

Ecological site R011XA006ID Saline Upland 7-12 PZ SAVE4/LECI4

Last updated: 4/06/2020
Accessed: 04/19/2024

General information

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

MLRA notes

Major Land Resource Area (MLRA): 011X–Snake River Plains

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Precipitation or Climate Zone: 7-12" P.Z.

Classification relationships

Land Resource Region: B (Northwest Wheat and Range)
MLRA: 11 (Snake River Plains)
EPA Eco Region: Level III (Snake River Plain)

Ecological site concept

Site does not receive additional moisture

Soils are:

Saline or saline sodic

Very deep, with <35% coarse fragments (by volume), not skeletal
not strongly or violently effervescent in the surface mineral 10"

Surface textures range from sandy loam to loam the surface mineral 4"

Slope is <30%

Clay content is =<35% in surface mineral 4"

Site does not have an argillic horizon with >35% clay

Associated sites

R011XA007ID	Semiwet Saline Meadow SAVE4/DISP
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on nearly level to rolling slopes that are less than 10 percent but more often less than 5 percent. This site occurs on all aspects. Elevations range from 2500 to 4000 feet (750-1250 meters). This site is associated with alluvial terraces and fans primarily adjacent to numerous dissecting and intermittent drainageways.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Alluvial fan
Flooding frequency	None
Elevation	2,500–4,000 ft
Slope	0–10%
Water table depth	60 in
Aspect	Aspect is not a significant factor

Climatic features

The Central Snake River Plain, MLRA 11A, has a mean elevation of 3929 feet above sea level, and varies from a minimum of 2575 feet to a maximum of 8586 feet. The average annual precipitation is 10.03 inches, with a range of 8.30 to 11.46 inches, based on 10 long term climate stations located throughout the MLRA. In general, annual precipitation is below the national average, especially during the summer months. Temperatures show considerable variation during the year. A maximum temperature of 112° Fahrenheit was recorded at the Hagerman climate station (# 103932; elevation 2880 feet), and a minimum of -38° was recorded at the Richfield station. Richfield has also recorded up to 186 days below freezing during the year.

The frost-free period ranges from 116 to 140 days. The freeze-free period can be as short as 144 days to as long as 169 days. Each period is greatest on the west side of the MLRA. In general, morning and afternoon relative humidity is at or far below the national average, especially during the months of May through September.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	169 days
Precipitation total (average)	11 in

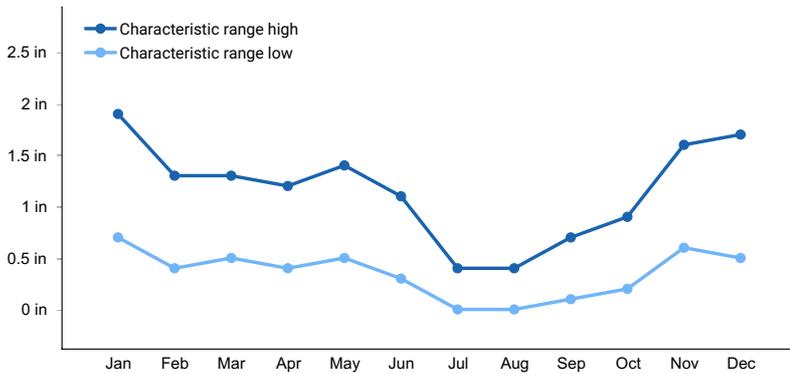


Figure 1. Monthly precipitation range

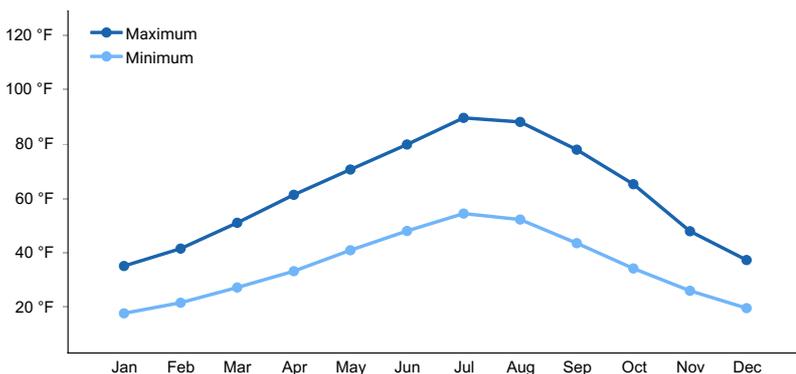


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

This site is influenced by run on from adjacent areas.

