USDA Natural Resources
Conservation Service

Ecological site DX032X02W140
Saline Lowland Drained (SLDr) Wind River Basin Wet

Last updated: 3/10/2025
Accessed: 05/12/2025

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): 032X–Northern Intermountain Desertic Basins

032X – Northern Intermountain Desertic Basins – This MLRA is comprised of two major Basins, the Big Horn and Wind River. These two basins are distinctly different and are split by LRU's to allow individual ESD descriptions. These warm basins are surrounded by uplifts and rimmed by mountains, creating a unique set of plant responses and communities. Unique characteristics of the geology and geomorphology further individualize these two basins.

For 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

32X02W (WY): This LRU is the Wind River Basin within MLRA 32X. This LRU tends to be just a fraction higher in elevation, slightly cooler (by 1-degree Celsius), and snowpack tends to persist longer into the spring than the Big Horn Basin (LRU 01).
This LRU was originally divided into two LRU's - LRU C which was the core and LRU D which was the rim. With the most current standards, this LRU is divided into three subsets. This subset is the "wet" subset of the Wind River Basin and is comprised of drainages, floodplains, floodplain steps, and stream terraces. This subset is driven by hydrology and the connectivity or disconnection from the water table, and significant periods of surface flow, that affects the soil chemistry, influencing the variety of ecological sites and plant interactions.

The wet subset includes all of the core subset and extensions into the rim subset. The hydrology factor is the driving factor over precipitation in this subset. Because of this and historic mapping, the extent of soils currently correlated to this ecological site does not fit within the current subset or LRU boundary. Many of the map unit components are correlated to ecological sites outside of this MLRA, but will be reviewed and corrected during mapping update projects.

Moisture Regime: typic aridic or ustic aridic
Temperature Regime: Mesic
Dominant Cover: Rangeland, with sagebrush steppe intermixed with saltbush flats, is the dominant vegetative cover.
Representative Value (RV) Effective Precipitation: 9-12 inches (229 – 305 mm)
RV Frost-Free Days: 85-115 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 and Grassland formation
3.B.1.NE Western North American Cool Semi-Desert Scrub & Grassland Division
M171 Great Basin - Intermountain Dry Shrubland & Grassland Macrogroup
G301 Intermountain Dwarf Saltbush - Sagebrush Scrub Group

Ecoregions (EPA):
Level I: 10 North American Deserts
Level II: 10.1 Cold Deserts
Level III: 10.1.18 Wyoming Basin
Level IV: 10.1.18g Big Horn Salt Desert Shrub Basin

National Hierarchical Framework of Ecological Units (USFS):
300 Dry Domain
340 Temperate Desert Division
342 Intermountain Semi-Desert Province
342A Bighorn Basin
342Ad Big Horn Basin

Ecological site concept

• Site receives additional moisture from surrounding uplands.
• Site exists along degraded (down-cut) channel systems that have had a significant drop in the water table.
• Slope is < 6%.
• Soils are:
- Textures range from sandy loam to clay in top four inches (10 cm) of mineral soil surface, and varies within profile.
- All subsurface horizons in the particle size control section have a weighted average of > 18% clay. (The particle size control section is the segment of the profile from either the start of an argillic horizon for 50 cm or from 25-100 cm).
- Not skeletal (<35% rock fragments) within 20 inches (50 cm) of mineral soil surface, may have stratification with gravels.
- None to strong effervescence throughout upper 20 inches (50 cm) of the mineral soil surface.
- Saline, sodic, or saline-sodic; but this may occur deeper in the profile (within rooting zone of woody species).

Associated sites

R032XY204WY	**Clayey (Cy) 5-9” Wind River Basin Precipitation Zone** Clayey sites are found in pockets or bands just above or within the Saline Lowland Drained soils. Clayey sites have never been influenced by a water table or significant overflow. Many times Clayey and Saline Lowland drained ecological sites will be found in bands or patchy complexes along eroded stream terraces or fans forming below shale outcroppings.
R032XY228WY	**Lowland (LL) 5-9” Wind River Basin Precipitation Zone** Saline Lowland Drained have lost the recognizable water table and are found on relict stream terraces, along drainageways, or on alluvial fans. The soils transition into Saline Lowland the closer to the existing water table you move. Lowland soils have a water table that fluctuates between depths of 100 to 200 cm below the soil surface during the growing season, and are on active floodplains or floodplain steps.
DX032X02A144	**Saline Upland (SU) Wind River Basin Core** The soils transition into Saline Upland the further up on the landform, as they shift off of old floodplains and stream terraces. Saline Upland does not have the influence of a historic water table or additional effective overland flow and so are lower in production and lack the greasewood and alkali sacaton components. Saline Upland in the core is on the lower/drier extents of Saline Lowland Drained.

DX032X02B144	**Saline Upland (SU) Wind River Basin Rim** The soils transition into Saline Upland the further up on the landform, as they shift off of old floodplains and stream terraces. Saline Upland does not have the influence of a historic water table or additional effective overland flow and so are lower in production and lack the greasewood and alkali sacaton components. Saline Upland in the Rim is on the upper/ higher precipitation extents of Saline Lowland Drained.

Similar sites

R032XY340WY	**Saline Lowland Drained (SLDr) 10-14" East Precipitation Zone** This is the historic version of the current ecological site description. This legacy site was developed for the upper extents of the Basin, including the foothills. Production and plant communities were narrowed to the Basin only.
R032XY240WY	**Saline Lowland Drained (SLDr) 5-9” Wind River Basin Precipitation Zone** This is the historic version of the current ecological site description. This legacy site was developed for the lower extents of the Basin only. Production and plant communities were updated to represent the full extent of this ecological site within the Basin.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus* (2) *Atriplex gardneri*
Herbaceous	(1) *Sporobolus airoides* (2) *Distichlis spicata*

Legacy ID

R032XW140WY

Physiographic features

This site normally occurs on land that receives overflow or runoff from adjacent slopes. The origin of the Saline Lowland Drained ecological site is related to the natural process of stream progressive formation processes and changing water tables. Degradation of the hydrological system has expediated this process in segments of the system. The stream process has created varying degrees of site transformation and community ages that relate to the landforms where the site is located.

Table 2. Representative physiographic features

Slope shape across	(1) Concave
Slope shape up-down	(1) Linear
Geomorphic position, terraces	(1) Tread
Landforms	(1) Intermontane basin > Alluvial fan (2) Intermontane basin > Drainageway (3) Intermontane basin > Stream terrace
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to rare
Elevation	4,000–6,800 ft
Slope	0–6%
Aspect	Aspect is not a significant factor

Climatic features

Although not the primary driver, climate is a factor in the overall ecology of this subset. Annual precipitation and modeled relative effective annual precipitation ranges from 9 to 12 inches (229–305 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. This amounts to about 50 percent 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 totals about 20 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

Average 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 generally are 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 1st 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 30-year trend data for average temperature, indicates there has been a warming trend. The last 12 years graphed, however, show temperatures have swayed high and low, but overall have maintained a steady trajectory, neither increasing nor decreasing. On the moisture side, the trajectory in trend has been a slow decline. The swings of when spring warm-up and first frost hit, combined with the decline in average precipitation, have produced a drought effect where the moisture is not being received when the plants and soils are able to utilize the moisture. 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 have 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/. Riverton, Shoshoni, Boysen Dam, Pavillion, and Diversion Dam are the representative weather stations within LRU 02W. 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)	90-112 days
Freeze-free period (characteristic range)	118-137 days
Precipitation total (characteristic range)	8-9 in
Frost-free period (actual range)	87-112 days
Freeze-free period (actual range)	111-138 days
Precipitation total (actual range)	8-9 in
Frost-free period (average)	99 days
Freeze-free period (average)	126 days
Precipitation total (average)	9 in

