USDA Natural Resources
Conservation Service

Ecological site R034BY103UT
Desert Clay (Castlevalley saltbush)

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

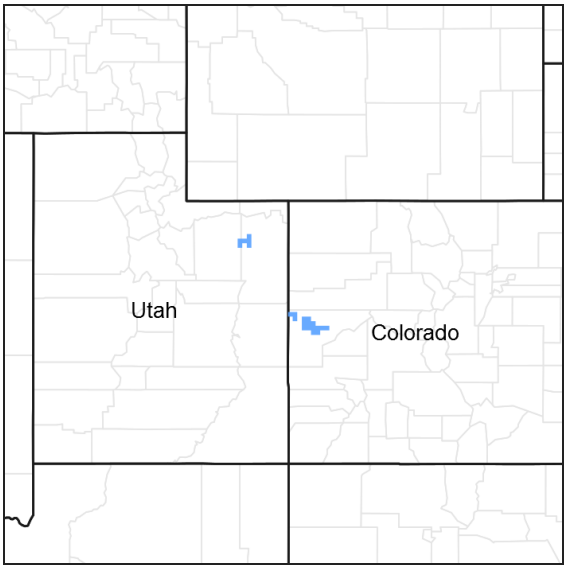


Figure 1. Mapped extent

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

Characteristic soils in this site are deep over shale and well drained. They formed in residuum and alluvium derived mainly from mancos or morrison shale parent materials. Surface soil textures range from silty clay loam, silt loam, extremely bouldery silt loam to loams. They are slightly to very strongly alkaline in the soil profile. Permeability is slow to very slow and runoff is high to very high. The water supplying capacity is 2 to 7 inches. Average annual soil loss in potential is approximately 3 tons/acre. Soil temperature regime is mesic and soil moisture regime is typic aridic.

Associated sites

R034BY117UT	**Desert Shallow Clay (Mat Saltbush)** Desert Shallow Clay (Mat saltbush)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex cuneata*
Herbaceous	(1) *Pleuraphis jamesii*

Physiographic features

This site occurs on eroded shale hills, benches and alluvial fans. Slopes are mostly 1 to 50 percent. Elevations range from 4,500 feet to 6,100 feet on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Pediment (2) Mesa (3) Plain
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,372–1,859 m
Slope	1–50%

Ponding depth	Not specified
Water table depth	Not specified

Climatic features

Average annual precipitation is 5 to 9 inches. Approximately 60 to 70 percent occurs as rain from March through September. On the average, November through February are the driest months and July through October are the wettest months. The mean annual air temperature is 8.4 degrees Celsius and the soil temperatures are in the mesic regime. The average freeze-free period is 120 to 160 days. In average years, plants begin growth around March 15 and end growth around October 15.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	120-160 days
Precipitation total (characteristic range)	127-229 mm

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

Characteristic soils in this site are deep over shale and well drained. They formed in residuum and alluvium derived mainly from mancos or morrison shale parent materials. Surface soil textures range from silty clay loam, silt loam, extremely bouldery silt loam to loams. They are slightly to very strongly alkaline in the soil profile. Permeability is slow to very slow and runoff is high to very high. The water supplying capacity is 2 to 7 inches. Average annual soil loss in potential is approximately 3 tons/acre. Soil temperature regime is mesic and soil moisture regime is typic aridic.

Modal Soil: Hanksville Family — fine, mixed (calcareous), mesic Typic Torriothents

Table 4. Representative soil features

Parent material	(1) Alluvium–shale (2) Residuum–shale
Surface texture	(1) Loam (2) Extremely bouldery silt loam (3) Silt loam (4) Silty clay loam
Family particle size	(1) Fine (2) Fine-silty
Drainage class	Well drained
Permeability class	Very slow to slow
Depth to restrictive layer	25–102 cm
Soil depth	25–102 cm
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0–26%
Available water capacity (Depth not specified)	5.08–17.78 cm
Calcium carbonate equivalent (Depth not specified)	3–40%

Electrical conductivity (Depth not specified)	0–16 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–15
Soil reaction (1:1 water) (Depth not specified)	7.4–9.6
Subsurface fragment volume <=3" (Depth not specified)	0–8%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

State 1 Reference State
The reference state was determined by literature review, historical accounts and observations of trends in plant community dynamics. Relic areas not influenced by grazing were not located within this site and may not exist. Community composition data were inferred from State 2.

