USDA Natural Resources Conservation Service

Ecological site R048AY465UT
Mountain Very Steep Loam (Oak)

Last updated: 3/01/2024
Accessed: 05/03/2024

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.

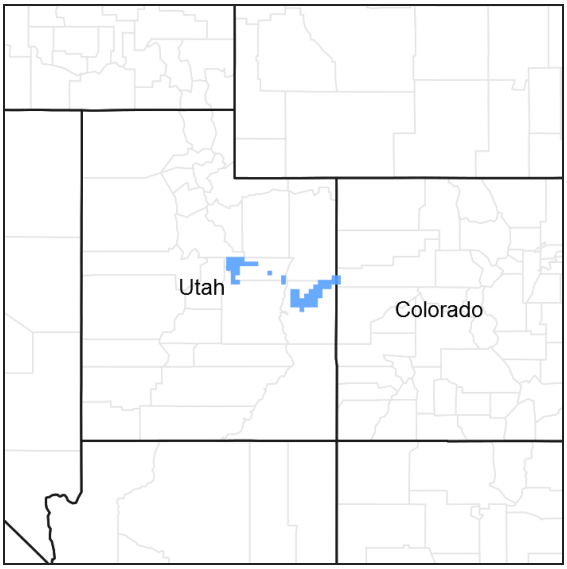


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 048A–Southern Rocky Mountains

MLRA 48A makes up about 45,920 square miles (119,000 square kilometers) and is the southern part of the Rocky Mountains. The Southern Rocky Mountains lies east of the Colorado Plateau, south of the Wyoming Basin, west of the Great Plains, and north of the Rio Grande Rift. It is in western and central Colorado, southeastern Wyoming, eastern Utah, and northern New Mexico. The headwaters of major rivers such as the Colorado, Yampa, Arkansas, Rio Grande, North Platte and South Plate rivers are located here. This MLRA has numerous national forests, including the Medicine Bow National Forest in Wyoming; the Routt, Arapaho, Roosevelt, Pike, San Isabel, White River, Gunnison, Grand Mesa, Uncompahgre, Rio Grande, and San Juan National Forests in Colorado; the Carson National Forest and part of the Santa Fe National Forest in New Mexico. Rocky Mountain National Park also is in this MLRA.

MLRA 48A is the southern Rocky Mountains physiographic region. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. It is characterized by mountain ranges that were uplifted during the Laramide Orogeny and then had periods of glaciation. The ranges include the Sangre de Cristo Mountains, the Laramie Mountains, and the Front Range in the east and the San Juan Mountains and the Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and glaciers. Elevation typically

ranges from 6,500 to 14,400 feet (1,980 to 4,390 meters) in this area. The part of this MLRA in central Colorado includes the highest point in the Rockies, Mount Elbert, which reaches an elevation of 14,433 feet (4,400 meters). More than 50 peaks in the part of the MLRA in Colorado are at an elevation of more than 14,000 feet (4,270 meters). Many small glacial lakes are in the high mountains.

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. This large MLRA can be subdivided into at least 4 large general divisions. First is the Rockies on the east side of this area are called the “Front Range,” which is a fault block that has been tilted up on edge and uplifted and is largely igneous and metamorphic geology. It was tilted up on the east edge, so there is a steep front on the east and the west side is more gently sloping and in the south east there are rocks exposed in the mountains are mostly Precambrian igneous and metamorphic rocks. Second is the tertiary rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area (San Juan Mountains Area). The third division is Northwest part of the MLRA is dominantly sedimentary rock from the cretaceous/tertiary and Permian/ Pennsylvanian periods. The fourth subset is the long and narrow Sangre de Cristos mountains uplifted in the Cenozoic are between the Rio Grande rift and the great plains. Many of the highest mountain ranges were reshaped by glaciation during the Pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are important sources of sand and gravel.

