

Ecological site R028AY024ID LOAMY 8-12 ARTRT/PSSPS

Last updated: 6/12/2025
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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): 028A–Ancient Lake Bonneville

MLRA 28A occurs in Utah (82 percent), Nevada (16 percent), and Idaho (2 percent). It encompasses approximately 36,775 square miles (95,246 square kilometers). A large area west and southwest of Great Salt Lake is a salty playa. This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet (1,204 to 2000 meters) in the basins and from 6,560 to 11,150 feet (1996 to 3398 meters) in the mountains. Much of the MLRA has alluvial valley fill and playa lakebed deposits at the surface from pluvial Lake Bonneville, which dominated this MLRA 13,000 years ago. A level line of remnant lake terraces on some mountain slopes indicates the former extent of this glacial lake. The Great Salt Lake is what remains of the pluvial lake.

Mountains in the interior of this MLRA consist of tilted blocks of marine sediments from Cambrian to Mississippian age with scattered outcrops of Tertiary continental sediments and volcanic rocks. The average annual precipitation is 5 to 12 inches (13 to 30 cm) in the valleys and ranges up to 49 inches (124 cm) in the mountains. Most of the rainfall in the southern LRU occurs as high-intensity, convective thunderstorms during the growing season (April through September). The driest period is from midsummer to early autumn in the northern LRU. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 °F (4 to 12 °C). The freeze-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with increasing elevation. The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols. Soils are

dominantly in the mesic or frigid soil temperature regime, aridic or xeric soil moisture regime, and mixed mineralogy. The soils are generally well drained, loamy or loamy-skeletal, and very deep.

LRU notes

The Basin and Range North LRU exhibits dry summer with stronger xeric patterns than the Basin and Range South LRU. Ranges in the north LRU are about 50 percent Paleozoic sedimentary/metasedimentary (limestone/quartzite dominant) and about 10 percent Tertiary volcanics. The basin floors are between 4,200 and 5,100 feet (1,280 to 1,554 meters) in elevation. Pinyon and juniper sites have a greater percentage of Utah juniper (*Juniperus osteosperma*) in the plant community than pinyon pine (*Pinus edulis* or *monophylla*). The Basin and Range North have few semidesert ecological sites with Utah juniper. Cool season grasses, such as bluebunch wheatgrass (*Pseudoroegneria spicata*), are dominant in the plant community, while warm season grasses are largely absent or a small component of the plant community.

Ecological site concept

The Loamy 8-12 ARTRT/PSSPS site occurs on nearly level to gently sloping lake terraces and fan remnants. Slopes are less than 12 percent. The dominant species are basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and bluebunch wheatgrass (*Pseudoroegneria spicata* ssp. *spicata*).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i> ssp. <i>tridentata</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>

Physiographic features

The Loamy 8-12 ARTRT/PSSPS site occurs on nearly level to gently sloping lake terraces and fan remnants. Slopes range from 1 to 12 (up to 30) percent on all aspects. Elevations range from 4400 to 5300 feet (1341 to 1615 meters).

Table 2. Representative physiographic features

Landforms	(1) Lake terrace (2) Fan remnant
Elevation	1,341–1,615 m
Slope	1–12%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The climate is semi-arid and characterized by cold winters and hot summers. The average annual precipitation ranges from 13 to 17 inches (33-43 cm.). Approximately 40 percent of the moisture comes during the period of plant growth between April and September. The moisture deficient period begins in early June when the evapo-transpiration rate is high. Re-growth may occur in late August and September if moisture is adequate. Frost-free period ranges from 90 to 150 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	68-89 days
Freeze-free period (characteristic range)	97-125 days
Precipitation total (characteristic range)	330-406 mm
Frost-free period (actual range)	63-95 days
Freeze-free period (actual range)	90-131 days
Precipitation total (actual range)	330-432 mm
Frost-free period (average)	78 days
Freeze-free period (average)	111 days
Precipitation total (average)	381 mm

