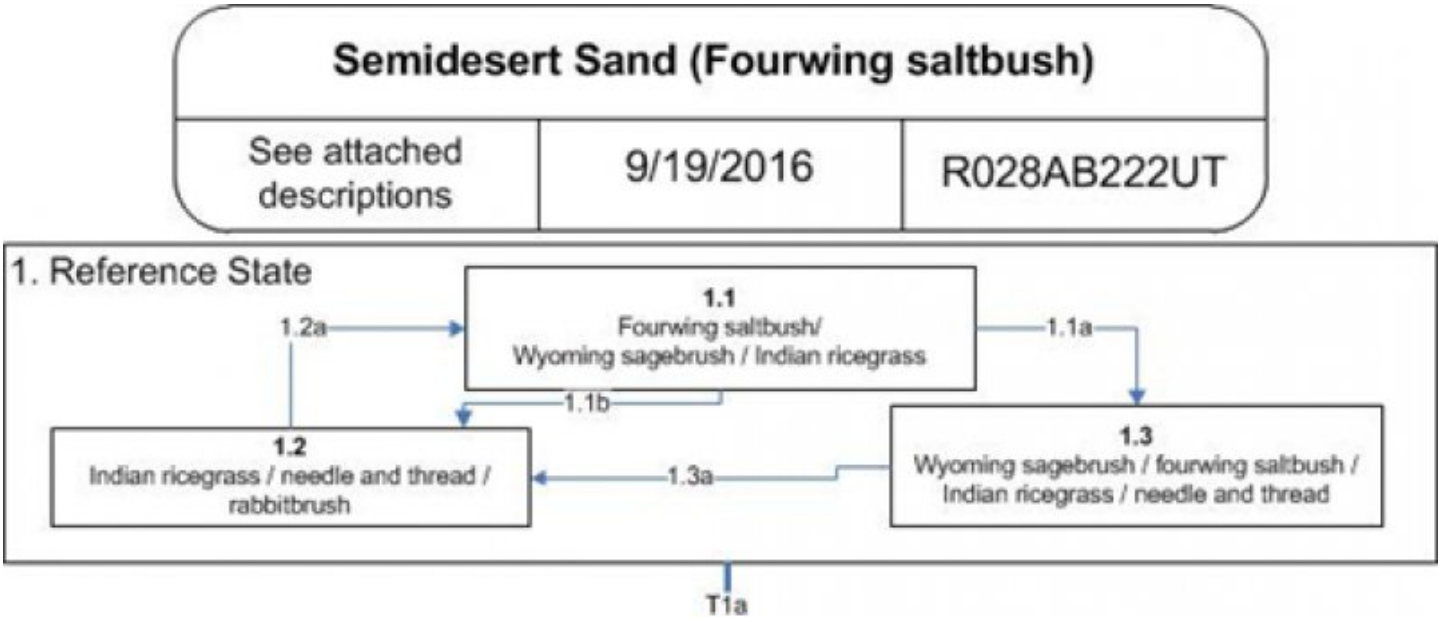
Calcium carbonate equivalent (0-101.6cm)	5–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–30
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The plant community on this ecological site is dominated by fourwing saltbush, Wyoming sagebrush, Indian ricegrass, and needle and thread (*Hesperostipa comata*). James' galleta (*Pleuraphis jamesii*), sand dropseed (*Sporobolus cryptandrus*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus*) are also found frequently on this site. Location on the valley floor as made this site susceptible to human influences, such as grazing. Potentially, grazing has been an influence on plant community dynamics since European settlement in the mid-1800s. Fourwing saltbush is fairly palatable to livestock and can be eliminated or reduced in density by overgrazing. Fire can also reduce the density of fourwing saltbush. The introduction of livestock, along with alteration of fire frequency, and spread of non-native plants can cause this site to depart from reference condition. Shifting from reference is marked by a decrease in native perennial grasses and shrubs, while annual forbs and grasses increase. Because this site is located on fairly unstable landforms, such as dunes, removal of native vegetation can increase erosion and active movement of dunes. Non-native plants can become established after disturbances, cheatgrass (*Bromus tectorum*), Russian thistle (Salsola iberica) and halogeton (Hologetom glomeratus) are common invasive plants on this site.