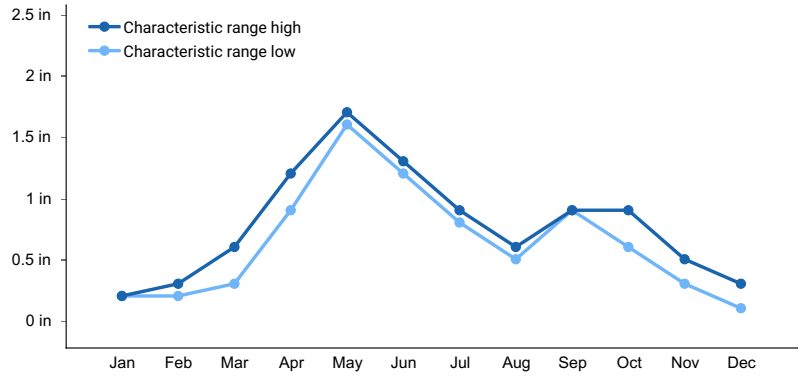


Figure 1. Monthly precipitation range

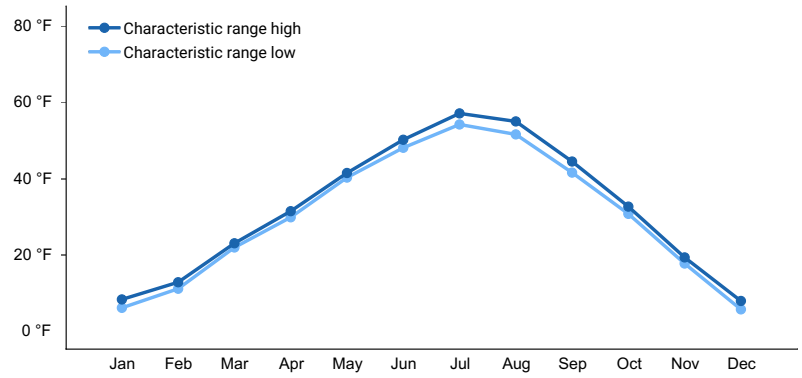


Figure 2. Monthly minimum temperature range

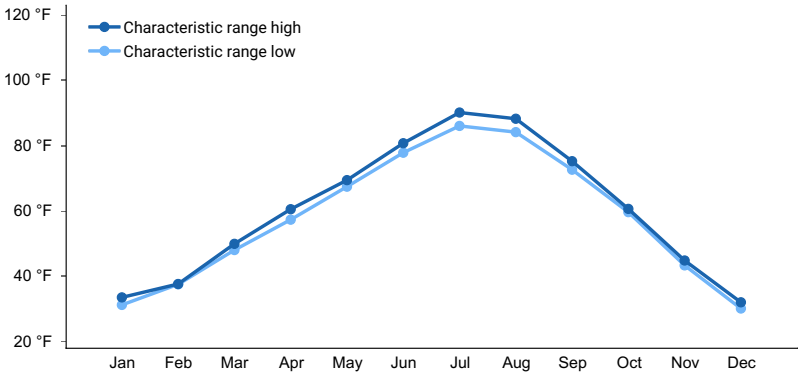


Figure 3. Monthly maximum temperature range

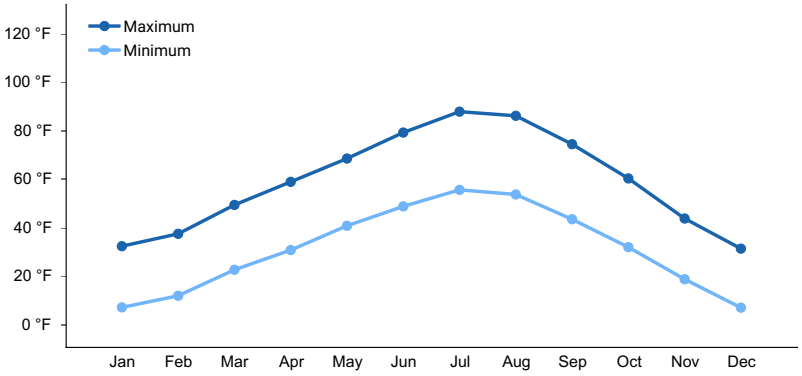


Figure 4. Monthly average minimum and maximum temperature

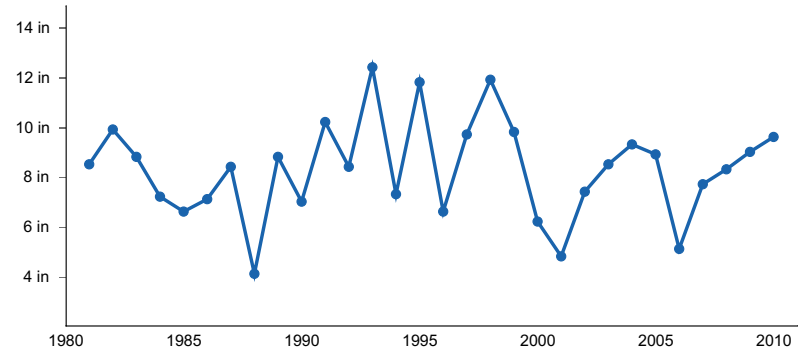


Figure 5. Annual precipitation pattern

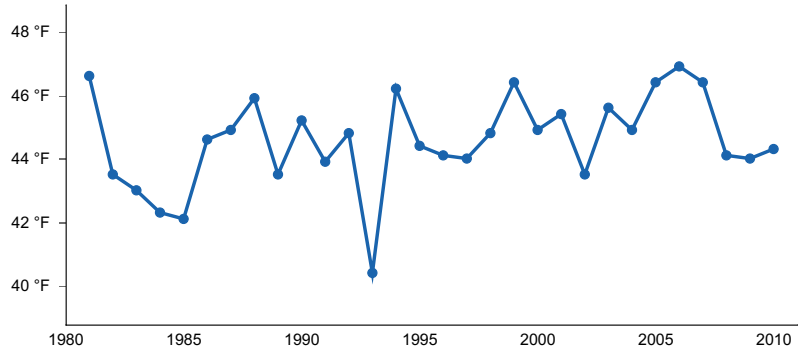


Figure 6. Annual average temperature pattern

Climate stations used

- (1) RIVERTON [USC00487760], Riverton, WY
- (2) RIVERTON [USW00024061], Riverton, WY
- (3) SHOSHONI [USC00488209], Shoshoni, WY
- (4) BOYSEN DAM [USC00481000], Riverton, WY
- (5) DIVERSION DAM [USC00482595], Kinnear, WY
- (6) PAVILLION [USC00487115], Pavillion, WY

Influencing water features

The transitional process of streams striving to reach gradient leads to natural downcutting and channel morphic processes that creates this site. The degradation of the site expediates this process. Downcutting of the stream channel and removal or disconnection of the water table creates an alteration of the plant community. Overflow during the spring runoff or snow melt provides additional moisture to this site. The site is generally adjacent to an active channel (ephemeral, intermittent or perennial). There may be instances of this site occurring in an upland position where a perched water table once existed.

Soil features

The soils of this site are moderately deep and very deep well-drained soils formed in alluvium. These soils have moderate to rapid permeability and are moderately to strongly saline and/or alkaline. Higher soluble salt concentrations may be found in the subsoils. The surface soil will be highly variable and vary from 2 to 8 inches in thickness. A water table if present is below 5 feet and is too deep to benefit the herbaceous species. These areas are subject to occasional overflow. The soil characteristics having the most influence on the plant community are the elimination of the water table near the surface, reduction in the potential to flood and the elevated quantities of soluble salts. Salts are generally found lower in the soil profile.

Major soil series correlated to this site include: Lostwells.
Soil series are subject to change upon completion and correlation of the initial soil surveys. It is recognized that some of these series are classified as typic aridic (5-9 inches precipitation, Mesic); however, map units were mapped across zones that are both typic aridic and ustic aridic (10-14 inches precipitation, Mesic). As surveys are

correlated, this will be corrected.

Figure 7.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Loam (2) Clay loam (3) Silt loam (4) Clay (5) Sandy loam (6) Silty clay
Family particle size	(1) Fine-loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	20–60 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–15%
Available water capacity (0-40in)	3.3–4.5 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–16 mmhos/cm
Sodium adsorption ratio (0-40in)	0–40
Soil reaction (1:1 water) (0-40in)	7.4–10
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The Saline Lowland Drained ecological site is the result of natural stream morphology processes and also occurs as a direct result of a hydrologic disruption to the Saline Lowland and Saline Subirrigated ecological sites. This disturbance, whether natural or human caused, alters the hydrologic function of a Saline Lowland to such a degree

that rehabilitation is not an option. As a result, subsoil that at one time was sufficiently moist during part of the growing season is literally drained as water is now diverted to deeply incised channels. Consequently, supplemental water that was predictable and available to herbaceous plants during part of the growing year is now lacking and the water table is permanently below the rooting depth of these plants. The Saline Lowland ecological site, however, gets an occasional overflow from the adjacent uplands and the water table is commonly at a depth that is still beneficial to deep-rooted shrub species.

Potential vegetation on this site is dominated by tall- and mid-stature perennial grasses, which can tolerate soils with moderate amounts of salinity and alkalinity and adapt to periodic overflows. Other significant vegetation includes greasewood, Gardner’s saltbush, and a variety of forbs. The expected potential cover composition for this ecological site is about 70% grasses, 10% forbs and 20% woody plants. The composition and production will vary naturally due to historical use and fluctuating precipitation.

As this site deteriorates, species such as inland saltgrass and greasewood will increase. Weedy annuals will invade. Grasses such as alkali sacaton, Indian ricegrass, and basin wildrye will decrease in frequency and production.

