USDA Natural Resources
Conservation Service

Ecological site EX043B23C178
Wetland (WL) Absaroka Subalpine Zone

Last updated: 10/05/2019
Accessed: 05/18/2024

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): 043B–Central Rocky Mountains

Major Land Resource Unit (MLRA) 43B: Central Rocky Mountains

43B – Central Rocky Mountains – The Central Rocky Mountains extends from northern Montana to southern extent of Wyoming and from Idaho to central Wyoming. The southern extent of 43B is comprised of a combination of metamorphic, igneous, and sedimentary mountains and foothills. Climatic changes across this extent are broad and create several unique breaks in the landscape.

Further information regarding MLRAs, refer to: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.
Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook.

LRU notes

Land Resource Unit (LRU) 43B23C: Absaroka Subalpine Zone

Based on the shifts in geology, precipitation patterns and other climatic factors, as well as elevation and vegetation, the Absaroka Range was divided into LRU 23. Further division of this LRU is necessary due to the gradient moving from the foothills to the summit, as well as aspect shifts (north/east face versus south/west face). Subset C is the high elevation zone noted for dense timber interspersed with open parks and longer persisting snowpack (within timberline). Precipitation can range from 18 to 20 plus inches and is more noted for the duration of snow cover and shorter growing season. To verify or identify Subset C (the referenced subset for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key.

This LRU/Subset occurs on the eastern divide of the Absaroka Range. This LRU starts north of Clark, WY and runs to the Thermopolis, WY area. Once the Absaroka Range merges with the Owl Creek and Wind River Ranges, the climatic patterns and elevational changes shifts the plant community and creates a break in the LRU/Subset.

The extent of soils currently correlated to this ecological site does not fit within the digitized boundary. Many of the noted soils are provisional and will be reviewed and corrected in mapping update projects. Other map units are correlated as small inclusions within other MLRA's/LRU's based on elevation, landform, and biological references.

Moisture Regime: Typic Ustic
Temperature Regime: Cryic
Dominant Cover: Rangeland – Sagebrush Steppe (major species is Mountain Big Sagebrush)
Representative Value (RV) Effective Precipitation: 20+ inches (508 mm)
RV Frost-Free Days: 31-65 days

Classification relationships

Relationship to Other Established Classification Systems:

National Vegetation Classification System (NVC):
2 Shrub & Herb Vegetation Class
2.B Temperate & Boreal Grassland & Shrubland Subclass
2.B.2 Temperate Grassland & Shrubland Formation
2.B.2.Na Western North American Grassland & Shrubland Division
M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macro-group
G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group

Ecoregions (EPA):
Level I: 6 North Western Forested Mountains
Level II: 6.2 Western Cordillera
Level III: 6.2.10 Middle Rockies
Level IV: 6.2.17ao – Absaroka Volcanic Subalpine Zone
6.2.17i – Absaroka – Gallatin Volcanic Mountains

Ecological site concept

• Site is controlled by a water table that is above the soil surface for part but not all of the growing season.
• Slope is < 6%.
• Soils are:
o Textures range from Silt Loam to clay in top 4” (10 cm) of mineral soil surface
o Clay content is <40% within the top 4” (10 cm) of mineral soil surface
o All subsurface horizons in the particle size control section have a weighted average of <60% clay. (The particle size control section is the segment of the profile from either the start of an argillic horizon for 50 cm’s or from 25-100 cm’s).
o Moderately deep to very deep (20-80+ in. (50-200+ cm) that are poorly to very poorly drained.
o Surface layer of soil contains a high organic matter content.
o None to Slightly effervescent throughout top 20” (50 cm) of mineral soil surface
o Non-saline, sodic, or saline-sodic

Associated sites

R043BY174WY	**Subirrigated High Mountains** Subirrigated

Similar sites

R043BY174WY	**Subirrigated High Mountains** Subirrigated (Sb) 20+M has a lower water table and more shrubs.
R043BY278WY	**Wetland Foothills and Mountains West** Wetland (WL) 15-19W has lower production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Kalmia microphylla* (2) *Salix*
Herbaceous	(1) *Carex nebrascensis* (2) *Deschampsia cespitosa*

Legacy ID

R043BX778WY

Physiographic features

This site occurs on level or gently-sloping land near springs, seeps or sloughs.

