USDA Natural Resources Conservation Service

Ecological site EX043B23B128
Lowland (LL) Absaroka Upper Foothills

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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): 043B–Central Rocky Mountains

43B – Central Rocky Mountains – The Central Rocky Mountains extends from northern Montana to southern extent of Wyoming and from Idaho to central Wyoming. The southern extent of 43B is comprised of a combination of metamorphic, igneous, and sedimentary mountains and foothills. Climatic changes across this extent are broad and create several unique breaks in the landscape.

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) 43B23B: Absaroka Upper Foothills

Based on the shifts in geology, precipitation patterns and other climatic factors, as well as elevations and vegetation, the Absaroka Range was divided into LRU 23. Further division of this LRU is necessary due to the gradient moving from the foothills to the summit, as well as aspect shifts (north/east face versus south/west face). Subset B is set for the higher elevations within the foothills, with 15 to 19 inches of precipitation. To verify or identify Subset B (the referenced subset for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key.

This particular LRU/Subset occurs along the eastern foothills of the Absaroka Range. This LRU starts north of Clark, WY and runs to the Thermopolis, WY area. Once the foothills cross into the Northern Beartooth Range, the climatic patterns and elevational changes shifts the plant community and allows for a break in LRU's near the Montana state line. As the LRU follows to the south and then tracks east to the intersection of the Absaroka Range and the Owl Creek Range, the face changes aspect and geology creating a shift in plant dynamics and a break in the LRU.

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, landform, and biological references.

Moisture Regime: Typic Ustic
Temperature Regime: Frigid
Dominant Cover: Rangeland – Sagebrush Steppe (major species is Mountain Big Sagebrush)
Representative Value (RV) Effective Precipitation: 15-19 inches (381 – 483 mm)
RV Frost-Free Days: 37 - 80 days

Classification relationships

Relationship to Other Established Classification Systems:

National Vegetation Classification System (NVC):
2 Shrub & Herb Vegetation Class
2.B Temperate & Boreal Grassland & Shrubland Subclass
2.B.2 Temperate Grassland & Shrubland Formation
2.B.2.Na Western North American Grassland & Shrubland Division Division
M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup
G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland 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.d Foothills and Low Mountains

Ecological site concept

• Site receives additional water from a fluctuating water table and overflow from stream flow.
• Depth of water can vary from one to five feet, but is below 40 inches for a majority of the growing season.
• Slope is <6%
• Soils are:
o Poorly drained
o Non-saline, sodic, or saline-sodic
o Moderately deep to very deep (20-80+ in. (50-200+ cm)
o None to Slightly effervescent throughout top 20” (50 cm) of mineral soil surface
o Textures range from loamy sand to clay loams, often soils are stratified in nature with gravels.
o <10% stone and boulder cover and <10% cobble and gravel cover

Associated sites

EX043B23B122	**Loamy (Ly) Absaroka Upper Foothills** Loamy ecological sites (sandy, or clayey sites are common as well), are generally found in connection to lowland sites. The Loamy is on dry, upland positions, with Lowlands on the lower landscape associated within drainages or concave positions with water influence. in concave, or flat. Generally, the loamy will be to the side or above the overflow position.
EX043B23B130	**Overflow (Ov) Absaroka Upper Foothills** Overflow ecological sites are similar to Lowland with additional moisture by overland flow, however Lowlands have associated water tables and overflow does not. Lowland is generally within the floodplain and directly tied to Subirrigated ecological sites, just on higher locations, where overflow is more related to upland sites or is the transition between upland and lowland sites.
EX043B23B174	**Subirrigated (Sb) Absaroka Upper Foothills** Subirrigated ecological sites have a water table in the upper portion of the soil profile and has more prominent water loving plants. Lowlands are a mix to upland and wetland type vegetation. Lowlands are in the upper reaches of the floodplain or floodplain steps, with Subirrigated in the active floodplain or channel directly.
EX043B23B178	**Wetland (WL) Absaroka Upper Foothills** Wetland ecological site is tied directly to the channel or water table, with ponding for a significant portion of the year. Lowlands are generally on the driest edge of the drainage system or wetland with Subirrigated between the Wetland and Lowland position.

Similar sites

EX043B23A128	**Lowland (LL) Absaroka Lower Foothills** The Lowland Lower Foothills ecological site is very similar with slightly lower productivity and a shift in vegetative species, especially woody cover.

EX043B23B130	**Overflow (Ov) Absaroka Upper Foothills** Overflow site are found on more of an upland location and is lacking any connection to the water table. It does receive significant overland flow, and may be in a floodplain step where flooding will still have an impact.

