

Ecological site DX032X01W106

Clayey Overflow (CyO)

Big Horn Basin Wet

Last updated: 9/05/2019
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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): 032X–Northern Intermountain Desertic Basins

Major land resource area (MLRA): 032X – Northern Intermountain Desertic Basins – This MLRA is comprised of two major Basins, the Big Horn and Wind River. These two basins are distinctly different and are split by LRU's to allow individual ESD descriptions. These warm basins are surrounded by uplifts and rimmed by mountains, creating a unique set of plant responses and communities. Unique characteristics of the geology and geomorphology single these two basins out. Further information regarding MLRAs, refer to: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook.

LRU notes

Land Resource Unit (LRU): 32X01W (WY): This LRU is the Big Horn Basin within MLRA 32. This LRU is lower in elevation, slightly warmer and receives slightly less overall precipitation than the Wind River Basin (LRU 02). This LRU was originally divided into two LRU's - LRU A which was the core and LRU B which was the rim. With the most current standards, this LRU is divided into two Subsets. This group is ambiguous of the two official subsets and will be referred to as Subset W, capturing those sites that are a factor of water or other processes outside of the general subset divisions (climate). As the LRU shifts outer edges, aspect and relation to the major bodies of water and taller land forms create minor shifts in soil chemistry influencing the variety of ecological sites and plant interactions. The extent of soils currently correlated to this ecological site does not fit within the digitized boundary. Many of the noted soils are provisional and will be reviewed and corrected in mapping update projects. Other map units are correlated as small inclusions within other MLRA's/LRU's based on elevation, land form, and biological references. Moisture Regime: typic aridic, or ustic aridic. Temperature Regime: Mesic Dominant Cover: Rangeland, with Saltbush flats the dominant vegetative cover for this MLRA. Representative Value (RV) Effective Precipitation: 5-14 inches (127 – 355 mm) RV Frost-Free Days: 105-150 days

Classification relationships

Relationship to Other Established Classification Systems: National Vegetation Classification System (NVC): 3 Xeromorphic Woodland, Scrub & Herb Vegetation Class 3.B Cool Semi-Desert Scrub & Grassland Subclass 3.B.1 Cool Semi-Desert Scrub & Grassland formation 3.B.1.NE Western North American Cool Semi-Desert Scrub & Grassland Division M169 Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup G302 Artemisia Tridentata - Artemisia tripartita - Purshia tridentata Big Sagebrush Steppe Group Ecoregions (EPA): Level I: 10 North American Deserts Level II: 10.1 Cold Deserts Level III: 10.1.18 Wyoming Basin Level IV: 10.1.18.g Big Horn Salt Desert Shrub Basin

Ecological site concept

- Site receives significant additional effective moisture as overland flow.
- Slope is 30%
- Soils are:
 - o Textures range from fine sandy loam to clay in top 4" (10 cm) of mineral soil surface
 - o Clay content is ?18% in top 4" (10 cm) of mineral soil surface
 - o All subsurface horizons in the particle size control section have a weighted average of > 35% clay. (The particle size control section is the segment of the profile from either the start of an argillic horizon for 50 cm's or from 25-100 cm's).
 - o Moderately deep to very deep (20-80+ in. (50-200+ cm)
 - o 3% stone and boulder cover and occasionally up to 10% cobble and gravel cover
 - o Not skeletal (35% rock fragments) within 20" (50 cm) of mineral soil surface
 - o None to Slightly effervescent throughout top 20" (50 cm) of mineral soil surface
 - o Non-saline, sodic, or saline-sodic

Associated sites

R032XY350WY	Sandy (Sy) 10-14" East Precipitation Zone Sandy deposits along the toe of an inter-bedded escarpment may contain areas of Clayey Overflow.
R032XY304WY	Clayey (Cy) 10-14" East Precipitation Zone Clayey sites will contain inclusions of Clayey overflow in concave positions of a slope.
R032XY322WY	Loamy (Ly) 10-14" East Precipitation Zone Loamy sites along the toe of an inter-bedded escarpment may contain areas of Clayey Overflow.
R032XY328WY	Lowland (LL) 10-14" East Precipitation Zone Depositional areas within the Lowland site may contain Clayey overflow.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. tridentata</i>
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Nassella viridula</i>

Legacy ID

R032XB106WY

Physiographic features

This site is located on nearly level land and either adjacent to streams that run water at least during the major part of the growing season or on alluvial fans adjacent to toe slopes or foothills.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Alluvial fan (2) Intermontane basin > Stream terrace
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding duration	Brief (2 to 7 days)

Ponding frequency	None to rare
Elevation	1,650 – 2,290 m
Slope	0 – 30 %
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 5 to 14 inches (127 – 355 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. The noted peaks account for approximately 50% of the mean annual precipitation. Much of the moisture that falls in the latter part of the summer is lost by evaporation and much of the moisture that falls during the winter is lost by sublimation.