Table 2. Representative physiographic features

Landforms	(1) Mountain range > Drainageway (2) Mountain range > Oxbow (3) Mountain range > Stream terrace
Runoff class	Negligible to high
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	1,981–3,658 m
Slope	0–10%
Ponding depth	0–30 cm
Water table depth	0–46 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation range from 18 to 35 inches (457 – 889 mm). The normal precipitation pattern is evenly distributed through the year and averages over 20 inches. Annual snowfall averages 150 to 200 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

Because of the varied topography, the wind will vary considerably for different parts of the area. 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.

Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. High winds are generally blocked by high mountains but occur in conjunction with thunderstorms, which are common in late summer. Growth of native cool-season plants begins about June 1, but can be as late as July 15, and continues until the beginning of September.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Climate station representative of this precipitation zone include: “Cooke City 2W” and “Tower Falls”. The following graphs and charts are a collective sample representing the averaged normals and 30-year annual rainfall data for the selected weather stations from 1981 to 2010.

Table 3. Representative climatic features

Frost-free period (characteristic range)	1-2 days
Freeze-free period (characteristic range)	23-47 days
Precipitation total (characteristic range)	457-584 mm
Frost-free period (actual range)	1-2 days

Freeze-free period (actual range)	17-53 days
Precipitation total (actual range)	432-610 mm
Frost-free period (average)	2 days
Freeze-free period (average)	35 days
Precipitation total (average)	533 mm

