

Ecological site R023XY212OR

LOAMY 10-12 PZ

Accessed: 05/13/2025

General information

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



Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Associated sites

R023XY200OR	PONDED CLAY Ponded Clay, also associated with South Slopes 8-10" PZ, North Slopes 6-10" PZ, and Cobbly Claypan 8-10" PZ
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Similar sites

R023XY220OR	CLAYEY 10-12 PZ Clayey 10-12" PZ (fine-textured argillic)
R023XY308OR	NORTH SLOPES 10-12 PZ North Slopes 10-12" PZ (southerly aspect)
R023XY300OR	SOUTH SLOPES 10-12 PZ South Slopes 8-12" PZ (southerly aspect)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>

Herbaceous	(1) <i>Achnatherum thurberianum</i> (2) <i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>
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Physiographic features

This site typically occurs on rolling uplands and lake basin terraces. Slopes are generally 2-20 percent. Elevations range from 4000 to 6000 feet.

Table 2. Representative physiographic features

Landforms	(1) Lake terrace (2) Hill
Elevation	1,219–1,829 m
Slope	2–20%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

The annual precipitation ranges from 10 to 12 inches, most of which occurs in the form of snow during the months of December through February. Spring rains are common. The soil temperature regime is frigid. Extreme temperatures range from 100 degrees F to -30 degrees F. The frost-free period is from 50 to 90 days. The optimum period for plant growth is from mid-April through June.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	0 days
Precipitation total (average)	305 mm

Influencing water features

Soil features

The soils of this site are typically shallow to moderately deep over hard bedrock. When occurring on old lake terraces, these soils typically have a duripan or weakly cemented layer within 40 inches of the soil surface. The soils are medium textured throughout the profile and are well-drained. Typically the surface is covered with 15 to 60 percent rock fragments (primarily cobbles and stones). The soils typically have 35 to 60 percent rock fragments in the subsoil. The shallow soils over bedrock and the lake terraces, typically have less than 35 percent rock fragments in the subsoil. Permeability is moderate to slow. The available water holding capacity (AWC) is 2 to 5 inches for the profile.

Table 4. Representative soil features

Parent material	(1) Alluvium–basalt (2) Colluvium–basalt (3) Residuum–welded tuff
Surface texture	(1) Very cobbly loam (2) Fine sandy loam (3) Very stony clay loam
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	25–102 cm

Surface fragment cover <=3"	15–30%
Surface fragment cover >3"	0–25%
Available water capacity (0-101.6cm)	4.32–13.21 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	12–30%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

Range in Characteristics:

Variability in the plant composition on this site results from variation in soil surface texture or the amount of gravel. Gravelly soils favor an increase in the understory. Cheatgrass and annual forbs readily invade this site. As conditions deteriorate the amount of bareground will also increase.

Four states have been identified for this site: a reference state; a state with the presence of annuals; a state with a shrub/annual co-dominance; and a state with annual dominance.

Reference State: Plant community phase change is driven by infrequent fire. Wyoming and basin big sagebrush decline after fire while Thurber's needlegrass, Indian ricegrass and other grasses increase. There may be a temporary increase in rabbitbrush after fire. Time facilitates the reintroduction of sagebrush. The introduction of invasive annual grasses and forbs transitions into state 2.

State 2: Compositionally similar to the reference state with a trace of cheatgrass and weedy forbs. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Prescribed grazing and infrequent fire (> 50 year return interval) maintain state dynamics. The timing and/or intensity of grazing or prolonged drought favors Wyoming and basin big sagebrush, squirreltail and Sandberg's bluegrass. Prescribed grazing and/or release from drought may reverse the decline in needlegrass and Indian ricegrass production. Infrequent fire reduces the shrub community and promotes the bunchgrass component. Mismanaged grazing and/or prolonged drought leads to a biotic threshold and into state 3.

State 3: Wyoming and basin big sagebrush is decadent with little recruitment. The perennial grass component is significantly reduced in both density and productivity. Cheatgrass and/or annual forbs and/or Sandberg's bluegrass along with sagebrush control site resources and drive ecological dynamics. Bare ground is abundant. Spatial and temporal energy capture and nutrient cycling has been truncated. Infiltration may be reduced due to lack of ground cover. Risk of soil erosion by both wind and water is increased. Catastrophic wildfire will lead to an abiotic threshold and into state 4.

