

# Ecological site R032XY354WY

## Shale (Sh) 10-14" East Precipitation Zone

Accessed: 05/19/2024

**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.

**Associated sites**

R032XY358WY	Shallow Clayey (SwCy) 10-14" East Precipitation Zone
R032XY376WY	Very Shallow (VS) 10-14" East Precipitation Zone

**Similar sites**

R032XY254WY	Shale (Sh) 5-9" Wind River Basin Precipitation Zone
R032XY154WY	Shale (Sh) 5-9" Big Horn Basin Precipitation Zone

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

**Physiographic features**

This site occurs on moderate to steep slopes and ridge tops.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Escarpment
Elevation	1,646–2,286 m
Slope	0–60%
Ponding depth	0 cm
Aspect	Aspect is not a significant factor

**Climatic features**

Annual precipitation ranges from 10-14 inches per year. The normal precipitation pattern shows the least amount of precipitation in December, January, and February, increasing to a peak during the latter part of May. Amounts decrease through June, July, and August and then increase some in September. Much of the moisture that falls in the latter part of the summer is lost by evaporation and much of the moisture that falls during the winter is lost by sublimation. Average snowfall exceeds 20 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

Temperatures show a wide range between summer and winter and between daily maximums and minimums, due

to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

Winds are generally not strong as compared to the rest of the state. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 75 mph.

Growth of native cool-season plants begins about April 15 and continues to about July 15. Cool weather and moisture in September may produce some green up of cool season plants that will continue to late October.

The following information is from the “Thermopolis 2” climate station:

Minimum Maximum 5 yrs. out of 10 between  
Frost-free period (days): 74 149 May 23 – September 16  
Freeze-free period (days): 112 180 May 8 – October 1  
Annual Precipitation (inches): 7.6 21.9

Mean annual precipitation: 12.35 inches

Mean annual air temperature: 46.2 F (30.1 F Avg. Min. to 62.3 F Avg. Max.)

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at <http://www.wcc.nrcs.usda.gov/> website. Other climate station(s) representative of this precipitation zone include” Grass Creek 1E”, “Thermopolis”, Thermopolis 25NW”, “Buffalo Bill Dam” and “Black Mountain”.

Table 3. Representative climatic features

Frost-free period (average)	149 days
Freeze-free period (average)	180 days
Precipitation total (average)	356 mm

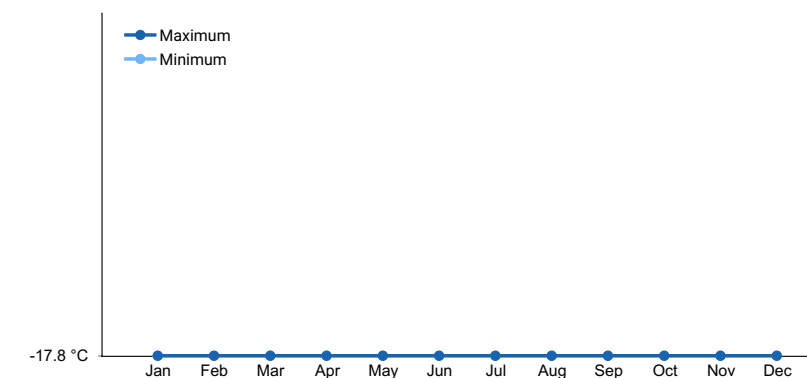


Figure 1. Monthly average minimum and maximum temperature

## Influencing water features

Stream Type: None

## Soil features

The soils of this site are very shallow (less than 10 inches to bedrock) well-drained soils formed from residuum. These soils have rapid to slow permeability and can be of any texture. This site usually occurs on steep slopes with many outcrops of shale bedrock. These clay shale soils are usually saline or alkaline in various degrees, and normally produce sparse stands of halophytes and saline tolerant grasses. The soil characteristics having the most influence on the plant community are the very shallow soils, which drastically reduces the amount of available moisture, and the potential quantities of soluble salts.

