Ecological site R035XC319AZ
Limestone/Sandstone Upland 10-14" p.z.

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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.

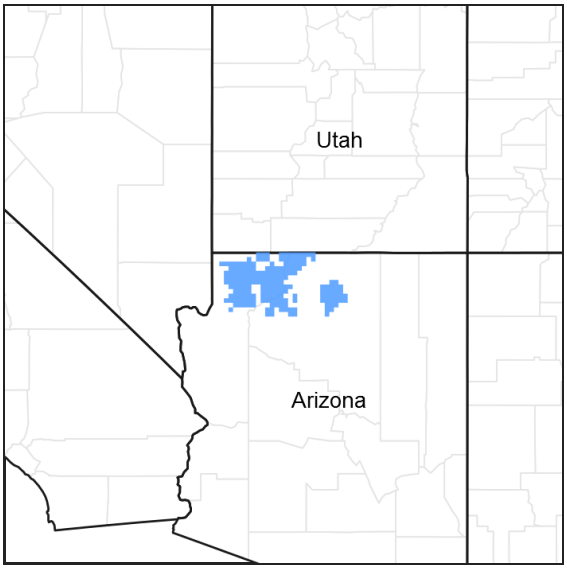

Figure 1. Mapped extent

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

Common Resource Area 35.3 – Colorado Plateau Sagebrush – Grasslands

This Common Resource Area 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. Elevations for the Common Resource Area where this ecological site may occur range from 4800 to 6700 feet and precipitation averages 10 to 14 inches. The elevation range is lower (about 4500 to 6000) on the western edge of the Colorado Plateau along the Grand Canyon, and moves up about 500 to 800 feet higher on the eastern side in the areas of the Navajo and Hopi Indian Reservations due to rain shadow effects from the Kaibab Plateau and Mogollon Rim. Common vegetation in this region includes Wyoming big sagebrush, Utah juniper, Colorado pinyon - cliffrose, Mormon tea, fourwing saltbush, blackbrush Indian ricegrass, needle and thread, western wheatgrass Galleta, black grama, blue grama, and sand dropseed. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin. The soil temperature regime is mesic and the soil moisture regime is ustic aridic.

Associated sites

R035XC308AZ	**Limestone/Sandstone Hills 10-14" p.z.** Hills of shallow to very shallow soils, often steeper with substantial rock outcrop.
R035XC313AZ	**Loamy Upland 10-14" p.z.** Moderately deep to very deep soils, often found in drainageways and valleys as part of a complex.
R035XC342AZ	**Gypsum Hills 10-14" p.z.** Sites where the limestone/sandstone bedrock has weathered away and a gypsiferous formation underneath has been exposed.

Similar sites

R035XC301AZ	**Basalt Upland 10-14" p.z.** Basalt is the restricting bedrock and soil textures are fine-loamy, usually clayloam.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Pleuraphis jamesii*

Physiographic features

This site occurs on gently rolling plateaus and structural benches; it includes the summits, backslopes, and toeslopes that are shallow (usually 14 inches or more) to moderately deep (usually under 25inches). The surface texture is dominantly loam, but can be fine sandy loam or sandy clay loam. The surface is also usually gravelly or very gravelly, but small areas may be non-gravelly or extremely gravelly. Rock outcrop is uncommon, but can be present. Slope range is most often 1 to 15 percent, but may be as high as 25 percent at times. This site occurs on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Structural bench (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,463–2,042 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

Winter summer moisture ratios range from 70:30 to 60:40. Late spring is usually the driest period, and early fall moisture can be sporadic. Summer rains fall from June through September; moisture originates in the Gulf of Mexico and creates convective, usually brief, intense thunderstorms. Cool season moisture from October through May tends to be frontal; it originates in the Pacific and the Gulf of California and falls in widespread storms with longer duration and lower intensity. Precipitation generally comes as snow from December through February. Accumulations above 12 inches are not common but can occur. Snow usually lasts for 3-4 days, but can persist much longer. Summer daytime temperatures are commonly 95 - 100 F and on occasion exceed 105 F. Winter air temperatures can regularly go below 10 F and have been recorded below - 20 F.

