

Ecological site DX035X03B628 Sandy Loam Upland (JUOS, PIED) 13-17" p.z.

Accessed: 05/21/2025

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.

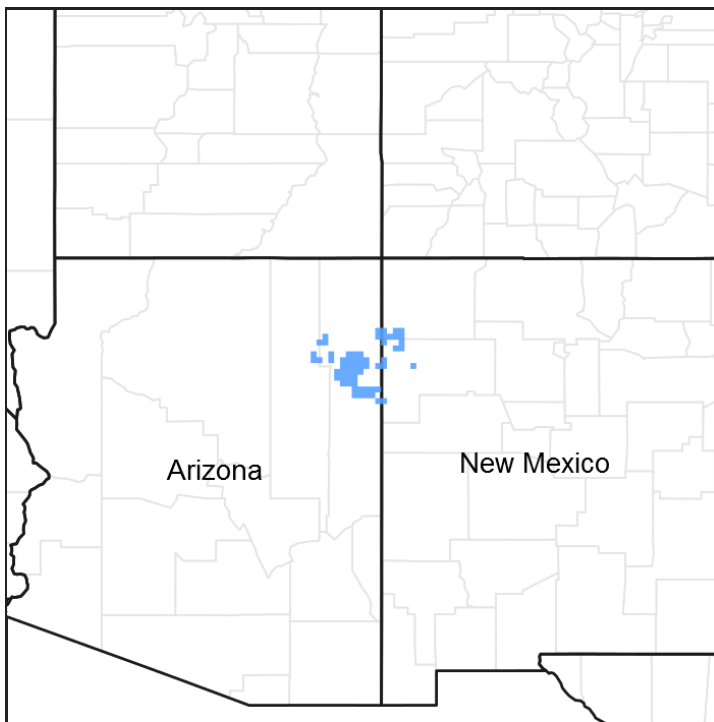


Figure 1. Mapped extent

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.

MLRA notes

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

AZ CRA 35.6 - Colorado Plateau Pinyon-Juniper-Sagebrush

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.

Table 1. Dominant plant species

Tree	(1) <i>Juniperus osteosperma</i> (2) <i>Pinus edulis</i>
Shrub	(1) <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> (2) <i>Purshia tridentata</i>
Herbaceous	(1) <i>Poa fendleriana</i> (2) <i>Achnatherum hymenoides</i>

Legacy ID

F035XF628AZ

Physiographic features

The landform and position for this site is summit areas, treads of fan terraces on plateaus and footslopes of broad, stable landslides. The soils are deep to very deep. The parent material is eolian, alluvium from sandstone and siltstone.

Slopes are normally 1-15%, but may go as high as 25% for short runs.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Mesa (3) Landslide
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 (60%) 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 (40%) 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 frost-free period (air temperature > 32 degrees F) ranges from 120 to 140 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

Soil features

The soils on this site are deep to very deep. Surface textures range from sandy loam to very fine sandy loam. Subsurface textures can include sandy loam to very fine sandy loam, loam and sandy clay loam to clay loam. The parent material is comprised of eolian and alluvium from sandstone and siltstone.

Typical taxonomic units include:

SSA-715 Fort Defiance Area AZ/NM MU's - 42 Iwela family, 77 Fraguni, 86 & 87 Plumasano;
 SSA-717 Shiprock Area AZ/NM MU's 400 & 404 Wetherill, 407 Nomrah;
 SSA-692 McKinley County Area NM - 561 & 565 Plumasano; 360 Fraguni

Table 4. Representative soil features

Parent material	(1) Eolian deposits—sandstone and siltstone
Surface texture	(1) Sandy loam (2) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate

