

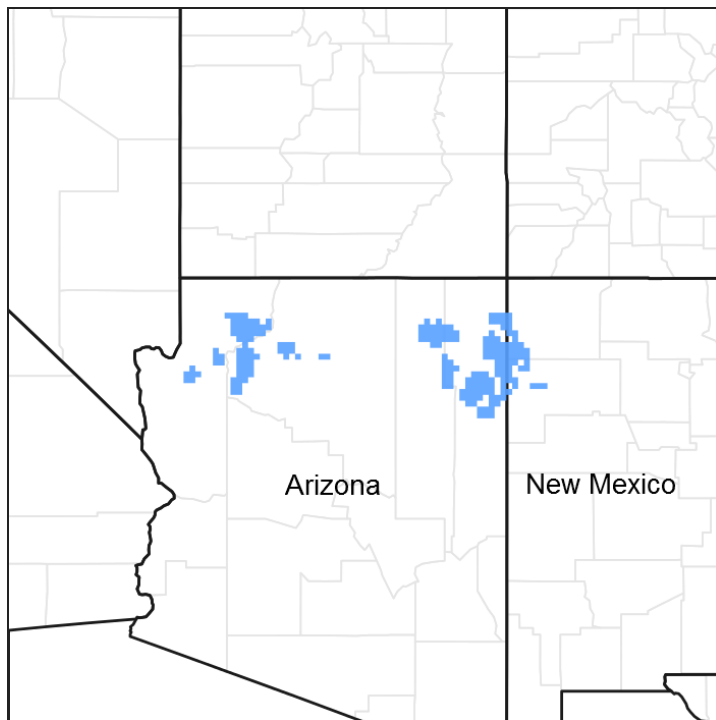
# Ecological site R035XF605AZ Loamy Upland 13-17" p.z.

Last updated: 5/19/2025  
Accessed: 05/21/2025

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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.



**Figure 1. Mapped extent**

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

## MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

This ecological site occurs in Common Resource Area 35.6 - the Colorado Plateau Pinyon-Juniper-Sagebrush

The Common Resource Area occurs within the Colorado Plateau Physiographic Province. Elevations range from 5800 to 7300 feet and precipitation averages 13 to 17 inches per year. Vegetation includes pinyon, juniper, big sagebrush, cliffrose, Mormon tea, muttongrass, prairie junegrass, squirreltail, western wheatgrass, and blue grama. The soil temperature regime is mesic and the soil moisture regime is aridic ustic. This unit occurs within the Colorado Plateau Physiographic Province and is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin.

## Ecological site concept

The soils grouped in this site are very deep with very fine sandy loam to sandy clay loam surface textures. This ecological site is found on valley floors and fan terraces of undulating plateaus. Slopes range from 1 to 15 percent. The site does not benefit significantly from run-on moisture from other sites.

## Associated sites

R035XF608AZ	<b>Limestone / Sandstone Upland 13-17" p.z.</b> Found on hills in complex with this site.
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**Table 1. Dominant plant species**

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

## Physiographic features

This ecological site is found on valley floors and fan terraces of undulating plateaus. The soil is deep to very deep. Slopes range from 1 to 15 percent. The site does not benefit significantly from run-on moisture from other sites.

**Table 2. Representative physiographic features**

Landforms	(1) Plateau (2) Fan (3) Valley floor
Flooding frequency	None
Ponding frequency	None

Elevation	1,768–2,225 m
Slope	1–15%
Aspect	Aspect is not a significant factor

## Climatic features

The climate of this land resource unit is semiarid with warm summers and cool winters. The mean annual precipitation ranges from 13 – 17 inches, but it is very erratic, often varying substantially from year to year. The majority of the precipitation comes from October through April. This precipitation comes as gentle rain or snow from frontal storms coming out of the Pacific Ocean. Snow is common from November through February. Generally no more than a few inches of snow accumulates, melting within a few days, but may last a week or more. The remaining precipitation comes from July through September as spotty, unreliable and sometimes violent thunderstorms. The moisture for this precipitation originates in the Gulf of Mexico (and the Pacific Ocean in the fall) and flows into the area on the north end of the Mexican monsoon. Late May through late June is generally a dry period. The mean annual air temperature ranges from 47 to 49 degrees Fahrenheit (F). The frost-free period (air temperature > 32 degrees F) ranges from 113 to 144 days (@ 50 percent probability). Strong winds are common, especially in the spring.