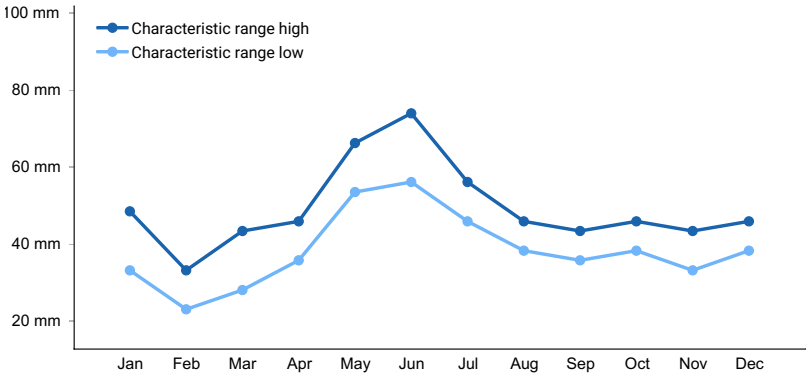


Figure 1. Monthly precipitation range

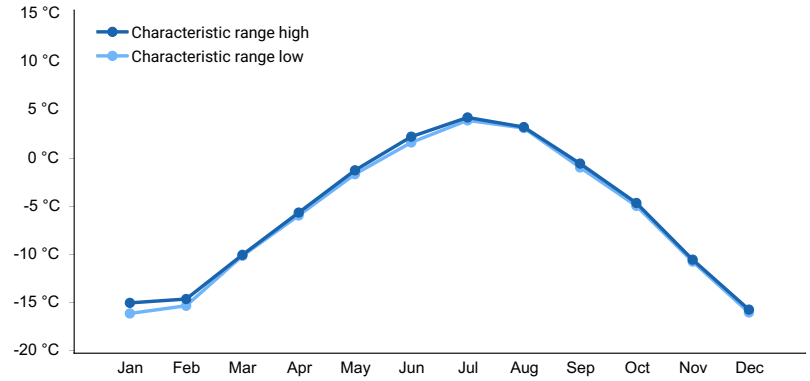


Figure 2. Monthly minimum temperature range

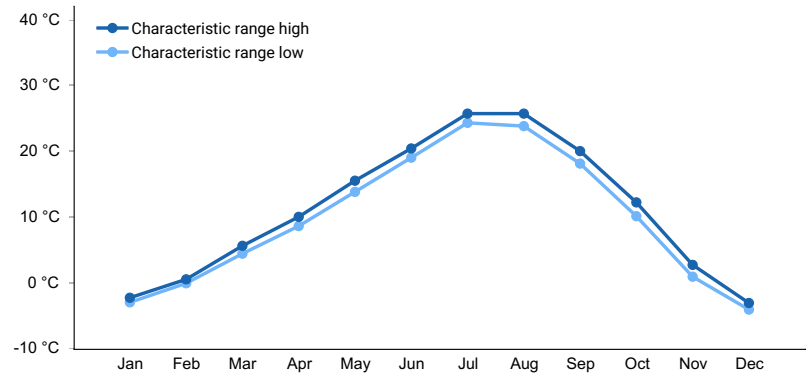


Figure 3. Monthly maximum temperature range

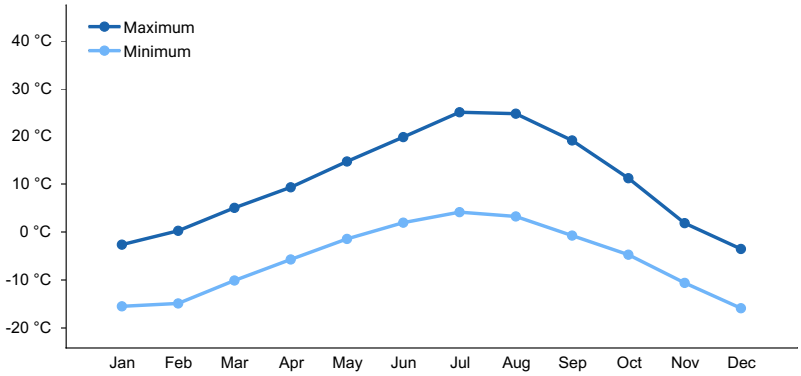


Figure 4. Monthly average minimum and maximum temperature

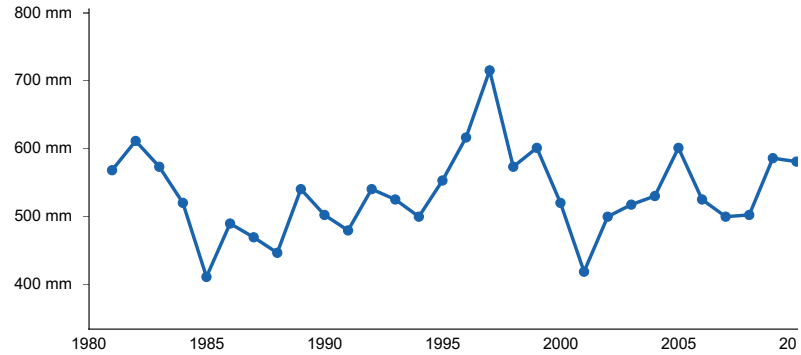


Figure 5. Annual precipitation pattern

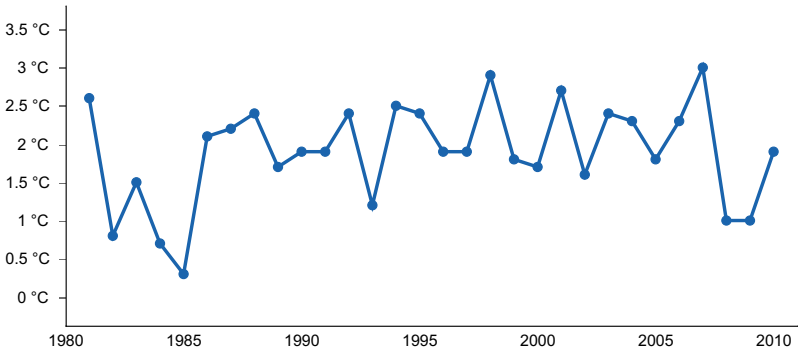


Figure 6. Annual average temperature pattern

Climate stations used

- (1) COOKE CITY 2 W [USC00241995], Gardiner, MT
- (2) TOWER FALLS [USC00489025], Yellowstone National Park, WY

Influencing water features

The characteristics of these soils have influence from ground water (water table above 12 inches (30 cm)) and water will be above the soil surface for part but not all of the growing season. These soils are moderately deep to deep and poorly to very poorly drained.

