USDA Natural Resources Conservation Service

Ecological site DX035X04B321
Sandstone Hills 10-14" p.z.

Accessed: 05/11/2025

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.

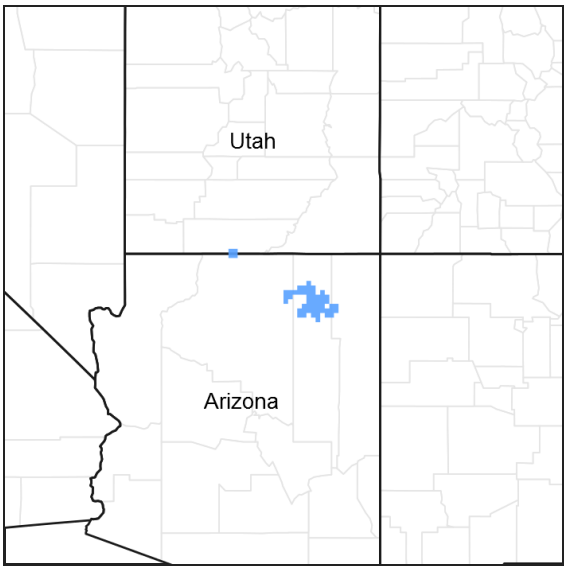

Figure 1. Mapped extent

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

This ecological site is found in Common Resource Area 35.3 – the Colorado Plateau Sagebrush – Grasslands.

The Common Resource Area occurs within the Colorado Plateau Physiographic Province. It is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Elevations 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 side 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.

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma*

Shrub	(1) *Purshia stansburiana* (2) *Artemisia bigelovii*
Herbaceous	(1) *Pleuraphis jamesii* (2) *Achnatherum hymenoides*

Legacy ID

R035XC321AZ

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plateau (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	4,800–6,700 ft
Slope	5–60%
Aspect	Aspect is not a significant factor

Climatic features

Winter to 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)	14 in

Influencing water features

Soil features

Soils are very shallow to shallow. Surface textures are generally very channery fine sandy loam to very channery sandy clay loam. Subsoil textures are extremely channery clay loam and very channery sandy clay loam. Parent materials are alluvium and colluvium from sedimentary rock. Geologic formation is the Mesa verde group. Available water capacity is very low. Water erosion hazard is moderate to high. Wind erosion hazard is slight. Soils are non-saline, non-sodic and mildli to moderate alkaline (pH 7.4-8.4). Soil moisture is Ustic Aridic. Soil temperature regime is Mesic.

Typical taxonomic units include:

SSA-711 Navajo Mountain Area MU 39 Reef;

SSA-713 Chinle Area MU 41 Reef;
SSA-714 Hopi Area - MU 16 Kydestea and
SSA-715 Fort Defiance Area AZ/NM - MU 53 Kydestea, MU 30 Teesto family.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Colluvium–sandstone and shale
Surface texture	(1) Very channery fine sandy loam (2) Very channery very fine sandy loam (3) Very channery sandy clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow
Soil depth	5–20 in
Surface fragment cover <=3"	0–45%
Surface fragment cover >3"	0–15%
Available water capacity (0-40in)	0–2.9 in
Calcium carbonate equivalent (0-40in)	0–15%
Subsurface fragment volume <=3" (Depth not specified)	20–40%
Subsurface fragment volume >3" (Depth not specified)	0–10%

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 fire, grazing, 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 amount shown for each group. Divide the resulting total by the total normal year production shown in the plant community description. If the rainfall has ben 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 these plant communities may be revised, removed, and some added to reflect the ecological dynamics of this site.

