USDA Natural Resources Conservation Service

Ecological site DX032X02W138
Saline Lowland (SL) Wind River Basin Wet

Last updated: 9/07/2023
Accessed: 05/08/2024

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): 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 and overflow from streams.
• Site exists along intermittent and perennial channel systems.
• Slope is < 10%.
• Soils are:
- Formed in alluvium.
- Water table that fluctuates between a depth of 100 and 200 cm below the soil surface during the growing season.
- 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 the mineral soil surface, may have thin stratified layer with gravels.
- None to strong effervescence throughout upper 20 inches (50 cm) of mineral soil surface.
- Saline, sodic, or saline-sodic.

Associated sites

DX032X02W140	**Saline Lowland Drained (SLDr) Wind River Basin Wet** Saline Lowland Drained is a transitional ecological site from the Saline Lowland. As the water table is removed from the system Saline Lowland will become Saline Lowland Drained. Often, Saline Lowland Drained will occur on the stream terrace above Saline Lowland.
R032XY228WY	**Lowland (LL) 5-9” Wind River Basin Precipitation Zone** Lowland ecological site will occur in similar landform positions where salts are less prominent.
R032XY204WY	**Clayey (Cy) 5-9” Wind River Basin Precipitation Zone** Clayey ecological sites will occur on upland soils that are adjacent to the Saline Lowland ecological sites occurring on the lowland soils.
DX032X02W142	**Saline Subirrigated (SS) Wind River Basin Wet** Saline Subirrigated has a water table occurring higher in the soil profile and supports a higher density of hydrophytic plants. These two ecological sites often occur as parallel bands or complexes along riparian systems and around wetlands.

Similar sites

DX032X02W140	**Saline Lowland Drained (SLDr) Wind River Basin Wet** Saline Lowland Drained is a transitional ecological site from the Saline Lowland. As the water table is removed from the system Saline Lowland will become Saline Lowland Drained. The plant communities can be similar between these two ecological sites, depending on the time frame within the transition that the community is reviewed.
R032XY238WY	**Saline Lowland (SL) 5-9" Wind River Basin Precipitation Zone** The Saline Lowland 5-9
R032XY338WY	**Saline Lowland (SL) 10-14" East Precipitation Zone** The Saline Lowland 10-14

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus*
Herbaceous	(1) *Sporobolus airoides* (2) *Leymus cinereus*

Legacy ID

R032XW138WY

Physiographic features

This site normally occurs on land that receives overflow from intermittent streams or runoff from adjacent slopes. Irrigation conveyance seepage as well as irrigation may induce similar conditions on stream terraces and alluvial fans.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Flood plain (2) Intermontane basin > Drainageway (3) Intermontane basin > Stream terrace
Runoff class	Negligible to medium
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	1,372–2,012 m
Slope	0–10%
Water table depth	102–198 cm
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)	203-229 mm
Frost-free period (actual range)	87-112 days
Freeze-free period (actual range)	111-138 days
Precipitation total (actual range)	203-229 mm
Frost-free period (average)	99 days
Freeze-free period (average)	126 days
Precipitation total (average)	229 mm