Wetland description

System: Palustrine
Subsystem: None
Class: Emergent Wetland
Sub-class: Persistent

Stream type: C (Rosgen)

Soil features

The soils of this site are deep and poorly drained with a water table above the surface for part, but not all, of the growing season. They are nearly level to slightly depressional areas with poor surface drainage. Surface textures range from moderately coarse to fine, but commonly are medium and moderately fine with dark color and high organic content. Thin peat layers are common.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Gravelly loam (2) Clay loam (3) Sandy clay loam (4) Silty clay loam (5) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Slow to moderate
Soil depth	51–152 cm
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	5.72–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0–15%

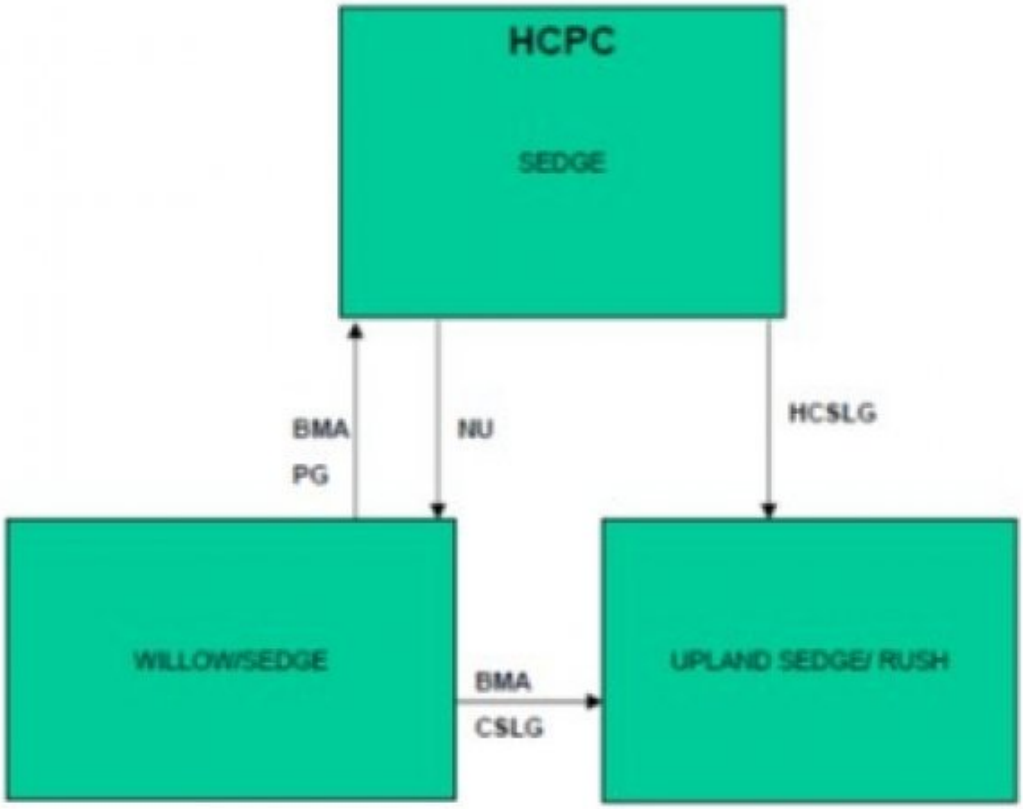
Ecological dynamics

As this site deteriorates, species such as upland sedges and rushes increase. Grasses and grass-like plants such as Nebraska sedge, northern reedgrass, and tufted hairgrass will decrease in frequency and production. Willows and water birch, when present, will lose density and age diversity with heavy browsing.