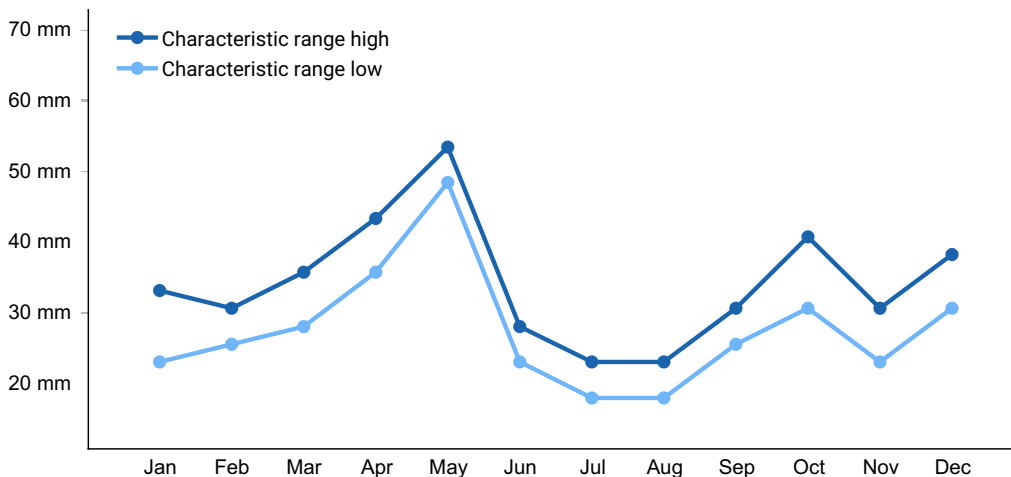


Figure 1. Monthly precipitation range

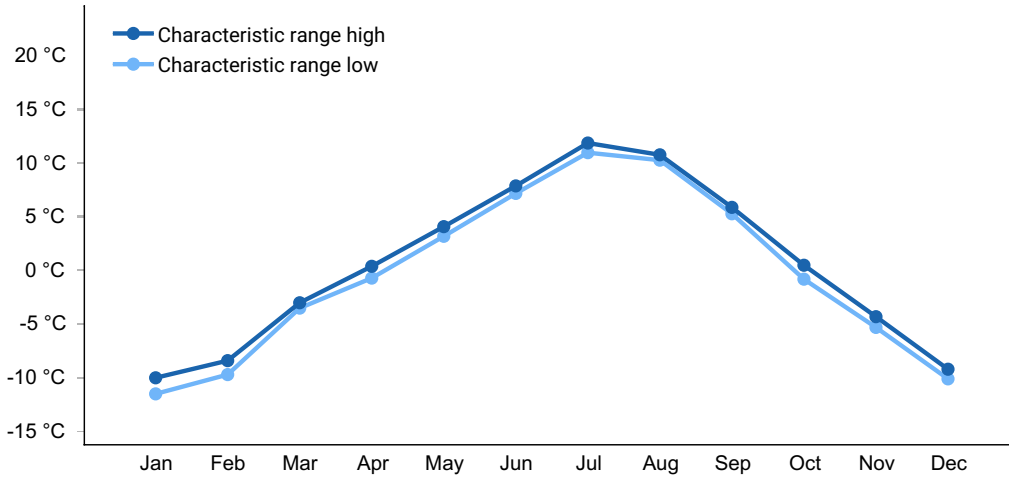


Figure 2. Monthly minimum temperature range

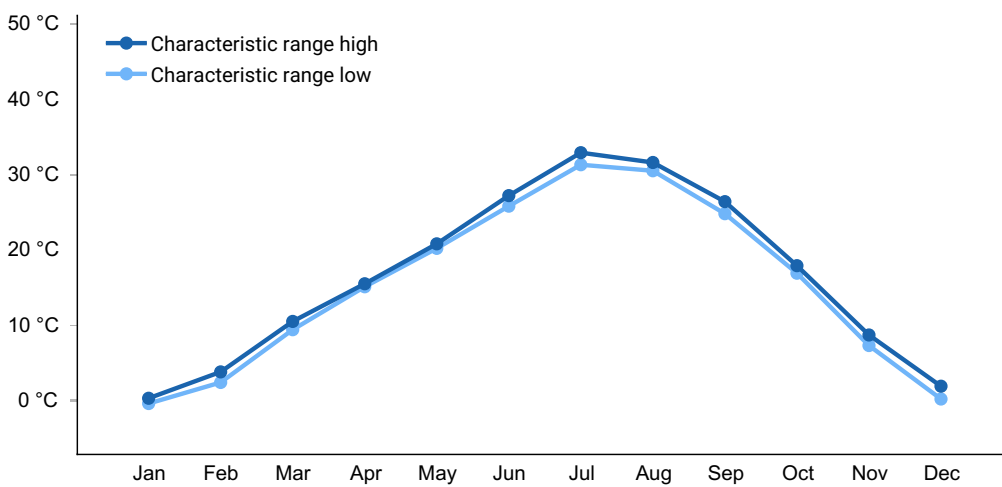


Figure 3. Monthly maximum temperature range

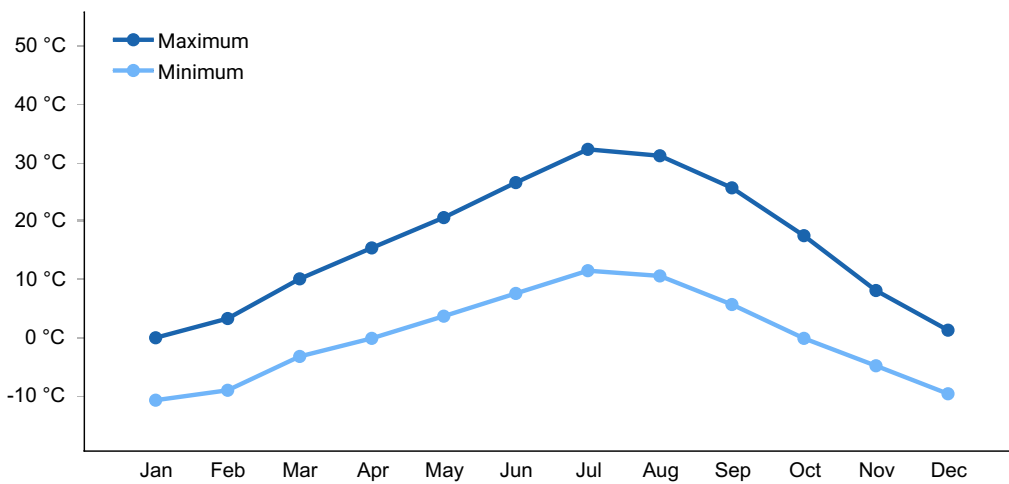


Figure 4. Monthly average minimum and maximum temperature

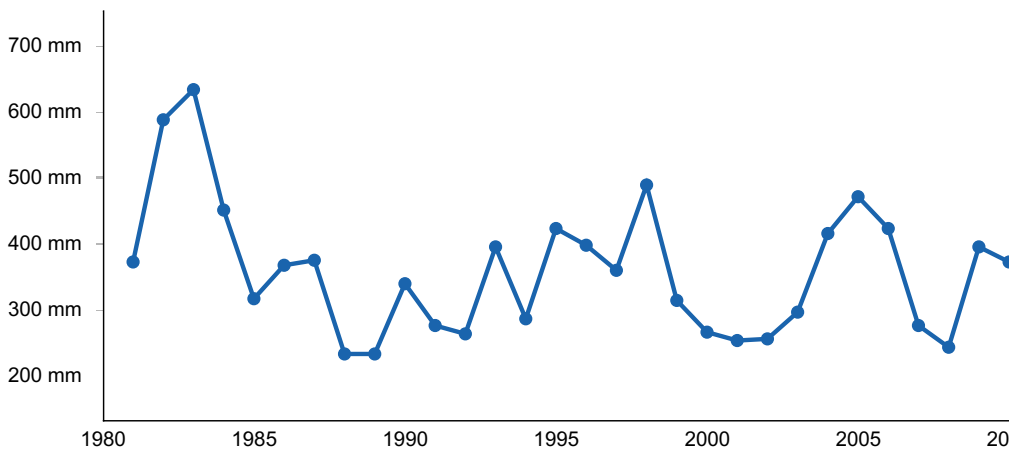


Figure 5. Annual precipitation pattern

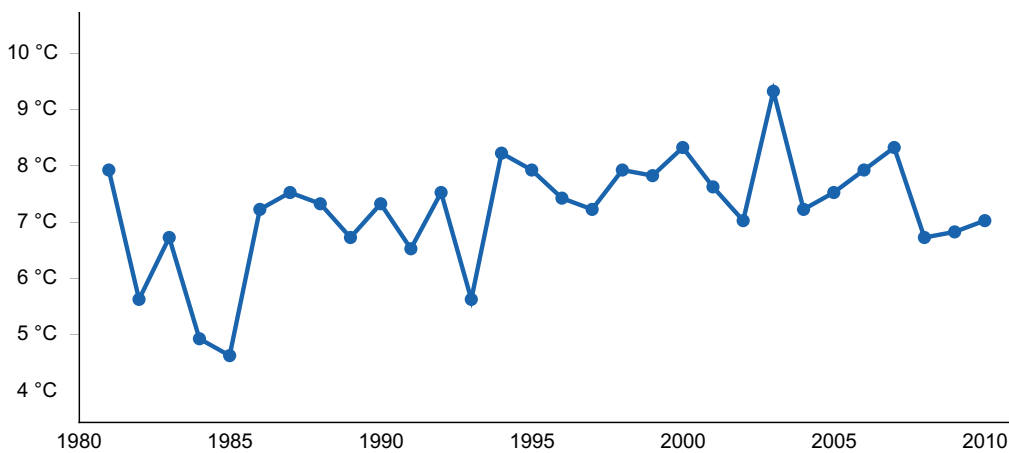


Figure 6. Annual average temperature pattern

Climate stations used

- (1) PRESTON [USC00107346], Preston, ID
- (2) MALAD CITY [USW00024151], Malad City, ID
- (3) SNOWVILLE [USC00427931], Snowville, UT

Influencing water features

The Loamy 8-12 ARTRT/PSSPS site is not influenced by adjacent wetlands, streams, or run on.

Soil features

The soils are very deep, well drained, silt loam, fine sandy loams, and gravelly loam. They are underlain by medium textured layers that may contain gravel and cobbles. Rock fragments are variable throughout the profile, but are