USDA Natural Resources
Conservation Service

Ecological site R047XB345UT
Upland Very Steep Shallow Loam (pinyon/Utah juniper/Douglas-fir)

Last updated: 2/06/2025
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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): 047X–Wasatch and Uinta Mountains

MLRA 47 occurs in Utah (86 percent), Wyoming (8 percent), Colorado (4 percent), and Idaho (2 percent). It encompasses approximately 23,825 square miles (61,740 square kilometers). The northern half of this area is in the Middle Rocky Mountains Province of the Rocky Mountain System. The southern half is in the High Plateaus of the Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south, and the Uinta Mountains, which trend east and west. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The Uinta Mountains have a broad, gently arching, elongated shape. Structurally, they consist of a broadly folded anticline that has an erosion-resistant quartzite core. The Wasatch and Uinta Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters).

The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifers. An ancient shoreline of historic Bonneville Lake is evident on the footslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments, but Precambrian rocks are exposed in the Uinta Mountains. The Uinta Mountains are one of the few ranges in the United States that are oriented west to east. The southern Wasatch Mountains consist of Tertiary volcanic rocks occurring as extrusive lava and intrusive crystalline rocks.

The average precipitation is from 8 to 16 inches (203 to 406 mm) in the valleys and can range up to 73 inches (1854 mm) in the mountains. In the northern and western portions of the MLRA, peak precipitation occurs in the winter months. The southern and eastern portions have a greater incidence of high-intensity summer thunderstorms; hence, a significant amount of precipitation occurs during the summer months. The average annual temperature is 30 to 50 degrees Fahrenheit (-1 to 15 C). The freeze-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. Mesic temperature regimes come in on the lower elevations and south facing slopes in the southern portion of this MLRA. The soil moisture regime is typically xeric in the northern part of the MLRA, but grades to ustic in the extreme eastern and southern parts. The mineralogy is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

E47B is the Wasatch Mountains South MLRA. It occurs in the Loa, Panguitch, New Harmony area. Most of Zion, Bryce Canyon National Parks and Cedar Breaks National Monument are in this area. This area is composed of mountain ranges that run north and south.

Ecological site concept

The soils of this site formed mostly in slope alluvium derived from igneous and sedimentary rock. Surface soils are sandy clay loam loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are shallow, well-drained, and have moderate permeability. pH is neutral and available water-holding capacity ranges from 5 to 6.6 inches of water in the upper 20 inches of soil. The soil moisture regime is mostly aridic ustic and the soil temperature regime is frigid. Precipitation ranges from 12 to 16 inches annually.

Associated sites

R047XB322UT	**Upland Shallow Loam (mountain big sagebrush)** Sites often occur adjacent to each other.

Similar sites

R047XB326UT	**Upland Shallow Loam (pinyon/Utah juniper)** Sites have similar floral characteristics, however this site is not as steep.

Table 1. Dominant plant species

Tree	(1) *Pinus edulis* (2) *Pseudotsuga menziesii*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site typically occurs on mountain slopes with slopes normally range from 15 to 65 percent but may occasionally be steeper. Slope steepness, aspect and elevation will influence the vegetative floristics of this site. Sites are typically located between 7,300 to 7,500 feet in elevation. Runoff is high to very high.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	7,300–7,500 ft
Slope	15–65%
Ponding depth	Not specified
Water table depth	Not specified
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by cold, snowy winters and cool, moist summers. Approximately 50 percent of the moisture comes during the plant growth period from April 1 through September 30. On the average April, May, and June are the driest months and July, August, and September are the wettest months. Annual precipitation is 12 to 16 inches.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	70-100 days
Precipitation total (characteristic range)	12-16 in

Influencing water features

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

Wetland description

N/A

Soil features

The soils of this site formed mostly in slope alluvium derived from igneous and sedimentary rock. Surface soils are sandy clay loam loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are shallow, well-drained, and have moderate permeability. pH is neutral and available water-holding capacity ranges from 5 to 6.6 inches of water in the upper 20 inches of soil. The soil moisture regime is mostly aridic ustic and the soil temperature regime is frigid. Precipitation ranges from 12 to 16 inches annually.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–igneous and sedimentary rock
Surface texture	(1) Sandy clay loam
Family particle size	(1) Fine-loamy
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	10–20 in
Soil depth	10–20 in
Surface fragment cover <=3"	3%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	5–6.6 in
Calcium carbonate equivalent (Depth not specified)	0–10%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	10%
Subsurface fragment volume >3" (Depth not specified)	7%