Table 3. Representative climatic features

Frost-free period (average)	168 days

Freeze-free period (average)	193 days
Precipitation total (average)	356 mm

Influencing water features

The soil moisture on this site is from precipitation. The site does not benefit from run-on moisture. Bedrock on the site may concentrate water in deeper soil pockets, increasing productivity on those areas.

Soil features

The soils characterizing this site are shallow (<20")to bedrock. There may be small areas with deeper soil pockets. Rock outcrop is uncommon. The surface texture is dominantly loam, but can be fine sandy loam or sandy clay loam. The soil is also generally gravelly to very gravelly at the surface; it may be extremely gravelly (chert bed areas) or non-gravelly (sandstone or toe-slope areas) in some places. The sub-soil is usually very to extremely gravelly and coarse-loamy. This soil has a calcic horizon that is occasionally a petrocalcic; most often, bedrock is the restricttive feature. At the surface the soil is typically non-effervescent to slightly effervescent, but there may be small patches that have strong effervescence. Cryptobiotic crusts have a minor presence at times.

Soils map unit components correlated to this site are:

Shivwits Area (AZ623) 45-Mellenthin, 46-Mellenthin, 48-Mellenthin;

Mohave County NE part (AZ625) 6-Bond 7- Bond, 17-Havasupai, 25-Klondike, 17-Mellonthin, 30-Mellonthin, 31-Mellonthin, 32-Mellonthin, 33-Mellonthin, 35-Mellonthin 41 Mellonthin;

Coconino County North Kaibab part (AZ629) 10-Curhollow, 23-Klondike, 10-Mellenthin 25-Mellenthin;

Hualapai/Supai Area (AZ699) 7-Curhollow, 9-Curhollow, 7-Puertecito, 9-Tenderfoot;

Grand Canyon Area (AZ701) 27-Curhollow, 28-Curhollow, 29-Curhollow, 31-Curhollow, 26-Curhollow (family), 30-Curhollow (family), 27-Mellenthin, 26-Mellenthin (family), 30-Mellenthin (family), 30-Puertecito (family), 97-Puertecito (family), 81-Tassi, 121-Tassi (gravelly loam very find sand), 31-Tenderfoot;

Little Colorado River Area (AZ707) 26-Mellenthin 29-Merishiticia, 29-Tassi, 60-Tassi

Shiprock Area NM/AZ (AZ717) 319-Lavellga and 310-Millett

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Gravelly loam (2) Stony loam (3) Extremely gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	25–51 cm
Surface fragment cover <=3"	20%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	3.1–4.06 cm
Calcium carbonate equivalent (0-101.6cm)	10–35%

Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	30%
Subsurface fragment volume >3" (Depth not specified)	5%

Ecological dynamics

The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The historical climax plant community represents the natural potential plant communities found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as grazing, fire, or drought.

Production data provided in this site description is standardized to air-dry weight at the end of the summer growing season. The plant communities described in this site description are based on near normal rainfall years.

NRCS uses a Similarity Index to compare existing plant communities to the plant communities described here. Similarity Index is determined by comparing the production and composition of a plant community to the production and composition of a plant community described in this site description. To determine Similarity Index, compare the production (air-dry weight) 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 normal year production shown in the plant community description. If rainfall has been significantly above or below normal, use the total production shown for above or below normal years. If field data is not collected at the end of the summer growing season, then the field data must be corrected to the end of the year production before comparing it to the site description. The growth curve can be used as a guide for estimating production at the end of the summer growing season.