State 4: Cheatgrass and/or annual weed dominated plant community with limited to no shrub or perennial grass component. Soil erosion and redistribution along with changes in dynamic soil properties affect the hydrologic cycle and thus the nutrient cycle. Harsh environmental factors increase state resiliency to change.

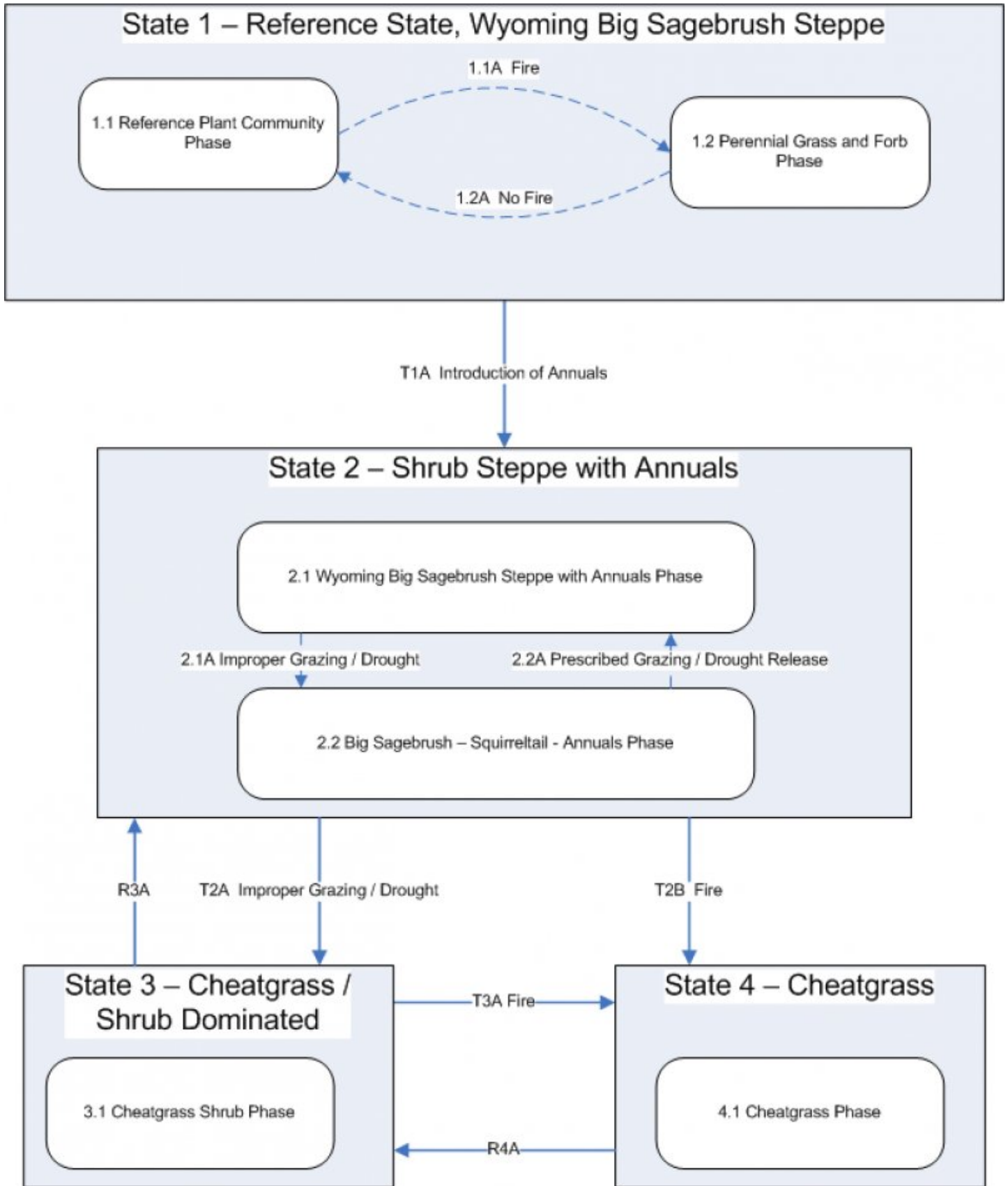
Response to Disturbance:

If heavy grazing causes site deterioration, big sagebrush and rabbitbrush become dominant. Sandberg bluegrass, bottlebrush squirreltail, and forbs will increase in the understory. Cheatgrass and annual forbs readily invade this site. As conditions deteriorate, the amount of bareground will also increase.

