USDA Natural Resources
Conservation Service

Ecological site R036XY328UT
Upland Very Steep Stony Loam (pinyon-Utah juniper)

Last updated: 1/16/2025
Accessed: 05/10/2025

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.

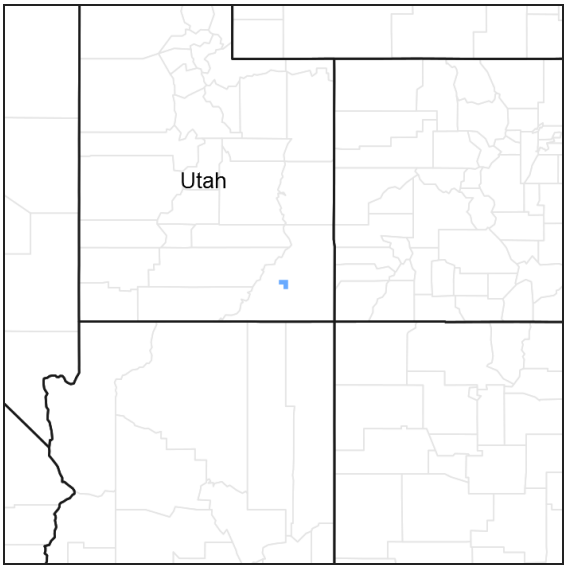


Figure 1. Mapped extent

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.

Classification relationships

Semiarid Benchlands and Canyonlands Ecoregion (Woods, A. J. et. Al, 2001)
Intermountain Semidesert and Desert Province, 341 (Bailey, 1995)

Associated sites

R036XY307UT	**Upland Loam (pinyon-Utah juniper)**
R036XY315UT	**Upland Shallow Loam (pinyon-Utah juniper)**

Similar sites

R035XY328UT	**Upland Very Steep Stony Loam (Pinyon-Utah Juniper)** This site is very similar to the site located in MLRA 36, however this site is located in MLRA 35. Other than location these sites are typically the same.

Table 1. Dominant plant species

Tree	(1) *Pinus edulis* (2) *Juniperus osteosperma*

Shrub	(1) *Amelanchier utahensis*
Herbaceous	Not specified

Physiographic features

This site occurs on plateaus, mesa escarpments, hills, and ridges, and is usually found in complex with large colluvial boulders and rocks. This site is heavily influenced by aspect, where the extremes are demonstrated on north facing aspects. These areas, when sheltered, support a dense diverse plant community. The south facing unprotected slopes support much sparse vegetation and lesser diversity.

Table 2. Representative physiographic features

Landforms	(1) Mesa (2) Hill (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	5,300–6,900 ft
Slope	50–75%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by warm summers, cool winters. The climate is modified by local topographic conditions, such as aspect. Mean annual high temperatures range from 62-65 degrees Fahrenheit and mean annual low temperatures range from 35-40 degrees Fahrenheit. Much of the rainfall occurs as convective storms in late summer and early fall; about 20-30% percent of the total precipitation fall in July and August. Snow packs are generally light and not persistent, about 15 to 20 percent of the total precipitation falls as snow. May and June are typically the driest months, with average annual precipitation ranging from 12-14 inches.

Table 3. Representative climatic features

Frost-free period (average)	175 days
Freeze-free period (average)	178 days
Precipitation total (average)	14 in

Influencing water features

There are no water features influencing this site.

Soil features

The soils are very shallow to very deep and vary greatly on their depth expressions due to slope and subsurface rock fragments. Typically the surface layer is a light yellowish brown to reddish brown. Run off is moderate to high due to slope. These soils have a moderate rapid to a very rapid permeability. The soil temperature and moisture regimes are mesic and aridic ustic respectively. Surface textures and subsurface textures are generally fine sandy loams to loams and will have gravelly and/or channery modifiers, where up to 75% gravels or channers may be present. Soils are nonsaline and slightly to moderately alkaline. Biological soil crust cover is rare; however, up to 5% (measured by first raindrop impact) may be found on this site. This site has been used in the following soils surveys and has been correlated to the following components:

UT638—Natural Bridges National Monument, UT – Metuck, extremely bouldery and Bamac family

Typical Soil Profile:
Shallow
A—0-1 inch; reddish brown; extremely channery fine sandy loam; moderately alkaline
Bw—1-8 inches; reddish brown; very channery fine sandy loam; moderately alkaline
BCk—8-10 inches; light reddish brown; very channery very fine sandy loam; slightly alkaline
Cr—10-12 inches; fractured weathered sandstone
R—12 inches; hard calcareous sandstone

Deep
A—0-4 inches; light yellowish brown; very gravelly loamy sand; moderately alkaline
C1—4-10 inches; light yellowish brown; loamy sand; moderately alkaline
C2—10-21 inches; very pale brown; very gravelly loamy coarse sand; moderately alkaline
C3—21-37 inches; pale brown; very gravelly loamy coarse sand; moderately alkaline
C4—37-65 inches; pink; very gravelly loamy coarse sand; moderately alkaline.