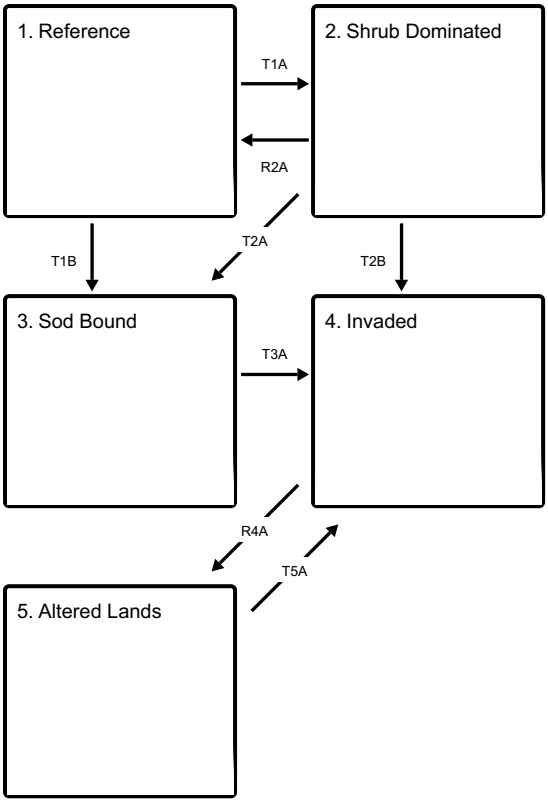
The Reference Community (description follows the State-and-Transition diagram) has been determined by study of rangeland relict areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily to lightly grazed areas, seasonal use pastures, and historical accounts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

The following is a State-and-Transition Model (STM) diagram for this ecological site. An STM has five fundamental components: states, transitions, restoration pathways, community phases, and community pathways. The state is a single community phase or suite of community phases. The Reference State is recognized as State 1. It describes the ecological potential and natural range of variability resulting from the natural disturbance regime of the site. The designation of alternative states (State 2, etc) in STMs denotes changes in ecosystem properties that cross a certain threshold.

Transitions are represented by the arrows between states moving from a higher state to a lower state (State 1 to State 2) and are denoted in the legend as a “T” (T1-2). They describe the variables or events that contribute directly to loss of state resilience and result in shifts between states. Restoration pathways are represented by the arrows between states returning back from a lower state to a higher state (State 2 to State 1) or better illustrated by State 1, and are denoted in the legend as a "R" (R2-1).

State and transition model

Ecosystem states



T1A - Continuous, season-long grazing, drought and ground disturbances can lead to the loss of herbaceous cover and increase in shrub canopy.

T1B - Continuous, season-long or repetitive early season use encourages sod forming species and reduces cool-season grasses.

R2A - Long-term prescribed grazing will encourage recovery of the native perennial grasses in this community.

T2A - Shifts in grazing patterns to favor warm season species will allow community to transition to a sod forming community.

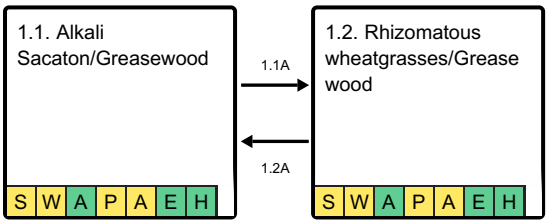
T2B - Soil disturbance with a seed source present opens this community to invasion by weedy species.

T3A - Continuous, season-long grazing weakens the sod-bound community to invasion by weedy species. This is exacerbated by prolonged drought and soil disturbances.

R4A - Weed control and seeding of the community is required to recover an invaded community. This community will remain disturbed with alterations to the soil and select seeded species.

T5A - Continued disturbance and lack of weed management will lead to an Invaded state where seed sources are present.

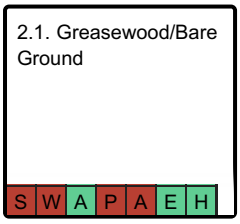
State 1 submodel, plant communities



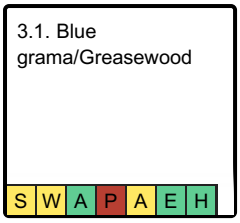
1.1A - Moderate, continuous season-long grazing will convert this plant community. Prolonged drought will exacerbate this transition.

1.2A - Prescribed grazing and potentially brush control will assist the return of this community to Reference.

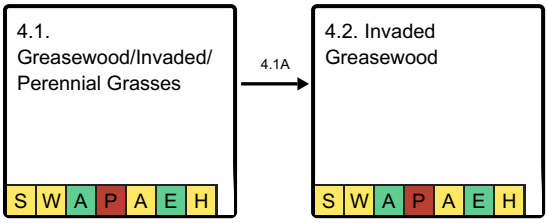
State 2 submodel, plant communities



State 3 submodel, plant communities

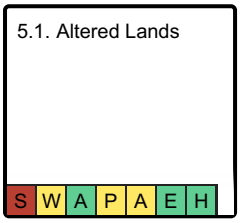


State 4 submodel, plant communities



4.1A - Lack of weed management with extended drought, continued severe grazing, or human disturbances remove native vegetation and allow the expansion of invasive species encroachment.

State 5 submodel, plant communities



State 1
Reference

The Reference State for the Saline Lowland Drained ecological site is representative of the native community phases that establish once the floodplain of a saline drainage is detached from the water during natural stream morphological processes or from channel disturbances. The loss of the natural water table results in a loss of hydrophytic plants and an establishment of upland plants.

Characteristics and indicators. Greasewood and alkali sacaton are present as well as inland saltgrass. Western wheatgrass replaces slender wheatgrass, Sandburg bluegrass will replace alkali bluegrass, and bottlebrush squirreltail and Indian ricegrass have increased in composition. Basin wildrye will persist but will be reduced in the community. Gardner's saltbush establishes once the community is disconnected from the water table, and forbs transition to upland species.

Resilience management. This state is in a state of transition and so although resilient, it is not resistant to change and disturbances can quickly shift this community. Grazing management, drought, natural channel and hydrologic shifts, and disturbances are influences for this state.

Community 1.1
Alkali Sacaton/Greasewood

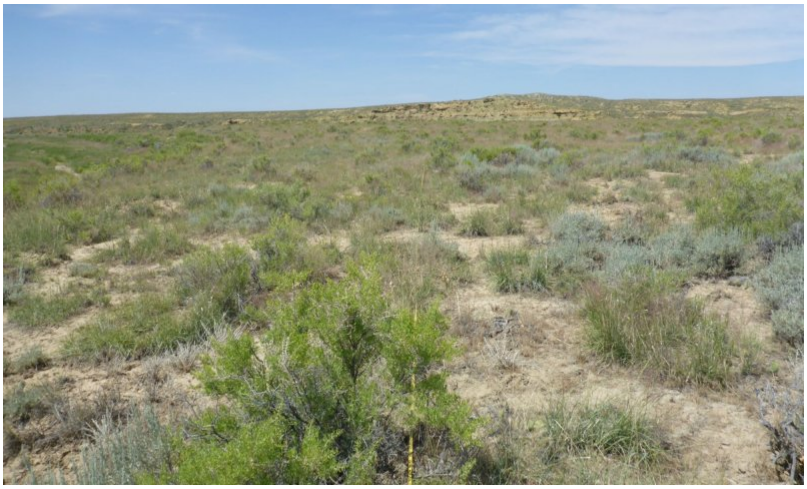


Figure 8. Alkali sacaton with greasewood are dominant with other native perennial grasses and forbs present.

The Reference Plant Community for the Saline Lowland Drained ecological site evolved with grazing by large herbivores and periodic fires. Potential vegetation composition by cover is is about 70% grasses or grass-like plants, 10% forbs and 20% woody plants. Tall and medium grasses, which can tolerate saline and/or alkali conditions and occasional overflows, dominate this plant community. The major grasses include inland saltgrass, alkali sacaton, rhizomatous wheatgrasses, bottlebrush squirreltail, basin wildrye, and Indian ricegrass. Woody plants are greasewood and Gardner's saltbush. A variety of forbs also occurs in this community and plant diversity is high (see Plant Composition Table for Community 1.1, Table 21). The total annual production (air-dry weight) of this state is about 525 pounds per acre, but it can range from about 350 lbs./acre in unfavorable years to about 700 lbs./acre in above average years.