As plant communities respond to changes in management or natural influences, recovery to previous states may not be possible without major energy inputs. The amount of energy needed to affect vegetative shifts depends on present biotic and abiotic features and the desired results. The following diagram does not necessarily depict all possible transitions and states, but it does present the most prevalent and repeatable plant communities. Ongoing data is collection may warrant revision or removal of plant communities and new ones may be added. This model was developed using rangeland data collected from 1984 to 2014. Both ocular estimated and measured data was collected and utilized.

State and transition model



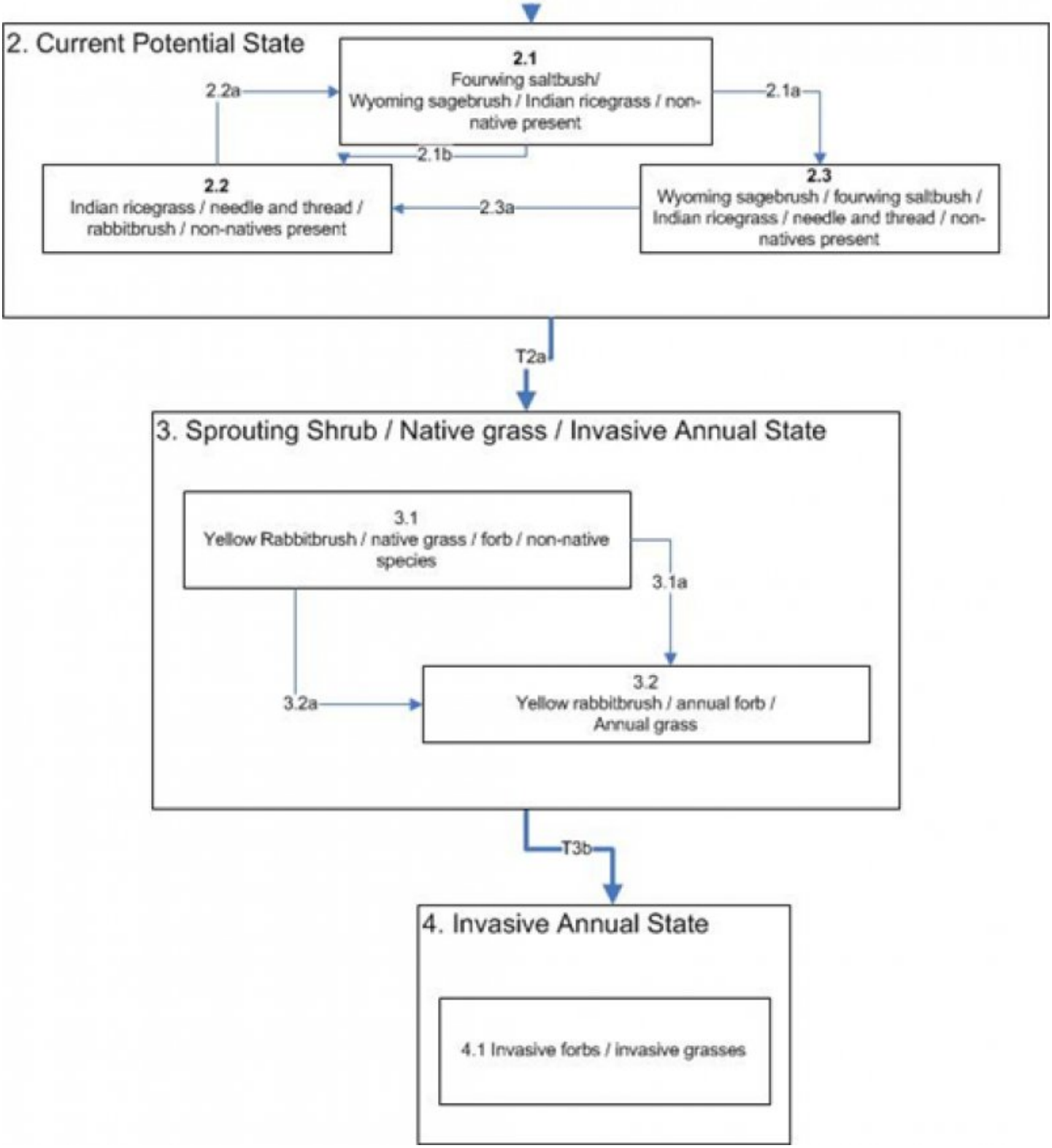


Figure 6. STM R028AB222UT

State 1
Reference State

This state represents the natural range of variability that dominates the dynamics of this ecological site. The biotic communities that persist when all successional sequences occur within the natural disturbance regime. Perennial cool and warm season grasses and a diverse shrub community are dominant in this State. Primary disturbance mechanisms include fire, grazing by native herbivores, and active alluvial deposits that change drainage patterns. These disturbances coupled with weather events dictate the dynamics that occur within the natural range of variability. The reference state is self-sustaining and hold a high resistance to natural disturbances and high resilience after natural disturbances. When natural disturbances occur, the rate of recovery is relatively rapid due to niches being filled with highly adapted native vegetation. The reference state has been determined by study of literature reviews, trends in plant community dynamics, and historical accounts.