Table 1. Dominant plant species

Tree	(1) *Populus balsamifera*
Shrub	(1) *Salix geyeriana* (2) *Dasiphora fruticosa*
Herbaceous	(1) *Leymus cinereus* (2) *Elymus trachycaulus*

Legacy ID

R043BX628WY

Physiographic features

This site is located on nearly level land adjacent to streams that run water at least during the major part of the growing season. Lowland ecological site are also found on upland or dryland areas associated with irrigation water seepage from conveyance ditches or excess flood irrigation.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Flood plain (2) Foothills > Drainageway (3) Foothills > Stream terrace
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Elevation	1,829–2,743 m
Slope	0–6%
Water table depth	102–152 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 15 to 19 inches (381 – 483 mm). The normal precipitation pattern shows peaks in June tapering into September. This amounts to about 50 percent of the mean annual precipitation. Average snowfall is about 150 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

Because of the varied topography, the wind will vary considerably for different parts of the area. The wind is usually much lighter at the lower elevations and in the valleys as compared with the higher terrain. The average winter wind velocity is 8.5 mph while the summer wind velocity averages 7.5 mph. Winds during storms and on ridges may exceed 45 mph.

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. High winds are generally blocked by high mountains but occur in conjunction with thunderstorms, which are common in late summer. Growth of native cool-season plants begins about May 1 to May 15 and continues until about October 15.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Historically, Crandall Creek was the representative weather stations within this subset. However, Sunshine 3NE, Tower Falls, and Yellowstone Pk Mammoth are the available weather stations within a close proximity in location and characteristics for this subset. 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)	17-57 days
Freeze-free period (characteristic range)	43-100 days
Precipitation total (characteristic range)	356-406 mm
Frost-free period (actual range)	5-65 days
Freeze-free period (actual range)	22-108 days
Precipitation total (actual range)	356-406 mm
Frost-free period (average)	36 days
Freeze-free period (average)	70 days
Precipitation total (average)	381 mm