Resilience management. This state is stable and well adapted to the arid climatic conditions. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity). Typically, relic rill and gullies are visible but are now stable. No recent accelerated erosion should be occurring in this state.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- Gardner's saltbush (*Atriplex gardneri*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- squirreltail (*Elymus elymoides*), grass
- saltgrass (*Distichlis spicata*), grass
- Pursh seepweed (*Suaeda calceoliformis*), other herbaceous
- smooth woodyaster (*Xylorhiza glabriuscula*), other herbaceous
- leafy wildparsley (*Musineon divaricatum*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Sediment transported to surface water
- Plant structure and composition
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	300	425	525
Shrub/Vine	50	75	125
Forb	0	25	50
Total	**350**	**525**	**700**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-15%
Grass/grasslike foliar cover	25-50%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	10-25%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	25-35%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	5-10%
Grass/grasslike basal cover	30-50%
Forb basal cover	0-5%
Non-vascular plants	0%
Biological crusts	2-10%
Litter	25-40%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	25-35%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	1-5%	0-5%	0-5%
>0.5 <= 1	–	0-5%	5-25%	0-5%
>1 <= 2	–	0-5%	5-25%	–
>2 <= 4.5	–	5-15%	1-10%	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

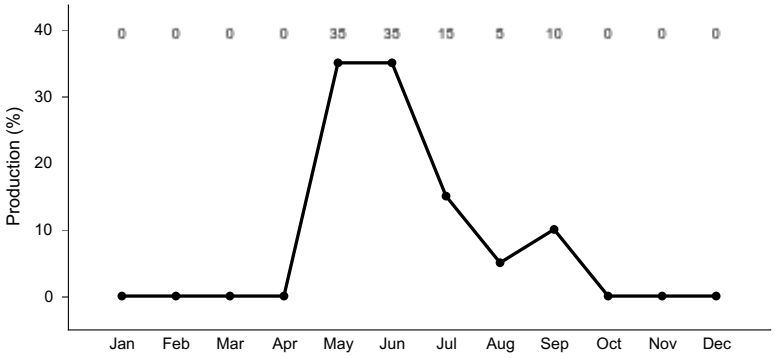


Figure 10. Plant community growth curve (percent production by month). WY0802, 5-9WR extra water sites.

Community 1.2
Rhizomatous wheatgrasses/Greasewood

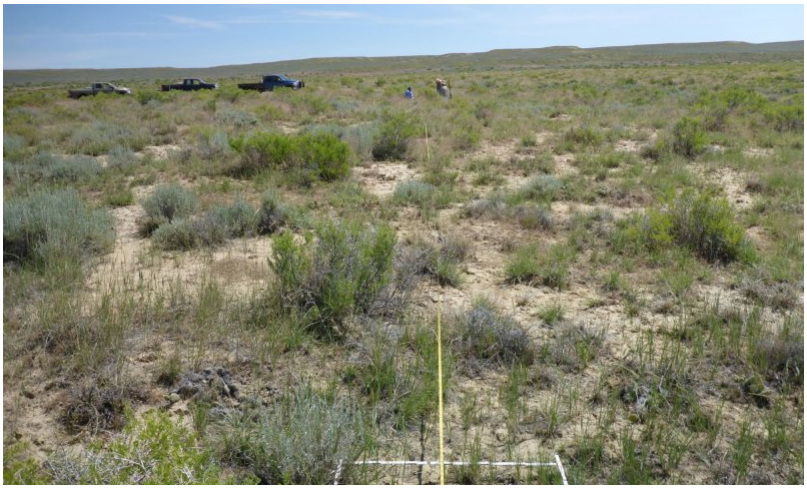


Figure 11. Rhizomatous wheatgrass, greasewood and other native grasses and forbs increase as alkali sacaton decreases in the community.

This plant community evolved under moderate grazing by domestic livestock and low fire frequency. Saline tolerant grasses make up the majority of the understory. Dominant grasses include rhizomatous wheatgrasses, inland saltgrass, alkali bluegrass, and alkali sacaton. Forbs commonly found in this plant community include wild onion, pursh seepweed, smooth goldaster, and povertyweed. Greasewood may comprise as much as 35% of the total annual production. When compared to the Reference Plant Community (Community Phase 1.1), basin wildrye, Indian ricegrass, rhizomatous wheatgrasses, bottlebrush squirreltail, and alkali sacaton have decreased. Inland saltgrass, blue grama, greasewood and rubber rabbitbrush have increased. The total annual production (air-dry weight) of this state is about 450 pounds per acre, but it can range from about 275 lbs./acre in unfavorable years to about 600 lbs./acre in above average years.

Resilience management. This state is stable and protected from excessive erosion. The herbaceous component is mostly intact and plant vigor and replacement capabilities are sufficient. Only minimal occurrences of water flow patterns and litter movement is evident. 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.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- Gardner's saltbush (*Atriplex gardneri*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- Indian ricegrass (*Achnatherum hymenoides*), grass
- squirreltail (*Elymus elymoides*), grass
- Pursh seepweed (*Suaeda calceoliformis*), other herbaceous
- smooth woodyaster (*Xylorhiza glabriuscula*), other herbaceous
- spiny phlox (*Phlox hoodii*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Aggregate instability
- Sediment transported to surface water
- Plant productivity and health
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	170	275	300
Shrub/Vine	100	150	250
Forb	5	25	50
Total	**275**	**450**	**600**

Table 10. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	10-35%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	15-25%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	20-35%

Table 11. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	15-35%

Grass/grasslike basal cover	25-40%
Forb basal cover	0-5%
Non-vascular plants	0%
Biological crusts	2-10%
Litter	20-40%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	30-45%

Table 12. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-10%	0-5%	0-5%
>0.5 <= 1	–	0-5%	20-40%	0-5%
>1 <= 2	–	0-5%	0-5%	–
>2 <= 4.5	–	10-30%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

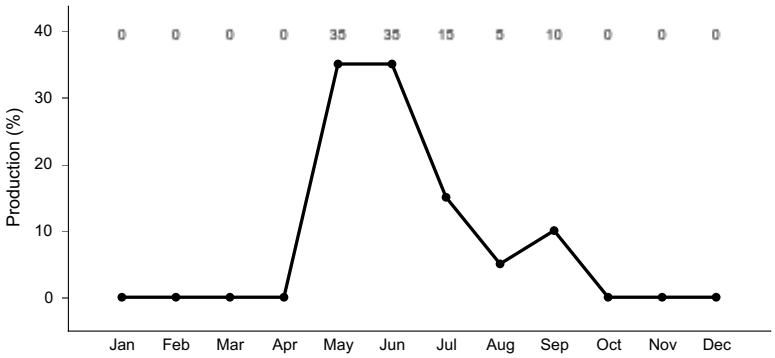


Figure 13. Plant community growth curve (percent production by month). WY0802, 5-9WR extra water sites.

Pathway 1.1A
Community 1.1 to 1.2

Alkali Sacaton/Greasewood

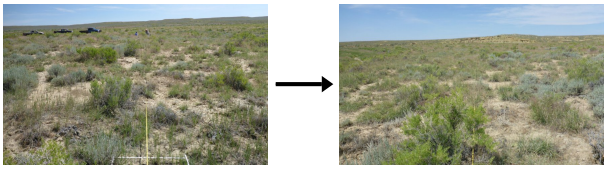
Rhizomatous wheatgrasses/Greasewood

Moderate, continuous season-long grazing will convert this plant community to the Rhizomatous Wheatgrasses/Greasewood Plant community (1.2). Prolonged Drought will exacerbate this transition. Rubber rabbitbrush and sagebrush will show effects of grazing pressure. However, greasewood and Gardner's saltbush

tend to show very little change through this transition.

Context dependence. This transition can also be a response to further alteration of the hydrologic cycle, especially with the loss of upland overflow moisture. Basin wild rye will decrease rapidly with the loss of hydrology, while other perennial grasses present will transition slower.

Pathway 1.2A
Community 1.2 to 1.1



Rhizomatous wheatgrasses/Greasewood

Alkali Sacaton/Greasewood

Prescribed grazing designed to provide recovery periods will allow alkali sacaton and basin wildrye to recover, resulting in a plant community very similar to Reference, except that greasewood density will persist. Brush control may be needed to reduce the greasewood and rubber rabbitbrush cover.

Context dependence. Historically, greasewood density was related to fire frequency. The sprouting response of greasewood to fire limits the function of fire in thinning the greasewood canopy. Chemical control and mechanical control are possibilities, but control is challenging. Variability in soil texture and salt content will affect the time required for communities to recover. The heavier the soil texture and the higher the salt content the soil is, the more difficult and more time that may be required to allow for recovery of this plant community to reference.

Conservation practices

Brush Management
Prescribed Grazing
Grazing Land Mechanical Treatment
Heavy Use Area Protection

State 2
Shrub Dominated

The Shrub Dominated State of the Saline Lowland Drained ecological site is a greasewood community with minimal understory. The bare ground and large patch dynamics creates a community that is at risk for invasion and further degradation.

