Ecological site R042BB035NM
Gravelly Loam, Desert Shrub

Accessed: 05/18/2024

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.

Associated sites

R042BB010NM	**Gravelly, Desert Shrub** The Gravelly Loam site is often associated with Gravelly sites.

Similar sites

R042BB010NM	**Gravelly, Desert Shrub** This site can have similar species composition, but typically higher production than Gravelly sites. Gravelly sites can occur on the same landform and landscape positions as Gravelly Loam sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site usually occurs on nearly level to rolling piedmont slopes, hill slopes, fan remnants, or alluvial fans. Slopes range from 0 to 15 percent and occasionally reach 30 percent but average 4 to 9 percent. Elevations range from 4,300 to 5,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Alluvial fan (3) Mountain slope
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to very rare
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	None to rare
Elevation	1,311–1,524 m
Slope	0–15%
Ponding depth	0 cm

Water table depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual average precipitation ranges from 7.35 to 11.90 inches. Wide fluctuations from year to year are common, ranging from a low of about 2 inches to a high of over 20 inches. At least one-half of the annual precipitation comes in the form of rainfall during July, August, and September. Precipitation in the form of snow or sleet averages less than 4 inches annually. The average annual air temperature is about 61 degrees F. Summer maximums usually exceed 100 degrees F. and winter minimums can go below zero. The average frost-free season exceeds 200 days and extends from April 1 to November 1. Both the temperature regime and rainfall distribution favor warm-season perennial plants on this site. Spring moisture conditions are only occasionally adequate to cause significant growth during this period of the year. High winds from the west and southwest are common from March to June, which further tends to create poor soil moisture conditions in the springtime.

Table 3. Representative climatic features

Frost-free period (average)	205 days
Freeze-free period (average)	227 days
Precipitation total (average)	305 mm

Influencing water features

This site is not influenced by water from wetlands or streams.

Soil features

Soils are moderately deep to deep. Surface textures are Gravelly loam, gravelly loamy sand, very gravelly loamy sand, gravelly sandy loam, very gravelly sandy loam, very cindery sandy loam, very gravelly loam, or very gravelly sandy clay loam.

Substratum textures are gravelly loam, gravelly loamy sand, very gravelly loamy sand, gravelly sandy loam, very gravelly sandy loam, very cindery sandy loam, very gravelly loam, or very gravelly sandy clay loam.

Subsoil textures are gravelly loam, gravelly loamy sand, very gravelly loamy sand, gravelly sandy loam, very gravelly sandy loam, very cindery sandy loam, very gravelly loam, or very gravelly sandy clay loam

They are usually noncalcareous or slightly calcareous (0 to 10 percent) in the upper part and become strongly calcareous in the subsoil (10 to 40 percent). Runoff is low to high.

Minimum and maximum values listed below represent the characteristic soils for this site.

Characteristic Soils:
Eba
Nolam
Hap
Pinaleno
Coxwell*
sonoita
Terino*

* Note: Both Coxwell and Terino soils have an indurated calichi layer between 19 and 30 inches (shellow or moderately deep soils).

Table 4. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Very gravelly very fine sand (3) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	61–183 cm
Surface fragment cover <=3"	15–40%
Surface fragment cover >3"	0–4%
Available water capacity (0-101.6cm)	2.54–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	10–40%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	30–55%
Subsurface fragment volume >3" (Depth not specified)	0–4%