Soil depth	152–203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–3%
Available water capacity (0-101.6cm)	17.78–25.4 cm
Calcium carbonate equivalent (0-101.6cm)	2–10%
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)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The historic climax plant community (HCPC) for a site in North America is the plant community that existed at the time of European immigration and settlement. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site. The historic climax plant community was in dynamic equilibrium with its environment. It is the plant community that was able to avoid displacement by the suite of disturbances and disturbance patterns (magnitude and frequency) that naturally occurred within the area occupied by the site. Natural disturbances, such as drought, fire, grazing of native fauna, and insects, were inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the site that contribute to that dynamic equilibrium. Fluctuations in plant community structure and function caused by the effects of these natural disturbances establish the boundaries of dynamic equilibrium. They are accounted for as part of the range of characteristics for an ecological site. Some sites may have a small range of variation, while others have a large range.

The historic climax plant community of 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 HCPC for this ecological site has been estimated by sampling relict or relatively undisturbed sites and/or reviewing historic records.

Plant communities that are subjected to abnormal disturbances and physical site

deterioration or that are protected from natural influences, such as fire and grazing, for long periods seldom typify the historic climax plant community. The physical site deterioration caused by the abnormal disturbance results in the crossing of a threshold or irreversible boundary to another state, or equilibrium, for the ecological site. There may be multiple thresholds and states possible for an ecological site, determined by the type and or severity of abnormal disturbance. The known states and transition pathways for this ecological site are described below and in the accompanying state and transition model. The Plant Community Plant Species Composition table provides a list of species and each specie's or group of species' annual production in pounds per acre (air-dry weight) expected in a normal rainfall year. Low and high production yields represent the modal range of variability for that species or group of species across the extent of the ecological site.

The Annual Production by Plant Type table provides the median air-dry production and the fluctuations to be expected during favorable, normal, and unfavorable years.

The present plant community on an ecological site can be compared to the various common vegetation states that can exist on the site. The degree of similarity is expressed through a similarity index. To determine the similarity index, compare the production of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum shown for the group. Divide the resulting total by the total representative value shown in the Annual Production by Plant Type table for the reference plant community. Variations in production due to above or below normal rainfall, incomplete growing season or utilization must be corrected before comparing it to the site description. The Worksheet for Determining Similarity Index is useful in making these corrections. The accompanying growth curve can be used as a guide for estimating percent of growth completed.

The State and Transition model shows the most common occurring plant communities likely to be encountered on this ecological site. This model may not show every possible plant community, but only those that are most prevalent and observed through field inventory. As more data is collected and research is available, these plant communities may be revised, removed, and even added to reflect the ecological dynamics of this site.

