

Ecological site DX034A02X104 Clayey Pinedale Plateau (Cy PP)

Last updated: 9/28/2023
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General information

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

MLRA notes

Major Land Resource Area (MLRA): 034A–Cool Central Desertic Basins and Plateaus

For further information regarding MLRAs, refer to:
<http://soils.usda.gov/survey/geography/mlra/index.html>

LRU notes

Land Resource Unit (LRU) 34A-02:

- Moisture Regime: aridic ustic
- Temperature Regime: frigid, cool
- Dominant Cover: rangeland
- Representative Value (RV) Effective Precipitation: 9-12 inches
- RV Frost-Free Days: 30-60 days

Classification relationships

Relationship to Other Established Classification Systems

National Vegetation Classification System (NVC):

3 Semi-Desert

3.B.1 Cool Semi-Desert Scrub & Grassland

D040 Western North American Cool Semi-Desert Scrub & Grassland

M169 Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Group

A3184 Wyoming big sagebrush Dry Steppe and Shrubland Alliance

CEGL001043 *Artemisia tridentata* ssp. *wyomingensis*/*Elymus elymoides* Shrubland Association

Ecoregions (EPA):

Level I: 10 North American Deserts

Level II: 10.1 Cold Deserts

Level III: 10.1.4 Wyoming Basin

Ecological site concept

- This site does not receive any additional water.
- These soils:
 - o may be slightly saline or saline-sodic
 - o are moderately deep, deep, or very deep
 - o are not skeletal within 20" of the soil surface; and have minimal rock fragments at the soil surface
 - o are not strongly or violently effervescent in the surface mineral layer (within top 10")
 - o have surface textures that usually range from clay loam to clay in surface mineral layer (4")
- have slopes less than 30 percent

- have a clay content that is greater than 35% in mineral soil surface layer (1-2")

Associated sites

DX034A02X122	Loamy Pinedale Plateau (Ly PP)
R034AY244WY	Saline Upland Foothills and Basins West (SU)
DX034A02X124	Loamy Argillic Pinedale Plateau (LyA PP)

Similar sites

R034AY104WY	Clayey Green River and Great Divide Basins (Cy) The Clayey site is drier and slightly warmer.
R034AY244WY	Saline Upland Foothills and Basins West (SU) The Saline Upland site has similar clay content, but will have a higher amount of salts with columnar structure in the sub soil.
DX034A02X122	Loamy Pinedale Plateau (Ly PP) The Loamy site has lighter soil textures and high annual production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. wyomingensis</i>
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Elymus lanceolatus ssp. lanceolatus</i>

Legacy ID

R034AC104WY

Physiographic features

The Clayey Pinedale Plateau (Cy) ecological site (R034AC104WY: D034A02X104) is located within LRU C 02 in MLRA 34A. This ecological site occurs in intermontane basin landscapes on hill, drainageway, and pediment landforms (see following definitions). The slopes range from level to 30 percent. This site occurs on all aspects.

Landscape Definitions:

intermontane basin—A generic term for wide structural depressions between mountain ranges that are partly filled with alluvium and called "valleys" in the vernacular.

Landform Definitions:

alluvial fan--A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley, or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

drainageway--(a) A general term for a course or channel along which water moves in draining an area. (b) [soil survey] a term restricted to relatively small, roughly linear or arcuate depressions that move concentrated water at some time, and either lack a defined channel (e.g. head slope, swale) or have a small, defined channel (e.g. low order streams).

hills—A landscape dominated by hills and associated valleys. The landform term is singular (hill).

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Hill (2) Drainageway (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,981–2,286 m
Slope	0–30%
Water table depth	152–508 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation in the Clayey Pinedale Plateau ecological site ranges from 9-12 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. Much of the precipitation accumulation (45 percent) comes in the winter in the form of snow (October to April). The wettest month is May (1.69 inches). The dominant plants (sagebrush and cool season grasses) are well adapted to these conditions. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph. The growing season is short (less than 60 day) and cool (critical growth period): primary growth typically occurs between May and June. Growth of native cool-season plants begins about mid-April and continues to approximately early July. Some green-up of cool-season plants usually occurs in September with adequate fall moisture.

All data is based on the 30 year average from 1981-2010.

Table 3. Representative climatic features

Frost-free period (characteristic range)	30-60 days
Freeze-free period (characteristic range)	60-90 days
Precipitation total (characteristic range)	229-305 mm
Frost-free period (actual range)	15-65 days
Freeze-free period (actual range)	45-90 days
Precipitation total (actual range)	229-330 mm
Frost-free period (average)	36 days
Freeze-free period (average)	64 days
Precipitation total (average)	279 mm

