USDA Natural Resources Conservation Service

Ecological site R043BY216WY
Igneous Foothills and Mountains West

Accessed: 05/10/2025

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.

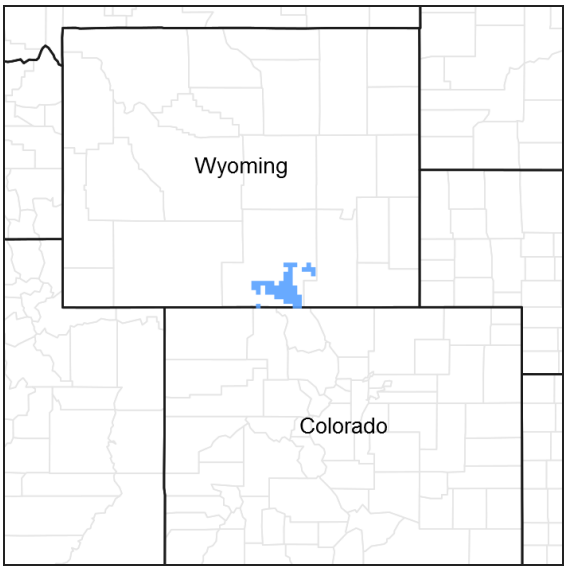


Figure 1. Mapped extent

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

R043BY262WY	**Shallow Loamy Foothills and Mountains West** Shallow Loamy

Similar sites

R034AY216WY	**Igneous Foothills and Basins West (Ig)** Igneous (Ig) 10-14W has lower production.
R043BY260WY	**Shallow Igneous Foothills and Mountains West** Shallow Igneous (Swl) 15-19W has higher production and more shrubs.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs in an upland position on steep slopes. It is commonly found on ridge tops.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	5,600–8,300 ft
Slope	5–70%
Ponding depth	0 in

Climatic features

Annual precipitation ranges from 15-19 inches per year. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This is predominantly due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

Prevailing winds are from the southwest, and strong winds are less frequent than over other areas of Wyoming. Occasional storms, however, can bring brief periods of high winds with gusts exceeding 50 mph.

Growth of native cool season plants begins about May 15 and continues to about August 15.

The following information is from the “Jackson” climate station:

Minimum Maximum 5 yrs. out of 10 between
Frost-free period (days): 12 60 July 9 – August 12
Freeze-free period (days): 42 100 June 20 – August 26

Annual Precipitation (inches): <11.98 >19.69 (2 years in 10)

Mean annual precipitation: 17.00 inches

Mean annual air temperature: 38.9?F (23.3?F Avg. Min. to 54.5?F Avg. Max.)

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=wy website. Other climate stations representative of this precipitation zone include ”Afton” in Lincoln County; and “Darwin Ranch” in Teton County.

Table 3. Representative climatic features

Frost-free period (average)	60 days
Freeze-free period (average)	100 days
Precipitation total (average)	19 in

Influencing water features

Soil features

The soils of this site are stony or cobbly and usually very shallow (less than 10”to igneous or volcanic bedrock).

Some pockets of deep soil and areas of exposed bedrock may be included. This site is usually found on mountain sides and ridge tops.

Table 4. Representative soil features

Surface texture	(1) Cobbly sandy loam (2) Stony loamy sand (3) Bouldery loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	4–10 in
Surface fragment cover <=3"	10–25%
Surface fragment cover >3"	20–45%
Available water capacity (0-40in)	0.25–1 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–7.2
Subsurface fragment volume <=3" (Depth not specified)	15–30%
Subsurface fragment volume >3" (Depth not specified)	30–45%

