USDA Natural Resources Conservation Service

Ecological site EX043B23A158
Shallow Clayey (SwCy) Absaroka Lower Foothills

Last updated: 4/30/2024
Accessed: 05/20/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 043B–Central Rocky Mountains

Major Land Resource Unit (MLRA) 43B: Central Rocky Mountains

43B – Central Rocky Mountains – The Central Rocky Mountains extends from northern Montana to southern extent of Wyoming and from Idaho to central Wyoming. The southern extent of 43B is comprised of a combination of metamorphic, igneous, and sedimentary mountains and foothills. Climatic changes across this extent are broad and create several unique breaks in the landscape.

Further information regarding MLRAs, refer to: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.
Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook.

LRU notes

Land Resource Unit (LRU) 43B23A: Absaroka Lower Foothills

Based on the shifts in geology, precipitation patterns and other climatic factors, as well as elevations and vegetation, the Absaroka Range was divided into LRU 23. Further division of this LRU is necessary due to the gradient moving from the foothills to the summit, as well as aspect shifts (north/east face versus south/west face). Subset A is set for the lower elevations within the foothills with 10 to 14 inches of precipitation. To verify or identify the LRU A (the referenced LRU for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key. This particular LRU occurs along the eastern lower foothills of the Absaroka Range. This LRU starts north of Clark, WY and runs to the Thermopolis, WY area. Once the foothills cross into the Northern Beartooth Range, the climatic patterns and elevational changes shifts the plant community and allows for a break in LRU's near the Montana state line. As the LRU follows to the south and tracks east with the intersection of the Absaroka and Owl Creek Ranges, the face changes aspect and geology creating a shift in plant dynamics and a break in the LRU. The extent of soils currently correlated to this ecological site does not fit within the digitized boundary. Many of the noted soils are provisional and will be reviewed and corrected in mapping update projects. Other map units are correlated as small inclusions within other MLRA’s/LRU’s based on elevation, landform, and biological references.

Moisture Regime: Aridic Ustic or Ustic Aridic – Progressive Initial mapping has shown that soil correlations completed prior to 2014 were identified as ustic aridic, after further evaluation of climatic and soil taxonomy information the proper moisture regime is aridic ustic. Both are recorded here until an update project is completed to correct the previous correlations.

Temperature Regime: Frigid

Dominant Cover: Rangeland – Sagebrush Steppe (major species is Wyoming Big Sagebrush)
Representative Value (RV) Effective Precipitation: 10-14 inches (254 – 355 mm)
RV Frost-Free Days: 80-110 days

Classification relationships

Relationship to Other Established Classification Systems:

National Vegetation Classification System (NVC):
3 Xeromorphic Woodland, Scrub & Herb Vegetation Class
3.B Cool Semi-Desert Scrub & Grassland Subclass
3.B.1 Cool Semi-Desert Scrub & Grassland formation
3.B.1.NE Western North American Cool Semi-Desert Scrub & Grassland Division
M169 Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup
G302 Artemisia Tridentata - Artemisia tripartita - Purshia tridentata Big Sagebrush Steppe Group
CEGL001535 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Herbaceous Vegetation or
CEGL001009 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Shrubland

Ecoregions (EPA):
Level I: 10 North American Deserts Level II: 10.1 Cold Deserts
Level III: 10.1.18 Wyoming Basin
Level IV: 10.1.18.b Big Horn Basin and
10.1.18.d Foothills and Low Mountains

Ecological site concept

• Site receives no additional water.
• Slope is < 60%
• Soils are:
o Textures range from loam to clay in top 4” (10 cm) of mineral soil surface
o Clay content is < 40% in top 4” (10 cm) of mineral soil surface
o All subsurface horizons have a weighted average of > 35% but < 60% clay.
o Shallow (10-20 in. (25-50 cm)
o < 10% stone and boulder cover and <25% cobble and gravel cover
o Not skeletal (<35% rock fragments) within 20” (50 cm) of mineral soil surface
o Non-saline, sodic, or saline-sodic; however, there is a potential for elevated soluble salts.

Associated sites

R032XY362WY	**Shallow Loamy (SwLy) 10-14" East Precipitation Zone** Shallow Loamy occurs in a complex with Shallow Clayey on escarpments or outcroppings of inter-bedded sedimentary bedrock.
R032XY304WY	**Clayey (Cy) 10-14" East Precipitation Zone** Clayey sites are associated with Shallow Clayey sites on escarpments or on shale outcroppings. The Clayey site will occur lower on the hill slope or further from the bedrock outcropping with the shallow sites residing at the site of the outcropping.
R032XY312WY	**Gravelly (Gr) 10-14" East Precipitation Zone** Gravelly sites will occur on the shoulder of a ridge or escarpment, with Shallow Clayey occuring on the scarp face or down slope on the dip slope/hill slope.