Average snowfall is about 20 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. High winds are generally blocked from the basin by high mountains but can occur in conjunction with an occasional thunderstorm.

Growth of native cool-season plants begins approximately on April 1st and continues through to July 1st. Cool weather and moisture in September may produce some green up of cool season plants that will continue to late October. For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at <http://www.wcc.nrcs.usda.gov/>. "Basin", "Clark 3NE", "Cody", "Cody 12SE", "Emblem", "Greybull", "Heart Mtn", "Lovell", "Powell Fld Stn", "Worland FAA AP", and "Worland" are the representative weather stations for LRU A. The following graphs and charts are a collective sample representing the averaged normals and 30-year annual rainfall data for the selected weather stations from 1981 to 2010.

Table 3 Representative climatic features

Frost-free period (characteristic range)	90-120 days
Freeze-free period (characteristic range)	120-140 days
Precipitation total (characteristic range)	180-230 mm
Frost-free period (actual range)	90-120 days
Freeze-free period (actual range)	110-150 days
Precipitation total (actual range)	180-250 mm
Frost-free period (average)	110 days
Freeze-free period (average)	130 days

Precipitation total (average)	200 mm
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- (1) WORLAND [USW00024062], Worland, WY
- (2) WORLAND [USC00489770], Worland, WY
- (3) BASIN [USC00480540], Basin, WY
- (4) GREYBULL [USC00484080], Greybull, WY
- (5) EMBLEM [USC00483031], Burlington, WY
- (6) CODY 12SE [USC00481850], Meeteetse, WY
- (7) CODY [USC00481840], Cody, WY
- (8) LOVELL [USC00485770], Lovell, WY
- (9) POWELL FLD STN [USC00487388], Powell, WY
- (10) HEART MTN [USC00484411], Powell, WY
- (11) CLARK 3NE [USC00481775], Powell, WY

Influencing water features

No water table is present on these sites. However, site receives significant additional effective moisture from overland flow from adjacent upland sites or from overflow during high spring run-off. Site is generally adjacent to an active channel (intermittent or perennial), but is also found on upland sites where runoff may accumulate (concave/linear positions).

Soil features

The soils of this site are very deep to moderately deep (greater than 20" to bedrock), moderately well to well-drained that formed in alluvium or alluvium over residuum. These soils have slow to moderate permeability. The surface soil will vary from 2 to 5 inches deep. These soils may develop severe cracks. The soil characteristics having the most influence on plants are the heavy texture and the additional available moisture. These areas receive additional water from overflow of intermittent streams or runoff from adjacent slopes.

Table 4. Representative soil features

Parent material	(1) Alluvium – calcareous shale (2) Residuum – interbedded sedimentary rock
Surface texture	(1) Clay loam (2) Clay (3) Silty clay loam (4) Fine sandy loam (5) Loam (6) Sandy clay
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	50 – 150 cm

Surface fragment cover <=3"	0 – 10 %
Available water capacity (0-101.6cm)	7.62 – 20 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	0 – 10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

****Disclaimer**** This PROVISIONAL ecological site was developed for an extended MLRA concept where the foothills (10-14" precipitation Frigid climatic zone) was included in this site. This has created an exaggerated or elevated production value for this site description.

Potential vegetation on this site is dominated by tall and mid cool-season perennial grasses. Other significant vegetation includes basin big sagebrush, silver sagebrush, rubber rabbitbrush, and a variety of forbs. The expected potential composition for this site is about 75% grasses, 10% forbs and 15% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates species such as rhizomatous wheatgrasses, blue grama, Sandberg bluegrass, and basin big sagebrush will increase. Plains pricklypear and weedy annuals will invade. Cool-season grasses such as, basin wildrye, green needlegrass, slender wheatgrass, needleandthread, and Indian ricegrass will decrease in frequency and production.

Typically, many of these overflow sites have been altered or modified, due to its productive features and proximity to water. Consequently, basin big sagebrush, which is specifically tied to the ecological feature of this site, has lost much of its original habitat. As basin big sagebrush is not a resilient plant, once removed it will require many years before the stand can be replaced. Some stands may never be replaced, if a vigorous stand of grass exists and is maintained.

In some instances, basin big sagebrush may become dominant on areas with an absence of fire and sufficient amount of overflow. If treatment of a stand is necessary, thinning is usually preferred instead of total removal. This can be accomplished by chemical, mechanical or closely monitored burning.