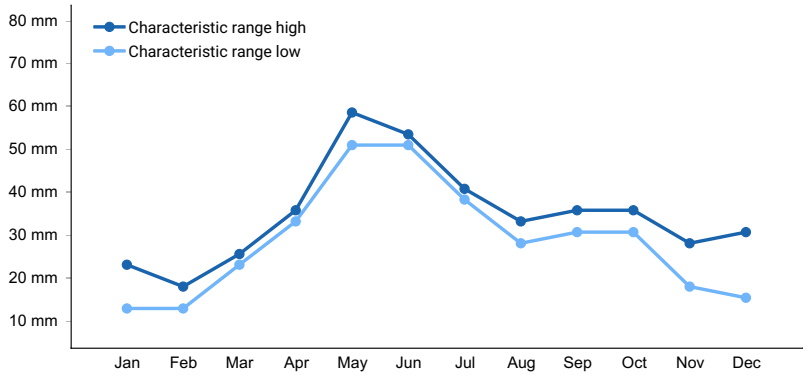


Figure 1. Monthly precipitation range

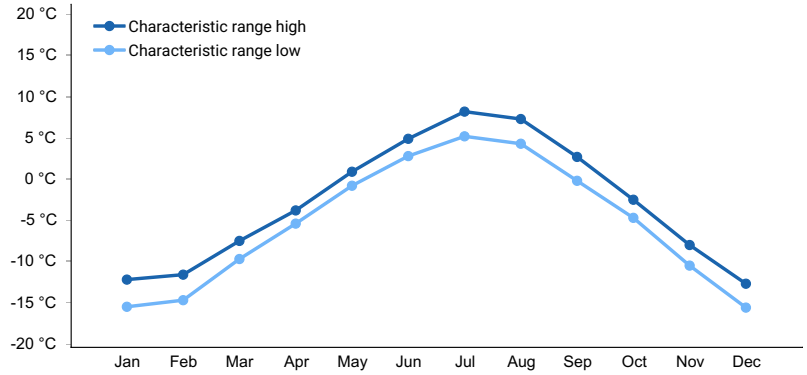


Figure 2. Monthly minimum temperature range

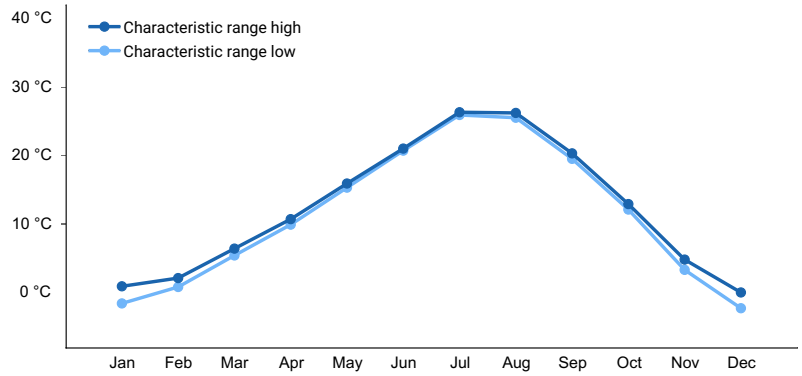


Figure 3. Monthly maximum temperature range

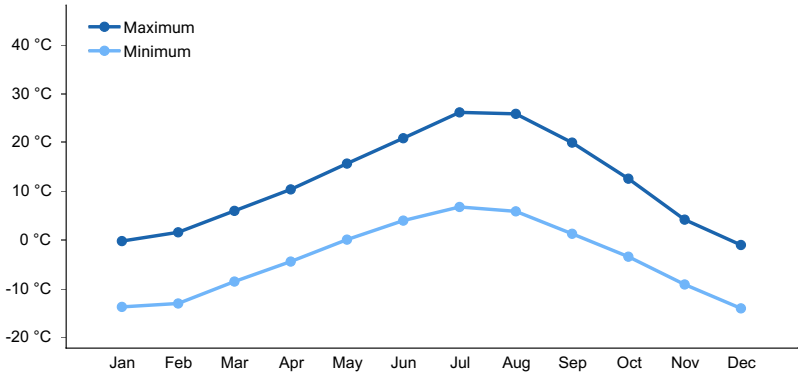


Figure 4. Monthly average minimum and maximum temperature

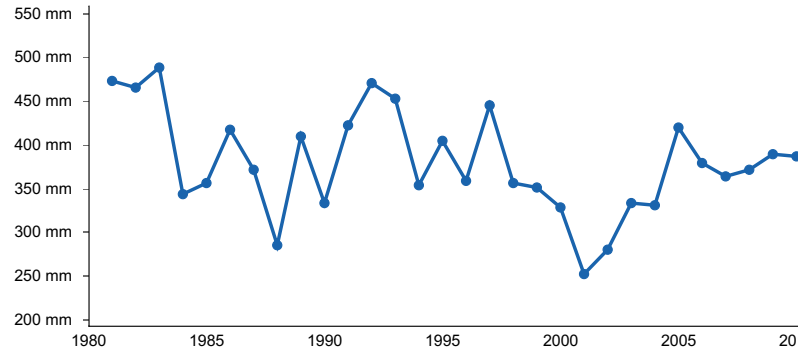


Figure 5. Annual precipitation pattern

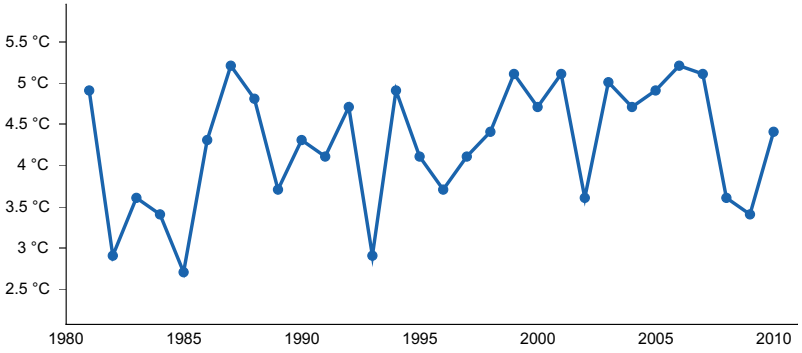


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SUNSHINE 3NE [USC00488758], Meeteetse, WY
- (2) TOWER FALLS [USC00489025], Yellowstone National Park, WY
- (3) YELLOWSTONE PK MAMMOTH [USC00489905], Yellowstone National Park, WY

Influencing water features

The characteristics of these bottomland soils have a minor influence from ground water (water table below 40 inches (100 cm)) and have an influence from surface water/overland flow. Irrigation induced seeps and overflow create these features on stream terraces and other isolated upland landforms.

Wetland description

The Lowland ecological site may be associated with a wetland area, but does not currently have a wetland designation assigned.

Soil features

The soils of this site are moderately deep to very deep poorly drained to well-drained soils formed in mixed alluvium. These soils have slow to rapid permeability. The surface soil will be highly variable and vary from 2 to 8 inches in thickness over gravel or bedrock. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick. A fluctuating water table occurs in these areas that is usually deeper than 40 inches but within the reach of trees. The soil characteristics having the most influence on the plant community are depth to a water table during the growing season and the minimal amount of soluble salts.

Major Soil Series correlated to this site include: Banks-like, Groveland, Kadygulch-like, Natherman, Riverrun, Toby-like, Weed, and Windbar-like.

Figure 7. Cut bank of the Greybull River, showing the Lowland ecological site soil profile.

Figure 8. Wider view of the Lowland's position on the landscape, The gallery on the top left portion of the photo is still within the active floodplain of the Greybull River.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Gravelly, cobbly clay loam (2) Sandy clay loam (3) Sandy loam (4) Loamy sand
Family particle size	(1) Fine-loamy (2) Fine-loamy over sandy or sandy-skeletal (3) Coarse-loamy (4) Loamy-skeletal
Drainage class	Well drained to poorly drained
Permeability class	Slow to rapid
Soil depth	51–152 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–10%
Available water capacity (Depth not specified)	7.11–15.75 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–12
Soil reaction (1:1 water) (Depth not specified)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