Major Soil Series correlated to this site include:

**Table 4. Representative soil features**

Surface texture	(1) Clay loam (2) Loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	3–25 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	1.52–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	4–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–13
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–20%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

Potential vegetation on this site is dominated by salt tolerant plants and drought resistant mid cool-season perennial grasses. The expected potential composition for this site is about 60% grasses, 5% forbs and 35% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates, species such as short warm-season grasses, birdfoot sagebrush and woodyaster will increase. Plains pricklypear and weedy annuals will invade. Cool season grasses such as Griffiths and bluebunch wheatgrasses and Indian ricegrass will decrease in frequency and production.

The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

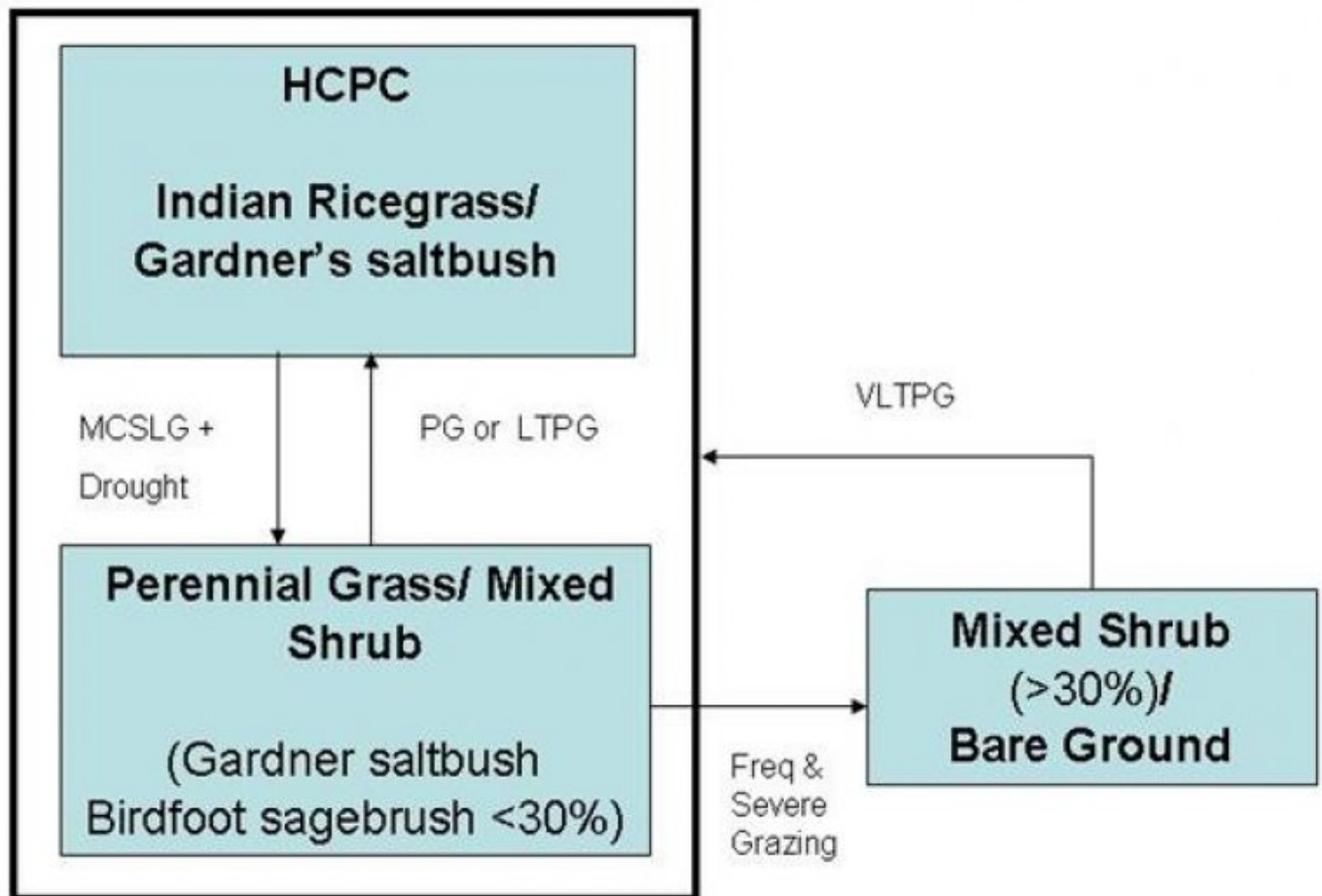
The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