Community 1.1
Fourwing saltbush/Wyoming sagebrush/Indian ricegrass

This plant community is characterized by both native shrubs and perennial cool season grasses and some warm season grasses. Indian ricegrass, Needleandthread, sand dropseed, and galleta may be present. Fourwing saltbush and/or Wyoming sagebrush form the dominant visual aspect, shadscale and rabbitbrush are generally present. Other grass, shrubs, and forbs may or may not be present and cover is variable. The composition by air-dry weight is approximately 55 percent perennial grasses, 5 percent forbs, and 40 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	93	401	678
Shrub/Vine	67	291	493
Forb	9	37	62
Total	**169**	**729**	**1233**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-30%
Grass/grasslike foliar cover	15-30%
Forb foliar cover	5%
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	–	–	–	0-10%
>0.3 <= 0.6	–	–	25-35%	–
>0.6 <= 1.4	–	25-35%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 8. Plant community growth curve (percent production by month). UT2221, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Community 1.2
Indian ricegrass/needle and thread/rabbitbrush

This community phase is characterized by perennial grasses where Indian ricegrass is the dominant plant species. Needle and thread, sand dropseed, sandhill muhly, and galleta may also be present. Perennial warm and cool season grasses (30-50% cover) are very common while shrubs make up only 1-9% of the canopy cover, measured as first raindrop impact. Fourwing saltbush and/or Wyoming sagebrush form the dominant visual cover.

Community 1.3
Wyoming sagebrush/four-wing saltbush/Indian ricegrass/needle and thread

This plant community is characterized by a dominance of native perennial shrubs, where cool season perennial grasses are still present in the understory. Indian ricegrass, Needleandthread, sand dropseed, and galleta may be present. Fourwing saltbush and/or Wyoming sagebrush form the dominant visual cover. Other grass, shrubs, and forbs may or may not be present and cover is variable. This plant community is more at risk that other plant communities in the reference state due to the lack of understory.

Pathway 1.1b
Community 1.1 to 1.2

This pathway occurs as events favor the increased establishment of perennial cool season grasses with a decrease in shrub cover. Events typically include fire, which reduces shrub cover and allows for increased establishment of grasses, and insect herbivory.

Pathway 1.1a
Community 1.1 to 1.3

This pathway occurs as events favor the increased establishment of shrubs. Events may include drought or time without fire disturbances. Drought favors the establishment of shrubs due to its ability to out-compete native perennial grasses for moisture. Time without fire allows shrubs, which have longer recovery periods, to establish.

Pathway 1.2a
Community 1.2 to 1.1

This pathway occurs as natural events favor the increased establishment of shrubs, including drought or time without disturbances. Drought favors the establishment of shrubs due to their ability to out-compete native perennial grasses for moisture. Time allows shrubs, which have longer recovery periods, to establish.

Pathway 1.3a
Community 1.3 to 1.2

This pathway occurs as natural events favor the increased establishment of perennial cool season grasses with a decrease in shrub cover. Events typically include patchy fire, which reduces shrub cover and allows for increased establishment of grasses, and insect herbivory.

State 2
Current Potential State

This state is similar to the reference state except that non-native plants are now present in all plant community phases. The primary disturbance mechanisms can be natural or human induced. Events, such as improper livestock grazing, prolonged rodent activity, changes in historic fire regimes, OHV overuse, insect herbivory, or drought may influence this site. A shift in species composition will affect the nutrient cycling, soil-water relationships, hydrology, and soil stability. Dominant grasses include both cool season and some warm season grasses; however

many times heavy spring grazing will remove the cool season grasses and heavy late summer and early fall grazing will remove the warm season grasses. This state is losing resistance to disturbances and resilience after disturbance. Invasive plants are beginning to fill the niches and establish on the site.