Similar sites

R032XY258WY	**Shallow Clayey (SwCy) 5-9” Wind River Basin Precipitation Zone** Shallow Clayey 5-9" Wind River Basin Precipitation Zone is lower in production than this site.
R032XY158WY	**Shallow Clayey (SwCy) 5-9” Big Horn Basin Precipitation Zone** Shallow Clayey 5-9" Big Horn Basin Precipitation Zone is lower in production than this site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis* (2) *Artemisia frigida*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Achnatherum hymenoides*

Legacy ID

R043BX558WY

Physiographic features

This site occurs on slopes and ridge tops, but may occur on all slopes.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Pediment (2) Foothills > Eroded fan remnant sideslope (3) Foothills > Escarpment
Runoff class	Negligible to very high
Elevation	1,646–2,286 m
Slope	0–60%
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 10 to 14 inches (254 – 355 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. This amounts to about 50% of the mean annual precipitation. 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 is about 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. High winds are generally blocked from the basin by high mountains, but can occur in conjunction with an occasional thunderstorm. Growth of native cool-season plants begins about April 15th and continues until about July 1st. Cool weather and moisture in September may produce some green up of cool season plants that will continue through late October.

Review of a 30 year trend of data for Average Temperature as well as Average Precipitation, there has been a warming trend, but as the last 12 years graphed, the temperatures have swayed high and low, but overall it has maintained a steady trajectory, neither increasing nor decreasing. Where on the moisture side, the trajectory in trend has been a slow decline. The swings of when spring warm up and first frost hit with the decline in average precipitation have produced a drought effect where the moisture is not being received when the plants and ground is able to utilize the moisture. And in some cases, the late precipitation has encouraged the warm season or mat forming species over the cool season bunchgrasses that are the drivers of the natural system. Early frosts, with dry open winters has created a more arid or desert effect on plants resulting in high rates of winter kill, loss of vigor or overall damage to the plant.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. “Buffalo Bill Dam", "Cody 21SW", "Thermopolis", "Thermopolis 25WNW" and

"Wapiti 1NE" are the representative weather stations within LRU D. The following graphs and charts are a collective sample representing the averaged normals and 30 year annual rainfall data for the selected weather stations from 1981 to 2010.

Table 3. Representative climatic features

Frost-free period (characteristic range)	64-106 days
Freeze-free period (characteristic range)	101-144 days
Precipitation total (characteristic range)	279-305 mm
Frost-free period (actual range)	46-118 days
Freeze-free period (actual range)	88-147 days
Precipitation total (actual range)	254-330 mm
Frost-free period (average)	80 days
Freeze-free period (average)	117 days
Precipitation total (average)	305 mm

