

Ecological site F043BP707WY

Subirrigated Cool Woodland Group

Last updated: 4/29/2024
Accessed: 05/17/2024

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

043B – Central Rocky Mountains – This MLRA is extensive including Montana, Idaho, Wyoming and a small portion in Utah. This MLRA consists of the major chains of Mountain Ranges with the corresponding valleys. Cartographic standards limited the ability to capture the foothills as a separate MLRA, so revisions of the MLRA boundaries in 2006 led to the inclusion of the foothills with the mountains for much of Wyoming.

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

LRU P: PES (Provisional Ecological Site or Group - PEG) A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise concept during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

This PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the Approved Ecological Site Description Standard, but it has been through a Quality Control and Quality Assurance processes to assure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an Approved Ecological Site Description.

Classification relationships

Other Classifications:

PIEN/EQAR h.t. (Steele Et.Al. 1983)

PIEN/CALE4 h.t. (Steele Et.Al. 1983)

PIEN/CADI6 h.t. (Steele Et.Al. 1983)

Ecological site concept

- Site does receive additional water, saturated most of the growing season
- Soils are
 - o Generally not saline or saline-sodic
 - o Moderately deep, deep, or very deep
 - o Typically less than 15% stone and boulder cover
 - o Soil surface texture ranges from sandy loam to clay loam in surface mineral 4"
 - o Organic layer common (up to 12" of muck)
 - o Hummocking is frequent

Associated sites

F043BP708WY	Upland Aspen Woodland Group Upland Aspen Woodland can be intermixed, especially in broken or uplifted areas following sharp valleys or canyon systems.
R043BY330WY	Overflow (Ov) 15-19" Foothills and Mountains East Precipitation Zone Overflow 15-19" Precipitation Foothills and Mountain East are open, herbaceous areas that will occur on the fringes of wetter sites, but do not have a water table and benefit from overland flow.
R043BY278WY	Wetland Foothills and Mountains West Wetlands 15-19" Precipitation Foothills and Mountain West are open, herbaceous areas that will occur in depressions on the landscape. They have water on the surface for at least part of the growing season.
R043BY230WY	Overflow Foothills and Mountains West Overflow 15-19" Precipitation Foothills and Mountain West are open, herbaceous areas that will occur on the fringes of wetter sites, but do not have a water table and benefit from overland flow.
F043BP702WY	Shallow Cool Woodland Group Shallow Cool Woodland can be found adjacent to on dry, upland sites where rock outcrop protrudes above the wet soils.
R043BY378WY	Wetland (WL) 15-19" Foothills and Mountains East Precipitation Zone Wetlands 15-19" Precipitation Foothills and Mountain East are open, herbaceous areas that will occur in depressions on the landscape. They have water on the surface for at least part of the growing season.
F043BP710WY	Upland Cool Woodland Group Upland Cool Woodland can be found adjacent to on the dry upland sites near the Subirrigated Cool Woodlands.

Similar sites

R043BY274WY	Subirrigated Foothills and Mountains West Subirrigated 15-19" Precipitation Foothills and Mountain West are open, herbaceous areas that will occur in similar soil conditions where a water table is present to within 30 cm of the soil surface for part of the growing season.
R043BY374WY	Subirrigated (Sb) 15-19" Foothills and Mountains East Precipitation Zone Subirrigated 15-19" Precipitation Foothills and Mountain East are open, herbaceous areas that will occur in similar soil conditions where a water table is present to within 30 cm of the soil surface for part of the growing season.

