USDA Natural Resources
Conservation Service

Ecological site R035XY306UT
Upland Loam (Basin Big Sagebrush)

Accessed: 05/12/2025

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.

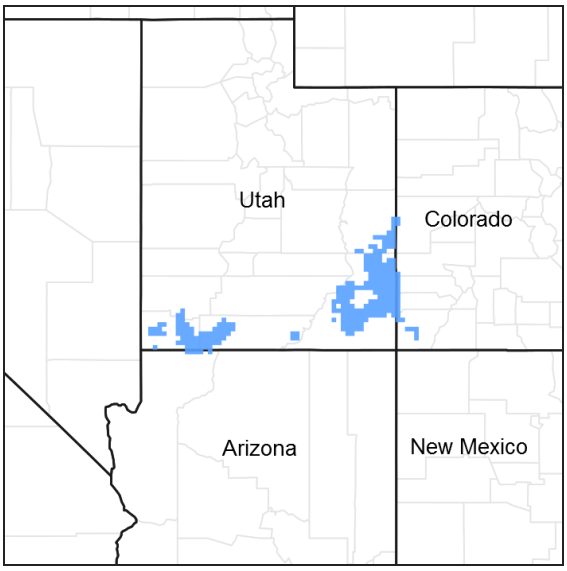

Figure 1. Mapped extent

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.

Classification relationships

Modal Soil: Barx — fine-loamy, mixed, mesic Ustollic Haplargids

Type Location: Consult the San Juan County Central Soil Survey Report.

Associated sites

R035XY302UT	**Upland Dissected Slope (Twoneedle Pinyon-Utah Juniper)**
R035XY315UT	**Upland Shallow Loam (Pinyon-Utah Juniper) AWC <3**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. tridentata*
Herbaceous	(1) *Hesperostipa comata*

Physiographic features

This site occurs on level to very gently sloping benches, mesas, and rolling hills.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Mesa (3) Hill
Elevation	1,585–2,408 m
Slope	1–15%

Climatic features

Average annual precipitation is 12 to 15 inches. Approximately 77 percent occurs as rain from March through October. On the average, February, May, and June are the driest months and August, September, and October are the wettest months. The mean annual air temperature is 7 to 9 degrees C. Soil temperatures are in the mesic regime with mean annual soil temperatures ranging from 8 to 11 degrees C. Much of the summer precipitation occurs as convection thunder storms. In average years, plants begin growth around March 10 and end growth around October 10.

Table 3. Representative climatic features

Frost-free period (average)	0 days
Freeze-free period (average)	130 days
Precipitation total (average)	381 mm

Influencing water features

Soil features

The characteristic soils in this site are more than 60 inches deep and well drained. They formed in eolian deposits and alluvium derived mainly from weathered sandstone and shale parent materials. These soils are well developed loamy soils with high water holding capacities. The water supplying capacity is 6 to 9 inches. Average annual soil loss in potential is approximately 0.5 to 2.0 tons per acre.

Table 4. Representative soil features

Surface texture	(1) Loam
Drainage class	Well drained
Soil depth	152 cm

Ecological dynamics

As ecological condition deteriorates due to overgrazing, needleandthread, muttongrass, Indian ricegrass, and winterfat decrease while big sagebrush, blue grama, low rabbitbrush, broom snakeweed, and pricklypear increase. When the potential natural plant community is burned, big sagebrush can be temporarily eliminated and muttongrass and needleandthread may decrease while low rabbitbrush, snakeweed, pricklypear, galleta, and blue grama may increase. Utah juniper, pinyon, and cheatgrass are most likely to invade this site. In the absence of fire, pinyon and juniper may become dense enough to exclude the understory. When this happens, soil erosion is generally high.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. Reference State

State 1
Reference State

Community 1.1
Reference State

The dominant aspect of the plant community is Wyoming big sagebrush. The composition by air-dry weight is approximately 60 percent perennial grasses, 5 percent forbs and 35 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	521	656	857
Shrub/Vine	304	382	500
Forb	44	55	72
Total	**869**	**1093**	**1429**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	14-16%
Grass/grasslike foliar cover	49-51%
Forb foliar cover	4-6%
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	–	–	–	4-6%
>0.3 <= 0.6	–	–	49-1%	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	14-16%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