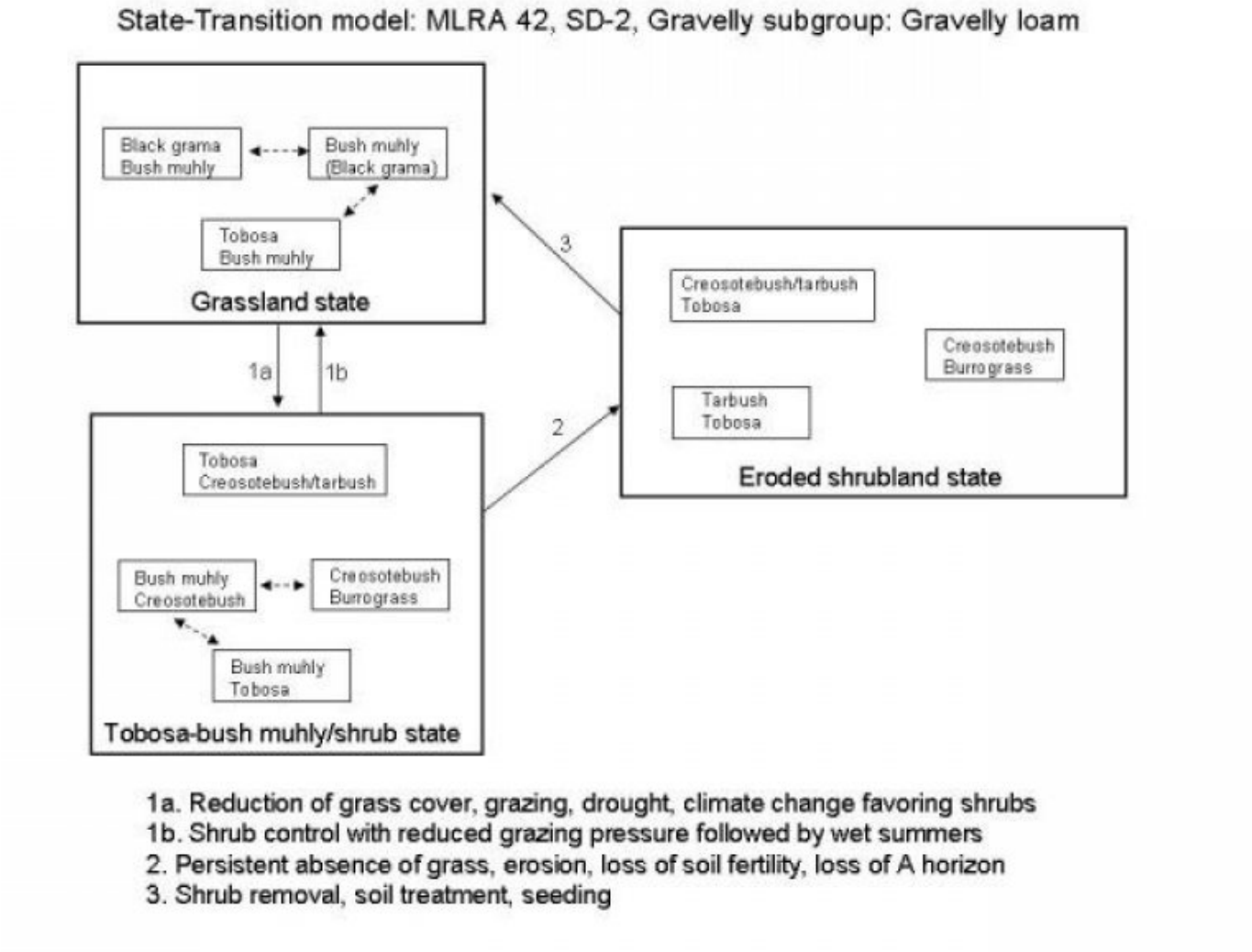
Ecological dynamics

MLRA 42, SD-2: Gravelly loam

Overview

This ecological site is frequently associated with gravelly ecological sites. The historic plant community type is assumed to have exhibited dominance by black grama (*Bouteloua eriopoda*) and secondarily by bush muhly (*Muhlenbergia porteri*), Arizona cottontop (*Digitaria californica*) and/or cane bluestem (*Bothriochloa barbinodis*). Creosotebush (*Larrea tridentata*) and mesquite (*Prosopis glandulosa*) occur but are not co-dominants with grasses. This ecological site tends to occur at slightly higher elevations, receives more rainfall, has higher water holding capacity, and is more productive than the other two members of the gravelly site group. Consequently, the grassland state of this site is more resilient than the other gravelly-soil sites. Bush muhly and other grasses can return to dominance after grazing perturbation and shrub encroachment. By virtue of the heavier soils, higher production of grasses, and unpalatability of some dominant grasses, erosion-generated transitions are less likely on this site than on the gravelly site. Continuous heavy grazing tends to remove black grama and results in dominance by tobosa (*Pleuraphis mutica*) and/or threeawns (Aristida spp) and subshrubs within the grassland state. Loss of grasses results in dominance or co-dominance by creosotebush and tarbush (*Flourensia cernua*) within a tobosa/bush muhly-shrub state. Shrub removal with grazing deferment can result in reestablishment of grasses. In extreme cases of prolonged heavy grazing and/or other disturbances, soil degradation and erosion may prohibit reestablishment of grasses with shrub removal within a shrubland state.
No studies have been conducted on the ecology of the gravelly loam ecological site.