generally less than 35 percent by volume. Permeability is moderate to moderately rapid. Roots readily penetrate the soil. The available water holding capacity (AWC) is very low to moderate. The soils are characterized by a xeric or aridic bordering on xeric soil moisture regime. The soil

temperature regime is predominantly mesic.

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock (2) Lacustrine deposits–sedimentary rock
Surface texture	(1) Silt loam (2) Gravelly loam (3) Fine sandy loam
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	152 cm
Surface fragment cover ≤3"	0–30%
Surface fragment cover >3"	0–2%
Available water capacity (Depth not specified)	4.32–21.08 cm
Calcium carbonate equivalent (Depth not specified)	5–35%
Electrical conductivity (Depth not specified)	0–8 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–13
Soil reaction (1:1 water) (Depth not specified)	7.4–9
Subsurface fragment volume ≤3" (Depth not specified)	0–33%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

The dominant visual aspect is basin big sagebrush with an understory of bluebunch wheatgrass. Composition by weight is approximately 60 to 70 percent grasses, 10 to 20 percent forbs, and 15 to 25 percent shrubs.

In the last few thousand years, this site has evolved in a semi-arid climate characterized by dry summers and cold winters. Herbivory has historically occurred on this site at low levels of utilization. Herbivores include mule deer, lagomorphs and small rodents.

Fire has historically occurred on the site at intervals of 20 to 50 years.

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 1.1. This plant community is dominated by bluebunch wheatgrass in the understory and basin big sagebrush in the overstory. Subdominant species include Sandberg bluegrass, bottlebrush squirreltail, thickspike wheatgrass, arrowleaf balsamroot and tapertip hawksbeard. There is a large variety of other grasses, forbs and shrubs that can occur in minor amounts. The plant species composition of Phase 1.1 is listed later under "Reference Plant Community Phase Plant Species Composition".