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					
0	**Dominant Grasses**			404–616	
	needle and thread	HECO26	*Hesperostipa comata*	168–224	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	112–168	–
	muttongrass	POFE	*Poa fendleriana*	56–112	–
	blue grama	BOGR2	*Bouteloua gracilis*	34–56	–
1	**Sub-Dominant Grasses**			191–460	
	Grass, annual	2GA	*Grass, annual*	56–112	–
	Grass, perennial	2GP	*Grass, perennial*	56–112	–
	purple threeawn	ARPU9	*Aristida purpurea*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	11–34	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–34	–
	Sandberg bluegrass	POSE	*Poa secunda*	11–34	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	11–34	–
Forb					
2	**Sub-Dominant Forbs**			224–560	
	Forb, annual	2FA	*Forb, annual*	56–112	–
	Forb, perennial	2FP	*Forb, perennial*	56–112	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	11–34	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	11–34	–
	sego lily	CANU3	*Calochortus nuttallii*	11–34	–
	Anderson's larkspur	DEAN	*Delphinium andersonii*	11–34	–
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	11–34	–
	Utah fleabane	ERUT	*Erigeron utahensis*	11–34	–
	scarlet gilia	IPAGA3	*Ipomopsis aggregata ssp. aggregata*	11–34	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	11–34	–

	spiny phlox	PHHO	*Phlox hoodii*	11–34	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	11–34	–
Shrub/Vine					
3	**Sub-Dominant Shrubs**			415–785	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	224–280	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–112	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	22–56	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	11–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–34	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	11–34	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	11–34	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	11–34	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	11–34	–
	mormon tea	EPVI	*Ephedra viridis*	11–34	–
	spiny hopsage	GRSP	*Grayia spinosa*	11–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–34	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	11–34	–

Animal community

--Livestock and Wildlife Grazing--

This site provides good grazing conditions for livestock and wildlife during spring, summer, and fall when in good ecological condition due to accessibility and nutritious forage. However, this site often lacks natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. Care should be taken to maintain the native perennial grasses and shrubs due to the poor suitability for re-seeding or restoring this site. Reseeding and/or restoration are possible, but the major limiting factor is the lack of precipitation at critical times. This site may occur in mule deer, desert bighorn sheep, pronghorn antelope, and elk habitat; however in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily grasses, including needleandthread, Indian ricegrass, mutton bluegrass, blue grama, and galleta, which provide desirable grazing conditions for all classes of livestock and wildlife. The presence of shrubs, including basin big sagebrush, winterfat, and fourwing saltbush, provide good browse for cattle, sheep, goats, mule deer, bighorn sheep and elk. In general, basin big sagebrush, the dominant shrub, is not preferred or desired by livestock, however it is an important winter browse species for wildlife, including mule deer, pronghorn antelope, and elk. The palatability of basin big sagebrush is variable and is the least palatable of all the big sagebrush species, thus livestock typically only utilize this shrub in a situation when other forage is unavailable. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

--References--

Relative Forage Preference of Plants for Grazing Use by Season: Plants commonly found in Major Land Resource Area D35 --The Colorado Plateau. 2007

Stubbendieck, J., S. L. Hatch, and C. H. Butterfield. 1997. North American range plants. Lincoln, NE: University of Nebraska Press. 501p.

USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at

http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

Hydrological functions

The soil is in hydrologic group b. The runoff curve numbers are 61 through 79 depending on the overall condition of the watershed.

Recreational uses

Recreation activities are hiking and hunting.

Wood products

None

Other information

--Poisonous/Toxic Plant Communities--

Toxic plants associated with this site include woolly locoweed and broom snakeweed. Woolly locoweed is toxic to all classes of livestock and wildlife. Locoweed is palatable and has similar nutrient value to alfalfa, which may cause animals to consume it even when other forage is available. Locoweed contains swainsonine (indolizdine alkaloid) and is poisonous at all stages of growth. Poisoning will become evident after 2-3 weeks of continuous grazing and is associated with 4 major symptoms: 1) neurological damage, 2) emaciation, 3) reproductive failure and abortion, and 4) congestive heart failure linked with “high mountain disease”. Broom snakeweed contains steroids, terpenoids, saponins, and flavones that can cause abortions or reproductive failure in sheep and cattle, however cattle are most susceptible. These toxins are most abundant during active growth and leafing stage. Cattle and sheep will typically only graze broom snakeweed when other forage is unavailable and generally in winter when toxicity levels are at their lowest.

Potentially toxic plants associated with this site include fourwing saltbush, some buckwheat species, and basin big sagebrush. Fourwing saltbush and some buckwheat species may accumulate selenium, but only when growing on selenium enriched soils. These plants, when consumed will cause alkali disease or chronic selenosis, which affects all classes of livestock (excluding goats). Typically animals consuming 5-50 ppm selenium will develop chronic selenosis and animals consuming greater than 50 ppm selenium will develop acute selenosis. Clinical signs include lameness, soughing of the hoof, hair loss, blindness, and aimless wondering. Horses tend to develop what is called a “bob” tail or “roached” main due to breakage of the long hairs. Basin big sagebrush contains sesquiterpene lactones and monoterpenes which have been suspected of being toxic to sheep. An experimental dosage of ¾ lbs of big sagebrush fed to sheep for three days was found to be lethal.