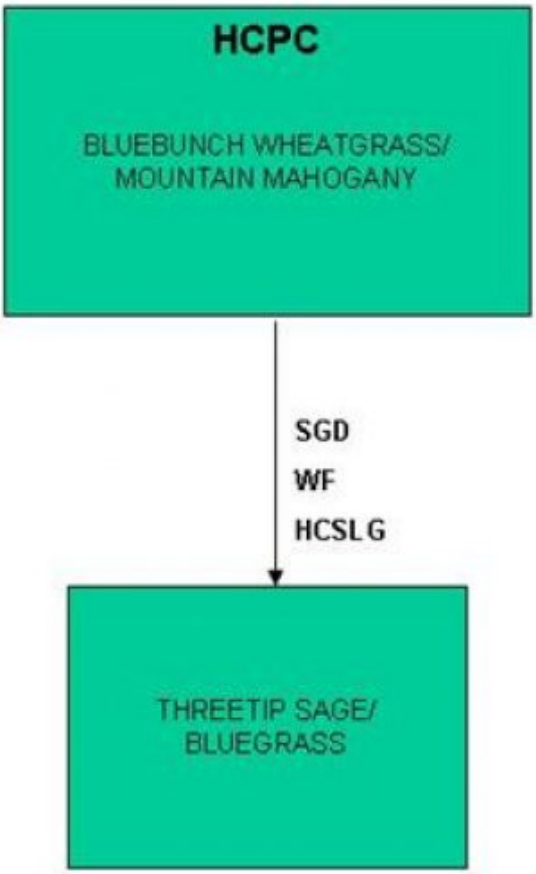
Ecological dynamics

As this site deteriorates, species such as rhizomatous wheatgrass, black and threetip sagebrush, green rabbitbrush, and bluegrasses will increase. Bluebunch wheatgrass, spike fescue, and mountain mahogany will decrease in frequency and production. This site has relatively low productivity potential, and is not well suited to grazing improvement practices unless treated as part of a larger unit containing more productive areas.

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

The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

State and transition model



BMA – Brush Management (all methods)
BMC – Brush Management (chemical)
BMF – Brush Management (fire)
BMM – Brush Management (mechanical)
CSP – Chemical Seedbed Preparation
CSLG – Continuous Season-long Grazing
DR – Drainage
CSG – Continuous Spring Grazing
HB – Heavy Browse
HCSLG – Heavy Continuous Season-long Grazing
HI – Heavy Inundation
LPG – Long-term Prescribed Grazing
MT – Mechanical Treatment (chiseling, ripping, pitting)
NF – No Fire
NS – Natural Succession
NWC – Noxious Weed Control
NWI – Noxious Weed Invasion
NU – Nonuse
P&C – Plow & Crop (including hay)
PG – Prescribed Grazing
RPT – Re-plant Trees
RS – Re-seed
SGD – Severe Ground Disturbance
SHC – Severe Hoof Compaction
WD – Wildlife Damage (Beaver)
WF - Wildfire

State 1
Bluebunch Wheatgrass/Mountain Mahogany Plant Community (HCPC)

Community 1.1
Bluebunch Wheatgrass/Mountain Mahogany Plant Community (HCPC)

The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is about 65% grasses or grass-like plants, 10% forbs, and 25% woody plants. The major grasses include bluebunch wheatgrass and rhizomatous wheatgrass. Other grasses and grass-like plants include Sandberg, Canby, and mutton bluegrass, spike fescue, bottlebrush squirreltail, Indian ricegrass, mountain brome, needleleaf sedge, Letterman needlegrass, California and timber oatgrass, Idaho fescue, oniongrass, spike trisetum, and prairie junegrass. Major woody plants are black and threetip sagebrush and mountain mahogany. Other woody plants include mountain big sagebrush, snowberry, bitterbrush, and green rabbitbrush. A typical plant composition for this state consists of bluebunch wheatgrass 10-25%, rhizomatous wheatgrass 5-10%, other grasses and grass-like plants 15-30%, perennial forbs 5-10%, threetip sagebrush 5-10%, mountain mahogany 5-10%, black sagebrush 1-10%, and 5-10% other woody plants. Ground cover, by ocular estimate, varies from 30-35%. The total annual production (air-dry weight) of this state is about 550 pounds per acre, but it can range from about 400 lbs./acre in unfavorable years to about 700 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0201 Growth curve name: 15-19W, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 10 35 30 20 5 0 0 0 (Monthly percentages of total annual growth) The state is stable and well adapted to the Central Rocky Mountains 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 Transitions or pathways leading to other plant communities are as follows: • Wildfire, Severe Ground Disturbance, and/or Heavy Continuous Season-Long Grazing will convert this plant community to the Threetip Sage/Bluegrass State.