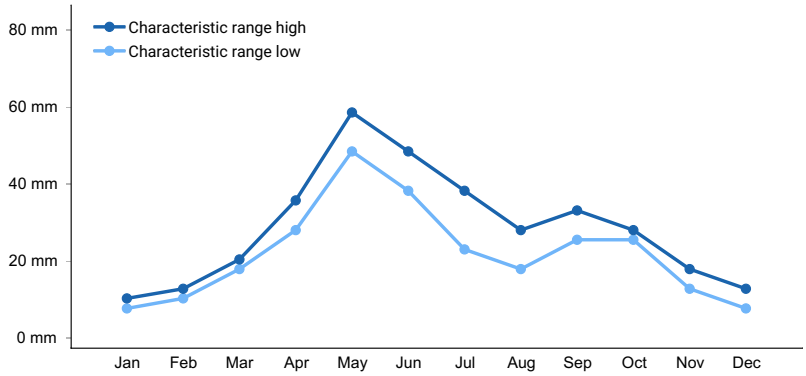


Figure 1. Monthly precipitation range

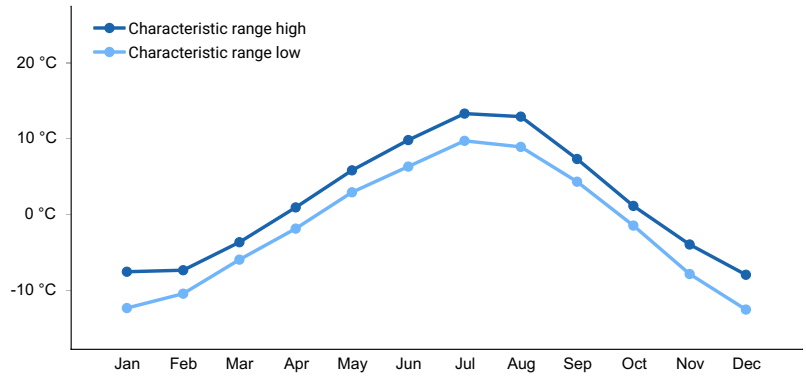


Figure 2. Monthly minimum temperature range

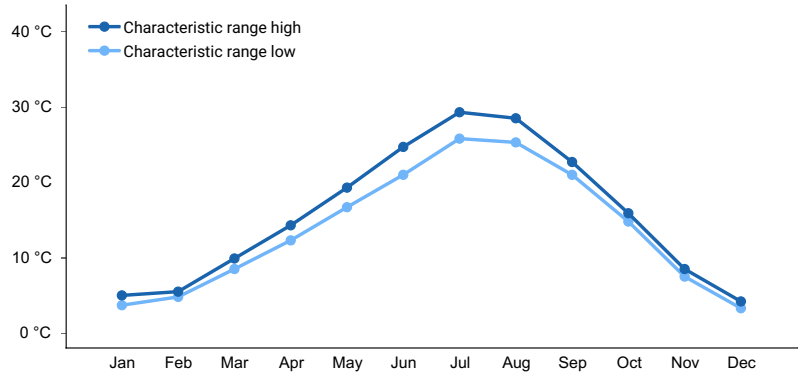


Figure 3. Monthly maximum temperature range

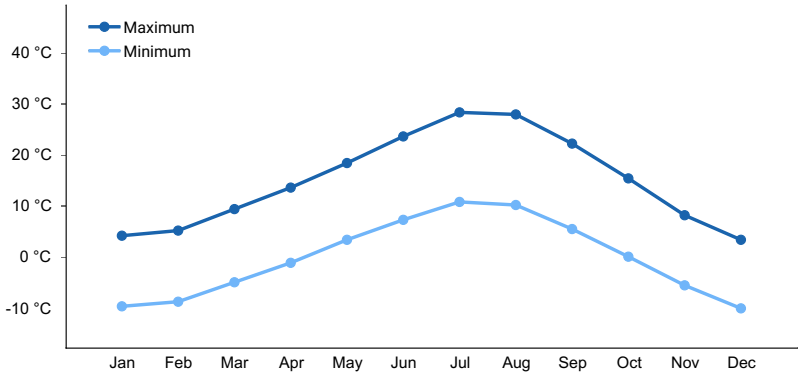


Figure 4. Monthly average minimum and maximum temperature

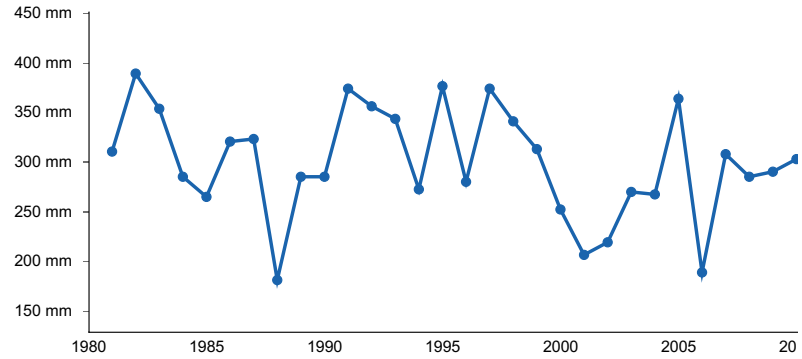


Figure 5. Annual precipitation pattern

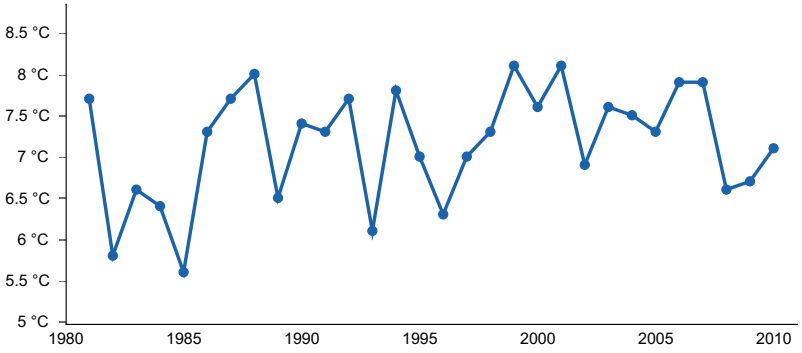


Figure 6. Annual average temperature pattern

Climate stations used

- (1) THERMOPOLIS [USC00488875], Thermopolis, WY
- (2) THERMOPOLIS 25WNW [USC00488888], Thermopolis, WY
- (3) SUNSHINE 3NE [USC00488758], Meeteetse, WY

- (4) CODY 21 SW [USC00481855], Cody, WY
- (5) WAPITI 1NE [USC00489467], Cody, WY
- (6) BUFFALO BILL DAM [USC00481175], Cody, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches (150 cm)) and have minimal influence from surface water/overland flow. There may be isolated features that are affected by snow pack that persists longer than surrounding areas due to position on the landform (shaded/protected pockets).

Soil features

The soils of this site are shallow (less than 20”to bedrock) well-drained soils formed in alluvium or residuum. These soils have moderately slow to very slow permeability and may occur on all aspects. The bedrock is clay shale which is virtually impenetrable to plant roots. Thin ineffectual layers of other soil textures are disregarded. The soil characteristics having the most influence on the plant community are the shallow depths, heavy textures, and the potential for elevated quantities of soluble salts.

