USDA Natural Resources Conservation Service

Ecological site R048AY315UT
Upland Clay Loam (Utah Juniper-Pinyon)

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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): 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 on this site formed in colluvium and/or slope alluvium over residuum weathered from sandstone, shale, calcareous sandstone and shale, and siltstone. Soils are moderately deep, well drained to well drained with moderately slow permeability. The surface textures are loam to clay loam. Soils have an available water capacity between 3 to 5 inches in the upper 40 inches of soil. The pH is between 7.4 and 8.4. The soil is calcareous with CaCO3 equivalent of 1 to 40 percent. The soil temperature and moisture regimes for this site are frigid and aridic bordering on ustic, respectively.

Associated sites

R048AY320UT	**Upland Shallow Loam (Black sagebrush)** Often occurs adjacent to this site.

Similar sites

R048AY322UT	**Upland Shallow Loam (Two-Needle Pinyon / Utah Juniper)** Similar plant communities.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Juniperus osteosperma*
Herbaceous	(1) *Leymus salinus ssp. salinus*

Physiographic features

This site occurs at elevations between 6,200 and 7,800 feet. It is found on ridges and mountain slopes with slopes ranging from 15-65 percent. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Hillslope (2) Escarpment (3) Structural bench
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None

Elevation	1,890–2,377 m
Slope	15–65%
Aspect	Aspect is not a significant factor

Climatic features

The climate is cold and snowy in the winter and warm and moist in the summer. Precipitation is 12 to 16 inches. Approximately 60 percent occurs as rain from March through October. Much of this summer precipitation occurs as convection thunderstorms. On the average, November through February are the driest months and July through October are the wettest months. The soil temperatures are in the mesic and frigid regime. In average years, plants begin growth around March and April and end growth in October. Plants usually remain green until frost in October except in drier than average years. There is usually an active greenup period in the fall. The most rapid growth occurs during April, May, and June.

Table 3. Representative climatic features

Frost-free period (characteristic range)	90-110 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	305-406 mm

Influencing water features

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

Soil features

The soils on this site formed in colluvium and/or slope alluvium over residuum weathered from sandstone, shale, calcareous sandstone and shale, and siltstone. Soils are moderately deep, well drained to well drained with moderately slow permeability. The surface textures are loam to clay loam. Soils have an available water capacity between 3 to 5 inches in the upper 40 inches of soil. The pH is between 7.4 and 8.4. The soil is calcareous with $CaCO_3$ equivalent of 1 to 40%. The soil temperature and moisture regimes for this site are frigid and aridic bordering on ustic, respectively.

Modal Soil: Cabba Family CNX-CL 40-60% — loamy, mixed (calcareous), mesic, shallow Typic Ustorthents

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone and shale (2) Slope alluvium–sandstone and shale (3) Residuum–calcareous shale
Surface texture	(1) Loam (2) Clay loam
Family particle size	(1) Fine-loamy
Drainage class	Well drained
Permeability class	Moderately slow
Depth to restrictive layer	51–102 cm
Soil depth	51–102 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	7.62–12.7 cm

Calcium carbonate equivalent (Depth not specified)	1–40%
Electrical conductivity (Depth not specified)	0–8 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–6
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

State 1: Reference State
This state represents the natural variability and dynamics of this site that occurred naturally. This state includes the dominant biotic communities that would have occurred on this ecological site prior to European Settlement. The dominant aspect of this site is Pinyon and Utah Juniper with an understory of shrubs and associated grasses. Fluctuations in species compositions and relative production may change from year to year dependent upon abnormal precipitation or other climatic factors. The primary disturbance mechanisms for this site in reference condition include drought, insects, and infrequent fire. Because catastrophic disturbances like a crown fire or drought happen with long intervals, these communities have long periods of succession, (i.e. long periods of dense Pinyon and Juniper)—300-600 years in upland/foothills ecological site zone and 300 to 1,000 in semi-desert ecological site zone. Typically, fires occurred in late spring through mid-summer following several wet years that allowed the fine fuels to become more contiguous. The higher in elevation and higher precipitation area would burn more frequently as they would have more fine fuels in the understory. The timing of drought, and fire, coupled with surface disturbance can dictate whether the community can stay within the reference state or if the community transitions into another state.