Table 1. Dominant plant species

Tree	(1) <i>Picea engelmannii</i> (2) <i>Populus balsamifera</i>
Shrub	(1) <i>Vaccinium scoparium</i> (2) <i>Cornus</i>
Herbaceous	(1) <i>Equisetum</i> (2) <i>Caltha</i>

Physiographic features

This site normally occurs on nearly level bottomlands and adjacent to perennial streams, springs and ponds.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Mountains > Swale (3) Foothills > Alluvial fan (4) Foothills > Stream terrace
Runoff class	Negligible to low
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Elevation	1,829–2,896 m
Slope	0–6%
Water table depth	30–102 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Not specified
Flooding frequency	Not specified
Elevation	Not specified
Slope	0–20%
Water table depth	Not specified

Climatic features

Annual precipitation ranges from 15-24 inches per year. June is generally the wettest month. July, August, and September are somewhat less with daily amounts rarely exceeding one inch. 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.

Snowfall is quite heavy in the area. Annual snowfall averages about 150 inches. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. Prevailing winds are from the southwest, because of the varied topography, the wind will vary considerably for different parts of the area. The wind is usually much lighter at the lower elevations and in the valleys as compared with the higher terrain. 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 September 15.

The following information is from the "Jackson", "Cooke City 2W", and "Burgess Junction" climate stations, at the lower end of this precipitation zone. Climate Data is limited and is being extrapolated from the nearest stations.

Table 4. Representative climatic features

Frost-free period (characteristic range)	4-7 days
Freeze-free period (characteristic range)	42-52 days
Precipitation total (characteristic range)	457-584 mm
Frost-free period (actual range)	3-7 days
Freeze-free period (actual range)	39-54 days

Precipitation total (actual range)	432-610 mm
Frost-free period (average)	5 days
Freeze-free period (average)	47 days
Precipitation total (average)	533 mm