Table 4. Representative soil features

Surface texture	(1) Extremely channery fine sandy loam (2) Very gravelly loamy sand (3) Stony fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	10–60 in
Surface fragment cover <=3"	50–75%
Surface fragment cover >3"	20–25%
Calcium carbonate equivalent (0-40in)	15–35%
Electrical conductivity (0-40in)	0–5 mmhos/cm
Sodium adsorption ratio (0-40in)	0–3
Soil reaction (1:1 water) (0-40in)	7.5–8
Subsurface fragment volume <=3" (Depth not specified)	25–55%
Subsurface fragment volume >3" (Depth not specified)	5–10%

Ecological dynamics

This site developed under Colorado Plateau climatic conditions and included natural influences of climate and insects. Due to steep slopes (50-75%) and large amounts (up to 65% cover) of surface rock fragments, boulders, and rock outcrop (on the shallow soils), this ecological site was not influenced by fire or large amounts of native large animal herbivory. This ecological site occurs on the very shallow to very deep, moderately developed soils found on , mesa escarpments, fan terraces, fan remnants, hills, and ridges in Major Land Resource Area (MLRA) 36—Southwestern Plateaus, Mesas, and Foothills.

Drought and insects appear to be the main driving factors in many of the Pinyon/Juniper communities. Bentancourt (1993), noted that Pinyon and Juniper woodlands in the southwest appear to be more susceptible to large die offs during droughts, than in other locations. As severe droughts persist, the Pinyon trees, being more susceptible to drought and insects, seem to die out, while the Utah juniper trees survive. This action could open the canopy for a few years and with sufficient moisture, grasses and forbs would be expected to respond favorably.

As vegetation communities respond to changes in management or natural occurrences, thresholds can be crossed, which usually means that a return to the previous state may not be possible without major energy inputs. The amount of energy input needed to affect vegetative shifts depends on the present biotic and abiotic features and the desired results. The following diagram does not necessarily depict all the transitions and states that this site may exhibit, but it does show some of the most common plant communities that can occur on the site and the transition pathways among the communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable. As more data is collected, some of these plant communities will be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as the “desired plant community. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

--Reference State (State 1)--
The Reference State has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under influences such as grazing and recreational uses. Through literature review, historical accounts and observations of trends in plant community dynamics under a variety of uses have been considered. Community phases, community pathways, states, transitions, and thresholds, have been determined through similar studies and experience.

This state represents the natural range of variability that historically dominated the dynamics of this ecological site. This state includes the biotic communities that would have been expressed on the ecological site if all successional sequences were completed without interferences by man under the present environmental conditions; natural disturbances are inherent in its development. This state is dominated by Pinyon and Utah juniper with a well developed understory of native shrubs, perennial grasses and perennial and annual forbs. The primary disturbance mechanisms for this site in reference condition include drought and insects.

Reference state: Community phases maintained by drought and insect pathogen cycles
Indicators: A well developed shrub and grass understory co-existing with a canopy of Pinyon and Utah juniper.

Feedbacks: Infrequent, but regular droughts to reduce tree cover, and allow for a subsequent increase in the shrub, grass, and forb understory.

At-risk Community Phase: All communities are at risk when native plants in the understory are stressed, and nutrients become available for non-natives to establish.

Trigger: The introduction of non-native plants into the understory.

--Transition from Reference State (State 1) to Current Potential State (State 2)--
T1a– This transition from the native perennial grass and forb understory found in the reference state to a state that has begun to be invaded by cheatgrass. This transition occurs as natural and/or management actions favor an increase in non-native grasses and forbs, especially annuals. Possible events include the mere presence of invasive species seed sources and extended droughts

--Current Potential State (State 2)--
This state is very similar to the reference state, except that non-native grasses and/or forbs are now present in all phases. The current potential state may include naturalized or invasive nonnative species. The primary disturbance mechanisms for this state include natural and human caused disturbances. Drought and insects still influence the community shifts; however, due to steep slopes there are very little man induced disturbances. Trailing of livestock to water and some minor recreational activities (i.e. hiking) are the most common and have very little impact on the site other than introduction of these non-native grasses and forbs. The 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. Therefore, this site is often irreversibly altered from the reference state

Current Potential State: Community phases maintained by drought and insect herbivory cycles