Total annual production is 600 pounds per acre (672 kilograms per hectare) in a normal year. Production in a favorable year is 1000 pounds per acre (1111 kilograms per hectare). Production in an unfavorable year is 400 pounds per acre (448 kilograms per hectare). Structurally, cool season deep rooted perennial bunchgrasses are very dominant, followed by tall shrubs being more dominant than perennial forbs while shallow rooted bunchgrasses are subdominant.

Function.

The Loamy 8-12 ARTRT/PSSPS site is suited for livestock grazing in the spring, early summer and fall. There are few limitations to grazing. The distance to water may be a problem in some areas. Usually this site is often the key area in a management program.

The site provides winter and spring range for mule deer. It has some value for sage grouse brood rearing.

The site has limited value for recreation but does provide some hunting, hiking, photography opportunities and off-road vehicle use.

Due to gentle slopes that allow easy access for livestock and relatively low production, this site can easily be degraded from improper livestock management. A mixed stand of shrubs and perennial grasses is necessary to reach the potential of the site.

Impacts on the Plant Community.

Influence of fire:

In the absence of normal fire frequency, basin big sagebrush can gradually increase on the site. Grasses and forbs decrease as shrubs increase. With the continued absence of fire, basin big sagebrush can displace most of the primary understory species.

When fire frequency is greater than historic levels, basin big sagebrush is reduced significantly. Rabbitbrush can increase slightly. With continued short fire frequency, basin big sagebrush can be completely eliminated along with many of the desirable understory

species such as bluebunch wheatgrass, Nevada bluegrass, and needle and thread. These species may be replaced by Sandberg bluegrass and bulbous bluegrass along with a variety of annual and perennial forbs including noxious and invasive plants. Cheatgrass will invade the site. These fine fuels will increase the fire frequency.

Influence of improper grazing management:

Season-long grazing and/or excessive utilization can be detrimental to this site. This type of management leads to reduced 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 basin big sagebrush and noxious and invasive plants. Continued improper grazing management influences fire frequency by reducing fine fuels that carry fires. As cheatgrass increases and becomes co-dominant with Sandberg bluegrass and other annuals, fires become frequent.

A planned grazing system can be developed to intentionally accumulate fine fuels in anticipation of a prescribed fire. Brush management should be carefully planned, as a reduction in shrubs can increase cheatgrass leading to frequent fire intervals.

Weather influences:

Above normal precipitation in March, April and May 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 good seed production. Overall plant composition is normally not effected when perennials have good vigor.

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

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 changes in fire frequency.

Influence of Insects and disease:

Outbreaks can affect health of vegetation. 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 weeds:

Annual and perennial invasive species compete with desirable plants for moisture and nutrients. The result is reduced production and change in composition of the understory.

Cheatgrass can be very invasive on this site. Once it becomes established the fire frequency increases. As a result, the shrub component can be lost.

Influence of wildlife:

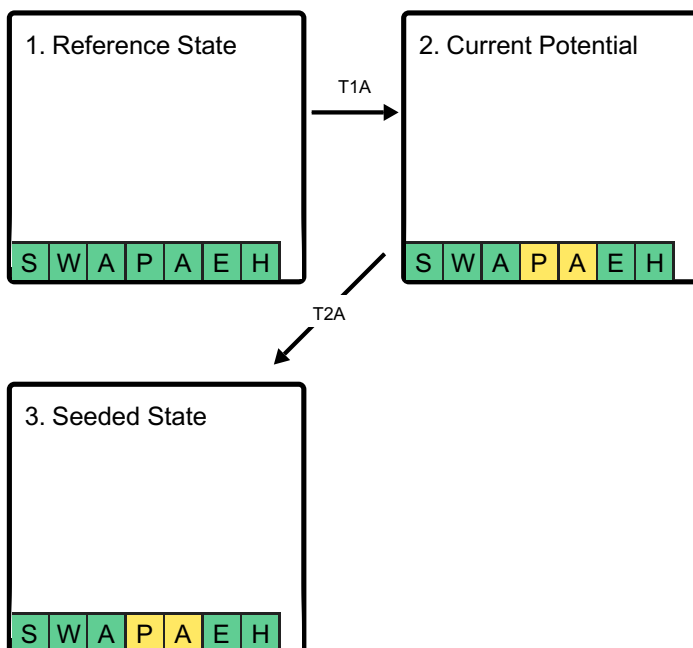
Big game use the Loamy 8-12 ARTRT/PSSPS site in the spring, summer and fall and in moderate winters. Their numbers are seldom high enough to adversely affect the plant community. Sage grouse may use the site for strutting grounds and also during the winter.