The reference state represents the plant communities and ecological dynamics of this ecological site under pre-settlement conditions and a natural disturbance regime. The plant communities of the reference state were likely similar to the climate induced plant communities of the interpretive state (State 2), and were characterized by a relatively sparse shrub cover of valley saltbush with Indian ricegrass and James' galleta. Indian ricegrass and valley saltbush cover were likely higher in the reference state. James' galleta often increases under grazing due to loss of less grazing tolerant species. Annual forbs were likely sparse and a minor component of the vegetation communities, highly dependent on precipitation timing and amount. The primary disturbances included fluctuations in precipitation and native ungulate browsing. Plant community composition likely changed during wet and dry periods, fluctuating between community phases 1.1 and 1.2.

Reference State: Plant communities influenced by climate fluctuations between wet and dry periods.

Indicators: Communities dominated by valley saltbush, with Indian ricegrass and James' galleta important perennial grasses. No invasive species present.

Feedbacks: Natural fluctuations in climate allow for a self-sustaining sparse shrub community with shrub and grass components.

At-risk Community Phase: Community 1.2 is particularly susceptible to damage from livestock grazing, invasion by non-native species, and erosion.

Trigger: Improper livestock grazing in an arid system that did not evolve with large herbivores, which reduced plant cover and disturbed soils, and concomitant invasion of non-native plants that permanently altered ecological dynamics.

Community 1.1 Valley saltbush /Indian ricegrass – James' galleta shrubland
Data for this community phase does not exist, but the community composition was likely similar to community phase 2.1, except with higher vegetative cover and production, fewer forbs, and a greater importance of Indian ricegrass and less importance of James' galleta. Species composition in the below table was interpreted from Community Phase 2.1.

Community 1.2 Valley saltbush /James' galleta – Indian ricegrass shrubland
Data for this community phase does not exist, but the community composition was likely similar to community phase 2.2, except with higher vegetative cover and production and fewer forbs. James' galleta may naturally have been a more dominant grass in this phase due to higher drought tolerance than Indian ricegrass.

Pathway 1.1a Community 1.1 to 1.2
This pathway occurs when a dry climatic phase triggers mortality and dieback in valley saltbush, Indian ricegrass,

and other shallow-rooted shrubs and herbaceous species. James' galleta may be impacted with severe drought, but is generally more tolerant of drought conditions than the other dominant species.

Pathway 1.2a Community 1.2 to 1.1
This pathway occurs with wetter than normal, or a return to normal precipitation periods and time, that allow for recruitment and growth of valley saltbush and Indian ricegrass.

State 2 Current Potential
This state represents the current potential of this ecological site, and the dynamics include disturbance by livestock and invasive species in addition to the climate fluctuations that influenced the reference state. This state will naturally fluctuate between community phases 2.1 and 2.2, and will shift to community phase 2.3 with abusive livestock use. Continued abusive use, especially if coupled with drought, could cause a transition to a degraded state (State 3), or a forb dominated state (State 4).

Current Potential State: Plant communities influenced by climate fluctuations between wet and dry periods, livestock grazing, and invasive plants.

Indicators: Communities dominated by valley saltbush with Indian ricegrass and James’ galleta important perennial grasses. Invasive species including cheatgrass and redstem stork’s bill (*Erodium cicutarium*) are typically present but not abundant.

Feedbacks: Natural fluctuations in climate allow for a self-sustaining sparse shrub community with shrub and grass components. Improper livestock use that damages soils, reduces vegetative cover and promotes establishment of non-native species.

At-risk Community Phase: Community phases 2.2 and 2.3 are at risk of transitioning to a degraded or forb dominated state with continued abusive livestock grazing use, especially in combination with drought.

Trigger: Continuous improper livestock grazing, or severe drought with invasive plant invasion.

Community 2.1 Valley saltbush /Indian ricegrass – James’ galleta shrubland
This phase is characterized by shrub dominance of valley saltbush. Secondary shrubs are of minor importance. Common species include green molly (*Bassia americana*), and broom snakeweed (*Gutierrezia sarothrae*). Perennial grasses are an important component of this phase, with Indian ricegrass, squirreltail (*Elymus elymoides*), and James’ galleta important species. Cheatgrass may be present. The forb component of this community is highly variable, with composition and amounts of forbs varying from year to year and site to site. The non-native annual forb redstem stork’s bill may be present.