Figure 3. Plant community growth curve (percent production by month). WY0201, 15-19W Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				10	35	30	20	5			

State 2
Threetip Sage/Bluegrass Plant Community

Community 2.1
Threetip Sage/Bluegrass Plant Community

This plant community is a result of severe disturbance such as wildfire, heavy grazing, or ground disturbing activities. Threetip sage, low growing bluegrasses, and annual forbs are significant components of this plant community. Cheatgrass may invade on south and west facing slopes. The total annual production (air-dry weight) of this state is about 200 pounds per acre, but it can range from about 100 lbs./acre in unfavorable years to about 400 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0201 Growth curve name: 15-19W, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 10 35 30 20 5 0 0 0 (Monthly percentages of total annual growth) The state is unstable and vulnerable to excessive erosion. However, rock fragment typically prevents serious erosion from occurring. The biotic integrity of this plant community is at risk depending on how far a shift has occurred in plant composition toward cheatgrass and annual forbs. The watershed is usually at risk or nonfunctioning due to an increase in bare ground. Transitional pathways leading to other plant communities are as follows: It is not often practicable or economically feasible to convert this plant community at the present time.

Figure 4. Plant community growth curve (percent production by month). WY0201, 15-19W Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				10	35	30	20	5			

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				110–220	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	110–220	–
2				28–55	
	western wheatgrass	PASM	*Pascopyrum smithii*	28–55	–
3				83–165	
	Grass, perennial	2GP	*Grass, perennial*	0–28	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	0–28	–
	mountain brome	BRMA4	*Bromus marginatus*	0–28	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–28	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–28	–
	California oatgrass	DACA3	*Danthonia californica*	0–28	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–28	–
	squirreltail	ELEL5	*Elymus elymoides*	0–28	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–28	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–28	–
	spike fescue	LEKI2	*Leucopoa kingii*	0–28	–
	oniongrass	MEBU	*Melica bulbosa*	0–28	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0–28	–
	muttongrass	POFE	*Poa fendleriana*	0–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–28	–
	spike trisetum	TRSP2	*Trisetum spicatum*	0–28	–
Forb					
4				28–83	
	Forb, perennial	2FP	*Forb, perennial*	0–28	–
	common yarrow	ACMI2	*Achillea millefolium*	0–28	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–28	–
	milkvetch	ASTRA	*Astragalus*	0–28	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	0–28	–
	hawksbeard	CREPI	*Crepis*	0–28	–
	fleabane	ERIGE2	*Erigeron*	0–28	–
	buckwheat	ERIOG	*Eriogonum*	0–28	–
	stoneseed	LITHO3	*Lithospermum*	0–28	–
	creeping barberry	MARE11	*Mahonia repens*	0–28	–
	bluebells	MERTE	*Mertensia*	0–28	–
	locoweed	OXYTR	*Oxytropis*	0–28	–
	phlox	PHLOX	*Phlox*	0–28	–
	stonecrop	SEDUM	*Sedum*	0–28	–
	aster	SYMPH4	*Symphyotrichum*	0–28	–
	clover	TRIFO	*Trifolium*	0–28	–

	American vetch	VIAM	*Vicia americana*	0–28	–
Shrub/Vine					
5				28–83	
	threetip sagebrush	ARTR4	*Artemisia tripartita*	28–83	–
6				28–55	
	mountain mahogany	CERCO	*Cercocarpus*	28–55	–
7				6–55	
	black sagebrush	ARNO4	*Artemisia nova*	6–55	–
8				28–55	
	big sagebrush	ARTR2	*Artemisia tridentata*	0–28	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–28	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–28	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–28	–

Animal community

Animal Community – Wildlife Interpretations
Bluebunch Wheatgrass/Mountain Mahogany Plant Community (HCPC): This plant community contributes important winter forage for mule deer and elk. It is not typically inhabited by burrowing animals due to the high volume of coarse fragments in the profile. It is mostly used by wildlife in transit to other habitats.