Community 2.1
Four-wing saltbush/Wyoming sagebrush/Indian ricegrass/non-native

This plant community is characterized by both native shrubs and perennial cool season grasses. Indian ricegrass, Needleandthread, sand dropseed, galleta and invasive non-native species may be present.

Community 2.2
Indian ricegrass/needle and thread/rabbitbrush/non-natives

This community phase is characterized by perennial grassland where Indian ricegrass is the dominant plant species. Needle and thread, sand dropseed, blue grama, and galleta may also be present. Perennial cool season grasses are very common while shrubs make up only a small percentage of the canopy cover, measured as first raindrop impact. Fourwing saltbush and/or Wyoming sagebrush form the dominant visual cover. Commonly seen invasive plant species include cheatgrass, Russian thistle, and halogeton. Other grasses, shrubs, and forbs may or may not be present and cover is variable.

Community 2.3
Wyoming sagebrush/Four-wind saltbush/Indian ricegrass/needle and thread/non-natives

This plant community is characterized by a dominance of native perennial shrubs, where cool and warm season perennial grasses are still present in the understory. Needleandthread, Indian ricegrass, sand dropseed, and galleta may be present. Fourwing saltbush and/or winterfat form the dominant visual cover, and generally cutler mormontea is present. Commonly seen invasive plant species include cheatgrass and Russian thistle. Other grass, shrubs, and forbs may or may not be present and cover is variable.

Pathway 2.1b
Community 2.1 to 2.2

This pathway occurs as natural events favor the increased establishment of perennial cool season grasses with a decrease in shrub cover. Events typically include fire, insect herbivory, and grazing in such a way to reduce shrub cover and production, resulting in an increase in the grass and forb understory.

Pathway 2.1a
Community 2.1 to 2.3

This pathway occurs as natural events favor the increased establishment of shrubs. Events may include drought, time without a fire disturbance, and grazing livestock in such a way that removes the grass and forb understory and causes an increase in shrub cover and production.

Pathway 2.2a
Community 2.2 to 2.1

This pathway occurs as events favor the increased establishment of shrubs, including drought time without fire disturbances, and grazing livestock in such a way that removes the perennial grass and forb understory and facilitates the increased establishment of shrubs.

Pathway 2.3a
Community 2.3 to 2.2

This pathway occurs as events, such as fire, insect herbivory, or grazing livestock in such a way to decrease shrub cover and production, favor the increased establishment of perennial warm and cool season grasses with a decrease in shrub cover.

State 3
Sprouting Shrub/Native Grass/Invasive Annual State

This state occurs after repeated fires or over grazing. Fourwing saltbush is susceptible to overgrazing and can leave a system if pressured by grazing. Fire can also remove fourwing saltbush from a site. It can then be replaced by fire tolerant shrubs such as rabbitbrush. Invasive annual, like cheatgrass and Russian thistle can also become dominant in the understory. Community phase 3.2 is the "At risk" phase.

Community 3.1
Yellow rabbitbrush/native grass/forb/non-natvie species

This plant community is characterized by a shrub overstory with an invasive forb and grass understory. The native and/or introduced perennial grass canopy cover is minimal. Invasive forbs make up a large portion of the understory. Russian thistle is present and the most productive species on the site. Other invasive species include stickseed, annual Cryptantha, tansy mustard, and broom snakeweed. Minimal amounts of cheatgrass are present.

Community 3.2
Yellow rabbitbrush/annual forb/annual grass

This plant community is characterized by a minimal shrub overstory with an invasive forb/grass understory and it is the “at-risk” community.

Pathway 3.1a
Community 3.1 to 3.2

Improper grazing management or fire reducing perennial bunchgrass cover and increasing annual forbs and grass cover.

