Ecological site R035XA111AZ
Limy Upland 10-14" p.z.

Accessed: 05/18/2024

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.

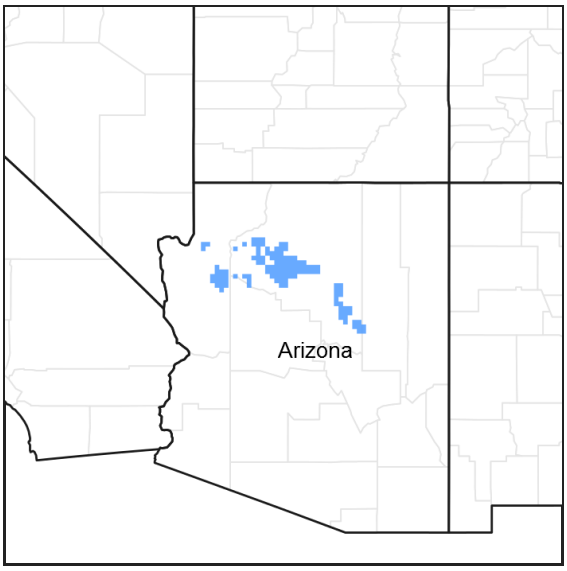

Figure 1. Mapped extent

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 35.1 - the Colorado Plateau Mixed Grass Plains

Elevations range from 4800 to 6300 feet and precipitation averages 10 to 14 inches per year. Vegetation includes Stipa species, Indian ricegrass, galleta, and blue grama, fourwing saltbush, winterfat, and cliffrose. The soil temperature regime is mesic and the soil moisture regime is ustic aridic. 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) *Juniperus osteosperma*
Shrub	(1) *Krascheninnikovia lanata* (2) *Atriplex canescens*
Herbaceous	(1) *Bouteloua eriopoda* (2) *Bouteloua gracilis*

Physiographic features

This site occurs on moderately deep to very deep, calcareous, well drained soils on fan terraces, msesas, and plateaus. Surface textures range from extremely gravelly coarse sandy loam to loam.Slopes are generally 1-15%, but there may be steeper spots within the site. The site does not benefit from run-on moisture.

Table 2. Representative physiographic features

Landforms	(1) Mesa (2) Alluvial fan (3) Plateau
Elevation	1,463–1,920 m
Slope	1–15%
Aspect	Aspect is not a significant factor

Climatic features

50-60% of moisture falls as rain Jul-Sep and is the most effective moisture for plant growth. The remaining moisture comes as snow during the winter.

Mean temperature for the hottest month (Jul) is 72 F; for the coldest month (Jan) is 32 F. Extreme temperatures of 105 F and -28F have been recorded. Long periods with little or no effective moisture are relatively common.

Cool season plants begin growth in early spring and mature early summer. Warm season plants take advantage of summer rains and are growing and nutritious Jul-Sep.

Table 3. Representative climatic features

Frost-free period (average)	160 days
Freeze-free period (average)	180 days
Precipitation total (average)	330 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 sandy loam to loamy surface texture of the soil allows the site to capture the majority of both gentle winter storms and intense summer thunderstorms with little runoff.

Soil features

Soils on this site are moderately deep to deep. These soils formed in alluvium derived from mixed sedimentary, igneous and metamorphic rocks. Surface textures range from extremely gravelly coarse sandy loam to loam. Subsoil textures range from gravelly sandy clay loam to extremely gravelly loam. Reaction ranges from neutral to slightly alkaline (pH 7.0 to 8.4). Lime content averages 15 to 50% in the soil profile. Effervesance is high the soil suface.

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

SSA-631 Coconino County Central Part MU's Tusayan-33, 40, 55 & 66;

SSA-697 Mohave County Central part MU's Milok-89, Peach springs-106, Strych-105 & Rolie-128;

SSA-699 Hualapai-Havasupai area MU's Peach Springs-29, Sazi-42 & Milok-26;

SSA-707 Little Colorado, 66-Tusayan.

