USDA Natural Resources
Conservation Service

Ecological site R023XY040NV
GRANITIC FAN 8-10 P.Z.

Last updated: 4/10/2025
Accessed: 12/19/2025

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.

Ecological site concept

Currently there is only a draft of the initial concept for this ecological site. The initial concept for this site places it within the Clayey Mesic Plateaus 8-14 PZ Wyoming Big Sagebrush and Thurber's Needlegrass Ecological Site Group. To view the General STM and other information available for this ESG please go to https://edit.jornada.nmsu.edu/catalogs/esg/023X/R023XY909OR

This site occurs on convex summits and back slopes of erosional fan remnants and on inset fans with smooth, rolling topography. Slopes are more gradual than the modal site. The soils on this site have formed in alluvium derived from granitic rocks. These soils are deep to very deep and well drained. Soils are moderately coarse textured and soil reaction is neutral to moderately alkaline. Because of soil depth and high intake rate, most of the available moisture is held within the soil profile and available for plant use. With a reduced vegetation cover, these soils are susceptible to wind erosion. Production is higher than the modal site, ranging from 600 lb/ac to 1000 lb/ac. The plant community is dominated by big sagebrush, basin wildrye, and Thurber’s needlegrass. This site has not been seen on field visits for the group report, but likely has the same STM as the modal site.

Associated sites

R024XY015NV	**DEEP SODIC FAN**

Similar sites

R023XY057NV	**GRANITIC LOAM 10-12 P.Z.** ACTH7-PSSPS codominant; less productive site

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata*
Herbaceous	(1) *Leymus cinereus* (2) *Achnatherum thurberianum*

Physiographic features

This site occurs on convex summits and backslopes of fan remnants and on inset fans. Topography is smooth to rolling. Slopes range from 0 to 15 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 4000 to 7500 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Inset fan
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare
Elevation	4,000–7,500 ft
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid and characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 8 to 10 inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is about 100 to 130 days.

Nevada’s climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors largely influence Nevada’s climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with

well-developed seasons and the terrain responds quickly to changes in solar heating. Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

Average annual precipitation is 16 to over 20 inches. Mean annual air temperature is 41 to 44 degrees F. The average growing season is about 50 to 70 days.

Mean annual precipitaion at the Bear Creek, Nevada SNOTEL station (170501020301) is 37.69 inches.

monthly mean precipitation is:
January 3.84; February 3.75; March 4.38; April 4.9;
May 3.99; June 2.82; July .95; August 1.66;
September 1.22; October 2.12;
November 3.67; December 4.38.

Table 3. Representative climatic features

Frost-free period (average)	115 days
Freeze-free period (average)	
Precipitation total (average)	9 in