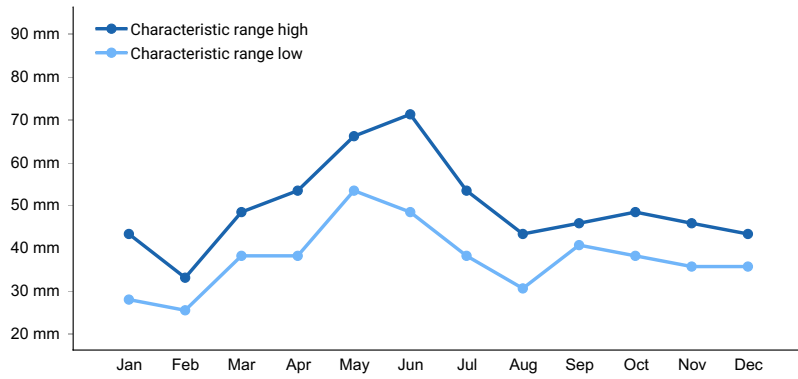


Figure 1. Monthly precipitation range

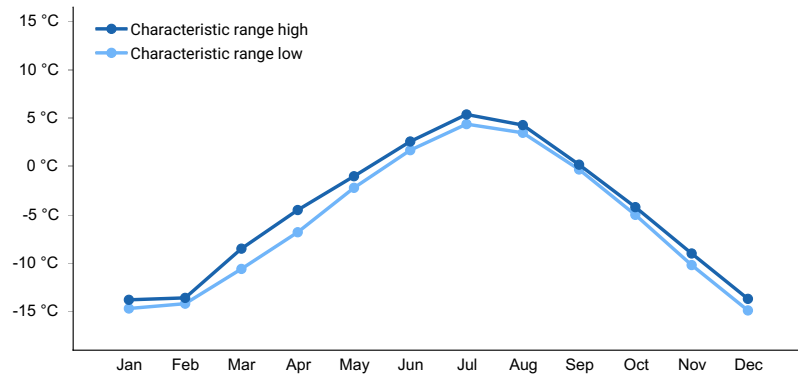


Figure 2. Monthly minimum temperature range

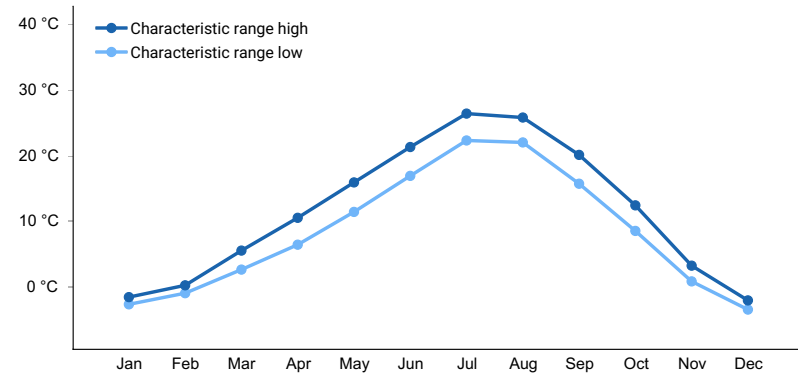


Figure 3. Monthly maximum temperature range

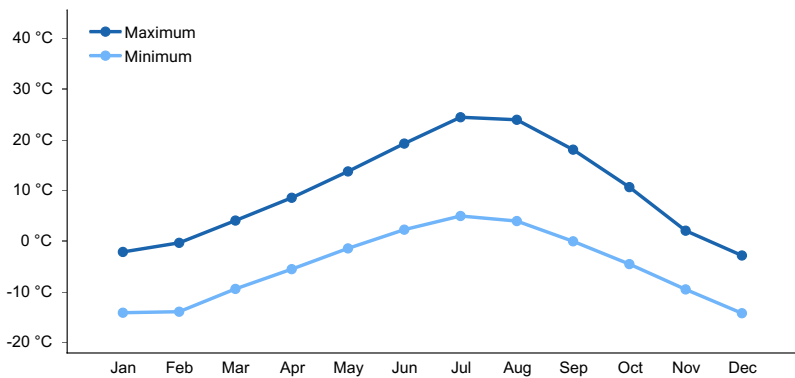


Figure 4. Monthly average minimum and maximum temperature

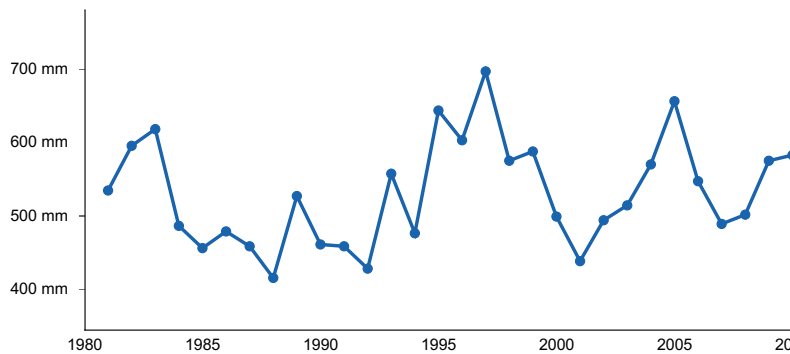


Figure 5. Annual precipitation pattern

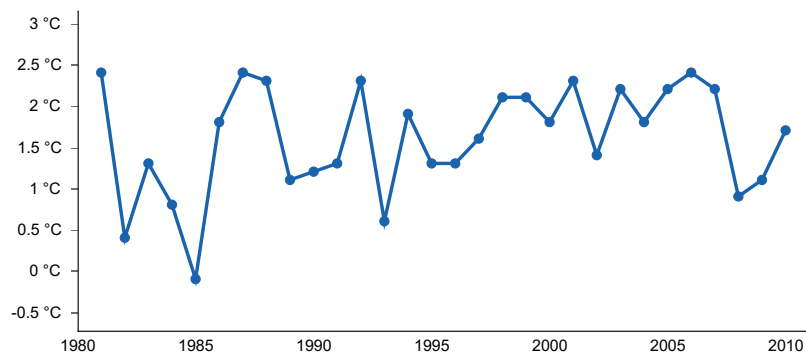


Figure 6. Annual average temperature pattern

Climate stations used

- (1) JACKSON [USC00484910], Jackson, WY
- (2) BURGESS JUNCTION [USC00481220], Dayton, WY
- (3) COOKE CITY 2 W [USC00241995], Gardiner, MT

Influencing water features

This ecological site is associated with Stream Type: C (Rosgen). Although it is not tied directly to a channel, these areas have significant overland and subsurface flow. Hummocks are common due to frost heave as well as from grazing impacts.