Major Soil Series correlated to this site includes: Persayo

Table 4. Representative soil features

Parent material	(1) Residuum–shale (2) Alluvium–interbedded sedimentary rock (3) Slope alluvium
Surface texture	(1) Clay loam (2) Clay (3) Silty clay loam (4) Silty clay (5) Clay (6) Sandy clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to moderately slow
Depth to restrictive layer	25–51 cm
Soil depth	25–51 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	3.56–10.67 cm
Calcium carbonate equivalent (0-101.6cm)	0–14%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–12
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	5–15%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

Potential vegetation on this site is dominated by mid cool-season perennial grasses. Other significant vegetation includes winterfat, Gardner’s saltbush, birdfoot sagebrush, and a variety of forbs. The expected potential composition for this site is about 75% grasses, 10% forbs and 15% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

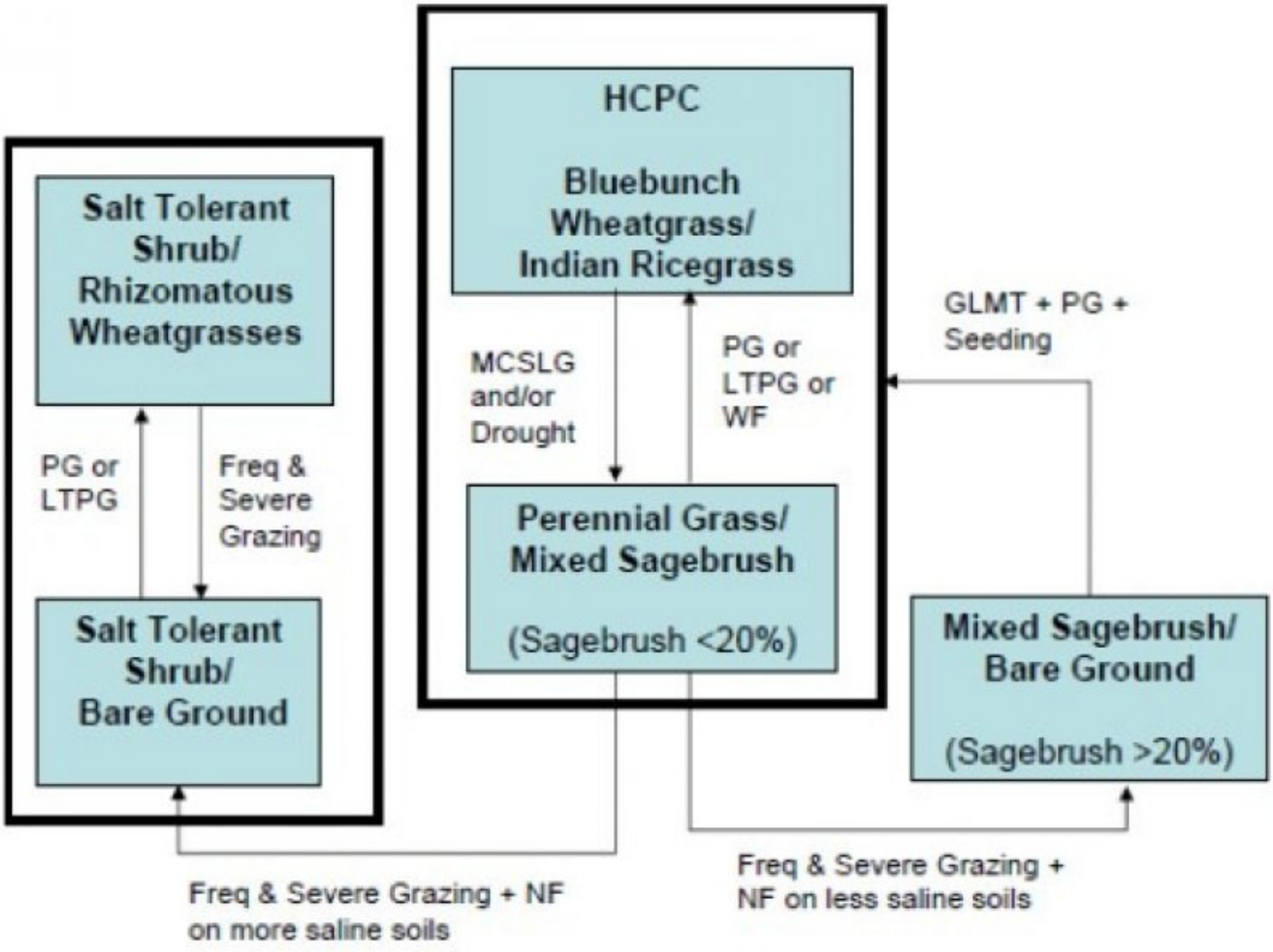
As this site deteriorates, species such as blue grama, rhizomatous wheatgrass, and shrubs will increase. Plains pricklypear and weedy annuals will invade. Cool season grasses such as bluebunch or Griffith’s wheatgrasses and Indian ricegrass will decrease in frequency and production.

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 (Natural or Human Caused)

State 1
Bluebunch Wheatgrass/ Indian Ricegrass

Community 1.1
Bluebunch Wheatgrass/ Indian Ricegrass

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores, soil less than 20 inches, and an occasional wildfire. The cyclical nature of the fire regime in this community prevented big sagebrush from being the dominant landscape. The state is mostly comprised of cool season mid-grasses and a variety of forbs and woody species. Potential vegetation is about 75% grasses or grass-like plants, 10% forbs, and 15% woody plants. The major grasses include bluebunch and Griffith's wheatgrasses, Indian ricegrass, and rhizomatous wheatgrasses. Green needlegrass is considered a major grass, however, it is usually found in the higher precipitation areas of this zone. Other grasses occurring on the state may include prairie junegrass, Sandberg bluegrass, blue grama, and spikefescue. Big and black sagebrush, Gardner's saltbush, and winterfat are conspicuous elements of this state, and often make up 15% of the annual production. A variety of forbs also 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 500 pounds per acre, but it can range from about 350 lbs./acre in unfavorable years to about 700 lbs./acre in above average years. The state is extremely stable and well adapted to the Northern Intermountain Desertic Basins climate. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity Transitions or pathways leading to other plant communities are as follows: • Moderate continuous season-long grazing will convert the plant community to the Perennial Grass/Mixed Sagebrush Plant Community. Prolonged drought will exacerbate this transition.

