

Ecological site R035XB226AZ **Sandstone/Shale Upland 6-10" p.z. Warm**

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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.

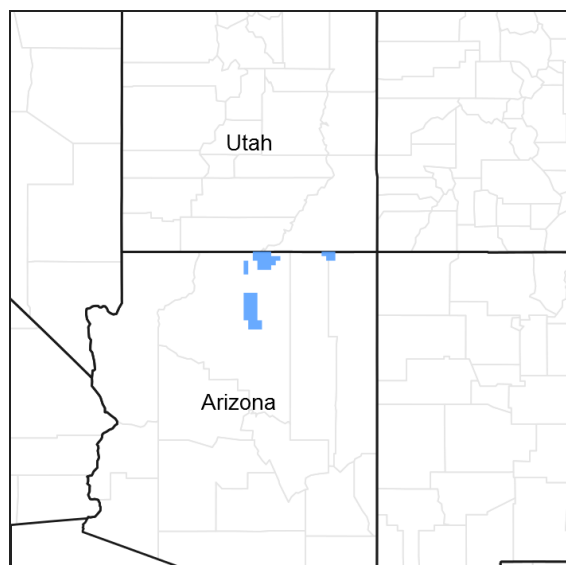


Figure 1. Mapped extent

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

This ecological site occurs in Common Resource Area 35.2 - the Colorado Plateau Shrub – Grasslands

Elevations range from 3800-5800 feet and precipitation averages 6 to 10 inches per year. Vegetation includes shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. The soil temperature regime is mesic and the soil moisture regime is typic 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.

Associated sites

R035XB206AZ	Sandy Upland 6-10" p.z. Warm Sandy Upland 6-10' p.z. Calcareous
R035XB209AZ	Loamy Wash 6-10" p.z. Loamy Wash 6-10" p.z.
R035XB216AZ	Sandy Wash 6-10" p.z. Sandy Wash 6-10" p.z.

R035XB217AZ	Sandy Upland 6-10" p.z. Sandy Upland 6-10" p.z.
R035XB230AZ	Sandstone Upland 6-10" p.z. Very Shallow, Warm Sandstone Upland 6-10" Calcareous
R035XB235AZ	Sandy Loam Upland 6-10" p.z. Warm Sandy Loam Upland 6-10" p.z Calcareous
R035XB255AZ	Sandstone Rockland 6-10" p.z. Sandstone Rockland 6-10" p.z.

Similar sites

R035XB234AZ	Sandstone Upland 6-10" p.z. Warm Shallow Sandy Loam 6-10" p.z. Calcareous
DX035X04B204	Sandstone Upland 6-10" p.z. Sandstone Upland 6-10" p.z. Very Shallow
R035XB230AZ	Sandstone Upland 6-10" p.z. Very Shallow, Warm Sandstone Upland 6-10" p.z. Calcareous

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Coleogyne ramosissima</i> (2) <i>Ephedra torreyana</i>
Herbaceous	Not specified

Physiographic features

This ecological site is found on summits and gentle side slopes of plateaus, mesas, and pediments. The slopes mostly range from 1 to 15 percent, with occasional areas as steep as 25 percent.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Mesa (3) Pediment
Flooding frequency	None
Ponding frequency	None
Elevation	1,158–1,768 m
Slope	1–15%
Aspect	Aspect is not a significant factor

Climatic features

The 35.2 Colorado Plateau Cold Desert Shrub - Grassland common resource area has a very dry and windy climate that is hot in the summer and cold in the winter. The annual precipitation averages between 6 and 10 inches. The soil moisture regime is typic aridic and the soil temperature regime is mesic. A slight majority of the precipitation arrives during the late fall, winter, and early spring. This winter season moisture originates in the Pacific Ocean and arrives as rain, or sometimes snow, during widespread frontal storms of generally low intensity. The majority of the snow (average range of 1 to 17 inches) falls from December through February, but rarely lasts more than a few days. A seasonal drought occurs from late May through early July. Summer rains occur from July through September during brief intense local thunderstorms. The rain is sporadic in intensity and location. The moisture originates from the Gulf of Mexico in the early summer and the Gulf of California in the late summer/early fall. Windy conditions are common year round, but the winds are strongest and most frequent during the spring.

Table 3. Representative climatic features

Frost-free period (average)	188 days
Freeze-free period (average)	163 days
Precipitation total (average)	203 mm

Influencing water features

The soil moisture on this ecological site comes from precipitation. Bedrock areas on the site may concentrate moisture in deeper soil pockets, increasing productivity in those areas.