Pathway 3.2a
Community 3.2 to 3.1

Grazing pressure alleviated allowing perennial bunchgrasses to establish

State 4
Invasive Annual State

This state is characterized by the dominance of invasive grasses/forbs. These species may include, but are not limited to cheatgrass, Russian thistle, tansy mustard, broom snakeweed, annual stickseed, or annual Cryptantha. One or more invasive species has increased to a point where they influence or drive the disturbance regime and nutrient cycle. Russian thistle and/or cheatgrass are the most likely of these species to establish and dominate. Russian thistle is a prolific reproducer—one plant can produce up to 250,000 seeds, which are dispersed by the wind causing the dead plant to “tumble” across the landscape. While generally considered an unwanted weed, Russian thistle may actually help disturbed sites recover more quickly. If topsoil is present, Russian thistle roots are invaded by mycorrhizal fungi and because this plant does not form associations with the fungi the root and plant are killed. This causes increased mycorrhizal fungi in the soil and an increased chance for other plants to establish through the aid of these fungi associations. Yet, managers must be aware that that without proper management other invasive annuals, such is cheatgrass may become established instead of the desirable native species. If topsoil is missing the mycorrhizal fungi, Russian thistle can persist for relatively long periods of time (Howard, 1992). Cheatgrass has an entirely other effect on the soil/plant/water relationships. Research has shown that plant species differ substantially in the effects on soil water content and temperature, and in their effects on the frequency and intensity of disturbance. After cheatgrass has invaded a site fundamental nutrient cycling processes, root pores, mycorrhizal associations, microbial species, and soil organic material changes (Chapin et al. 1997; Belnap and Phillips, 2001). These alterations may eventually create ecologically impoverished sites that are very difficult to restore to functionally diverse perennial herbaceous and woody communities. The competitiveness of the invasive species and the ability of these species to quickly establish after a disturbance make this state extremely resistance to change and resilient after a disturbance. Invasive Annual State: Community phases influenced by improper grazing and weather cycles. Indicators: A complete understory of invasive annuals, where native perennial shrubs, grasses, and forbs are minimally present. Feedbacks: Improper livestock grazing and weather cycles that maintain

the dominance of invasive forbs/shrubs with minimal decrease in occurring native perennial grasses, shrubs, and forbs. Increased occurrence of cheatgrass, decreasing the fire return interval. Flooding and alluvial deposits that facilitates the establishment of sand sagebrush. Trigger – The increased establishment of cheatgrass, caused by a decrease in the fire return interval, which facilitates the continued removal of other grasses, shrubs, and forbs.

Community 4.1
Invasive forbs/invasive grasses

This plant community is characterized by a shrub overstory with an invasive forb and grass understory. The native and/or introduced perennial grass canopy cover is minimal. Invasive forbs make up a large portion of the understory. Russian thistle is present and the most productive species on the site. Other invasive species include stickseed, annual Cryptantha, tansy mustard, and broom snakeweed. Minimal amounts of cheatgrass are present.

Transition T1A
State 1 to 2

This transition is from the native perennial bunchgrass understory in the reference state to a state that has non-native invasive plants present in the understory. This transition occurs as natural and/or management actions favor a decline in native perennial grasses and an increase in invasive plant species. Possible events include poorly managed domestic livestock, extended droughts, fire, etc. Cheatgrass, although has been known to establish in intact perennial vegetation communities that have experienced little disturbances either caused naturally or by human activities. Once non-native plants have established, a threshold had been crossed.

Transition T2A
State 2 to 3

Inappropriate grazing management favoring shrub dominance and reducing perennial bunchgrasses and/or drought or fire.

Transition T3A
State 3 to 4

Continued improper grazing or large fire

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	**Primary Shrubs**			188–275	
	fourwing saltbush	ATCA2	*Atriplex canescens*	118–157	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	24–39	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	24–39	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	24–39	–
3	**Secondary Shrubs**			39–78	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	8–24	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	8–24	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	8–24	–
	spiny hopsage	GRSP	*Grayia spinosa*	8–24	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	8–24	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	8–24	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	8–24	–
Grass/Grasslike					
0	**Primary Grasses**			298–432	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	235–314	–
	needle and thread	HECO26	*Hesperostipa comata*	39–78	–
	James' galleta	PLJA	*Pleuraphis jamesii*	24–39	–
1	**Secondary Grasses**			39–78	
	purple threeawn	ARPU9	*Aristida purpurea*	8–24	–
	squirreltail	ELEL5	*Elymus elymoides*	8–24	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	8–24	–
	western wheatgrass	PASM	*Pascopyrum smithii*	8–24	–
	Sandberg bluegrass	POSE	*Poa secunda*	8–24	–
	alkali sacaton	SPAI	*Sporobolus airoides*	8–24	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	8–24	–
Forb					
2	**Forbs**			39–78	
	Geyer's milkvetch	ASGE	*Astragalus geyeri*	8–24	–
	mat sandbur	CELO3	*Cenchrus longispinus*	8–24	–
	western tansymustard	DEPI	*Descurainia pinnata*	8–24	–
	money buckwheat	ERNU4	*Eriogonum nummulare*	8–24	–
	clasping pepperweed	LEPE2	*Lepidium perfoliatum*	8–24	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	8–24	–

Animal community

Approximately 90 to 95 percent of the plants furnish forage for livestock. Only a few species of plants occur, but they offer enough variety to provide balanced nutrition for cattle, sheep, and horses. The site is adapted to all seasons of use, but is best adapted for winter and spring use.