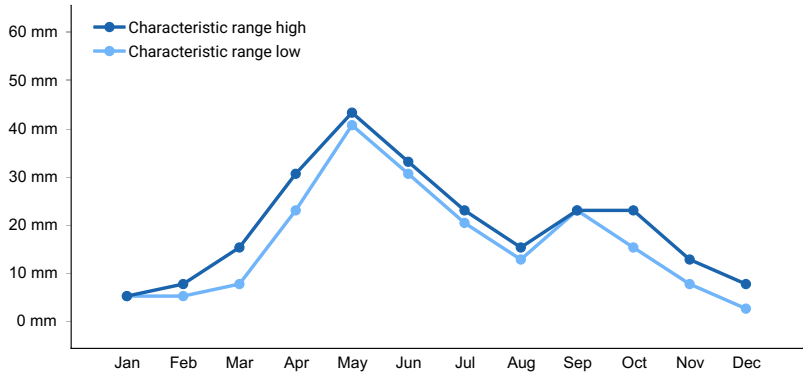


Figure 1. Monthly precipitation range

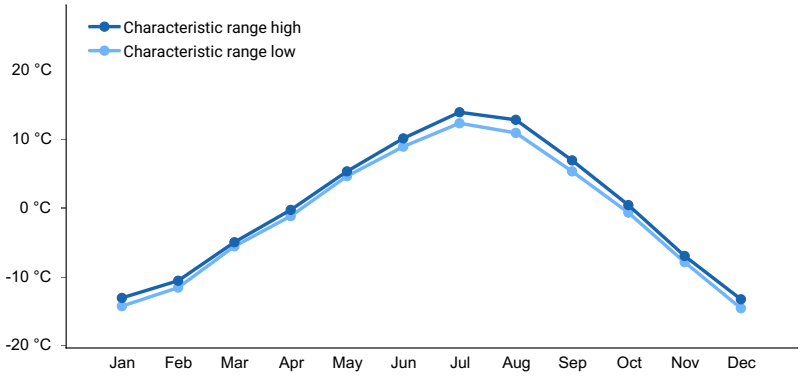


Figure 2. Monthly minimum temperature range

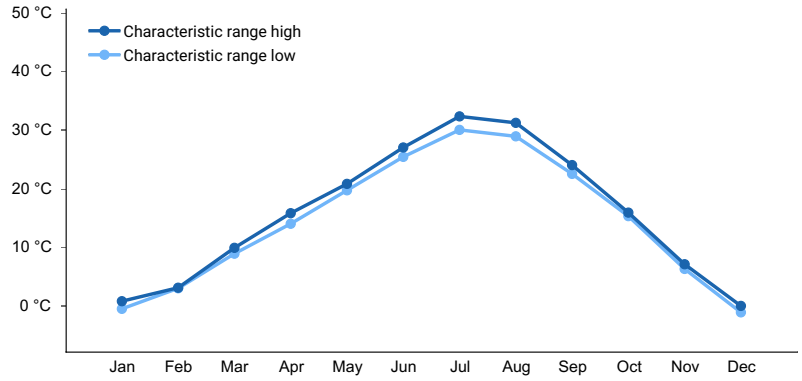


Figure 3. Monthly maximum temperature range

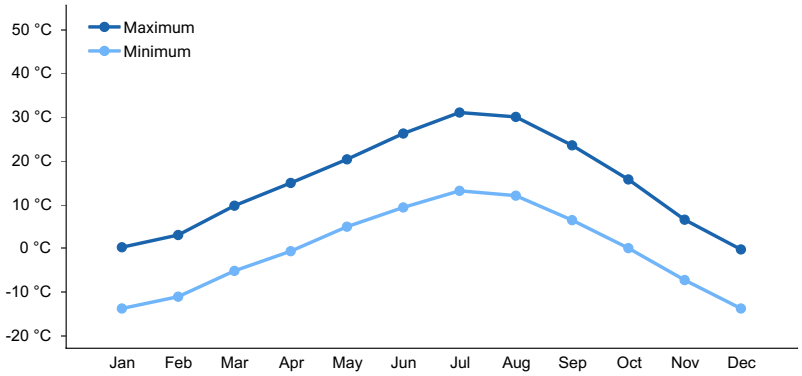


Figure 4. Monthly average minimum and maximum temperature

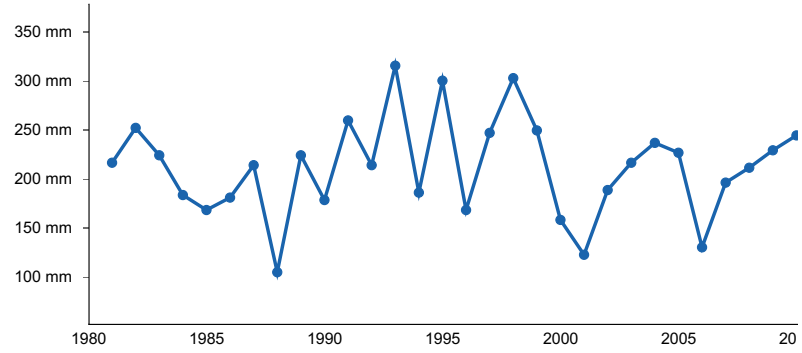


Figure 5. Annual precipitation pattern

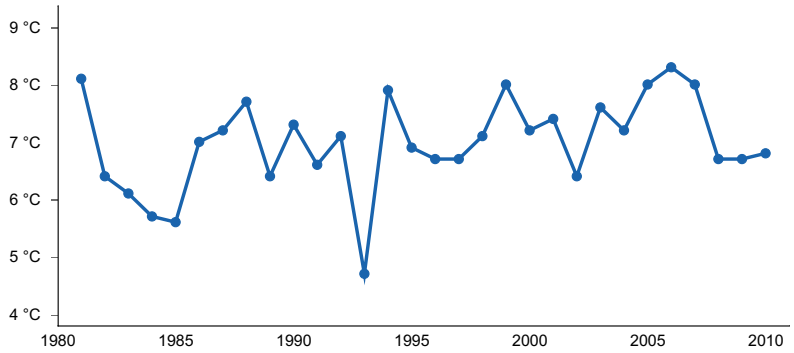


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

Saline Lowland ecological site occurs within the influence of a fluctuating water table and overland flow from intermittent or perennial waterways that are influenced by salts. Salts can originate in the soil and water. Site has a water table that fluctuates between 100 cm and 200 cm below the soil surface during the growing season. This allows woody species to persist on the site and encourages a mix of upland and wetland herbaceous species. In some instances the water influence for this ecological site is due to irrigation conveyance seep and irrigation runoff.

Wetland description

These sites would not classify as a wetland, but often support some wetland vegetation and are closely associated to or a component of wetlands.

Soil features

The soils of this site are moderately deep to very deep, somewhat poorly to well-drained soils formed in alluvium. These soils have slow to rapid permeability and are moderately to strongly saline and potentially slightly to moderately alkaline. Higher soluble salt concentrations may be found in the subsoils. The surface soil will be highly variable and vary from 5 to 20 cm in thickness. A fluctuating water table occurs in these areas and ranges from 100 to 200 cm. These areas are subject to occasional overflow. The upper 100 cm may be dry for part of the growing season. The soil characteristics having the most influence on the plant community are depth to a water table during the growing season, occasional overflow or flooding during the growing season, and the elevated quantities of soluble salts.

Figure 7. Soils profile of the Saline Lowland ecological site before the soils above the water table.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Loam (2) Clay loam (3) Silty clay loam (4) Sandy loam (5) Loamy sand (6) Silt loam
Family particle size	(1) Fine-loamy
Drainage class	Somewhat poorly drained to well drained
Permeability class	Slow to rapid
Soil depth	51 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	8.13–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–40
Soil reaction (1:1 water) (0-101.6cm)	7.9–10
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

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. These grasses are also adapted to periodic overflows and a water table near the surface for a portion of the growing season. Other significant vegetation includes greasewood, rubber rabbitbrush and a variety of forbs. The expected potential composition for this site is about 70 percent grasses, 10 percent forbs and 20 percent woody plants.

The composition and production will vary naturally due to historical use and fluctuating precipitation. Naturally occurring channel morphology and variable channel flows are major forces that also influence the development and changes in the vegetation composition. Transitional bands will occur as water tables fluctuate and channel development occurs.

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

There are instances where the ecological site may shift due to a shift in the hydrology. Vegetation will transition slower than hydrologic changes, so use sound scientific reasoning in these instances. When channel morphological process complete a cycle, there will be saline lowland sites that will transition to upland sites, thus becoming the Saline Lowland Drained ecological site. Initially after loss of hydrology, the two ecological site may appear very similar. However, with time the difference will become very obvious with shifts in species dominance, bare ground, and production.

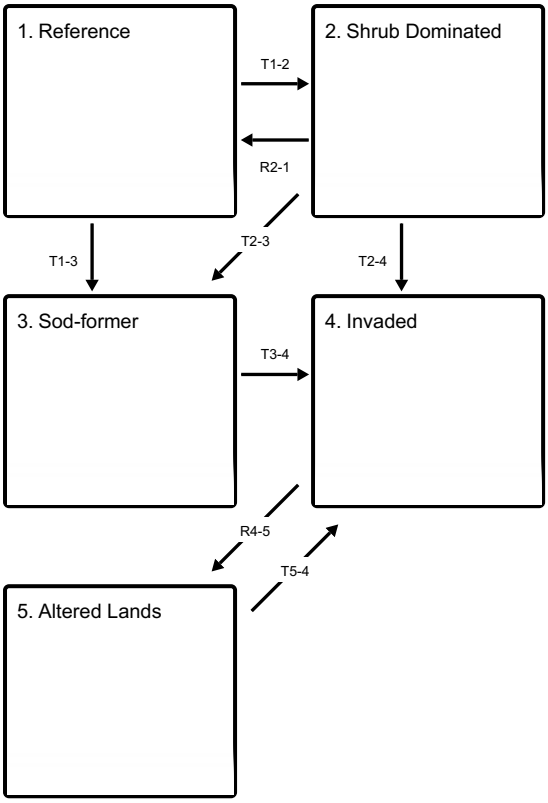
The reference community (description follows the state and transition diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts 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 - 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 - State 1) or better illustrated by State 1.