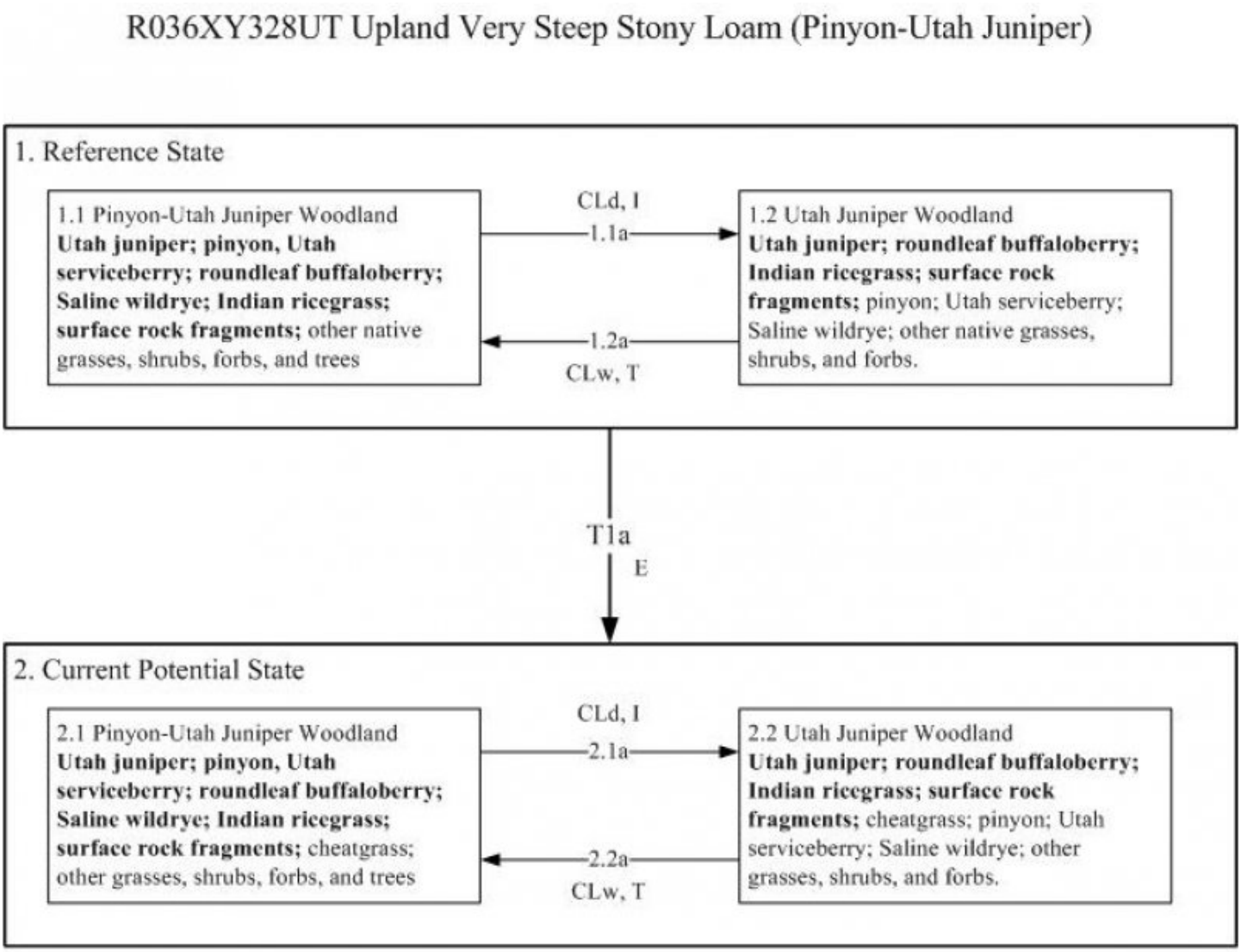
Indicators: A well developed shrub and grass understory co-existing with a canopy of Pinyon and Utah juniper.

Feedbacks: Infrequent, but regular droughts to reduce tree cover, and allow for a subsequent increase in the shrub,

grass, and forb understory. Establishment of non-native plant species, such as cheatgrass.

At-risk Community Phase: All communities are at risk when native plants become stressed and non-native invasive species are allowed to flourish.