**Table 3. Representative climatic features**

Frost-free period (average)	144 days
Freeze-free period (average)	160 days
Precipitation total (average)	432 mm

## Influencing water features

The soil moisture on this ecological site comes from precipitation. The site does not benefit significantly from run-on moisture. The loamy surface texture of the soil allows the site to capture the majority of the winter storms and the light to moderate summer storms if the site has good vegetative cover. Intense summer thunderstorms will produce runoff, reducing the amount of effective rainfall.

## Soil features

Soils are very deep with very fine sandy loam to sandy clay loam surface textures. Subsurface horizon textures range from loam to sandy clay. Available water capacity is high. Potential for water erosion is moderate to severe. The potential for wind erosion is slight to moderate. Runoff is slow to medium. Soils are non-saline and non-sodic with pH range of 6.1-8.4. The soils are non to slightly effervescent in the surface and non to strongly effervescent in the subsurface horizons.

Soil survey map unit components that have been correlated to this ecological site include:

SSA-623 Shivwits Area MU Whiskey 85;

SSA-625 Mohave County NE Part MU's - Whiskey 66, Goesling;

SSA-697 Mohave County Central Part MU Lykorly 79;

SSA-699 Hualapai-Havasupai Area MU's - Lykorly 21, Frazwell 5 & 13;

SSA-701 Grand Canyon Area MU's - Albers 35, Aridic haplustepts 5, Plumasano family 167, Lykorly GrL 77, Lykorly L 78;

SSA-712 Canyon de Chelly NM MU Lykorly 10;

SSA-713 Chinle Area MU 7 Aridic Ustorthents,

SSA-715 Fort Defiance Area NM/AZ MU's - 3-Parkelei family, 42-Parkelei ,74-Parkelei ,78-Vosburg;

SSA-717 Shiprock Area MU's Vosburg 407, Chinlini 409.

**Table 4. Representative soil features**

Parent material	(1) Alluvium–limestone and sandstone
Surface texture	(1) Loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	17.78–25.4 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm

Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0–10%

## Ecological dynamics

An ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities; however, can be recognized by characteristic patterns of species composition, association, and community structure. The historic climax plant community for this ecological site has been described by sampling relict or relatively undisturbed sites and/or reviewing historic records. The historic climax plant community is the plant community that evolved over time with the soil forming process and long term changes in climatic conditions of the area. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site.

Natural disturbances, such as drought, fire, grazing of native fauna, and insects, are inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the ecological site.

Fluctuations in plant community structure and function caused by the effects of natural disturbances help establish the boundaries and characteristics of an ecological site. They are accounted for as part of the range of characteristics of the ecological site.

Recognizable plant community phases are identified in the reference state of the ecological site. Some sites may have a small range of variation, while others have a large range. Some plant community phases may exist for long periods of time, while others may only occur for a couple of years after a disturbance.

Deterioration of the plant community, hydrology, or soil site stability on an ecological site can result in crossing a threshold or potentially irreversible boundary to another state, or equilibrium. This can occur as a result of the loss of soil surface through erosion, the loss of the stability of the site due to disturbances that cause active erosion on the site, increases in the amounts and/or patterns or runoff from rainstorms, changes in availability of surface and subsurface water, significant changes in plant structural and functional types, or the introduction of non-native species. When these thresholds are crossed, the potential of the ecological site to return to the historic climax plant community can be lost, or restoration will require significant inputs . There may be multiple states possible for an ecological site, determined by the type and or severity of disturbance.

The known states and transition pathways for this ecological site are described in the state and transition model. Within each state, there may be one or more known plant community phases. These community phases describe the different plant community that can be recognized and mapped across this ecological site. The state and transition model is intended to help land users recognize the current plant community on the ecological site, and the management options for improving the plant community to the desired plant community.

Plant production information in this site description is standardized to the annual production on an air-dry weight basis in near normal rainfall years.