State and transition model

Ecosystem states



T1-2 - Frequent and severe grazing with no overflow will convert this plant community to the Dense Shrub/Bare Ground Sod Plant Community. Prolonged Drought will exacerbate this transition.

T1-3 - Frequent and severe grazing with brush management will convert this plant community to the Inland Saltgrass Sod Vegetation State.

R2-1 - Brush management to reduce shrub cover, prescribed grazing, and potentially seeding, assists the recovery of this State.

T2-3 - Brush management with prescribed grazing, potentially long-term prescribed grazing, will result in the Sod-bound State.

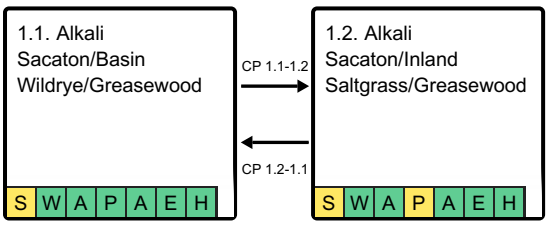
T2-4 - Continued disturbance with a seed source present allows invasive species to establish and become dominant in a community.

T3-4 - Ground disturbance and drought provides opportunity for invasive species to establish within the community when seed sources are present.

R4-5 - Weed control, mechanical preparation and seeding of improved varieties with prescribed grazing will aid to improve this community to the Altered State.

T5-4 - Lack of weed control or management, seeding failure, or continued disturbance will allow an Altered State to become an Invaded State.

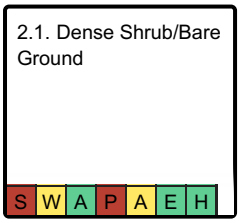
State 1 submodel, plant communities



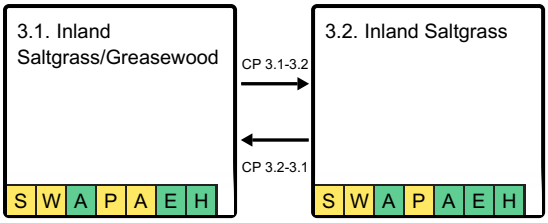
CP 1.1-1.2 - Moderate, continuous season-long grazing will convert this plant community, and the change is expedited by prolonged drought.

CP 1.2-1.1 - Prescribed grazing (potentially long-term) and brush control may be required to recover this community phase.

State 2 submodel, plant communities



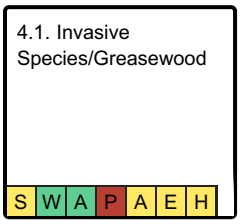
State 3 submodel, plant communities



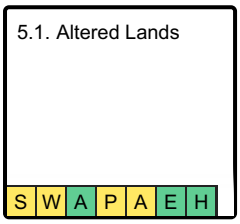
CP 3.1-3.2 - Continued impacts from grazing, drought and brush control will transition the community to be sod-dominated.

CP 3.2-3.1 - Grazing management and time will begin the recovery.

State 4 submodel, plant communities



State 5 submodel, plant communities



State 1
Reference

The Reference State of the Saline Lowland ecological site is the native community phases that have historically populated the flood plains of ephemeral and perennial drainages. The community relies on the overland flows/flooding from spring runoff and large precipitation events as well as woody species are utilizing the water table (generally deeper than herbaceous root systems).

Characteristics and indicators. Alkali sacaton and basin wildrye are major components to the community with greasewood as a minor but distinct cover component (less than 15 percent). Bare ground is minimal, with only small interspaces between vegetative cover. A mixture of tall- and mid-stature grasses both warm and cool-season, with a scattering of forbs is key to the Reference State.

Resilience management. The Reference State is diverse in plant composition providing flexibility in responses to fluctuating water tables and drought conditions. This resiliency of the community, however, is limited by the dependency on the fluctuating water table. Once altered, the communities have little resistance to change.

Community 1.1
Alkali Sacaton/Basin Wildrye/Greasewood

Figure 8. Alkali sacaton is prominent in this community with basin wildrye, greasewood, rhizomatous wheatgrasses, and other native perennial grasses present.

The interpretive plant community for the Saline Lowland ecological site is the Alkali Sacaton/Basin Wildrye/Greasewood community phase of the Reference State. This community phase evolved with grazing by large herbivores, supplemental moisture, and saline and/or alkali soils. Potential vegetation is about 70 percent grasses or grass-like plants, 10 percent forbs and 20 percent woody plants. Saline tolerant grasses dominate the state. The major grasses include alkali sacaton, basin wildrye, rhizomatous wheatgrasses, and bottlebrush squirreltail. Woody plants are greasewood and rubber rabbitbrush. 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 1200 pounds per acre, but it can range from about 700 pounds per acre in unfavorable years to about 1600 pounds per acre in above average years.

Resilience management. This state is stable and well adapted to the Northern Great Plains 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).