Wetland description

Although this site is associated with wetlands, but not named as a wetland, it has features that meet the core definition and qualities of a wetland. Saturated soils for part of the year, supporting OBL, FAC, and FACW plants. Further refinement and definition will need to be detailed on a site specific level.

Soil features

The soils of this site are moderately deep to very deep, poorly drained to moderately well-drained and formed in mixed alluvium. These soils have slow to rapid permeability. These soils are non-saline and/or non-alkaline and with a water table within reach of the herbaceous species (usually less than three feet) through most of the growing season. These areas may have water over the surface from run-in but only for short periods. The soil characteristics having the most influence on the plant community are depth to a water table during the growing season.

Table 5. Representative soil features

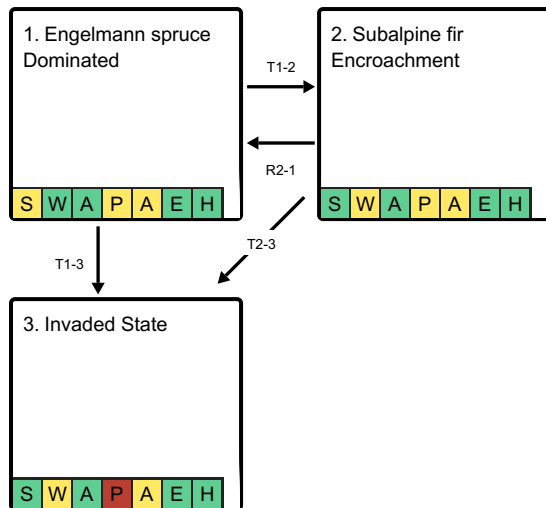
Parent material	(1) Alluvium–limestone and dolomite (2) Volcanic rock (3) Igneous, metamorphic and sedimentary rock
Surface texture	(1) Bouldery, stony, cobbly loam (2) Loamy sand (3) Sandy loam (4) Silt loam (5) Silty clay (6) Clay loam (7) Clay
Drainage class	Moderately well drained to poorly drained
Permeability class	Slow to rapid
Depth to restrictive layer	51 cm
Soil depth	51 cm
Surface fragment cover ≤3"	0–10%
Surface fragment cover >3"	0–10%
Available water capacity (Depth not specified)	7.11–15.75 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0–8 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	5.4–8.4
Subsurface fragment volume ≤3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The ecological dynamics that drive the Subirrigated Cool Woodland are under further research. There is thought, however, that with alternation in use, fire, and climatic patterns, these communities are a result of encroachment of conifers into an otherwise rangeland site. Another theory is that the conifers are re-establishing after the last geomorphic process - glacier receding, landslide, etc. Because of the wet nature of these soils, and the more isolated or linear appearances on the landscape, fire is not seen as a major driver in these systems. However, the lack of fire is one explanation of the expansion of these wooded subirrigated sites.

State and transition model

Ecosystem states



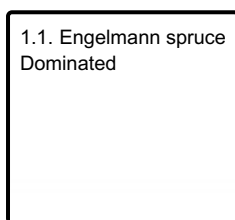
T1-2 - Disease, insects or other disturbances removes engelmann spruce and leaves the site vulnerable to encroachment by subalpine fir.

T1-3 - Soil disturbance (hoof action) with a seed source is the main driver to the invaded state.