Table 4. Representative soil features

Parent material	(1) Alluvium–calcareous sandstone
Surface texture	(1) Extremely gravelly sandy clay loam (2) Gravelly loam (3) Gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderate
Soil depth	51–152 cm
Surface fragment cover <=3"	10–25%
Available water capacity (0-101.6cm)	12.7–19.05 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
Soil reaction (1:1 water) (0-101.6cm)	7–8.4
Subsurface fragment volume <=3" (Depth not specified)	25–55%

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

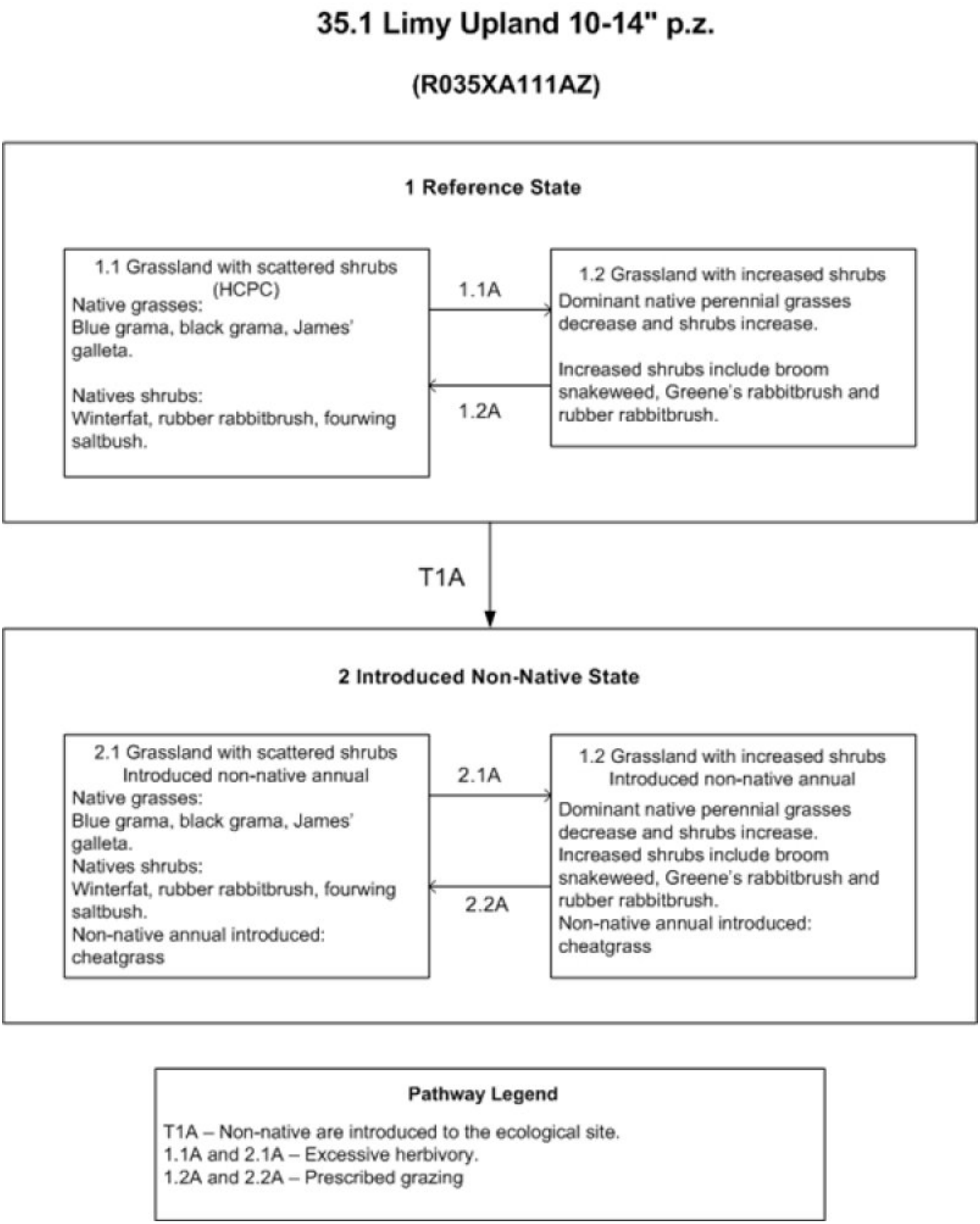

Figure 4. 35.1 Limy Upland 10-14"p.z.

State 1
Reference State

The reference state is best represented by a grassland plant community with scattered shrubs. With enough disturbance the grass community is diminished and shrubs become more prominant on this site.