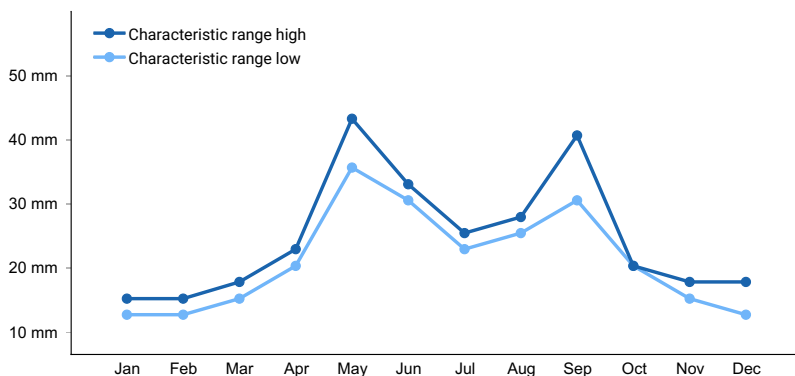


Figure 1. Monthly precipitation range

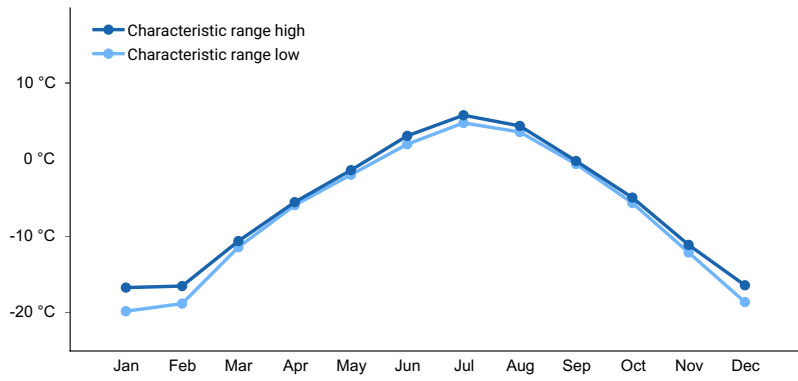


Figure 2. Monthly minimum temperature range

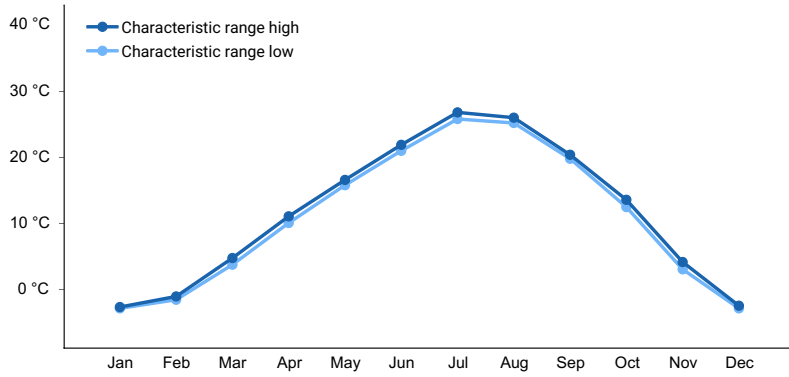


Figure 3. Monthly maximum temperature range

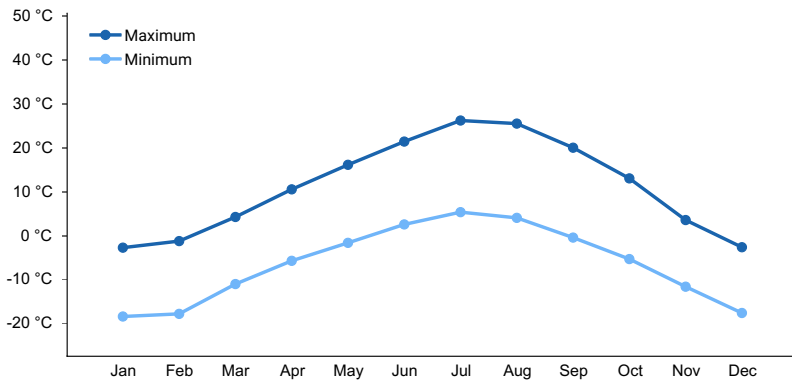


Figure 4. Monthly average minimum and maximum temperature

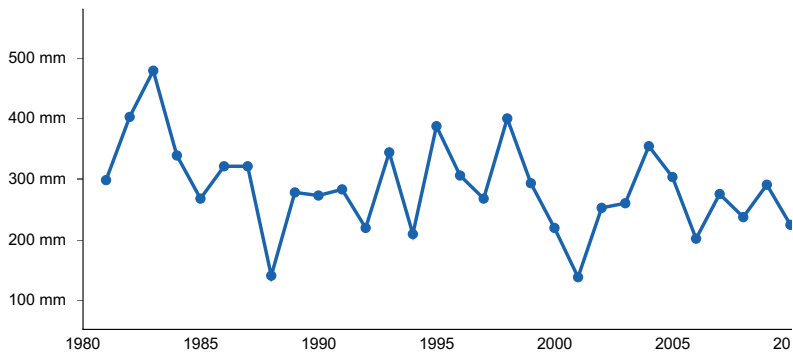


Figure 5. Annual precipitation pattern

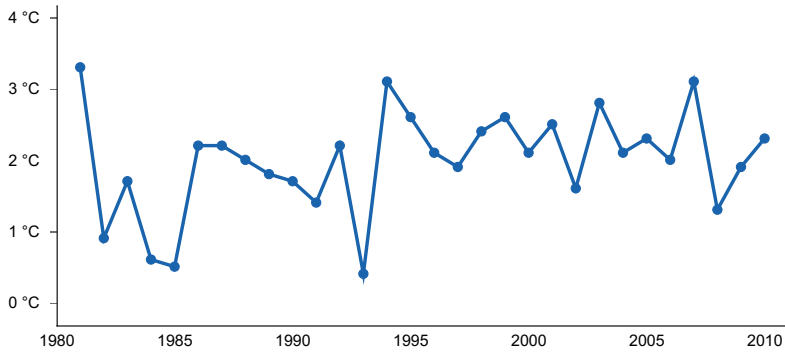


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BOULDER REARING STN [USC00480951], Boulder, WY
- (2) CORA [USC00482054], Cora, WY
- (3) PINEDALE [USC00487260], Pinedale, WY

Influencing water features

There are no influencing water features in the Clayey Pinedale Plateau ecological site.

Soil features

These are moderately deep and deep (at least 20 inches deep) well drained soils with more than 35 percent clay in the subsoil. Some soil cracking (not severe) occurs during the dry summer months, especially where the plant cover has been reduced. Water-holding capacity is high, but surface intake is restricted which causes runoff and reduces effectiveness of precipitation. A common scenario is to have a 1-2" cap of sandy loam over clay loam due to young soil development of weathered shale, mudstone, and sandstone parent materials.

Major Soil Series correlated to this site include: the Gunsone and Oysterridge series.

Typical taxonomy: Fine Torrertic Haplustepts

Soil organic matter (SOM) <2% is common. Color and structure are difficult indicators to assess in semiarid soils because SOM potential is naturally low. Typically, the soil surface consists of an A-horizon of 1-6 inches (3-16 cm) thick with strong medium granular structure and a subsurface that is medium to strong subangular blocky or prismatic structure. The surface is typically brown to grayish brown (i.e. 10YR 4/3 to 5/2) with a similar colored subsurface. Field indicators of departure from the reference condition include exposure of subsoil as evidenced by excessive pedestalling and/or surface disturbance.

Table 4. Representative soil features

Parent material	(1) Alluvium–mudstone (2) Slope alluvium–shale
Surface texture	(1) Clay loam (2) Silty clay loam (3) Clay
Family particle size	(1) Fine-loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to very slow
Soil depth	51–203 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–3%

Available water capacity (0-101.6cm)	14.73–20.32 cm
Calcium carbonate equivalent (0-50.8cm)	0–15%
Electrical conductivity (0-50.8cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-50.8cm)	0–5
Soil reaction (1:1 water) (0-15.2cm)	6.6–8.4
Subsurface fragment volume <=3" (15.2-50.8cm)	0–25%
Subsurface fragment volume >3" (15.2-50.8cm)	0–5%

Ecological dynamics

The Clayey Pinedale Plateau ecological site is dominated (species composition by dry weight) by big sagebrush and perennial grasses, with forbs as a minor component. The site consists of four states: The Reference State (1), *Bare Ground* State (2), Disturbed State (3), and Highly Disturbed State (4). A Pasture State (5) may occur if the ecological site has been converted to a pasture landuse by cultivation or any other means of conversion to the pasture landuse.

The Reference State is a collection of two distinct plant communities that exist on a continuum relative to disturbances, primarily grazing, pests, and drought with no disturbance causing successional changes as well over time. These Plant Communities represent the best adapted plant communities to the soils and climate found on the site, and they represent the best estimation of ecological dynamics present on this site at the time of European settlement.

The Reference Plant Community (big sage/rhizomatous wheatgrass) of this site is dominated by Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*) and cool-season rhizomatous species, primarily western wheatgrass (*Pascopyron smithii*) and thickspike wheatgrass (*Elymus lanceatous* ssp. *lanceatous*) with bottlebrush squirreltail (*Elymus elymoides*), and Indian ricegrass (*Achnantherum hymnoides*) as a subdominant. Minor components include short-statured bunchgrasses such as Sandberg bluegrass, perennial forbs, and shrubs, including green rabbitbrush (*Chrysothamnus viscidiflorus*).

After a sagebrush-killing disturbance, the Reference Plant Community transitions to the Rhizomatous Wheatgrass Plant Community, which is dominated by rhizomatous wheatgrasses. Sagebrush is a minor component of this plant community, and only time without a sagebrush-killing disturbance will advance this back to the Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community. Sagebrush-killing disturbances are thought to be fairly infrequent on this site (Bukowski and Baker, 2013).