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

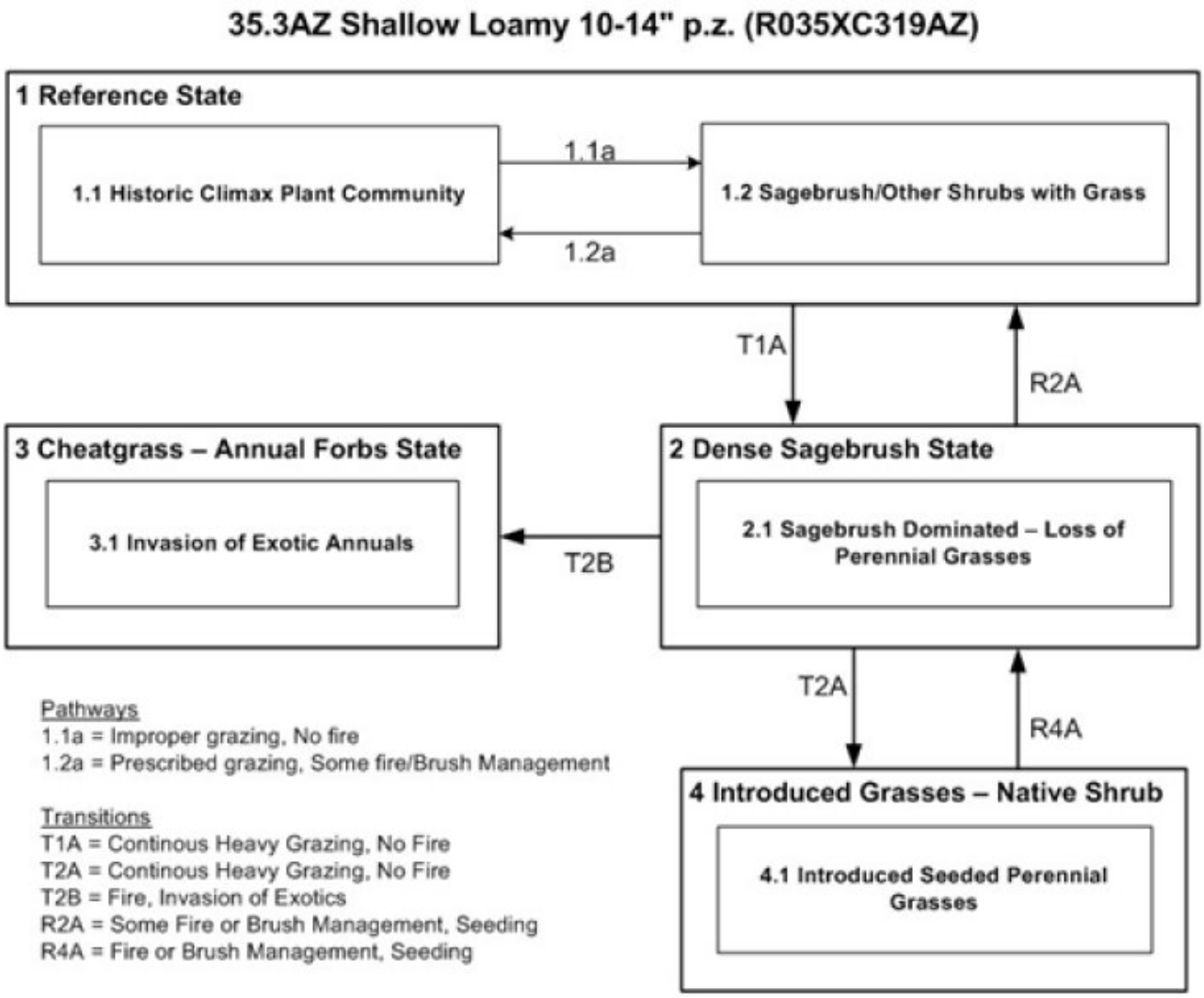

Figure 4. State and Transition Model - R035XC319AZ

State 1
Reference State

Community 1.1
Historic Climax Plant Community

Figure 5. 35.3 Limestone/Sandstone Upland 10-14" p.z.