### Plant Community Narratives

Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they probably are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities”. According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main

purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

## **State and transition model**



**BM** - Brush Management (fire, chemical, mechanical)

**Freq. & Severe Grazing** - Frequent and Severe Utilization of the Cool-season Mid-grasses during the Growing Season

**GLMT** - Grazing Land Mechanical Treatment

**LTPG** - Long-term Prescribed Grazing

**MCSLG** - Moderate, Continuous Season-long Grazing

**NU, NF** - No Use and No Fire

**PG** - Prescribed Grazing (proper stocking rates with adequate recovery periods during the growing season)

**VLTPG** - Very Long-term Prescribed Grazing (could possibly take generations)

**WF** - Wildfire

## State 1

### Indian Ricegrass/ Gardner's saltbush

#### Community 1.1

##### Indian Ricegrass/ Gardner's saltbush

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and droughty soils due to the very shallow depth to undeveloped salty weathered shale material. Historically, fire has not played an important role in this site due to the naturally sparse vegetation, which prohibits the spread of fire. Potential vegetation is about 60% grasses, 5% forbs, and 35% woody plants. Cool season midgrasses dominate the state. The major grasses include bluebunch wheatgrass, Indian ricegrass, and bottlebrush squirreltail. Other grasses occurring on the state include blue grama, rhizomatous wheatgrasses, and Sandberg bluegrass. Gardner's saltbush and birdfoot sagebrush are conspicuous elements of this state although a variety of shrubs can also occur. An array of forbs occurs in this state and plant diversity is high (see Plant Composition Table). The total annual production (air-dry weight) of this state is about 200 pounds per acre, but it can range from about 75 lbs./acre in unfavorable years to about 300 lbs./acre in above average years. The state is fragile and adapted to the Northern Intermountain Desertic Basins climate. The diversity in plant species allows for some drought resistance. This is a sustainable plant community, but is difficult to reestablish when damaged. Runoff and consequently, erosion is a normal part of this plant community due to the sparseness of the vegetation and the high potential of these soils to form a surface seal. Transitions or pathways leading to other plant communities are as follows: • Moderate, Continuous Season-Long grazing will convert this plant community to the Perennial Grass/Mixed Shrub Plant Community. Prolonged drought will exacerbate this transition.

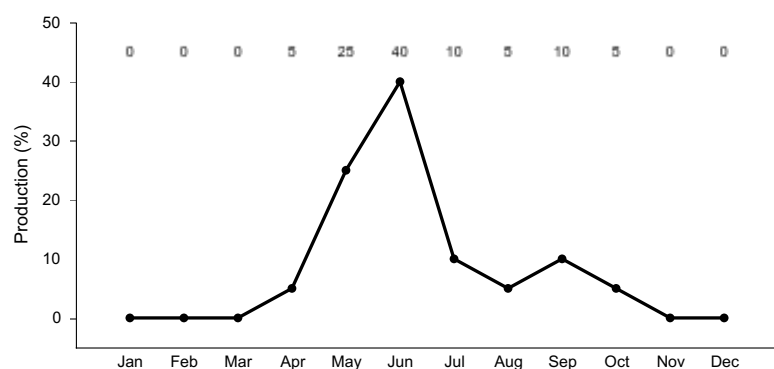


Figure 3. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.