Characteristics and indicators. The plant community is dominated by greasewood with common occurrences of rubber rabbitbrush. Communities in soils that have deeper salts or lower overall salt composition will host scattered amounts of Wyoming big and basin big sagebrush. Remnants of native grasses including bottlebrush squirreltail and six-weeks fescue will occur in the basal cover of greasewood, but very minimal occurrences of grasses occur in the shrub interspaces. Annual and perennial forbs will occur within the greasewood basal cover as well and will extend into the interspaces, especially in wetter years.

Resilience management. Soil crusting, generally higher salt concentrations, especially around the canopy of greasewood, and restrictive soils, natural repopulation of native grasses has not been seen. Invasive encroachment occurs more readily in the open interspaces where seed source is available. The community is stable unless invasion occurs.

Community 2.1
Greasewood/Bare Ground

This plant community evolved under frequent and severe grazing with the absence of fire. Greasewood and rubber rabbitbrush are the dominant species of this plant community. Tall and medium grasses have been eliminated. The

interspaces between shrubs have expanded leaving the amount of bare ground more prevalent and more soil surface exposed to erosive elements. Annuals such as six week fescue and wooly plantain fill in the interspaces. Total annual production is mostly from shrubs and these weedy annuals. The total annual production (air-dry weight) of this state is about 350 pounds per acre, but it can range from about 100 lbs./acre in unfavorable years to about 450 lbs./acre in above average years.

Resilience management. This plant community is resistant to change as the stand becomes more decadent. These areas may actually be 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 plant composition or structure of the plant community. Annual grasses, weedy species and bare ground compromise the biotic integrity. Plant diversity is poor and the potential for native grasses to reproduce is absent. The shift in the vegetative structure and function is extreme and the biotic integrity is lost. 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 lateral gullies are numerous.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- squirreltail (*Elymus elymoides*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- woolly plantain (*Plantago patagonica*), other herbaceous
- madwort (*Alyssum*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Wind erosion
- Ephemeral gully erosion
- Classic gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Concentration of salts or other chemicals
- Aggregate instability
- Naturally available moisture use
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Table 13. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	100	275	300
Grass/Grasslike	0	50	100
Forb	0	25	50
Total	**100**	**350**	**450**

Table 14. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-30%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-15%
Non-vascular plants	0%

Biological crusts	0-5%
Litter	10-15%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	40-60%

Table 15. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	20-40%
Grass/grasslike basal cover	0-20%
Forb basal cover	0-15%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	15-30%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	40-70%

Table 16. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	2-10%	5-10%	0-10%
>0.5 <= 1	–	0-5%	5-10%	0-5%
>1 <= 2	–	0-5%	0-5%	–
>2 <= 4.5	–	10-30%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 3
Sod Bound

The mat-forming growth habit expressed by blue grama and threadleaf sedge create a dense, short, sod-bound community that affects the hydrology and overall function of the community. As the cool-season grasses are removed from the system and the mid-stature warm-season grasses are restricted by use, the short grasses increase to stabilize the community.

Characteristics and indicators. Remnants of alkali sacaton and some cool-season species will persist at the bases of greasewood and scattered across the community. But the dominant grass cover shifts to blue grama or a threadleaf sedge/blue grama mix.

Resilience management. The dense, tightly rooted sod-forming species are resistant to hoof impact and traffic, as well as drought tolerant. This combination makes for a resilient community with continued disturbances.

Community 3.1
Blue grama/Greasewood

This plant community is the result of frequent and severe grazing with periodic overflows and no fire or brush control. This plant community is dominated by a dense sod of inland saltgrass, blue grama and alkali bluegrass and includes a mosaic shrub overstory. Greasewood and rubber rabbitbrush are the dominant overstory but Gardner's saltbush is also an important shrub in this plant community. Shrubs comprise less than 35% of the annual production and are kept in check by the herbaceous sod understory. When compared to the Reference Plant Community (Community Phase 1.1), the tall- and medium-stature grasses are absent. Short-stature warm-season grasses are dominant and weedy annuals are common. Shrubs will have increased as a percentage of the total production, but will not dominate as the sod prevents a homogeneous shrub cover. Noxious weeds such as Russian knapweed are present if a seed source is available. The total annual production (air-dry weight) of this state is about 250 pounds per acre, but it can range from about 150 lbs./acre in unfavorable years to about 400 lbs./acre in above average years.

Resilience management. The sod component of this plant community is extremely resistant to change and continued frequent and severe grazing or the removal of grazing does not seem to affect the plant composition or structure of the plant community. The biotic integrity of this state is generally not functional as plant diversity is poor especially among the herbaceous species. However, the vegetative structure may still be partially intact as the shrub component is still within a reasonable percentage of the total composition. This sod bound plant community is very resistant to water infiltration. While this sod protects the site itself, excessive runoff increases erosion on bare ground areas and worsens the channelization already present. Water flow patterns are obvious in the bare ground areas and shrubs and sod patches are pedestalled. Rill channels are noticeable in the interspaces and lateral gullies will increase. The watershed is not normally functioning, as runoff is excessive and erosional processes are accelerated.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- blue grama (*Bouteloua gracilis*), grass
- woolly plantain (*Plantago patagonica*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Naturally available moisture use
- Plant productivity and health
- Plant structure and composition
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Table 17. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	100	125	200
Shrub/Vine	50	100	150
Forb	0	25	50
Total	**150**	**250**	**400**

Table 18. Ground cover

Tree foliar cover	0%

Shrub/vine/liana foliar cover	5-15%
Grass/grasslike foliar cover	20-30%
Forb foliar cover	0-10%
Non-vascular plants	0%
Biological crusts	0-2%
Litter	2-10%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	35-55%

Table 19. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	10-25%
Grass/grasslike basal cover	20-35%
Forb basal cover	0-10%
Non-vascular plants	0%
Biological crusts	0-2%
Litter	10-25%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	35-60%

Table 20. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-10%	15-30%	0-5%
>0.5 <= 1	–	0-5%	5-10%	0-5%
>1 <= 2	–	0-5%	0-5%	–
>2 <= 4.5	–	10-20%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

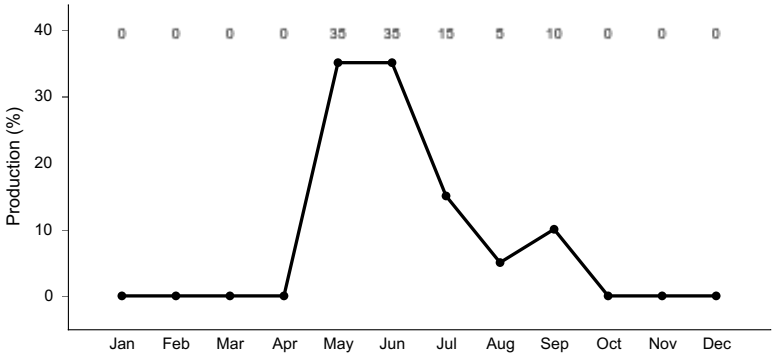


Figure 16. Plant community growth curve (percent production by month). WY0802, 5-9WR extra water sites.

State 4
Invaded

The Saline Lowland Drained ecological site is vulnerable to invasion by many of the aggressive weedy species threatening the rangelands today. Cheatgrass (downy brome) poses the greatest threat, with annual mustards and clasping pepperweed taking advantage of the open canopy and occasional flushes of overland flow.

Characteristics and indicators. The presence of at least 5 percent cover of an invasive species, dominantly cheatgrass, within the community is the threshold forcing this community into the invaded state.

Resilience management. Managing to maintain the remaining native species while working to reduce the invasive species is the best management practice focus for the Invaded State.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- Gardner's saltbush (*Atriplex gardneri*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- squirreltail (*Elymus elymoides*), grass
- cheatgrass (*Bromus tectorum*), grass
- clasping pepperweed (*Lepidium perfoliatum*), other herbaceous
- mustard (*Brassica*), other herbaceous

Community 4.1
Greasewood/Invaded/Perennial Grasses

Figure 17. Rhizomatous wheatgrass with an intermixed cover of cheatgrass and clasping pepperweed.

This plant community evolved under frequent and severe grazing with the absence of fire. Greasewood and rubber rabbitbrush are the dominant species of this plant community. Tall- and medium-stature grasses have been

eliminated. The interspaces between shrubs have expanded leaving the site open to invasive and aggressive species. The extent of soil surface exposed to erosive elements decreases with increasing coverage of annual species. The annual grasses and forbs, such as foxtail barley, mustards, pepperweeds, and Russian thistle, make up the dominant understory along with invasive weeds such as cheatgrass and halogeton. Total annual production is mostly from shrubs and these weedy annuals. The total annual production (air-dry weight) of this state is about 300 pounds per acre, but it can range from about 100 lbs./acre in unfavorable years to about 550 lbs./acre in above average years.