State and transition model

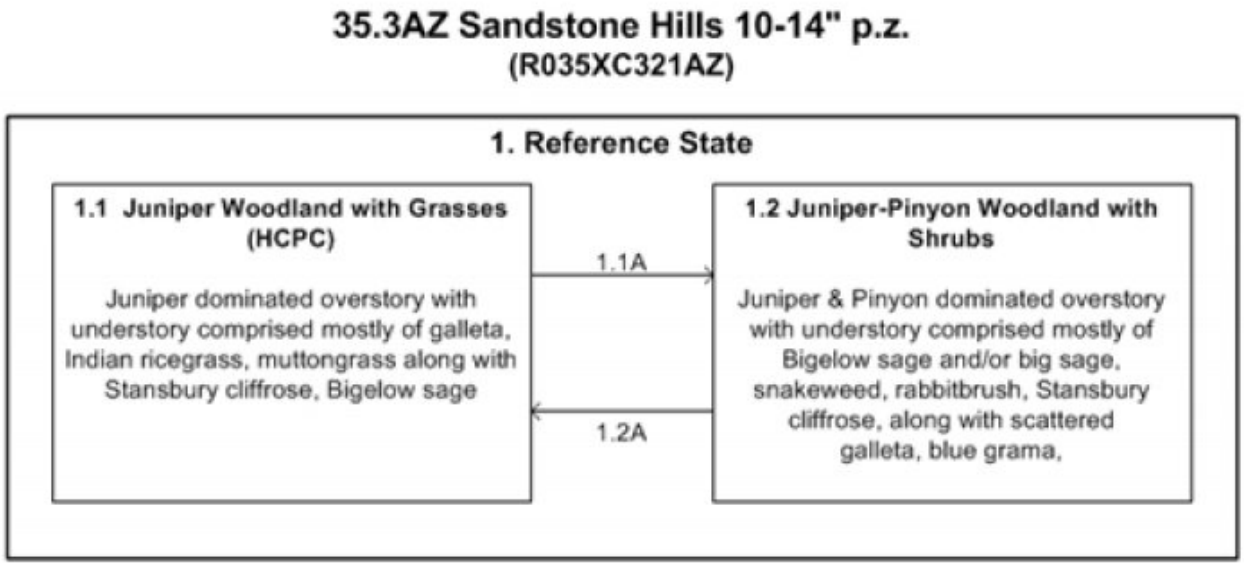

Figure 4. STM - R035XC321AZ

State 1
Reference State

In aspect view this plant community is dominated by trees. Tree canopy cover is 10 - 25% with Utah juniper dominates with less amounts of Colorado pinyon.. Understory species are comprised of grasses, including galleta and Indian ricegrass, forbs such like stemless goldenweed and James cryptantha, shrubs like Stansbury cliffrose and Bigelow sagebrush.

Community 1.1
Juniper/Stansbury cliffrose/Galleta

Figure 5. Sandstone Hills 10-14" p.z.

In the this plant community shrubs and trees dominate the plant community. The understory is mostly grasses with small percentage of forbs. Tree canopy ranges from 5 to 20% depending on aspects and elevations. In the understory there is a mix of cool and warm season grasses. Common shrubs include Stansbury cliffrose and Bigelow sage. At the highest elevation Wyoming big sagebrush will replace Bigelow sage.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	75	175	250
Tree	50	150	250
Grass/Grasslike	45	100	150
Forb	15	35	50
Total	**185**	**460**	**700**

Table 6. Ground cover

Tree foliar cover	5-25%
Shrub/vine/liana foliar cover	5-12%
Grass/grasslike foliar cover	1-5%
Forb foliar cover	1-3%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-20%
Surface fragments >0.25" and <=3"	0-45%
Surface fragments >3"	0-15%
Bedrock	0%
Water	0%
Bare ground	15-25%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-2%	0-2%	0-1%
>0.5 <= 1	–	0-5%	0-2%	0-1%
>1 <= 2	0-1%	0-5%	0-1%	0-1%
>2 <= 4.5	0-3%	–	–	–
>4.5 <= 13	5-20%	–	–	–
>13 <= 40	0-1%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

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
Juniper-Pinyon Woodland with Shrubs

In this plant community the tree canopy has increased (10-25%)and dominated by juniper with pinyon. The understory canopy of shrubs has increased and herbaceous cover has decline, especially perennial cool season

grasses. Common shrubs found include Stansbury cliffrose, Bigelow sagebrush, snakeweed, rabbitbrush, big sagebrush, Torrey mormon tea and yucca.

Pathway 1.1A
Community 1.1 to 1.2

Drought, improper grazing reduces perennial herbaceous cover, lack of fire.

Pathway 1.2A
Community 1.2 to 1.1

Reduced tree canopy thru fire or woodcutting, Prescribed grazing or No grazing, favorable moisture/climate.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses**			45–150	
	James' galleta	PLJA	*Pleuraphis jamesii*	25–75	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	15–35	–
	blue grama	BOGR2	*Bouteloua gracilis*	5–25	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	5–25	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	5–25	–
	muttongrass	POFE	*Poa fendleriana*	5–25	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–10	–
Forb					
2	**Forbs**			15–50	
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–10	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–10	–
	Forb, perennial	2FP	*Forb, perennial*	0–10	–
	winged buckwheat	ERAL4	*Eriogonum alatum*	0–10	–
	Fendler's bladderpod	LEFE	*Lesquerella fendleri*	0–5	–
	rock goldenrod	PEPU7	*Petradoria pumila*	0–5	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–5	–
	biennial wormwood	ARBI2	*Artemisia biennis*	0–5	–
	milkvetch	ASTRA	*Astragalus*	0–5	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–5	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–5	–
	desert princesplume	STPI	*Stanleya pinnata*	0–5	–
	James' cryptantha	CRCIJ	*Cryptantha cinerea var. jamesii*	0–5	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–5	–
	Forb, annual	2FA	*Forb, annual*	0–5	–
Shrub/Vine					
3	**Shrubs**			75–250	

	Bigelow sage	ARBI3	*Artemisia bigelovii*	10–40	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	10–40	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–25	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	5–25	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–20	–
	Greene's rabbitbrush	CHGR6	*Chrysothamnus greenei*	0–20	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–20	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–20	–
	black sagebrush	ARNO4	*Artemisia nova*	0–20	–
	mormon tea	EPVI	*Ephedra viridis*	0–20	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–20	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–10	–
	banana yucca	YUBA	*Yucca baccata*	0–10	–
	Whipple cholla	CYWH	*Cylindropuntia whipplei*	0–5	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–5	–
Tree					
4	**Trees**			50–250	
	Utah juniper	JUOS	*Juniperus osteosperma*	50–200	–
	twoneedle pinyon	PIED	*Pinus edulis*	0–50	–

Animal community

Site is fairly suitable for grazing for cattle, sheep, goats and horses in late spring, summer and fall. Steep slopes limit livestock movement. Management consideration should be placed on proper grazing use, grazing systems and water developments.