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- basin big sagebrush (*Artemisia tridentata ssp. tridentata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- basin wildrye (*Leymus cinereus*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- smooth woodyaster (*Xylorhiza glabriuscula*), other herbaceous
- Pursh seepweed (*Suaeda calceoliformis*), other herbaceous
- silverweed cinquefoil (*Argentina anserina*), other herbaceous

Dominant resource concerns

- Ephemeral gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	504	953	1121
Shrub/Vine	140	224	392
Forb	140	168	280
Total	**784**	**1345**	**1793**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-20%
Grass/grasslike foliar cover	35-70%
Forb foliar cover	10-20%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-40%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	5-15%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	10-20%
Grass/grasslike basal cover	20-50%
Forb basal cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-50%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	10-25%

Table 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	0-5%	0-5%
>0.15 <= 0.3	–	0-2%	5-10%	0-10%
>0.3 <= 0.6	–	0-2%	15-50%	0-5%
>0.6 <= 1.4	–	2-15%	0-30%	–
>1.4 <= 4	–	0-5%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

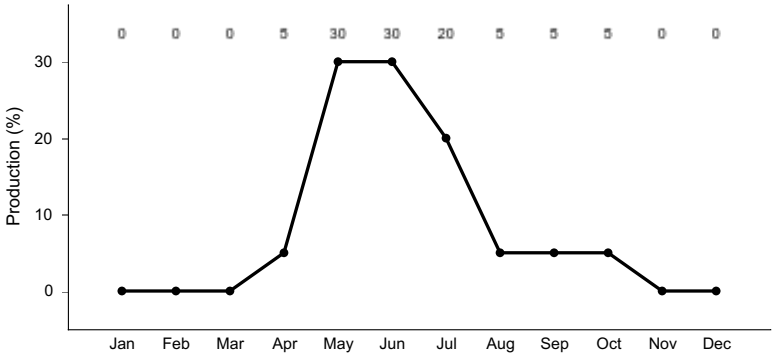


Figure 10. Plant community growth curve (percent production by month). WY0803, 5-9WR free water sites.

Community 1.2
Alkali Sacaton/Inland Saltgrass/Greasewood

Figure 11. Inland saltgrass is increasing while alkali sacaton and rhizomatous wheatgrasses remain in this community phase. Basin wildrye has declines and annuals have started to appear (six-weeks fescue).

Historically, this plant community evolved under moderate grazing by large ungulates and low fire frequency. Currently, this site is normally found under a moderate, continuous season-long grazing regime and in the absence of fire or brush control. Prolonged drought can also play an important role and will exacerbate these conditions. Saline and flood tolerant perennial plants make up the dominant species in this plant community. Dominant grasses include alkali sacaton, inland saltgrass, rhizomatous wheatgrasses, blue grama, and mat muhly. Forbs commonly found in this plant community include wild onion, pursh seepweed, smooth woodyaster, and povertyweed. Greasewood and rubber rabbitbrush comprise the majority of the woody species and make up less than 25 percent of the annual production. When compared to the Reference Plant Community (Community Phase 1.1), basin wildrye and rhizomatous wheatgrasses have decreased. Annual weedy plants have increased, but occur in small patches. Inland saltgrass, greasewood, and rubber rabbitbrush have increased. The total annual production (air-dry weight) of this state is about 875 pounds per acre, but it can range from about 500 pounds acre in unfavorable years to about 1100 pounds per acre in above average years.

Resilience management. The Alkali Sacaton/Inland Saltgrass/Greasewood community phase 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
- basin big sagebrush (*Artemisia tridentata ssp. tridentata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass

- saltgrass (*Distichlis spicata*), grass
- slender wheatgrass (*Elymus trachycaulus*), grass
- smooth woodyaster (*Xylorhiza glabriuscula*), other herbaceous
- Pursh seepweed (*Suaeda calceoliformis*), other herbaceous
- povertyweed (*Iva axillaris*), other herbaceous

Dominant resource concerns

- Ephemeral gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Plant structure and composition

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	336	476	560
Shrub/Vine	168	336	448
Forb	56	168	224
Total	**560**	**980**	**1232**

Table 10. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-30%
Grass/grasslike foliar cover	30-70%
Forb foliar cover	5-20%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-35%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	10-20%

Table 11. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	15-30%
Grass/grasslike basal cover	20-50%
Forb basal cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-40%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	15-30%

Table 12. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	0-5%	0-5%
>0.15 <= 0.3	–	0-2%	5-30%	0-10%
>0.3 <= 0.6	–	0-5%	5-25%	0-5%
>0.6 <= 1.4	–	5-25%	0-10%	–
>1.4 <= 4	–	0-5%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

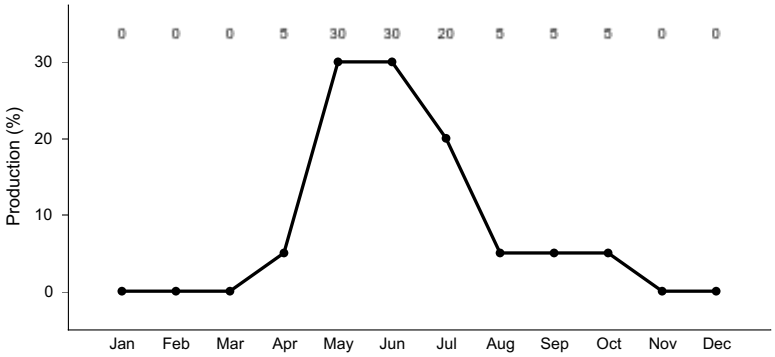
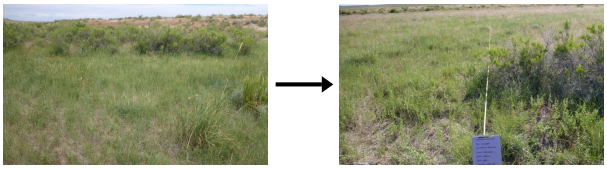


Figure 13. Plant community growth curve (percent production by month). WY0803, 5-9WR free water sites.

Pathway CP 1.1-1.2
Community 1.1 to 1.2



Alkali Sacaton/Basin Wildrye/Greasewood

Alkali Sacaton/Inland Saltgrass/Greasewood

Moderate, continuous season-long grazing reduces the vigor basin wildrye and other cool-season tall and mid-stature grasses, forcing the transition to the Alkali Sacaton/Inland Saltgrass/Greasewood Plant Community. Prolonged Drought will exacerbate this transition.

Pathway CP 1.2-1.1
Community 1.2 to 1.1

Alkali Sacaton/Inland Saltgrass/Greasewood

Alkali Sacaton/Basin Wildrye/Greasewood

Prescribed grazing and possible long-term prescribed grazing will result in a plant community very similar to the Reference Community Phase (1.1), except that greasewood will persist without some form of brush control. Providing a period of recovery following grazing or delaying grazing until the tall- and mid-stature cool-season

grasses are able to recover and have a period of growth, will allow them to re-establish or improve over time. Recovery may take a longer duration of time than one or two years, especially during drought conditions.