The average annual precipitation ranges predominantly from 12 to 63 inches. Summer rainfall commonly occurs as high-intensity, convective thunderstorms. About half of the annual precipitation occurs as snow in winter; this proportion increases with elevation. In the mountains, deep snowpacks accumulate throughout the winter and generally persist into spring or early summer, depending on elevation. Some permanent snowfields and small glaciers are on the highest mountain peaks. In the valleys at the lower elevations, snowfall is lighter and snowpacks can be intermittent. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The freeze-free period averages 135 days and ranges from 45 to 230 days, decreasing in length with elevation. The climate of this area is strongly dependent upon elevation; precipitation is greater, and temperatures are cooler at the higher elevations. The plant communities vary with elevation, aspect and change in latitudes due to changing in precipitation kind and timing and temperature.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the area dominantly have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. Mineralogy is typically mixed, smectitic, or paramicaceous. In areas with granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on mountain slopes. Dystrocryepts (Leighcan and Mummy series) formed on mountain slopes and summits at the higher elevations. In areas of andesite and rhyolite bedrock, Dystrocryepts (Endlich and Whitecross series) formed in colluvium on mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on mountain slopes at low elevations and with low precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in colluvium on mountain slopes at high elevations.

Ecological site concept

The soils of this site formed mostly in interbedded colluvium derived from sandstone and shale and/or interbedded residuum weathered from sandstone and shale. Surface soils are very stony loam, fine sandy loam to loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are moderately deep to deep, well-drained, and have moderately slow to moderately rapid permeability. pH is slightly acidic to moderately alkaline. Available water-holding capacity ranges from 2 to 5 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 16 to 22 inches annually.

Associated sites

R048AY436UT	**Mountain Shallow Loam (Mountain Big Sagebrush)**

Similar sites

R048AY466UT	**Mountain Very Steep Loam (Salina Wildrye)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Quercus gambelii*
Herbaceous	(1) *Leymus salinus ssp. salinus*

Physiographic features

This ecological site typically is on mountain slopes. Sites are located between 6,000 to 9,000 feet in elevation. Slopes normally range from 5 to 80 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,829–2,743 m
Slope	50–80%
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

Average annual precipitation is 16 to 22 inches. Approximately 55 percent occurs as rain from May through October. On the average, November through June are the driest months and July through October are the wettest months. Cool temperatures and length of growing season are important environmental factors in this site. In average years, plants begin growth around April 20 and end growth around September 30.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	406-559 mm

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

The soils of this site formed mostly in interbedded colluvium derived from sandstone and shale and/or interbedded residuum weathered from sandstone and shale. Surface soils are very stony loam, fine sandy loam to loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are moderately deep to deep, well-drained, and have moderately slow to moderately rapid permeability. pH is slightly acidic to moderately alkaline. Available water-holding capacity ranges from 2 to 5 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 16-22 inches annually.

Modal Soil: Razorba Family – coarse-loamy, mixed Pachic Crypborolls

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone and shale (2) Residuum–sandstone and shale
Surface texture	(1) Fine sandy loam (2) Very stony loam (3) Loam
Family particle size	(1) Loamy-skeletal (2) Coarse-loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	51–152 cm
Soil depth	51–152 cm
Surface fragment cover <=3"	2–20%
Surface fragment cover >3"	0–25%
Available water capacity (Depth not specified)	5.08–12.7 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	3–20%
Subsurface fragment volume >3" (Depth not specified)	2–20%

Ecological dynamics

Reference State (State 1)
The reference state for the mountain loam (oak) site was determined by study of relic areas that have been protected from altered disturbance regimes and are considered to be representative of the historic climax plant community. Literature reviews, trends in plant community dynamics, and historical accounts are also considered.

State 1, the reference state, represents the historic plant communities of the mountain loam (oak) site and the naturally occurring dynamics associated with those communities. This state includes all known biotic communities that would exist under natural disturbance regimes and current climatic conditions. The dominant overstory species is Gambel oak (*Quercus gambelii*) with the understory dominated by the perennial bunchgrasses Salina Wildrye (*Leymus salinus* ssp. salinus), muttongrass (*Poa fendleriana*) and/or Bluebunch wheatgrass (Elymus spicata). The plant communities in state 1 are naturally resistant to disturbance and resilient following disturbance due to favorable amounts of precipitation and the ability of Gambel oak to resprout following disturbance. Wildfire is the predominant disturbance affecting ecological processes and is the primary factor driving plant community change in this state. The common fire return interval is 35-100 years and plant recovery following a wildfire is rapid, often with Gambel oak resprouting within the same growing season.