Soil features

The soils formed in residuum and pedisediment from sandstone (calcareous and non-calcareous), mudstone, shale, and conglomerate of the Chinle Formation and Carmel Formation. Most of the soils are very shallow (<10 inches) to sandstone. A few areas are shallow (10-15 inches). The surface textures are mostly clay loam and sandy clay loam, but also include: loam, sandy clay, and clay. The profile can have a lot of coarse fragments, but most soils are not skeletal. The surface usually effervesces slightly to strongly when treated with hydrochloric acid. The subsurface is generally strongly to violently effervescent.

Typical Taxonomic Units include:

SSA 707 Little Colorado River Area: MU's 5 Tsaya, 14 Lithic Haplargids, 15 Hoskinnini & Moenkopie, 24 & 54 Leupp;
SSA 711 Navajo Mountain Area MU 60 Moenkopie family.

Table 4. Representative soil features

Parent material	(1) Residuum—sandstone and shale (2) Pedisediment—calcareous sandstone
Surface texture	(1) Clay loam (2) Channery sandy clay loam (3) Gravelly
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderately rapid
Soil depth	13–38 cm
Surface fragment cover <=3"	5–25%
Available water capacity (0-101.6cm)	0.64–4.45 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Soil reaction (1:1 water) (0-101.6cm)	8–8.4
Subsurface fragment volume <=3" (Depth not specified)	2–30%

Ecological dynamics

The historic climax plant community (HCPC) for a site in North America is the plant community that existed at the time of European immigration and settlement. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site. The historic climax plant community was in dynamic equilibrium with its environment. It is the plant community that was able to avoid displacement by the suite of

disturbances and disturbance patterns (magnitude and frequency) that naturally occurred within the area occupied by the site. Natural disturbances, such as drought, fire, grazing of native fauna, and insects, were inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the site that contribute to that dynamic equilibrium. Fluctuations in plant community structure and function caused by the effects of these natural disturbances establish the boundaries of dynamic equilibrium. They are accounted for as part of the range of characteristics for an ecological site. Some sites may have a small range of variation, while others have a large range.

The historic climax plant community of an ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities; however, can be recognized by characteristic patterns of species composition, association, and community structure. The HCPC for this ecological site has been estimated by sampling relict or relatively undisturbed sites and/or reviewing historic records.

Plant communities that are subjected to abnormal disturbances and physical site deterioration or that are protected from natural influences, such as fire and grazing, for long periods seldom typify the historic climax plant community. The physical site deterioration caused by the abnormal disturbance results in the crossing of a threshold or irreversible boundary to another state, or equilibrium, for the ecological site. There may be multiple thresholds and states possible for an ecological site, determined by the type and or severity of abnormal disturbance. The known states and transition pathways for this ecological site are described in the accompanying state and transition model.

The Plant Community Plant Species Composition table provides a list of species and each specie's or group of species' annual production in pounds per acre (air-dry weight) expected in a normal rainfall year. Low and high production yields represent the modal range of variability for that species or group of species across the extent of the ecological site.

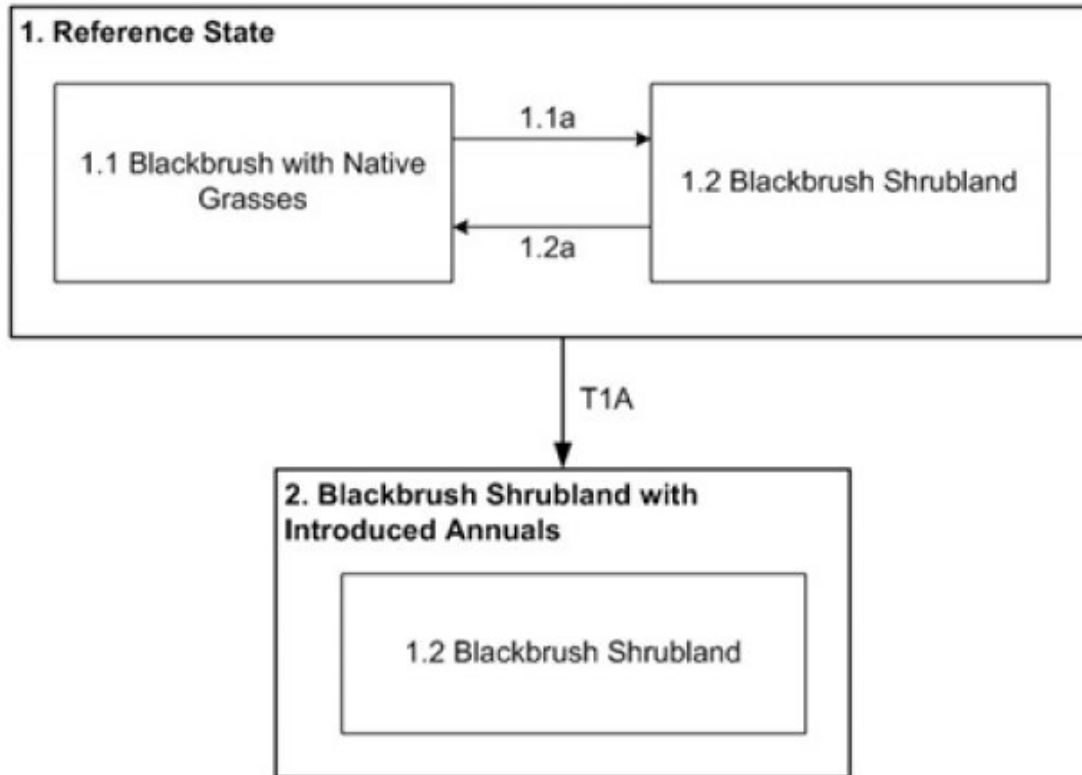
The Annual Production by Plant Type table provides the median air-dry production and the fluctuations to be expected during favorable, normal, and unfavorable years.