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur.

--Invasive Plant Communities--

Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass, Russian thistle, kochia, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture

availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible. Pinyon pine and Utah juniper are natural invaders if stands are found adjacent to this site. Trees left uncontrolled can form dense stands and eventually dominate the site.

--Fire Ecology--

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Many plant communities in the Colorado Plateau may have evolved without the influence of fire. However a year of exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

Fire is an important aspect of basin big sagebrush dominated ecological sites. Fire intervals are historically 10-70 years and fires are typically patchy, forming mosaics. Shrub vegetation is able to reestablish from seed dispersal from the adjacent non burned sagebrush stands; however the process is relatively slow. Fire also decreases the extent of Utah juniper/pinyon pine invasions, which allows the historic plant community to maintain integrity. When the plant community is burned shrubs will decrease, while perennial and annual grasses increase. The perennial shrubs associated with this site are able to recover at a faster rate than the invading trees. When the site is degraded by the presence of invasive annuals, the fire return interval is shortened due to increased flashy fuels. The shortened fire return interval is often sufficient to suppress the native plant community.

--References--

Knight, A. P. and R. G. Walter. 2001. A guide to plant poisoning of animals in North America. Jackson, WY: Teton NewMedia. 367p.

USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

Contributors

George Cook

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	01/30/2007
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to very few. Any rills present should be short in length (less than 6 feet long) and only occur where increased runoff on lower part of steeper slopes and areas below exposed bedrock. An increase in rill formation may be seen after disturbance events such as recent fire or episodic thunderstorms.

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2. **Presence of water flow patterns:** None to few. Flow patterns wind around perennial plant bases and should show little to no evidence of erosion. They are short (less than 3 feet long) and stable, not connected.

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3. **Number and height of erosional pedestals or terracettes:** rare-Plants should show little or no pedestalling. Terracettes should be absent or few.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 35-40% bare ground. Ground cover is based on the first raindrop impact, and bare ground is the opposite of ground cover. Well developed biological soil crusts should not be recorded as bare ground. Poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground.

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5. **Number of gullies and erosion associated with gullies:** None to very few. Gully development is expected to be limited to slopes exceeding 20% and adjacent to sites where runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Minor evidence of wind generated soil movement, slight deposition at the base of shrubs. Wind caused blowouts and depositions are not present.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place, under plant canopies, with some redistribution caused by water movement. Minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems not likely to move.

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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):** This site should have a soil stability rating of 5 to 6 under the plant canopies using the soil stability kit test, and a rating of 3 to 5 in the interspaces. The average should be a 5. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface varies from 2 to 3 inches thick. Structure is thin platy. Color is reddish brown (5YR5/4). There is little if any difference under canopy or in interspaces and a recognizable A horizon is expected to be present throughout. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff: Bare spaces are small and rounded in shape and are usually not connected, Perennial cool and warm season grasses, sagebrush, biological soil crusts are usually distributed in sufficient density to intercept raindrops, increase surface detention of water, to increase infiltration and reduce erosive energy of runoff. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff would be expected to increase and associated infiltration would be reduced. A reduction in vegetative structure can reduce snow capture.

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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. Some soils have increase in clay content at 3 to 9 inches that could be mistaken for a compaction layer. Naturally occurring hard layer (clay, calcic horizon) should not be considered as compaction layers.

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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: Perennial bunchgrasses = non-sprouting shrubs

    Sub-dominant: rhizomatous grasses = sprouting shrubs = forbs

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Crested wheatgrass, Intermediate wheatgrass, Small burnet, etc.)Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover.

    Additional: Disturbance regime includes fire, insects, and drought. Assumed fire cycle of 40-60 years. Following a recent disturbance such as fire, drought, or insects that removes the Sagebrush vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. If a disturbance has not occurred for an extended period of time, sagebrush and juniper may continue to increase crowding out the perennial herbaceous understory species. In either case, these conditions could reflect a functional community phase within the reference state.
    Dominants: Indian ricegrass, Basin big sagebrush; Sub-dominants: Fourwing saltbush, Western wheatgrass. The perennial grass and non-sprouting shrub functional groups are expected on this site. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued under below average conditions, or on sites with high (usually greater than 65%) similarity index (late seral to historic climax). Slight decadence in the principle shrubs could occur near the end of the fire cycle. In general, a mix of age classes may be expected with some dead and decadent plants present.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 950-1000

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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:** Cheatgrass, Snakeweed, Utah juniper, Pinion, Green rabbitbrush, Annual forbs, and other annual grasses.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.