## State 2

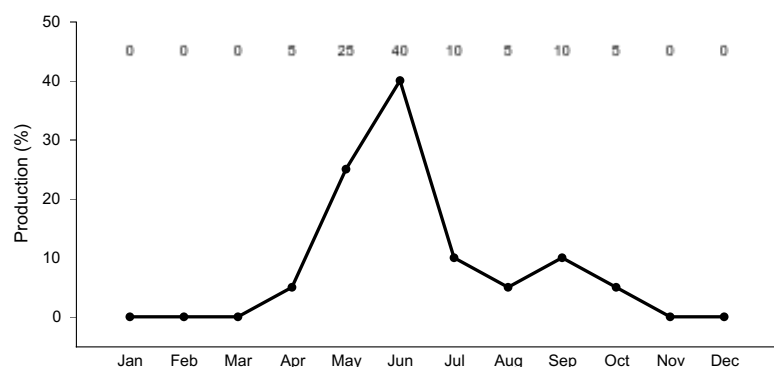
### Perennial Grass/ Mixed Shrub

#### Community 2.1

##### Perennial Grass/ Mixed Shrub

Historically, this plant community evolved under grazing and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock and will be exacerbated by prolonged drought conditions. This plant community is still dominated by cool-season mid-grasses, while short warm-season grasses and miscellaneous forbs account for the balance of the understory. A variety of shrubs makes up the overstory. The dominant grasses include bluebunch wheatgrass, bottlebrush squirreltail, and rhizomatous wheatgrasses. Grasses of secondary importance include Sandberg bluegrass, blue grama, and alkali sacaton. Forbs commonly found in this plant community include smooth woodyaster, stemless mock goldenweed, Hood's phlox, sulfur flower buckwheat, Cous biscuitroot, and scarlet globemallow. Shrubs such as Gardner's saltbush, winterfat, birdfoot sagebrush, black sagebrush, and shadscale saltbush account for 20% to 30% of the total production. Plains pricklypear can also occur. When compared to the Historical Climax Plant Community, birdfoot sagebrush, shadscale, and smooth woody aster have increased. Indian ricegrass and bluebunch wheatgrass have decreased as the production of cool-season grasses has been reduced. Indian ricegrass may occur in only trace amounts under the shrub canopy or within the patches of pricklypear. Blue grama has increased. In addition, the amount of winterfat may or may not have changed depending on the season of use. The total annual production (air-dry weight) of this state is about 150 pounds per acre, but it can range from about 50 lbs./acre in unfavorable years to about 250 lbs./acre in above

average years. This plant community is resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. The herbaceous component is mostly intact and plant vigor and replacement capabilities are sufficient. Water flow patterns and litter movement if present are normally occurring, due to the potential of these sites to have an expected amount of normal runoff. Incidence of pedestalling can occur but should not be excessive. Soils are relatively stable and the surface shows some soil loss especially on steeper slopes. The watershed is functioning and the biotic community is intact. Transitional pathways leading to other plant communities are as follows: • Prescribed grazing or possibly long-term prescribed grazing, will convert this plant community to the HCPC. The probability of this occurring is high especially if rotational grazing along with short deferred grazing is implemented as part of prescribed method of use. • Frequent and severe grazing over the long-term will convert this plant community to the Mixed Shrub/Bare Ground Plant Community.