Community Phase 1.1 Gambel oak / Perennial Bunchgrasses
This plant community consists of mature Gambel oak trees that dominate the overstory and Salina Wildrye (*Leymus salinus* ssp. salinus), muttongrass (*Poa fendleriana*) and/or Bluebunch wheatgrass (Elymus spicata) that dominate the understory. Mountain brome, Geyer sedge, as well as other cool season grasses may be present. Common shrubs and forbs are mountain snowberry, Utah serviceberry, yarrow, and a suite of other species adapted to grow either in the interspaces or under the canopy of Gambel oak stands. Bare ground is not common and no non-native

plants are present.

Community Pathway 1.1a Wildfire --This pathway often occurs late in the growing season when precipitation is low and fuel load is at its peak. Gambel oak is at peak underground carbohydrate storage around this time of year, which provides the energy needed for resprouting.

Community Pathway 1.1b No Fire --This pathway is a subsequent step in natural succession that occurs when fire free periods approach their upper limits and allow fire sensitive species to encroach into Gambel oak sites.

Community Phase 1.2 Post-fire Community / Resprouting Gambel oak Thicket
This plant community consists of young Gambel oak shoots that are beginning to reestablish following a wildfire. Burned trunks will usually be visible above the new growth. The Gambel oak suckers often form dense thickets of foliage up to several feet in height which effectively intercept sunlight and crowd out potential invaders. Given adequate recovery time of a few months to a year, the interspaces will exhibit native buchgrasses and forbs, but few shrubs.

Community Pathway 1.2a Natural Succession—As the post-fire community ages, Gambel oak becomes less dominant near the soil surface, but maintains its dominance in the canopy. Perennial grasses become more robust and the plant community becomes more diverse with the establishment of shrubs and shade sensitive species.

Community Phase 1.3 Encroachment by Other Tree Species
This plant community is comparable in composition to community 1.1 with the addition of fire sensitive tree species such as Rocky mountain Douglas fir, Canyon maple, and/or white fir. The percent composition of these tree species is relatively low (3-5%).

Community Pathway 1.3a Wildfire-- This pathway often occurs late in the growing season when precipitation is low and fuel load is at its peak. Gambel oak also is at peak carbohydrate storage around this time of year, an adaptation which provides the energy needed to resprout and maintain its niche.

Transition 1-- Invasive Plants Transition from Reference State (State 1) to current Potential State (State 2)
This transition occurs when non-native or invasive species become established in the plant community. Common invasive species include Dalmation toadflax, Annual forbs, Dandelion, Houndstongue, Rubber rabbitbrush, Broom snakeweed, and Cheatgrass. Intermediate wheatgrass, Smooth brome, and Kentucky bluegrass may also spread into the site. Events that may facilitate the establishment of non-native plants are wildfire, introduction of livestock, seeding, and recreation.

Current Potential State (State 2)
State 2 is very similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of native species, and a different climate. State 2 is a description of the ecological site shortly following Euro-American settlement.

Community Phase 2.1 Gambel oak / Salina Wildrye
Phase 2.1 is 30-40% grasses, 5-15% forbs and 50-60% shrubs by air-dry weight. After a fire, Gambel oak sprouts vigorously and suppresses perennial grass and forb production. Non-native species are present, but not dominant.

Community Pathway 2.1a Wildfire -- This pathway often occurs late in the growing season when precipitation is low and fuel load is at its peak. Gambel oak is at peak underground carbohydrate storage around this time of year, which provides the energy needed for resprouting.

Community Pathway 2.1b No Fire -- This pathway is a subsequent step in natural succession that occurs when fire free periods approach their upper limits and allow fire sensitive species to encroach into Gambel oak sites.

Community Pathway 2.1c Prescribed Fire and Re-seed – This pathway occurs when land owners and/or land managers are attempting to improve the vigor of the native plant community.

Community Pathway2.1d Continuous Heavy Grazing – This pathway occurs when improper grazing continues for extended periods of time not allowing for native plants to recover, ultimately lowering the health and vigor of these plants to compete with available resources.

Community Phase 2.2 Resprouting Gambel oak thicket
Phase 2.2 Gambel oak stem density is less than phase 1.1, though oak production may be higher. Non-native species are present, but not dominant.

Community Pathway 2.2a Natural Succession on the site

Community Phase 2.3 Encroachment by other tree species
Phase 2.3 is characterized by encroachment of conifer species including Douglas fir, juniper and pinyon. Higher elevations of this ecological site are more susceptible to conifer encroachment. At lower elevations, this phase is characterized by decadent Gambel oak with patches of young sprouts. Gambel oak dies naturally around 80 years of age and promptly responds with vigorous young sprouts to replace the oak foliage. Native species are present, but not dominant

Community Pathway 2.3a Wildfire -- This pathway often occurs late in the growing season when precipitation is low and fuel load is at its peak. Gambel oak is at peak underground carbohydrate storage around this time of year, which provides the energy needed for resprouting.