Mid-stature bunchgrasses act as decreaser species in the Reference Community. Low-stature bunchgrasses and rhizomatous grasses tolerate higher grazing pressure and grow on less fertile soils (USDA/NRCS 2007) than mid-stature bunchgrasses. They often fill in the vegetation gaps created when mid-stature bunchgrasses decline, hence they are collectively referred to as increaser species.

Big sagebrush is the dominant shrub on this site. Most often Wyoming big sagebrush is the subspecies present. Snow catchment and run-in position are significant hydrologic components of this site, and the hydrology changes when shrubs are removed from this site.

Prior to the introduction of livestock (cattle and sheep) during the late 1800s, elk, mule deer, and pronghorn grazed this ecological site, primarily as winter and transitional range (early spring, late fall). Significant livestock grazing has occurred on most of this ecological site for more than 100 years. The Trans-Continental Railroad in the 1860s brought the first herds, and homesteaders began settling the area through the turn of the 20th century. Livestock grazing in this region historically has been cattle. In fact, early grazers established a "Deadline" from Fontenelle

Creek across the desert to the Big Sandy River, and sheep grazing was not allowed north of this line. Sheep crossing the line often died of plant poisoning from plants that were more prominent north of the boundary line. (Sommers, 1994)

Without ground-disturbing activities, this site is relatively free of invasive weeds, but once mechanically or physically disturbed it is prone to weed invasion, primarily by annuals such as lambsquarter (*Chenopodium album*), Russian thistle (*Salsola kali*), flixweed (*Descurainia sophia*), and kochia (*Bassia scoparia*). The most common noxious species affecting this site after soil disturbance are whitetop (*Cardaria draba*) and Canada thistle (*Cirsium arvense*) at the upper end of its precipitation range. Soil disturbance can be caused by vehicles, equipment, severe overutilization of the herbaceous vegetation, or large amounts of bare ground created by extended drought conditions combined with overutilization.

The most prevalent noxious weed in this LRU is Canada thistle (*Cirsium arvense*). It can be found in all plant community types but is mostly associated with riparian areas and disturbances. Developments and disturbance of the soil usually will result in a new infestation of Canada thistle. Canada thistle is from Eurasia; it was introduced via Canada as a seed contaminant in the 18th century. It is prevalent though out the United States as seeds are transported via wind and its aggressive rhizomatous root system sustains very dense patches.

The second most prevalent noxious weed, located predominantly in riparian areas and irrigated meadows, is perennial pepperweed (*Lepidium latifolium*). This mustard is usually found in wetter areas, but it is starting to invade other sites too. The Green River and many of its tributaries have significant perennial pepperweed infestations. It is said to be introduced to the LRU as a hay contaminant, when ranches had to bring in hay from Utah, Idaho, and other areas in the state during a drought in the 70s.

Another noxious mustard of concern is whitetop, or hoary cress (*Cardaria draba*). This species is also found in all habitat types within the Pinedale Plateau. It is found in irrigated hay meadows, roadsides, rangelands, but most significantly invades rangelands or fields that have had a disturbance event. This disturbance can be from overutilization of forage or native plant thinning due to drought. This deep-rooted perennial mustard completes its life cycle in early summer. There are several varieties of *Cardaria draba* in the area which are difficult to distinguish; all seem to have the same effect, but bloom at different times of the summer. Whitetop can tolerate alkaline soils.

Another species of concern is the invasive annual cheatgrass (*Bromus tectorum*). There is a limited population within this LRU that has invaded energy industry disturbances and reclamation as well as gravelly south- and west-facing slopes. A prolific seed source occurs in the adjacent foothills of the Wind River Mountains on southerly aspects.

Plant Communities and Transitional Pathways

A State-and-Transition Model (STM) for the Clayey ecological site (34AC104WY; D034A02X104) is depicted in Figure 1. Thorough descriptions of each state, transition, plant community, and pathway are found after the model in this document. This model is based on available experimental research, field observations, professional consensus, and interpretations. While based on the best available information, the STM will change over time as knowledge of ecological processes increases.

Plant communities within the same ecological site differ across the LRU due to the naturally occurring variability in weather, soils, and aspect. Not all managers will choose the Reference Plant Community as the management goal. Other plant communities may be desired to meet land management objectives. This is valid as long as the rangeland health attributes assessment departures are slight to moderate or none to slight for the Reference State. The biological processes on this site are complex; therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Both percent species composition by weight and percent cover are used in this ESD. Most observers find it easier to visualize or estimate percent cover for woody species (trees and shrubs). Foliar cover is used to define plant community phases and states in the State-and-Transition Model. Cover drives the transitions between communities and states because of the influence of shade and interception of rainfall.

Species composition by dry weight remains an important descriptor of the herbaceous community and of site

productivity as a whole, and includes both herbaceous and woody species. In fact, the percent foliar cover column in the plant tables is actually species composition by dry weight, and foliar cover is only discussed in the STM and narratives. Calculating similarity index requires data on species composition by dry weight.

Although there is considerable qualitative experience supporting the pathways and transitions within the State-and-Transition Model, no quantitative information exists that specifically identifies threshold parameters between reference states and degraded states in this ecological site. For information on STMs, see the following citations: Bestelmeyer et al. 2003, Bestelmeyer et al. 2004, Bestelmeyer and Brown 2005, and Stringham et al. 2003.