Potential vegetation on this site is dominated by tall and mid-stature, cool-season perennial grasses, which are adapted to occasional overflows during flooding conditions and a water table near the surface during these times. Other significant vegetation includes narrowleaf cottonwood or balsam poplar, and a variety of riparian shrubs and forbs. The expected potential composition for this site is about 60% grasses, 15% forbs and 25% 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 basin big sagebrush, silver sagebrush, wild rose, and gooseberry will increase. Species such as thistles and Kentucky bluegrass will invade the site. Cool season grasses such as basin wildrye and slender wheatgrass will decrease in frequency and production. In cases of hydrologic disruption and/or channelization upland species will increase and cottonwood stands will become increasingly mature and regeneration will cease

Fire behavior plays a role in this plant community especially due to the addition of tree species as part of the vegetative composition. However, fire frequency is still low, with significant time between burns. The intensity of a fire determines vegetative succession and structure. Low intensive, or ground fires, typically result in thinning of trees to provide micro-sites, which can quickly be colonized by new saplings and riparian shrubs. Moderate or severe fires, however, usually result in total stand mortality. Eventually, if the conditions are right, seedlings will establish, but it may take decades to return to a multi-age mature stand.

Flooding with associated scouring and deposition is an important factor to the longevity, health, and reproduction of cottonwood and balsam popular in this community. With dams and irrigation effects on stream flow, the natural flooding cycles have been interrupted, and has impacted many of the riparian cottonwood galleries.

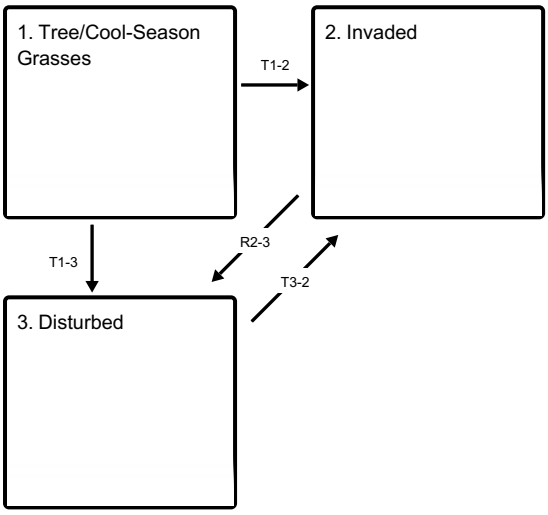
The ecological states and community phases as well as the dynamic processes driving the transitions between these communities have been determined by studying this ecological site under all management scenarios, including those that do not include cattle grazing. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have been used.

The following State and Transition Model (STM) Diagram has five fundamental components: states, transitions, restoration pathways, community phases and community pathways. The state, designated by the bold box, is considered to be a set of parameters with thresholds defined by ecological processes. A State can be a single community phase or suite of community phases. The reference state is recognized as State 1. It describes the ecological potential and natural range of variability resulting from dynamic ecological processes occurring on the site. The designation of alternative states (State 2, etc.) in STMs denotes changes in ecosystem properties that cross a certain threshold.

Transitions are represented by the arrows between states moving from a higher state to a lower state (State 1 - State 2) and are denoted in the legend as a “T” (T1-2). They describe the variables or events that contribute directly to loss of state resilience and result in shifts between states. Restoration pathways are represented by the arrows between states returning back from a lower state to a higher state (State 2 - State) or better illustrated by State 1.

State and transition model

Ecosystem states



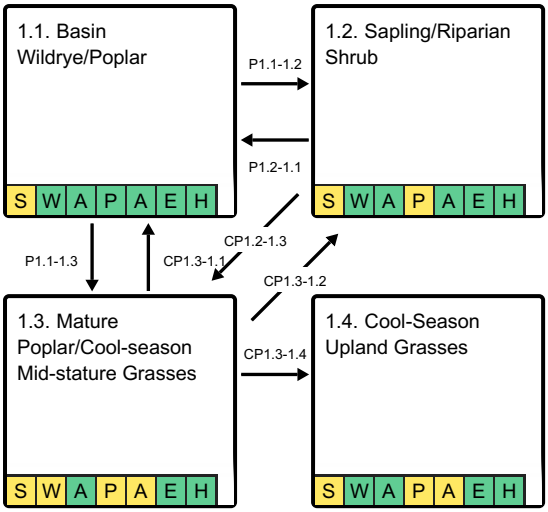
T1-2 - Frequent and Severe grazing plus encroachment will convert this plant community to a Invaded State.

T1-3 - Catastrophic events, such as extensive flooding, as well as intensive grazing and recreational impacts will degrade or disturb the community.

R2-3 - Intensive weed control, seed bed preparation to remove, tame invaders followed with seeding and grazing management will restore this community.

T3-2 - The failure of restoration attempts as well as the lack of management leaves a restored community as well as a disturbed community open to invasion.

State 1 submodel, plant communities



P1.1-1.2 - Wildfires (if severe), will convert this plant community to the Sapling/Riparian Shrub Regeneration Community Phase.