Resilience management. This plant community is resistant to change as the stand increases in percent invasive species. These areas increase in fire potential as fine fuels accumulate and the bare ground between the shrubs is filled with annual species. Continued frequent and severe grazing or the removal of grazing does not seem to affect the plant composition or structure of the plant community. Annual grasses, weedy species and bare ground compromise the biotic integrity. Plant diversity is poor and the potential for native grasses to reproduce is absent. The shift in the vegetative structure and function is extreme and the biotic integrity is lost. Soil erosion rates will vary depending on the species of invasion and the amount of litter produced. Water flow patterns and pedestalling are obvious. Infiltration is reduced and runoff is increased. Rill channels may be noticeable in the interspaces and lateral gullies are numerous.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- cheatgrass (*Bromus tectorum*), grass
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- clasping pepperweed (*Lepidium perfoliatum*), other herbaceous
- mustard (*Brassica*), other herbaceous
- woolly plantain (*Plantago patagonica*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Concentration of salts or other chemicals
- Aggregate instability
- Salts transported to surface water
- Salts transported to ground water
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Community 4.2
Invaded Greasewood

Figure 18. Native perennial grasses are near non-existent in the understory of cheatgrass and clasping pepperweed.

This plant community evolved under frequent and severe grazing. Fire may play a minor role in encouraging invasive species and sprouting of shrubs. Greasewood and rubber rabbitbrush are the dominant species of this plant community. Most native perennial grasses have been eliminated. The interspaces between shrubs have expanded leaving the amount of bare ground more prevalent, which allows rapid establishment and dominance of invasive species. The annual grasses and forbs, such as foxtail barley, mustards, and pepperweeds, make up the dominant understory along with invasive weeds such as cheatgrass and halogeton. Total annual production is mostly from shrubs and these weedy annuals. The total annual production (air-dry weight) of this state is about 400 pounds per acre, but it can range from about 100 lbs./acre in unfavorable years to about 600 lbs./acre in above average years.

Resilience management. This plant community is resistant to change as the stand becomes more invaded. Continued frequent and severe grazing or the removal of grazing does not seem to affect the plant composition or structure of the plant community. Annual grasses, weedy species and bare ground compromise the biotic integrity. Plant diversity is poor and the potential for native grasses to reproduce is absent. The shift in the vegetative structure and function is extreme and the biotic integrity is lost. Soil erosion is dependent on the species of invasion, but is generally controlled by the annual cover even with increased interspaces between shrubs. Water flow patterns and pedestalling are obvious. Infiltration is maintained or slightly increased by the roots of cheatgrass and other invasive species; however, runoff may increase as litter biomass increases. Rill channels may be noticeable in the interspaces and lateral gullies are numerous.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- cheatgrass (*Bromus tectorum*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- clasping pepperweed (*Lepidium perfoliatum*), other herbaceous
- mustard (*Brassica*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Concentration of salts or other chemicals
- Aggregate instability
- Ground water depletion
- Salts transported to surface water
- Salts transported to ground water
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure

- Wildfire hazard from biomass accumulation
- Aquatic habitat for fish and other organisms
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Pathway 4.1A
Community 4.1 to 4.2

Greasewood/Invaded/Perennial Grasses

Invaded Greasewood

In the absence of weed management, continued disturbance or pressure on native species removes them from the system and encourages the invasive species to increase in dominance on the ecological site. Extended or continued drought with exacerbate the degradation of the site as will continued severe grazing and other human disturbances.

Context dependence. The specific species of encroachment will depend on what species are present in the system. Cheatgrass is one of the most prevalent invasive species for the Wind River Basin.

State 5
Altered Lands

Energy development, mining, farming, irrigation canals, drainage laterals, and roads are only a few of the land uses that have had an impact on these arid, salt-affected landscapes.

Characteristics and indicators. The alteration of the soils and removal of the native vegetation are the key indicators for this State. Scaring of the activities completed are visible for significant periods following activities.

Resilience management. Much of this site is deemed unfit or non-productive; attempts to reclaim are marginal, and many attempts have failed. Historic attempts to improve productivity have altered the resilience and response pathways, affecting the site potential and stability.

Community 5.1
Altered Lands

Altered lands have been impacted by human settlement and land use advancement. Many areas within the Wind River Basin were farmed during settlement periods, but as water and times became difficult many homesteads were abandoned. Rangeland improvement projects were completed in the late 1940s and early 1950s by the Bureau of Land Management in conjunction with University of Wyoming. Sections of salt-affected barren landscapes were dissected with water-spreader dikes and seeded with predominantly a variety of grasses. Seeding trails were completed using species including crested wheatgrass, Russian wildrye, wheatgrasses, and Indian ricegrass. The dikes were created to increase water-holding capacity, which in turn improved vigor and production of greasewood and gardner’s saltbush and assisted the establishment of grasses. Remnants of the spreader dikes are still visible and in some areas the seeded grass species are persistent in small scattered populations. Productivity variances were found negligible between treated and untreated locations; however, within the spreader systems, an increase in vigor and production are seen within the immediate vicinity of the dikes. Spaces between the dikes do not show any lasting benefit. Mechanical alteration of these areas in conjunction with seeding of an introduced species carried a lasting effect to hydrology; and even though the introduced species did not persist in all locations, these sites are altered from the Reference State functionality. Similarly, with lands that were farmed or irrigated, then abandoned to return to a natural state of vegetation, they will not be the same as the Reference Community in response to management and natural disturbances. Greasewood, with time, has the potential to return if seed sources and moisture are present to encourage growth.

Resilience management. The persistence of an introduced, non-native species is a very indicative trait that will

assist in identifying this community phase. These non-native species are not invasive, although they may be persistent and aggressive species. Crested wheatgrass, varieties of wildrye and hybrid wheatgrasses are a few cultivars that have been planted that have persisted on the landscape, altering the site. The act of seedbed preparation alone, without consideration of the original disturbance can be seen as an alteration to the soil function. Productivity of these sites varies greatly depending on the exact disturbance, age and successional stage of recovery from this disturbance, and what, if any, species were seeded into the site. Composition variability of this plant community limits the ability to provide accurate averages and grow curves, so no production values or growth curves are provided for this community phase.

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Classic gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Concentration of salts or other chemicals
- Ground water depletion
- Naturally available moisture use
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance
- Inadequate livestock shelter
- Inadequate livestock water quantity, quality, and distribution

Transition T1A
State 1 to 2

Continuous, season-long grazing, ground disturbance, and drought can facilitate the loss of herbaceous cover and create a greasewood/bare ground community. Hoof impact as well as lack of recovery for all perennial grass species weakens their resiliency in the community. Remnants of these species may persist in the protective bases of greasewood, but are otherwise removed from the system. Drought assists with the weakening and removal of the herbaceous as well as shrub species. Ground disturbance will remove the herbaceous cover and in many instances encourage the sprouting of greasewood further exacerbating the concern.

Constraints to recovery. Lack of seed source in conjunction with a harsh climate for seedling establishment inhibit natural recovery of this community. Shrub density can also have an impact on herbaceous recovery.

Transition T1B
State 1 to 3

Continuous, season-long use or repetitive timing of use during early growing season will reduce the mid-stature cool-season grasses and encourage the short sod-forming grasses to establish. Drought will exacerbate this process.

Constraints to recovery. The dense root mat of sod forming species alters water flow across the site and inhibits infiltration causing dry subsoil conditions (droughty). This alteration in hydrology and resistance of the root mat to degradation creates a hostile environment for other species to establish.

Restoration pathway R2A
State 2 to 1

Prescribed grazing and management to reduce pressure on the plant community during the early growing season will provide the native perennial cool-season grasses to establish and to recover within the community. Inland saltgrass and alkali sacaton will respond with hoof action to stimulate the basal growth and rest during the mid to late growing season. The time required for recovery will vary depending on texture and salt content. Shifts in the community will be slow but obvious in the health and vigor of the existing species. Density of shrubs may require

mechanical or chemical treatment to thin them to an acceptable level of cover.

Conservation practices

Brush Management
Critical Area Planting
Prescribed Grazing
Grazing Land Mechanical Treatment
Heavy Use Area Protection
Integrated Pest Management (IPM)

Transition T2A
State 2 to 3

A shift in grazing management, specifically to a grazing pattern favoring warm season species, will allow recovery of blue grama and threadleaf sedge. With time, the community will recover to a sod-former community. Precipitation pattern changes can also be a factor in this shift.

Constraints to recovery. Sod forming species are resistant to change and resilient making it challenging to break the root mat to allow other native species to establish. The shift in hydrology caused by the root mat (filtering water off site, causing dryer subsurface conditions) also limits recovery of other native grasses.

Context dependence. The presence of these sod forming species must exist in the community before the shift occurs for this transition to occur.