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

Sedge Plant Community (HCPC)

Community 1.1
Sedge Plant Community (HCPC)

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is estimated at 70% grasses or grass-like plants, 15% forbs, and 15% woody plants. The major grasses and grass-like plants include Nebraska sedge, tufted hairgrass, and northern reedgrass. Other grasses and grass-like plants that may occur on this site include alpine timothy, tall and American mannagrass, Baltic rush, bearded wheatgrass, big bluegrass, blue wildrye, inland sedge, nodding brome, bluejoint reedgrass, and other wetland sedge species. Willows are the major woody species. Other woody species may include woods rose, bog kalmia (alpine laurel), currant and water birch. A typical plant composition for this state consists of Nebraska sedge 10-25%, tufted hairgrass 15-25%, northern reedgrass 10-25%, other grasses and grass-like plants 10-20%, perennial forbs 5-15%, and up to 15% woody plants. Ground cover, by ocular estimate, varies from 85-100%. The total annual production (air-dry weight) of this state is about 6500 pounds per acre, but it can range from about 5500 lbs./acre in unfavorable years to about 7500 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0103 Growth curve name: 20+M, FREE WATER SITES Growth curve description: WL, SB, SS FREE WATER SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) The state is well adapted to the Central Rocky Mountains climatic conditions. It is a critical state providing water and habitat for the surrounding area. The diversity in plant species provides a variety of habitats for wildlife. It is resistant to drought due to a dependable water supply. 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: • Nonuse will convert this plant community to the Willow/Sedge State. • Heavy Continuous Season-long Grazing will convert this plant community to the Upland Sedge/Rush State.

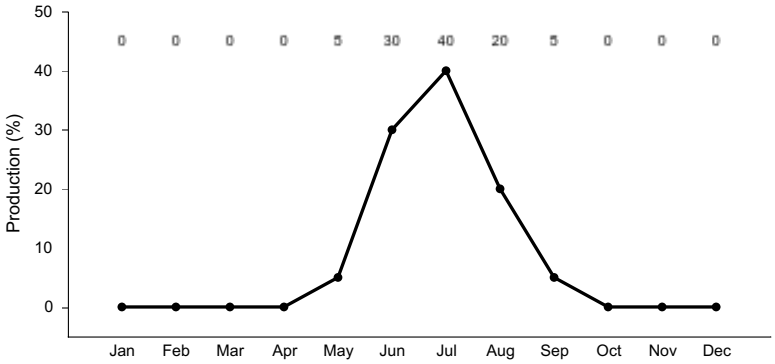


Figure 8. Plant community growth curve (percent production by month). WY0103, 20+ free water sites.

State 2
Willow/Sedge Plant Community

Community 2.1
Willow/Sedge Plant Community

This plant community results from nonuse. Willows increase and often will inhibit herbaceous forage availability by creating a physical barrier to grazing animals. Nebraska sedge, water sedge, beaked sedge, and dogwood are often present in the protected understory. The total annual production (air-dry weight) of this state is about 4500 pounds per acre, but it can range from about 3000 lbs./acre in unfavorable years to about 6000 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0103 Growth curve name: 20+M, FREE WATER SITES Growth curve description: WL, SB, SS FREE WATER SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) The state is very stable and protected from excessive erosion. The biotic integrity of this plant community is intact. The watershed is functioning. Transitional pathways leading to other plant communities are as follows: • Brush Management followed by deferment for 1 to 2 years as part of a Prescribed Grazing plan will result in a plant community very similar to the Historic Climax Plant Community (Sedge

State). Care should be taken when planning brush management to consider wildlife habitat and critical winter ranges. • Brush Management followed by Continuous Season-long Grazing will convert this plant community to the Upland Sedge/Rush State.

