

Ecological site R027XY041NV

DEEP SODIC FAN

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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.

MLRA notes

Major Land Resource Area (MLRA): 027X–Fallon-Lovelock Area

Physiography Found in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus this area is characterized by isolated uplifted fault block mountain ranges trending north to south that are separated by broad, hydrologically closed basins. The entire area occurs in the rain-shadow of the Sierra Nevada mountains and is influenced by Pleistocene Lake Lahontan which reached its most recent high stand about 12,000 years ago. There is substantial evidence suggesting the western Great Basin has been the site of pluvial-interpluvial cycles for at least the past two million years. The mountains and valleys are dissected by the Humboldt, Truckee, Carson, and Walker Rivers and their tributaries, all of which terminate within MLRA 27. Extensive playas can be found throughout this area and are the result of drying of ancient Lake Lahontan. Elevation generally ranges from 3,300 to 5,900 feet (1,005 to 1,800 meters) in valleys, but on some mountain peaks it is more than 7,870 feet (2,400 meters). Geology Landforms and soils of this MLRA have been heavily influenced by fluctuating lake level over the last 40,000 years. There is a level line evident on the higher slopes marking the former extent of glacial Lake Lahontan. Almost half of this area has surface deposits of alluvial valley fill influenced by lacustrine sediment. The rest has andesite and basalt rocks of different ages. Mesozoic and Tertiary intrusives are concentrated along the western border of the area, and Lower Volcanic Rocks (17 to 43 million years old) are common on the eastern side of the area. Also, some scattered outcrops of Mesozoic sedimentary and volcanic rocks and tuffaceous sedimentary rocks are in the mountains within the interior of this MLRA. Climate The average annual precipitation is 5 to 10 inches (125 to 255 millimeters) in most of the area but is as much as 19 inches (485 millimeters) on high mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The amount of precipitation is very low from summer to midautumn. The precipitation in winter occurs mainly as snow. The average annual temperature is 43 to 54 degrees F (6 to 12 degrees C). The freeze-free period averages 155 days and ranges from 110 to 195 days, decreasing in length with elevation. Water The amount of precipitation is very low, and water for irrigation is obtained principally from diversions on the four large rivers in the area and from water stored in the Lahontan, Rye Patch, and Weber Reservoirs. Pyramid Lake and Walker Lakes are terminal lakes for the Truckee and Walker Rivers, respectively. Much of the annual flow of both rivers is diverted for irrigation, causing lake levels to fall and levels of dissolved salts to increase causing problems for the native Lahontan cutthroat trout. Soils The dominant soil orders are Aridisols and Entisols. The soils in the area are predominantly a mesic temperature regime, aridic moisture regime, and have a mixed mineralogy. They are generally well drained, loamy or sandy, commonly skeletal, and shallow to very deep. Accumulation of salts, tufa deposits, and eolian sediments with soluble salts over lacustrine deposits influence most of the soils in the basin landforms of this MLRA. Soils on bedrock-controlled landforms are typically comprised of volcanic or tuffaceous sedimentary colluvium over residuum. Biological Resources This area supports extensive areas of salt-desert shrub vegetation. Shadscale and Bailey's greasewood are widespread, occurring both individually and together. Grasses are generally sparse, although Indian ricegrass is prominent, especially on the sandy soils. Fourwing saltbush, winterfat, spiny hopsage, wolfberry, ephedra, dalea, and bud sagebrush are common shrubs. Basin wildrye, creeping wildrye, alkali sacaton, saltgrass, black greasewood, rubber rabbitbrush, and big saltbush are important plants on saline bottom lands and terraces. A few marsh areas support cattail, bulrushes, sedges, and rushes. Big sagebrush, along with scattered Utah juniper and singleleaf pinyon, is associated with Thurber needlegrass, desert needlegrass, Sandberg bluegrass, and squirreltail on the higher elevation piedmont slopes and mountains.

Ecological site concept

The Deep Sodic Fan site occurs on alluvial flats, lake plains, inset fans, and axial-stream floodplains. Slope gradients are typically less than 2 percent. Elevations are 3800 to 4200 feet. The soils are very deep and somewhat poorly to well drained. Surface soils are moderately-fine textured and subsurface soils are typically very fine textured. These soils are calcareous and they are strongly salt and sodium affected throughout the soil profile. Additional moisture is received on this site during the winter and spring months as run-in from higher landscapes or occasional brief overflow from adjacent streams.