State and transition model

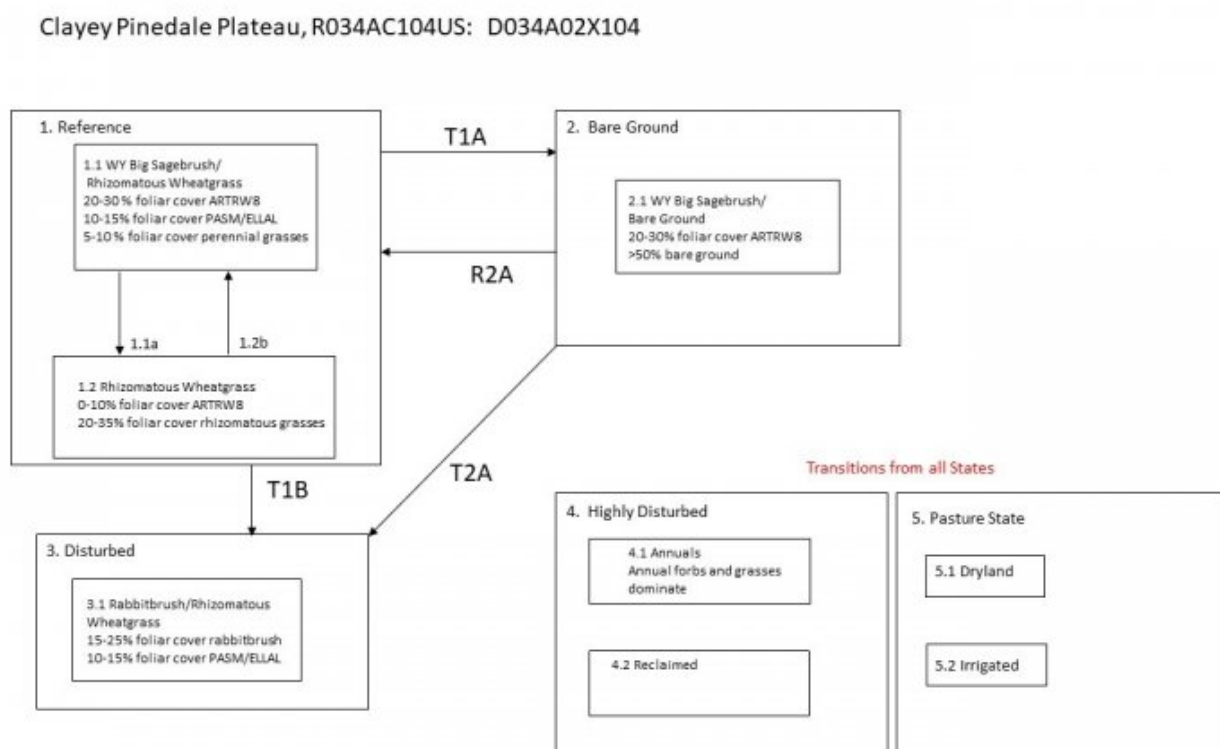


Figure 7. STM

- **Community Pathways**

- 1.1a: Sagebrush-killing event (Flood, disease, drought, chemical/biological/mechical)
- 1.2b: No disturbance, rest, deferment

- **State Transitions**

- T1A: Increased herbivory (long duration medium-high frequency)
- T1B: Soil-disturbing activity (hoof action, anthropogenic activity, rodent activity)
- T2A: Soil-disturbing activity (hoof action, anthropogenic activity, rodent activity)
- All states will transition to State 4 (Highly Disturbed) when severe soil disturbance occurs (removal of topsoil)
- All state will transition to State 5 (Pasture) if converted to pasture plant species

- **State Restorations**

- R2A: Rest/deferment; range seeding; ???

State 1

Reference State

The Reference State consists of two plant communities: the Wyoming Big Sagebrush/Rhizomatous Wheatgrass Community (1.1), and the Rhizomatous Wheatgrass Community (1.2). Each community differs in percent composition of bunchgrasses, rhizomatous grasses and percent woody canopy cover. Forbs are a minor component on this site. The percentage of woody canopy cover is less than 30 percent. The dominant shrub species is Wyoming big sagebrush in the Reference State (1). Two important processes that occur in this state result in plant community changes within the Reference State: sagebrush-killing disturbances (browse, insects, drought, flood) and time without those disturbances. These processes generally are referred to as “natural succession.” The shift from the Rhizomatous Wheatgrass Plant Community (1.2) to the Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community (1.1) is dependent upon an increase of woody cover. Without sagebrush-killing disturbance, shrubs will increase on this ecological site even with proper grazing management. Improper grazing management may accelerate the rate of increase for woody species. The shift from the Wyoming Big Sagebrush/Rhizomatous Wheatgrass or Rhizomatous Wheatgrass Plant Communities is dependent upon sagebrush-killing disturbances such as drought, flood, browse, and insects. Management actions can and are often used to mimic these processes through mechanical and chemical treatments. Prescribed fire is not often used on this site due to current land uses and lack of fuels and adequate burn windows (Clause and Randall, 2014).

Community 1.1

Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community



Figure 9. Typical landscape of Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community. Sublette County, Wyoming

This community can occur over time without disturbance (i.e. “natural succession”), or it can be accelerated with moderate herbaceous grazing pressure. Wyoming big sagebrush is dominant with sagebrush foliar cover ranging from 10-20 percent. At this level of sagebrush cover in this precipitation zone, there is competition between the shrub overstory and the herbaceous understory (Winward, 2007). A Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community with a degraded understory is an “at-risk” community, particularly when occurring homogeneously across the landscape. There are generally few canopy gaps, and most basal gaps are moderate (1-2 feet). Rock cover on the soil surface is low. Many plant interspaces have canopy or litter cover. Production of grasses is slightly lower than in the Rhizomatous Wheatgrass Plant Community (1.2).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	202	303	404
Shrub/Vine	202	303	404
Forb	45	67	90
Total	449	673	898

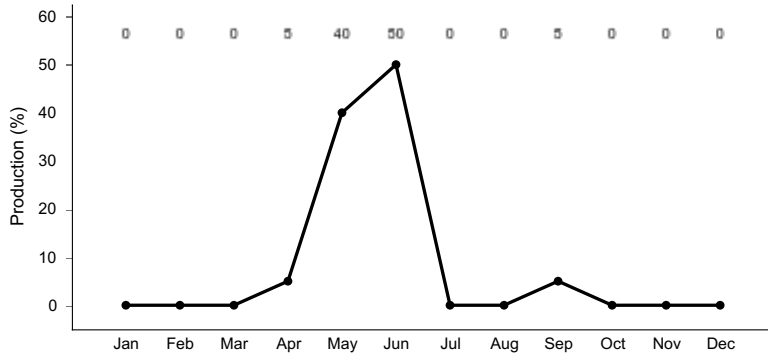


Figure 11. Plant community growth curve (percent production by month). WY0301, 34AC, Upland Sites. All Upland Sites.

Community 1.2 Rhizomatous Wheatgrass Plant Community



Figure 12. Typical landscape of Rhizomatous Wheatgrass Plant Community. Sublette County, Wyoming.

Rhizomatous wheatgrasses dominate in the Rhizomatous Wheatgrass Plant Community (1.2) with sagebrush subdominant and foliar cover ranging from 0-10 percent. At this sagebrush canopy level in this precipitation zone, there is little if any competition between the shrub overstory and the herbaceous understory. In fact, there is evidence to suggest that the understory receives more benefit from the sage overstory than negative effects. (Winward, 2007) In the Rhizomatous Wheatgrass Plant Community (1.2), there are generally fewer canopy gaps, and most basal gaps are generally 1-2 feet. Rock cover on the soil surface essentially is nonexistent. Many plant interspaces have canopy or litter cover. Production of grasses is higher than in the Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community (1.1), and shrub production is lower with more diversity, including sprouting shrubs.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	269	404	538
Shrub/Vine	135	202	269
Forb	45	67	90
Total	449	673	897

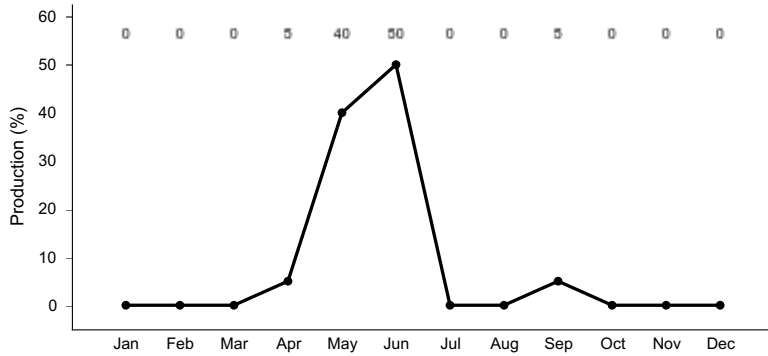


Figure 14. Plant community growth curve (percent production by month). WY0301, 34AC, Upland Sites. All Upland Sites.