When this site is at or near it's potential, pinyon pine and Utah juniper dominate the site and make up over 80 percent of the plant community. Understory production is very limited and provides marginal amounts of forage for livestock and or wildlife. It does provide good escape cover and thermal cover for deer. When the tree canopy cover exceeds 30 percent, diversity, both plant and animal drops to its lowest level.

Community Phase 1.1: Pinyon-Juniper Woodland
A well-developed understory with a canopy of younger pinyon and Utah juniper. At this stage Utah juniper may be dominant over pinyon. Pinyon trees are more susceptible to drought, insects, and disease than Utah juniper trees. In fact, it is difficult to identify methods beside fire that naturally reduce Utah juniper. After long periods of drought weaken the pinyon trees, beetle kills can become quite extensive, especially after the droughts. Drought periods can also weaken and reduce the understory. Plant establishment is mainly limited by the available moisture. Biological crusts can be highly developed and diversified in the large interspaces between trees.

When the tree canopy ranges from 15 to 30 percent, a wide variety of grasses, forbs, and shrubs will also be present in addition to the pinyon pine and Utah juniper. During this tree canopy stage, diversity of plant and animal species will reach its peak.

Community Phase Pathway 1.1A
This pathway occurs when events create a wetter climate cycle, favor pinyon and perennial bunch grass establishment. Following several favorable precipitation years and lack of surface disturbances, native perennial plants will reestablish.

Community Phase Pathway 1.1B
This pathway is very unlikely but can occur when a fire is able to move through the community. Two situations can make this occur: 1) a fire can carry in the understory after several wet years allow fine fuels to accumulate, or 2) as the woodland approaches the later stages of development where canopies become dense and crown sizes have increased, and thus community phase becomes susceptible to crown fires.

Community Phase 1.2: Mature Pinyon-Juniper Woodland
Mature pinyon and Utah juniper woodland characterized this community phase. When weather patterns favor an increase of pinyon and Utah juniper canopy with the associated understory of shrubs, grasses and forbs. Depending on the timing of precipitation, cool season grasses, or warm season grasses could be dominant. Interspaces supporting highly developed biological crusts are
common.

Community Phase Pathway 1.2A
This pathway occurs during and after events such as drought or insect/pathogen outbreaks. Droughts and insects can kill the trees, increasing nutrient availability in the system. Due to the natural conditions of drought, grasses typically do not take up the extra nutrients in the long term. In the short term, grasses and forbs may increase for a few years until juniper and pinyon recover.

Community Phase Pathway 1.2B
This pathway is very unlikely but can occur when a fire is able to move through the community phase. Two situations can make this occur: 1) a fire can carry in the understory after several wet years allow fine fuels to accumulate, or 2) as the woodland approaches the later stages of development where canopies become dense and crown sizes have increased, and thus community phase becomes susceptible to crown fires.

Community Phase 1.3: Perennial Grassland/Shrubland with scattered PJ
The overall aspect of this community phase is grasses and shrubs with scattered pinyon and Utah juniper. The herbaceous understory has a mix of grasses and forbs. This community phase is a result of a crown fire or sufficiently large and hot ground fire that will kill many of the trees, combined with sufficient seed-banks and moisture for reestablishment of grasses and forbs. It is common that after a crown fire many patches of trees will remain unburned, because of fire's unpredictability and broken topography. This leaves a seed bank for the burned areas. This community phase is very short lived in comparison to the other community phases in this state.

When the tree canopy ranges from 0 - 15 percent; grasses, forbs, and shrubs will produce approximately 80 to 90 percent of the total production. When the tree canopy level is reduced by fire, chaining and/or application of herbicides, forage production will be at its highest level for big game animals as well as domestic livestock.

Community Phase Pathway 1.3A
This pathway occurs when the climate favors the establishment and growth of trees. More energy is taken-up and stored in the trees as the length between fires and droughts increase. In addition, when shrubs establish on the site they can provide safe-sites for tree establishment furthering the presence of trees.

Transition T1A
This transition from the native perennial bunchgrass and shrub understory in the reference state to a state that has been invaded by naturalized species such as crested wheatgrass (blown in or seeded), cheatgrass, annual wheatgrass and other introduced or exotic plants. This transition occurs as natural and/or management actions favor an increase in non-native grasses and forbs, especially annuals. Possible events include the presence of invasive species, improper livestock grazing, extended droughts, and fire combined with an available seed source of non-native species.