Soil features

The soils supporting this site are very deep but have a restrictive layer due to high salt and carbonate content beginning between 3 and 8 inches depth. They are well drained, with impermeable or slow permeability. Runoff is high to very high. The erosion hazard is slight to very severe by water and moderate by wind. The available water holding capacity (AWC) is low to moderate. These soils are characterized by an aridic moisture regime bordering on xeric. Soil temperature regime is mesic.

Soil Series Correlated to this Ecological Site

Antelope Springs

Kudlac

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Loam
Drainage class	Well drained
Permeability class	Slow
Soil depth	60 in
Surface fragment cover <=3"	0–3%
Surface fragment cover >3"	0–3%
Available water capacity (0-40in)	4.7–6.3 in
Calcium carbonate equivalent (0-40in)	10–25%
Electrical conductivity (0-40in)	2–18 mmhos/cm
Sodium adsorption ratio (0-40in)	2–12
Soil reaction (1:1 water) (0-40in)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	0–3%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

The dominant visual aspect of this site is black greasewood along with some basin big sagebrush and spiny hopsage with a scattered grass understory. The amount and distribution of the understory grasses is quite variable and is dependent upon the degree of salinity. Composition by weight is 60 percent grasses, 5 percent forbs, and 35 percent shrubs.

The Historic Climax Plant Community (HCPC), the Reference State (State 1), moves through many phases depending on the natural and man-made forces that impact the community over time. State 1, described later,

indicates some of these phases. The Reference Plant Community Phase is Phase A. This plant community is dominated by basin wildrye and black greasewood. Subdominants include Indian ricegrass, inland saltgrass, and spiny hopsage. Basin big sagebrush is usually present in small amounts. The plant species composition of Phase A is listed later under "Reference Plant Community Phase Plant Species Composition".

During the last few thousand years, this site has evolved in a semi-arid climate characterized by warm, dry summers and cold, wet winters. Herbivory has historically occurred on the site at low levels of utilization. Herbivores primarily include lagomorphs and small rodents. Infrequent use is made by mule deer and pronghorn antelope. Fire has historically occurred on this site every 80 to 100 years. Fire occurs only in years with above normal precipitation. Total annual production is 850 pounds per acre (944 Kg/ha) in a normal year. Production in a favorable year is 1200 pounds per acre (1333 Kg/ha). Production in an unfavorable year is 650 pounds per acre (722 Kg/ha). Structurally, cool season deep rooted perennial bunchgrasses are very dominant, followed by medium height shrubs being more dominant than perennial forbs while shallow rooted bunchgrasses are subdominant.

FUNCTION:

This site is suited for grazing by domestic livestock in the late spring and early summer. Due to easy access by livestock and the relatively low precipitation on the site, degradation can occur if the plant cover is reduced. Wildlife uses the site in very low numbers. Recreational opportunities are very limited.

Because of the gentle topography, infiltration is normally high and runoff low. Runoff, when it does occur is non-erosive except during high intensity convection storms. Snow accumulates on the site due to the presence of tall shrubs.

Impacts on the Plant Community.

Influence of fire:

In the absence of normal fire frequency, black greasewood and basin big sagebrush increases. Grasses and forbs decrease as shrubs increase.

When fires become more frequent than historic levels (80-100 years), black greasewood, basin big sagebrush, and spiny hopsage are reduced significantly. The reduction is temporary however, since black greasewood and spiny hopsage re-sprout after light to moderate intensity fires. Basin wildrye and inland saltgrass will generally increase after fire. With continued short fire frequency, basin big sagebrush can be completely eliminated along with many of the desirable understory species. These species may be replaced by cheatgrass and medusahead, along with a variety of annual and perennial forbs including noxious and invasive plants. These fine fuels will increase the fire frequency. Root sprouting shrubs such as rabbitbrush and littleleaf horsebrush may increase.

Influence of improper grazing management:

Season-long grazing and/or excessive utilization can be very detrimental to this site. This type of management leads to reducing vigor of the bunchgrasses. With reduced vigor, recruitment of these species declines. As these species decline, the plant community becomes susceptible to an increase in black greasewood and noxious and invasive plants. As cheatgrass and medusahead increase along with other annuals, fires become more frequent. Continued improper grazing management influences fire frequency by increasing fine fuels.