**Figure 4. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.**

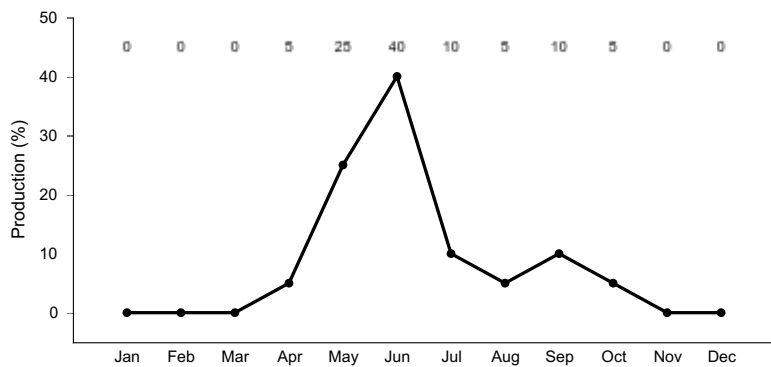
## State 3

### Mixed Shrub/ Bare Ground

#### Community 3.1

#### Mixed Shrub/ Bare Ground

This plant community currently is found under heavy, season-long grazing by livestock. A variety of shrubs and smooth woodyaster are significant components of this plant community. Bare ground is very prominent. Warm season grasses and annual plants can also be prominent. The dominant grasses/grasslikes are blue grama and threadleaf sedge. Cool-season grasses have been eliminated or significantly reduced. Weedy annual species such as cheatgrass, Russian thistle, and halogeton, may occur, if a seed source is available. Cactus often invades. Noxious weeds such as Russian knapweed may invade the site if a seed source is available. Birdfoot sagebrush, black sagebrush, skunkbush sumac, shadscale saltbush, Utah juniper, and other shrub species are significant components of this plant community. The interspaces between plants have expanded significantly leaving the amount of bare ground more prevalent. As a result, the herbaceous production has been significantly reduced. When compared with the Perennial Grass/Mixed Shrub Plant Community, the total annual production is less, however, the shrub production off sets some of the decline in the herbaceous production. The total annual production (air-dry weight) of this state is about 100 pounds per acre, but it can range from about 35 lbs./acre in unfavorable years to about 175 lbs./acre in above average years. This plant community is resistant to change. These areas are actually more resistant to fire as less fine fuels are available and the bare ground between the shrubs is increased. Continued frequent and severe grazing or the removal of grazing does not seem to affect the composition or structure of the plant community. Plant diversity is moderate to poor. The plant vigor is diminished and replacement capabilities are limited due to the reduced number of cool-season grasses. Plant litter is noticeably less when compared to the HCPC. Soil erosion is excessive and accelerated because of increased bare ground. Water flow patterns and pedestalling are obvious. Runoff has greatly increased. Rill channels are usually noticeable in the interspaces and gullies have established where rills have concentrated down slope. Transitional pathways leading to other plant communities are as follows: • Very Long Term Prescribed Grazing may eventually return this state to near Historic Climax Plant Community. Seeding native perennials may be necessary to hasten establishment of these species.



**Figure 5. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.**

## Additional community tables

**Table 5. Community 1.1 plant community composition**

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1				34–56	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34–56	–
2				11–34	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	11–34	–
3				0–22	
	Montana wheatgrass	ELAL7	<i>Elymus albicans</i>	0–22	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	0–22	–
4				0–22	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–22	–
5				22–45	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–11	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–11	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–11	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–11	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–11	–
<b>Forb</b>					
6				11–22	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–11	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–11	–
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	0–11	–
	cous biscuitroot	LOCO4	<i>Lomatium cous</i>	0–11	–
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0–11	–
	phlox	PHLOX	<i>Phlox</i>	0–11	–
	princesplume	STANL	<i>Stanleya</i>	0–11	–
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–11	–
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	0–11	–
	woodyaster	XYLOR	<i>Xylorhiza</i>	0–11	–
<b>Shrub/Vine</b>					



7				22–45	
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	22–45	–
8				0–22	
	birdfoot sagebrush	ARPE6	<i>Artemisia pedatifida</i>	0–22	–
9				22–45	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–11	–
	black sagebrush	ARNO4	<i>Artemisia nova</i>	0–11	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0–11	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–11	–
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–11	–
	winterfat	KRASC	<i>Krascheninnikovia</i>	0–11	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–11	–

## Animal community

### Animal Community – Wildlife Interpretations

Historic Climax Plant Community: The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and antelope. Suitable thermal and escape cover for deer and antelope is limited due to the short growth forms of woody plants. However, topographical variations could provide some escape cover. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing/foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would occur here.