State and transition model



State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

Grassland: The historic plant community is believed to be diverse grassland community dominated by black grama, with bush muhly, Arizona cottontop, cane bluestem, tobosa, and threeawns as subordinates. Sideoats grama (*Bouteloua curtipendula*) and plains bristlegrass (*Setaria leucopila*) are also common. Winterfat (*Krascheninnikovia lanata*) and succulents such as ocotillo (Fouqueria splendens) and sotol (Dasylirion spp.) or yuccas (Yucca spp.) may be common, although in Sierra County they are not (Gene Adkins, NRCS Truth or Consequences). Creosotebush, mesquite, and tarbush densities are low and these shrubs are minor components. Grazing-induced retrogression from this community is characterized by a reduction in the cover of black grama (Bush muhly/black grama community). Secondarily, bush muhly, cane bluestem, Arizona cottontop, sideoats grama and winterfat will decrease. This is accompanied by an increase in the proportional representation tobosa, threeawns, burrograss (*Scleropogon brevifolius*), fluffgrass (*Dasyochloa pulchella*), snakeweed (*Gutierrezia sarothrae*), and shrubs (tobosa/bush muhly community). Diagnosis: Black grama and bush muhly grass cover dominant, tobosa may also be dominant. Several grass species represented. Shrubs are sparse and there are few signs of erosion. Additional States and Transition Pathways: Transition to tobosa-bush muhly/shrub state (1a): The cause of this transition is presumed to be due to grazing or other soil disturbance, possibly in combination with climate change, that allows shrubs to attain and maintain dominance. Key indicators of approach to transition: Increases in bare ground and bare ground patch size, decreases in black grama and bush muhly cover, possibly increased germination of creosotebush and tarbush. Changing climate may also drive these changes. Transition to grassland state (1b): Shrub control measures (e.g. tebuthiron application) have achieved desired results on gravelly loam soils and may be used to recover a productive grassland. The transition is probably contingent on grazing deferment and high

summer rainfall to facilitate grass establishment. Transition to eroded shrubland state (2): With persistent lack of grass and litter cover and high rates of erosion, soil surface conditions may be altered such that grass reestablishment is rare across the site. This is likely to be due to the loss of nutrients and water-retaining organic matter with the loss of the A horizon due to wind and water erosion. Key indicators of approach to transition: Increases in bare ground cover and patch size, loss of grass cover, increased evidence of erosion (rills, gullies, deepening of gullies, pedestalling), including loss of the A horizon. Transition to tobosa-bush muhly/shrub state (3): Unknown, but presumably requires shrub removal and treatment of the soil surface (pitting) to increase infiltration, and seeding. Data and information sources and theoretical background: Communities and states are derived largely from Jim Powell, NRCS, retired and observations by Brandon Bestelmeyer, USDA-ARS Jornada Experimental Range. Mechanisms driving transitions are assumed to be similar to those described for the Gravelly ecological site. Specifically soil truncation due to erosion and the competitive or allelopathic effects of creosotebush on other plants and soil microbes are believed to cause transitions. Because erosion to a petrocalcic horizon is not a factor on these soils, as it is in gravelly soils, erosion to an argillic (Bt) soil horizon may limit grass survival and establishment. The loss of organic matter needed to retain water at the rooting depth of grasses may be a key mechanism.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	247	426	605
Shrub/Vine	37	64	91
Forb	25	43	61
Total	**309**	**533**	**757**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	16%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	7%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	35%

Figure 5. Plant community growth curve (percent production by month). NM2517, R042XB035NM-Gravelly Loam-Warm Season Plant- HCPC. SD-2 Warm Season Plant Community.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	10	25	30	15	5	0	0

State 2
Tobosa-Bush muhly/Shrub State

Community 2.1
Tobosa-Bush muhly/Shrub State

Tobosa-bush muhly/shrub: In this state, creosotebush or tarbush is either dominant or co-dominant and tobosa, bush muhly, or burrograss are dominant grasses. Mesquite (*Prosopis glandulosa*) may also be present. Black grama has usually been reduced to a minor component if it is present at all and overall grass cover is lower than in the grassland state. It is unknown whether different communities within this state are spatially segregated in response to minor soil texture variation or if they occur on the same sites over time in response to grazing or climate variation. It is likely that grazing-induced retrogression within this state leads to a reduction of tobosa and bush muhly and increasing representation of burrograss (creosotebush-burrograss). Shrub control within this state may increase cover of perennial grasses only temporarily (e.g. bush muhly/tobosa community), especially if shrub propagules reestablish (e.g. due to summer drought with good spring/ winter rains) or shrub kill is incomplete. Diagnosis: Creosotebush/tarbush density is moderate and perennial grasses are patchy. Bare patches may be common and large (> 2m). Evidence of erosion, including gullies and rills, may be apparent in bare areas but not necessarily.