Continuous spring grazing can significantly reduce the vigor of basin wildrye. Excessive utilization during the spring is even more detrimental. The growing points of basin wildrye are several inches above the soil surface. Utilization during the growing season should allow for a 10-12" stubble height by the end of the grazing period.

Proper grazing management that addresses frequency, duration, and intensity of grazing can also keep fine fuels from developing, thereby reducing fire frequency. This can lead to gradual increases in basin big sagebrush. Proper grazing management will also help maintain the integrity of the plant community.

Weather influences:

Above normal precipitation in April, May, and June can dramatically increase total annual production of the plant community. These weather patterns can also increase viable seed production of desirable species to provide for recruitment. Likewise, below normal precipitation during these spring months can significantly reduce total annual production and be detrimental to viable seed production. Overall plant composition is normally not affected when perennials have good vigor.

Below normal temperatures in the spring can have an adverse impact on total production regardless of the precipitation. An early, hard freeze can occasionally kill some plants.

Prolonged drought adversely affects this plant community in several ways. Vigor, recruitment, and production are usually reduced. Mortality can occur. Prolonged drought can lead to a reduction in fire frequency.

Influence of insects and disease:

An outbreak of a particular insect is usually influenced by weather but no specific data for this site is available. Mormon cricket and grasshopper outbreaks occur periodically. Outbreaks seldom cause plant mortality since defoliation of the plant occurs only once during the year of the outbreak.

Influence of noxious and invasive plants:

Many of these species add to the fine-fuel component and lead to increased fire frequency. Many of the annual and perennial invasive species with deep root systems compete with desirable plants for moisture and nutrients. The result is reduced production and change in composition of the understory.

Influence of wildlife:

Big game animals use this site sparingly. Since their use is so light, the influence on the site is minimal. Population explosions of black-tailed jackrabbits occur occasionally. These high populations can affect the plant community. However, the effect is usually temporary since population die-offs normally occur within a year or two.

Watershed:

Decreased infiltration and increased runoff occur with the increase in black greasewood. Desired understory species can be reduced. The increased runoff also causes sheet and rill erosion. This composition change can affect nutrient and water cycles. Abnormally short fire frequency also gives the same results, but to a lesser degree. The long-term effect is a transition to a different state.

Plant Community and Sequence:

Transition pathways between common vegetation states and phases:

State 1.

Phase A to B. Develops with improper grazing management and in the absence of fire.

Phase A to C. Develops with fire.

Phase B to A. Develops with prescribed grazing and brush management.

Phase C to A. Develops with prescribed grazing and no fire.

State 1 to State 2. Develops through frequent fire and improper grazing management. This site has crossed the threshold. It is generally economically impractical to move this state back across the threshold with accelerating practices.