State and transition model

**35.6AZ Sandy Loam Upland 13-17' p.z. (PIED, JUOS)
(F035XH628AZ)**

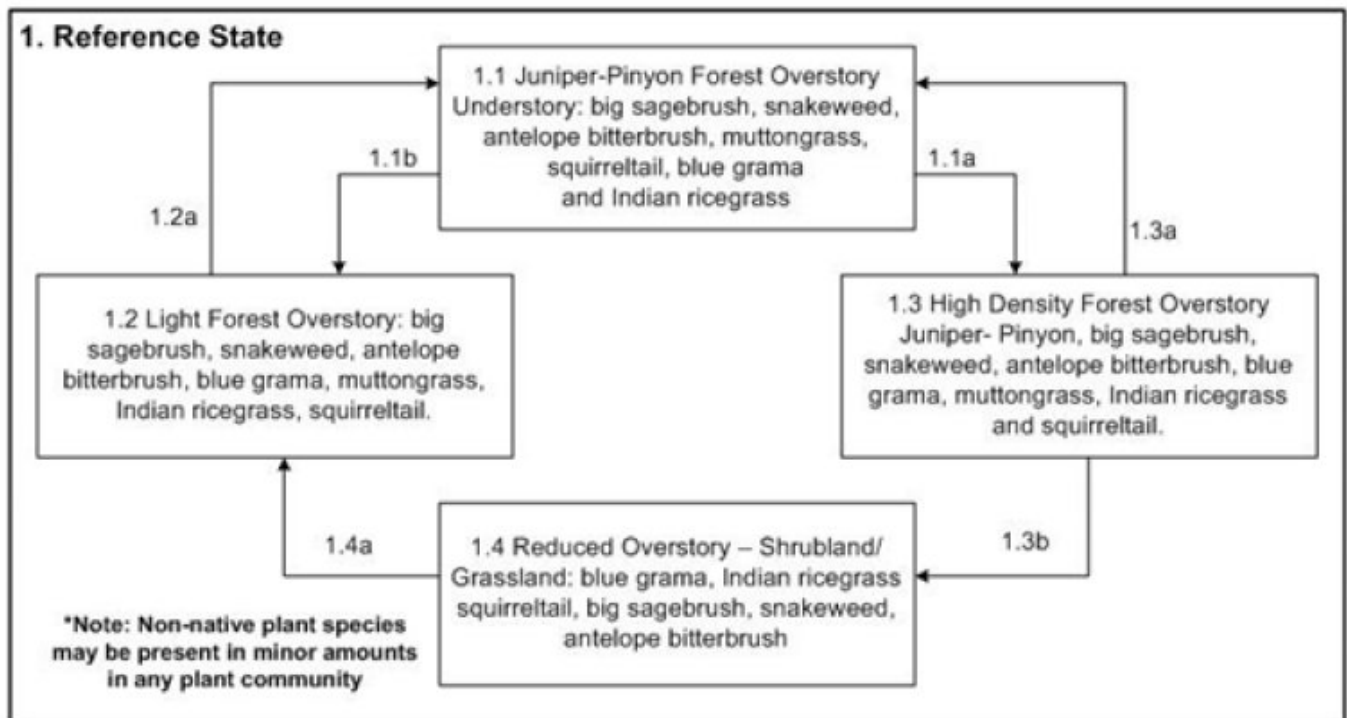


Figure 4. 35.6 Sandy Loam Upland 13-17"p.z. (JUOS, PIED)

**State 1
Reference State**

On this forested site, pinyon and juniper trees dominate the overstory with shrubs and grasses in the understory.

**Community 1.1
Reference Community - Juniper-Pinyon Forest Overstory**



Figure 5. Sandy Loam Upland 13-17" p.z. 1.1 Plant Community

This plant community is a woodland site with the overstory dominated by Pinyon (PIED) and Juniper (JUMO or JUOS). The canopy cover ranges from 50-60%. Pinyon is 50-80% and juniper is 20-50% of the canopy composition. The understory composition is predominately grasses, such as blue grama, squirreltail, Indian ricegrass and muttongrass; and shrubs, such as big sagebrush and antelope bitterbrush. Grasses and grass-like plants are 30-50% understory composition and shrubs are 30-40%. Small trees (<4.5') comprise about 10% of composition.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	168	280	392
Shrub/Vine	101	168	235
Tree	34	56	78
Forb	34	56	78
Total	337	560	783

Table 6. Ground cover

Tree foliar cover	10-60%
Shrub/vine/liana foliar cover	10-30%
Grass/grasslike foliar cover	25-55%
Forb foliar cover	0-20%
Non-vascular plants	0%
Biological crusts	0%

Litter	25-75%
Surface fragments >0.25" and <=3"	0-5%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-20%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	0-20%	—
>0.15 <= 0.3	—	—	—	0-10%
>0.3 <= 0.6	—	0-15%	—	—
>0.6 <= 1.4	0-10%	0-15%	—	—
>1.4 <= 4	—	—	—	—
>4 <= 12	50-60%	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Figure 7. 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 8. Plant community growth curve (percent production by month). AZ3561, 35.6 13-17" p.z. all sites. Growth begins in the spring and continues into the fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	16	17	15	15	15	11	5	0	0