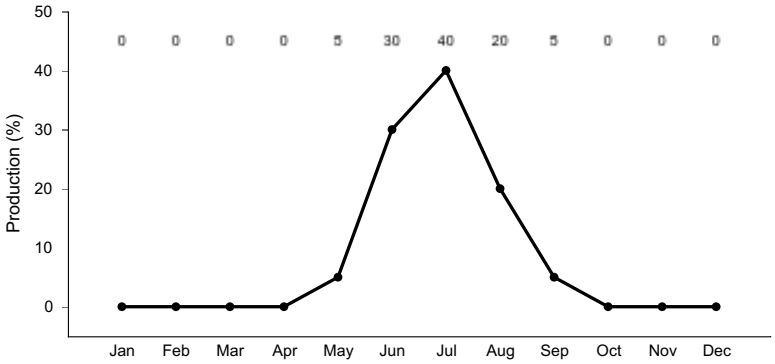


Figure 9. Plant community growth curve (percent production by month). WY0103, 20+ free water sites.

State 3
Upland Sedge/Rush Plant Community

Community 3.1
Upland Sedge/Rush Plant Community

This plant community evolved under heavy continuous season-long grazing by domestic livestock. Species such as Baltic rush, inland sedge, horsetail, elephanthead, and Rocky Mountain iris often dominate this state. Willows are greatly diminished and lack a diversity of age classes or are completely missing from the plant community. The total annual production (air-dry weight) of this state is about 2500 pounds per acre, but it can range from about 1500 lbs./acre in unfavorable years to about 3500 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0103 Growth curve name: 20+M, FREE WATER SITES Growth curve description: WL, SB, SS FREE WATER SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) The state is vulnerable to downcutting and excessive erosion. The biotic integrity of this plant community is at risk due to the replacement of deep rooted wetland species with shallow rooted grasses and forbs. The watershed is at risk from downcutting activity. Transitional pathways leading to other plant communities are as follows: It is not often practicable or economically feasible to convert this plant community.

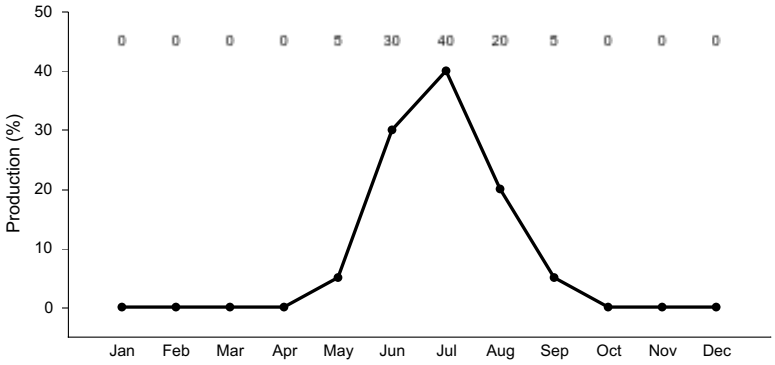


Figure 10. Plant community growth curve (percent production by month). WY0103, 20+ free water sites.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				729–1821	
	Nebraska sedge	CANE2	*Carex nebrascensis*	729–1821	

	Nebraska sedge	CANE2	*Carex nebrascensis*	729–1821	–
2				729–1821	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	729–1821	–
3				1093–1821	
4				729–1457	
	Grass, perennial	2GP	*Grass, perennial*	0–364	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	0–364	–
	mountain brome	BRMA4	*Bromus marginatus*	0–364	–
	Porter brome	BRPO2	*Bromus porteri*	0–364	–
	water sedge	CAAQA	*Carex aquatilis var. aquatilis*	0–364	–
	bluejoint	CACA4	*Calamagrostis canadensis*	0–364	–
	inland sedge	CAIN11	*Carex interior*	0–364	–
	dunhead sedge	CAPH2	*Carex phaeocephala*	0–364	–
	beaked sedge	CARO6	*Carex rostrata*	0–364	–
	spikerush	ELEOC	*Eleocharis*	0–364	–
	blue wildrye	ELGL	*Elymus glaucus*	0–364	–
	slender wheatgrass	ELTRS	*Elymus trachycaulus ssp. subsecundus*	0–364	–
	mannagrass	GLYCE	*Glyceria*	0–364	–
	alpine timothy	PHAL2	*Phleum alpinum*	0–364	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–364	–
	bulrush	SCIRP	*Scirpus*	0–364	–
	cattail	TYPHA	*Typha*	0–364	–
Forb					
5				364–1093	
	Forb, perennial	2FP	*Forb, perennial*	0–364	–
	columbine	AQUIL	*Aquilegia*	0–364	–
	white marsh marigold	CALEL7	*Caltha leptosepala ssp. leptosepala*	0–364	–
	water hemlock	CICUT	*Cicuta*	0–364	–
	shootingstar	DODEC	*Dodecatheon*	0–364	–
	horsetail	EQUIS	*Equisetum*	0–364	–
	gentian	GENTI	*Gentiana*	0–364	–
	common sneezeweed	HEAU	*Helenium autumnale*	0–364	–
	waterleaf	HYDRO4	*Hydrophyllum*	0–364	–
	rubberweed	HYMEN7	*Hymenoxys*	0–364	–
	Rocky Mountain iris	IRMI	*Iris missouriensis*	0–364	–
	wild mint	MEAR4	*Mentha arvensis*	0–364	–
	bluebells	MERTE	*Mertensia*	0–364	–
	monkeyflower	MIMUL	*Mimulus*	0–364	–
	ragwort	PACKE	*Packera*	0–364	–
	elephanthead lousewort	PEGR2	*Pedicularis groenlandica*	0–364	–
	plantain	PLANT	*Plantago*	0–364	–
	American bistort	POBI6	*Polygonum bistortoides*	0–364	–
	knotweed	POLYG4	*Polygonum*	0–364	–