Pathway 1.1a Community 1.1 to 1.2



Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community



Rhizomatous Wheatgrass Plant Community

The plant community shift from Plant Community 1.1 to 1.2 (1.1a) is dependent on an increase in the disturbance regime, to include increased herbivory, flooding, drought, disease, and/or another sagebrush-killing events, such as chemical, biological, or mechanical sagebrush treatments, or a combination of factors.

Pathway 1.2b Community 1.2 to 1.1



Rhizomatous Wheatgrass Plant Community



Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community

The plant community shift for Plant Community 1.2 to 1.1 (1.2b) is dependent upon a reduction or removal of natural disturbances such as flooding, drought, and disease, resulting in an increase in sagebrush cover and composition.

State 2 Bare Ground State

Community 2.1 Wyoming Big Sagebrush/Bare Ground Plant Community



Figure 15. Typical landscape of Wyoming Big Sagebrush/Bare Ground Plant Community. Sublette County, Wyoming.

This plant community is the result of improper grazing. Improper grazing is defined as either high- or low-intensity grazing without the appropriate recovery period. Wyoming big sagebrush dominates with annual production often exceeding 40 percent. There is mostly bare ground between sagebrush plants with an understory of grass and forbs limited to the protected areas under shrubs. The major grasses include Sandberg bluegrass and rhizomatous wheatgrass. The total annual production (air-dry weight) of this state is about 400 pounds per acre, but it can range from about 200 lbs./acre in unfavorable years to about 600 lbs./acre in above-average years. Soil erosion is accelerated because of increased bare ground. The biotic community has been compromised but is relatively stable. The watershed is functioning but is at risk of further degradation. Water flow patterns and pedestals are obvious. Infiltration is reduced, and runoff is increased.

State 3 Disturbed State

Community 3.1 Rabbitbrush/Rhizomatous Wheatgrass Plant Community



Figure 16. Typical landscape of Rabbitbrush/Rhizomatous Wheatgrass Plant Community. Sublette County, Wyoming.

This plant community is the result of soil-disturbing activities such as hoof action, anthropogenic activity, rodent activity, and frequent flooding, which includes occasional irrigation. It can also occur after brush management followed by improper grazing techniques that usually include high-intensity grazing without appropriate recovery periods. Rhizomatous wheatgrass is the dominant grass. With sagebrush removed, green rabbitbrush will be the dominant shrub, often exceeding 10-20 percent of the annual production. Subdominant understory species include bottlebrush squirreltail, Sandberg bluegrass, and unpalatable annual and perennial forbs. There is a substantial amount of bare ground. 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 450 lbs./acre in above-average years. The soil is not protected, and erosion will increase if management is not changed. The biotic integrity may be reduced due to

low vegetative production. The watershed is functioning-at-risk.

State 4 Highly Disturbed State

Community 4.1 Annuals Plant Community

As part of succession, all ecological sites that are severely disturbed will go through this plant community as part of their restoration. Weather is the largest determining factor in how long a site will be in this plant community phase but is approximately 2-5 years on sites that use Best Management Practices for site restoration (<http://www.uwyo.edu/wrrc/>). The Clayey Pinedale Plateau ecological site has low potential for recovery. Seeding is needed to restore functional structural groups. Productivity in this plant community phase is highly variable based on the current year's weather, and can range from 100 lbs./ac. or less up to 600 lbs./ac., with representative value of 200 lbs./ac.

Community 4.2 Reclaimed Plant Community

This plant community is highly variable based on weather conditions during restoration activities, the management practices used to implement the restoration, the seed mix, and how soil was stockpiled during the disturbance. However, if revegetation is successful, this site has the potential to provide similar productivity to the Reference State. Forage value will depend on the proportion of palatable species for the kind and class of animal in the seed mix, and the successful establishment of seeded forage species.

State 5 Pasture State

Community 5.1 Dryland Plant Community

See Clayey Forage Suitability Group (FSG) for MLRA 34A LRU E (10-14" ppt, <70 day growing season) for more information at https://efotg.sc.egov.usda.gov/references/public/WY/mlra34A_fsg_clayey_lru_E_.pdf This FSG covers moderately deep to deep soils with clay loam or heavier soil textures and greater than 6" available water-holding capacity (AWC) in the top 60" of the soil profile. Production expected to range from 500 to 900 lbs./ac. with representative value (RV) of 700 lbs./ac. Adapted species for use as dryland pasture include native species such as Indian ricegrass, big bluegrass, basin wildrye, slender wheatgrass, and western wheatgrass; introduced species including crested wheatgrass, Russian wildrye, sheep fescue, and tall wheatgrass; and forb and shrub species such as sweetclover, forage kochia, winterfat, and four-wing saltbush. Selection of species should be based on production goals and intended use (goals and objectives). More information regarding adapted species for dryland can be found at https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/mtpmspu1138.pdf

Community 5.2 Irrigated Plant Community

See Clayey Forage Suitability Group (FSG) for MLRA 34A LRU E (10-14" ppt, <70 day growing season) for more information at https://efotg.sc.egov.usda.gov/references/public/WY/mlra34A_fsg_clayey_lru_E_.pdf This FSG covers moderately deep to deep soils with clay loam or heavier soil textures and greater than 6" available water-holding capacity (AWC) in the top 60" of the soil profile. Production expected to range from 2,000 to 4,000 lbs./ac. with representative value (RV) of 3,000 lbs./ac. Adapted species for use as irrigated pasture include native species such as Idaho fescue, prairie junegrass, blue wildrye, slender wheatgrass, western wheatgrass, and tufted hairgrass; introduced species including meadow brome, timothy, orchardgrass, beardless wildrye, Altai wildrye, red fescue, sheep fescue, tall fescue, creeping meadow foxtail, Canada bluegrass, Kentucky bluegrass; and forb and shrub species such as cicer milkvetch, birdsfoot trefoil, small burnett, white clover, alsike clover, red clover, and strawberry clover. Selection of species should be based on production goals and intended use (goals and objectives). More information regarding adapted species for irrigated pasture can be found at https://www.nrcs.usda.gov/wps/PA_NRCSCconsumption/download?cid=nrcseprd401859&ext=pdf or at

Transition T1A

State 1 to 2

The driver for transition T1A from State 1 (Reference State) to State 2 (*Bare Ground*) is low to high intensity, long duration, and high frequency herbivory events.

Transition T1B

State 1 to 3

The driver for transition T1B from State 1 (Reference State) to State 3 (Disturbed) is an increase in soil-disturbing activity such as hoof action, anthropogenic activity, rodent activity, or occasional flooding.

Transition T1C

State 1 to 4

All states will transition to State 4 (Highly Disturbed) when severe soil disturbance occurs (removal of topsoil).

Transition T1D

State 1 to 5

All states will transition to State 5 (Pasture) if landuse converted to pasture. Pasture is defined as land composed of introduced or domesticated native forage species that is used primarily for the production of livestock. Pastures receive periodic renovation and cultural treatments, such as tillage, fertilization, mowing, weed control, and may be irrigated. Pastures are not in rotation with crops.