P1.1-1.3 - Moderate, continuous season-long grazing and drought will convert this plant community.

P1.2-1.1 - No fire plus prescribed grazing will result in a plant community very similar to Reference Community Phase.

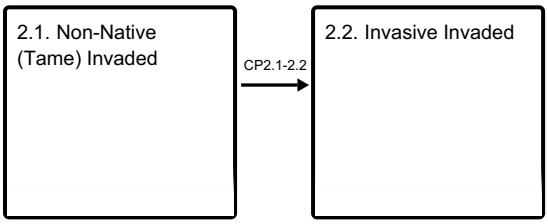
CP1.2-1.3 - Over time, lack of fire and grazing pressure will limit the understory and leave a mature overstory of poplars.

CP1.3-1.1 - Prescribed grazing with periodic flooding helps to rejuvenate the poplar community and maintains a healthy understory.

CP1.3-1.2 - Prescribed grazing with rest, over a period of time, will allow this site to gain transition to a younger tree stand.

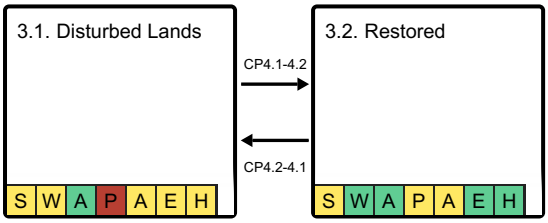
CP1.3-1.4 - Change in flooding intensity and frequency and the loss of trees due to age lead to a transition to a upland grasses dominated community.

State 2 submodel, plant communities



CP2.1-2.2 - Soil disturbance with seed sources present will aid in adding invasive species to a tame community.

State 3 submodel, plant communities



CP4.1-4.2 - Weed control and seed bed preparation with seeding and grazing management will improve a disturbed community phase.

CP4.2-4.1 - Lack of management of seeding failure are the main drivers for transitioning back to a disturbed community.

State 1
Tree/Cool-Season Grasses

The complexity of the Lowland ecological state, and the narrow or linear patterns of this ecological site, make it difficult to capture the full range of variability. The alterations and encroachment of non-native species has had a significant impact on these communities as well as the alteration of the hdyrologic patterns of flooding due to water control structures has further impacted this ecological site. This State is to capture the native component of the community with the major tree cover, and then the step of tree loss and transition to a dryer, more upland related community.

Characteristics and indicators. The native composition of trees, shrubs, and grasses is the indicator for this community. The presence or remnants of narrowleaf cottonwood and balsam poplar are key in this community. The understory of riparian and upland shrubs including wood's rose, gooseberry, mountain big sagebrush, and snowberry are prominent. A variety of forbs are present, and are highly variable. The grasses are cool-season grasses with tall-stature grasses dominant in Reference, moving to mid and short-stature grasses in the more at-risk communities in this state.

Resilience management. The Reference communities are fragile due to the dependence on spring flooding and infrequent fires to maintain a healthy community. The proximity to water creates a high impact to this ecological site, especially with livestock, putting these communities at risk. The Reference State is resilient to disturbances when the system is unimpaired by human interference (natural stream system). However, with water control structures, fire suppression and shifts in grazing patterns has weakened the resilience and resistance of this State.

Community 1.1
Basin Wildrye/Poplar

Figure 9. Reference Community Phase 1.1 following an intensive fall grazing period.

The interpretive plant community for this site is the Reference Community Phase. This state and community evolved with grazing by large herbivores, occasional overflows during flooding events, and periodic fires. Potential vegetation is about 60 percent grasses or grass-like plants, 15 percent forbs and 25 percent woody plants. Cool-season tall and mid-stature grasses dominate this state. The major grasses include basin wildrye, slender wheatgrass, Columbia needlegrass, and rhizomatous wheatgrasses. Other grasses occurring in this community include Canada wildrye, big bluegrass, and nodding brome. Narrowleaf cottonwood and balsam poplars of various age classes comprises the primary overstory species, while mountain big sagebrush and a variety of riparian shrub species are a component of the understory. A variety of forbs also occurs in this community and plant diversity is high (see Plant Composition Table). The total annual production (air-dry weight) averages 2500 pounds per acre in a normal year, ranging from 2000 pounds per acre in unfavorable years to 3000 pounds per acre in above average years.