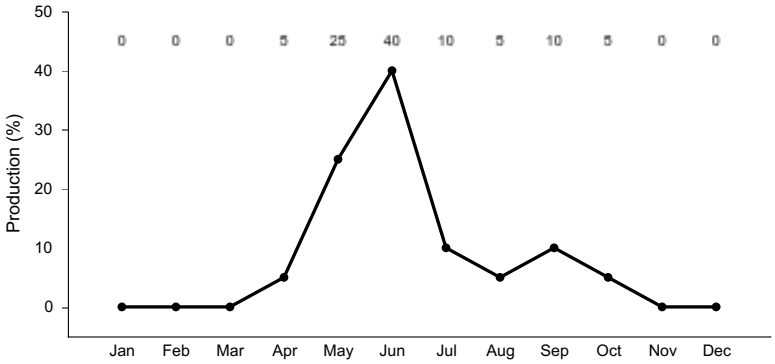


Figure 8. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.

State 2
Perennial Grass/ Mixed Sagebrush

Community 2.1
Perennial Grass/ Mixed Sagebrush

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. Fire is a rarity and extended periods without fire is common as fire suppression has changed the natural fire regime. This plant community is still dominated by cool-season grasses, while short warm-season grasses and miscellaneous forbs account for the balance of the understory. A variety of shrubs is now a conspicuous part of the overall production. The dominant grasses include bluebunch or Griffith's wheatgrass, rhizomatous wheatgrasses, and bottlebrush squirreltail. Green needlegrass is considered a major grass, however, it is usually found in the higher precipitation areas of this zone. Grasses and grass-like species of secondary importance include prairie junegrass, blue grama, and Sandberg bluegrass. Forbs commonly found in this plant community include scarlet globemallow, wild onion, smooth woodyaster, leafy wildparsley, and Hood's phlox. Big sagebrush, black sagebrush, birdfoot sagebrush, Gardner's saltbush, and shadscale saltbush dominate the overstory. These shrubs can make up to 20% of the annual production. Plains pricklypear cactus can also invade. When compared to the Historic Climax Plant Community, big sagebrush, black sagebrush, birdfoot sagebrush, rhizomatous wheatgrasses, prairie junegrass, and blue grama have increased. Plains pricklypear cactus may have invaded, but occurs only in small patches. Indian ricegrass and bluebunch wheatgrass have decreased and may occur in only trace amounts under the sagebrush canopy or within the patches of pricklypear. In addition, 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 425 pounds per acre, but it can

range from about 250 lbs./acre in unfavorable years to about 650 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 may be occurring but only on steeper slopes. Incidence of pedestalling is minimal. Soils are mostly stable and the surface shows minimum soil loss. The watershed is functioning and the biotic community is intact. Transitions or 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 the prescribed method of use. In addition, the removal of fire suppression will allow a somewhat natural fire regime to reoccur to more easily transition between this plant community and the HCPC. A prescribed fire treatment can be useful to hasten this transition if desired. • Frequent and severe grazing plus no fire on more saline soils will convert the plant community to the Salt Tolerant Shrub/*Bare Ground* Plant Community. • Frequent and severe grazing (yearlong grazing) plus no fire on less saline soils, will convert the plant community to the Mixed Sagebrush/*Bare Ground* Plant Community.

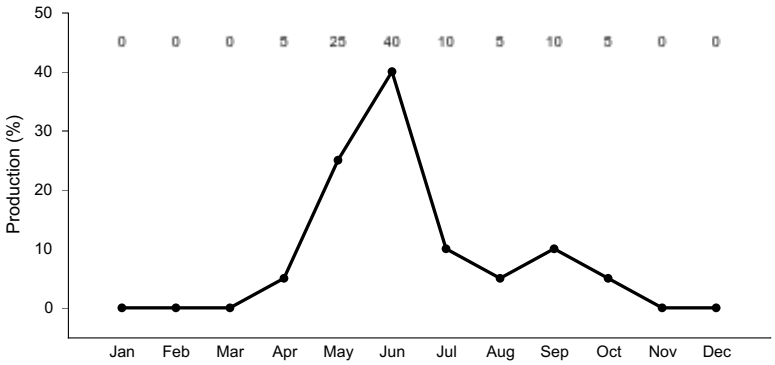


Figure 9. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.