State and transition model

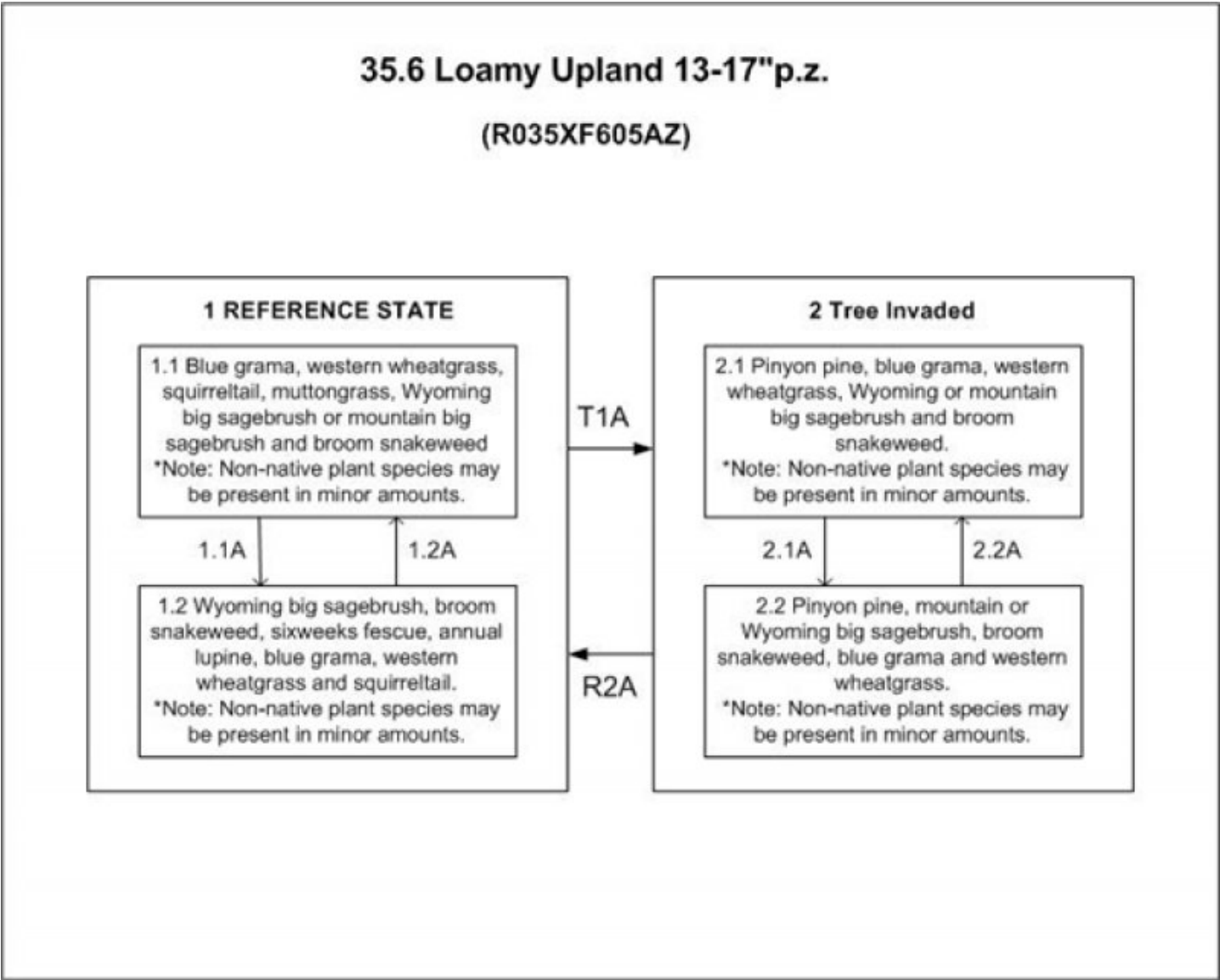


Figure 4. Loamy Upland 13-17"p.z.

State 1  
Reference State

This is a grassland / shrub mix. The approximate total production breakdown is grasses

are 60-70%, forbs 1-5%, shrubs 25-35% and trees 0-4%. Western wheatgrass, squirreltail, muttongrass and blue grama are the dominant grasses and Wyoming big sagebrush is the dominant shrub.

## Community 1.1

### Historic Climax Plant Community



Figure 5. 35.6 Loamy Upland

The dominant aspect of the site is a grass-shrub mix. Major grasses include western wheatgrass, blue grama and bottlebrush squirreltail. Dominant shrubs are mountain and Wyoming big sagebrush.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	241	381	504
Shrub/Vine	78	191	303
Forb	6	22	34
Tree	—	17	28
<b>Total</b>	<b>325</b>	<b>611</b>	<b>869</b>

Table 6. Ground cover

Tree foliar cover	0-2%
Shrub/vine/liana foliar cover	5-35%
Grass/grasslike foliar cover	15-35%
Forb foliar cover	0-10%
Non-vascular plants	0%

Biological crusts	0%
Litter	25-35%
Surface fragments >0.25" and <=3"	0-2%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	20-45%

**Table 7. Canopy structure (% cover)**

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	15-35%	—
>0.15 <= 0.3	—	—	15-35%	0-10%
>0.3 <= 0.6	—	5-35%	—	—
>0.6 <= 1.4	0-2%	5-35%	—	—
>1.4 <= 4	0-2%	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