Overgrazing leads to an increase in sagebrush and a decline in understory plants like Thurber's needlegrass and Indian ricegrass. Squirreltail will increase temporarily with further degradation.

Invasion of annual weedy forbs and cheatgrass could occur with further grazing degradation, leading to a decline in squirreltail and an increase in bare ground. Wetter sites are more resistant to degradation and may end up having sagebrush and Sandberg's bluegrass dominate the site. A combination of overgrazing and prolonged drought leads to soil erosion, increased bare ground and a loss in plant production. This site with frigid soils is less susceptible to cheatgrass invasion than warmer sites. However annual mustards will invade. Wildfire in sites with cheatgrass present could transition to cheatgrass dominated communities.

State and transition model



State 1
Reference State

Community 1.1
Reference Plant Community

The potential native plant community is dominated by Thurber needlegrass and Wyoming big sagebrush. Indian ricegrass and Sandberg bluegrass are other important grasses associated with this site. Vegetative composition is

about 80 percent grasses, 5 percent forbs, and 15 percent shrubs. Approximate ground cover is 15 to 25 percent (basal and crown).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	538	717	897
Shrub/Vine	101	135	168
Forb	34	45	56
Total	673	897	1121

Community 1.2 Perennial Grass and Forb Phase

Pathway 1.1A Community 1.1 to 1.2

Infrequent fire reduces sagebrush production and density.

Conservation practices

Prescribed Burning

Pathway 1.2A Community 1.2 to 1.1

Time since fire and prescribed grazing allow sagebrush to increase.

Conservation practices

Prescribed Grazing

State 2 Shrub Steppe with Annuals

Compositionally similar to the reference state with a trace of cheatgrass and weedy forbs. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Prescribed grazing and infrequent fire (> 50 year return interval) maintain state dynamics.

Community 2.1 Wyoming Big Sagebrush Steppe with Annuals Phase

The plant community is dominated by Thurber needlegrass and Wyoming big sagebrush. Indian ricegrass and Sandberg bluegrass are other important grasses associated with this site. Annual grasses and forbs are present. Vegetative composition is about 80 percent grasses, 5 percent forbs, and 15 percent shrubs. Approximate ground cover is 15 to 25 percent (basal and crown).

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	359	538	717
Shrub/Vine	67	101	135
Forb	22	34	45
Total	448	673	897

Community 2.2

Big Sagebrush - Squirreltail - Annuals Phase

Wyoming and basin big sagebrush, squirreltail and Sandbergs bluegrass are dominant. Annual grasses and/or forbs are present.

Pathway 2.1A

Community 2.1 to 2.2

Improper grazing and/or drought favor Wyoming and basin big sagebrush, squirreltail and Sandberg's bluegrass.

Conservation practices

Prescribed Burning

Pathway 2.2A

Community 2.2 to 2.1

Prescribed grazing and/or release from drought may reverse the decline in needlegrass and Indian ricegrass production.

Conservation practices

Prescribed Grazing

State 3

Cheatgrass - Shrub Dominated

Wyoming and basin big sagebrush is decadent with little recruitment. The perennial grass component is significantly reduced in both density and productivity. Cheatgrass and/or annual forbs and/or Sandberg's bluegrass along with sagebrush control site resources and drive ecological dynamics. Bare ground is abundant. Spatial and temporal energy capture and nutrient cycling has been truncated. Infiltration may be reduced due to lack of ground cover. Risk of soil erosion by both wind and water is increased.