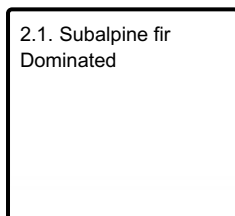
R2-1 - The removal of subalpine fir and rejuvenation of engelmann spruce with rest from grazing are the first steps in recovery of this site.

T2-3 - Soil disturbance with a seed source present is the driver to this invaded state.

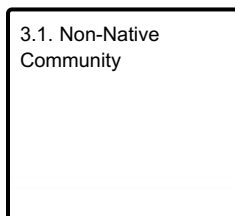
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1 Engelmann spruce Dominated

This state is a wet ecosite dominated by woody vegetation, namely englemann spruce. However, white bark pine and limber pine have been found within the community as well. These sites are a result of snow pack melt, or runoff that create these wet boundary communities. They can be found along the edge of wetlands, bogs/fens, or along toe slope areas.

Characteristics and indicators. The dominant tree canopy is engelmann spruce, with and under story of willow, shrubby cinquefoil, dogwoods or a host of other shrubs that trend towards wetter soils. Forbs such as marsh marigold, globeflower, and horsetail are common on these sites.

Resilience management. Fire is not a significant player in this community, however, the wet soils are fragile and deteriorate easily with grazing (trampling) or timber harvest (machinery), resulting in erosion or compaction that can impact the viability of engelmann spruce.

Dominant plant species

- Engelmann spruce (*Picea engelmannii*), tree
- whitebark pine (*Pinus albicaulis*), tree
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- dogwood (*Cornus*), shrub
- grouse whortleberry (*Vaccinium scoparium*), shrub
- tufted hairgrass (*Deschampsia cespitosa*), grass
- sedge (*Carex*), grass
- rush (*Juncus*), grass
- woodrush (*Luzula*), grass
- marsh marigold (*Caltha*), other herbaceous
- horsetail (*Equisetum*), other herbaceous
- twinflower (*Linnaea borealis*), other herbaceous
- arrowleaf ragwort (*Senecio triangularis*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Compaction
- Organic matter depletion
- Seasonal high water table
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

Community 1.1

Engelmann spruce Dominated



Figure 7. Engelmann spruce canopy with a variety of forbs and shrubs in the under story on a wet soil.

This community is a Engelmann spruce woodland with an understory of shrubby cinquefoil, grouse whortleberry, and twinflower. Sedges and tufted hairgrass are prevalent.

Resilience management. The fragile soils are the biggest driver of change on this site outside of the hydrologic function. The role of fire is minor due to the wet conditions of the area, although it can still have an impact.

Dominant plant species

- Engelmann spruce (*Picea engelmannii*), tree
- grouse whortleberry (*Vaccinium scoparium*), shrub

- dogwood (*Cornus*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- tufted hairgrass (*Deschampsia cespitosa*), grass
- sedge (*Carex*), grass
- twinflower (*Linnaea borealis*), other herbaceous
- marsh marigold (*Caltha*), other herbaceous
- horsetail (*Equisetum*), other herbaceous

State 2

Subalpine fir Encroachment

Slight changes in hydrology, due to compaction increased runoff, and aging of stands allows subalpine fir to increase on these wooded subirrigated sites. The increase in subalpine fir will result in a decrease or shift in the other woody species including shrubs.

Characteristics and indicators. The presence and indication of reproduction (both young and old growth stages) of subalpine fir are visible in the community, and englemann spruce is declining. Willow, balsam poplar and aspen are declining.