Conservation practices

Brush Management
Prescribed Grazing

State 2
Shrub Dominated

The Shrub Dominated State is a greasewood community with significant extents of bare ground and potential for weedy annuals. Rubber rabbitbrush and basin big sagebrush are also common members of this community.

Characteristics and indicators. Greasewood, or a combination of shrubs, will form a significant (greater than 15 percent) cover within the community. Few perennial grasses are present in the community. Those that are able to persist generally are found within the basal cover of the greasewood or other shrub cover. Bare ground is often extensive, comprising between 30 to 50% of the cover. Weedy annuals such as mustards, six-weeks fescue, and annual wheatgrass will often provide some cover in these interspaces. Often, evidence of wind scour and other erosional patterns are present in the interspaces between greasewood.

Resilience management. The shrub cover and exposed salty soils limit the ability for seedling establishment. However, greasewood is persistent even with intensive use. The community is resilient, but is not resistant to invasive by non-native, noxious weeds.

Community 2.1
Dense Shrub/Bare Ground

The Dense Shrub/*Bare Ground* Plant Community evolved under frequent and severe grazing with the absence of fire and an interruption in overflow or an extended period of drought. 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. The annual grasses and forbs, such as six-weeks fescue, annual wheatgrass, foxtail barley, mustards and woolly plantain, make up the dominant understory. Total annual production is mostly from shrubs and these weedy annuals. Shrubs make up greater than 25 percent of the total annual production. When compared with the Mixed Shrub/Inland Saltgrass Sod Plant Community, the annual production is similar as the shrub production compensates for the decline in the herbaceous production. The total annual production (air-dry weight) of this state is about 450 pounds per acre, but it can range from about 350 pounds per acre in unfavorable years to about 600 pounds per acre in above average years.

Resilience management. This plant community is resistant to change as the stand becomes more decadent. 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. The soil of this community phase is not well protected as erosion has accelerated because of increased bare ground. Water flow patterns and pedestalling are obvious. Infiltration is reduced and runoff is increased. Rills may be noticeable in the interspaces and gullies may be establishing where rills have concentrated.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- basin big sagebrush (*Artemisia tridentata ssp. tridentata*), shrub
- sixweeks fescue (*Vulpia octoflora*), grass
- annual wheatgrass (*Eremopyrum triticeum*), grass
- povertyweed (*Iva axillaris*), other herbaceous
- American licorice (*Glycyrrhiza lepidota*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Wind erosion
- Ephemeral gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Aggregate instability
- Salts transported to surface water
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Feed and forage imbalance

State 3
Sod-former

The tillering, mat-forming nature of inland saltgrass forms a sod-bound community that hinders water movement into the soil profile and hinders other native species from establishing or persisting in the community. As the tall- and mid-stature grasses are removed from the community, the short-stature sod-forming grasses increase to stabilize the community.

Characteristics and indicators. Remnants of alkali sacaton will persist with a few less desirable species (little barley, foxtail barley, Baltic rush). Greasewood is generally present, but more scattered across the community.

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
Inland Saltgrass/Greasewood

This plant community is the result of frequent and severe grazing with periodic overflows and no brush control. This plant community is dominated by a dense short grass sod and includes a mosaic shrub overstory. Greasewood and rubber rabbitbrush are the primary overstory species in this plant community. Shrubs comprise less than 25 percent of the annual production. The dominant grasses are inland saltgrass and blue grama. Historically, mat muhly was recorded on these sites, but has not be identified in current inventories. Plant diversity is moderate to poor. When compared with Reference Plant Communities, the annual production is similar, as the shrub production compensates for the decline in the herbaceous production. When compared to the Reference State, the tall- and mid-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. Areas of bare ground may have increased in patches and total production has decreased. The total annual production (air-dry weight) of this state is about 480 pounds per acre, but it can range from about 300 pounds per acre in unfavorable years to about 600 pounds per 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 mostly not functional as plant diversity is poor especially the amount of 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 and can cause rills, channels and gully erosion. Water flow patterns are obvious in the bare ground areas and shrubs and sod patches are pedestalled. Rills are noticeable in the interspaces and gullies may be establishing where rills have concentrated. The watershed may or may not be functioning, as runoff is excessive and erosional processes are accelerated.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- saltgrass (*Distichlis spicata*), grass
- little barley (*Hordeum pusillum*), grass

- mountain rush (*Juncus arcticus ssp. littoralis*), grass
- American licorice (*Glycyrrhiza lepidota*), other herbaceous
- povertyweed (*Iva axillaris*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Aggregate instability
- Salts transported to surface water
- Sediment transported to surface water
- Plant structure and composition
- Feed and forage imbalance

Community 3.2
Inland Saltgrass

The Inland Saltgrass Community Phase is the result of long-term improper grazing use plus some form of brush removal. This community phase is dominated by inland saltgrass sod. Intermittent areas of bare ground have increased and extend between the patches of sod. When compared to the Reference State, the tall- and mid-stature grasses are absent. Short-stature warm-season grasses are dominant and weedy annuals are common. Greasewood and other common shrubs (rubber rabbitbrush and basin big sagebrush) are absent from the community. The total annual production (air-dry weight) of this state is about 280 pounds per acre, but it can range from about 100 pounds per acre in unfavorable years to about 350 pounds per acre in above average years.

Resilience management. This sod 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 is not functional and plant diversity is extremely low. 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 can cause rills, channels and gully erosion. Water flow patterns are obvious in the bare ground areas and pedestalling is apparent along the sod edges. Rills are noticeable in the interspaces and gullies may be establishing where rills have concentrated. The watershed is not normally functioning, as runoff is excessive and erosional processes are accelerated.

Dominant plant species

- little barley (*Hordeum pusillum*), grass
- saltgrass (*Distichlis spicata*), grass
- mountain rush (*Juncus arcticus ssp. littoralis*), grass
- American licorice (*Glycyrrhiza lepidota*), other herbaceous
- povertyweed (*Iva axillaris*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Aggregate instability
- Salts transported to surface water
- Sediment transported to surface water
- Plant structure and composition
- Feed and forage imbalance

Pathway CP 3.1-3.2
Community 3.1 to 3.2

Continued impacts from frequent and continuous year-long grazing removes remaining tall- and mid-stature grasses and shrubs. Drought with further exacerbate the loss of shrubs in the community with the loss of overflow, lower water tables, and increased risk of insect and disease. Traffic or shrub treatments may also transition the community to a sod-dominated community with the loss of shrub cover.