State 3
Mixed Sagebrush/ Bare Ground

Community 3.1
Mixed Sagebrush/ Bare Ground

This plant community is the result of frequent and severe yearlong grazing and no fire. Soils on these sites are usually less saline. It is dominated by shrubs but areas of blue grama sod can occur. Big sagebrush, black sagebrush, and birdfoot sagebrush are the most common shrubs in this plant community. Pricklypear cactus can become dense in areas so that livestock cannot graze forage growing within the cactus clumps. Perennial cool season mid-grasses have been removed leaving mostly bare ground amongst the shrub component but patches of blue grama and annuals are noticeable. Cheatgrass and weedy annual forbs such as halogeton, Russian thistle, and kochia, will occupy the site if a seed source is available. Noxious weeds such as Russian knapweed may also invade this state. When the historic climax plant community is replaced by warm season grasses total annual production is reduced. The total annual production (air-dry weight) of this state is about 250 pounds per acre, but it can range from about 100 lbs./acre in unfavorable years to about 350 lbs./acre in above average years. This state is relatively stable as the shrubs become more dominant. Patches occupied by the grass sod are protected from excessive erosion. The sod formed by these grasses is resistant to water infiltration. While the soil is protected by the sod areas, excessive runoff may occur outside the sodded area. As a result, rills or other more severe erosion can occur on unprotected areas. The watershed may or may not be functioning, as runoff may affect adjoining sites. The biotic integrity of this plant community is not intact. Plant diversity is low. Transitional pathways leading to other plant communities are as follows: • Grazing land mechanical treatment (chiseling etc.) followed by prescribed grazing and if necessary seeding will return this plant community to near Historic Climax Plant Community.

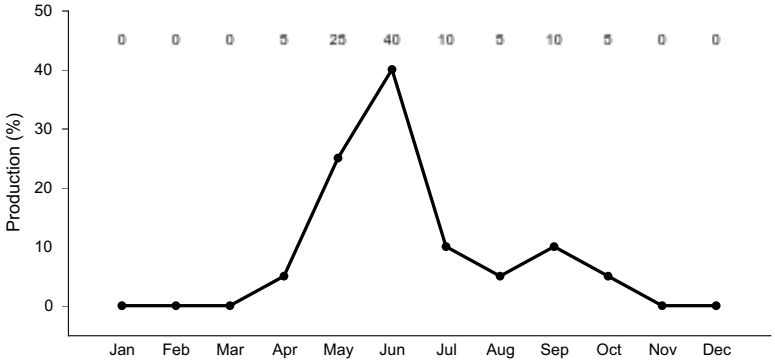


Figure 10. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.

State 4
Salt tolerant Shrub/ Bare Ground

Community 4.1
Salt tolerant Shrub/ Bare Ground

This plant community can occur on sites subjected to frequent and severe grazing and on soils influenced by elevated amounts of soluble salts. Salt tolerant shrubs will replace the characteristic shrub species as the major overstory species, while the preferred cool season grasses have been eliminated or greatly reduced. Bare ground and weedy grasses and forbs dominate the understory. This state is dominated by an overstory of salt tolerant shrubs, such as greasewood, birdfoot sagebrush and saltbushes, which can vary widely in their composition and production. The leaves of some of these plants contain high amounts of sodium and other salts, and when shed, these soluble salts are transferred to the soils underneath the plants. Consequently, the soil can exhibit wide variations in soluble salts, which can explain the variation in shrub composition. Big sagebrush and rubber rabbitbrush are present but are mostly in small patches. Perennial cool season mid-grasses have been removed leaving mostly patches of blue grama and annuals. Cheatgrass and weedy annual forbs such as halogeton, Russian thistle, and kochia, will occupy the site if a seed source is available. Noxious weeds such as Russian knapweed may also invade the site. Plant diversity is moderate to poor. When compared to the HCPC, grass production has diminished but is somewhat off set by the increase in shrub production. The interspaces between plants have expanded leaving the amount of bare ground more prevalent. Surface salts have increased, especially on sites dominated by greasewood and saltbushes. The total annual production (air-dry weight) of this state is about 300 pounds per acre, but it can range from about 200 lbs./acre in unfavorable years to about 375 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 has 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 biotic integrity of this state is mostly dysfunctional because of the predominant salt tolerant shrub overstory and absence of perennial cool season grasses. Soil erosion is accelerated because of increased bare ground. Water flow patterns and pedestalling are obvious. Infiltration is reduced and runoff is increased. Rill channels may be noticeable in the interspaces and gullies may be establishing where rills have concentrated down slope. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing or possibly long-term prescribed grazing, will convert this plant community to the Salt Tolerant Shrub/Rhizomatous Wheatgrasses Plant Community. Recovery to near Historic Climax Plant Community condition is difficult to impossible due to the resistance of these shrubs to herbicides and other brush management techniques. In addition, the increase in surface salts has had accumulated effects on the soil so most of the plants associated with the HCPC are no longer suitable for this site. The most notable exception is the rhizomatous wheatgrasses and bottlebrush squirreltail. Soil remediation to reduce the surface salts is mostly ineffective and extremely costly. Seeding more salt-tolerant native grasses and forbs will improve the productivity of the site and also improve plant cover.