Community Pathway 2.3b Brush Management (Fire) and re-seeding – Utilization of techniques such as prescribed fire and range seeding can reduce composition of invading conifers as well as temporarily reduce competition from oak to allow for the herbaceous component to become established.

Community Pathway 2.3c Continuous Heavy Grazing -- This pathway occurs when improper grazing continues for extended periods of time not allowing for native herbaceous plants and shrubs to recover, ultimately lowering the health and vigor of these plants to compete with available resources.

Community Phase 2.4 Seeded Gambel oak Woodland
Phase 2.4 is an aerial seeding following fire. Both native and non-native perennial grasses and forbs are included in most seed mixes. Under proper grazing, native grass and forb species can outcompete introduced species and dominate the understory within 5-10 years.

Community Pathway 2.4a Wildfire -- This pathway often occurs late in the growing season when precipitation is low and fuel load is at its peak. Gambel oak is at peak underground carbohydrate storage around this time of year, which provides the energy needed for resprouting.

Community Pathway 2.4b Natural Succession/prescribed grazing – This pathway can occur through natural succession and prescribed grazing. Over time the oak will begin to be the dominant aspect on the site, and with proper grazing management the herbaceous understory and shrubs will maintain health and vigor on the site.

Community Pathway 2.4c Continuous Heavy Grazing -- This pathway occurs when improper grazing continues for extended periods of time not allowing for native herbaceous plants and shrubs to recover, ultimately lowering the health and vigor of these plants to compete with available resources.

Community Phase 2.5 Overgrazed Gambel oak
Phase 2.5 displays a reduction in the herbaceous understory and/or shrub component do to improper grazing/browsing from livestock and/or wildlife.

Community Pathway 2.5a No Fire – lack of fire over time will allow other tree species to naturally encroach into the site.

Community Pathway 2.5b Brush Management (Mechanical) and re-seeding -- utilization of techniques such as mechanical brush management and range seeding can reduce composition of oak to allow for the herbaceous component to become established.

Community Pathway 2.5c Natural succession and prescribed grazing – practicing prescribed grazing over time will allow the herbaceous and shrub components to become established on this site.

Transition 2 Noxious Weed Invasion / Repeated Wildfires

Transition from State 2 to State 3

Transition 3 Prescribed Grazing (Goats)
Transition from State 2 to State 4

State 3 Noxious Weed State
State 3 is characterized by a dominance of non-native noxious weeds. The threshold has been crossed into State 3 and the dynamics of this site will likely prohibit the return back into State 2 without and extraordinary amount of external inputs.

Community Phase 3.1 Broadleaf weed dominates interspaces
Native herbaceous and/or shrubs have largely been replaced by prolific noxious weeds establishment which generally flourish in sites where there is a short fire return interval. This process makes it incredibly hard for native herbaceous species to become reestablished on the site. Gambel oak is able to remain on this site by utilizing available resources due to its extensive root system and its sprouting abilities following wildfire.

Community Pathway 3.1a Wildfire – The nature of this site with the abundance of noxious weeds/fine fuels shortens the fire return interval compared to the historic fire regime.