Natural water is scarce. Mule deer use the area for winter cover. Food is adequate for most wildlife species. The area is sometimes used by grassland wildlife species.

Recreational uses

Site has a high aesthetic appeal, particularly where it borders open grasslands for contrast. Hunting, hiking, and wildlife observation are the main recreational activities.

Wood products

Equipment with rubber tires work best. Crawler tractor type equipment works best on slopes 10-25%. Tree thinning is best done by hand. Slopes over 15% limit equipment use. There are no limitations on unsurfaced roads. Some rock outcrop and stones are present. Equipment is not limited by water table/flooding.

Wind erosion is slight. Water erosion is accelerated by slopes. Compaction potential is fair as soil and channery material mix well. Soils will rut when wet. Revegation potential is poor due to shallow, droughty soils.

Harvest cutting should be limited due to low production. Prescribed burning and mechanical tree removal is not recommended. Control pests to prevent tree damage and loss. Fire hazard is low, shallow soils produce low fuel load. These areas are locally important for fuel wood harvesting.

Replanting potential is poor due to shallow soils. Seedling mortality is severe as the soil is droughty. Natural regeneration is slow, but will occur in time. Shrubs and grasses compete for moisture. There is no windthrow hazard.

Other products

These sites, where adaquate pinyon tree grow, provide areas of pinyon nut harvesting during years of good nut productions.

Type locality

Location 1: Navajo County, AZ	
General legal description	John Daw Mesa, Kydestea Spring, Red Willow Spring and Owl Valley Quads on the Hopi Indian 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.

This site was originally developed as a woodland site (F035XC321AZ). These sites are not forestland sites, but are rangeland ecological sites.

Contributors

Ken Gishi

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.

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Date	09/19/2012
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills may be common on steepest slopes due to high amount of rock outcrop directing runoff onto soils and low potential to support vegetative growth on shallow and very shallow soils.

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2. **Presence of water flow patterns:** Water flow patterns may be common on the steepest slopes due to high amount of rock outcrop directing runoff onto the soils and low potential for supporting vegetative growth on the shallow and very shallow soils. These patterns are short and discontinuous across larger soil areas, but may be longer and more continuous where soils lie adjacent to bedrock.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals and terracettes may be common due to the slopes and moderate potential for water erosion.

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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 15 to 25 percent.

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5. **Number of gullies and erosion associated with gullies:** Few are expected. When site is well vegetated and covered with rock fragments gullies are stablilzed with vegetation, shallow and will only show minor signs of active erosion.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scour and blowouts are not expected on this site. There may be some deposition around large shrubs and trees.

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7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous and fine woody litter will be transorted in water flow pathways and by wind. Coarse woody litter will remain under shrub and tree canopies. Litter movement may be greatest in areas of steep slopes or areas adjacent to 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):** The expected average soil stability is 2. Surface fragments, litter, and vegetation cover aid in reducing erosion. This site has moderate resistance to wind erosion and low resistance to water erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structures are waek platy (thin, fine to moderate) parting to medium granular structure. Surface thickness of the A-horizon is 1-3 inches. Color of the A-horizon does not differ significatly from the subsurface soil horizons.

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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 even distribution of perennial grasses with scattered half-shrubs, large shrubs, forbs and scattered trees. The vegetation when well distributed along with rock fragments across the site lends to slowing runoff and allowing for some infiltration. Steep slopes and areas of rock outcrops lends to high runoff on this site.

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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. These soils are shallow with rock fragments.

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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: Shrubs (large and low shrubs) >

    Sub-dominant: Trees > cool season grasses > warm season grasses >

    Other: Forbs > cacti & succulents

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 the shrubs the most. Severe summer droughts affect grasses the most.

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14. **Average percent litter cover (%) and depth (in):** Litter size and depth on this size will vary greatly beneath tree canopies and the platn interspaces. Litter size will range from 1 leaf thickness to woody litter 3 inches in diameter. Litter will be the highest under tree canopies with a mix of herbaceous, duff and woody litter.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production on this site is expected to be 400 to 500 lbs/ac. in a year of average annual precipitation.

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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:** Juniper, broom snakeweed and rabbitbrush are all native to the site, but may have the potential to increase with continued disturbance. Cheatgrass and Russian thistle are non-native annuals that have the potential to invade the site with or without disturbance.

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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/or rhizomes during the most severe droughts.