Conservation practices

Brush Management

Pathway CP 3.2-3.1
Community 3.2 to 3.1

Development of a grazing prescription to allow recovery of desirable tall- and mid-stature grasses as well as to encourage the recovery of the shrub species (greasewood and rubber rabbitbrush) will bring this transition with time. The plan may require a longer period of time, especially with on-going drought. In some instances, seeding or planting of shrubs may be necessary to begin the recovery process.

Conservation practices

Critical Area Planting
Stream Habitat Improvement and Management
Prescribed Grazing
Wetland Wildlife Habitat Management
Upland Wildlife Habitat Management

State 4
Invaded

Deterioration of the reference community opens the soil to invasion by undesirable species. Migration of wildlife, use by livestock, and water flow events provide seed sources to encourage invasive species to establish in the disturbed communities. This disturbance with a seed source present is what allows establishment to a significant level to occur.

Characteristics and indicators. When the community is comprised of five percent or greater of invasive (non-native) species, the threshold has been crossed into the Invaded State. Cheatgrass, salt cedar, and Russian Olive are among potential species of invasion; however, whitetop, knapweeds, and thistle are also prevalent.

Resilience management. The inability to eradicate cheatgrass, and the challenges to maintain high levels of weed control limit the ability for this State to improve, making it resistant to change. The ability for the invasive species to adapt and recover following disturbance make this state resilient.

Community 4.1
Invasive Species/Greasewood

Figure 14. Saltcedar (Tamarisk) and cheatgrass are dominant in this Saline Lowland community.

The Invasive Species/Greasewood Community Phase is capturing a wide array of potential transitions in one

community phase. It is necessary to complete a site specific inventory to know the exent of invasion and the potential of the community. Each invasive species has different management challenges that will determine the risk to the community. Initially, this community may resemble the Reference State, but as invasive species increase, fewer native species are able to persist in the community. The basal cover of greasewood provides potential niches for natives to reside, but the remaining community will transition to invasive species.

Resilience management. The strategy for managing this community phase focusing on minimizing the spread or increase of invasive species while protecting and hopefully encouraging the native species to increase within the community. Timing of grazing to utilize invasive species while the native grasses are dormant and integrated weed management can maintain and strive to improve this plant community.

Dominant plant species

- saltcedar (*Tamarix ramosissima*), tree
- Russian olive (*Elaeagnus angustifolia*), tree
- greasewood (*Sarcobatus vermiculatus*), shrub
- cheatgrass (*Bromus tectorum*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- annual wheatgrass (*Eremopyrum triticeum*), grass
- clasping pepperweed (*Lepidium perfoliatum*), other herbaceous
- American licorice (*Glycyrrhiza lepidota*), other herbaceous
- povertyweed (*Iva axillaris*), other herbaceous

Dominant resource concerns

- Ephemeral gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Feed and forage imbalance

State 5
Altered Lands

Mining, energy development, irrigation conveyance lines, irrigation, and livestock operating facilities are a few activities that have created a change to this ecological site. The soil disturbance, removal of greasewood and other vegetation, as well as impacts to they hydrology of this ecological site has left scars on the landscape.

Characteristics and indicators. Outside of the visible evidence of soil movement, seeding, or development the altered/disturbed community is comprised of non-native or improved varieties and varying successional species such as weedy annuals (Russian thistle, sunflower or other asters) and foxtail barley.

Resilience management. Frequency of disturbance, species established, level of management, and remaining hydrology determines the resistance and resiliency of the Altered State.

Community 5.1
Altered Lands

Figure 15. Evidence of the old road bed in the upper portion of the photo and the current road bed with the remnants of an old head gate are a few of the disturbances to this site.

Altered lands have been impacted by human settlement and land use advancement. Many areas within the Wind River Basin were farmed during early settlement periods. Water collection structures and conveyance ditches were cut through the channel systems to move water across the landscape for irrigation. Diversion structures, culverts, and intensive use of the riparian systems impacted the water flow and channel stability, causing downcutting and other erosional processes to occur. These alterations with changes in the precipitation and runoff into the system had an impact on the system and over time many ditches and irrigation systems were abandoned. Remnants of old mining towns, farmsteads, and corrals are visible along sections of these drainages today. Mechanical alteration of these areas in conjunction with the introduction of species from hayfields and in attempts to stabilize areas created these altered lands.

Resilience management. The persistence of an introduce non-native species is a very indicative that will assist in identify 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. The preparation of the seedbed as well as any original soil disturbance have altered the soil function and site characteristics. 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 provided accurate averages and growth curves, so no production values are provided for this community phase.

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Aggregate instability
- Salts transported to surface water
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Feed and forage imbalance

Transition T1-2
State 1 to 2

Repeated frequent and severe grazing, especially year-long or continuous, will weaken the herbaceous cover. Frequent years with reduced or no overflow will convert this plant community to the Dense Shrub/*Bare Ground* Sod Community phase. Prolonged Drought will exacerbate this transition. The lack of extra effective moisture and the lack of recovery time for the perennial grasses remove them from the community and allow greasewood and rubber rabbitbrush to persist.

Constraints to recovery. The harsh environment created by salt-laden soils and the potential for compaction limits the ability for grasses and other herbaceous species to establish. The droughty conditions that created the transition also limit seedling establishment. Over time, the lack of seed-source for desired perennial grasses becomes scarce further limiting the ability for the community to recover.

Transition T1-3
State 1 to 3

Frequent and severe grazing with brush management or disturbance to brush cover will convert this plant community to the Sod Bound State. The loss of overflow conditions or high traffic aids in this conversion.

Constraints to recovery. The competitive nature of inland saltgrass and its tillering root structure limits the ability for other native species to propagate and compete in these communities.

Restoration pathway R2-1
State 2 to 1

Grazing land mechanical treatment (chiseling, etc.) and brush management followed by prescribed grazing and if necessary seeding will return this plant community to near Reference. Return of overflow conditions and restored water table assists with recovery of this site as well. The time required for a transition will be determined by climatic factors and seed sources present.

Context dependence. Extent of soil disturbance determines if the site is able to move towards the Reference State, or if hydrology and soils are altered enough that the site becomes disturbed or the Altered State.