Community 2.2 Valley saltbush /James’ galleta shrubland
This community phase is characterized by valley saltbush, with minor secondary shrubs as in community phase 2.1. James’ galleta is the dominant grass in this phase. Indian ricegrass and squirreltail is the second most abundant grasses. Cheatgrass may be present at low amounts. Forbs may be more diverse in this phase, due to reduced competition with shrubs. The below table lists commonly forb encountered species. Redstem stork’s bill may be present at low amounts.

Community 2.3 Valley saltbush
Community composition data were not collected for this phase. This community phase is characterized by dominance of bare ground, almost no herbaceous cover, and greatly reduced shrub cover. This phase is at high risk of erosion and invasive species dominance.

Pathway 2.1a Community 2.1 to 2.2
This pathway occurs when a dry climatic phase triggers mortality and dieback in valley saltbush, Indian ricegrass, and other shallow-rooted shrubs and herbaceous species. James' galleta may be impacted with severe drought, but is generally more tolerant of drought conditions than the other dominant species.

Pathway 2.1b Community 2.1 to 2.3
This pathway occurs when abusive livestock grazing, often in combination with drought, remove the bulk of herbaceous vegetation, and remove significant shrub cover, leaving a phase dominated by bare ground with low

shrub cover.

Pathway 2.2a Community 2.2 to 2.1
This pathway occurs with wetter than normal, or a return to normal precipitation periods and time, that allow for recruitment and growth of valley saltbush and Indian ricegrass.

Pathway 2.2b Community 2.2 to 2.3
This pathway occurs when abusive livestock grazing, often in combination with drought, remove the bulk of herbaceous vegetation, and remove significant shrub cover, leaving a phase dominated by bare ground with low shrub cover.

Pathway 2.3a Community 2.3 to 2.1
This pathway may occur with time in the absence of further disturbance, and will occur more quickly with favorable precipitation conditions. The time necessary for recovery is unknown; one study found an increase in Gardner's saltbush cover after 14 years of rest from grazing. Recovery times will depend on precipitation and the level of degradation.

Pathway 2.3b Community 2.3 to 2.2
This pathway may occur with rest from grazing and no additional disturbance. James' galleta may recover more quickly, and this pathway may be more likely than pathway 2.3a.

State 3 Degraded
This state is characterized by low vegetative cover with eroded soils and dynamics influenced by halogeton invasion. Reduced vegetative cover in this state has exposed soil to erosion, and soil surfaces have high gravel cover, sometimes approaching a desert pavement appearance. Halogeton alters soil biology and chemistry, which can make soils more hostile for native plant recruitment, and facilitates further halogeton establishment. This state is very vulnerable, and continued abusive use, especially if coupled with drought, or severe drought alone could cause a transition to a forb dominated state (State 4).

Degraded State: Plant communities influenced by abusive livestock grazing, climate fluctuations and halogeton invasion.

Indicators: Low vegetative cover and high cover of bare ground and gravels. Halogeton is significant but not dominant. Forbs are more important and diverse in this state than in the interpretive or reference state.

Feedbacks: Improper livestock use that damages soils, reduces vegetative cover and promotes soil erosion, establishment of non-native species, and an increase in forbs.

At-risk Community Phase: Community phase 3.1 is at high risk of transitioning to a forb dominated state (State 4).

Trigger: Continuous improper livestock grazing, and/or severe drought or other disturbance that removes vegetation.

Community 3.1 Valley saltbush / James’ galleta- Halogeton
This community phase is characterized by low cover of valley saltbush,. James’ galleta is the dominant species. Indian ricegrass may be present at low cover. Forbs make a significant contribution to this community phase, although cover and density will vary with precipitation. Halogeton is prevalent in this community phase, but is still at relatively low cover.

State 4 Forb dominated
This state is characterized by dominance by forbs, with halogeton the most important species. Valley saltbush may be eliminated or greatly reduced. James’ galleta is the dominant grass, and Indian ricegrass may be eliminated or greatly reduced. Desert trumpet (*Eriogonum inflatum*) may be an important species. Reduced vegetative cover in this state has exposed soil to erosion, and soil surfaces have high gravel cover, sometimes approaching a desert pavement appearance. Halogeton alters soil biology and chemistry, which can make soils more hostile for native plant recruitment, and facilitates further halogeton establishment.

Annual dominated State: Plant communities influenced by climate fluctuations between wet and dry periods,

livestock grazing, and invasive plants.

Indicators: Communities dominated by forbs, with halogeton the dominant species. Valley saltbush is eliminated or greatly reduced. High cover of bare ground and gravels, and erosion is typically visible.