Wildlife species found at least part of the year are pronghorn antelope, chukar, gambel's quail, sage grouse, cottontail, coyote, badger, songbirds, and small mammals.

This is a short list of the more common species found. Many other species are present as well and migratory birds are present at times.

Hydrological functions

The soil series is in hydrologic group A. The hydrologic curve number is 39 when the vegetation is in good condition.

Recreational uses

This site has poor to fair aesthetic appeal and natural beauty. It has little recreational value. It has a few plants blooming mostly in the spring. It has slight value for hunting and very little value for camping and picnicking except a small amount of winter and early spring use.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT	
General legal description	West Box Elder County Soil Survey, Utah

Contributors

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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	02/08/2010
Approved by	Shane A. Green

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** No rills present. Very minor rill development may occur in sparsely vegetated areas. If rills are present, they should be widely spaced and not connected. Rill development may increase following large storm events, but should begin to heal during the following growing season. Frost heaving will accelerate recovery. Rill development may increase when run inflow enters site from adjacent sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop). Site is essentially level and rills do not form.

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2. **Presence of water flow patterns:** Water flow patterns will be short (2-5') and meandering; interrupted by plants and exposed rocks. Some evidence of erosion or deposition associated with flow patterns. Where slopes exceed 5%, water flow patterns may be longer (5–10').

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3. **Number and height of erosional pedestals or terracettes:** Plants may have small pedestals (1-3") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (1-3") and show little sign of active erosion. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

   Well-developed biological crusts may appear pedestalled, but are actually a characteristic of the crust formation. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-40% bare ground (soil with no protection from raindrop impact). Herbaceous communities are most likely to have lower values. As species composition by shrubs increases, bare ground is likely to increase. Poorly developed biological soil crust that is susceptible to raindrop splash erosion should be recorded as bare ground. Very few if any bare spaces of greater than 1 square foot.

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5. **Number of gullies and erosion associated with gullies:** No gullies present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of active wind generated soil movement is present in reference communities. Wind scoured (blowouts) and depositional areas are rarely present. Slight depositional mounding at plant bases. Slight deposition may occur in perennial bunchgrasses, under winterfat canopy, and within biological soil crusts. Wind scour or deposition areas are associated with fire activity. Very small areas (less than 4 square feet) may be present.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water and wind movement. Very minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some leaves, stems, and small twigs may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface is moderately stable (average soil stability score of 3 - 4).

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** This description is based on the modal soil (Goldrun LFS, 8-25%, soil survey area: 611, Tooele), the only soil correlated with this site.

   Soil surface horizon is typically 7 inches deep. Structure is typically weak thin platy. Color is typically light brownish gray (10YR 6/2), dark grayish brown (10YR 4/2) moist.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants and any well-developed biological soil crusts (where present) will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well-developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Since site is level and well covered, infiltration is very high and runoff very low.

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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. Naturally occurring soil horizons may be harder than the surface and should not be considered as 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: Indian ricegrass

    Sub-dominant: fourwing saltbrush

    Other: other grasses > other shrubs > forbs

    Additional: In the northern portion of the MLRA cool-season perennial grasses (Indian ricegrass, needle and thread) dominate. In the southernmost portion of the MLRA warm-season perennial grasses (galleta, sand dropseed) dominate. The two groups share dominance in the middle portion of the MLRA.

    Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. crested wheatgrass and Russian wildrye may substitute for mid stature cool season perennial native bunchgrasses.). Biological soil crust is variable in its expression on this site and is measured as a component of ground cover. Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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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 very little recent mortality or decadence apparent in either the shrubs or grasses. Some mortality of bunchgrass and other shrubs may occur during very severe (long-term) droughts. There may be partial mortality of individual bunchgrasses and shrubs during less severe drought. Long-lived species dominate site. Open spaces from disturbance are quickly filled by new plants through

seedlings and reproductive reproduction (tillering).

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14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 20-30% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 650#/acre.
    Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.

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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:** Annual grasses and annual forbs

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.