**Figure 7. Plant community growth curve (percent production by month). AZ3504, 35.3 10-14" p.z. bottlebrush squirreltail. Growth occurs in late winter, spring, and fall. Plants often remain green through the winter..**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	5	15	35	25	10	0	0	5	5	0	0

**Figure 8. Plant community growth curve (percent production by month). AZ3506, 35.6 13-17" p.z. blue grama. Growth occurs mostly in summer and early fall during the rainy season..**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	15	25	30	15	0	0	0

**Figure 9. Plant community growth curve (percent production by month). AZ3601, 35.6 13-17" p.z. western wheatgrass. Growth begins in the spring and continues into fall during the rainy season..**



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	20	20	20	20	5	0	0

**Figure 10. Plant community growth curve (percent production by month). AZ3603, 35.6 13-17" p.z. Wyoming big sagebrush. Most growth occurs in the summer. Seed set occurs in the fall..**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	15	20	20	20	10	10	0	0

**Figure 11. Plant community growth curve (percent production by month). AZ3927, 35.6 13-17" p.z. big sagebrush. Growth begins in the spring and continues through the summer. Stem elongation occurs in the summer. Seed set occurs in the fall..**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	15	20	20	20	10	10	0	0

## Community 1.2

### Increased Shrubs and Annuals (forbs and grasses)

1.2 Disturbance has reduced perennial grasses. Sagebrush, broom snakeweed, sixweeks fescue and annual lupine increase. \*Note: Non-native plant species may be present in minor amounts.

### Pathway 1.1A

#### Community 1.1 to 1.2

Continuous understory disturbance decreases perennial grasses and allows the shrubs to increase along with annual grasses and forbs.

### Pathway 1.2A

#### Community 1.2 to 1.1

Shrub treatment if necessary along with careful management. There may be a need for some range re-seeding if conditions warrant it.

## State 2

### Tree Invaded State

2.2 Trees (mostly pinyon pine) is invading the site. Disturbed understory, lack of fire and favorable climatic conditions have opened up the site to this tree invasion. Left unchecked the trees and shrubs will dominate the site and the understory becomes less productive with less quality forage plant species. It takes tree and shrub treatments along with careful management which might include some re-seeding to move back to a more desired plant

community. There are times when drought and insect damage reduce tree densities,also. There may be very little to a few percent of non-native plants. Introduction of non-native annuals species creates an irreversible change in the plant community

**Community 2.1**  
**Pinyon pine - Invaded Grassland/Shrub**

2.1-This community will have pinyon pine (PIED) invade this site when fire has been suppressed and there is a favorable moisture regime to allow the trees to move in from adjacent areas. Grasses will still be the dominant plants followed by shrubs and will remain similar to the plant community of 1.1. There may be very little to a few percent of non-native plants. Introduction of non-native annuals species creates an irreversible change in the plant community

**Community 2.2**  
**Tree / Shrubland**

2.2 Continued tree invasion is facilitated by continuous understory disturbance. Pinyon pine and sagebrush expand and increase their influence on the site. Broom snakeweed and annual forbs and grasses increase while perennial native grasses decrease. Note: Mechanical removal of the trees will be needed to reverse the tree invasion. There are times when drought, fire and insect damage reduce tree densities. There may be very little to a few percent of non-native plants. Introduction of non-native annuals species creates an irreversible change in the plant community

**Transition T1A**  
**State 1 to 2**

Trees are allowed to invade the site.

**Restoration pathway R2A**  
**State 2 to 1**

Trees and possibly shrubs are treated mechanically or chemically to remove from the site. This and management will help restore more desirable site properties. There are times when drought, fire and insect damage reduce tree densities.

**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					
1	Grasses			241–504	

	blue grama	BOGR2	<i>Bouteloua gracilis</i>	101–146	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	56–112	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	34–67	–
	muttongrass	POFE	<i>Poa fendleriana</i>	34–67	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	34–67	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	6–34	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–34	–
<b>Forb</b>					
2	<b>Forbs</b>			6–34	
	muttongrass	POFE	<i>Poa fendleriana</i>	34–67	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	6–22	–
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0–11	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–11	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			78–303	
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	67–202	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	67–202	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	101–135	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–34	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	6–34	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	6–17	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–17	–
<b>Tree</b>					
4	<b>Trees</b>			0–28	
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	34–67	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	0–17	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–17	–

## Animal community

Wildlife found on this ecological site include: mule deer, coyote, snakes, lizards, cottontail rabbit, blacktail jackrabbit, and elk.

## Recreational uses

Recreational activities include: hiking, horseback riding, wildlife observations and photography.