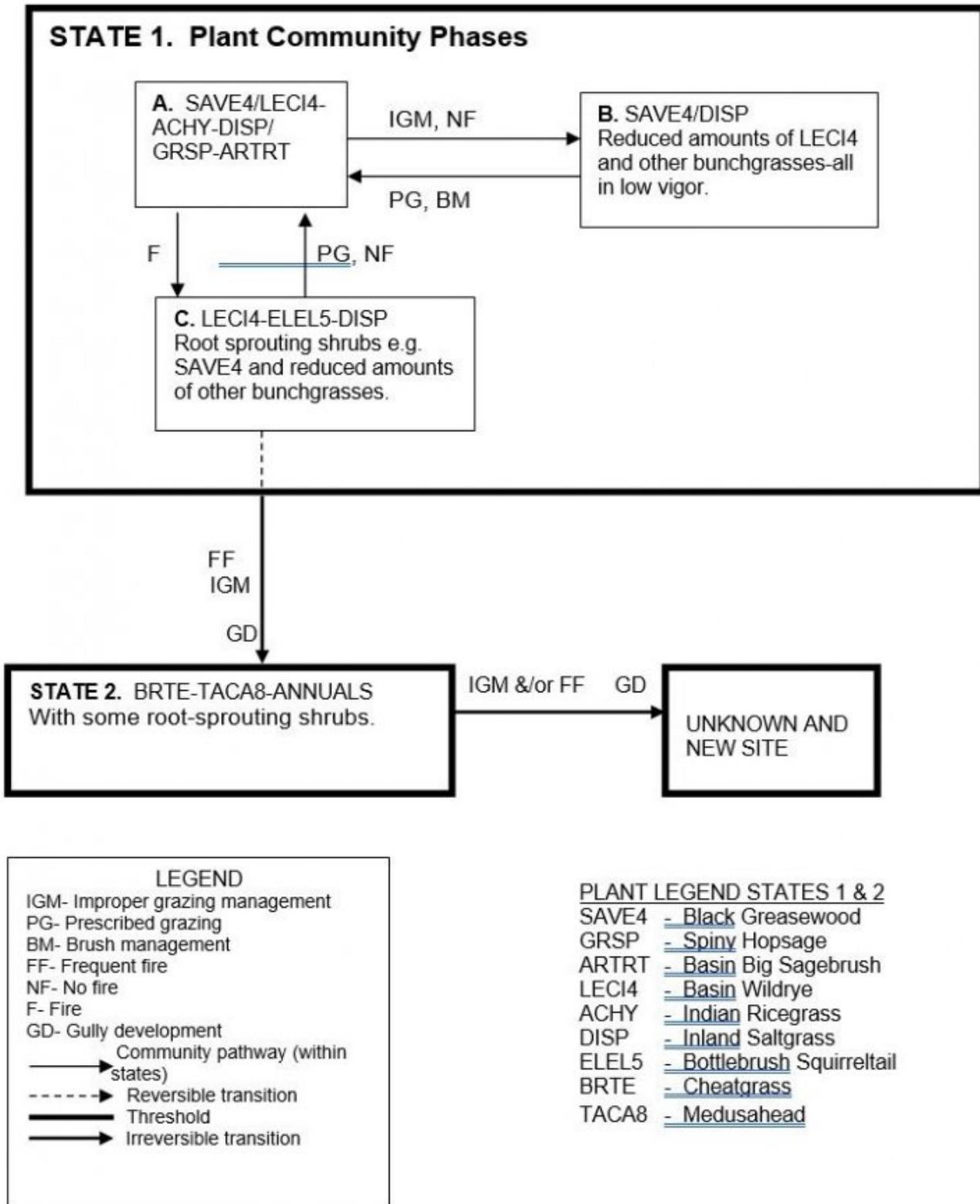
State 2 to unknown site. Excessive soil loss and changes in the hydrologic cycle caused by continued improper grazing management and/or frequent fire cause this state to cross the threshold and retrogress to a new site with reduced potential. It is economically impractical to return this site to State 1 with accelerating practices.

Practice Limitations.

Due to the relatively low production potential, soil texture problems, wet soil periods from run-on, and the saline or alkaline conditions, it is generally not economically feasible to seed or use brush management on this site.

No physical limitations exist for seeding on this site except for periods of run-on. The silty clay and strongly saline or alkaline conditions may present specific challenges for seedbed preparation and seeding.

State and transition model



State 1
State 1 Phase A

Community 1.1 State 1 Phase A

This plant community has black greasewood with basin wildrye, Indian ricegrass, and inland saltgrass dominating the understory. Bottlebrush squirreltail is sub-dominant in the understory. Spiny hopsage and basin big sagebrush occur in the overstory in small amounts. Natural fire frequency is 80-100 years.

Table 5. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	45-55%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

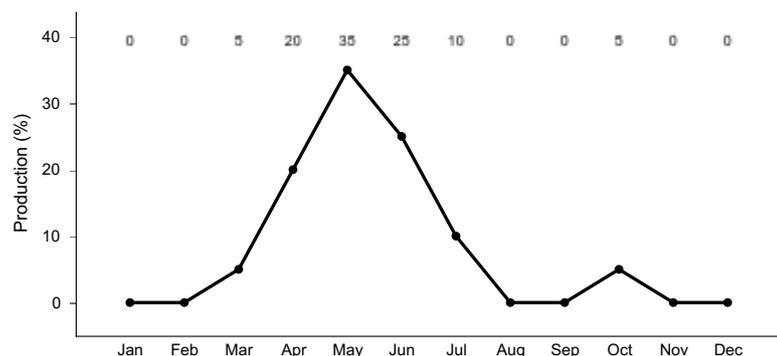


Figure 3. Plant community growth curve (percent production by month). ID1101, D25 ARTRV HCPC. State 1.