State 2: Current Potential State
This state is very similar to the reference state, except that non-native grasses and/or forbs are now present in all community phases. The current potential state may include introduced (seeded) or invasive nonnative species. The invasive plants are present in sparse amounts in this state. Natural disturbance are still drought, insects, and infrequent fires still influence the community shifts. The human caused disturbance drivers (i.e. domestic livestock grazing, vegetation manipulation, and recreational activities (i.e. OHV use)) are now present. This shift in species composition could affect nutrient cycling, hydrology and soil stability. At this time there is no known way to effectively remove the non-native plants from the site once they have become established. State 2 is in jeopardy of moving to State 3 (Pinyon-Juniper Invasive State) when remaining native understory plants are stressed and invasive species have increased till they are dominant.

Community Phase 2.1: Pinyon-Juniper Woodland
A well-developed understory with a canopy of younger Pinyon and Utah juniper. At this stage Utah juniper may be dominant over Pinyon. Pinyon trees are more susceptible to drought, insects, and disease than Utah Juniper trees.

In fact, it is difficult to identify methods beside fire that naturally reduce Utah juniper. After long periods of drought weaken the Pinyon trees, beetle kills can become quite extensive, especially after the droughts. Drought periods can also weaken and reduce the understory. Plant establishment is mainly limited by the available moisture. Biological crusts can be highly developed and diversified in the large interspaces between trees. Sparse invasive introduced plants species would be present in this phase.

Community Phase Pathway 2.1A
This pathway occurs when events create a wetter climate cycle, favor Pinyon and perennial bunch grass establishment. Following several favorable precipitation years and lack of surface disturbances, native perennial bunch grasses and forbs will reestablish.

Community Phase Pathway 2.1B
This pathway is very unlikely but can occur when a fire or vegetation manipulation happens to the trees. Two situations can make this occur: 1) a fire can carry in the understory after several wet years allow fine fuels to accumulate, or 2) as the woodland approaches the later stages of development where canopies become dense and crown sizes have increased, and thus community phase becomes susceptible to crown fires. Seeding after the tree removal may be necessary to help facilitate the return of understory species. Seeding depending on the species may take this community phase into state 4 (Seeded State).

Community Phase 2.2: Mature Pinyon-Juniper Woodland
Mature pinyon and Utah juniper woodland with a well-developed understory would characterized this community phase. This phase supports a diverse understory of grasses, forbs and shrubs. Depending on the timing of precipitation, cool season grasses, or warm season grassescould be dominant. Interspaces supporting highly developed biological crusts are common. Sparse invasive introduced plants species would be present in this phase.

Community Phase Pathway 2.2A
This pathway occurs during and after events such as drought or beetle infestations. Droughts and insects can kill pinyon trees, increasing nutrient availability in the system. Due to the natural conditions of drought, grasses typically do not take up the extra nutrients in the long term. In the short term, grasses and forbs may increase for a few years until Juniper recover. Utah Juniper are more able to compete for these nutrients and became the dominant overstory tree over time.

Community Phase Pathway 2.2B
This pathway is very unlikely to occur naturally with fire. But, vegetation manipulation can be used to remove trees. Two situations occur naturally: 1) a fire can carry in the understory after several wet years allow fine fuels to accumulate, or 2) as the woodland approaches the later stages of development where canopies become dense and crown sizes have increased, and thus community phase becomes susceptible to crown fires. Seeding after the tree removal may be necessary to help facilitate the return of understory species. Seeding depending on the species may take this community phase into state 4 (Seeded State).

Community Phase 2.3: Perennial Grassland/Shrubland with scattered PJ
The overall aspect of this community phase is grassland with scattered pinyon and Utah juniper. The herbaceous understory has a mix of grasses and forbs. This community phase is a result of a crown fire or sufficiently large and hot ground fire that will kill many of the trees, combined with sufficient seed-banks and moisture for reestablishment of grasses and forbs. It is common that after a crown fire many patches of trees will remain unburned, because of fire’s unpredictability and broken topography. This leaves a seed bank for the burned areas. This community phase is very short lived in comparison to the other community phases in this state. Sparse invasive introduced plants species would be present in this phase.