State and transition model



Legend:
CLd = Climate-drought
CLw = Climate-wet
I = Insect herbivory
T = Time
E = Establishment of non-native species

State 1
Reference

The Reference state has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under influences such as grazing and recreational uses. Through literature review, historical accounts and observations of trends in plant community dynamics under a variety of uses have been considered. Community phases, community pathways, states, transitions, and thresholds, have been determined through similar studies and experience. This state represents the natural range of variability that historically dominated the dynamics of this ecological site. This state includes the biotic communities that would have been expressed on the

ecological site if all successional sequences were completed without interferences by man under the present environmental conditions; natural disturbances are inherent in its development. This state is dominated by Pinyon and Utah juniper with a well developed understory of native shrubs, perennial grasses and perennial and annual forbs. The primary disturbance mechanisms for this site in reference condition include drought and insects. Reference state: Community phases maintained by drought and insect pathogen cycles Indicators: A well developed shrub and grass understory co-existing with a canopy of Pinyon and Utah juniper. Feedbacks: Infrequent, but regular droughts to reduce tree cover, and allow for a subsequent increase in the shrub, grass, and forb understory. At-risk Community Phase: All communities are at risk when native plants in the understory are stressed, and nutrients become available for non-natives to establish. Trigger: The introduction of non-native plants into the understory.

Community 1.1
Pinyon-Utah Juniper Woodland

This plant community phase is characterized by a dominance overstory canopy of Pinyon and Utah juniper, with a well developed shrub and perennial grass understory. Shrubs commonly seen include Utah serviceberry and Roundleaf buffaloberry. Grasses that typically inhabit this site include Indian ricegrass and Salina wildrye. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses, shrubs, and trees are present; however, species composition varies from one site to the next. Bare ground and biological crust cover make up less than 10% when measured by first raindrop impact. Surface rock fragments, ranging from gravels to boulders, make up the majority of this site and may be has high as 65 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	150	250	350
Tree	100	200	300
Shrub/Vine	100	150	200
Forb	25	50	75
Total	**375**	**650**	**925**

Table 6. Ground cover

Tree foliar cover	20-25%
Shrub/vine/liana foliar cover	15-25%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	1-5%
Surface fragments >0.25" and <=3"	50-75%
Surface fragments >3"	20-25%
Bedrock	0-5%
Water	0%
Bare ground	3-10%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	0-5%	0-5%
>0.5 <= 1	–	3-5%	5-10%	0-5%
>1 <= 2	0-5%	5-10%	3-5%	0-5%
>2 <= 4.5	5-10%	5-10%	0-3%	–
>4.5 <= 13	10-15%	0-3%	–	–
>13 <= 40	0-5%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 1.2
Utah Juniper Woodland

This plant community phase is characterized by a dominance overstory canopy of Utah juniper, with roundleaf buffaloberry, Indian ricegrass, and various forbs in the understory. Pinyon, Utah serviceberry, and Salina wildrye may or may not be present. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses, shrubs, and trees are present; however, species composition varies from one site to the next. Bare ground and biological crust cover make up less than 10% when measured by first raindrop impact. Surface rock fragments, ranging from gravels to boulders, make up the majority of this site and may be has high as 65 percent.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	100	200	300
Grass/Grasslike	50	150	250
Shrub/Vine	50	100	150
Forb	25	50	75
Total	**225**	**500**	**775**

Table 9. Ground cover

Tree foliar cover	20-25%
Shrub/vine/liana foliar cover	10-20%
Grass/grasslike foliar cover	5-8%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	1-5%
Surface fragments >0.25" and <=3"	50-75%
Surface fragments >3"	20-25%
Bedrock	0-5%
Water	0%
Bare ground	3-10%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	0-5%	0-5%
>0.5 <= 1	–	3-5%	5-8%	0-5%
>1 <= 2	0-5%	5-10%	3-5%	0-5%
>2 <= 4.5	5-10%	5-10%	0-3%	–
>4.5 <= 13	10-15%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway 1.1A
Community 1.1 to 1.2

This pathway occurs as drought or insect herbivory removes the Pinyon canopy and allows for increased growth of the understory. When this pathway occurs as a response to drought, shrub and grass production may be slow until more normal climatic patterns return. The canopy is opened and sunlight is able to reach the understory allowing for nutrients to be captured.

Pathway 1.2A
Community 1.2 to 1.1

This pathway occurs as normal to above average precipitation patterns coupled with time allow for the reestablishment of Pinyon and other less drought tolerant shrubs and grasses.

State 2
Current Potential

This state is very similar to the reference state, except that non-native grasses and/or forbs are now present in all phases. The current potential state may include naturalized or invasive nonnative species. The primary disturbance mechanisms for this state include natural and human caused disturbances. Drought and insects still influence the community shifts; however, due to steep slopes there are very little man induced disturbances. Trailing of livestock to water and some minor recreational activities (i.e. hiking) are the most common and have very little impact on the site other than introduction of these non-native grasses and forbs. The 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. Therefore, this site is often irreversibly altered from the reference state Current Potential state: Community phases maintained by drought and insect herbivory cycles Indicators: A well developed shrub and grass understory co-existing with a canopy of Pinyon and Utah juniper. Feedbacks: Infrequent, but regular droughts to reduce tree cover, and allow for a subsequent increase in the shrub, grass, and forb understory. Establishment of non-native plant species, such as cheatgrass. At-risk Community Phase: All communities are at risk when native plants become stressed and non-native invasive species are allowed to flourish.