Ecological dynamics

As ecological condition deteriorates due to anthropogenic disturbances and the alteration of the natural disturbance

regime, native perennial bunchgrasses decrease while pinyon and juniper increase. When the potential natural plant community is burned or drought conditions persist, pinyon and juniper decrease while native perennial bunch grasses increase.

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 to 600 years in upland or 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 bunchgrass 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, like Indian ricegrass or warm season grasses like galleta 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 or 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 Pinyon and Juniper
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 to 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 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 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 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 bunchgrass 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, like Indian ricegrass or warm-season grasses like galleta could 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 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 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 or increase in tree and shrub interspaces when pinyon and juniper 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, and 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 and shrubs, it is difficult to re-establish 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 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.

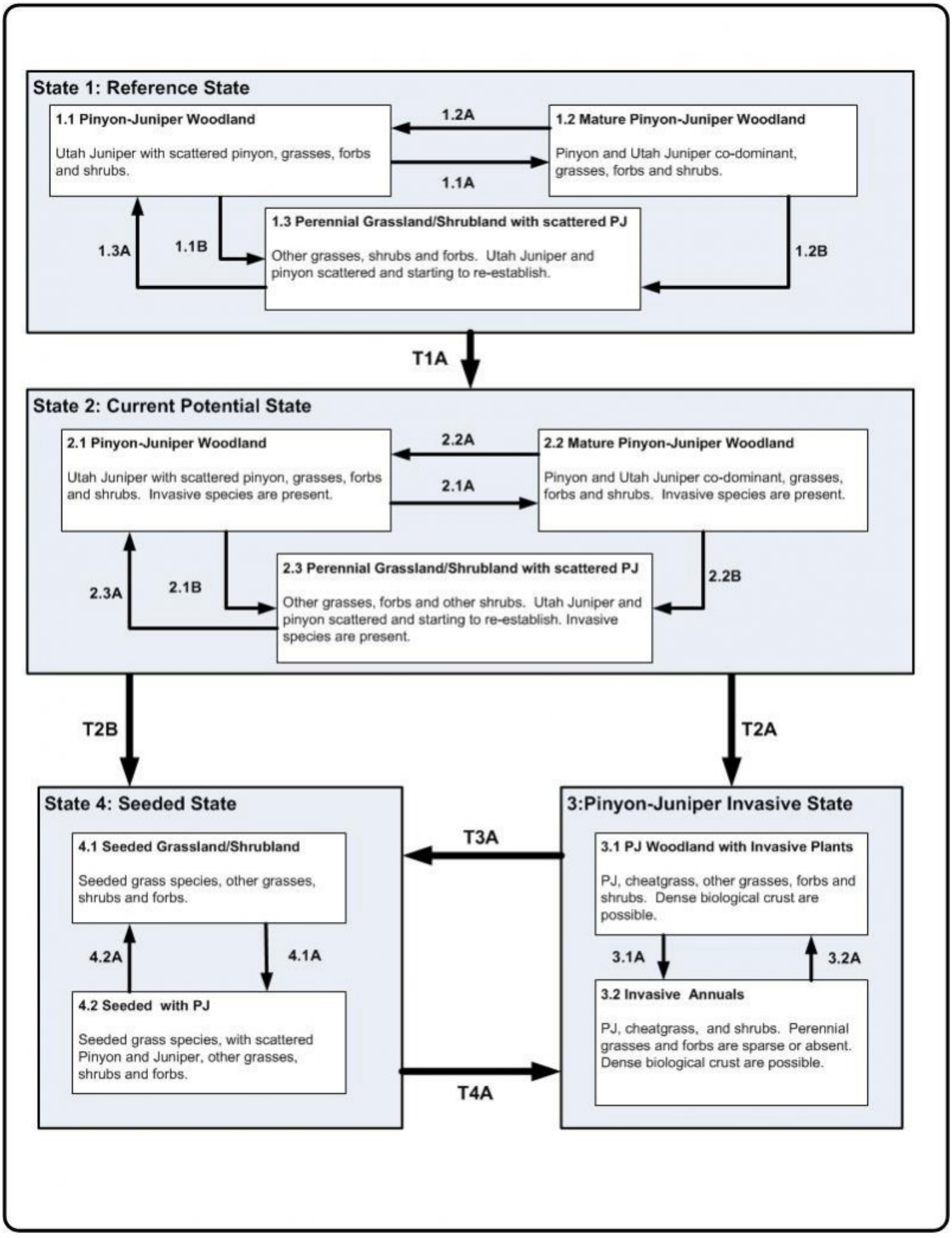
Community Phase 4.2: Seeded with Pinyon and Juniper