Community Phase Pathway 2.3A
This pathway occurs when the climate favors the establishment and growth of trees. More energy is taken-up and stored in the trees as the length between fires and droughts increase. In addition, when shrubs establish on the site they can provide safe-sites for tree establishment furthering the presence of trees.

Transition T2A
When this transition to state 3 occurs the site has lost much of its expected resistance and resilience. At this point natural and/or management actions have decreased the understory to a point where erosion increases. Reduced influence from fire, insects, and drought could cause the tree canopy to close, effectively reducing the herbaceous

understory thus facilitating the transition. Improper grazing and or increase surface disturbance combined with periods of drought can facilitate this transition because soil stability is lost and susceptibility to soil loss increases.

Transition T2B
This transition is from tree canopy reduction and re-establishment of grasses and forbs. If the community is approaching state 3 (pinyon juniper invasive state), due to a loss of understory and increase invasive plants this pathway of seeding could be preferable to doing nothing. This pathway may facilitate the recovery of the soils. The infrequent naturally occurring fires could also cause this transition. Reseeding after a fire may be the only way to successfully restore the ecological dynamics to a site. Either way this pathway involves large energy and monetary inputs by man.

State 3: Pinyon-Juniper Invasive State
This state occurs when there is an absence of natural disturbance (i.e. Insects and drought and/or fire) over long time frames. Also, management actions could have allowed trees to become very mature and have effectively closed out the understory. Invasive plants have increased in abundance. This state has the lowest resiliency and resistance of any state in this model. There may be no practicable way back to the Current Potential State (State 2), due to the large amounts of energy and monetary inputs that are needed. Seeding, with either natural disturbance and/or vegetation management to transition it to State 3 (Seeded State) may be the best long term option for this site.

Community Phase 3.1: PJ Woodland with Invasive Plants
A lack of understory with a canopy of older Pinyon and Juniper, where plant interspaces very large and connected. This community phase occurs when natural or management actions allow for the increase in Pinyon and Utah juniper and a decrease in the grass and forb understory. Invasive introduced plants species would be present in this phase and are increasing.

Community Phase Pathway 3.1A
This pathway occurs when events such as frequent fire or drought remove the trees and shrubs, and facilitate the continued establishment of cheatgrass or other invasive annuals. Cheatgrass will typically invade/increase in tree/shrub interspaces when PJ communities are degraded. Once the cheatgrass establishes the amount and continuity of fine fuels increases. This can reduce the fire return interval and shorten the time between fires. When fire eliminates the tree/shrub/native grass component, it completes the conversion to annual dominant community phase. Cheatgrass and other invasive annuals can persist for long periods of time. Once a fire or a drought removes the trees/shrubs, it is difficult to reestablish because, not only has the fire return interval been shortened to a time that will not allow seedling establish, the soil and other abiotic factors have been altered.

Community Phase 3.2: Invasive Annuals
This state is characterized by annual grasses like cheatgrass, annual wheatgrass dominating the understory. Also, invasive forbs like storkbill, halogeton and others may be present. This community phase has active erosion under the pinyon and Utah juniper canopy. Utah Juniper has allelopathic effects on some plant (i.e. Sandberg bluegrass, blue grama).

Community Phase Pathway 3.2A
This pathway is when there is a lack of fire and/or disturbance. The fire return interval lengthens. This could be done by having firebreaks and/or fire suppression which will allow the perennial species a chance to establish with natural processes or with vegetation manipulation.

Transition T3A
Vegetation treatment can transition it to a seeded state. Because of the soils (shallow and/or rocky) and the unpredictable precipitation, this pathway should be used cautiously. This pathway involves large energy and monetary inputs by man.

State 4: Seeded State
This state is a result seeding plants species. Vegetation manipulation may or may not have been done depending on disturbance history of the location. The trees were removed and adapted grasses, forbs and shrubs are established. Plants can be native or introduced depending on the desired management goals. If grazing tolerant species were established these communities can better withstand grazing and other disturbances. Due to the shallow or rocky soils and unpredictable precipitations patterns, it is difficult to establish grasses from seed, so this

state may be hard to achieve and require large energy inputs.