Figure 9. Plant community growth curve (percent production by month). AZ3602, 35.6 13-17" p.z. muttongrass. Most growth occurs in early to mid spring, plants may be green in the fall. Seed set occurs by summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	10	20	30	15	5	5	10	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

Community 1.2
Light Forest Overstory

This plant community is characterized by a sparse overstory of woodland species. The crown canopy is less than 35%, ranging from 25-40%. The understory has more production than the 1.1 plant community with an increase of grasses and forbs and less shrubs. The understory plant community composition is comprised of about 20-30% grasses, 40-60% shrubs, 5-10 forbs and 10-20% trees (under 4.5 feet tall). Common grasses include blue grama, muttongrass, Indian ricegrass and squirreltail. Dominant shrubs include big sagebrush, snakeweed and antelope bitterbrush.

Community 1.3
High Density Overstory

This plant community is characterized by a dense overstory of woodland species. The crown canopy is greater than 55%. The understory has less production than the 1.1 plant community with a decrease of perennial grasses and forbs and less shrubs. The understory plant community composition is comprised of about 5-20% grasses, 50-70% shrubs, 1-5 forbs and 15-30% trees (under 4.5 feet tall). Common grasses include muttongrass, Indian ricegrass, squirreltail and bluegrama. Dominant shrubs include big sagebrush, snakeweed and antelope bitterbrush.

Community 1.4
Reduced Overstory - Shrubland/Grassland

This plant community is characterized by a reduced overstory of woodland species. The crown canopy is usually less than 20%, ranging from 5-25%. The understory has more production than the 1.1 plant community with an increase of grasses, forbs and shrubs. The understory plant community composition is comprised of about 30-50% grasses, 20-40% shrubs, 10-20 forbs and 5-20% trees (under 4.5 feet tall). Common grasses include blue grama, Indian ricegrass and squirreltail. Dominant shrubs include big sagebrush, snakeweed, antelope bitterbrush and succulents.

Pathway 1.1b
Community 1.1 to 1.2

Drought, insect infestation, and/or woodcutting

Pathway 1.1a

Community 1.1 to 1.3

Fire exclusion/Lack of natural fire, favorable precipitation, Unmanaged grazing

Pathway 1.2a

Community 1.2 to 1.1

Favorable precipitation, managed grazing, trees compete with shrubs/grass

Pathway 1.3a

Community 1.3 to 1.1

Drought, insect infestation, fire.

Pathway 1.3b

Community 1.3 to 1.4

Drought in combination with severe disturbance such as major insect infestation and/or intense fire.

Pathway 1.4a

Community 1.4 to 1.2

Favorable precipitation, seed source for tree regeneration.

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			168–392	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	39–84	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	39–84	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	39–84	–
	muttongrass	POFE	<i>Poa fendleriana</i>	39–84	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	17–39	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	17–39	–
	prairie	KOMA	<i>Koeleria macrantha</i>	0–17	–

	Junegrass				
Shrub/Vine					
2	Shrubs			101–235	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	84–196	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–84	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	0–84	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	17–39	–
	pingue rubberweed	HYRI	<i>Hymenoxys richardsonii</i>	0–6	–
	aridland goosefoot	CHDE	<i>Chenopodium desiccatum</i>	0–2	–
5	Succulents			17–39	
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	17–39	–
	banana yucca	YUBA	<i>Yucca baccata</i>	17–39	–
Forb					
3	Forbs			34–78	
	beardtongue	PENST	<i>Penstemon</i>	0–17	–
	globemallow	SPHAE	<i>Sphaeralcea</i>	0–17	–
	trailing fleabane	ERFL	<i>Erigeron flagellaris</i>	0–17	–
	redroot buckwheat	ERRA3	<i>Eriogonum racemosum</i>	0–17	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–17	–
	Carruth's sagewort	ARCA14	<i>Artemisia carruthii</i>	0–17	–
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0–17	–
	purplewhite owl's-clover	ORPU2	<i>Orthocarpus purpureoalbus</i>	0–6	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–6	–
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0–6	–
	Mexican woollywhite	HYME	<i>Hymenopappus mexicanus</i>	0–6	–
	pepperweed	LEPID	<i>Lepidium</i>	0–6	–
Tree					