Associated sites

R027XY006NV	SALINE BOTTOM More productive site; SAVE4 dominant shrub; ATTO minor shrub, if present
R027XY044NV	SALINE FLAT Much less productive site

Similar sites

R027XY024NV	SODIC TERRACE Less productive site ATCO-SAVE4 codominant shrubs
R027XY003NV	LOAMY BOTTOM More productive site; ATTO, SAVE4 & DISP absent; soils not saline alkali affected

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex torreyi</i>
Herbaceous	(1) <i>Leymus cinereus</i>

Physiographic features

The Deep Sodic Fan site occurs on alluvial flats, lake plains, inset fans, and axial-stream floodplains. Slope gradients range from 0 to 4 percent, however, slope gradients of 0 to 2 percent are most typical. Elevations are 3800 to 4200 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat (2) Lake plain (3) Inset fan
Runoff class	Low to very high
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None

Elevation	1,160 – 1,280 m
Slope	0 %
Water table depth	70 – 180 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is arid, characterized by cool, moist winters and hot, dry summers. Average annual precipitation is 4 to 8 inches. Mean annual air temperature is 48 to 58 degrees F. The average growing season is about 110 to 180 days.

Table 3 Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	
Precipitation total (average)	200 mm

Influencing water features

This site may receive additional moisture by flooding and ponding due to its occurrence on lake plains and axial-stream floodplains.

Soil features

The soils associated with this site are very deep and somewhat poorly to well drained. Surface soils are moderately-fine textured and subsurface soils are typically very fine textured. These soils are calcareous and they are strongly salt and sodium affected throughout the soil profile. Additional moisture is received on this site during the winter and spring months as run-in from higher landscapes or occasional brief overflow from adjacent streams. Wetting of these soils dilutes their salt and sodium concentrations and the degree of salinity and alkalinity fluctuates widely through the year. Permeability is very slow to moderate and available water capacity is low to high. Runoff is low to very high and ponding occurs in some areas. Potential for sheet and rill erosion is slight. The soil series associated with this site include: Carcity, Carson, Dedmount, Schurz, Slaw, Slawha, Trocken, Walker River, and Wendane.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Clay (2) Clay loam (3) Silty clay loam
Family particle size	(1) Clayey

Drainage class	Somewhat poorly drained to well drained
Permeability class	Very slow to moderate
Soil depth	180 – 210 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.16 – 20.07 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 40 %
Electrical conductivity (0-101.6cm)	0 – 30 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 60
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 9.6
Subsurface fragment volume <=3" (Depth not specified)	0 – 40 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

As ecological condition declines, Torrey's quailbush, rubber rabbitbrush, and black greasewood increase as basin wildrye and other deep-rooted perennial herbaceous plants decrease. Inland saltgrass increases as condition declines and may dominate the understory when this site is in low ecological condition. Species likely to invade this site are annual mustards, cheatgrass, and salt cedar.

Fire Ecology:

In saltbush scrub communities fire is rare due to lack of continuous fuels. The expansion of invasive annuals such as cheatgrass and mustard can increase the frequency of fire in these ecosystems. Fires in saltbush vegetation are likely to be more severe and spread

faster with increasing fuel porosity, decreasing levels of moisture, and increasing amounts of fine fuels and dead vegetation. Torrey's quailbush has been shown to have reduced flammability due to high moisture and ash contents. Torrey's quailbush can survive at least some fires. The limited information available suggests that the most likely postfire regeneration strategy of Torrey's quailbush is seed production. Black greasewood may be killed by severe fires, but it commonly sprouts soon after low to moderate-severity fire. Torrey's quailbush has been shown to have reduced flammability due to high moisture and ash contents. 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. Fire top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush may sprout after top-kill. Fourwing saltbush probably establishes primarily from seed after fire, with some populations also regenerating vegetatively. 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. Alkali sacaton is classified as tolerant of, but not resistant to, fire. Top-killing by fire is probably frequent, and the plants can be killed by severe fire.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Primary Perennial Grasses			359-616	
	basin wildrye	LECI4	<i>Leymus cinereus</i>	336-504	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	22-112	–
2	Secondary Perennial Grasses			56-112	
	saltgrass	DISP	<i>Distichlis spicata</i>	6-34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	6-34	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	6-34	–
Forb					
3	Perennial			22-90	
	saltgrass	DISP	<i>Distichlis spicata</i>	6-34	–
	milkvetch	ASTRA	<i>Astragalus</i>	6-22	–
	povertyweed	IVAX	<i>Iva axillaris</i>	6-22	–
	thelypody	THELY	<i>Thelypodium</i>	6-22	–
Shrub/Vine					
4	Primary Shrubs			404-818	
	Torrey's saltbush	ATTO	<i>Atriplex torreyi</i>	336-560	–
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	22-112	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	22-90	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	22-56	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	6-34	–
5	Secondary Shrubs			22-112	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	6-34	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	6-34	–
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	6-34	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	6-34	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	6-34	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	6-34	–
	seepweed	SUAED	<i>Suaeda</i>	6-34	–