Feedbacks: Low or absent cover of native perennials, a halogeton seedbank, and altered soils promote the maintenance of a halogeton dominated state.

Community 4.1 Forb dominated
This community phase is characterized by absence or very low cover of valley saltbush and dominance of forbs. Halogeton is the dominant plant, and desert trumpet is an important species. James' galleta is the most abundant native perennial grass, but is present at much reduced levels relative to more intact states.

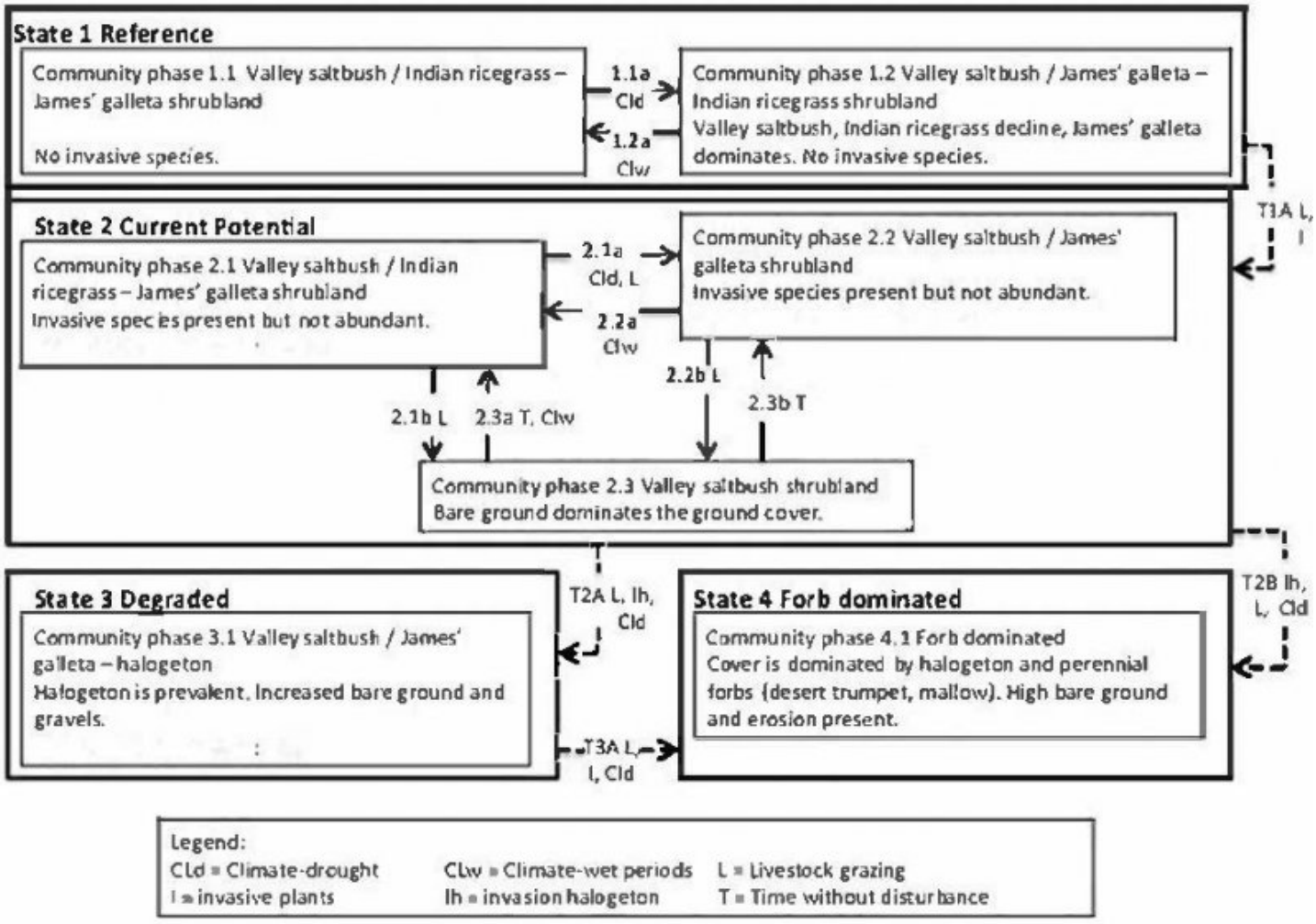
Transition T1A State 1 to 2
Transition from reference state (State 1) to interpretive state (State 2). This transition occurred with pervasive intensive livestock use beginning in the 1880's. Livestock grazing introduced invasive species such as cheatgrass and halogeton, and increased site susceptibility to continued invasion; once established these species are virtually impossible to remove, thus causing a shift to an altered state. The composition and productivity of the altered state was also likely affected, with reduced cover of palatable, grazing intolerant species and increasing the importance of less palatable, more grazing tolerant species.