Resilience management. This plant community is extremely stable and well adapted to the climatic conditions of the Upper Foothills. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Dominant plant species

- balsam poplar (*Populus balsamifera*), tree
- narrowleaf cottonwood (*Populus angustifolia*), tree
- currant (*Ribes*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- Geyer willow (*Salix geyeriana*), shrub
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- basin wildrye (*Leymus cinereus*), grass
- slender wheatgrass (*Elymus trachycaulus*), grass

- Columbia needlegrass (*Achnatherum nelsonii*), grass
- goldenrod (*Solidago*), other herbaceous
- geranium (*Geranium*), other herbaceous
- silvery lupine (*Lupinus argenteus*), other herbaceous

Dominant resource concerns

- Bank erosion from streams, shorelines, or water conveyance channels
- Compaction
- Wildfire hazard from biomass accumulation

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1569	1793	2074
Shrub/Vine	448	673	841
Forb	224	336	448
Total	**2241**	**2802**	**3363**

Table 6. Soil surface cover

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

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-2%	0-5%	0-2%
>0.15 <= 0.3	–	0-5%	0-10%	3-5%
>0.3 <= 0.6	–	0-5%	10-30%	2-10%
>0.6 <= 1.4	–	0-20%	0-15%	–
>1.4 <= 4	–	–	–	–
>4 <= 12	0-15%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

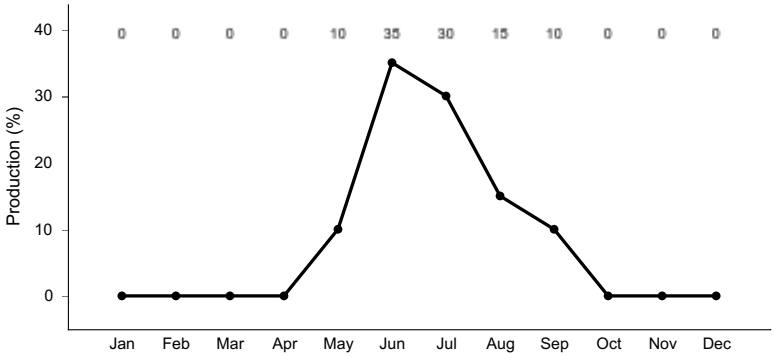


Figure 11. Plant community growth curve (percent production by month). WY0602, 15-19E Extra water sites - LL, Ov, CyO, SL.

Community 1.2
Sapling/Riparian Shrub

Figure 12. Slender wheatgrass and cottonwood saplings are significant with a mixture of shrubs and a few mature trees.

Historically, this plant community was considered rare as the natural fire regime within a riparian community provided for more frequent and less severe fires. These low intensive or ground fires resulted in thinning of the poplar stand and provided micro-sites, which quickly were colonized by new saplings. These transitions were relatively short lived, because of the moist soil conditions, adaptability of the species, and mosaic nature of the fire. As such, these areas maintained the mixed age stands, which is synonymous with the Reference Community Phase. Today these low intensity fires can still occur and under this situation, the natural regeneration of vegetation is considered a transitional phase of this ecological site and not a separate plant community. This plant community is now more common, as fire suppression has resulted in more fuels and when fires do occur these fires are normally more intense and can affect larger areas. Severe fires typically result in the total mortality of the stand, as poplar and cottonwoods are not very resistant to high temperatures. Subsequently, the regeneration of poplar trees to a multi-age mature stand can take decades. This is especially true if the soils are sterilized. This transition to a mature cottonwood plant community usually occurs only after the saplings become mature trees and shading by the expanding canopy helps to suppress the dominant shrub understory component. Given the extent of the burned areas and prolonged time to transition to a multi-age poplar stand, this site can become relatively stable. Under this situation, these sites should be considered separate plant communities. Riparian shrubs such as willow, wild rose, snowberry, and gooseberry dominate this plant community. Poplar saplings regeneration will depend on availability of seeds and seed bed conditions. Shrubs, poplar and cottonwood saplings usually make at least 40 percent and can even reach to 80 percent of the total production. On sites where there was a healthy stand of perennial grasses prior to the fire, these grasses can quickly become reestablished and will diminish the total frequency and production of shrubs and saplings. Dominant grasses may include rhizomatous wheatgrasses, green needlegrass, and slender wheatgrass. Grasses of secondary importance include Sandberg bluegrass and big bluegrass. Bare ground can also be pronounced and and litter diminished. When compared to the Reference Community Phase, the production is less but the re-growth after a fire and amount of shrubs offset some of the reduction in the total production. The total annual production (air-dry weight) varies depending on the stage of the succession but averages about 1800 pounds per acre is normal years. It can range from about 1300 pounds per acre in

unfavorable years to about 2300 pounds per acre in above average years.

Resilience management. This Community Phase (1.2) is relatively stable but grazing the site before the vegetation becomes stabilized is not recommended. Erosion may be excessive until the site is revegetated. Erosion control may be necessary if soil loss is excessive, however, cottonwood regeneration depends on exposed bare soil. The biotic integrity of this plant community is in intact. The watershed is functioning.