Conservation practices

Brush Management
Critical Area Planting
Stream Habitat Improvement and Management
Grade Stabilization Structure
Prescribed Grazing
Grazing Land Mechanical Treatment
Range Planting
Heavy Use Area Protection

Transition T2-3
State 2 to 3

Mechanical disturbance to eradicate or reduce the cover of greasewood and other woody species, while providing opportunity for resilient species to establish with prescribed grazing and time, helps this site to transition to the Sod-Bound State. Disease, drought, and other disturbances are also responsible for the removal of shrub cover that will also allow inland saltgrass to establish, when it is prominent in the understory or seedbank.

Constraints to recovery. The nature of tillering plants, i.e. inland saltgrass, restrict other native grasses and forbs from establishing in the community. This cover is also restrictive to shrub recovery. Recovery to Reference is highly unlikely due to the lack of key species and the restrictive nature of the sod cover. The removal of the sod cover is highly unlikely to occur without major disturbance that would alter the function of the site, transitioning to the Altered State.

Transition T2-4
State 2 to 4

The open nature of the Shrub Dominated State provides opportunity for invasive species to gain a foothold in a

community. The lack of ground cover, and the on-going disturbances in this state provide a seed-source as well as seed-soil contact to encourage establishment. Livestock and wildlife movement through the site, human traffic, as well as wind and water aid in providing seed sources.

Constraints to recovery. Once most invasive species establish in a community, on going disturbances, encourage further spread and prominence. The difficulty to control, let alone eradicate, most invasive species limits the potential for recovery once a community becomes invaded.

Transition T3-4
State 3 to 4

Ground disturbance and drought assist to weaken inland saltgrass, providing opportunity for invasive species to establish. Traffic, human and animal, as well as wind and water provide seed sources for invasive species to the community.

Constraints to recovery. The challenge to control (maintain) or eradicate invasive species is the major constraint to the recovery from this transition.

Restoration pathway R4-5
State 4 to 5

An integrated approach, generally including chemical treatment of invasive species, mechanical working of the soil and seeding or planting native or improved varieties to provide perennial cover of desirable species is applied to improve this community. Continued weed or integrated pest control as well as grazing management is needed to prevent further regression or invasion of the site.

Context dependence. The extent of treatment and necessary procedures will be determined by the exact species of invasion within the community, the accessibility of the community, and native species remaining in the community.

Conservation practices

Brush Management
Critical Area Planting
Stream Habitat Improvement and Management
Grade Stabilization Structure
Prescribed Grazing
Grazing Land Mechanical Treatment
Range Planting
Heavy Use Area Protection
Integrated Pest Management (IPM)
Early Successional Habitat Development/Management

Transition T5-4
State 5 to 4

Seeding failure or lack of management following seeding are common mechanisms that allow for the re-establishment or establishment of weeding species in an altered community. Continued disturbance or new disturbances to a community provide opportunity for new or reoccurring invasion.

Constraints to recovery. Weed control is the limiting factor to recovery for this site.

Additional community tables

Table 13. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall-stature, Cool-season Bunchgrasses**			140–392	
	basin wildrye	LECI4	*Leymus cinereus*	140–336	10–25
	Canada wildrye	ELCA4	*Elymus canadensis*	0–56	0–5
2	**Mid-stature, Cool-season Bunchgrasses**			0–56	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–56	0–5
3	**Rhizomatous, Cool-season Wheatgrasses**			56–196	
	western wheatgrass	PASM	*Pascopyrum smithii*	56–196	5–15
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–56	0–5
4	**Short-stature, Cool-season Bunchgrasses**			56–140	
	squirreltail	ELEL5	*Elymus elymoides*	56–140	5–10
5	**Mid-stature, Warm-season Bunchgrasses**			196–392	
	alkali sacaton	SPAI	*Sporobolus airoides*	196–336	15–25
	saltgrass	DISP	*Distichlis spicata*	0–56	0–5
6	**Short-stature, Warm-season Tillering Grasses**			0–56	
	blue grama	BOGR2	*Bouteloua gracilis*	0–56	0–5
7	**Miscellaneous Grass/Grass-likes**			0–56	
	Grass, perennial	2GP	*Grass, perennial*	0–56	0–5
Forb					
8	**Perennial Forbs**			140–280	
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0–28	0–5
	spiny phlox	PHHO	*Phlox hoodii*	0–28	0–5
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–28	0–5
	povertyweed	IVAX	*Iva axillaris*	0–28	0–5
	textile onion	ALTE	*Allium textile*	0–28	0–5
	silverweed cinquefoil	ARAN7	*Argentina anserina*	0–28	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–28	0–5
Shrub/Vine					
9	**Dominant Shrubs**			140–280	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	140–280	10–20
10	**Miscellaneous Shrubs**			0–112	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–56	0–5
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	0–56	0–5

Table 14. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall-stature, Cool-season Bunchgrasses**			0–56	
	Canada wildrye	ELCA4	*Elymus canadensis*	0–56	0–5
2	**Mid-stature, Cool-season Bunchgrasses**			0–56	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–56	0–5
3	**Rhizomatous, Cool-season Grasses**			56–224	
	western wheatgrass	PASM	*Pascopyrum smithii*	56–168	5–15
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	56–168	5–15
4	**Short-stature, Cool-season Bunchgrasses**			56–112	
	squirreltail	ELEL5	*Elymus elymoides*	56–112	5–10
5	**Mid-stature, Warm-season Bunchgrasses**			56–168	
	saltgrass	DISP	*Distichlis spicata*	56–112	5–10
	alkali sacaton	SPAI	*Sporobolus airoides*	0–56	0–5
6	**Short-stature, Warm-season Tillering Grasses**			0–56	
	blue grama	BOGR2	*Bouteloua gracilis*	0–56	0–5
7	**Native Annual Grasses**			0–56	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–56	0–5
8	**Miscellaneous Grass/Grasslikes**			0–56	
	Grass, perennial	2GP	*Grass, perennial*	0–56	0–5
Forb					
9	**Perennial Forbs**			56–168	
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0–56	0–5
	spiny phlox	PHHO	*Phlox hoodii*	0–56	0–5
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–56	0–5
	povertyweed	IVAX	*Iva axillaris*	0–56	0–5
	textile onion	ALTE	*Allium textile*	0–56	0–5
	silverweed cinquefoil	ARAN7	*Argentina anserina*	0–56	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–56	0–5
10	**Annual Forbs**			0–56	
	woolly plantain	PLPA2	*Plantago patagonica*	0–56	0–5
Shrub/Vine					
11	**Dominant Shrubs**			168–336	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	168–336	15–30
12	**Miscellaneous Shrubs**			0–56	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–56	0–5
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	0–56	0–5

Animal community

Wildlife Interpretations:

Reference - Basin Wildrye/Greasewood: 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 are 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.