Community Phase 4.1: Seeded Grassland/Shrubland
This community phase appears as a grassland with scattered shrubs and trees. The vegetative production is typically higher than in the current potential state, depending on grass species seeded; however the grass is still sparse due to the low water holding capacity of soils associated with pinyon and juniper.

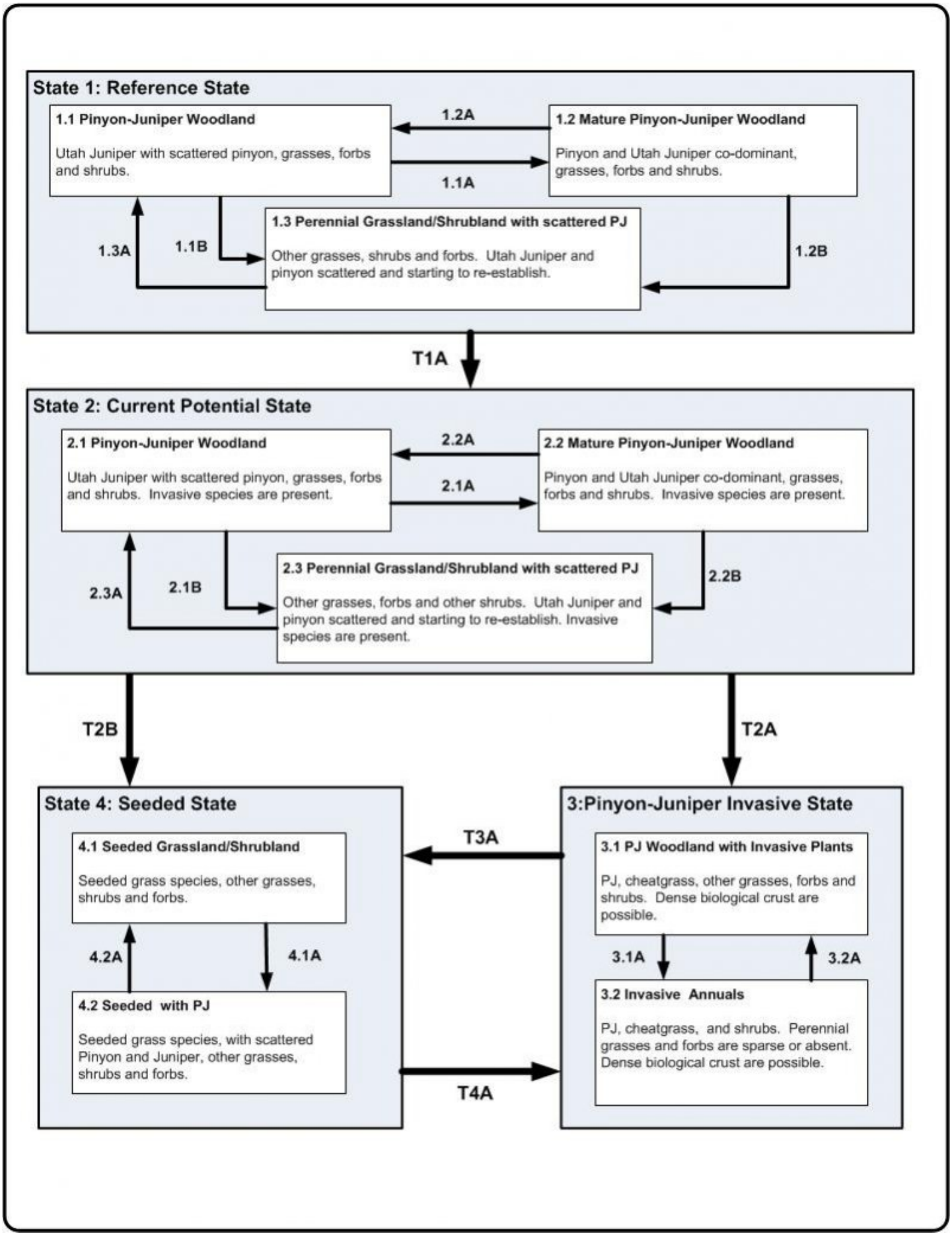
Community Phase Pathway 4.1A
This pathway occurs when events favor the establishment of shrubs and trees, including long periods without disturbances.