Transition T2B
State 2 to 4

The open gaps between greasewood canopy is open to invasive species. Once disturbed by hoof action or human disturbance, the soil is vulnerable to invasive species when seed sources are available.

Constraints to recovery. The lack of successful eradication of invasive species and the harsh soil conditions are the two limiting factors to recovery.

Transition T3A
State 3 to 4

Continuous, season-long grazing weakens the sod-bound community opening a niche for invasive species to establish. Prolonged drought or soil disturbance (traffic) will also reduce the resistance of the sod former species allowing invasive species to establish when the seed source is available. Roadways and trails are common sources. However, proximity to the water source also serves as a source via water transmission as well as animal movement through the community.

Constraints to recovery. The inability to eradicate most invasive species is the main limiting factor to recovery. However, the harsh growth environment of the climate and soils also restricts recovery.

Restoration pathway R4A
State 4 to 5

Once a community becomes invaded (greater than 5% composition of non-native invasive species), eradication or significant control of invasive species must occur to recover the community. In many instances this may require cultural practices to achieve success. Seeding of the community with integrated weed control to minimize the chance of re-establishment is needed to move the community towards a reference community. Once soil disturbance occurs, the response to management and natural disturbance regimes are not the same as reference. The species seeded will also be improved varieties and will respond to management differently than native populations. So although the community may resemble reference, it will maintain as a disturbed or altered

community.

Conservation practices

Brush Management
Critical Area Planting
Prescribed Grazing
Grazing Land Mechanical Treatment
Range Planting
Heavy Use Area Protection
Integrated Pest Management (IPM)
Invasive Plant Species Control

Transition T5A
State 5 to 4

Continued ground disturbance, natural or man-induced, with a seed source present will revert an abandoned or disturbed landscape to the invaded state. The generally challenging soils and climate of the basin make reclamation a risky venture. When failure with seeding or improvement projects occur, invasive weeds are quick to establish in the disturbed soils. Wildlife and livestock moving through the Saline Lowland Drained ecological site are great vectors for seed dispersal.

Constraints to recovery. Cheatgrass is the most prominent invader that is found. Control of cheatgrass as well as many invasive species, is difficult and holds a low success rate, let a lone eradication. This inability to out-compete the invasive species is the main constraint to recovery. However, the hostile growth environment of the soils also limits successful recovery.

Additional community tables

Table 21. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall-stature Cool-season Bunchgrasses**			25–50	
	basin wildrye	LECI4	*Leymus cinereus*	25–50	2–5
2	**Mid-stature Cool-season Bunchgrasses**			25–50	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	25–50	5–10
3	**Rhizomatous Wheatgrasses**			25–100	
	western wheatgrass	PASM	*Pascopyrum smithii*	25–75	5–15
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–25	0–5
4	**Short-stature Cool-season Bunchgrasses**			25–75	
	squirreltail	ELEL5	*Elymus elymoides*	25–75	5–15
	Sandberg bluegrass	POSE	*Poa secunda*	0–25	0–5
5	**Mid-stature Warm-season Grasses**			50–175	
	alkali sacaton	SPAI	*Sporobolus airoides*	50–100	10–20
	saltgrass	DISP	*Distichlis spicata*	0–75	0–15
6	**Short-stature Warm-season Grasses**			0–25	
	blue grama	BOGR2	*Bouteloua gracilis*	0–25	0–5
7	**Other Grasses/Grasslikes**			0–50	
	threadleaf sedge	CAFI	*Carex filifolia*	0–25	0–5
	Grass, perennial	2GP	*Grass, perennial*	0–25	0–5
Forb					
8	**Perennial Forbs**			0–50	
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0–25	0–5
	spiny phlox	PHHO	*Phlox hoodii*	0–25	0–5
	desertparsley	LOMAT	*Lomatium*	0–25	0–5
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–25	0–5
	povertyweed	IVAX	*Iva axillaris*	0–25	0–5
	textile onion	ALTE	*Allium textile*	0–25	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–25	0–5
Shrub/Vine					
9	**Dominant Shrubs**			25–100	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	25–75	5–
	Gardner's saltbush	ATGA	*Atriplex gardneri*	5–25	0–5
10	**Miscellaneous Shrubs**			0–25	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–25	0–5
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–25	0–5

Table 22. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid-stature, Cool-season Bunchgrasses**			10–50	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	10–50	1–10
2	**Rhizomatous Wheatgrasses**			50–100	
	western wheatgrass	PASM	*Pascopyrum smithii*	50–100	10–20
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–25	0–5
3	**Short-stature, Cool-season Bunchgrasses**			25–100	
	squirreltail	ELEL5	*Elymus elymoides*	25–75	5–15
	Sandberg bluegrass	POSE	*Poa secunda*	0–25	0–5
4	**Mid-stature, Warm-season Grasses**			10–50	
	alkali sacaton	SPAI	*Sporobolus airoides*	10–50	1–10
5	**Short-stature, Warm-season Tillering Grasses**			0–25	
	blue grama	BOGR2	*Bouteloua gracilis*	0–25	0–5
6	**Native Annual Grasses**			0–25	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–25	0–5
7	**Miscellaneous Grasses/Grasslikes**			0–25	
	threadleaf sedge	CAFI	*Carex filifolia*	0–25	0–5
	Grass, perennial	2GP	*Grass, perennial*	0–25	0–5
Forb					
8	**Perennial Forbs**			0–50	
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0–25	0–5
	spiny phlox	PHHO	*Phlox hoodii*	0–25	0–5
	desertparsley	LOMAT	*Lomatium*	0–25	0–5
	povertyweed	IVAX	*Iva axillaris*	0–25	0–5
	textile onion	ALTE	*Allium textile*	0–25	0–5
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–25	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–25	0–5
9	**Annual Forbs**			0–25	
	woolly plantain	PLPA2	*Plantago patagonica*	0–25	0–5
Shrub/Vine					
10	**Dominant Shrubs**			50–250	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	50–200	5–15
	Gardner's saltbush	ATGA	*Atriplex gardneri*	5–50	0–5
11	**Miscellaneous Shrubs**			0–50	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–25	0–5
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–25	0–5

Table 23. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrasses**			25–50	
	western wheatgrass	PASM	*Pascopyrum smithii*	25–50	5–10
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–25	0–5
2	**Short-stature, Cool-season Bunchgrasses**			25–50	
	squirreltail	ELEL5	*Elymus elymoides*	25–50	5–10
	Sandberg bluegrass	POSE	*Poa secunda*	0–25	0–5
3	**Short-stature, Warm-season Tillering Grasses**			0–25	
	blue grama	BOGR2	*Bouteloua gracilis*	0–25	0–5
4	**Annual Grasses**			0–25	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–25	0–5
5	**Miscellaneous Grasses/Grasslikes**			0–25	
	threadleaf sedge	CAFI	*Carex filifolia*	0–25	0–5
	Grass, perennial	2GP	*Grass, perennial*	0–25	0–5
Forb					
6	**Perennial Forbs**			0–50	
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0–25	0–5
	desertparsley	LOMAT	*Lomatium*	0–25	0–5
	povertyweed	IVAX	*Iva axillaris*	0–25	0–5
	textile onion	ALTE	*Allium textile*	0–25	0–5
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–25	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–25	0–5
7	**Annual Forbs**			0–25	
	woolly plantain	PLPA2	*Plantago patagonica*	0–25	0–5
Shrub/Vine					
8	**Dominant Shrubs**			50–250	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	50–200	10–30
	Gardner's saltbush	ATGA	*Atriplex gardneri*	5–50	2–10
9	**Miscellaneous Shrubs**			0–50	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–25	0–5
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–25	0–5

Table 24. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid-stature, Cool-season Bunchgrasses**			0–25	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–25	0–5
2	**Rhizomatous Wheatgrasses**			0–25	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–25	0–5
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–25	0–5
3	**Short-stature, Cool-season Bunchgrasses**			0–25	
	squirreltail	ELEL5	*Elymus elymoides*	0–25	0–5
	Sandberg bluegrass	POSE	*Poa secunda*	0–25	0–5
4	**Short-stature, Warm-season Tillering Grasses**			50–75	
	blue grama	BOGR2	*Bouteloua gracilis*	50–75	20–30
5	**Native Annual Grasses**			0–25	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–25	0–5
6	**Miscellaneous Grasses/Grasslikes**			0–50	
	threadleaf sedge	CAFI	*Carex filifolia*	0–25	0–10
	Grass, perennial	2GP	*Grass, perennial*	0–25	0–5
Forb					
7	**Perennial Forbs**			0–50	
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0–25	0–5
	spiny phlox	PHHO	*Phlox hoodii*	0–25	0–5
	desertparsley	LOMAT	*Lomatium*	0–25	0–5
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–25	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–25	0–5
8	**Annual Forbs**			0–25	
	woolly plantain	PLPA2	*Plantago patagonica*	0–25	0–5
Shrub/Vine					
9	**Dominant Shrubs**			50–100	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	25–75	5–15
	Gardner's saltbush	ATGA	*Atriplex gardneri*	5–50	0–10
10	**Miscellaneous Shrubs**			0–50	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–25	0–5
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–25	0–5

Animal community

Wildlife Interpretations

1.1 Reference - Alkali Sacaton/Greasewood Plant Community: The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, deer, and antelope. Suitable thermal and escape cover for wildlife is available as quantities of woody plants is adequate. In addition, topographical variations provide some escape cover as well. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing/foraging areas for sage grouse. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles as well as upland game birds. Many grassland obligate small mammals would occur here.