Perennial Grass/Mixed Shrub: The combination of a shrubs grasses and forbs provide a diverse plant community for wildlife, but little overall available forage. Suitable thermal and escape cover for deer and antelope is limited due to the low growth forms of the woody plants. However, topographical variations could provide some escape cover. Some large ungulates especially antelope and upland game birds use this site during winter times for forage, as snow is not apt to accumulate on these sites.

Mixed Shrub/Bare Ground: This plant community provide little winter foraging for mule deer and antelope. Due to the sparseness of the vegetation, this community usually provides minimal escape and thermal cover for large ungulates or for nesting habitat for sage grouse. However, areas with topographical variations and pockets of juniper can provide sufficient escape cover for big game.

### Animal Community – Grazing Interpretations

The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor.

### Plant Community Production Carrying Capacity\*

(lb./ac) (AUM/ac)

Historic Climax Plant Community 75-300 .10

Perennial Grass/Mixed Shrub 50-250 .07

Mixed Shrub/Bare Ground 35-175 .02

\* - Continuous, season-long grazing by cattle under average growing conditions.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

## Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration ranges from slow to moderate. Runoff potential for this site varies from moderate to very high depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information).

Rills and gullies should not typically be present. Water flow patterns may be present but should be barely distinguishable. Pedestals are only slightly present in association with bunchgrasses such as bluebunch wheatgrass. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

## Recreational uses

This site provides hunting opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

## Wood products

No appreciable wood products are present on the site.

## Other products

None noted.

## Inventory data references

Information presented here has been derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in developing this site include: Chris Krassin, Range Management Specialist, NRCS and Everett Bainter, Range Management Specialist. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, USDI and USDA Interpreting Indicators of Rangeland Health Version 3, and USDA NRCS Soil Surveys from various counties.

## Contributors

D. Tranas

## 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	05/01/2008
Approved by	E. Bainter
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** Some rills to be expected on this site. Depending on slope, rills range from .5-2 inches (1-5 cm) wide and are found every 3-6 feet (1-2 m).

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2. **Presence of water flow patterns:** Barely observable.

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3. **Number and height of erosional pedestals or terracettes:** Slight pedestalling evident.

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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 can range from 40-60%.

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5. **Number of gullies and erosion associated with gullies:** Active gullies, if present, should be rare.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Minimal to nonexistent.

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7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter expected to move only in small amounts. Woody debris will show only slight movement down slope.

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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):** Soil Stability Index ratings range from 3 (interspaces) to 6 (under plant canopy), but average values should be 3.5 or greater.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Typically an A-horizon of 1-5 inches (3-12 cm) with weak granular or platy structure and brown to gray in color with OM of .5 to 1%.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 55-75% grasses, 10% forbs, and 15-35% shrubs. Minimal plant canopy (20-50%) and litter plus moderate to slow infiltration rates result in moderate runoff. Basal cover is typically less than 5% and does very little to effect runoff on this site.

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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):** No compaction layer exists, but soil crusting in dry conditions is typical.
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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: perennial shrubs> mid-size, cool season bunchgrasses>cool season rhizomatous grasses>perennial forbs>>short, cool season bunchgrasses
- Sub-dominant:
- Other:
- Additional:
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal decadence, typically associated with shrub component.
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14. **Average percent litter cover (%) and depth ( in):** Litter ranges from 5-25% of total canopy measurement with total litter (including beneath the plant canopy) from 15-50% expected. Herbaceous litter depth is typically shallow, ranging from 2-8mm. Woody litter can be up to an inch (3 cm).
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** English: 75 -300 lb/ac (188 lb/ac average); Metric: 84 -336 kg/ha (210 kg/ha average).
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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:** Bare ground greater than 80% is the most common indicator of a threshold being crossed. Short warm season grasses, birdfoot sagebrush, Woodyaster and phlox are common increasers. Annual weeds such as halogeton, kochia, and Russian thistle are common invasive species in disturbed sites.
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17. **Perennial plant reproductive capability:** All species are capable of reproducing, except in drought years.
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