Community 2.1
Pinyon-Utah Juniper Woodland

This plant community phase is characterized by a dominance overstory canopy of Pinyon and Utah juniper, with a well developed shrub and perennial grass understory. Shrubs commonly seen include Utah serviceberry and roundleaf buffaloberry. Grasses that typically inhabit this site include cheatgrass, Indian ricegrass and Saline wildrye. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses, shrubs, and trees are present; however, species composition varies from one site to the next. Bare ground and biological crust cover make up less than 10% when measured by first raindrop impact. Surface rock fragments, ranging from gravels to boulders, make up the majority of this site and may be has high as 65 percent.

Table 11. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	150	250	350
Tree	100	200	300
Shrub/Vine	100	150	200
Forb	25	50	75
Total	**375**	**650**	**925**

Table 12. Ground cover

Tree foliar cover	20-25%
Shrub/vine/liana foliar cover	15-25%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	1-5%
Surface fragments >0.25" and <=3"	50-75%
Surface fragments >3"	20-25%
Bedrock	0-5%
Water	0%
Bare ground	3-10%

Table 13. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	0-5%	0-5%
>0.5 <= 1	–	3-5%	5-10%	0-5%
>1 <= 2	0-5%	5-10%	3-5%	0-5%
>2 <= 4.5	5-10%	5-10%	0-3%	–
>4.5 <= 13	10-15%	0-3%	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 2.2
Utah Juniper Woodland

This plant community phase is characterized by a dominance overstory canopy of Utah juniper, with roundleaf buffaloberry, cheatgrass, Indian ricegrass, and various forbs in the understory. Pinyon, Utah serviceberry, and Saline wildrye may or may not be present. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses, shrubs, and trees are present; however, species composition varies from one site to the next. Bare ground and biological crust cover make up less than 10% when measured by first raindrop impact. Surface rock fragments, ranging from gravels to boulders, make up the majority of this site and may be has high as 65 percent.

Table 14. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	100	200	300
Grass/Grasslike	50	150	250
Shrub/Vine	50	100	150
Forb	25	50	75
Total	**225**	**500**	**775**

Table 15. Ground cover

Tree foliar cover	20-25%
Shrub/vine/liana foliar cover	10-20%
Grass/grasslike foliar cover	5-8%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	1-5%
Surface fragments >0.25" and <=3"	50-70%
Surface fragments >3"	20-25%
Bedrock	0-5%
Water	0%
Bare ground	3-10%

Table 16. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	0-5%	0-5%
>0.5 <= 1	–	3-5%	5-8%	0-5%
>1 <= 2	0-5%	5-10%	3-5%	0-5%
>2 <= 4.5	5-10%	5-10%	0-3%	–
>4.5 <= 13	10-15%	0-3%	–	–
>13 <= 40	5-10%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway 2.1A
Community 2.1 to 2.2

This pathway occurs as drought or insect herbivory removes the Pinyon canopy and allows for increased growth of the understory. When this pathway occurs as a response to drought, shrub and grass production may be slow until more normal climatic patterns return. The canopy is opened and sunlight is able to reach the understory allowing for nutrients to be captured.

Pathway 2.2A
Community 2.2 to 2.1

This pathway occurs as normal to above average precipitation patterns coupled with time allow for the reestablishment of Pinyon and other less drought tolerant shrubs and grasses.

Transition T1A
State 1 to 2

This transition from the native perennial grass and forb understory found in the reference state to a state that has begun to be invaded by cheatgrass. This transition occurs as natural and/or management actions favor an increase in non-native grasses and forbs, especially annuals. Possible events include the mere presence of invasive species seed sources and extended droughts.