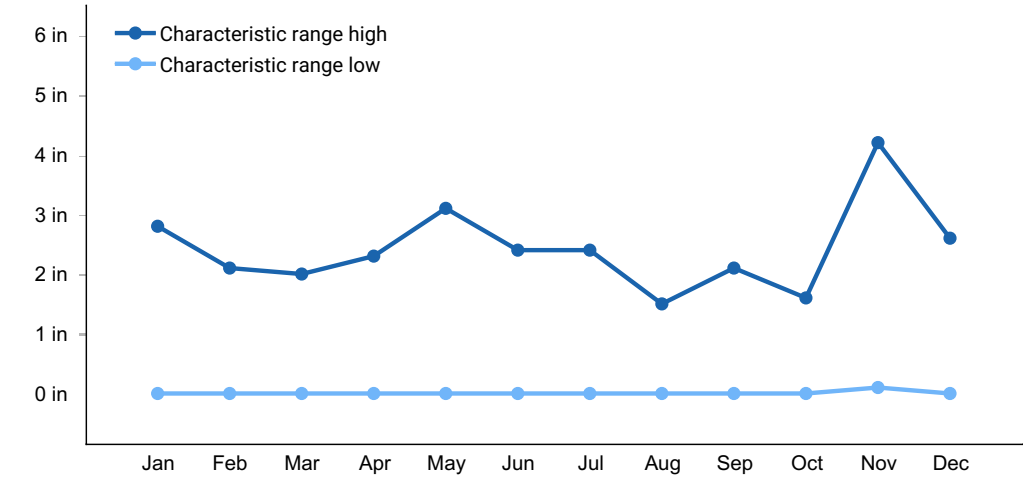

Figure 1. Monthly precipitation range

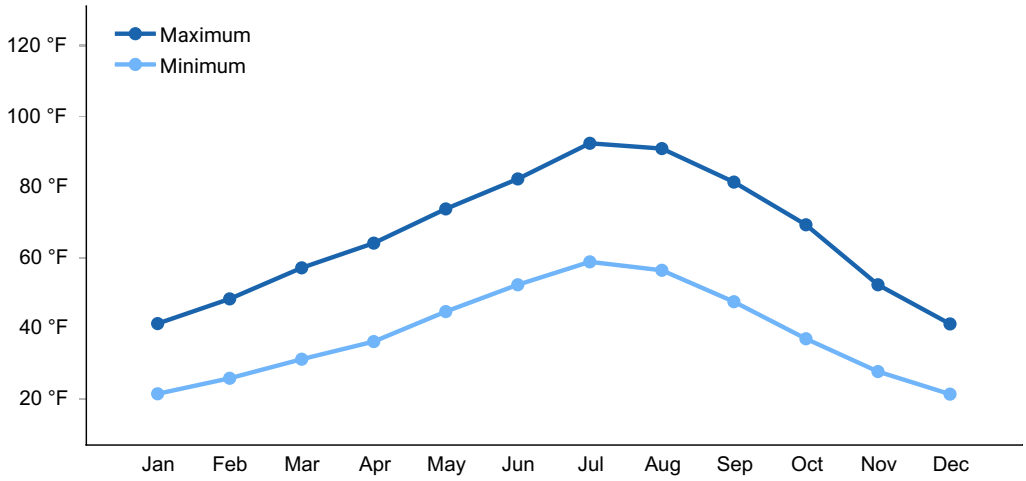

Figure 2. Monthly average minimum and maximum temperature

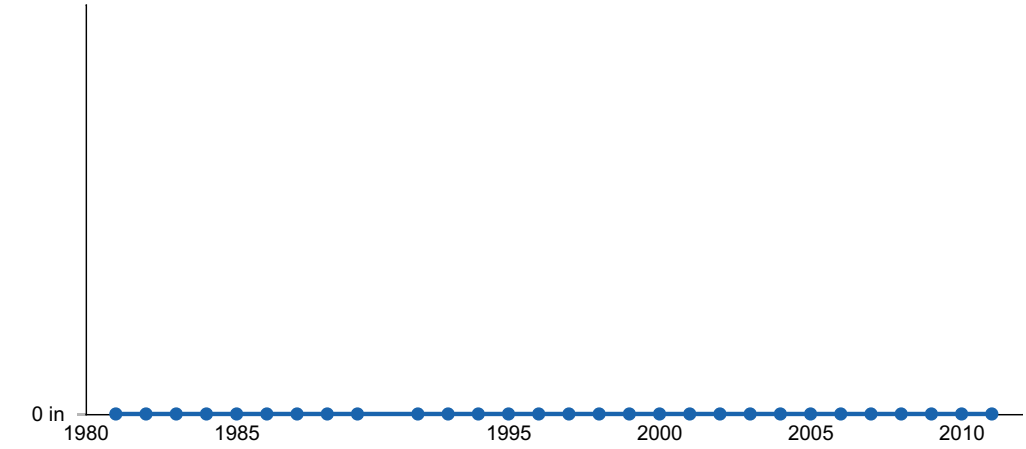

Figure 3. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site have formed in alluvium derived from granitic rocks. These soils are very deep and well drained. Soils are moderately coarse textured and soil reaction is neutral to moderately alkaline. Because of soil depth and moderate intake rates, most of the available moisture is held within the soil profile and available for plant use. With a reduced vegetation cover, these soils are susceptible to wind erosion. The soil series associated with this site include: Deadyon.

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	72–84 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4.1–4.6 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–12
Soil reaction (1:1 water) (0-40in)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	7–30%
Subsurface fragment volume >3" (Depth not specified)	0–17%

Ecological dynamics

Where management results in abusive grazing use by livestock and/or ferqal horses, Thurber’s needlegrass, and basin wildrye generally decline in production and abundance while big sagebrush, arrowleaf balsamroot, and rabbitbrush increase. Cheatgrass and other annual plants are likely to invade this site.