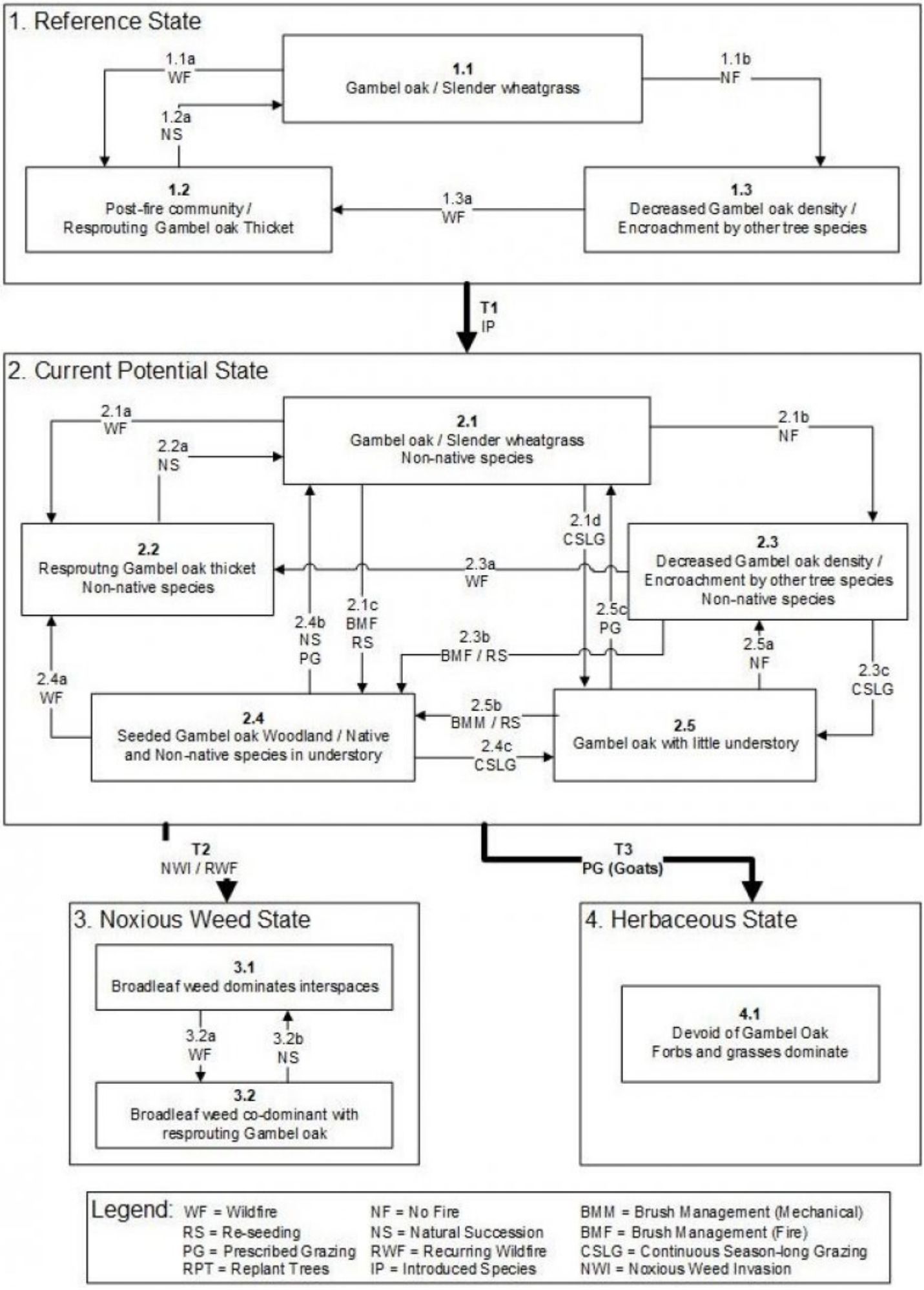
Community Phase 3.2 Weed co-dominant with resprouting Gambel oak
Following a wildfire, the herbaceous weed component and sprouting Gambel oak will dominate this site.

Community Pathway 3.2a Natural Succession – Do to the nature of this site, there is often a frequent fire return interval which will return this site back to Community Phase 3.1.

State 4: Herbaceous State:
Utilizing browsing animals such as goats, the threshold from State 2 is crossed in to this State. Browsing animals will shift the competitive advantage to the herbaceous component leaving the site devoid of Gambel oak and dominated by the herbaceous understory.