The interpretive plant community for this site is HCPC. This community has a large component of warm season perennial grasses along with a much smaller component of cool season perennial grasses. Mid-shrubs are also a large part of the community and big sagebrush is a dominant shrub; it may comprise as much as one-third of the

total plant community. Taller shrubs and short trees are scattered across the site. Trees may become more plentiful near the upper boundary of the Land Resource Unit (LRU). Black sagebrush will occasionally replace big sagebrush in transitions areas and along the rims of high plateaus.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	258	319	392
Shrub/Vine	168	224	291
Tree	6	34	67
Forb	11	28	45
Total	**443**	**605**	**795**

Figure 7. Plant community growth curve (percent production by month). AZ3531, 35.3 10-14" p.z. all sites. Growth begins in the spring and continues through the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	17	18	10	19	20	10	1	1	0

Community 1.2
Sagebrush - Other Shrubs with Some Grasses

State 2
Dense Sagebrush State

Community 2.1
Sagebrush Dominated - Loss of Perennial Grasses

This state developed under the influences of long-term lack of fire and a pattern of continuous heavy grazing. It is a stable plant community and will not shift significantly toward the HCPC simply because of short-term climate fluctuation or changes in grazing management. By itself, fire may shift the plant community toward domination by annuals, most of them exotic; seeding (native and/or naturalized) is often necessary to shift the plant community back toward a significant perennial grass component. Other types of brush management, such as herbicides, can be effective at restoring a grassland community if the remaining perennial grass component is well distributed across the site.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	435	489	542
Tree	7	63	121
Grass/Grasslike	7	49	91
Forb	–	16	30
Total	**449**	**617**	**784**

Table 7. Ground cover

Tree foliar cover	0-2%
Shrub/vine/liana foliar cover	3-5%
Grass/grasslike foliar cover	1-5%
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 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	1-5%	0-2%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	20-30%	–	–
>1.4 <= 4	0-10%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 9. Plant community growth curve (percent production by month). AZ3531, 35.3 10-14" p.z. all sites. Growth begins in the spring and continues through the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	17	18	10	19	20	10	1	1	0

State 3
Cheatgrass - Annual Forbs State

Community 3.1
Invasion by Exotic Annuals

This state can result if this site burns when it has a plant community dominated by big sagebrush. Fires burn very hot and can remove the perennial vegetation completely. If there is a seed source for exotic annuals on the site, particularly cheatgrass brome (*Bromus tectorum*), the annuals cand dominate the site very quickly. The site has the potential to remain dominated by annuals for a long period of time.

State 4
Introduced Grasses with Shrubs State

Community 4.1
Introduced Seeded Perennial Grasses

Areas of dense sagebrush that have burned or that have had the sagebrush physically removed may be seeded to get perennial species established before invading annuals become dominant on the site. adapted grasses such as crested wheatgrass, Russian wildrye, and others have often been used as a majority of the seed mix.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Common Native Summer Perennial Shortgrasses**			157–219	
	blue grama	BOGR2	*Bouteloua gracilis*	62–123	–
	James' galleta	PLJA	*Pleuraphis jamesii*	6–123	–
2	**Occasional Native Summer Perennial Mid Grasses**			0–22	
	Grass, perennial	2GP	*Grass, perennial*	0–22	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–22	–
	black grama	BOER4	*Bouteloua eriopoda*	0–22	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–22	–
	Forb, annual	2FA	*Forb, annual*	0–15	–
	Forb, perennial	2FP	*Forb, perennial*	0–15	–
	milkvetch	ASTRA	*Astragalus*	0–15	–
	buckwheat	ERIOG	*Eriogonum*	0–15	–
	pingue rubberweed	HYRI	*Hymenoxys richardsonii*	0–15	–
	globemallow	SPHAE	*Sphaeralcea*	0–15	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–6	–
3	**Occasional Native Summer Perennial Short Grasses**			0–11	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	36–219	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	36–73	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	36–73	–
	jointfir	EPHED	*Ephedra*	7–36	–
	bastardsage	ERWR	*Eriogonum wrightii*	7–36	–
	pricklypear	OPUNT	*Opuntia*	0–29	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–15	–
	Apache plume	FAPA	*Fallugia paradoxa*	0–15	–
	snakeweed	GUTIE	*Gutierrezia*	0–15	–
	turpentine bush	ERLA12	*Ericameria laricifolia*	0–15	–
	brickellbush	BRICK	*Brickellia*	0–15	–
	Greene's rabbitbrush	CHGR6	*Chrysothamnus greenei*	0–15	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–15	–
	globe cactus	MAMMI	*Mammillaria*	0–15	–
	agave	AGAVE	*Agave*	0–15	–
	Grass, perennial	2GP	*Grass, perennial*	0–6	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0–6	–
	burrograss	SCBR2	*Scleropogon brevifolius*	0–6	–
4	**Common Native Spring Perennial Mid Grasses**			45–112	
	juniper	JUNIP	*Juniperus*	19–73	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–45	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	11–45	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	11–45	–