Community 1.1
Historic Climax Plant Community

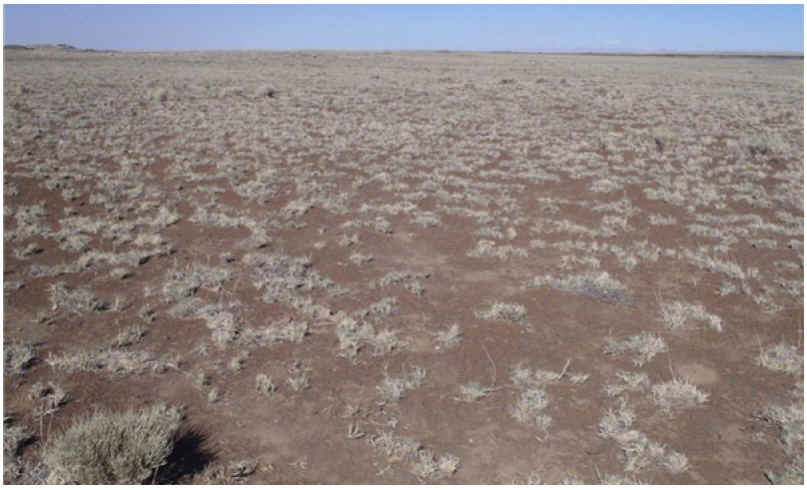

Figure 5. 35.1 Limy Upland 10-14"p.z. R035XA111AZ - Grazed

1.1 The major grasses in this grassland community are blue grama, black grama and James'galleta. The shrub component is represented by winterfat, rubber rabbitbrush and fourwing saltbush.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	336	504	616
Shrub/Vine	101	151	214
Forb	11	28	45
Tree	–	6	11
Total	**448**	**689**	**886**

Table 6. Ground cover

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

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	1-5%	10-15%	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	0-1%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). AZ3502, 35.1 10-14" p.z. black grama. Growth occurs mostly during the summer to early fall rainy season..

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

Figure 8. Plant community growth curve (percent production by month). AZ5102, 35.1 10-14" 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	5	15	30	30	15	0	0	0

Figure 9. Plant community growth curve (percent production by month). AZ5103, 35.1 10-14" p.z. sideoats grama. Most growth occurs 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	20	30	20	10	5	0	0

Figure 10. Plant community growth curve (percent production by month). AZ5213, 35.1 10-14" p.z. winterfat. Growth begins in the spring and continues through the summer. Seed stalk extension and seed set occurs in summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	25	20	10	15	10	0	0	0

Community 1.2
Grassland with increased shrubs

Disturbance decreases native perennial grasses and shrubs increase. The shrubs that are most likely to incrase on this site are broom snakeweed, Greene's rabbitbrush and rubber rabbitbrush.

Pathway 1.1A
Community 1.1 to 1.2

Disturbance - (herbivory, drought)

Pathway 1.2A
Community 1.2 to 1.1

Grazing management

State 2
Introduced Non-native State

Non-native annuals have been introduced to the plant community. The common example is cheatgrass. Introduction of non-native annuals species creates an irreversible change in the plant community

Community 2.1
Grassland with scattered shrubs and introduced non-native plants

2.1 This plant community resembles 1.1 and there are non-native annual plants present on the site.

Community 2.2
Grassland with increased shrubs and introduced annual plants

2.2 This community resembles plant community 1.2 and there can be a small to significant amount of introduced annual plants present on the site.

Pathway 2.1A
Community 2.1 to 2.2

Disturbance and the presence of non-native plants.

Pathway 2.2A
Community 2.2 to 2.1

Prescribed grazing and possibly treatment of non-native plants.

Transition T1A
State 1 to 2

Introduction of non-native plants.

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	**Dominant Grasses**			325–448	
	blue grama	BOGR2	*Bouteloua gracilis*	235–280	–
	black grama	BOER4	*Bouteloua eriopoda*	67–112	–
	James' galleta	PLJA	*Pleuraphis jamesii*	6–28	–
	spike dropseed	SPCO4	*Sporobolus contractus*	7–17	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	6–11	–
2	**Other Grasses**			22–168	
	Grass, perennial	2GP	*Grass, perennial*	7–39	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	7–39	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	7–39	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	7–39	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0–7	–
Forb					
3	**All Forbs**			11–45	
	Forb, annual	2FA	*Forb, annual*	6–17	–
	Forb, perennial	2FP	*Forb, perennial*	6–17	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	6–17	–
	phlox	PHLOX	*Phlox*	6–17	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	6–17	–
	milkvetch	ASTRA	*Astragalus*	0–6	–
	fleabane	ERIGE2	*Erigeron*	0–6	–
Shrub/Vine					
4	**Dominant Shrubs**			101–163	
	winterfat	KRLA2	*Krascheninnikovia lanata*	67–101	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	34–67	–
5	**Other Shrubs**			17–84	
	Shrub, deciduous	2SD	*Shrub, deciduous*	6–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–22	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–11	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–11	–
	Greene's rabbitbrush	CHGR6	*Chrysothamnus greenei*	0–11	–
	mormon tea	EPVI	*Ephedra viridis*	0–11	–
Tree					
6	**Trees**			0–11	
	Utah juniper	JUOS	*Juniperus osteosperma*	0–11	–

Animal community

Site is favorable for grazing throughout most of the year except when snow cover restricts availability of forage. With continuous grazing use during winter and spring, the relatively scarce cool season mid grasses are replaced by rabbit brush, snakeweed and lower value forbs and grasses. Planned grazing systems adapt well to use on this site.