State 2 State 1 Phase B

Community 2.1 State 1 Phase B

This plant community is dominated by black greasewood with reduced amounts of basin wildrye. Inland saltgrass has increased in the understory. All deep-rooted bunchgrasses are typically in low vigor. Black greasewood has increased as well as some other tall shrubs. This state has developed due to improper grazing management and lack of fire. Some cheatgrass, and/or medusahead may have invaded the site.

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%

Non-vascular plants	0%
Biological crusts	0%
Litter	45-55%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

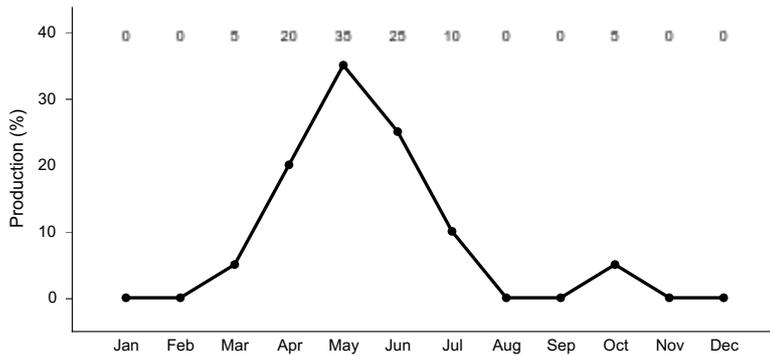


Figure 4. Plant community growth curve (percent production by month). ID1101, D25 ARTRV HCPC. State 1.

State 3 State 1 Phase C

Community 3.1 State 1 Phase C

This plant community is dominated by basin wildrye with some rabbitbrush and gray horsebrush. Bottlebrush squirreltail and inland saltgrass have increased. Forbs remain about in the same proportion as Phase A. Basin big sagebrush has been reduced significantly due to wildfire. Black greasewood has re-sprouted. Some cheatgrass and/or medusahead may have invaded the site. This plant community is the result of wildfire.

Table 7. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	45-55%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

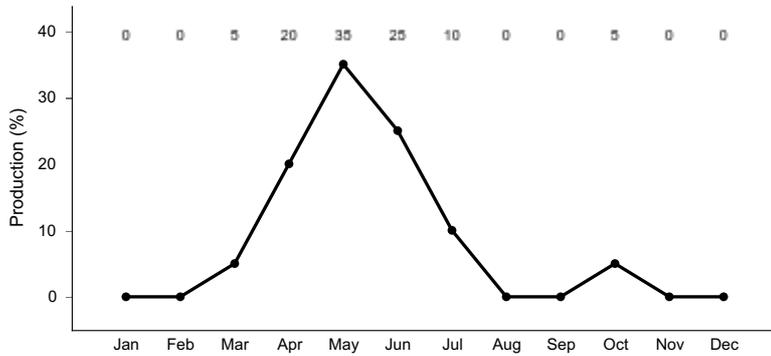


Figure 5. Plant community growth curve (percent production by month). ID1101, D25 ARTRV HCPC. State 1.

**State 4
State 2**

**Community 4.1
State 2**

This plant community is dominated by cheatgrass, and /or other annuals. Medusahead may also be present. Root sprouting shrubs such as black greasewood, rabbitbrush, spiny hopsage, and littleleaf horsebrush can be present, dependent upon, how frequent, fire has occurred. Some soil loss has occurred. Gully development has begun due to increased run-on from adjacent sites. This state has developed due to frequent fires and improper grazing management. The site has crossed the threshold. It is economically impractical to return this plant community to State 1 with accelerating practices.

Table 8. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	45-55%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

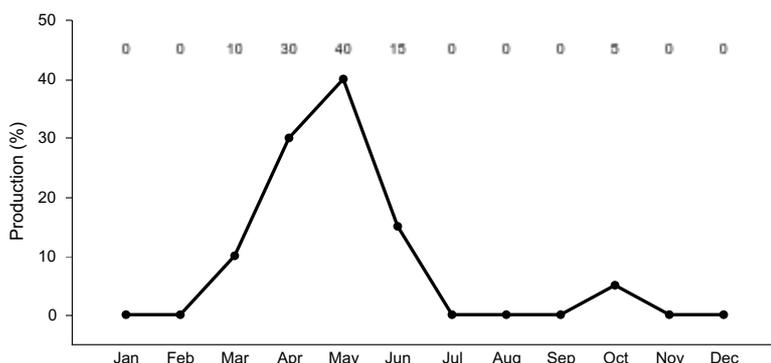


Figure 6. Plant community growth curve (percent production by month).