	threeawn	ARIST	*Aristida*	6–34	–
	twoneedle pinyon	PIED	*Pinus edulis*	0–19	–
5	**Common Native Early Spring Perennial Short Grasses**			34–62	
	squirreltail	ELEL5	*Elymus elymoides*	34–62	–
6	**Occasional Native Spring Perennial Mid Grasses**			0–11	
	Grass, perennial	2GP	*Grass, perennial*	0–6	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–6	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–6	–
	muttongrass	POFE	*Poa fendleriana*	0–6	–
	slim tridens	TRMU	*Tridens muticus*	0–6	–
7	**Occasional Native Annual Grasses**			0–11	
	Grass, annual	2GA	*Grass, annual*	0–11	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–11	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–11	–
Forb					
8	**Occasional Native Spring Perennial Short Forbs**			6–34	
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	onion	ALLIU	*Allium*	0–11	–
	rockcress	ARABI2	*Arabis*	0–11	–
	groundcover milkvetch	ASHU2	*Astragalus humistratus*	0–11	–
	Silver's milkvetch	ASSU6	*Astragalus subcinereus*	0–11	–
	winding mariposa lily	CAFL	*Calochortus flexuosus*	0–11	–
	sego lily	CANU3	*Calochortus nuttallii*	0–11	–
	pale bastard toadflax	COUMP	*Comandra umbellata ssp. pallida*	0–11	–
	springparsley	CYMOP2	*Cymopterus*	0–11	–
	desert larkspur	DEPA	*Delphinium parishii*	0–11	–
	matted buckwheat	ERCA8	*Eriogonum caespitosum*	0–11	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–11	–
	pepperweed	LEPID	*Lepidium*	0–11	–
	bladderpod	LESQU	*Lesquerella*	0–11	–
	Lewis flax	LILE3	*Linum lewisii*	0–11	–
	spiny phlox	PHHO	*Phlox hoodii*	0–11	–
	longleaf phlox	PHLO2	*Phlox longifolia*	0–11	–
	globemallow	SPHAE	*Sphaeralcea*	0–11	–
	stemless Townsend daisy	TOEX2	*Townsendia exscapa*	0–11	–
	foothill deathcamas	ZIPA2	*Zigadenus paniculatus*	0–11	–
9	**Occasional Native Summer Perennial Short Forbs**			0–22	
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	Indian paintbrush	CASTI2	*Castilleja*	0–11	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–11	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	0–11	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–11	–
	horehound	MAVU	*Marrubium vulgare*	0–11	–
	Colorado four o'clock	MIMU	*Mirabilis multiflora*	0–11	–