Dominant plant species

- narrowleaf cottonwood (*Populus angustifolia*), tree
- balsam poplar (*Populus balsamifera*), tree
- Geyer willow (*Salix geyeriana*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- gooseberry currant (*Ribes montigenum*), shrub
- slender wheatgrass (*Elymus trachycaulus*), grass
- mountain brome (*Bromus marginatus*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- American licorice (*Glycyrrhiza lepidota*), other herbaceous
- groundsel (*Tephroseris*), other herbaceous
- goldenrod (*Solidago*), other herbaceous

Dominant resource concerns

- Bank erosion from streams, shorelines, or water conveyance channels
- Compaction
- Plant productivity and health
- Plant structure and composition

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	869	1121	1345
Shrub/Vine	560	841	1121
Forb	28	56	112
Total	**1457**	**2018**	**2578**

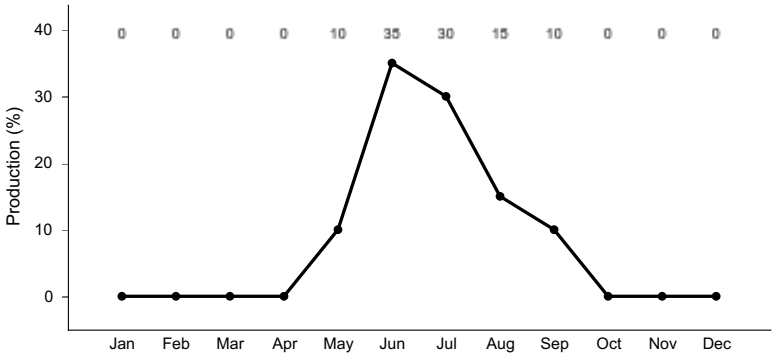


Figure 14. Plant community growth curve (percent production by month). WY0602, 15-19E Extra water sites - LL, Ov, CyO, SL.

Community 1.3
Mature Poplar/Cool-season Mid-stature Grasses

Figure 15. The mature poplar stand in the background with a shrub and native grass understory.

This plant community evolved under moderate grazing by domestic livestock, periodic flooding, and fire suppression. Mid-stature cool-season grasses make up the majority of the understory with the balance made up of short cool-season grass, and miscellaneous forbs. Balsam poplars, cottonwood, sagebrush, and riparian shrubs comprise greater than 35 percent of the total annual production of this plant community. Dominant grasses include slender wheatgrass, rhizomatous wheatgrasses, Idaho fescue, and mountain brome. Grasses of secondary importance include Sandberg bluegrass, big bluegrass, and Canada wildrye. Mountain big and silver sagebrush and a variety of riparian species comprise most of the total shrub production. Cottonwood stands are still a prominent part of the plant community. When compared to the Reference Community, Phase, basin wildrye and Columbia needlegrass has decreased. Rhizomatous wheatgrasses, big bluegrass, and Sandberg bluegrass and other more upland grass species have increased. Willow, mountain big and silver sagebrush, snowberry, gooseberry, and wild rose have increased. The percentage of mature poplars to younger aged trees has increased although young saplings and mid-aged trees are still healthy and flourish in this site. Poplar saplings are not as extensive. The total annual production (air-dry weight) of this state is about 2300 pounds per acre, but it can range from about 1600 lbs./acre in unfavorable years to about 3100 lbs./acre in above average years.

Resilience management. This state is stable and protected from excessive erosion once established. The biotic integrity of this plant community is intact. However, a slight decline in the cottonwood reproduction is evident and may affect the vigor of the stand over a long period. This is true especially if no low intensive or ground fires occur or if conditions are not right for seedling establishment. The watershed is functioning. Water flow patterns and litter movement may be occurring but in isolated areas. Incidence of pedestalling is minimal. Soils are mostly stable and the surface shows minimum soil loss.

Dominant plant species

- narrowleaf cottonwood (*Populus angustifolia*), tree
- balsam poplar (*Populus balsamifera*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- slender wheatgrass (*Elymus trachycaulus*), grass
- Canada wildrye (*Elymus canadensis*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- goldenrod (*Solidago*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous
- rosy pussytoes (*Antennaria rosea*), other herbaceous

Dominant resource concerns

- Sheet and rill erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Compaction
- Plant productivity and health
- Plant structure and composition

- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	869	1289	1681
Shrub/Vine	897	1233	1681
Forb	28	56	112
Total	**1794**	**2578**	**3474**

Community 1.4
Cool-Season Upland Grasses

Figure 17. Rhizomatous wheatgrass and a few scattered shrubs maintain this community, where the cottonwood galleries are restricted to the wet channels.

This plant community can occur where the dominant tree species have been removed and suppressed. Preferred cool season grasses have been established and shrubs have been controlled, but the upland plants are now the dominant species. Poplar and Cottonwood trees are not a part of this community and will not be able to reestablish. This site is dominated by an overstory of a variety of shrubs, such as mountain big sagebrush, silver sagebrush, gooseberry and wild rose. Small patches of riparian shrubs may remain where moisture can accumulate. Perennial cool-season mid-stature grasses have been established such as rhizomatous wheatgrasses, mountain brome, tufted hairgrass and slender wheatgrass. Basin wildrye and a variety of sedges may also be establishing in small pockets where additional moisture accumulates but will be infrequent. The interspaces between plants will have diminished in size. When compared with the Reference Community Phase, the annual production has been significantly reduced and the plant composition is clearly unique as upland plants now make up the balance of the species. The total annual production (air-dry weight) of this state is not provided. Insufficient data exists to establish an accurate production value at this time.