	cinquefoil	POTEN	*Potentilla*	0–364	–
	dock	RUMEX	*Rumex*	0–364	–
	western coneflower	RUOC2	*Rudbeckia occidentalis*	0–364	–
	ragwort	SENEC	*Senecio*	0–364	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–364	–
	clover	TRIFO	*Trifolium*	0–364	–
	violet	VIOLA	*Viola*	0–364	–
Shrub/Vine					
6				364–1093	
	Shrub, deciduous	2SD	*Shrub, deciduous*	0–364	–
	Shrub, evergreen	2SE	*Shrub, evergreen*	0–364	–
	Tree, deciduous	2TD	*Tree, deciduous*	0–364	–
	Tree, evergreen	2TE	*Tree, evergreen*	0–364	–
	water birch	BEOC2	*Betula occidentalis*	0–364	–
	dogwood	CORNU	*Cornus*	0–364	–
	alpine laurel	KAMI	*Kalmia microphylla*	0–364	–
	currant	RIBES	*Ribes*	0–364	–
	Woods' rose	ROWOW	*Rosa woodsii var. woodsii*	0–364	–
	willow	SALIX	*Salix*	0–364	–

Animal community

Animal Community – Wildlife Interpretations

Sedge Plant Community (HCPC): This plant community is very important for most wildlife in the area. Over 80% of all wildlife use this site to fulfill some part of their habitat needs. It provides forage and thermal and hiding cover for mule deer, elk, and moose. It provides nesting habitat for shorebirds, songbirds, and waterfowl as well as ground nesting birds such as harriers. Dense ground cover provides escape cover, forage, and breeding areas for small mammals which draw predators such as raptors, red fox and coyote. Other birds that would frequent this plant community include red-wing blackbirds, sandhill cranes, western meadowlarks, neo-tropical migrants, and golden eagles.

Willow/Sedge Plant Community: This plant community is beneficial for the same wildlife that would use the Historic Climax Plant Community. However, dominance of woody species may improve thermal and hiding cover for all species, especially structural diversity needed for neo-tropical migrants, as well as provide more foraging areas for moose.

Upland Sedge/Rush Plant Community: This plant community may be beneficial for some of the same wildlife that would use the Historic Climax Plant Community. However, the woody component is typically less productive and unable to support large browsers such as moose. As woody plants decrease, structural diversity is lost for neo-tropical migrants, cover decreased for deer and elk, and nesting for shrub-nesting birds is impacted.

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)
Sedge (HCPC) 5500-7500 2.0
Willow/Sedge 3000-6000 1.4
Upland Sedge/Rush 1500-3500 0.8

* - 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

Climate is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration rate is very slow and runoff potential high for the soils of this site due to a high water table and saturated soil conditions. However, high forage production on this site diminishes runoff potential as long as site is managed for maintaining adequate residual vegetation. (Refer to Part 630, NRCS National Engineering Handbook for detailed hydraulic information).