	beardtongue	PENST	*Penstemon*	0–11	–
	Navajo tea	THSU	*Thelesperma subnudum*	0–11	–
10	**Occasional Native Annual Short Forbs**			0–22	
	Forb, annual	2FA	*Forb, annual*	0–11	–
	fiddleneck	AMSIN	*Amsinckia*	0–11	–
	milkvetch	ASTRA	*Astragalus*	0–11	–
	pitseed goosefoot	CHBE4	*Chenopodium berlandieri*	0–11	–
	tickseed	COREO2	*Coreopsis*	0–11	–
	tansymustard	DESCU	*Descurainia*	0–11	–
	sanddune wallflower	ERCA14	*Erysimum capitatum*	0–11	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–11	–
	erigenia	ERIGE	*Erigenia*	0–11	–
	buckwheat	ERIOG	*Eriogonum*	0–11	–
	spurge	EUPHO	*Euphorbia*	0–11	–
	gilia	GILIA	*Gilia*	0–11	–
	trefoil	LOTUS	*Lotus*	0–11	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–11	–
	phacelia	PHACE	*Phacelia*	0–11	–
	groundcherry	PHYSA	*Physalis*	0–11	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–11	–
Shrub/Vine					
11	**Occasional Native Short Shrubs**			6–34	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–22	–
	rough menodora	MESC	*Menodora scabra*	0–11	–
	mat penstemon	PECAD2	*Penstemon caespitosus var. desertipicti*	0–11	–
	rock goldenrod	PEPU7	*Petradoria pumila*	0–11	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–11	–
	threadleaf ragwort	SEFL3	*Senecio flaccidus*	0–11	–
	desert princesplume	STPI	*Stanleya pinnata*	0–11	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–11	–
	longflower rabbitbrush	CHDE2	*Chrysothamnus depressus*	0–11	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–11	–
12	**Dominant Native Mid Shrubs**			90–185	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	90–185	–
13	**Common Native Mid Shrubs**			11–45	
	fourwing saltbush	ATCA2	*Atriplex canescens*	6–34	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	6–34	–
	mormon tea	EPVI	*Ephedra viridis*	6–34	–
14	**Common Native Short Shrubs**			6–34	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–22	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	6–22	–
15	**Occasional Native Tall Shrubs**			6–22	

	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–22	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–22	–
16	**Occasional Native Mid Shrubs**			0–28	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–17	–
	black sagebrush	ARNO4	*Artemisia nova*	0–17	–
	Greene's rabbitbrush	CHGR6	*Chrysothamnus greenei*	0–17	–
	blackbrush	CORA	*Coleogyne ramosissima*	0–17	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–17	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–17	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–17	–
	Apache plume	FAPA	*Fallugia paradoxa*	0–17	–
	water jacket	LYAN	*Lycium andersonii*	0–17	–
	pale desert-thorn	LYPA	*Lycium pallidum*	0–17	–
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–17	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–17	–
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–17	–
17	**Occasional Native Agave-Yucca-Like**			0–17	
	Utah agave	AGUT	*Agave utahensis*	0–11	–
	banana yucca	YUBA	*Yucca baccata*	0–11	–
18	**Occasional Native Cacti**			0–17	
	cactus apple	OPEN3	*Opuntia engelmannii*	0–11	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–11	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–6	–
	kingcup cactus	ECTR	*Echinocereus triglochidiatus*	0–6	–
Tree					
19	**Common Native Short Trees**			6–62	
	Utah juniper	JUOS	*Juniperus osteosperma*	6–62	–
	twoneedle pinyon	PIED	*Pinus edulis*	6–62	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Occasional Native Summer Perennial Short Grasses**			0–31	
	blue grama	BOGR2	*Bouteloua gracilis*	0–31	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–31	–
	Grass, perennial	2GP	*Grass, perennial*	0–7	–
2	**Occasional Native Summer Perennial Mid Grasses**			0–6	
	Grass, perennial	2GP	*Grass, perennial*	0–6	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–6	–
	black grama	BOER4	*Bouteloua eriopoda*	0–6	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–6	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–6	–
3	**Occasional Native Spring Perennial Mid Grasses**			0–17	