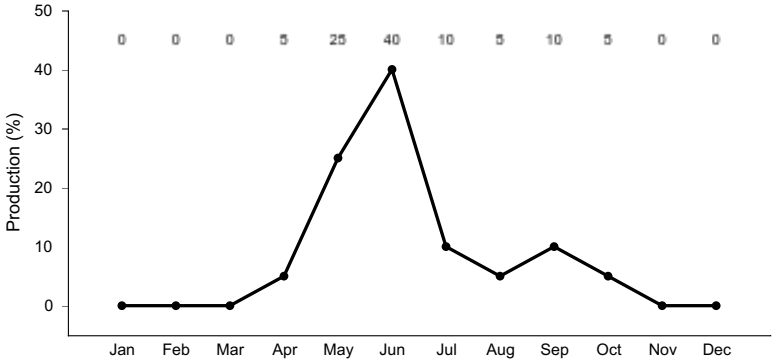


Figure 11. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.

State 5
Salt tolerant Shrub/ Rhizomatous Wheatgrasses

Community 5.1
Salt tolerant Shrub/ Rhizomatous Wheatgrasses

This plant community can occur where prescribed grazing management is implemented in the Salt Tolerant Shrub/*Bare Ground* Plant Community. Salt tolerant shrubs remain a significant component of the plant community, but preferred cool season grasses have reestablished. This site is dominated by an overstory of salt tolerant shrubs, such as birdfoot sagebrush, saltbushes, and greasewood, but can exhibit a wide variety of shrub composition and production. Some perennial cool season mid-grasses have once again reestablished such as rhizomatous wheatgrasses, and bottlebrush squirreltail. Other important grasses include Sandberg bluegrass, blue grama, and Fendler threeawn. Patches of annuals such as cheatgrass and other weedy annual forbs such as halogeton, Russian thistle, and kochia, will persist on this site. Noxious weeds such as Russian knapweed may also remain if not treated. The interspaces between plants will have diminished in size. The total annual production (air-dry weight) of this state is about 400 pounds per acre, but it can range from about 225 lbs./acre in unfavorable years to about 550 lbs./acre in above average years. This plant community is mostly resistant to change, but species composition can be altered through long-term overgrazing. The herbaceous component is stable and plant vigor and replacement capabilities are sufficient. The watershed may or may not be functioning and the biotic community is not intact because of the predominant salt tolerant shrub overstory. Plant diversity is moderate Soils are mostly stable and recent soil loss is minimal. This should not be confused with evidence of remnant erosion. Water flow patterns and litter movement is stable but is still occurring on steeper slopes. Incidence of pedestalling is improving. Transitions or pathways leading to other plant communities are as follows: • Frequent and severe grazing will convert the plant community to the Salt Tolerant Shrub/*Bare Ground* Plant Community. • Recovery to near Historic Climax Plant Community condition is difficult to impossible due to the resistance of these shrubs to herbicides and other brush management techniques. In addition, the increase in surface salts has had accumulated effects on the soil so most of the herbaceous plants associated with the HCPC are no longer suitable for this site. The most notable exception is the rhizomatous wheatgrasses and bottlebrush squirreltail. Soil remediation to reduce the surface salts is mostly ineffective and extremely costly. Seeding more salt-tolerant grasses and forbs will improve the productivity of the site and also plant cover, but will not improve the biotic integrity.

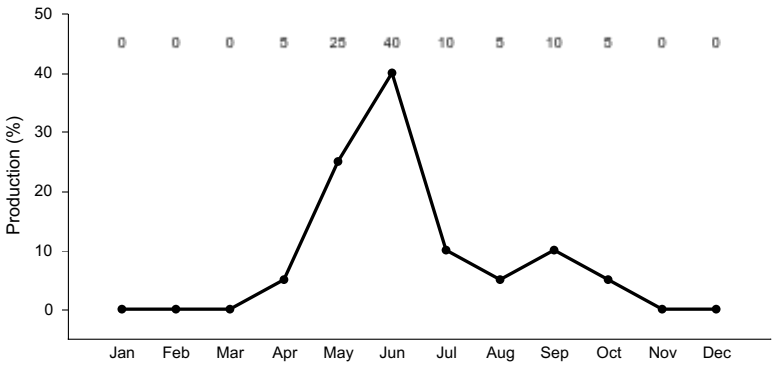


Figure 12. Plant community growth curve (percent production by month). WY0701, 10-14E upland sites.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				112–168	
	Montana wheatgrass	ELAL7	*Elymus albicans*	112–168	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	112–168	–
2				84–140	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	84–140	–
3				56–112	
	western wheatgrass	PASM	*Pascopyrum smithii*	56–112	–
4				6–84	
	green needlegrass	NAVI4	*Nassella viridula*	6–84	–
5				0–56	
	Grass, perennial	2GP	*Grass, perennial*	0–28	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–28	–
	squirreltail	ELEL5	*Elymus elymoides*	0–28	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–28	–
	spike fescue	LEKI2	*Leucopoa kingii*	0–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–28	–
Forb					
6				0–56	
	Forb, perennial	2FP	*Forb, perennial*	0–28	–
	textile onion	ALTE	*Allium textile*	0–28	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–28	–
	Indian paintbrush	CASTI2	*Castilleja*	0–28	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–28	–
	cous biscuitroot	LOCO4	*Lomatium cous*	0–28	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–28	–
	beardtongue	PENST	*Penstemon*	0–28	–
	spiny phlox	PHHO	*Phlox hoodii*	0–28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–28	–
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0–28	–
Shrub/Vine					
7				28–84	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–28	–
	black sagebrush	ARNO4	*Artemisia nova*	0–28	–
	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0–28	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–28	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–28	–
	Gardner's saltbush	ATGA	*Atriplex gardneri*	0–28	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–28	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–28	–

Animal community

Animal Community – Wildlife Interpretations

Bluebunch Wheatgrass/Indian Ricegrass (HCPC): 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 may be limited due to the low quantities 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 Sagebrush Plant Community: The combination of an overstory of sagebrush and an understory of grasses and forbs provide a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows' nest in big sagebrush plants, and hosts of other nesting birds utilize stands in the 20-30% cover range.