1.2 Rhizomatous Wheatgrasses/Greasewood Plant Community: This plant community exhibits a moderate level of plant species diversity due to the accumulation of salts in the soil. It provides both thermal and escape cover for deer and antelope especially if other woody communities are nearby. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles as well as upland game birds. Many grassland obligate small mammals would occur here.

2.1 Greasewood/*Bare Ground* Plant Community: This plant community can provide important winter foraging and cover for mule deer and antelope. This community provides escape and thermal cover for large ungulates, as well as nesting habitat for sage grouse and other upland game birds.

3.1 Blue Grama/Greasewood Plant Community: These communities provide some foraging and cover for deer, antelope, and other large ungulates. This plant community, especially if proximal to other woody cover, may be used by sage grouse and other game birds for foraging and cover.

Grazing Interpretations

The following table lists suggested stocking rates for cattle under continuous, season-long grazing with 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 pant 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.

The Carrying capacity is calculated as the production for a normal year X .25 efficiency factor / 912.5 #/AUM (Animal Unit Month) to calculate the AUMs/Acre.

Plant Community Production (lbs./ac); Carrying Capacity* (AUM/ac); (Ac/AUM)
Below Avg. - Normal - Above Avg.
1.1 Reference - Alkali sacaton/Greasewood 350-525-700 0.14 7.14
1.2 R. Wheatgrasses/Greasewood 275-450-600 0.12 8.33
2.1 Greasewood/Bare ground 100-350-450 0.09 11.11
3.1 Blue grama/Greasewood 150-250-400 0.07 14.71
State 4 and State 5 not defined. **

* - Continuous, season-long grazing by cattle under average growing conditions.
** - Production and carrying capacity is dependent on the species mixture that is present and the stage of succession in which each community is located. Site-specific investigation is necessary due to the highly variable composition.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide year-long forage for cattle, sheep, or horses. Supplementation of livestock may be necessary during the dormant season (protein and minerals) if the quality does not meet minimum livestock requirements.

Distance to water, terrain, slope and length of slope, access, shrub density, fencing, and management can affect carrying capacity (grazing capacity) within a management unit as well as kind, class, and breeds of livestock. Adjustments should be made for the area that is considered necessary for reduction of animal numbers. For example, 30 percent of a management unit may have 25 percent slopes and distances of greater than one mile from water; therefore, the adjustment is only calculated for 30 percent of the unit (i.e. 50 percent reduction on 30 percent of the management unit).

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from moderate to rapid. 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 percent 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 percent 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 with the exception of relics, which should now be stabilized. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts may be present. Cryptogamic crusts are present, but only cover one to two percent of the soil surface.

Recreational uses

This site provides excellent hunting opportunities for upland game species as well as antelope and deer. The proximity to water and the shrub canopy provides cover for birds and other wildlife. Cultural artifacts can be found or viewed in the area, especially along the drainages that typically dissect these landforms. The extent of this ecological site is found within wild horse range and tribal horse ranges. This ecological site, however, proves to be limited in association with roadways and trails in relation to erosion potential and functionality. The soils will be sticky or slick when wet and are more erosive than other associated ecological sites. These soils need to be taken into consideration when crossing the area with trails or roadways. The site is generally rough and provides no soft cover for camping or resting. The spiny and defensive nature of greasewood is also harsh on tires, clothing and skin when moving through the shrub cover.

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 4 and 5, 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 Saline Upland 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 Saline Upland Ecological site include: Ray Gullion, Area Range Management Specialist, Jim Haverkamp, Area Range Management Specialist, NRCS; Mandi Hirsch, Range Management Specialist, Popo Agie Conservation District; Jim Wolf, Resource Manager, USDI-BLM; John Likins, Range Management Specialist, Retired USDI-BLM; Jeremy Artery, Rangeland Management Specialist, USDI-BLM; Leah Yandow, Wildlife Biologist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS.

Quality control and quality assurance completed by: John Hartung, State Rangeland Management Specialist, NRCS; Brian Jensen, State Wildlife Biologist, NRCS; Kirt Walstad, Regional Quality Assurance 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 (overstory 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 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. Read 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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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem

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

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Date	02/03/2021
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. Rills are not expected on this site.

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2. **Presence of water flow patterns:** None, or barely visible. Evidence of water flow may be present after high overland flow events, but vegetation normally remains intact.

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3. **Number and height of erosional pedestals or terracettes:** None. Erosional pedestals and terracettes are not expected on this site.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically 25 to 35 percent occurring in small areas throughout site

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present Evidence of pre-exiting gullies may be extensive due to the hydrologic disruption resulting in this site and should not be construed as active unless current headcutting or downcutting is evident.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Wind-scoured areas and areas of deposition from wind are not expected on this site in reference; however, as the site degrades, this becomes prominent.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter of small and medium size classes will show no or minimal movement after average to high rainfall events. Litter does not travel far, typically being trapped in small bunches by the vegetative cover. Small woody debris may move up to 6 inches. Fine litter may move up to 12 inches. Numerous debris dams or vegetative barriers may be present.

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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):** Plant cover and litter is at 60 percent or greater of soil surface and maintains soil surface integrity. Soil aggregate stability ratings should typically be 2 to 5 normally. Surface organic matter adheres to the soil surface. Soil surface peds will typically retain structure indefinitely when dipped in distilled water. In the interspaces, ratings could be

0 to 3 if around 12 inches in diameter. Under canopy should be a rating of 2 to 4. Elevated salt content of these soils reduces the stability of these soils.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 1 to 4 inches; light brownish gray (10YR7/2) loam, grayish brown (10YR 5/2) moist; moderate fine granular structure; weak thick platy structure in upper half inch; slightly hard, firm; slightly sticky and slightly plastic; strongly alkaline (pH 8.8); gradual smooth boundary (3 to 6 inches thick).

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Relative composition is approximately 70% grasses and grass-like plants, 10% forbs, 20% shrubs. (F/S Group Information Needed). Grass canopy and basal cover should reduce raindrop impact and slow overland flow providing increased time for infiltration to occur. Healthy deep rooted native grasses enhance infiltration and reduce runoff. Infiltration is Moderate.

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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 or soil surface crusting should be present.

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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: Mid-stature Warm-season Bunchgrasses are greater than Shrubs. Groups are comprised of 2 and 3 species respectively, and account for 45% of the composition by production.

    Sub-dominant: Rhizomatous Wheatgrasses are greater than Short Stature Cool-season Bunchgrasses. Groups are comprised of 2 prominent species each, and account for 28% of the composition by production.

    Other: Mid-stature Cool-season Bunchgrasses are equal or greater than Tall-stature Cool-season bunchgrasses. Groups are comprised of 1 species each, and account for 22% of the composition by production.

    Additional: There are a total of 9 Functional/Structural Groups. (3 are trace). There are 9 dominant and sub-dominant species. Functional/Structural Groups not expected are Introduced annual grasses, perennial introduced and naturalized grasses and annual forbs.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs have few dead stems.

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14. **Average percent litter cover (%) and depth (in):** Plant litter cover is expected to be 25-40 percent and at a depth of 0.25-0.50 inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Reference (Community Phase 1.1) Annual production ranges from a low of 350 to a high of 800 pounds per acre (air dry basis). Normal Annual production is 525 pounds per acre in a year with normal precipitation and

weather conditions.

Community Phase 1.2 - Annual production ranges from 275 to 600 pounds per acre with the normal average production of 450 pounds per acre.

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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:** Greasewood, rubber rabbitbrush, and inland saltgrass are natives that can be aggressive on this ecological site. Cheatgrass, clasping pepperweed, mustards (Brassicas), bull thistle, Canada thistle, pennycress, annual forbs, and others as they become known.
    See:
    Wyoming Weed and Pest Council Website: https://wyoweed.org/

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17. **Perennial plant reproductive capability:** All perennial species exhibit moderate vigor relative to recent weather conditions. Perennial grasses should have vigorous rhizomes or tillers; vegetative and reproductive structures are slightly stunted in response to high salt content in soils. All perennial species should be capable of reproducing annually.