Watershed:

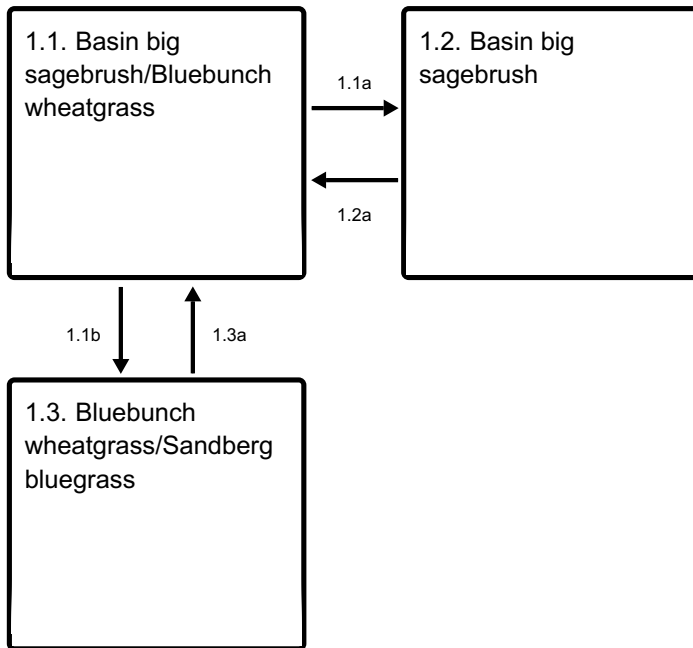
Decreased infiltration and increased runoff occur with an increase in basin big sagebrush. Desired understory species can be reduced. This composition change can affect nutrient and water cycles. Increased runoff also causes sheet and rill erosion. Abnormally short fire frequency also gives the same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

State and transition model

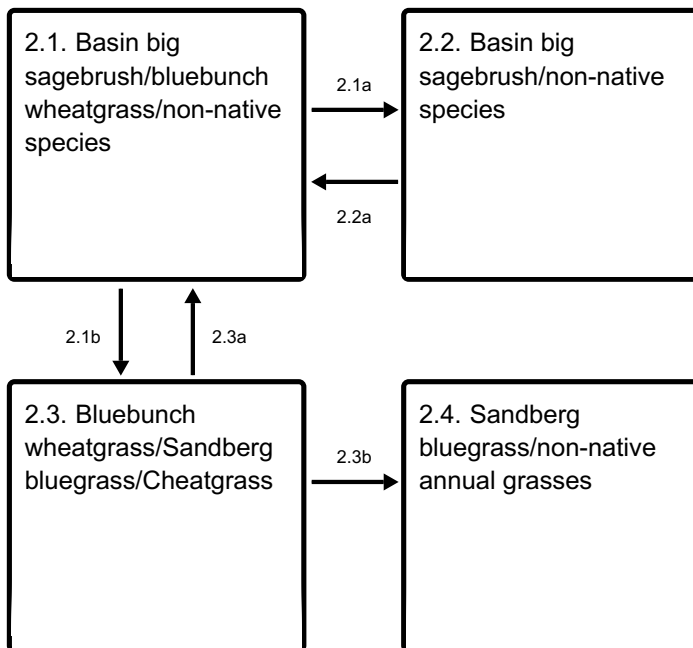
Ecosystem states



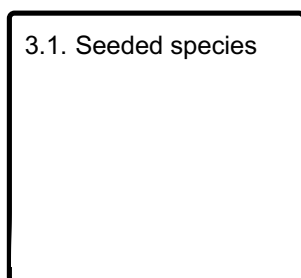
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1 Reference State

The Reference State (State 1), the Historic Climax Plant Community (HCPC) moves

through many phases depending on the natural and human forces that impact the community over time. The Reference Plant Community Phase is Phase 1.1, State 1. The plant species composition of Phase 1.1 is listed later under “Reference Plant Community Phase Plant Species Composition”.