Transition T2A State 2 to 3
Transition from interpretive state (State 2) to degraded state (State 3). This transition may occur with continued heavy grazing that reduces valley saltbush cover and exposes soils to invasion by halogeton and erosion.

Transition T2B State 2 to 4
Transition T2B Transition from interpretive state (State 2) to forb dominated state (State 4). This transition may occur when severe abusive grazing, often in combination with drought, that eliminates or depletes valley saltbush cover to the extent that halogeton and other forbs dominate.

Transition T3A State 3 to 4
Transition from degraded state (State 3) to forb dominated state (State 4). This transition may occur with continued abusive grazing, often in combination with drought, that eliminates or depletes valley saltbush cover to the extent that halogeton and other forbs dominate. This transition may occur even if livestock grazing is removed if drought or other disturbance removes valley saltbush cover and provides an opening for halogeton to become dominant.

State and transition model



State 1
Reference State

Community 1.1
Reference State

The dominant aspect of the plant community is castlevalley saltbush and galleta. The composition by air-dry weight is approximately 35 percent perennial grasses, 15 percent forbs, and 50 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	78	132	188
Grass/Grasslike	55	92	131
Forb	24	39	56
Total	**157**	**263**	**375**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	29-31%
Grass/grasslike foliar cover	19-21%
Forb foliar cover	9-11%
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	–	29-31%	–	9-11%
>0.3 <= 0.6	–	–	19-21%	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>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 Shrubs**			112–154	
	valley saltbush	ATCU	*Atriplex cuneata*	91–106	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	9–16	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	9–16	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	3–16	–
3	**Sub-Dominant Shrubs**			24–49	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	3–16	–
	mat saltbush	ATCO4	*Atriplex corrugata*	3–6	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–6	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	3–6	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	3–6	–
	green molly	BAAM4	*Bassia americana*	3–6	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	3–6	–
Grass/Grasslike					
0	**Dominant Grasses**			73–121	
	James' galleta	PLJA	*Pleuraphis jamesii*	46–61	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	16–30	–
	squirreltail	ELEL5	*Elymus elymoides*	3–16	

	squirreltail	ELEL5	*Elymus elymoides*	3–16	–
	purple threeawn	ARPU9	*Aristida purpurea*	6–9	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–6	–
1	**Sub-Dominant Grasses**			7–11	
	Grass, annual	2GA	*Grass, annual*	3–6	–
	Grass, perennial	2GP	*Grass, perennial*	3–6	–
Forb					
0	**Dominant Forbs**			7–31	
	desert trumpet	ERIN4	*Eriogonum inflatum*	3–16	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	3–16	–
2	**Sub-Dominant Forbs**			46–109	
	Forb, annual	2FA	*Forb, annual*	3–16	–
	Forb, perennial	2FP	*Forb, perennial*	3–16	–
	grass milkvetch	ASCH7	*Astragalus chloodes*	3–6	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	3–6	–
	Dinosaur milkvetch	ASSA5	*Astragalus saurinus*	3–6	–
	sego lily	CANU3	*Calochortus nuttallii*	3–6	–
	Gate Canyon buckwheat	ERHY3	*Eriogonum hylophilum*	3–6	–
	basin fleabane	ERPU9	*Erigeron pulcherrimus*	3–6	–
	Gray's biscuitroot	LOGR	*Lomatium grayi*	3–6	–
	rusty lupine	LUPU	*Lupinus pusillus*	3–6	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	3–6	–
	pale evening primrose	OEPA	*Oenothera pallida*	3–6	–
	woolly plantain	PLPA2	*Plantago patagonica*	3–6	–
	desert princesplume	STPI	*Stanleya pinnata*	3–6	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	3–6	–

Animal community

This site provides proper grazing for cattle and sheep during winter and early spring seasons. This site provides food and limited cover for wildlife. Wildlife using this site include jackrabbit, coyote, lizard, snake, mice, sparrow, and hawk.

Hydrological functions

The soil is in hydrologic groups c and d. The runoff curve numbers are 74 through 89 depending on the watershed condition

Recreational uses

This site may have aesthetic values but limited recreational opportunities.