Mixed Sagebrush/*Bare Ground* Plant Community: These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Perennial Grass/Mixed Shrub Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management.

Salt Tolerant Shrub/*Bare Ground* Plant Community: This plant community exhibits a low level of plant species diversity due to the accumulation of salts near the soil surface. It may provide some thermal and escape cover for deer and antelope if no other woody community is nearby, but in most cases, it is not a desirable plant community to select as a wildlife habitat management objective.

Salt Tolerant Shrub/Rhizomatous Wheatgrasses Plant Community: The combination of an overstory of sagebrush and an understory of grasses and forbs provide a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows' nest in big sagebrush plants, and hosts of other nesting birds utilize stands in the 20-30% cover range.

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 350-700 .20
Perennial Grass/ Mixed Sagebrush 250-650 .17
Mixed Sagebrush/*Bare Ground* 100-350 .1
Salt Tolerant Shrub/*Bare Ground* 200-375 .05
Salt Tolerant Shrub/Rhizomatous Wheatgrasses 225-550 .15

* - 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 C and D. Infiltration ranges from very slow to moderately slow. Runoff potential for this site varies from moderate to 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 should be barely distinguishable if at all present. 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 variety 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 in the original site description was derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in developing the original site include: Chris Krassin, Range Management Specialist, NRCS and Everet 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.

Information presented here has been derived from NRCS inventory data, Field observations from range trained personnel, and the existing range site descriptions. Those involved in developing the Loamy range site include: Chris Krassin, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist.

Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Ray Gullion, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Jack Mononi, Range Management Specialist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS.

Inventory Data References:
Ocular field estimations observed by trained personnel were completed at each site. Then sites were selected where a 100 foot tape was stretched and the following sample procedures were completed by inventory staff. For full sampling protocol and guidelines with forms please refer to the Wyoming ESI Operating Procedures, compiled in 2012 for the Powell and Rock Springs Soil Survey Office, USDA-NRCS.
• Double Sampling Production Data (9.6 hoop used to estimate 10 points, clipped a minimum of 3 of these estimated points, with two 21 foot X 21 foot square extended shrub plots).
• Line Point Intercept (over story and understory captured with soil cover). Height of herbaceous and woody cover is collected every three feet along established transect.)

• Continuous Line Intercept (Woody Canopy Cover, with minimum gap of 0.2 of a foot for all woody species and succulents. Intercept height collected at each measurement.),
• Gap Intercept (Basal Gap measured with a minimum gap requirement of 0.7 foot.),
• Sample Point (10 – 1 meter square point photographs taken at set distances on transect. Red using the sample point computer program established by the High Plains Agricultural Research Center, WY).
• Soil Stability (Slake Test – surface and subsurface samples collected and processed according to the soil stability guidelines provided by the Jornada Research Center, NM.)

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Contributors

D. Tranas

Approval

Kirt Walstad, 4/30/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Ray Gullion, E. Bainter
Contact for lead author	ray.gullion@wy.usda.gov or 307-347-2456
Date	05/02/2008
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to nonexistent. Where present, short and widely spaced.

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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:** Rare to nonexistent.

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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 20-50%.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter expected to move only in small amounts (to leeward side of shrubs). Large woody debris from sagebrush will show no movement.

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 1 (interspaces) to 5 (under plant canopy), but average values should be 3.0 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil data is limited for this site. Soil OM usually varies from .5 to 1.5%.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 60-85% grasses, 5% forbs, and 10-35% shrubs. Evenly distributed plant canopy (30-50%) and litter plus slow to moderate infiltration rates result in slight to minimal runoff. Basal cover is typically less than 5% for this site and does very little to effect runoff on this site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None, but some soil crusting and cracking is expected during dry conditions.

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: cool season rhizomatous grasses perennial shrubs

    Sub-dominant: Mid-size, cool season bunchgrasses

    Other: short, cool season bunchgrasses perennial forbs

    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.

14. **Average percent litter cover (%) and depth (in):** Litter ranges from 20-30% of total canopy measurement with total litter (including beneath the plant canopy) from 30-50% expected. Herbaceous litter depth typically ranges from 3-10mm. Woody litter can be up to a couple inches (4-6 cm).

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** English: 350-700 lb/ac (525 lb/ac average); Metric 392 -784 kg/ha (588 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 75% is the most common indicator of a threshold being crossed. Blue grama, rhizomatous wheatgrasses, Rabbitbrush and other shrubs, Sandberg bluegrass, and phlox are common increasers. Annual weeds such as kochia, mustards, lambsquarter, 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.