Fire Ecology:
Fire return intervals in basin big sagebrush are intermediate between mountain big sagebrush (15 to 25 years) and Wyoming big sagebrush (10 to 70 years). A naturally wide variation in fire frequency in this system is expected. Basin big sagebrush is readily killed when aboveground plant parts are charred by fire. Prolific seed production from nearby unburned plants coupled with high germination rates enables seedlings to establish rapidly following fire. Wyoming big sagebrush is killed by fire and establishes after fire from a seedbank; from seed produced by remnant plants that escaped fire; and from plants adjacent to the burn that seed in. Spiny hopsage is considered to be somewhat fire tolerant and often survives fires that kill sagebrush. Mature spiny hopsage generally sprout after being burned. Spiny hopsage is reported to be least susceptible to fire during summer dormancy. Black greasewood may be killed by severe fires, but it commonly sprouts soon after low to moderate-severity fires. Basin wildrye is top-killed by fire. Older basin wildrye plants with large proportions of dead material within the perennial crown can be expected to show higher mortality due to fire than younger plants having little debris. Basin wildrye is generally tolerant of fire but may be damaged by early season fire combined with dry soil conditions. Thurber’s needlegrass is classified as moderately resistant, but depending on season of burn, phenology, and fire severity, this perennial bunchgrass is moderately to severely damaged by fire. Early season burning is more damaging to this needlegrass than late season burning.

State and transition model

Ecosystem states

1. Reference Plant Community

State 1 submodel, plant communities

1.1. Reference Plant Community

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by Thurber's needlegrass, basin wildrye and big sagebrush. Black greasewood occurs on this site where faulting has brought subterranean water close to the surface. Potential vegetative composition is about 55% grasses, 10% forbs and 35% shrubs. Approximate ground cover (basal and crown) is about 15 to 25 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	330	440	550
Shrub/Vine	210	280	350
Forb	60	80	100
Total	**600**	**800**	**1000**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			240–440	
	basin wildrye	LECI4	*Leymus cinereus*	160–240	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	80–200	–
2	**Secondary Perennial Grasses**			40–80	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	4–24	–
	squirreltail	ELEL5	*Elymus elymoides*	4–24	–
	needle and thread	HECO26	*Hesperostipa comata*	4–24	–
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	4–24	–
Forb					
3	**Perennial**			40–120	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	4–24	–
	lupine	LUPIN	*Lupinus*	4–24	–
4	**Annual**			8–24	
Shrub/Vine					
5	**Primary Shrubs**			161–320	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	60–100	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	60–100	–
	spiny hopsage	GRSP	*Grayia spinosa*	40–80	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	1–40	–
6	**Secondary Shrubs**			40–80	
	Torrey's saltbush	ATTO	*Atriplex torreyi*	8–24	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	8–24	–
	mormon tea	EPVI	*Ephedra viridis*	8–24	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	8–24	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Grazing management should be keyed to perennial grass production. The early growth and abundant production of basin wildrye make it a valuable source of forage for livestock. It is important forage for cattle and is readily grazed by cattle and horses in early spring and fall. Though coarse-textured during the winter, basin wildrye may be utilized more frequently by livestock and wildlife when snow has covered low shrubs and other grasses. Thurber's needlegrass species begin growth early in the year and remain green throughout a relatively long growing season. This pattern of development enables animals to use Thurber's needlegrass when many other grasses are unavailable. Cattle prefer Thurber's needlegrass in early spring before fruits have developed as it becomes less palatable when mature. Thurber's needlegrasses are grazed in the fall only if the fruits are softened by rain. Basin big sagebrush may serve as emergency food during severe winter weather, but it is not usually sought out by livestock. Livestock browse Wyoming big sagebrush, but may use it only lightly when palatable herbaceous species are available. Spiny hopsage provides a palatable and nutritious food source for livestock, particularly during late winter through spring. Domestic sheep browse the succulent new growth of spiny hopsage in late winter and early spring. Black greasewood is an important winter browse plant for domestic sheep and cattle. It also receives light to moderate use by domestic sheep and cattle during spring and summer months. Black greasewood contains soluble sodium and potassium oxalates that may cause poisoning and death in domestic sheep and cattle if large amounts are consumed in a short time.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
Basin big sagebrush is the least palatable of all the subspecies of big sagebrush. Basin big sagebrush is browsed by mule deer from fall to early spring, but is not preferred. Wyoming big sagebrush is preferred browse for wild ungulates. Pronghorn usually browse Wyoming big sagebrush heavily. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Meadows surrounded by sagebrush may be used as feeding and strutting grounds. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover. Sage-grouse prefer mountain big sagebrush and Wyoming big sagebrush communities to basin big sagebrush communities. Spiny hopsage provides a palatable and nutritious food source for big game animals. Spiny hopsage is used as forage to at least some extent by domestic goats, deer, pronghorn, and rabbits. Black greasewood is an important winter browse plant for big game animals and a food source for many other wildlife species. It also receives light to moderate use by mule deer and pronghorn during spring and summer months. Basin wildrye provides winter forage for mule deer, though use is often low compared to other native grasses. Basin wildrye provides summer forage for black-tailed jackrabbits. Because basin wildrye remains green throughout early summer, it