Community Phase 4.1 Devoid of Gambel oak

State and transition model


1. Reference State
1.1
Gambel oak / Slender wheatgrass
1.1a
WF
1.2a
NS
1.1b
NF
1.2
Post-fire community /
Resprouting Gambel oak Thicket
1.3a
WF
1.3
Decreased Gambel oak density /
Encroachment by other tree species
T1
IP
2. Current Potential State
2.1
Gambel oak / Slender wheatgrass
Non-native species
2.1a
WF
2.2a
NS
2.1b
NF
2.2
Resproutng Gambel oak thicket
Non-native species
2.3a
WF
2.1d
CSLG
2.3
Decreased Gambel oak density /
Encroachment by other tree species
Non-native species
2.4b
NS
PG
2.1c
BMF
RS
2.3b
BMF / RS
2.5c
PG
2.5a
NF
2.3c
CSLG
2.4a
WF
2.4
Seeded Gambel oak Woodland / Native
and Non-native species in understory
2.5b
BMM / RS
2.4c
CSLG
2.5
Gambel oak with little understory
T2
NWI / RWF
T3
PG (Goats)
3. Noxious Weed State
3.1
Broadleaf weed dominates interspaces
3.2a
WF
3.2b
NS
3.2
Broadleaf weed co-dominant with
resprouting Gambel oak
4. Herbaceous State
4.1
Devoid of Gambel Oak
Forbs and grasses dominate
Legend:
WF = Wildfire
RS = Re-seeding
PG = Prescribed Grazing
RPT = Replant Trees
NF = No Fire
NS = Natural Succession
RWF = Recurring Wildfire
IP = Introduced Species
BMM = Brush Management (Mechanical)
BMF = Brush Management (Fire)
CSLG = Continuous Season-long Grazing
NWI = Noxious Weed Invasion

State 1
Reference State

Community 1.1
Reference Plant Community

The dominant aspect of this site is Gambel oak and serviceberry. The composition by air-dry weight is approximately 35 percent perennial grasses, 10 percent forbs, and 55 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	340	586	833
Grass/Grasslike	215	372	529
Forb	62	106	151
Total	**617**	**1064**	**1513**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	39-41%
Grass/grasslike foliar cover	19-21%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-5%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	–	19-21%	–
>1.4 <= 4	–	39-41%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			437–673	
	Gambel oak	QUGA	*Quercus gambelii*	280–392	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	56–112	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	34–56	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	34–56	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	34–56	–
3	**Sub-Dominant Shrubs**			157–415	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–112	–
	longleaf brickellbush	BRLO	*Brickellia longifolia*	11–34	–
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	11–34	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	11–34	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	11–34	–
	Oregon boxleaf	PAMY	*Paxistima myrsinites*	11–34	–
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	11–34	–
	chokecherry	PRVI	*Prunus virginiana*	11–34	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	11–34	–
	Woods' rose	ROWO	*Rosa woodsii*	11–34	–
Grass/Grasslike					
0	**Dominant Grasses**			224–392	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	112–168	–
	muttongrass	POFE	*Poa fendleriana*	56–112	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	56–112	–
1	**Sub-Dominant Grasses**			112–336	
	Grass, annual	2GA	*Grass, annual*	34–56	–
	Grass, perennial	2GP	*Grass, perennial*	34–56	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	11–34	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	11–34	–
	mountain brome	BRMA4	*Bromus marginatus*	11–34	–
	Ross' sedge	CARO5	*Carex rossii*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	11–34	–
	needle and thread	HECO26	*Hesperostipa comata*	11–34	–
	spike fescue	LEKI2	*Leucopoa kingii*	11–34	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–34	–
Forb					
2	**Sub-Dominant Forbs**			168–224	
	Forb, annual	2FA	*Forb, annual*	168–224	–
	Forb, perennial	2FP	*Forb, perennial*	168–224	–
	common yarrow	ACMI2	*Achillea millefolium*	11–22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	11–22	–

	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	11–22	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	11–22	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	11–22	–
	Shockley's buckwheat	ERSH	*Eriogonum shockleyi*	11–22	–
	pineywoods geranium	GECA3	*Geranium caespitosum*	11–22	–
	Nevada pea	LALA3	*Lathyrus lanszwertii*	11–22	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	11–22	–
	creeping barberry	MARE11	*Mahonia repens*	11–22	–
	dusty beardtongue	PECO5	*Penstemon comarrhenus*	11–22	–
	Mt. Albert goldenrod	SOSI3	*Solidago simplex*	11–22	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	11–22	–
	American vetch	VIAM	*Vicia americana*	11–22	–

Animal community

This site is not grazed by livestock because of steep slopes.

This site produces food and cover for wildlife. Wildlife using this site include jackrabbit, coyote, mule deer, and elk.

Hydrological functions

The soil is in hydrologic group B. The runoff curve numbers are 61 through 79 depending on the condition of the watershed.

Recreational uses

This site has aesthetic appeal but very limited recreation potential.