	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–11	–
	threeawn	ARIST	*Aristida*	0–11	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–11	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	0–11	–
4	**Common Native Early Spring Perennial Short Grasses**			7–31	
	squirreltail	ELEL5	*Elymus elymoides*	7–31	–
5	**Occasional Native Annual Short Grasses**			0–31	
	Grass, annual	2GA	*Grass, annual*	0–31	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–31	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–31	–
Forb					
6	**Occasional Native Perennial Short Forbs**			0–11	
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	winding mariposa lily	CAFL	*Calochortus flexuosus*	0–11	–
	sego lily	CANU3	*Calochortus nuttallii*	0–11	–
	springparsley	CYMOP2	*Cymopterus*	0–11	–
	desert larkspur	DEPA	*Delphinium parishii*	0–11	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–11	–
	longleaf phlox	PHLO2	*Phlox longifolia*	0–11	–
	globemallow	SPHAE	*Sphaeralcea*	0–11	–
7	**Occasional Native Perennial Short Forbs**			0–11	
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	Indian paintbrush	CASTI2	*Castilleja*	0–11	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–11	–
	horehound	MAVU	*Marrubium vulgare*	0–11	–
	beardtongue	PENST	*Penstemon*	0–11	–
8	**Occasional Native Annual Short Forbs**			0–17	
	Forb, annual	2FA	*Forb, annual*	0–17	–
	fiddleneck	AMSIN	*Amsinckia*	0–17	–
	milkvetch	ASTRA	*Astragalus*	0–17	–
	pitseed goosefoot	CHBE4	*Chenopodium berlandieri*	0–17	–
	tickseed	COREO2	*Coreopsis*	0–17	–
	tansymustard	DESCU	*Descurainia*	0–17	–
	sanddune wallflower	ERCA14	*Erysimum capitatum*	0–17	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–17	–
	fleabane	ERIGE2	*Erigeron*	0–17	–
	buckwheat	ERIOG	*Eriogonum*	0–17	–
	spurge	EUPHO	*Euphorbia*	0–17	–
	gilia	GILIA	*Gilia*	0–17	–
	trefoil	LOTUS	*Lotus*	0–17	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–17	–
	phacelia	PHACE	*Phacelia*	0–17	–
	groundcherry	PHYSA	*Physalis*	0–17	–

	desert Indianwheat	PLOV	*Plantago ovata*	0–17	–
Shrub/Vine					
9	**Common Native Short Shrubs**			19–49	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	19–49	–
10	**Dominant Native Mid Shrubs**			432–525	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	432–525	–
11	**Common Native Mid Shrubs**			0–17	
	Nevada jointfir	EPNE	*Ephedra nevadensis*	0–11	–
	mormon tea	EPVI	*Ephedra viridis*	0–11	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	–
12	**Common Native Short Shrubs**			19–49	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	19–49	–
13	**Occasional Native Tall Shrubs**			0–11	
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–11	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–11	–
14	**Occasional Native Mid Srubs**			0–11	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–11	–
	black sagebrush	ARNO4	*Artemisia nova*	0–11	–
	Greene's rabbitbrush	CHGR6	*Chrysothamnus greenei*	0–11	–
	blackbrush	CORA	*Coleogyne ramosissima*	0–11	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–11	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–11	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–11	–
	Apache plume	FAPA	*Fallugia paradoxa*	0–11	–
	water jacket	LYAN	*Lycium andersonii*	0–11	–
	pale desert-thorn	LYPA	*Lycium pallidum*	0–11	–
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–11	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–11	–
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–11	–
15	**Occasional Native Agave-Yucca-Like**			0–6	
	Utah agave	AGUT	*Agave utahensis*	0–6	–
	banana yucca	YUBA	*Yucca baccata*	0–6	–
16	**Occasional Native Cacti**			0–6	
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–6	–
	kingcup cactus	ECTR	*Echinocereus triglochidiatus*	0–6	–
	cactus apple	OPEN3	*Opuntia engelmannii*	0–6	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	–
Tree					
17	**Common Native Short Trees**			7–123	
	Utah juniper	JUOS	*Juniperus osteosperma*	0–123	–
	twoneedle pinyon	PIED	*Pinus edulis*	0–123	–

Animal community

This site is usable yearlong by all classes of livestock. It will respond well to management even though the soils are often shallow. The diversity of grasses and shrubs on this site promotes a fair diversity of wildlife when the site is in excellent condition. Permanent waters are lacking, which precludes a diverse assemblage of animals. Herbivores adapted to a high desert climate typify the fauna. These include deer, antelope, jackrabbits, cottontails, and horned larks. Predators such as coyotees, bobcats, prarie falcons, golden eagles, buteos and foxes are also important members of the community.