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

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

State and transition model

**35.2AZ Sandstone/Shale Upland 6-10" p.z. Warm
(R035XB226AZ)**



Legend

1.1a = Drought, Domestic/Wildlife Grazing

1.2a = Favorable precipitation, Time without disturbance, Prescribed Grazing

T1A = Introduction of Non-native Annuals create a irreversible change in plant community

Figure 6. State and Transition Model - R035XB226AZ

State 1

Reference State

This site exists on summits and side slopes of plateaus, mesas, and pediments. The site is characterized by a mix of shrubs with scattered perennial grasses and forbs. Primary shrubs are blackbrush and Torrey's jointfir with James' galleta and Indian ricegrass as the understory. Other shrubs present include cliffrose, snakeweed and Greenes' rabbitbrush.

Community 1.1

Shrubland with Native Grasses

The Shrubland with Native Grasses plant community is characterized by a dominance of shrubs with scattered perennial grasses and forbs. Primary shrubs are blackbrush and Torrey's jointfir with James' galleta and Indian ricegrass as the understory. Other shrubs present include cliffrose, snakeweed and Greenes' rabbitbrush.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	157	179	202
Grass/Grasslike	22	39	56
Forb	11	17	22
Total	190	235	280

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0-5%
Grass/grasslike basal cover	0-2%
Forb basal cover	0-2%
Non-vascular plants	0%
Biological crusts	0-15%
Litter	5-10%
Surface fragments >0.25" and <=3"	30-60%
Surface fragments >3"	0-20%
Bedrock	0-10%
Water	0%
Bare ground	10-40%

Table 7. Canopy structure (% cover)

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

Figure 8. Plant community growth curve (percent production by month).
AZ5201, 35.2 6-10" p.z. galleta. Growth begins in spring, most growth occurs during summer rains..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	10	15	35	5	0	0	0

Figure 9. Plant community growth curve (percent production by month).
AZ5206, 35.2 6-10" p.z. blackbrush. Most growth occurs in the spring, goes dormant during the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	10	20	50	20	0	0	0	0	0	0

Community 1.2

Blackbrush Shrubland

Blackbrush Shrubland - The dominant aspect of this site is of blackbrush. Other shrubs are present but in small amounts. Perennial forbs and grasses are present, but in minor amounts. Grasses commonly present are James galletaa and Indian ricegrass. Shrubs commonly present include blaackbrush, Torrey jointfir along with other native shrubs in small amounts.

Pathway 1.1a
Community 1.1 to 1.2

Drought, Domestic/Wildlife Grazing

Pathway 1.2a
Community 1.2 to 1.1

Favorable precipitation, Time without disturbance, Prescribed Grazing

State 2
Blackbrush Shrubland with Introduced Annuals

Community 2.1
Blackbrush Shrubland with Introduced Annuals

Blackbrush Shrubland - The dominant aspect of this site is of blackbrush. Other shrubs are present but in small amounts. Perennial forbs and grasses are present, but in minor amounts. Grasses commonly present are James galletaa and Indian ricegrass. Shrubs commonly present include blaackbrush, Torrey jointfir along with other native shrubs in small amounts. Introduced annuals occur, but are a very minor part of the plant community, usually only found in trace amounts.