Restoration pathway R2A

State 2 to 1

Restoration is possible with sagebrush treatment. Mowing may be the best tool to increase residual and litter in smaller size classes to mulch the site for moisture retention. However, other mechanical tools such as a harrow or aerator should be considered if there is soil crusting and range seeding will be implemented. Chemical treatment could be considered, especially if rabbitbrush densities are higher than desired, but 2,4-DLVE is recommended over tebuthiuron. Tebuthiuron is not recommended due to the high clay content in these soils. Contact the University of Wyoming Extension Service or local Weed & Pest District for appropriate rates and timing. Temporary rest or deferment from grazing is needed to allow an herbaceous response which may take two to several years. If an herbaceous response does not occur or accelerated restoration is desired, a range seeding may be required.

Transition T2A

State 2 to 3

The driver for transition T2A from State 2 (*Bare Ground*) to State 3 (Disturbed) is an increase in soil-disturbing activity such as hoof action, anthropogenic activity, rodent activity, or occasional flooding.

Transition T2B

State 2 to 4

All states will transition to State 4 (Highly Disturbed) when severe soil disturbance occurs (removal of topsoil).

Transition T2C

State 2 to 5

All states will transition to State 5 (Pasture) if landuse converted to pasture. Pastures receive periodic renovation and cultural treatments, such as tillage, fertilization, mowing, weed control, and may be irrigated. Pastures are not in rotation with crops.

Transition T3A State 3 to 4

All states will transition to State 4 (Highly Disturbed) when severe soil disturbance occurs (removal of topsoil).

Transition T3B State 3 to 5

All states will transition to State 5 (Pasture) if land use converted to pasture. Pasture definition - land composed of introduced or domesticated native forage species that is used primarily for the production of livestock. Pastures receive periodic renovation and cultural treatments, such as tillage, fertilization, mowing, weed control, and may be irrigated. Pastures are not in rotation with crops.

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 Mid-Size Cool Season Grasses			22–67	
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	7–34	1–5
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	7–34	1–5
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–34	0–5
	muttongrass	POFE	<i>Poa fendleriana</i>	0–34	0–5
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	0–34	0–5
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–34	0–5
2	Rhizomatous Grasses			56–168	
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	67–168	10–25
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	67–168	10–25
3	Misc. Grasses/Grasslikes			22–67	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	7–67	1–10
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0–34	0–5
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	0–34	0–5
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–34	0–5
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–34	0–5
Forb					
4	Perennial Forbs			18–61	
	buckwheat	ERIOG	<i>Eriogonum</i>	7–34	1–5
	spiny phlox	PHHO	<i>Phlox hoodii</i>	7–34	1–5
	lupine	LUPIN	<i>Lupinus</i>	0–34	0–5
	aster	SYMPH4	<i>Symphotrichum</i>	0–34	0–5
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	0–20	0–3
	ragwort	SENEC	<i>Senecio</i>	0–20	0–3
	fleabane	ERIGE2	<i>Erigeron</i>	0–20	0–3
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–20	0–3
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	0–20	0–3
	flaxleaf plainsmustard	SCLI	<i>Schoenocrambe linifolia</i>	0–20	0–3

	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	0–20	0–3
	agoseris	AGOSE	<i>Agoseris</i>	0–20	0–3
	pussytoes	ANTEN	<i>Antennaria</i>	0–20	0–3
	milkvetch	ASTRA	<i>Astragalus</i>	0–20	0–3
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	0–20	0–3
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	0–20	0–3
	bluebells	MERTE	<i>Mertensia</i>	0–20	0–3
	beardtongue	PENST	<i>Penstemon</i>	0–20	0–3
	hollyleaf clover	TRGY	<i>Trifolium gymnocarpon</i>	0–7	0–1
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–7	0–1
	sagebrush buttercup	RAGL	<i>Ranunculus glaberrimus</i>	0–7	0–1
	western wallflower	ERAS2	<i>Erysimum asperum</i>	0–7	0–1
	desertparsley	LOMAT	<i>Lomatium</i>	0–7	0–1
	larkspur	DELPH	<i>Delphinium</i>	0–7	0–1
	rockcress	ARABI2	<i>Arabis</i>	0–7	0–1
	sandwort	ARENA	<i>Arenaria</i>	0–7	0–1
	onion	ALLIU	<i>Allium</i>	0–7	0–1
	Indian paintbrush	CASTI2	<i>Castilleja</i>	0–7	0–1
	pale bastard toadflax	COUMP	<i>Comandra umbellata</i> ssp. <i>pallida</i>	0–7	0–1
	clover	TRIFO	<i>Trifolium</i>	0–7	0–1
	violet	VIOLA	<i>Viola</i>	0–7	0–1
	cryptantha	CRYPT	<i>Cryptantha</i>	0–7	0–1
	stonecrop	SEDUM	<i>Sedum</i>	0–7	0–1
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–7	0–1
5	Annual Forbs			0–7	
	Forb, annual	2FA	<i>Forb, annual</i>	0–7	0–1
	bushy bird's beak	CORA5	<i>Cordylanthus ramosus</i>	0–7	0–1
	rockjasmine	ANDRO3	<i>Androsace</i>	0–7	0–1
Shrub/Vine					
6	Shrubs			90–269	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	135–269	20–40
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	0–269	0–40
7	Misc Shrubs			11–34	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–34	0–5
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–34	0–5
	little sagebrush	ARARL	<i>Artemisia arbuscula</i> ssp. <i>longiloba</i>	0–34	0–5
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0–34	0–5
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	7–34	1–5
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–20	0–3
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	0–20	0–3
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	0–20	0–3
	granite prickly phlox	LIPU11	<i>Linanthus pungens</i>	0–20	0–3

	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-7	0-1
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	0-7	0-1

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Perennial Mid-Size Cool Season Bunchgrasses			34-101	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34-101	5-15
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	34-101	5-15
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-67	0-10
	muttongrass	POFE	<i>Poa fendleriana</i>	0-67	0-10
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	0-34	0-5
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0-34	0-5
2	Rhizomatous Grasses			78-235	
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	67-235	10-35
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	67-235	10-35
3	Misc Grasses/Grasslikes			22-67	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	7-67	1-10
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0-34	0-5
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	0-34	0-5
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0-34	0-5
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-34	0-5
Forb					
4	Perennial Forbs			18-61	
	buckwheat	ERIOG	<i>Eriogonum</i>	7-34	1-5
	lupine	LUPIN	<i>Lupinus</i>	0-34	0-5
	aster	SYMPH4	<i>Symphyotrichum</i>	0-34	0-5
	spiny phlox	PHHO	<i>Phlox hoodii</i>	7-34	1-5
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	0-20	0-3
	flaxleaf plainsmustard	SCLI	<i>Schoenocrambe linifolia</i>	0-20	0-3
	ragwort	SENEC	<i>Senecio</i>	0-20	0-3
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-20	0-3
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	0-20	0-3
	fleabane	ERIGE2	<i>Erigeron</i>	0-20	0-3
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	0-20	0-3
	bluebells	MERTE	<i>Mertensia</i>	0-20	0-3
	beardtongue	PENST	<i>Penstemon</i>	0-20	0-3
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	0-20	0-3
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	0-20	0-3
	agoseris	AGOSE	<i>Agoseris</i>	0-20	0-3
	pussytoes	ANTEN	<i>Antennaria</i>	0-20	0-3
	milkvetch	ASTRA	<i>Astragalus</i>	0-20	0-3