Animal community

Livestock Interpretations: This site is suited for livestock grazing. Grazing management should be keyed to basin wildrye 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. Alkali sacaton is a valuable forage species in arid and semiarid regions. Plants are tolerant to moderate grazing and can produce abundant herbage utilized by livestock. Livestock browse the leaves of Torrey's quailbush. 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. Basin big sagebrush may serve as emergency food during severe winter weather, but it is not usually sought out by livestock. Fourwing saltbush is one of the most palatable shrubs in the West. Its protein, fat, and carbohydrate levels are comparable to alfalfa. It provides nutritious forage for all classes of livestock. Palatability is rated as good for domestic sheep and domestic goats; fair for cattle; fair to good for horses in winter, poor for horses in other seasons. 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 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. The western salt desert shrub and grassland communities where alkali sacaton is common support an abundance of mule deer, pronghorn, carnivores, small mammals, birds, amphibians, and reptiles. Leaves and seeds of Torrey's quailbush are eaten by many species. Mule deer and pronghorn browse the leaves. Small mammals such as rabbits and rodents have been reported to eat Torrey's quailbush. Dense stands of Torrey's quailbush provide excellent cover for several species. 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 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. 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. Fourwing saltbush provides valuable habitat and year-round browse for wildlife. Fourwing saltbush also provides browse and shelter for small mammals. Additionally, the browse provides a source of water for black-tailed jackrabbits in arid environments. Granivorous birds consume the fruits. Wild ungulates, rodent and lagomorphs readily consume all aboveground portions of the plant. Palatability is rated good for deer, elk, pronghorn and bighorn sheep.

Hydrological functions

Runoff is very low to low. There are no rills or pedestals. Water flow patterns are rare to common. Moderately fine to fine surface textures result in limited infiltration rates. Concentrations of surface salts and sodium often result in chemical crusts which impede infiltration of precipitation. Water flow patterns are typically short, ending in depressional areas. Gullies are rare to common depending on landform. Where this site occurs on landforms not associated with ephemeral or perennial drainageways, gullies do not occur. Where this site occurs associated with drainageways, gullies are rare to common. Gullies and associated head cuts should be healing and stable. Deep-rooted, perennial grasses (i.e., basin wildrye & alkali sacaton) slow runoff and increase infiltration. Tall stature and relatively coarse foliage of basin wildrye and shrubs (with associated litter) break raindrop impact and provide opportunity for snow catch and moisture accumulation on site.

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

Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand. Tribes of the American southwest used Torrey's quailbush seeds to make a thick gruel. They made flour to make small cakes, used the leaves as soap, and used the flowers, stems and leaves as a treatment for nasal congestion. The seeds were likely used in a similar way to fourwing saltbush. Seeds of fourwing saltbush were also reportedly ground into flour. Other uses for fourwing saltbrush that may have been similar for big saltbrush are the use of the ground meal as an emetic, use of ground flowers or roots moistened with saliva in treating ant bites, and addition of ashes to water for dyeing meal greenish-blue. The leaves, seeds and stems of black greasewood are edible. Some Native American peoples used the bark of big sagebrush to make rope and baskets. Fourwing saltbush is traditionally important to Native Americans. They ground the seeds for flour. The leaves, placed on coals, impart a salty flavor to corn and other roasted food. Top-growth produces a yellow dye. Young leaves and shoots were used to dye wool and other materials. The roots and flowers were ground to soothe insect bites.