Resilience management. Soils are wet and fragile so deterioration is a threat from grazing (trampling) or timber harvest (machinery) resulting in soil erosion. Subalpine fir is able to tolerate dry soils and shallow to deep soils and so is able to persist as this site shifts or is degraded. Fire may pose a risk as the stand become more dense, but due to the moist nature it is not seen to play a significant role in this ecological site.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- whitebark pine (*Pinus albicaulis*), tree
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- dogwood (*Cornus*), shrub
- tufted hairgrass (*Deschampsia cespitosa*), grass
- sedge (*Carex*), grass
- woodrush (*Luzula*), grass
- rush (*Juncus*), grass
- marsh marigold (*Caltha*), other herbaceous
- horsetail (*Equisetum*), other herbaceous
- arrowleaf ragwort (*Senecio triangularis*), other herbaceous
- twinflower (*Linnaea borealis*), other herbaceous

Dominant resource concerns

- Compaction
- Seasonal high water table
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

Community 2.1

Subalpine fir Dominated



Figure 8. In the center of the image, can see the subalpine fir dominated wet zone on the fringe of the wetland.

The encroachment of subalpine fir into the site will eventually crowd out the Englemann spruce and other woody species on the site.

Resilience management. The adaptability and tolerance of subalpine fir makes this site resistant to change. Fire does not play a significant role in this community due to the wet nature of the site.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- whitebark pine (*Pinus albicaulis*), tree
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- dogwood (*Cornus*), shrub
- tufted hairgrass (*Deschampsia cespitosa*), grass
- sedge (*Carex*), grass
- rush (*Juncus*), grass
- woodrush (*Luzula*), grass
- marsh marigold (*Caltha*), other herbaceous
- horsetail (*Equisetum*), other herbaceous
- arrowleaf ragwort (*Senecio triangularis*), other herbaceous
- twinflower (*Linnaea borealis*), other herbaceous

State 3 Invaded State

Increased use and movement through higher elevation communities has opened them to the threat of invasive species, including non-native invaders such as kentucky bluegrass. Little disturbance is needed to introduce these species, but once established they can quickly dominate the site.

Characteristics and indicators. This state resembles State 1 and State 2, but with the significant presence of a non-native invader including, kentucky bluegrass, redtop, smooth brome, and other species. Significant at this time is being considered to be 10% or greater of the total under story canopy cover.

Resilience management. These communities are resilient and resistant to change. The ability to reduce or eradicate most of the invader species is the management constraint of this state.

Dominant plant species

- Englemann spruce (*Picea engelmannii*), tree
- subalpine fir (*Abies lasiocarpa*), tree
- willow (*Salix*), shrub
- dogwood (*Cornus*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- redtop (*Agrostis gigantea*), grass

- Kentucky bluegrass (*Poa pratensis*), grass
- tufted hairgrass (*Deschampsia cespitosa*), grass
- marsh marigold (*Caltha*), other herbaceous
- horsetail (*Equisetum*), other herbaceous
- arrowleaf ragwort (*Senecio triangularis*), other herbaceous

Dominant resource concerns

- Compaction
- Organic matter depletion
- Seasonal high water table
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

Community 3.1

Non-Native Community



Figure 9. Engelmann spruce and Douglas-fir overstory with mixed forbs and shrubs with a 10% Kentucky bluegrass understory.

This community is dominated by either Engelmann's spruce or subalpine fir with an understory that is co-dominated with non-native species such as kentucky bluegras or smooth brome.

Resilience management. The lack of any successful removal or treatment for these non-natives, and their grazing tolerance makes this site extremely resilient and resistant to change.

Dominant plant species

- Engelmann spruce (*Picea engelmannii*), tree
- subalpine fir (*Abies lasiocarpa*), tree
- willow (*Salix*), shrub
- dogwood (*Cornus*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- sedge (*Carex*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- redtop (*Agrostis gigantea*), grass
- marsh marigold (*Caltha*), other herbaceous
- arrowleaf ragwort (*Senecio triangularis*), other herbaceous
- fringed grass of Parnassus (*Parnassia fimbriata*), other herbaceous
- twinflower (*Linnaea borealis*), other herbaceous

Transition T1-2

State 1 to 2

Disease and insect damage due to aging or weakened trees, or major disturbance such as microbursts, fire (although rare), or canopy removal of engelmann spruce leaves the site vulnerable to encroachment by subalpine fir. The ability to tolerate changes in hydrology and changes in the soil more readily is also thought to be a driver in this system, although more documentation is needed.