Additional community tables

Table 17. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			35–95	
	Utah serviceberry	AMUTU	*Amelanchier utahensis var. utahensis*	20–75	–
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	10–20	–
3	**Sub-Dominant Shrubs**			25–75	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–15	–
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–15	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–15	–
	mormon tea	EPVI	*Ephedra viridis*	0–15	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–15	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–15	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–15	–
	Havard oak	QUHA3	*Quercus havardii*	0–15	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–15	–
Grass/Grasslike					
0	**Dominant Grasses**			165–220	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	150–200	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	15–20	–
1	**Sub-Dominant Grasses**			0–50	
	Grass, perennial	2GP	*Grass, perennial*	0–15	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–15	–
	squirreltail	ELEL5	*Elymus elymoides*	0–15	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–15	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–15	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–15	–
Forb					
2	**Forbs**			30–60	
	Forb, annual	2FA	*Forb, annual*	0–15	–
	Forb, perennial	2FP	*Forb, perennial*	0–15	–
	brickellbush	BRICK	*Brickellia*	0–15	–
	cryptantha	CRYPT	*Cryptantha*	0–15	–
	winged buckwheat	ERAL4	*Eriogonum alatum*	0–15	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–15	–
	desert princesplume	STPI	*Stanleya pinnata*	0–15	–
Tree					
4	**Trees**			100–200	
	Utah juniper	JUOS	*Juniperus osteosperma*	75–140	–
	twoneedle pinyon	PIED	*Pinus edulis*	75–140	–

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
1	**Dominant Tree**			100–200	
	Utah juniper	JUOS	*Juniperus osteosperma*	100–200	–
2	**Sub-Dominant Tree**			0–50	
	twoneedle pinyon	PIED	*Pinus edulis*	0–50	–
Shrub/Vine					
3	**Dominant Shrub**			25–50	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	25–50	–
4	**Sub-Dominant Shrubs**			25–75	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–15	–
	Utah serviceberry	AMUTU	*Amelanchier utahensis var. utahensis*	0–15	–
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–15	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–15	–
	mormon tea	EPVI	*Ephedra viridis*	0–15	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–15	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–15	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–15	–
	Havard oak	QUHA3	*Quercus havardii*	0–15	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–15	–
Grass/Grasslike					
5	**Dominant Grasses**			50–100	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	50–100	–
6	**Subdominant Grasses**			10–50	
	Grass, perennial	2GP	*Grass, perennial*	0–15	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–15	–
	squirreltail	ELEL5	*Elymus elymoides*	0–15	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–15	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–15	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–15	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–15	–
Forb					
7	**Forbs**			30–60	
	brickellbush	BRICK	*Brickellia*	0–15	–
	cryptantha	CRYPT	*Cryptantha*	0–15	–
	winged buckwheat	ERAL4	*Eriogonum alatum*	0–15	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–15	–
	desert princesplume	STPI	*Stanleya pinnata*	0–15	–
	Forb, annual	2FA	*Forb, annual*	0–15	–
	Forb, perennial	2FP	*Forb, perennial*	0–15	–

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Dominant Shrub**			35–95	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	25–75	–
2	**Sub-Dominant Shrubs**			25–75	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–15	–
	Utah serviceberry	AMUTU	*Amelanchier utahensis var. utahensis*	0–15	–
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–15	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–15	–
	mormon tea	EPVI	*Ephedra viridis*	0–15	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–15	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–15	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–15	–
	Havard oak	QUHA3	*Quercus havardii*	0–15	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–15	–
Grass/Grasslike					
3	**Dominant Grasses**			165–220	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	50–100	–
	cheatgrass	BRTE	*Bromus tectorum*	5–20	–
4	**Sub-Dominant Grasses**			0–50	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–15	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–15	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–15	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–15	–
	Grass, annual	2GA	*Grass, annual*	0–15	–
	Grass, perennial	2GP	*Grass, perennial*	0–15	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–15	–
	squirreltail	ELEL5	*Elymus elymoides*	0–15	–
Forb					
5	**Forbs**			30–60	
	Forb, annual	2FA	*Forb, annual*	0–15	–
	Forb, perennial	2FP	*Forb, perennial*	0–15	–
	brickellbush	BRICK	*Brickellia*	0–15	–
	cryptantha	CRYPT	*Cryptantha*	0–15	–
	tansymustard	DESCU	*Descurainia*	0–15	–
	winged buckwheat	ERAL4	*Eriogonum alatum*	0–15	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–15	–
	prickly Russian thistle	SATR12	*Salsola tragus*	0–15	–
	desert princesplume	STPI	*Stanleya pinnata*	0–15	–
Tree					
6	**Trees**			100–200	

6	**Trees**			100–200	
	Utah juniper	JUOS	*Juniperus osteosperma*	100–200	–
	twoneedle pinyon	PIED	*Pinus edulis*	0–50	–