The potential plant community produced by this site provides food for those species of wildlife that utilize grass as a

major portion of their diet. When vegetative retrogression occurs, unpalatable shrubby species increase and some wildlife species may be benefit.

Recreational uses

Site is typically low, gently rolling plains and fans. It produces high desert grasslands which can be very picturesque.

Winters are cold, however, relatively mild spring, fall and summer months are attractive to recreationists.

Activities include hunting, cross-country riding, photography, hiking rock collecting, and wildlife observation.

Wood products

Personal woodcutting.

Other information

Threatened and Endangered Species: Golden eagles and Prairie falcons occasionally use the site for feeding areas.

Inventory data 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.

Type locality

Location 1: Coconino County, AZ	
Township/Range/Section	T18N R12W S14
General legal description	In Flagstaff 7 Miles south of Meteor Crater Also in Kingman Cherokee Point Quad - NW1/4, SE1/4, S19, T24N, R11W Mohave County 1 mile west from Endwater Tank; Endwater Exclosure

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)	Karlyn Huling
Contact for lead author	NRCS Flagstaff Area Office

Date	03/13/2006
Approved by	S. Cassady
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. These soils have slow to moderate permeability and a moderate runoff on steeper slopes, but soils (gravelly sandy loam and loam) have low erodibility by water.

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2. **Presence of water flow patterns:** A few water flow patterns may form, especially on steeper slopes, due to slow to moderate permeability and moderate runoff.

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3. **Number and height of erosional pedestals or terracettes:** A few very short pedestals or terracettes may form on steeper slopes, due to slow to moderate permeability and moderate runoff.

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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 ranges from 30-65% (average 45%). Areas with a higher cover of rock fragments have less bare ground. This site may have a high percentage of bare ground due to very low potential productivity. Available water capacity averages only 3 inches. Drought may cause an increase in bare ground.

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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:** None

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7. **Amount of litter movement (describe size and distance expected to travel):** There will be some herbaceous litter movement following the water flow patterns on steeper slopes. Most woody little will stay in place under shrub and tree canopies.

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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):** Soil aggregate stability ratings from a few areas ranged from 3-6 (average 4) under plant canopy and from 3-4 (average 4) in the interspaces. Rock fragment cover on the surface ranges from 5-15%. Soil surface textures are mostly sandy loam or loam. Most surface horizons are gravelly. When well vegetated and/or protected by rock armor, the soils have a high resistance to both water and wind erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is mostly granular (weak, very fine and fine), with some platy (weak, medium). Surface thickness is mostly 2-3 inches. Color is variable depending upon parent material.

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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 uniform distribution of mostly grasses with some shrubs and a few forbs. There may be a few patches of trees in some higher elevation areas. Canopy cover ranges from 15-50% (10-35% grasses, 1-5% forbs, 5-15% shrubs, 0-10% trees). Basal plant cover ranges from 2-15% (2-10% grasses, 0-1% forbs, 0-3% shrubs, 0-1% trees). Both cover values decrease during a prolonged drought. This type of plant community structure is moderately effective at capturing and storing precipitation.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. The soils could be easily compacted due to the sandy loam and loam textures, but they are generally not susceptible due to the high amount of gravel in the surface horizons.

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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% of annual production: warm season bunchgrasses >>

    Sub-dominant: 11-40%: shrubs > warm season colonizing grasses > cool season bunchgrasses

    Other: Minor (3-10%): forbs >
    Trace (<3%): trees > cacti

    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 but the most severe droughts. Severe winter droughts affect shrubs and trees the most. Severe summer droughts affect grasses the most.

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14. **Average percent litter cover (%) and depth (in):** Mostly herbaceous litter with some 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):** 300-500 pounds per acre (dry weight) in dry years, 500-700 pounds per acre in median years, 700-1000 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:** Green rabbitbrush, broome snakeweed and Fendler threeawn are native to the site, but they have the potential to increase and dominate the area after heavy grazing. Oneseed and Utah juniper are native to the site, but have the potential to increase and dominate after heavy grazing and/or fire exclusion. Cheatgrass is an exotic plant that can invade the site, regardless of managment. It has the potential to dominate the site after heavy grazing and/or a fire. Russian thistle is an exotic plant that can invade after heavy grazing, especially in old farm fields or on rangelands adjacent to farmed or developed areas.

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