	Indian paintbrush	CASTI2	<i>Castilleja</i>	0–7	0–1
	pale bastard toadflax	COUMP	<i>Comandra umbellata ssp. pallida</i>	0–7	0–1
	rockcress	ARABI2	<i>Arabis</i>	0–7	0–1
	sandwort	ARENA	<i>Arenaria</i>	0–7	0–1
	onion	ALLIU	<i>Allium</i>	0–7	0–1
	cryptantha	CRYPT	<i>Cryptantha</i>	0–7	0–1
	larkspur	DELPH	<i>Delphinium</i>	0–7	0–1
	western wallflower	ERAS2	<i>Erysimum asperum</i>	0–7	0–1
	desertparsley	LOMAT	<i>Lomatium</i>	0–7	0–1
	hollyleaf clover	TRGY	<i>Trifolium gymnocarpon</i>	0–7	0–1
	clover	TRIFO	<i>Trifolium</i>	0–7	0–1
	violet	VIOLA	<i>Viola</i>	0–7	0–1
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–7	0–1
	stonecrop	SEDUM	<i>Sedum</i>	0–7	0–1
	sagebrush buttercup	RAGL	<i>Ranunculus glaberrimus</i>	0–7	0–1
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–7	0–1
5	Annual Forbs			0–7	
	Forb, annual	2FA	<i>Forb, annual</i>	0–7	0–1
	rockjasmine	ANDRO3	<i>Androsace</i>	0–7	0–1
	bushy bird's beak	CORA5	<i>Cordylanthus ramosus</i>	0–7	0–1
Shrub/Vine					
6	Shrubs			45–135	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	34–135	5–20
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	0–135	0–20
7	Misc Shrubs			22–67	
	little sagebrush	ARARL	<i>Artemisia arbuscula ssp. longiloba</i>	0–34	0–5
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0–34	0–5
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	7–34	1–5
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–34	0–5
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–34	0–5
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	0–20	0–3
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	0–20	0–3
	granite prickly phlox	LIPU11	<i>Linanthus pungens</i>	0–20	0–3
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–20	0–3
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–7	0–1
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	0–7	0–1

Animal community

The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions with a harvest efficiency (HE) of 25 percent. 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). A field visit is required to document actual plant composition and production. More precise carrying capacity estimates, considering forage preference and accessibility (slope, distance to water, etc.), should be calculated

using this information, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies (up to 35 percent) can result in an increased carrying capacity, but recovery time for upland sites is much longer. If distribution problems occur, stocking rates should be reduced or facilitating conservation practices (i.e., cross-fencing, water development) implemented to maintain plant health and vigor.

Stocking rates are expressed in Animal Unit Months (AUMs) which is defined as the amount of forage consumed by a 1,000 lb. cow with a less than 4 month old calf at her side.

Plant Community Production (lbs./ac.) Initial Suggested Stocking Rate (AUMs/ac.)* Ac./AUM

1.1 ARTRW8/ELLAL	400-600-800	0.07	14
1.2 ELLAL	400-600-800	0.1	10
2.1 ARTRW8/BG	200-400-600	0.03	33
3.1 CHVI8/ELLAL	100-200-450	0.05	20
4.1 Annuals	100-300-600	0.04	24
4.2 Reclaimed	400-600-800	0.08	13
5.1 Dryland Pasture	500-700-900	0.19	5
5.2 Irrigated Pasture	2000-3000-4000	0.82	1.25

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

Calculation for stocking rates are as follows: Using RV values for production, take forage palatable to grazing cattle and multiply by 0.25 HE and divide by 912.5 lbs./AUM air-dry weight (ADW) to arrive at the initial suggested stocking rate in AUMs/acre.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide year-long forage for cattle, sheep, or horses. During the dormant period, the forage for livestock must be supplemented with protein because the quality does not meet minimum livestock requirements.

Distance to water, shrub density, and slope can affect grazing capacity within a management unit. Adjustments should be made for the area that is considered necessary for reduction of animal numbers. For example, 30 percent of a management unit may have 25 percent slopes and distances of greater than one mile from water; therefore the adjustment is calculated for 30 percent of the unit (i.e. 50 percent reduction on 30 percent of the management unit). Fencing, slope length, management, access, terrain, kind and class of livestock, and breeds are all factors that can increase or decrease the percent of grazeable acres within a management unit. Adjustments should be made that incorporate these factors when calculating stocking rates.

Wildlife:

Reference State:

1.1 WY Big Sagebrush/Perennial Grass: This community phase provides good transitional and summer habitat for greater sage-grouse, mule deer, pronghorn, and elk. Suitable thermal and escape cover for mule deer exists. A diverse suite of herbaceous species also provide important micronutrient requirements for big game species throughout the year. These areas also provide high quality bird-nesting habitat where sagebrush canopy and residual bunchgrasses hide nests and young from predators. This community can be used as migration and stopover habitat by big game, but is generally a small component of the landscape. Spring green-up of grass is an important nutritional component of this community for migrating big game.

1.2 Rhizomatous Wheatgrass: Suitable thermal and escape cover for mule deer and pronghorn may be limited due to the low density of woody plants. However, sagebrush is a very important winter forage for mule deer and antelope. Year-round habitat is provided for greater sage-grouse and many other sagebrush obligate species such as sage sparrow, Brewer's sparrow, sage thrasher, pygmy rabbit, sagebrush vole, horned lizard, and pronghorn. Open spaces in sagebrush canopy are potential sage grouse lek locations. Other birds that would frequent this plant community include horned larks and golden eagles.

2. *Bare Ground*

2.1 WY Big Sagebrush/*Bare Ground*: This community phase provides potential foraging habitat for big game and greater sage-grouse when the sagebrush plants are in a healthy condition. If the sagebrush is old and has poor leader production, it may not be providing quality forage for browsing animals. The lack of herbaceous species limits

the species diversity, thus the value of the site for birds and small mammals is likely less than the Reference State due to the lack of cover in the interspaces of the sagebrush plants. The lack of plant diversity also limits the diversity of insects used by wildlife species.

3. Disturbed: These communities provide limited forage for pronghorn and mule deer due to low production and lack of sagebrush. They may be used as a foraging site by sage grouse if proximal to woody cover, or seasonally used by cottontail or jack rabbits. The overall dominance of rabbitbrush is generally not ideal to support a wide variety of wildlife.

4. Highly Disturbed State:

4.1 Annuals: This community phase is highly variable in its value to wildlife. It typically is less diverse, has lower forage value, and has limited structure that wildlife need for cover. This state is vulnerable to repeated disturbance which can result in a complete loss of value for wildlife. In addition, sites in this state are more susceptible to invasion of non-native species, further degrading the value for wildlife.