4	Trees < 4.5'			0–34	
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0–39	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	0–39	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–39	–

Table 9. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
Utah juniper	JUOS	<i>Juniperus osteosperma</i>	Native	0.3–6.1	20–30	7.6–30.5	–
twoneedle pinyon	PIED	<i>Pinus edulis</i>	Native	1.2–6.7	20–30	7.6–27.9	–

Animal community

Site factors influencing wildlife:

- Water: Scattered springs and pockets.
- Cover: Good for most species.
- Food: Good diversity.
- Other: Topography provides escape habitat.

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

Recreational uses

Recreational activities: Hiking, horseback riding, wildlife observations and photography.

Other products

1. Livestock

- Suitability for grazing: Good, especially before canopy exceeds 45% and slopes are less than 35%
- Kind of livestock: Cattle, sheep, goats, and horses.
- Season of use: Late spring, summer, and fall.
- Management considerations: Grazing systems, reseeding of grass after harvest operations to help prevent erosion. Steeper slopes will limit livestock use.

Other information

Woodland

1. Equipment and Operability Considerations --

a. Suitable equipment for:

- 1) Harvesting: All kinds; use crawler type or rubber tread equipment.
- 2) Site Preparation: All kinds.
- 3) Tree planting: All kinds; shallow soils and slopes restrict planting.
- 4) Precommercial thinning: All kinds; slope limits use of wheeled equipment.

b. Equipment limitations:

- 1) Slope: Slopes over 20% limit rubber tread equipment; use crawler tractors.
- 2) Unsurfaced roads: Steeper slopes would be a limiting factor.
- 3) Stominess/rock outcrop: Rock outcrop on steep slopes limits use.
- 4) Water table/flooding: None.

2. Erosion Potentials --

a. Cutover areas/bare ground: Water and wind erosion will occur.

b. Roads/trails/landings: Water and wind erosion will occur; water erosion on steeper slopes will be accelerated.

3. Soil management --

a. Compaction potential: Fair, soils don't bind together very well.

b. Rutting potential: Soils will rut when wet.

c. Revegetation potential: Poor because of shallow soil and steep slopes.

4. Silvicultural potentials and limitations --

a. Harvest cutting: Harvest mature trees when canopy exceeds 45% and on slopes less than 25%

b. Thinning and Improvement: Cutting posts (juniper) and Christmas trees (pinyon) will improve wood growth on trees left.

c. Prescribed burning: Not recommended.

Mechanical tree removal: Not practical; shallow soils and steep slopes limit equipment use.

d. Suitability for replanting: Poor; shallow soils and steep slopes.

e. Seedling mortality: Very shallow and shallow soils make for severe mortality.

f. Natural regeneration: Slow, but will occur in time.

g. Seedling protection: Seedlings should be protected from grazing.

h. Plant competition: Severe because of competition for limited moisture.

i. Windthrow hazard: Slight; even though soils are shallow, trees root in cracks of sandstone.

Table 10. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
Utah juniper	<i>JUOS</i>	70	80	6	8	75	202	—	

Type locality

Location 1: Apache County, AZ	
Township/Range/Section	T38N R30E S32
UTM zone	N
UTM northing	3947966
UTM easting	649325
General legal description	East of Kinlichee Quad, Navajo Reservation, Apache County, South of Highway 264. Also Boiling Over Well Quad - 6 miles NNW of Red Rock, AZ Navajo Reservation

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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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)	
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Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

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

5. Number of gullies and erosion associated with gullies:

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

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

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

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

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

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

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

Dominant:

Sub-dominant:

Other:

Additional:

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

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

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

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:

17. **Perennial plant reproductive capability:**