Community 3.1

Cheatgrass Shrub Phase

Wyoming and basin big sagebrush is decadent with little recruitment. The perennial grass component is significantly reduced in both density and productivity. Cheatgrass and/or annual forbs and/or Sandberg's bluegrass along with sagebrush control site resources. Bare ground is abundant.

State 4

Cheatgrass

Cheatgrass and/or annual weed dominated plant community with limited to no shrub or perennial grass component. Soil erosion and redistribution along with changes in dynamic soil properties affect the hydrologic cycle and thus the nutrient cycle. Harsh environmental factors increase state resiliency to change.

Community 4.1

Cheatgrass Phase

Cheatgrass and/or annual weed dominated plant community with limited to no shrub or perennial grass component.

Transition T2A

State 2 to 3

Abusive grazing and/or prolonged drought leads to a biotic threshold characterized by decadent Wyoming and basin big sagebrush with an understory dominated by cheatgrass and/or weedy forbs and/or Sandberg's bluegrass. Trace amounts of the original community remain. Rabbitbrush may increase.

Transition T2B

State 2 to 4

Catastrophic wildfire leading to an abiotic threshold.

Restoration pathway R3A

State 3 to 2

Rehabilitation involves mechanical or herbicide control of sagebrush. Herbicide treatment of weedy species may be required. If Sandberg's bluegrass dominates, a mechanical or herbicide treatment may be necessary to facilitate desired seedling establishment. Seeding may be necessary.

Conservation practices

Brush Management
Range Planting
Integrated Pest Management (IPM)

Transition T3A

State 3 to 4

Catastrophic wildfire leading to an abiotic threshold.

Restoration pathway R4A

State 4 to 3

Drill seeding with drought tolerant species. Herbicide may be an option. If seeding is successful follow with prescribed grazing to reduce cheatgrass and decrease fuel loading. Low probability of seeding success.

Conservation practices

Prescribed Grazing
Range Planting
Integrated Pest Management (IPM)

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Perennial, deep-rooted, bunchgrass			493–717	
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	314–448	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	179–269	–
2	Perennial, deep-rooted, bunchgrass			90–179	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	45–90	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	45–90	–
4	Perennial, shallow-rooted, bunchgrass			45–135	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	45–135	–

5	Other perennial grasses, all			18–90	
	sedge	CAREX	<i>Carex</i>	0–18	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0–18	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–18	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	0–18	–
	foxtail wheatgrass	PSSA2	× <i>Pseudelymus saxicola</i>	0–18	–
Forb					
7	Perennial, all, dominant			36–72	
	milkvetch	ASTRA	<i>Astragalus</i>	9–18	–
	balsamroot	BALSA	<i>Balsamorhiza</i>	9–18	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	9–18	–
	lupine	LUPIN	<i>Lupinus</i>	9–18	–
9	Other perennial forbs, all			9–36	
	agoseris	AGOSE	<i>Agoseris</i>	0–9	–
	mariposa lily	CALOC	<i>Calochortus</i>	0–9	–
	Indian paintbrush	CAST12	<i>Castilleja</i>	0–9	–
	Douglas' dustymaiden	CHDO	<i>Chaenactis douglasii</i>	0–9	–
	larkspur	DELPH	<i>Delphinium</i>	0–9	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–9	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–9	–
	beardtongue	PENST	<i>Penstemon</i>	0–9	–
	phlox	PHLOX	<i>Phlox</i>	0–9	–
	ragwort	SENEC	<i>Senecio</i>	0–9	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–9	–
Shrub/Vine					
11	Perennial, evergreen, dominant			45–90	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	45–90	–
12	Perennial, evergreen, sub-dominant			36–90	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	18–45	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	18–45	–
15	Other perennial shrubs, all			18–45	
	rabbitbrush	CHRY9	<i>Chrysothamnus</i>	0–18	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	0–18	–
	horsebrush	TETRA3	<i>Tetradymia</i>	0–18	–

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Perennial, deep-rooted, bunchgrass			247–415	
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	112–213	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	135–202	–
2	Perennial, deep-rooted, bunchgrass			67–135	