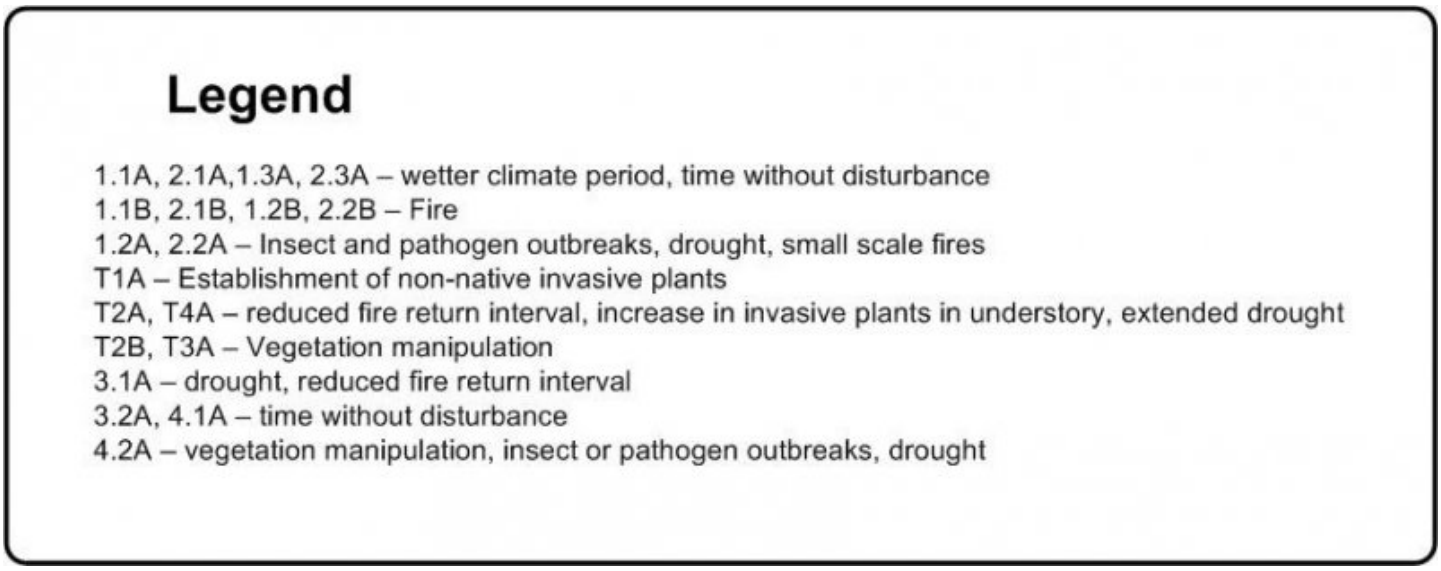
Community Phase 4.2: Seeded with PJ
This community phase has a dense under story of introduced grasses and forbs, but a canopy of pinyon and Utah juniper are establishing. Native perennial grasses, forbs, and shrubs may also be starting to establish. Interspaces are filled with biological crusts and herbaceous plants.

Community Phase Pathway 4.2A
This pathway occurs as trees and shrubs are removed from the community, either naturally through insect herbivory or through vegetation manipulation by man.

Transition T4A
This transition occurs when events favor the establishment and dominance of invasive annuals. Events may include an extended drought, surface disturbance such as off road vehicle use, and/or a shortened fire return interval, all of which can stress the native perennial bunchgrasses.