State 5**State 3****Community 5.1****State 3**

Unknown new site. This plant community has gone over the threshold to a new site. Site potential has been reduced. Significant soil loss has occurred. Gully development is extensive due to increased run-on from adjacent sites. Infiltration has been reduced and run-off has become more rapid. This state has developed due to continued improper grazing management and/or frequent fires. It is economically impractical to return this plant community to State 1 with accelerating practices.

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	45-55%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Additional community tables**Animal community**

Wildlife Interpretations.

Animal Community – Wildlife Interpretations

This ecological site provides diverse habitat for many native wildlife species. The high diversity of plant species and structure, and proximity to areas with water at or near the soil surface favors a large variety of wildlife. Area sensitive species that may utilize the site include Woodhouse's toad, Great Basin collared lizard, long-nosed snake, groundsnake, and Great Basin ground squirrel.

State 1 Phase 1.1 – Black Greasewood/ Basin Wildrye/ Indian Ricegrass/ Inland Saltgrass/ Spiny Hopsage/ Basin Big Sagebrush Reference Plant Community (RPC): The RPC provides a diversity of grasses, forbs and shrubs, used by native insect communities who assist in the pollination process for the plant community. The reptile and amphibian community is represented by leopard lizard, short horned lizard, sagebrush lizard, western skink, western rattlesnake and western toad. The canopy cover of greasewood, spiny hopsage, and sagebrush provides suitable thermal and escape cover for mule deer and antelope. This plant community may provide brood rearing/foraging areas for sage grouse. This community provides habitat for a wide array of small mammals such as jackrabbits, cottontail rabbits, mice, and voles, so diverse prey populations are available for badgers, fox, coyotes, and raptors such as red-tail and Swainson's hawks. Birds such as horned lark and western meadowlark will utilize this community for nesting and foraging. This site may be adjacent to seasonal and permanent wetlands and can provide limited nesting cover for a variety of waterfowl and shorebirds.

State 1 Phase 1.2 – Black Greasewood/ Inland Saltgrass Plant Community: This state has developed due to improper grazing management and lack of fire. The diversity of the invertebrate community will decrease due to an increase in woody cover and reduction of understory vegetation, although the numbers of insects may still be large. Small mammals including deer mice and northern grasshopper mice may occur here. Birds of prey (northern harrier and Cooper's hawk) may range throughout these areas looking for prey species. When the site is found adjacent to sagebrush dominated sites, this plant community may provide brood rearing/foraging areas for sage grouse. This plant community would be useful to large grazers like deer and antelope for thermal and escape cover. However, the plant community composition is less diverse, with less palatable herbaceous vegetation and thus is less apt to meet the seasonal needs of these animals.

State 1 Phase 1.3 – Basin Wildrye/ Bottlebrush Squirreltail/ Inland Saltgrass Plant Community: This plant community is the result of wildfire. This plant community exhibits a moderate level of plant species diversity. Invertebrate populations would be similar to Phase 1.1 and 1.2 communities. Birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles as well as upland game birds. Small mammals including the deer mouse and northern grasshopper mouse may utilize the site. They would provide a prey base for fox, coyote, badgers and raptors. Deer and antelope would utilize the site on a short seasonal basis in the spring for available forage.

State 2 –Cheatgrass/ Medusahead/ Annuals Plant Community: This state has developed due to frequent fires and improper grazing management. The loss of the native shrub and herbaceous plant community would not support a diverse insect community. The reduced forb component in the plant community would support a very limited population of pollinators. Most native reptilian species are not supported with food, water or cover. This plant community does not support the habitat requirements for sage-grouse. Diversity of avian species is reduced due to poor cover and food. Birds of prey including hawks and falcons may range throughout these areas looking for prey species. Large mammals may utilize the herbaceous vegetation in the early part of the year when the invasive annuals (cheatgrass) are more palatable. At other times of the year large mammals would not regularly utilize these areas due to poor food and cover conditions. The populations of small mammals would be dominated by open grassland species like the Columbian ground squirrel and deer mouse.

Grazing Interpretations.