remains available for small mammal forage for longer time than other grasses. Thurber needlegrass is valuable forage for wildlife.

Hydrological functions

Runoff is low to medium. Permeability is moderate. Hydrologic soil group is B.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other products

Some Native American peoples used the bark of big sagebrush to make rope and baskets. Native Americans made tea from big sagebrush leaves. They used the tea as a tonic, an antiseptic, for treating colds, diarrhea, and sore eyes and as a rinse to ward off ticks. Big sagebrush seeds were eaten raw or made into meal. Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand.

Other information

Basin big sagebrush shows high potential for range restoration and soil stabilization. Basin big sagebrush grows rapidly and spreads readily from seed. Wyoming big sagebrush is used for stabilizing slopes and gullies and for restoring degraded wildlife habitat, rangelands, mine spoils and other disturbed sites. It is particularly recommended on dry upland sites where other shrubs are difficult to establish. Spiny hopsage has moderate potential for erosion control and low to high potential for long-term revegetation projects. It can improve forage, control wind erosion, and increase soil stability on gentle to moderate slopes. Spiny hopsage is suitable for highway plantings on dry sites in Nevada. Basin wildrye is useful in mine reclamation, fire rehabilitation and stabilizing disturbed areas. Its usefulness in range seeding, however, may be limited by initially weak stand establishment.

Type locality

Location 1: Washoe County, NV	
Township/Range/Section	T33N R23E S1
UTM zone	N

UTM northing	303975
UTM easting	4516190
Latitude	40° 46′ 24″
Longitude	119° 19′ 22″
General legal description	SW 1/4 SW 1/4, Approximately 12 miles north of Gerlach along west side of NV Hwy. 34, Hualapai Flat area, Washoe County, Nevada.

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

USDA-NRCS Plants Database (Online; http://www.plants.usda.gov).

Great Basin Ecological Site Development Project: State and Transition Models for Major Land Resource Area 23, Nevada and portions of California (Online; https://naes.agnt.unr.edu/PMS/Pubs/2019-4060.pdf)

Contributors

CP/SW/DK
T Stringham (UNR under contract with BLM)

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)	P. NOVAK-ECHENIQUE
Contact for lead author	State Rangeland Management Specialist
Date	05/06/2013
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to rare. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

---

2. **Presence of water flow patterns:** Water flow patterns are none to rare but can be expected in areas recently subjected to summer convection storms or rapid snowmelt, usually on steeper slopes.

---

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 50 - 70%;

---

5. **Number of gullies and erosion associated with gullies:** None

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

---

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length (<3 m) during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 on most soil textures found on this site. (To be field tested.)

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically weak, thin platy. Soil surface colors are pale brown and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 4

inches is typically 1 to 2 percent, dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., basin wildrye]) slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Massive sub-surface horizons or subsoil argillic horizons are not to be interpreted as compacted.

---

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: Deep-rooted, cool season, perennial bunchgrasses >> tall shrubs (big sagebrush & spiny hopsage)

    Sub-dominant: deep-rooted, cool season, perennial forbs > associated shrubs > shallow-rooted, cool season, perennial bunchgrasses > fibrous, shallow-rooted, cool season, perennial and annual forbs

    Other:

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<15%) have dead centers.

---

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (20-30%) and litter depth is ± ¼ inch.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-June) ± 800 lbs/ac; Favorable years 1000 lbs/ac and unfavorable years 600 lbs/ac Spring moisture significantly affects total production

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:** Potential invaders on this site include cheatgrass, snakeweed, halogeton, Russian thistle, annual mustards, knapweeds, yellow star thistle, Utah juniper and singleleaf pinyon.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years