Alkali Sacaton/Inland Saltgrass/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. 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.

Mixed Shrub/Inland Saltgrass Sod 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.

Dense Shrub/*Bare Ground* Plant Community: This plant community can provide important winter foraging and cover for mule deer and antelope. The plant community composition has little diversity, and thus, is less apt to meet the seasonal needs of large grazers. It may provide some foraging opportunities and cover for sage grouse, pheasant, and partridge.

Inland Saltgrass Sod Plant Community: This plant community may be used by the same large grazers that would use the Reference Plant Community. However, the plant community composition is less diverse and productive, thus, less apt to meet the seasonal needs of these animals. It may provide some foraging opportunities for sage grouse when it occurs proximal to woody 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 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*

The carrying capacity is calculated as the production (normal year) X .25 efficiency factor / 912.5 lbs. /AUM (Animal Unit Month, the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month) to calculate the
AUMs/Acre.

Plant Community Description/Title lbs./Acre; AUM/Acre*; Acres/AUM*
Below Ave.-Normal-Above Ave.
Reference - Basin Wildrye/Greasewood 700-1600 .30
Alkali sacaton/Greasewood 500-1100 .22
Mixed Shrub/Inland Saltgrass Sod 300-600 .12
Dense Shrub/*Bare Ground* 350-600 .07
Inland Saltgrass Sod 100-350 .07

* - Carrying capacity is figured for continuous, season-long grazing by cattle under average growing conditions.
** - Sufficient data for invaded and reclaimed communities has not yet been collected or evaluated, so no projection of a stocking rate recommendation or production range will be established at this time.

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 must be supplemented with protein because the forage quality does not meet minimum livestock requirements.

Distance to water, shrub density, and slope can affect carrying capacity (grazing capacity) within a management unit. 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).

Fencing, slope length, management, access, terrain, kind and class of livestock, and breeds are all factors that can increase or decrease the percent of grazeable acres within a management unit. Adjustments should be made that incorporate these factors when calculating stocking rates.

Hydrological functions

Water is the principal factor limiting forage production on this site. The Saline Lowland ecological 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 that dominates 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. 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 1-2 percent of the soil surface.

Recreational uses

This site provides hunting opportunities for upland game species and big game such as deer and antelope. The wide variety of plants which bloom from spring until fall have an aesthetic 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 5, and USDA NRCS Soil Surveys from various counties.

Those involved in the development of the new concept for Saline Lowland ecological site include: Jim Haverkamp, Area Range Management Specialist, NRCS; 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 Ecological Data Quality 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. 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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Approval

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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.

Author(s)/participant(s)	Marji Patz Everet Bainter - original reference sheet
Contact for lead author	marji.patz@usda.gov; 307-271-3130
Date	03/16/2021
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present on this site.

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2. **Presence of water flow patterns:** Water flow patterns are barely observable on the soil. Vegetation may lay over (lodging) following a high flow/overflow event, but soil flow patterns should not be visible.

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3. **Number and height of erosional pedestals or terracettes:** Overflow events tend to create very minor pedestals on the bases of bunchgrasses even in reference condition. However, these are very slight and are essentially non-existent.

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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 15 to 25 percent occurring in small areas throughout site. Patch dynamics of bare ground is minimal in this ecological site, with bare ground patches occurring as less than 12 inches in diameter across the extent.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present. Evidence of pre-existing headcutting may be present, but active or new headcutting should not be present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of wind scour or blowouts should be

present. Minor areas of sediment deposition from spring flooding may be present, but should not completely bury the current community.

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement is seer with general precipitation events. Following spring flood events, small debris deposits or dams may be present from off sight locations, but on site litter should show little movement.

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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 70 percent or greater of soil surface and maintains soil surface integrity. Soil aggregate stability ratings should typically be is anticipated to be 4 ranging from 2 to 5. Surface organic matter adheres to the soil surface. Soil surfaces 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.

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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 8 inches; pale brown (10YR 6/3) light clay loam dry, dark brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; strongly effervescent; very strongly alkaline (pH 9.2); clear smooth boundary. In some instances, the A horizon may not be present or will be very thin, generally on active floodplains of perennial systems.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The potential vegetation is 70 percent grasses, 10 percent forbs, and 20 percent shrubs. 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 physical soil surface crusting should be present. Minor chemical crusting will be evident in barren interspaces as soils dry following extended wet periods.

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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 Tall-stature Cool season Bunchgrasses. Groups are comprised of two species each, and account for 44% of the composition by production.

    Sub-dominant: Shrubs are equal to or greater than perennial native forbs. Groups are comprised of 1 and 2 prominent species respectively, and account for 31% of the composition by production.

    Other: Rhizomatous Grasses are equal or greater than Short-stature Cool-season bunchgrasses. Groups are comprised of 1 species each, and account for 17% of the composition by production.

    Additional: There are a total of 9 Functional/Structural Groups. (3 are trace). There are 5 dominant and sub-dominant species. Functional/Structural Groups not expected are Introduced annual grasses, perennial introduced and naturalized grasses and annual forbs.

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 should be visible. Bunchgrasses have strong, healthy centers and shrubs have few dead stems.

14. **Average percent litter cover (%) and depth (in):** Average plant litter cover is expected to be 25 to 35 percent with depths of 0.2 to 0.5 inches.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Reference (CP 1.1) Annual production ranges from a low of 700 to a high of 1600 pounds per acre (air dry basis). Normal annual production is 1200 pounds per acre in a year with normal precipitation and weather conditions. CP 1.2 Annual production ranges from 500 to 100 with Normal annual production averaging 875 pounds per acre.

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, mustards (brassicas), Canada thistle, bull thistle, pennycress, salt cedar and Russian olive are known invaders. For other possible invaders or new species identified follow the Wyoming Weed and Pest Council website: https://wyoweed.org/

17. **Perennial plant reproductive capability:** Salt-dependent species (inland saltgrass, alkali sacaton) express high vigor relative to recent weather conditions. Adapted or tolerant species will exhibit moderate vigor. All perennial grasses will have vigorous rhizomes or tillers; vegetative and reproductive structures may be slightly stunted in response to high salt content in soils. All perennial species should be capable of reproducing annually.