Rills and gullies should not typically be present. Water flow patterns may be present if associated with a perennial flowing stream. Litter typically falls in place, and signs of movement are not common unless associated with a perennial flowing stream. Chemical and physical crusts are rare to non-existent.

Recreational uses

This site provides a variety of hunting and fishing opportunities as well providing popular camping areas for recreationists when not saturated. Waterfowl hunting opportunities exist when associated with open water. The wide variety of plants which bloom from spring until fall have esthetic values that appeal to visitors.

Wood products

No appreciable wood products are present on the site.

Inventory data references

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, USDI and USDA Interpreting Indicators of Rangeland Health Version 3, and USDA NRCS Soil Surveys from various counties.

Information presented here has been derived from NRCS inventory data, Field observations from range trained personnel, and the existing range site descriptions. Those involved in developing the Loamy range site include: Karen Clause, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist.

Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Ray Gullion, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Jack Mononi, Range Management Specialist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS.

Inventory Data References:
Ocular field estimations observed by trained personnel were completed at each site. Then sites were selected where a 100-foot tape was stretched, and the following sample procedures were completed by inventory staff. For full sampling protocol and guidelines with forms please refer to the Wyoming ESI Operating Procedures, compiled

in 2012 for the Powell and Rock Springs Soil Survey Office, USDA-NRCS.
• Double Sampling Production Data (4.8 square foot hoop used to estimate 10 points, clipped a minimum of 2 of these estimated points, with two 21-foot X 21-foot square extended shrub plots).
• Line Point Intercept (over story and understory captured with soil cover). Height of herbaceous and woody cover is collected every three feet along established transect.)
• Continuous Line Intercept (Woody Canopy Cover, with minimum gap of 0.2 of a foot for all woody species and succulents. Intercept height collected at each measurement.),
• Gap Intercept (Basal Gap measured with a minimum gap requirement of 0.7 foot.),
• Sample Point (10 – 1-meter square point photographs taken at set distances on transect. Red using the sample point computer program established by the High Plains Agricultural Research Center, WY).
• Soil Stability (Slake Test – surface and subsurface samples collected and processed according to the soil stability guidelines provided by the Jornada Research Center, NM.)

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Contributors

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Approval

Scott Woodall, 10/05/2019

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

Indicators

1. **Number and extent of rills:** Rare to nonexistent.

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2. **Presence of water flow patterns:** Water flow patterns sometimes evident in floodplain zone where this site occurs.

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3. **Number and height of erosional pedestals or terracettes:** Rare to nonexistent.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically less than 1%.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter exhibits slight movement only associated with water flow patterns.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Stability Index ratings are typically 6.0

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface variable, typically an A-horizon that has colors with a chroma of 2 or less and OM of 10-20%. Sometimes the A-horizon is overlain or replaced by an O-horizon with 40-60% OM.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 70-85% grasses, 15% forbs, and 0-15% shrubs. Dense plant canopy (>95%) and litter, despite slow to moderate infiltration rates, results in no runoff for this site until soils are saturated. Basal cover is typically 20-30% for this site and effectively reduces runoff on this site as well.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer exists.

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

    Dominant: mid-size, cool season bunchgrasses

    Sub-dominant: rhizomatous grass-likes

    Other: perennial forbs = perennial shrubs cool season rhizomatous grasses

    Additional:

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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 0-5% of total canopy measurement with total litter (including beneath the plant canopy) from 90-100% expected. Herbaceous litter depth typically ranges from 20-35 mm. Woody litter can be up to a couple inches (4-6 cm).

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** English: 5500-7500 lb/ac (6000 lb/ac average); Metric: 6160-8400 kg/ha (6720 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 15% and presence of noxious weeds are the most common indicators of a threshold being crossed. Baltic rush and slim sedge are common increasers. Canada thistle is a common invasive species.

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