Transition T1A
State 1 to 2

Introduction of Non-native Annuals create a irreversible change in plant community

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grasses			22–56	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	11–34	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	2–17	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–9	–
	Grass, annual	2GA	<i>Grass, annual</i>	0–4	–
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–4	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	0–4	–
Forb					
2	Forbs			11–22	
	Forb, annual	2FA	<i>Forb, annual</i>	0–9	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–9	–
	fiddleneck	AMSIN	<i>Amsinckia</i>	0–2	–
	cryptantha	CRYPT	<i>Cryptantha</i>	0–2	–
	nodding buckwheat	ERCE2	<i>Eriogonum cernuum</i>	0–2	–
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–2	–
	spurge	EUPHO	<i>Euphorbia</i>	0–2	–
	lemonscent	PEAN	<i>Pectis angustifolia</i>	0–2	–
Shrub/Vine					
3	Spring flowering shrubs			123–168	
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	101–135	–
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	11–45	–
	button brittlebush	ENFR	<i>Encelia frutescens</i>	0–11	–
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	0–11	–
	turpentinebroom	THMO	<i>Thamnosma montana</i>	0–11	–
	skunkbush sumac	RHTRS	<i>Rhus trilobata</i> var. <i>simplicifolia</i>	0–9	–
	water jacket	LYAN	<i>Lycium andersonii</i>	0–9	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	0–1	–
4	Summer flowering shrubs			11–45	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–17	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–17	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–11	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–11	–
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	0–11	–
5	Yucca and agave-like			2–11	
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	0–11	–
	Utah agave	AGUT	<i>Agave utahensis</i>	0–2	–
6	Cacti			0–4	
	beehive cactus	CORYP	<i>Coryphantha</i>	0–4	–
	Engelmann's hedgehog cactus	ECEN	<i>Echinocereus engelmannii</i>	0–4	–

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
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Hydrological functions

There are no hydrologic features associated with this site.

Wood products

There is no potential for the production of wood products on this site.

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)	Genevieve Benally, Kenneth Gishi and Steve Cassady
Contact for lead author	State Rangeland Management Specialist, NRCS-Arizona State Office
Date	03/04/2010
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- Number and extent of rills:** Very few (<5% cover) expected on this site due to rock fragment cover and gentle slopes. Slighter more expected (<8% cover) on higher slopes.
- Presence of water flow patterns:** The water flow patterns are widely spaced and uniform, the average length is 5-15 feet long with 1-5% coverage across the site. Flow paths should be less than 12 inches wide.
- Number and height of erosional pedestals or terracettes:** Only very few low terracettes along water flow patterns. There is some slight mounding (less than 1 inch) around long-lived perennial grasses and shrubs. These should not be considered pedestalling

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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 10 to 40%.
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5. **Number of gullies and erosion associated with gullies:** None expected, but can occur where adjacent sandstone breaks and rock outcrop concentrate on-site water flow.
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6. **Extent of wind scoured, blowouts and/or depositional areas:** None expected, due to loamy textures and amount of rock cover on surface. There is some slight mounding occurring around the bases of shrubs.
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7. **Amount of litter movement (describe size and distance expected to travel):** The majority of the fine herbaceous litter (<1/8") are moved by wind and water in flow paths, and only the medium size herbaceous and coarse woody litter remains and accumulate under the shrubs.
-
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Expected soil stability average rating range from 2 to 3. Soil stability with canopy ranges from 4 to 5 and with no canopy ranges from 1 to 2 in the interspaces.
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is fine granular structure, the color is dark reddish brown-5YR, and surface thickness ranges from 2 to 3 inches.
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The site is dominated by shrubs and makes up the majority of the plant composition (75%) and along with rock fragments help reduce splash erosion and slow runoff. However, the lack of good herbaceous perennial cover and moderate bare ground cover limits the sites ability to effectively capture and hold runoff.
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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. Soil can be very shallow (<10 inches) to bedrock.
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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 (blackbrush, Torrey Mormon tea, Stansbury cliffrose) >
- Sub-dominant: Low growing shrubs (broom snakeweed, shadscale, Bigelow sagebrush) >>
- Other: Perennial grasses > forbs > cacti and succulents
- Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Prolonged droughts can affects shrubs and cool season grasses especially if there are insufficient winter moisture. On this site, there is a 5-10% decadence in shrubs and succulents species.

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** The site has an expected annual production of about 200-250 lbs/ac during normal years.

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:** Blackbrush is native to the site, but has the potential to become the dominant species. Snakeweed is also a native species but also has the ability to increase and dominate a site after heavy grazing. Introduced annuals such as cheatgrass and Russian thistle have the ability to increase and co-dominate the site after heavy continuous grazing or disturbance.

17. **Perennial plant reproductive capability:** The only natural limitations to reproductive capability are weather related and natural disease or herbivory that reduces reproductive capability. All plants native to this site are adapted to the climate and are capable of producing seeds, stolons, and/or rhizomes except during the most severe droughts.