Other information

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. Alkali sacaton is one of the most commonly used species for seeding and stabilizing disturbed lands. Due to alkali sacaton's salt tolerance, is recommended for native grass seeding on subirrigated saline sites. Torrey's quailbush is a recommended revegetation species in riparian areas throughout its range and has also been used in revegetation projects in other habitats. Black greasewood is useful for stabilizing soil on wind-blown areas. It successfully revegetates processed oil shale and is commonly found on eroded areas and sites too saline for most plant species. Basin big sagebrush shows high potential for range restoration and soil stabilization. Basin big sagebrush grows rapidly and spreads readily from seed. Fourwing saltbush is widely used in rangeland and riparian improvement and reclamation projects, including burned area recovery. It is probably the most widely used shrub for restoration of winter ranges and mined land reclamation.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T21N R34E S24
General legal description	About 2 miles east of Dixie Valley Road (NVHwy 121) south side of Settlement Road, Dixie Valley area, Churchill County, Nevada. This site also occurs in Lyon, Mineral, Pershing, and Storey Counties, Nevada.
Location 2: Churchill County, NV	
Township/Range/Section	T17N R36E S28
General legal description	About 2 miles west of Eastgate, south of USHwy50, East Gate wash and lower reaches of Buffalo Creek, Churchill County, Nevada. This site also occurs in Lyon, Mineral, Pershing, and Storey Counties, 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>).

Contributors

DK/GD

Approval

Kendra Moseley, 6/03/2024

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)	GK BRACKLEY
Contact for lead author	State Rangeland Management Specialist
Date	06/20/2006
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills: None

2. Presence of water flow patterns: Water flow patterns are rare to common. Moderately fine to fine surface textures result in limited infiltration rates. Concentrations of surface salts and sodium often result in chemical crusts which impede infiltration of precipitation. Water flow patterns are typically short, ending in depressional areas.

3. Number and height of erosional pedestals or terracettes: None

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):
Bare Ground $\pm$ 30%; surface rock fragments less than 5%; shrub canopy $\pm$ 10%; basal area for perennial herbaceous plants $\pm$ 20%.

5. Number of gullies and erosion associated with gullies: Gullies are rare to common depending on landform. Where this site occurs on landforms not associated with ephemeral or perennial drainageways, gullies do not occur. Where this site occurs associated with drainageways, gullies are rare to common. Gullies and associated head cuts should be healing and stable.

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 of grasses and annual & perennial forbs) is only expected to move during periods of flooding by adjacent streams. Persistent litter (large woody material) will remain in place except during catastrophic flooding events.
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8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): Soil stability values will range from 1 to 4. (To be field tested.)
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9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Structure of soil surface will be platy or massive. Soil surface colors are light and soils are typified by an ochric epipedon. Organic carbon can range from 1.5 to 4.5 percent (OM values taken from lab characterization data.)
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10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Deep-rooted, perennial grasses (i.e., basin wildrye & alkali sacaton) slow runoff and increase infiltration. Tall stature and relatively coarse foliage of basin wildrye and shrubs (with associated litter) break raindrop impact and provide opportunity for snow catch and moisture accumulation on 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): Compacted layers are not typical. Platy or massive subsurface layers are normal for this site and are not to be interpreted as compaction.
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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: Reference Plant Community: Tall shrubs > tall-statured, deep-rooted, cool season, perennial bunchgrasses. (By above ground production)
- Sub-dominant: Short-statured, deep-rooted, cool season, perennial grasses having large basal area > perennial rhizomatous grasses > deep-rooted, cool season, perennial forbs > fibrous, shallow-rooted, cool season, perennial and annual forbs=shallow-rooted, cool season, perennial grasses and grass-like plants. (By above ground production)
- Other:
- Additional:
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13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 25% of total woody canopy.
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14. Average percent litter cover (%) and depth (in): Within plant interspaces ($\pm$ 40%) and depth of litter $\pm$ 1 inch.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
For normal or average growing season (through end of May) $\pm$ 1000 lbs/ac; Winter moisture significantly affects total production.
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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: Rubber rabbitbrush, annual mustards, povertyweed, annual kochia, pigweed, bassia, cheatgrass, and knapweeds are invaders on this site.
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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years.
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