Community 1.1 Basin big sagebrush/Bluebunch wheatgrass

The plant community in Community Phase 1.1 is dominated by bluebunch wheatgrass in the understory and basin big sagebrush in the overstory. Subdominant species include Sandberg bluegrass, bottlebrush squirreltail, thickspike wheatgrass, arrowleaf balsamroot, and tapertip hawksbeard. Natural fire frequency is 20 to 50 years.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	291	510	729
Shrub/Vine	90	157	224
Forb	67	118	168
Total	448	785	1121

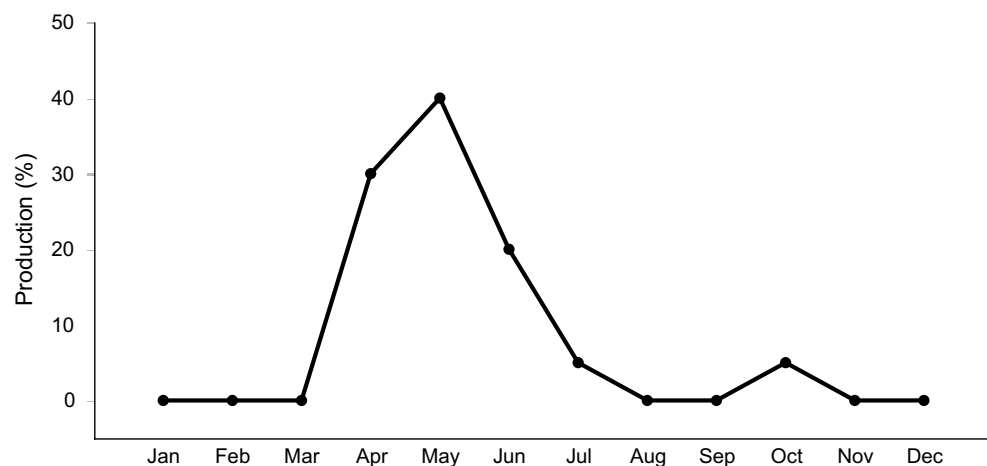


Figure 8. Plant community growth curve (percent production by month). ID1002, ARTRT Early Seral. State 2.

Community 1.2 Basin big sagebrush

The plant community in Community Phase 1.2 is dominated by basin big sagebrush with reduced amounts of bluebunch wheatgrass and other deep rooted perennial grasses. Sandberg bluegrass and bottlebrush squirreltail have increased in the understory. All deep-rooted bunchgrasses are typically in low vigor. Basin big sagebrush has increased. Community Phase 1.2 has developed due to lack of disturbance, such as fire.

Community 1.3

Bluebunch wheatgrass/Sandberg bluegrass

The plant community in Community Phase 1.3 is dominated by bluebunch wheatgrass and Sandberg bluegrass. Bottlebrush squirreltail and thickspike wheatgrass have increased. Forbs remain about in the same proportion as Phase 1.1. Little basin big sagebrush is present due to wildfire, but some rabbitbrush and horsebrush are present due to sprouting. The plant community is the result of wildfire.

Pathway 1.1a

Community 1.1 to 1.2

Time since disturbance.

Pathway 1.1b

Community 1.1 to 1.3

Fire or other disturbance that removes shrubs.

Pathway 1.2a

Community 1.2 to 1.1

Disturbance to remove some shrub cover.

Pathway 1.3a

Community 1.3 to 1.1

Time since disturbance. This allows non-fire tolerant shrubs to establish in the community.

State 2

Current Potential

The Current Potential state is similar to the Reference State, with the addition of non-native species. Non-native species lower resistance and resilience to disturbance.

Community 2.1

Basin big sagebrush/bluebunch wheatgrass/non-native species

The plant community in Community Phase 1.2 is dominated by bluebunch wheatgrass in the understory and basin big sagebrush in the overstory. Subdominant species include Sandberg bluegrass, bottlebrush squirreltail, thickspike wheatgrass, arrowleaf balsamroot, and tapertip hawksbeard. Some cheatgrass may have invaded the site. Natural fire frequency is 20 to 50 years.