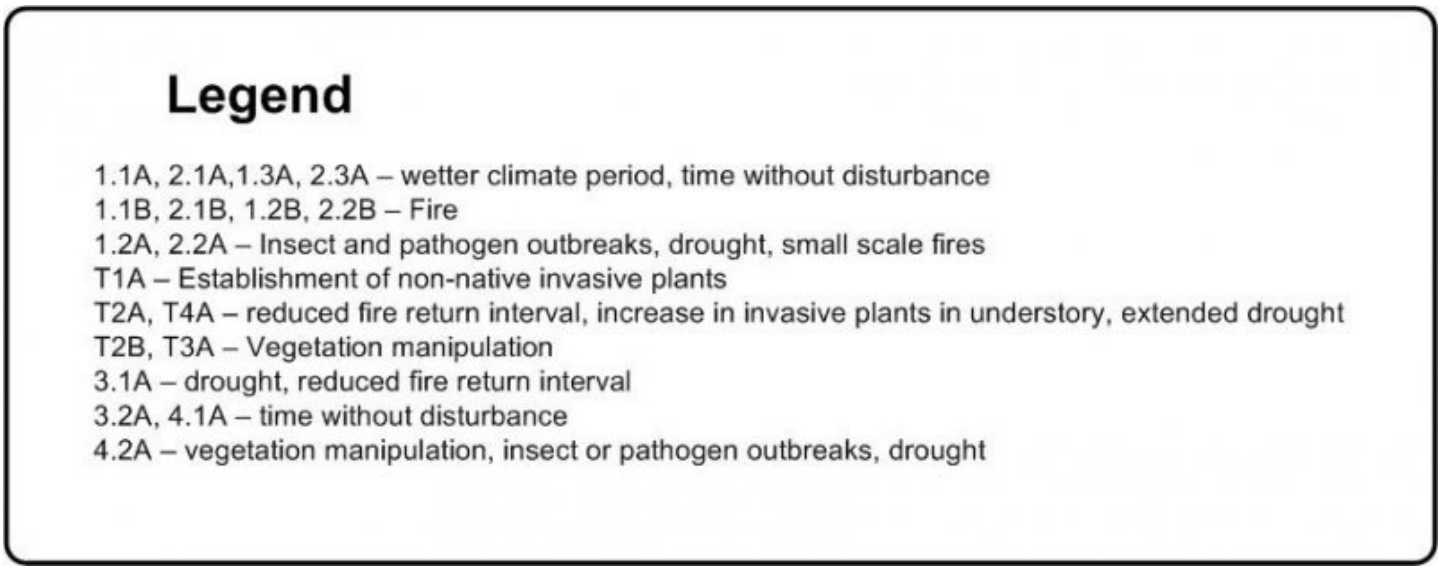
This community phase has a dense understory of introduced grasses and forbs, but a canopy of pinyon and Utah juniper are establishing. Native perennial grasses, forbs, and shrubs may also be starting to establish. Interspaces are filled with biological crusts and herbaceous plants.

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, 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.



Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used.

Other references

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Contributors

M. Dean Stacy

Approval

Kendra Moseley, 2/06/2025

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	05/11/2025
Approved by	Kendra Moseley
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:

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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):**

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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:

    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:**