	Indian ricegrass	ACHY	<i>Acnatherum nymenoides</i>	34–67	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	34–67	–
4	Perennial, shallow-rooted, sub-dominant			34–101	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	34–101	–
5	Other perennial grasses, all			13–67	
	sedge	CAREX	<i>Carex</i>	0–13	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0–13	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–13	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	0–13	–
	foxtail wheatgrass	PSSA2	× <i>Pseudelymus saxicola</i>	0–13	–
6	Annual Grasses			22–56	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	22–56	–
Forb					
7	Perennial, all, dominant			20–40	
	milkvetch	ASTRA	<i>Astragalus</i>	6–10	–
	balsamroot	BALSA	<i>Balsamorhiza</i>	4–10	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	6–10	–
	lupine	LUPIN	<i>Lupinus</i>	4–10	–
9	Other perennial forbs, all			7–54	
	agoseris	AGOSE	<i>Agoseris</i>	0–7	–
	mariposa lily	CALOC	<i>Calochortus</i>	0–7	–
	Indian paintbrush	CASTI2	<i>Castilleja</i>	0–7	–
	Douglas' dustymaiden	CHDO	<i>Chaenactis douglasii</i>	0–7	–
	larkspur	DELPH	<i>Delphinium</i>	0–7	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–7	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–7	–
	beardtongue	PENST	<i>Penstemon</i>	0–7	–
	phlox	PHLOX	<i>Phlox</i>	0–7	–
	ragwort	SENEC	<i>Senecio</i>	0–7	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–7	–
10	Annual Forbs			7–13	
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	7–13	–
Shrub/Vine					
11	Perennial, evergreen, dominant			34–67	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	34–67	–
12	Perennial, evergreen, sub-dominant			27–67	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	13–34	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	13–34	–
15	Other perennial shrubs, all			13–34	
	rabbitbrush	CHRY9	<i>Chrysothamnus</i>	0–11	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	0–11	–
	horsebrush	TETRA3	<i>Tetradymia</i>	0–11	–
	rabbitbrush	CHRY9	<i>Chrysothamnus</i>	0–11	–

	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	0-11	-
	horsebrush	TETRA3	<i>Tetradymia</i>	0-11	-

Animal community

Livestock Grazing:

This grazing site is suited to livestock use in all seasons under a planned grazing system.

Native Wildlife Associated with the Potential Climax Community:

Mule deer
Pronghorn antelope
Sage grouse

This site offers forage and limited cover to pronghorn antelope.

Hydrological functions

The soils of this site have medium infiltration rates and slow to medium runoff potential. The hydrologic soil groups are B and C.

Wood products

This site is susceptible to invasion by western juniper. In this event, a limited supply of fence posts and firewood are available.

Other information

Cobbles and stones on the surface and in the profile make excavation for pipelines difficult.

Contributors

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RC/HB

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)	Jeff Repp and Bruce Frannsen
Contact for lead author	State Rangeland Management Specialist for NRCS - OR
Date	08/15/2012
Approved by	Bob Gillaspy
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** none to some, slight to moderate sheet & rill erosion hazard

2. **Presence of water flow patterns:** None to some

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5-10%

5. **Number of gullies and erosion associated with gullies:** None

6. **Extent of wind scoured, blowouts and/or depositional areas:** None, slight wind erosion hazard

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Slightly to moderately resistant to erosion: aggregate stability = 2-4

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Shallow to moderate deep, well drained fine sandy loams, silt loams, to very gravelly loams with 15-30% rock fragments on the surface: Low OM (1-2%)

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Slight ground cover (15-25%) and gentle slopes (0-30%) moderately limit rainfall impact and overland flow

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

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: Thurber needlegrass (gravelly surface) > Bluebunch wheatgrass > Indian ricegrass (sandy surfaces) > other grasses > shrubs > forbs

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Normal decadence and mortality expected
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14. **Average percent litter cover (%) and depth (in):**
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Favorable: 800, Normal: 600, Unfavorable: 400 lbs/acre/year at high RSI (HCPC)
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Western Juniper readily invades the site. Cheatgrass and Medusahead invade sites that have lost deep rooted perennial grass functional groups.
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17. **Perennial plant reproductive capability:** All species should be capable of reproducing annually
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