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
1	**Dominant Tree**			100–200	
	Utah juniper	JUOS	*Juniperus osteosperma*	100–200	–
2	**Sub-Dominant Tree**			0–50	
	twoneedle pinyon	PIED	*Pinus edulis*	0–50	–
Shrub/Vine					
3	**Dominant Shrub**			25–50	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	25–75	–
4	**Sub-Dominant Shrub**			25–75	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–15	–
	Utah serviceberry	AMUTU	*Amelanchier utahensis var. utahensis*	0–15	–
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–15	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–15	–
	mormon tea	EPVI	*Ephedra viridis*	0–15	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–15	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–15	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–15	–
	Havard oak	QUHA3	*Quercus havardii*	0–15	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–15	–
Grass/Grasslike					
5	**Dominant Grasses**			55–120	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	50–100	–
	cheatgrass	BRTE	*Bromus tectorum*	5–20	–
6	**Sub-Dominant Grasses**			5–50	
	Grass, annual	2GA	*Grass, annual*	0–15	–
	Grass, perennial	2GP	*Grass, perennial*	0–15	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–15	–
	squirreltail	ELEL5	*Elymus elymoides*	0–15	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–15	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–15	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–15	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–15	–
Forb					
7	**Forbs**			30–60	
	Forb, annual	2FA	*Forb, annual*	0–15	–
	Forb, perennial	2FP	*Forb, perennial*	0–15	–

	brickellbush	BRICK	*Brickellia*	0–15	–
	cryptantha	CRYPT	*Cryptantha*	0–15	–
	tansymustard	DESCU	*Descurainia*	0–15	–
	winged buckwheat	ERAL4	*Eriogonum alatum*	0–15	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–15	–
	prickly Russian thistle	SATR12	*Salsola tragus*	0–15	–
	desert princesplume	STPI	*Stanleya pinnata*	0–15	–

Animal community

--Threatened and Endangered Species--
This section will be populated as more information becomes available.

--Wildlife Interpretation--
The scarcity of water up on the mesas limits the species richness and the abundance of large mammals. This site provides thermal cover and limited forage opportunities for mule deer and elk. Birds, bats, lizards, snakes and rodents are more common. Birds from several families are common, from hawks to sparrows. Golden eagles and red-tailed hawks are common as well as the great horned-owl. Species typical of pinyon juniper areas including black-chinned and rufous hummingbirds, and several fly catchers, wood peckers. Corvids will use this site for nesting and foraging. Several species of rodents forage and occupy this site including desert cottontail, black tailed jack rabbit, Colorado chipmunk, white–tailed antelope squirrel, Apache pocket mouse, and several species of Peromyscus. Coyotes and kit foxes will also forage in the area; however dens are likely to be located in other ecological sites due to shallow soils and/or presence rocks fragments and rock outcrop. Bats (Myotis, Pipisturellus, and others) can be observed in this ecological site, but are likely limited to areas near water or canyons.

--Grazing Interpretations--
Due to the steep slopes and rocky terrain found that characterize this site, domestic livestock grazing is of little concern. However these sites may have been used for trailing sheep and cattle down to water sources where available. Thus some grazing likely has occurred on these sites. The abundance of Salina wildrye and Indian ricegrass provide good grazing conditions for both sheep and cattle year round, while Utah serviceberry and Birchleaf mountain mahogany provide good browsing opportunities. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. Forb composition should be monitored for species richness, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group B. Here runoff potential is low and infiltration rates are moderate, depending on slope and ground cover/health (NRCS National Engineering Handbook). Hydrological groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water. In areas similar to the reference state where ground cover is adequate infiltration is increased and runoff potential is decreased. In areas where ground cover is less than 50%, infiltration is reduced and runoff potential is increased. Heavy use by domestic livestock affects hydrology in two ways. Trampling increases bulk density and breaks down soil aggregates. This results in decreased infiltration rates and increased runoff. Heavy grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but it is variable. Fire intensity, fuel type, soil, climate, and topography can each have different influences. Fires can increase areas of bare ground and hydrophobic layers that reduce infiltration and increase runoff. Different plant communities affect hydrology in different ways. Weedy communities such as states 3 and 4 alter the hydrology by changing the surface soil texture. Soil surfaces will typically become siltier which reduces infiltration and increases runoff potential. (National Range and Pasture Handbook, 2003)

Recreational uses

Recreation activities include aesthetic value and fair opportunities for hiking and hunting. Due to steep slopes and boulders associated with this site opportunities for camping and off highway vehicle use are limited.

Wood products

This site is a good site for gathering fence posts or firewood; however steep slopes may not make it economical or feasible.

Other information

--Poisonous/Toxic Plant Communities--
Toxic plants associated with this site include broom snakeweed, which contains steroids, terpenoids, saponins, and flavones that can cause abortions or reproductive failure in sheep and cattle, however cattle are most susceptible. These toxins are most abundant during active growth and leafing stage. Cattle and sheep will typically only graze broom snakeweed when other forage is unavailable and generally in winter when toxicity levels are at their lowest. (Knight and Walter, 2001)

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur. (Knight and Walter, 2001)

--Invasive Plant Communities--
Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass, Russian thistle, kochia, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible.