Wood products

Firewood

Inventory data references

Type Location: See Carbon County, Grand County and Canyonlands soil survey reports

Contributors

George Cook, David Somerville

Approval

Kirt Walstad, 3/01/2024

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	03/16/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Many rills present. This site is subject to rilling even in reference condition due to slope, erodible soils, and percent bare ground. Rill development may increase following large storm events, but should begin to heal during the following growing season. Frost heaving will accelerate recovery. Rill development may increase when run inflow enters site from other sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop).

---

2. **Presence of water flow patterns:** Water flow patterns are common. Some are long (15-20'). They are generally very widely spaced (about 20-30' apart). Flow patterns occur in low places associated with microtopography commonly occurring on this site.

---

3. **Number and height of erosional pedestals or terracettes:** Plants may have small pedestals (1-3") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (1-3") and show little sign of active erosion. Some plants may appear to have a pedestal but rather than be formed by erosion, they are the result of litter and soil accumulating at plant bases, forming the appearance of a pedestal.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 15-30% bare ground (soil with no protection from raindrop impact). Very few if any bare spaces of greater than 1 square foot. In general, bare ground increases as production decreases. As species composition of shrubs relative to grasses increases, bare ground is likely to increase. Poorly developed biological soil crust that is susceptible to erosion from raindrop impact should be recorded as bare ground.

---

5. **Number of gullies and erosion associated with gullies:** None to very few. Gullies should show only minor signs of active erosion and should be mostly stabilized with perennial vegetation and rock fragments. Gullies may show slightly more indication of erosion as slope steepens, or as the site occurs adjacent to steep areas with concentrated flow patterns.

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of active wind-generated soil movement. Wind scoured (blowouts) and depositional areas are rarely present. If present they have muted features and are mostly stabilized with vegetation and/or biological crust.

---

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place but on steep slopes (>30%), at least half of the litter is likely to be transported downhill by wind or water short. Litter rarely moves more than 1-2' to next obstruction. Leaves, stems, and small twigs will accumulate at plant bases, against rocks, in soil

depressions, or against larger woody litter. Woody litter is not likely to move.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have an erosion rating of 4 to 5 under plant canopies and a rating of 3 to 4 in the interspaces with an average rating of 4 using the soil stability kit test.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A1--0 to 9 inches; dark grayish brown (10YR 4/2) channery sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; about 20 percent fine channery fragments; slightly effervescent; moderately alkaline; clear wavy boundary. (4 to 13 inches thick)

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Bunchgrasses and shrubs are more important than trees for enhancing infiltration and preventing runoff. Although tree canopies intercept rainfall and provide a barrier to raindrop impact, some evergreen trees such as pinyon and juniper may intercept so much rainfall that not enough water reaches the ground to supply the understory. In this situation, the soil beneath tree canopies is often unvegetated and susceptible to erosion. Bunchgrasses and shrubs, on the other hand, not only intercept rainfall, but contribute litter cover, soil organic matter, and physical stability to the soil. Bunchgrasses contribute organic matter directly to soil through root decay, and organic matter helps stabilize soil aggregates and maintain soil porosity. Shrubs hold snow and slow wind evaporation. Bunchgrass bases intercept litter and soil in water flow paths, reducing runoff. Biological soil crusts (where present) are resistant to raindrop impact and splash erosion. Spatial distribution of vascular plants and well-developed biological soil crusts (where present) provides detention storage and surface roughness that slows runoff, allowing time for infiltration. Water flow patterns are likely to develop under tree canopies, where herbaceous vegetation is sparse.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** A compaction layer is not expected.

---

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: Dominant: Sprouting shrub (Gambel oak) > perennial cool-season bunchgrasses (saline wildrye, muttongrass, bluebunch wheatgrass) > sprouting shrubs (Utah serviceberry, mountain snowberry)

    Sub-dominant: Sub-dominant: Non-sprouting shrubs (mountain big sagebrush) = trees (alderleaf mountain mahogany)

    Other: Other: Perennial forbs > other shrubs > other perennial grasses

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. Some mortality of bunchgrass and other shrubs may occur during very severe (long-term) droughts. Long-lived species dominate the site. Open spaces from disturbance are quickly filled by new plants through seedlings and asexual reproduction (tillering).

14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine (herbaceous) litter. Almost all litter is concentrated under plant canopies. Litter between plant canopies is very sparse. Average litter cover is 10-20% and average litter depth is 0.5-0.75 inches.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 900-1000 lbs/acre.
    Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.

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:** Cheatgrass, halogeton, kochia, Russian thistle, Utah juniper

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.