Constraints to recovery. Recovery time, and seed sources and conditions to allow the rejuvenation of engelmann spruce after the removal of subalpine fir and preventing further deterioration or invasion is the main constraints to recover.

Transition T1-3 State 1 to 3

The introduction of seed source with soil disturbance is the driver of this transition. Moving cattle through areas of known infestations, or wildlife traveling through the wet soils, plants the seeds and easily introduce non-native species such as kentucky bluegrass and smooth brome in to these areas. Other invaders such as houndstonue and canada thistle are a major issue in these soils as well.

Constraints to recovery. The inability to control or eradicate the non-native invaders without impact to the native species is the most understood constraint to recovery.

Restoration pathway R2-1 State 2 to 1

The use of fire or other timber management is needed to reduce the subalpine fir and encourage the rejuvenation of engelmann spruce to start the restoration to reference. Rest and mitigation to soil impacts on the site may be required.

Conservation practices

Heavy Use Area Protection
Wetland Wildlife Habitat Management
Upland Wildlife Habitat Management
Forest Stand Improvement
Forest Land Management
Grazing Management Plan
Patch-burning to enhance wildlife habitat

Transition T2-3 State 2 to 3

Recreation, timber harvest, grazing, wildlife, and wind are the major factors introducing seed sources for major invader species into these ecosystems. The hoof and track impact from any animal, human or vehicle is a means to incorporate the seed and start the invasion processes.

Constraints to recovery. The inability to eradicate or control the non-native invaders without impacting the site further is the largest constraint to recovery for this community.

Additional community tables

Animal community

The combination of an over story of woody species and shrubs and an under story of grasses and forbs provides a very diverse plant community for wildlife. The shrubs tend to break up hard crusted snow and many of these provide important sources of food for many wildlife species. Consequently, many large mammals use this state for foraging and cover year-round. These sites are also important corridors within the foot slopes of mountains and between upland sites and valuable water sources. It provides important winter foraging habitat for sage grouse.

Other birds that would frequent this plant community include nesting species, blue grouse, American kestrel, hawks, and golden eagle. As these sites are adjacent to water, bald eagles, Wilson's phalarope, sandhill crane, great blue heron, waterfowl, and kingfishers can be found frequenting the site. Many small mammals occur here including water species such as muskrat, beaver and river otter.

Hydrological functions

Climate is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group and water table. Runoff will be high on this site since the soil is usually saturated. (Refer to Part 630, NRCS National Engineering Handbook for detailed hydraulic information.

Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. 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 hunting opportunities for upland game and water species. Sites adjacent to perennial stream provide opportunities for fishing and water activities. The wide varieties of plants that bloom from spring until fall have an aesthetic value that appeals to visitors. Other recreational uses may include hiking, camping, mountain biking, and in the winter snowshoeing and cross-country skiing.

Wood products

Firewood and pole and post may be harvested off of these locations. Due to the wet nature of the soils, access and removing products can be detrimental to the location or difficult to do at best. Large scale timber harvest is not recommended for these sites.

Other products

Berry harvest from understory species as well as medicinal plants can be found within this ecological site. Fungi (mushroom) harvest can also occur in specific locations. Bird watchers, wild flower enthusiasts and other outdoor enthusiasts enjoy these areas.

Inventory data references

Information presented here has been derived from NRCS 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.

Other references

Steele, Robert; Cooper, Stephen V.; Ondov, David M.; Roberts, David W.; Pfister, Robert D. 1983. Forest Habitat Types of Eastern Idaho-Western Wyoming. General Technical Report INT-144. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 122 p.

Contributors

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Approval

Kirt Walstad, 4/29/2024

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	04/29/2024
Approved by	Kirt Walstad
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:**

17. **Perennial plant reproductive capability:**