## Type locality

Location 1: Coconino County, AZ	
Township/Range/Section	T29 N. R7 W. S14
General legal description	National Tank quad. - Along Albers Wash; Section 14, T. 29 N., R. 7 W., Hualapai Indian Reservation, Arizona.

## Other references

Updates and revisions for this ESD were conducted as part of a 2007-2012 Interagency Technical Assistance Agreement between the Bureau of Indian Affairs–Navajo Region and the NRCS-Arizona.

## Contributors

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## Approval

Kendra Moseley, 5/19/2025

## 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)	Karlynn Huling and Kevin Williams and Steve Cassady
Contact for lead author	State Rangeland Management Specialist, NRCS-Arizona State Office, Phoenix,AZ
Date	10/29/2007
Approved by	Steve Barker
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** Generally none, although minor rill formation is possible on steeper slopes (10 to 15%), due to loamy surface textures, moderately slow permeability, medium runoff, and high amount of bare ground.  

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2. **Presence of water flow patterns:** Water flow patterns are few and scattered. They are less than 2 meters in length and generally are less than 10% of the site composition.  

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3. **Number and height of erosional pedestals or terracettes:** There is mounding that may be present near shrubs (1-6") and trees (6-10") and pedestals are seen along water flow patterns near perennial grasses (1-2").  

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** The bare ground for this particular site is varied and although it is normally 20-35% it will appear as high as 60% near water flow patterns. The available water capacity ranges from 8.5 to 11 inches, so this site has the potential to produce a high amount of plant cover. The average fetch between perennial plants is 2.5 inches.  

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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:** There can be some

deposition around long lived perennial shrubs and grasses.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter is transported by wind and water about 1-2 meters in open areas that are away from shrubs and trees and under shrubs and trees movement is less at 0-1 meter. Coarse woody litter tends to stay in place in all areas.
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** The soil surface textures are loam, silt loam and sandy clay loam. The soil stability test results showed an average of 1.8 to 2.3 out of a possible 6 for open areas outside of any canopy and an average of 5 out of 6 for soil samples that were extracted from under various plant canopies. The soil surface and profile does not contain many rock fragments. The presence of cracks could lead to low aggregate stability of the surface. When well vegetated, these soils have a low to moderate resistance to water erosion and a moderate to high resistance to wind erosion.
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is mostly platy (weak to moderate, thin to thick) or granular (weak to moderate, fine to medium). The thickness of the A-horizon is 2-3 inches in depth. The surface colors are brown to reddish brown.
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** This site is characterized by a relatively even distribution of mostly grasses and shrubs, with a few patches of trees in some areas. Canopy cover range is 15-50% (warm season grasses>evergreen shrubs>deciduous shrubs>cool season grasses>forbs>succulents> trees). Basal cover ranges from 18% to 21% (grasses>shrubs). Both of these cover values will decrease during prolonged drought. This type of plant community is moderately effective at capturing and storing precipitation.
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Most of the soils may be easily compacted when wet (some animal trails) due to the loam or silt loam, textures at or near the surface. Many of the soils have a naturally platy surface structure.

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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: (>40%): none

Sub-dominant: (11%-40%): warm season colonizing grasses = evergreen shrubs > deciduous shrubs > cool season grasses.

Other: Minor (0%-10%): forbs. Trace (0-3%): succulents > trees.

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All plant functional groups are adapted to survival in all years except during the most severe droughts. Severe winter droughts affect shrubs, trees, and cool season grasses the most. Severe summer droughts affect warm season grasses the most.
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14. **Average percent litter cover (%) and depth ( in):** Of the total litter amount, it would be expected that approximately 70% to 90% would be herbaceous litter and approximately 10% to 30% would be woody litter. Litter amounts increase during the first few years of drought, then decrease in later years.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 400-500 pounds per acre (dry weight) in dry years; 500-850 pounds per acre in median years; 850-1200 pounds per acre in wet years.
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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:** Wyoming big

sagebrush is native to the site, but has the potential to increase and dominate. Broom snakeweed and pricklypear cactus are natives that have the potential to increase and dominate after a sagebrush fire. Utah juniper and Colorado pinyon are natives that may increase after fire suppression. Sixweeks fescue and lupine are natives that may increase after severe disturbance. Cheatgrass is an exotic annual that is becoming endemic to the site regardless of management or fire frequency. It may become dominant after a sagebrush fire.

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17. **Perennial plant reproductive capability:** All plants native to this site are adapted to the climate and are capable of producing seeds, stolons and rhizomes in most years except during the most severe droughts.
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