Inventory data references

Data used to develop this site was collected in Natural Bridges National Monument and was associated with a soil survey update. All points where georeferenced and typically correlated to a soil observation. Data was collected in 2005-2007.

Type locality

Location 1: San Juan County, UT	
UTM zone	N
UTM northing	585651
UTM easting	4161530
General legal description	Located in Natural Bridges National Monument; North-Northwest facing colluvial slope near Kachina Bridge.

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Contributors

Dana Truman/Ashley Garrelts

Approval

Kirt Walstad, 1/16/2025

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)	Shane A. Green (NRCS) and Ashley Garrelts (NRCS)
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Date	11/05/2008
Approved by	Kirt Walstad
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are rarely found on the site in the reference condition despite steep slopes, due to abundance of surface rock fragments.

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2. **Presence of water flow patterns:** Water flow patterns may form on soil surface as water flows from exposed bedrock but not at sufficient quantity to cause erosion. Typically the surface rock fragments will mask water flow patterns on this site.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals and terracettes are rare due to the surface being largely covered in surface rock fragments which inhibits soil erosion and movement. However some pedestalling may occur due to steep slopes, surface rock fragments may be moved by water and become trapped by plants. There should be no exposed roots.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground in the reference state is expected to range from 0-5 %. Except where covered by plant canopy cover, the primary areas of bare ground are in water flow patterns and between surface rock fragments.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** The occurrence of wind scoured, blowouts, and/or depositional areas are rare. Trees intercept wind and prevent wind generated soil movement.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement and wind. Fine litter (<¼ inch in diameter) may be moved and usually occurs in water flow patterns and rills, with deposition occurring at obstruction. The majority of litter accumulates at the base of plants or in soil depression adjacent to the plant. Woody stems (those greater than ¼ inch in diameter) are not likely to move under normal conditions.

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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 a soil stability rating of 5-6 throughout the site. Surface textures range from fine sandy loams to flaggy/gravelly/channery fine sandy loams.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is 1-4 inches deep and structure is typically described as weak very fine granular to weak fine platy. The A-horizon color is a light yellowish brown (10YR6/4) to a reddish brown (5YR5/4). The A-horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A-horizon under plant canopies as well as the interspaces. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The presence of perennial grasses, shrubs, trees an as well as any well developed biological soil crusts (moss, pinnacled lichen, and light cyanobacteria) will break raindrop impact and splash erosion. The spatial distribution of vascular plants, non-vascular communities (when present), and interspaces provide detention storage and surface roughness that slows down runoff, allowing time for infiltration. The tree canopy is effective in intercepting rain drops and preventing splash erosion but configuration of crowns and litter accumulation under crowns forms micro-topography that may help accumulate water for more rapid runoff, particularly if bare soil lies below the outer edge of the canopy.

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 on this site; however, bedrock may lie within 20 inches or less of the soil surface. Naturally occurring layers of hard calcium carbonate and/or unweathered parent material may also be found in the soil, but should not be considered a compaction layer.

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: Trees (e.g. Two Needle Pinyon and Utah Juniper) > shrubs (e.g. Utah serviceberry and roundleaf buffaloberry) > perennial grasses (e.g. Salina wildrye and Indian ricegrass)

    Sub-dominant: forbs > biological soil crusts

    Other: Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mix of young, medium aged, and old Pinyon and Utah juniper are expected to be found on this site. During years with average to above average precipitation, there should be very little mortality or decadence apparent in either shrubs or grasses. Old and young tree mortality and decadence naturally occurs during severe droughts. Insects and droughts may combine to increase death of pinyon in natural cycles.

14. **Average percent litter cover (%) and depth (in):** Litter cover (not including under plants) ranges from 1-5%. Most litter accumulates at below and to the side of live plants, and thus percent litter will be just slightly above percent of canopy cover. Litter associated with forbs is less than .10 inches deep, while litter under shrubs is .25 to .5 inches deep and litter under trees is 100% and .5 to 1 inches deep. Bare interspaces of water flow patterns, rill, and gullies do not have litter except where debris dams occur.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 400-600 pounds per acre in average year.

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:** Invasive species likely to invade this site include cheatgrass (Bromus tectorum), broom snakeweed (Gutierrezia sarothrae), tansy mustard (Descurainia pinnata), annual stickseed (Lappula sp.), annual Cryptantha (Cryptantha sp.), and Russian thistle (Salsola tragus).

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except during drought.

18. **Supporting Data:** NRCS (Dana Truman) 2007 ESD data from Natural Bridges National Monument.