Threetip Sage/Bluegrass Plant Community: This plant community exhibits a low level of plant species diversity. In most cases, it is not a desirable plant community to select as a wildlife habitat management objective.

Animal Community – Grazing Interpretations
The following table lists suggested stocking rates for cattle under continuous season-long grazing under 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*
(lb./ac) (AUM/ac)
Bluebunch Wheatgrass/Mountain Mahogany (HCPC) 400-700 .15
Threetip Sage/Bluegrass 100-400 .06

* - Continuous, season-long grazing by cattle under average growing conditions.

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 needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is highly variable and is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from slow to very rapid. Runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. Areas where ground cover is less than 50% 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 may be present, but should be small. Water flow patterns should be barely distinguishable. Pedestals are only slightly present in association with bunchgrasses such as bluebunch wheatgrass. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides limited hunting opportunities for upland game species.

Wood products

No appreciable wood products are present on the site.

Inventory data references

Inventory Data References (narrative)
Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Those involved in developing this site include: Bill Christensen, Range Management Specialist, NRCS; Karen Clause, Range Management Specialist, NRCS; and Everet Bainter, Range Management Specialist, NRCS. Other sources used as references include: USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Inventory Data References
Data Source Number of Records Sample Period State County
SCS-RANGE-417 58 1966-1986 WY Lincoln & others

Contributors

K. Clause

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)	K. Clause, E. Bainter
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Date	03/16/2007
Approved by	E. Bainter
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Some rills to be expected on this site.

2. **Presence of water flow patterns:** Barely observable.

3. **Number and height of erosional pedestals or terracettes:** Slight pedestalling evident.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground can range from 20-50%.

5. **Number of gullies and erosion associated with gullies:** Active gullies, where present, should be rare.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter expected to move in moderate amounts. Large woody debris will show only slight movement down slope.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Stability Index ratings range from 1 (interspaces) to 6 (under plant canopy), but average values should be 3.0 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Currently no soil series are correlated to this ecological site. Soil Organic Matter of less than 3% is expected.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 50-70% grasses, 10% forbs, and 20-40% shrubs. Sparse plant canopy (40-60%) and litter plus slow to moderate infiltration rates result in slight to moderate runoff. Basal cover is typically less than 10% and marginally affects runoff on this site. Surface rock outcrop of 10-30% provide stability to the site, but reduce infiltration. Runoff can be rapid on this site with a moderate to high erosion hazard associated with steep slopes.

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:

    Sub-dominant:

Other:

Additional: perennial shrubs>mid-size, cool season bunchgrasses>>perennial forbs=cool season rhizomatous grasses>short cool season bunchgrasses

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal decadence, typically associated with shrub component.

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14. **Average percent litter cover (%) and depth (in):** Litter ranges from 10-30% of total canopy measurement with total litter (including beneath the plant canopy) from 30-50% expected. Herbaceous litter depth typically ranges from 3-10mm. Woody litter can be up to several inches (>6 cm).

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** English: 400-700 lb/ac (550 lb/ac average); Metric 448-784 kg/ha (616 kg/ha average).

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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:** Bare ground greater than 75% is the most common indicator of a threshold being crossed. Rabbitbrush, Sandberg bluegrass, buckwheat, and phlox are common increasers. Annual weeds such as cheatgrass and mustards are common invasive species in disturbed sites.

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17. **Perennial plant reproductive capability:** All species are capable of reproducing, except in extreme drought years.