The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

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				504-706	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	504-706	–
2				404-605	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	404-605	–
3				101-303	
	basin wildrye	LECI4	<i>Leymus cinereus</i>	101-303	–
4				101-303	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-101	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-101	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-101	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-101	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0-101	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0-101	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-101	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-101	–
Forb					
5				20-202	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-101	–
	textile onion	ALTE	<i>Allium textile</i>	0-101	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-101	–
	Indian paintbrush	CASTI2	<i>Castilleja</i>	0-101	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	0-101	–
	larkspur	DELPH	<i>Delphinium</i>	0-101	–
	parsnipflower buckwheat	ERHE2	<i>Eriogonum heracleoides</i>	0-101	–
	fleabane	ERIGE2	<i>Erigeron</i>	0-101	–
	bigseed biscuitroot	LOMA3	<i>Lomatium macrocarpum</i>	0-101	–
	desertparsley	LOMAT	<i>Lomatium</i>	0-101	–
	phlox	PHLOX	<i>Phlox</i>	0-101	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-101	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	0-101	–
Shrub/Vine					
6				101-303	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-101	–

	silver sagebrush	ARCA13	Artemisia cana	0-101	–
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	0-101	–
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	0-101	–
	winterfat	KRASC	Krascheninnikovia	0-101	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Animal community

Animal Community – Wildlife Interpretations Rhizomatous Wheatgrass/Green Needlegrass (HCPC): The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, deer, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing/foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would occur here. Perennial Grasses/Big Sagebrush Plant Community: The combination of an overstory of shrubs and an understory of grasses and forbs plus its proximity to water provides a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows' nest in big sagebrush plants and hosts of other nesting birds utilize stands in the 20-30% cover range. Big Sagebrush/Rhizomatous Wheatgrass Plant Community: The combination of an overstory of shrubs and an understory of grasses and forbs plus its proximity provides a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows' nest in big sagebrush plants and hosts of other nesting birds utilize stands in the 20-30% cover range. Dense Shrub/Bare Ground Plant Community: This plant community can provide important winter foraging for elk, mule deer and antelope, as sagebrush can approach 15% protein and 40-60% digestibility during that time. This community provides excellent escape and thermal cover for large ungulates, as well as nesting habitat for upland game birds including sage grouse. Weedy Annuals/Short Grass Plant Community: These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Perennial Grasses/ Big Sagebrush Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management. Animal Community – Grazing Interpretations The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. Plant Community Production Carrying Capacity* (lb./ac) (AUM/ac) Rhizomatous Wheatgrass/Green Needlegrass 1200-2400 .60 Perennial Grass/Big Sagebrush 1100-2000 .50 Big Sagebrush/Rhizomatous Wheatgrass 800-1600 .25 Dense Shrub/Bare Ground 800-1500 .20 Weedy Annuals/Short Grass 300-800 .15 * - Continuous, season-long grazing by cattle under average growing conditions. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from moderately slow to moderate. Runoff potential for this site varies from low to moderate depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the

greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information). Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides hunting opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

none noted

Inventory data references

Information presented here has been derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in developing this site include: Chris Krassin, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, USDI and USDA Interpreting Indicators of Rangeland Health Version 3, and USDA NRCS Soil Surveys from various counties.

Contributors

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Approval

Scott Woodall, 9/05/2019

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	05/01/2008
Approved by	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production
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Indicators

1. **Number and extent of rills:** Rare to nonexistent.

2. **Presence of water flow patterns:** Water flow patterns sometimes evident in ephemeral floodplain zone where this site occurs.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**
Bare ground can range from 5-20%.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter expected to move in water flow patterns.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Stability Index ratings range from 2 (interspaces) to 6 (under plant canopy), but average values should be 2.5 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil data is limited for this site. Described A-horizons vary from 1 to 2 inches (3-5 cm). Organic matter is typically 1 to 2%.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 60-75% grasses, 20% forbs, and 5-20% shrubs. Moderate plant canopy (50-70%) and litter plus slow to moderately slow infiltration rates result in slight to moderate runoff. Basal cover is typically around 2-3% for this site and does not effectively reduce runoff on this site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer exists.

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: cool season rhizomatous grasses

Sub-dominant: mid-size, cool season bunchgrasses=tall, cool season bunchgrasses

Other: perennial shrubs = perennial forbs short, cool season bunchgrasses

Additional:

13. **Amount of plant mortality and decadence** (include which functional groups are expected to show mortality or decadence):
Minimal decadence, typically associated with shrub component.
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14. **Average percent litter cover (%) and depth (in):** Litter ranges from 20-40% of total canopy measurement with total litter (including beneath the plant canopy) from 75-90% expected. Herbaceous litter depth typically ranges from 10-25 mm. Woody litter can be up to several inches (>8 cm).
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15. **Expected annual annual-production** (this is TOTAL above-ground annual-production, not just forage annual-production):
English: 1200-2400 lb/ac (1800 lb/ac average); Metric: 1344-2688 kg/ha (2016 kg/ha average).
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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: Bare ground greater than 40% or noxious weed invasion are the most common indicators of a threshold being crossed. Rhizomatous wheatgrasses, Blue grama, Sandberg bluegrass, and Basin big sagebrush are common increasers. Annual weeds such as pepperweed and blue mustard are common invasive species on disturbed sites.
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17. **Perennial plant reproductive capability:** All species are capable of reproducing, except in drought years.
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