State 3
Eroded Shrubland State

Community 3.1
Eroded Shrubland State

Eroded shrubland state: Creosotebush or tarbush is dominant and grasses, including tobosa, burrograss, or fluffgrass occur only in small patches. As in the tobosa-bush muhly/shrub state, soil texture variation may alter the degradation trajectory. On Eba soils, tarbush may dominate whereas on Hap soils, creosotebush may dominate. Permeability of water may be low across the site where the Bt horizon has been exposed and soil stability and fertility are low. Note that in the field, this state can be expressed as a mosaic with the tobosa-bush muhly state. Diagnosis: Creosotebush/tarbush density is moderate to high. Grasses occur in relatively small patches separated by large amounts of interconnected bare ground. Evidence of erosion, especially pedestalling of grasses and shrubs and terracettes, are apparent throughout the site.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season**			160–186	
	black grama	BOER4	*Bouteloua eriopoda*	160–186	–
2	**Warm Season**			54–80	
	bush muhly	MUPO2	*Muhlenbergia porteri*	54–80	–
3	**Warm Season**			6–27	
	sideoats grama	BOCU	*Bouteloua curtipendula*	6–27	–
	blue grama	BOGR2	*Bouteloua gracilis*	6–27	–
4	**Warm Season**			54–80	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	54–80	–
	Arizona cottontop	DICA8	*Digitaria californica*	54–80	–
5	**Warm Season**			16–27	
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	16–27	–
6	**Warm Season**			27–54	
	threeawn	ARIST	*Aristida*	27–54	–
7	**Warm Season**			6–54	
	tobosagrass	PLMU3	*Pleuraphis mutica*	6–54	–
8	**Warm Season**			6–16	

	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	6–16	–
Shrub/Vine					
9	**Shrub**			6–27	
	winterfat	KRLA2	*Krascheninnikovia lanata*	6–27	–
10	**Shrub**			6–27	
	agave	AGAVE	*Agave*	6–27	–
	common sotol	DAWH2	*Dasylirion wheeleri*	6–27	–
	ocotillo	FOSP2	*Fouquieria splendens*	6–27	–
	yucca	YUCCA	*Yucca*	6–27	–
11	**Shrub**			0–16	
	sacahuista	NOMI	*Nolina microcarpa*	0–16	–
12	**Shrub**			6–16	
	whitethorn acacia	ACCO2	*Acacia constricta*	6–16	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–16	–
	creosote bush	LATR2	*Larrea tridentata*	6–16	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	6–16	–
13	**Cactus**			6–16	
	pricklypear	OPUNT	*Opuntia*	6–16	–
14	**Shrub**			6–16	
	featherplume	DAFO	*Dalea formosa*	6–16	–
Forb					
15	**Forb**			16–43	
	dwarf desertpeony	ACNA2	*Acourtia nana*	16–43	–
	desert marigold	BAMU	*Baileya multiradiata*	16–43	–
	buckwheat	ERIOG	*Eriogonum*	16–43	–
	blazingstar	MENTZ	*Mentzelia*	17–43	–
	woolly plantain	PLPA2	*Plantago patagonica*	16–43	–
	woolly paperflower	PSTA	*Psilostrophe tagetina*	16–43	–
16	**Forbs**			6–27	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	6–27	–

Animal community

This site provides habitat which support a resident animal community that is characterized by coyote, badger, desert cottontail, antelope, spotted ground squirrel, desert pocket mouse, Merriam's kangaroo rat, cactus mouse, southern plains woodrat, Swainson's hawk, roadrunner, crissal thrasher, cactus wren, black throated sparrow, white-necked raven, scaled quail, Scott's oriole, greater earless lizard, leopard lizard, roundtail horned lizard and striped whipsnake.

Large yuccas and woody shrubs of desert washes concentrate wildlife and provide breeding habitat for Scott's oriole, mocking bird, mourning dove, Swainson's hawk and roadrunner.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydraulic cover conditions and hydrologic soil groups.

Hydrologic Interpretations
Soil Series----------Hydrologic Group
Eba----------C
Hap----------B
Pinaleno----------B
Nolam----------B
Coxwell----------C
sonoita ----------B
Terino

Recreational uses

Suitability for camping and picnicking is fair. Rock hounding is fair. Hunting is fair for pronghorn antelope, quail, dove, small game. Photography and bird watching can be fair to good, especially during migration seasons. Most small animals of the site are nocturnal and secretive, seen only at night, early morning or evening. Scenic beauty is greatest during spring and sometimes summer months when flowering of forbs, shrubs, and cacti occurs.

Wood products

This site has no significant value for wood products.

Other products

This site is suitable for yearlong use, although most of the green forage is produced in the summer months. It is suited to grazing by cattle, sheep, goats, and horses, generally without regard to class of livestock. Retrogression caused by inadequately managed grazing usually results in such plants as black grama, bush muhly, sideoats grama, blue grama, and winterfat being replaced by such plants as threeawns, tobosa, broom snakeweed, and mesquite. Except in cases of severe deterioration where the site has been taken over by woody plants, recovery can be effected through good grazing management.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index-------Ac/AUM
100 - 76---------- 3.2 – 4.1
75 – 51---------- 3.8 – 6.3
50 – 26----------6 .2 – 11.0
25 – 0----------11.0 - +

Inventory data references

Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Socorro, Sierra County Dona Ana County Grant County Hidalgo County Luna County Otero County

Other references

Contributors

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Dr. Brandon Bestelmeyer

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)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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):**

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:**

17. **Perennial plant reproductive capability:**