This site is suited for grazing by domestic livestock in the late spring and early summer. Estimated initial stocking rate will be determined with the landowner or decision-maker. They will be based on the inventory which includes species composition, similarity index, production, past use history, season of use, and seasonal preference. Calculations used to determine estimated initial stocking rate will be based on forage preference ratings.

Hydrological functions

Soils on this site are in hydrologic group D. When the hydrologic condition of the vegetative cover is good, natural erosion hazard is moderate.

Recreational uses

This site offers few recreational or aesthetic opportunities.

Wood products

None

Other products

None

Other information

Field Offices

Mountain Home, ID
Marsing, ID
Gooding, ID
Twin Falls, ID
Jerome, ID
Shoshone, ID
Burley, ID
Rupert, ID

Inventory data references

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used. Those involved in developing this site description include:

Dave Franzen, co-owner, Intermountain Rangeland Consultants, LLC
Jacy Gibbs, co-owner, Intermountain Rangeland Consultants, LLC
Jim Cornwell, Range Management Specialist, IASCD
Brendan Brazee, State Rangeland Management Specialist, NRCS, Idaho
Leah Juarros, Resource Soil Scientist, NRCS, Idaho
Lee Brooks, Range Management Specialist, IASCD

Other references

Hironaka, M., M.A. Fosberg, A. H. Winward. 1983. Sagebrush-Grass Habitat Types of Southern Idaho. University of Idaho, Moscow, Idaho. Bulletin Number "35".
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USDA, NRCS.2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA
USDA, Forest Service, Fire Effects Information Database. 2004. www.fs.fed.us/database.
USDI Bureau of Land Management, US Geological Survey; USDA Natural Resources Conservation Service, Agricultural Research Service; Interpreting Indicators of Rangeland Health. Technical Reference 1734-6; Version 4-2005.

Approval

Kendra Moseley, 4/06/2020

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	03/31/2008
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** rills rarely occur on this site. If rills are present they are likely to occur immediately following wildfire. Rills are most likely to occur on soils with surface textures of silt loam and clay loam. Rills may also occur in the vicinity of the water flow patterns where run-on occurs from adjacent uplands.

2. **Presence of water flow patterns:** water-flow patterns rarely occur on this site. When they occur they are short and disrupted by cool season grasses and tall shrubs and are not extensive. Water flow patterns can be expected to occur where run-on from adjacent sites is present.

3. **Number and height of erosional pedestals or terracettes:** both are rare on this site.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** data is not available. On sites in mid-seral status bare ground may range from 45-55 percent.

5. **Number of gullies and erosion associated with gullies:** gullies do not occur on this site.

6. **Extent of wind scoured, blowouts and/or depositional areas:** are usually not present. Immediately following wildfire some soil movement may occur on silty textured soils.

7. **Amount of litter movement (describe size and distance expected to travel):** fine litter in the interspaces may move up to 2 feet following a significant run-off event. Coarse litter generally does not move.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** values should range from 4 to 6 but needs to be tested.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** structure ranges from moderate thin to moderate medium platy. Soil organic matter (SOM) is 0.5 to 2 percent. The A or A1 horizon is typically 3 to 4 inches thick.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** bunchgrasses, especially deep-rooted perennials, slow run-off and increase infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** not present.

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: cool season deep-rooted perennial bunchgrasses

Sub-dominant: tall shrubs

Other: perennial forbs

Additional: basin big sagebrush, black greasewood, and basin wildrye will become decadent in the absence of fire and ungulate grazing. Grass and forb mortality will occur as tall shrubs increase.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** additional litter cover data is needed but is expected to be 20-25 percent to a depth of 0.1 inches. Under mature shrubs litter is >0.5 inches deep and is 90-100 percent ground cover.

14. **Average percent litter cover (%) and depth (in):** additional litter cover data is needed but is expected to be 20-25 percent to a depth of 0.1 inches. Under mature shrubs litter is >0.5 inches deep and is 90-100 percent ground cover.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** is 850 pounds per acre (944 kilograms per hectare) in a year with normal temperatures and precipitation. Perennial grasses produce 55-65 percent of the total production, forbs 2-5 percent, and shrubs 30-40 percent.

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:** includes cheatgrass, *Vulpia* sp., annual mustards, halogeton, Russian thistle, and annual Kochia.

17. **Perennial plant reproductive capability:** all functional groups have the potential to reproduce in favorable years.