4.2 Reclaimed: This community phase is highly variable in its value to wildlife. Reclamation success, size and configuration of the reclaimed area, the species planted, and the time it takes for plants to establish will determine the value of the site for wildlife. A fully reclaimed site containing a diversity of herbaceous and woody native plants can eventually provide the same wildlife habitat benefits as the Reference State. In most cases, grasses and forbs establish early in the reclamation process, whereas shrubs take significantly longer to establish. Wildlife species dependent upon herbaceous plant communities for forage will benefit from reclamation sooner than those species dependent upon a mixed shrub/grass community. Suitable habitat for wildlife species that require tall, dense sagebrush (greater sage-grouse, pronghorn, mule deer, and sagebrush obligate songbirds) will likely take several decades to achieve providing appropriate shrub species were planted. It is possible to achieve successful, diverse reclamation on linear disturbances (i.e., pipelines) without seeding shrubs, but it will likely take longer than a decade for seed from shrubs adjacent to the area to establish on-site.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group C, with localized areas in hydrologic group D. Infiltration ranges from very slow to moderately slow. Runoff potential for this site varies from moderate to high, depending upon soil hydrologic group and ground cover. In many cases, lesser sloping areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. Greater sloping areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrologic 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 and shrubs. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are sometimes present on this site.

Recreational uses

This site provides some limited recreational opportunities for hiking, horseback riding, bird watching, and upland game hunting. The forbs have a variety of colors and shapes that appeal to photographers. This site provides valuable open space when located in large, unfragmented landscapes.

Wood products

No wood products are associated with the Clayey Pinedale Plateau ecological site.

Other products

No other products are associated with the Clayey Pinedale Plateau ecological site.

Other information

Site is provisional (2019). History of site development: Range Site Clayey Foothills and Basins West (Cy 10-14W)

published in 1988. Site converted to provisional Ecological Site Description in 2005 (pdf format) and entered into ESIS. Range health reference worksheet completed in 2007. Pinedale Plateau LRU designation occurred in 2012. Site concept updated for new LRU designation (provisional status) in 2019.

Inventory data references

Information presented was derived from: 1988 Range Site Descriptions - Clayey Foothills and Basins West (10-14W) MLRA 34A Cool Desertic Basins and Plateaus, historic NRCS clipping data, literature, Sublette Soil Survey field observations (based on five paired plot sampled sites in 2018 in the Reference State), observations from numerous others, and personal contacts with range-trained personnel (i.e., agency specialists, landowners, land managers, and scientists).

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Contributors

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Approval

Kirt Walstad, 9/28/2023

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	04/30/2019
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to Rare. Some very minor rills (less than 12 in. or 30 cm) may occur after a major thunderstorm event or spring runoff. Rills may also occur in areas of greater slope (>8%) and adjacent to areas with exposed bedrock, but should heal during the following growing season

2. **Presence of water flow patterns:** Barely observable. Some minor evidence of water flow patterns may be found winding around perennial plant bases with little evidence of erosion and they are short; less than 6 ft (2 m) long, less than 1 ft (30 cm) wide, and disconnected.

3. **Number and height of erosional pedestals or terracettes:** None to Rare. Pedestals may occur on slopes greater than 8%. Roots are not exposed with blunted features and are not active.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically 15% - 30%. Bare ground is scattered throughout this site and patches are not connected. Higher bare ground is expected after a sagebrush killing event, but returns to less than 30% within 2 years post disturbance.

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

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 only in short distances (to leeward side of shrubs) due to wind. Large woody debris from sagebrush will show no movement.

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 2 in the interspaces to 6 under plant canopy, but average values should be 4.0 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil organic matter (SOM) <2% is common. Color and structure are difficult indicators to assess in semiarid soils because SOM potential is naturally low. Typically, the soil surface consists of an A-horizon of 1-6 inches (3-16 cm) thick with strong medium granular structure and a subsurface that is medium to strong subangular blocky or prismatic structure. The surface is typically brown to grayish brown (i.e. 10YR 4/3 to 5/2) with a similar colored subsurface. Field indicators of

departure from the reference condition include exposure of subsoil as evidenced by excessive pedestalling and/or surface disturbance.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community composition by dry weight consists of 45-60% grasses, 10% forbs, and 30-45% shrubs. Evenly distributed plant canopy (30-50% foliar cover), litter and moderately slow to very slow permeability result in slight runoff. The shrub component is important for snow trapping and the herbaceous component is important for reducing runoff from short intense thunderstorms. Basal cover is typically less than 5% for this site and does very little to effect runoff on this site.
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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):** None, but soil cracking and crusting in dry conditions is typical. Soil probe refusal may result in a mis-identification of a compaction layer, and must be described by hand dug holes.
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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: 1.1 sagebrush (1 species)

1.2 rhizomatous grasses (2 species)

Sub-dominant: 1.1 rhizomatous grasses (2 species)

1.2 sagebrush (1 species)

Other: Minor:

1.1 mid-size cool season bunchgrasses (2 species)

short, cool season bunchgrasses (1 species)

perennial forbs (2 species)

sprouting shrubs (1 species)

1.2 mid-size cool season bunchgrasses (2 species)

short, cool season bunchgrasses (2 species)

sprouting shrubs (1 species)

perennial forbs (2 species)

Trace:

annual forbs (2 species)

Additional: 12a. Relative dominance of functional/structural groups.

1.1 mid-size cool season bunchgrasses > short, cool season bunchgrasses > perennial forbs > sprouting shrubs >> annual forbs

1.2 mid-size cool season bunchgrasses > short, cool season bunchgrasses = sprouting shrubs > perennial forbs >> annual forbs

12b. Functional/Structural groups not expected:

annual grasses

12c. Number for functional/structural groups: 7

12d. Number of species in dominant/sub-dominant f/s groups: 3

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 15-40% of total canopy measurement with total litter (including beneath the plant canopy) from 45-70% expected. Herbaceous litter depth typically ranges from 1-5mm. Woody litter can be up to 1-2.5 inches (4-6 cm) in diameter.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** English: 400-800 lb/ac (600 lb/ac average); Metric 448-897 kg/ha (673 kg/ha average).

1.1

PERENNIAL MID-SIZE COOL SEASON GRASSES (5-10%)

RHIZOMATOUS GRASSES (10-25%)

MISC. GRASSES/GRASSLIKES (5-10%)

PERENNIAL FORBS (5-9%)

ANNUAL FORBS (0-1%)

SAGEBRUSH (20-40%)

MISC. SHRUBS (0-5%)

1.2

PERENNIAL MID-SIZE COOL SEASON GRASSES (5-15%)

RHIZOMATOUS GRASSES (10-35%)

MISC. GRASSES/GRASSLIKES (5-10%)

PERENNIAL FORBS (5-9%)

ANNUAL FORBS (0-1%)

SAGEBRUSH (5-20%)

MISC. SHRUBS (5-10%)

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:** Annual weeds such as halogeton, kochia, mustards such as desert alyssum and flixweed, lambsquarter, and Russian thistle are common species to invade disturbed sites. Cheatgrass (*Bromus tectorum*) and hoary alyssum (*Berteroa incana*) are emerging invasive species to this LRU, but have not been found on this site. Other noxious weeds that could potentially invade this site: Canada thistle (*Cirsium arvense*) and whitetop (*Cardaria draba*). Greasewood (*Sarcobatus vermiculatus*) is a native shrub that can encroach from adjacent salt affected sites.
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17. **Perennial plant reproductive capability:** All species are capable of reproducing, except in drought years. Thickspike wheatgrass will commonly reproduce by underground rhizomes and not by seed production.
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