Recreational uses

The land consists principally of undulating plains and rolling hills. Grassland is interspered with shrubs, often with sparse juniper and pinyon. Summers are quite warm and winters are cold. Spring is typically dry and windy. Summer and fall are comfortable for recreation use. Hunting is the main activity on this site. Incidental activities include horseback riging, wildlife observation and rock collecting.

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.

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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)	Karlynn Huling
Contact for lead author	NRCS State Rangeland Management Specialist, Phoenix AZ
Date	04/17/2006
Approved by	Steve Barker
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Some minor (short and narrow) rill formation is possible on steeper slopes due to loamy textures, moderate permeability, shallow depth, and rapid runoff. Rill formation will be reduced if the soil has a lot of rock

fragment armor and/or a large amount of rock fragments in the profile.

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2. **Presence of water flow patterns:** Water flow patterns may be occasional to common due to moderate permeability, shallow depth, and rapid runoff. These patterns are generally short and stable. There will be more water flow patterns in steeper areas and in areas with more rock outcrop and/or very shallow (<10") soils.

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3. **Number and height of erosional pedestals or terracettes:** Some pedestals and terracettes may form, but they should be very short.

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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 generally ranges from 30-50%. Areas with greater cover of rock fragments and/or rock outcrop have less bare ground. This site usually has less than 1.5 inches of available water capacity, so the potential for production of plant cover is very low. 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):** Herbaceous and fine woody litter will be transported in water flow pathways. Coarse woody litter will remain under shrub and tree canopies. Litter movement may be greater in areas with very shallow soils and lots of rock outcrop.

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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 surface textures range from loamy very fine sand to sandy clay loam, but are mostly loam. Most surface horizons contain a significant amount of rock fragments (mostly gravels). Most oils also have at least 20% cover of rock fragments (mostly gravels). Cryptogams may cover up to 3% of the soil surface. When well vegetated or covered with 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):** Soil surface structure is mostly granular (weak to moderate, very fine to fine) or platy (weak to strong, thin to thick), whilc a few areas have surfaces that are subangular blocky (weak to moderate, fine to medium). Surface thickness ranges from 1-8 inches, but is usually 1-3 inches. Color varies 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 shrubs and grasses with a few forbs. Canopy cover ranges from 15-40%, with the majority split between shrubs and grasses. Basal plant cover ranges from 10-20% (mostly grasses). The cover (especially basal cover) is reduced by the amount of rock fragment and/or bedrock ground cover. Both cover values decrease during a prolonged drought.

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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. Due to loamy surface textures, this sois may be easily compacted, but it is generally protected by a significant amount of rock fragment armor on the surface and within the surface horizons. Some 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: none

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

    Other: Minor: trees > perennial forbs > warm season bunchgrasses > half shrubs >
    Trace: annual forbs = annual grasses = Agave family = 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 ar adapted to survival except during the most severe droughts. Sever winter droughts affect shrubs and trees the most. Severe summer droughts affect grasses most. Very shallow (<10") soils will show the most mortality in all functional groups.

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14. **Average percent litter cover (%) and depth (in):** Litter consists of a combination of woody and herbaceous. 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):** 400-475 pounds per acre (dry weight) in drought years, 475-625 pounds per acre in median years, 625-700 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 after heavy grazing. Broom snakeweed, Douglas rabbitbrush, pricklypear cactus, and cholla cactus are natives that have the potential to increase and dominate the site after a sagebrush fire and/or heavy grazing. Cheatgrass, red brome and redstem filaree are exotic annuals that are becoming endemic to the site regardless of management or fire frequency. They may become dominant plants on the site after a sagebrush fire, even with conservative or no grazing.

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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 except during the most severe droughts.