Community 2.2

Basin big sagebrush/non-native species

The plant community in Community Phase 2.2 is dominated by basin big sagebrush with reduced amounts of bluebunch wheatgrass and other deep rooted perennial grasses. Sandberg bluegrass and bottlebrush squirreltail have increased in the understory. All deep-rooted bunchgrasses are typically in low vigor. Basin big sagebrush has increased. Community Phase 2.2 has developed due to improper grazing management. Some cheatgrass may have invaded the site.

Community 2.3

Bluebunch wheatgrass/Sandberg bluegrass/Cheatgrass

The plant community in Community Phase 2.3 is dominated by bluebunch wheatgrass and Sandberg bluegrass. Bottlebrush squirreltail and thickspike wheatgrass have increased. Forbs remain about in the same proportion as Phase 2.1. Little basin big sagebrush is present due to wildfire, but some rabbitbrush and horsebrush are present due to sprouting. Some cheatgrass has invaded the site. Community Phase 2.4 is the result of wildfire.

Community 2.4

Sandberg bluegrass/non-native annual grasses

The plant community in Community Phase 2.4 is dominated by Sandberg bluegrass, cheatgrass, and other annuals. Root sprouting shrubs such as rabbitbrush and horsebrush can be present. Some soil loss has occurred. Community Phase 2.4 has developed due to frequent fires and improper grazing management.

Pathway 2.1a

Community 2.1 to 2.2

Time since disturbance, such as fire. Also can develop with season long grazing.

Pathway 2.1b

Community 2.1 to 2.3

Disturbance, such as fire, that reduces or eliminates sagebrush cover.

Pathway 2.2a

Community 2.2 to 2.1

Lack of disturbance to the understory grasses, such as reduction in grazing.

Pathway 2.3a

Community 2.3 to 2.1

Time since disturbance. Extended time since a disturbance, such as fire, allows the sagebrush to establish.

Pathway 2.3b Community 2.3 to 2.4

Frequent disturbance, such as fire or grazing. The frequency of disturbance is outside of the normal or historical range.

State 3 Seeded State

The Seeded State has been seeded with non-native species that mimic the reference plant community.

Community 3.1 Seeded species

Community Phase 3.1 contains seeded species.

Transition T1A State 1 to 2

Introduction and establishment of non-native species in the plant community. Annual non-native species, like cheatgrass, lower the site resistance and resilience to disturbance. This occurs through an increase in fine fuels that make the site more susceptible to fires. More frequent fires reduce shrub cover and increase non-native annual species. This positive feedback may lead to a transition to a different state that has not been identified (a potential State 4).

Transition T2A State 2 to 3

Site is seeded with non-native perennial species.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				–	
	bluebunch wheatgrass	PSSPS	<i>Pseudoroegneria spicata</i> <i>ssp. spicata</i>	202–504	–

	wheatgrass		ssp. <i>secunda</i>		
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	34–84	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	22–56	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	18–45	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–28	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	9–22	–
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	0–17	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–11	–
Forb					
2				–	
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	34–84	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	25–62	–
	phlox	PHLOX	<i>Phlox</i>	9–22	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	7–17	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–17	–
	desertparsley	LOMAT	<i>Lomatium</i>	0–11	–
	Indian paintbrush	CASTI2	<i>Castilleja</i>	0–6	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	0–6	–
Shrub/Vine					
3				–	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	78–196	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	7–17	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	0–11	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–11	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	0–11	–
	threetip sagebrush	ARTR4	<i>Artemisia tripartita</i>	0–11	–

	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–6	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–6	–
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0–6	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–6	–

Contributors

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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)	
Contact for lead author	
Date	04/10/2026
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

-
4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

 5. **Number of gullies and erosion associated with gullies:**

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

 7. **Amount of litter movement (describe size and distance expected to travel):**

 8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

 9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

 10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

 11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

 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:

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
-

14. **Average percent litter cover (%) and depth (in):**
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
-

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:**
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17. **Perennial plant reproductive capability:**
-