State and transition model


State 1: Reference State
1.1 Pinyon-Juniper Woodland
Utah Juniper with scattered pinyon, grasses, forbs and shrubs.
1.2A
1.1A
1.2 Mature Pinyon-Juniper Woodland
Pinyon and Utah Juniper co-dominant, grasses, forbs and shrubs.
1.3A
1.1B
1.3 Perennial Grassland/Shrubland with scattered PJ
Other grasses, shrubs and forbs. Utah Juniper and pinyon scattered and starting to re-establish.
1.2B
T1A
State 2: Current Potential State
2.1 Pinyon-Juniper Woodland
Utah Juniper with scattered pinyon, grasses, forbs and shrubs. Invasive species are present.
2.2A
2.1A
2.2 Mature Pinyon-Juniper Woodland
Pinyon and Utah Juniper co-dominant, grasses, forbs and shrubs. Invasive species are present.
2.3A
2.1B
2.3 Perennial Grassland/Shrubland with scattered PJ
Other grasses, forbs and other shrubs. Utah Juniper and pinyon scattered and starting to re-establish. Invasive species are present.
2.2B
T2B
T2A
State 4: Seeded State
4.1 Seeded Grassland/Shrubland
Seeded grass species, other grasses, shrubs and forbs.
4.2A
4.1A
4.2 Seeded with PJ
Seeded grass species, with scattered Pinyon and Juniper, other grasses, shrubs and forbs.
T3A
T4A
3:Pinyon-Juniper Invasive State
3.1 PJ Woodland with Invasive Plants
PJ, cheatgrass, other grasses, forbs and shrubs. Dense biological crust are possible.
3.1A
3.2A
3.2 Invasive Annuals
PJ, cheatgrass, and shrubs. Perennial grasses and forbs are sparse or absent. Dense biological crust are possible.



State 1
Reference State

As ecological condition deteriorates due to anthropogenic disturbances and/or the alteration of the natural disturbance regime, native perennial bunch grasses decrease while pinyon and juniper increase. When the potential natural plant community is burned and/or drought conditions persist, pinyon and juniper decrease while native perennial bunch grasses increase.

Community 1.1
Reference Plant Community

The general view of this site is Utah juniper and pinyon with an understory of birchleaf mountainmahogany and Salina wildrye. The composition by air-dry weight is approximately 15 percent trees, 40 percent grasses, 10 percent forbs, and 35 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	67	157	247
Shrub/Vine	58	137	215
Tree	26	59	93
Forb	17	39	62
Total	**168**	**392**	**617**

Table 6. Ground cover

Tree foliar cover	14-16%
Shrub/vine/liana foliar cover	19-21%
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	–	–	–	4-6%
>0.3 <= 0.6	–	–	19-21%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	14-16%	–	–	–
>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 (%)
Grass/Grasslike					
0	**Dominant Grasses**			67–112	
	Grass, annual	2GA	*Grass, annual*	22–45	–
	Grass, perennial	2GP	*Grass, perennial*	22–45	–
	blue grama	BOGR2	*Bouteloua gracilis*	4–13	–
	needle and thread	HECO26	*Hesperostipa comata*	4–13	–
	western wheatgrass	PASM	*Pascopyrum smithii*	4–13	–
	Sandberg bluegrass	POSE	*Poa secunda*	4–13	–
Forb					
0	**Dominant Forbs**			84–157	
	Forb, annual	2FA	*Forb, annual*	22–45	–
	Forb, perennial	2FP	*Forb, perennial*	22–45	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	4–13	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	4–13	–
	manybranched ipomopsis	IPPO2	*Ipomopsis polycladon*	4–13	–
	foothill bladderpod	LELU	*Lesquerella ludoviciana*	4–13	–
	Utah desertparsley	LOPA	*Lomatium parryi*	4–13	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	4–13	–
	rock goldenrod	PEPU7	*Petradoria pumila*	4–13	–
	spiny phlox	PHHO	*Phlox hoodii*	4–13	–
	desert princesplume	STPI	*Stanleya pinnata*	4–13	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	4–13	–
Shrub/Vine					
0	**Dominant Shrubs**			112–157	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	13–22	–
	spiny greasebush	GLSPM	*Glossopetalon spinescens var. meionandrum*	4–13	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	4–13	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	4–13	–
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	4–13	–

Animal community

This site provides proper grazing for cattle and sheep during spring, summer, and fall. This site provides food and cover for wildlife.
Wildlife using this site include rabbit, coyote, bobcat, mule deer, and elk.

Hydrological functions

The soil is in hydrologic group d. The hydrologic curve number is 80 when the vegetation is in good condition.

Recreational uses

Hunting and hiking

Wood products

Firewood and posts

Inventory data references

Data to support ecological site gathered from historic surveys by USDA range professionals.

Other references

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Contributors

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Approval

Kirt Walstad, 3/05/2024

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	05/17/2024

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

Indicators

1. **Number and extent of rills:**

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

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

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

5. **Number of gullies and erosion associated with gullies:**

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

7. **Amount of litter movement (describe size and distance expected to travel):**

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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

    Dominant:

Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