Wood products

None

Inventory data references

Type Location: See the Grand County and Uintah County Soil Surveys.

Contributors

George Cook

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	05/31/2012
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are common. They may be more pronounced on steeper slopes and/or on areas located below exposed bedrock, or other water shedding areas where increased runoff may occur. Rills present should be < 2 inches deep, fairly long (> 15 feet) and somewhat widely spaced (8-10 feet). On steeper slopes, rills may be 20 to 25+ feet long and spaced 6 to 8 feet apart. The expression of rills may be less defined where coarse fragments (i.e., gravels and/or channers) dominate the soil surface.

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2. **Presence of water flow patterns:** Water flow patterns are common throughout the site. They often form sinuous flow patterns that wind around perennial plants and surface rock. Evidence of flow patterns is expected to increase somewhat with slopes greater than 15%. Water flow patterns are long (15-20 feet), narrow (1 to 2 feet wide), and spaced widely (10-20 yards) on gentle slopes (<15%) and more closely (<10 yards) on steeper slopes (>15%).

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3. **Number and height of erosional pedestals or terracettes:** Small pedestals may form at the base of plants that occur on the edge of water flow patterns, but should not show any exposed roots. Terracettes are fairly common, forming behind debris dams of small to medium sized litter (up to 1 inch) in water flow patterns. These debris dams may accumulate smaller litter (leaves, grass and forb stems) and sediment.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 45–60%. (Soil surface is typically covered by 5% surface fragments). Most bare ground is associated

with water flow patterns, rills, and gullies. Bare ground spaces should not be greater than 2 to 3 feet and may be connected. Poorly developed biological soil crusts that are interpreted as functioning as bare ground should be recorded as bare ground.

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5. **Number of gullies and erosion associated with gullies:** Rare on slopes < 15%. A few will be expected to occur on steeper slopes and on areas below exposed bedrock. There they do occur, their length often extends from the exposed bedrock to where the gully reaches a stream or other area where water and sediment accumulate. Gullies may show slightly more indication of erosion as slope increases, or as the site occurs adjacent to steep sites/watershed with concentrated flow patterns.

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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 deposition are not expected to 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 movement. Some litter removal may occur in flow channels with deposition occurring within 2 to 3 feet at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move. However, some litter movement is expected (up to 4 feet) with increases in slopes > 15% and/or increased runoff resulting from heavy thunderstorms.

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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 site should have a soil stability rating of 3 to 4 under plant canopies and a rating of 2 to 3 in the interspaces. The average should be a 3. Surface texture is silty clay loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Sagers) Soil surface horizon is typically 0 to 8 inches deep. Texture is a silt loam, structure is typically moderate medium and thin platy. Color is a pale brown (10YR 6/3). An ochric horizon extends 8 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.

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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 is expected to break raindrop impact and splash erosion reducing splash erosion but not eliminating it. Spatial distribution of vascular plants slows runoff somewhat by obstructing surface flows and help create sinuous flow patterns that dissipate energy and allow time for some infiltration. Natural erosion would be expected in most storms and spring 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. Clay content within the soil profile increases with depth. This should not be mistaken for a compaction layer.

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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: Non-sprouting shrubs (castlevalley saltbush, bud sagebrush) > Rhizomatous grasses (James galleta) > Cool season perennial bunchgrasses (Indian ricegrass, bottlebrush squirreltail) > Perennial forbs (scarlet globemallow) > Biological soil crusts.

Sub-dominant: Sprouting shrubs (winterfat, rubber rabbitbrush) > Perennial bunchgrasses (purple threeawn, sand dropseed) > Perennial forbs (Indian pipeweed).

Other: Biological soil crust is variable in its expression where present 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.

Additional: Moss and lichen communities will normally be found under plant canopies while the cyanobacteria may be found throughout the site. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species. Perennial and annual 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):** All age classes of perennial grasses should be present during years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. During severe (multi-year) drought or insect infestations, up to 20% of the winterfat may die. There may be partial mortality of individual bunchgrasses and shrubs during severe drought.

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14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 10 to 20%. Depth should vary from none to a 1 leaf thickness in the interspaces and from 1/4 - 1/2 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 200 to 270 pounds per acre on an average year. Production could vary from 100 to 375 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:** Russian thistle, halogeton, kochia, common sunflower, and annual mustards.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species should be present during average and above average growing years.