Resilience management. This plant community is mostly resistant to change, but species composition can be altered through long-term overgrazing. The herbaceous component is stable, but does not include most climax species. Plant vigor and replacement capabilities are sufficient. The biotic community is not intact because of the predominant upland plants and lack of climax grass species. Plant diversity is moderate. Soils are mostly stable and recent soil loss is minimal. This should not be confused with evidence of remnant erosion. Water flow patterns and litter movement is stable but is still occurring on steeper slopes. Incidence of pedestalling is improving. The watershed is not functioning.

Dominant plant species

- currant (*Ribes*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub

- slender wheatgrass (*Elymus trachycaulus*), grass
- mountain brome (*Bromus marginatus*), grass
- Montana wheatgrass (*Elymus albicans*), grass
- American licorice (*Glycyrrhiza lepidota*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous

Dominant resource concerns

- Classic gully erosion
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Inadequate livestock shelter
- Inadequate livestock water quantity, quality, and distribution

Pathway P1.1-1.2
Community 1.1 to 1.2

Basin Wildrye/Poplar **Sapling/Riparian Shrub**

Fire, especially when severe, will remove the mature tree stands and leave saplings and shrub mix to regenerate in the community. This transitional community phase is part of the natural rejuvenation process of the Poplar community.

Pathway P1.1-1.3
Community 1.1 to 1.3

Basin Wildrye/Poplar **Mature Poplar/Cool-season Mid-stature Grasses**

Moderate, continuous season-long grazing and Drought will convert this plant community to the Mature Stand/Cool-season Mid-stature Grasses Community Phase. Prolonged drought will exacerbate this transition, as periodic flooding of the site will not occur. The grazing pressure with drought stress removes the taller grass species and key forbs from the community aiding in the transition.

Pathway P1.2-1.1
Community 1.2 to 1.1

Sapling/Riparian Shrub **Basin Wildrye/Poplar**

No fire plus prescribed grazing will result in a plant community very similar to the Reference Community Phase (1.1). Allowing mature trees to stand with an undergrowth of younger saplings and a mixture of tall and mid-stature cool-season grasses. Periodic flooding will hasten this transition with rejuvenation of the tree stand.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Upland Wildlife Habitat Management

Pathway CP1.2-1.3
Community 1.2 to 1.3

Sapling/Riparian Shrub

Mature Poplar/Cool-season Mid-stature Grasses

Lack of fire over time with grazing and browse will reduce saplings and leave a mature tree stand with a limited understory of mid-stature cool-season grasses. Drought will affect the understory vegetation, limiting the community to mid and short-stature cool-season grasses and a mixture of forbs.

Pathway CP1.3-1.1
Community 1.3 to 1.1

Mature Poplar/Cool-season Mid-stature Grasses

Basin Wildrye/Poplar

Prescribed grazing and re-occurrence of periodic flooding will result in a plant community very similar to the Reference Community Phase. Low intensive fires will hasten this transition.

Conservation practices

Brush Management
Prescribed Grazing
Grazing Land Mechanical Treatment
Upland Wildlife Habitat Management
Native Plant Community Restoration and Management

Pathway CP1.3-1.2
Community 1.3 to 1.2

Mature Poplar/Cool-season Mid-stature Grasses

Sapling/Riparian Shrub

Prescribed grazing with rest will allow perennial grasses to recover, allowing the key tall-stature species to re-establish. With rest and possibly with plantings to assist, the shrub and tree component can improve in this system. Fire and drought may trigger a thinning of tree canopies to allow the light and precipitation to reach the lower canopy to encourage new growth.

Context dependence. The hydrologic processes of flooding with scouring and deposition of materials must still occur to have this process occur naturally.

Conservation practices

Brush Management
Prescribed Burning
Critical Area Planting
Stream Habitat Improvement and Management
Prescribed Grazing
Grazing Land Mechanical Treatment
Upland Wildlife Habitat Management

Pathway CP1.3-1.4
Community 1.3 to 1.4

Mature Poplar/Cool-season Mid-stature Grasses

Cool-Season Upland Grasses

The change in flooding cycles with control of water ways with dams and irrigation systems have limited the rejuvenation of poplar and cottonwood galleries. The loss of this system function has created a droughty community within the Lowland ecological site that has lost the tree cover and the taller grass community.

State 2
Invaded

Increased activity on the landscapes provides more opportunity for disturbances as well as an increase of non-native species seed source. Disturbances to the soil surface and exiting canopy cover provides opportunity for non-native species to establish. The most prevalent invader on Lowland ecological site is smooth brome and Kentucky bluegrass. The occurrence of these communities can be a process of time or of disturbance. Historic studies have documented the presence of non-native species such as Kentucky bluegrass and dandelions prior to the early 1950's. Different references list these two species as naturalized species. Another concern is the threat of large scale weed invasions. Currently, most of the mountain has retained only small or isolated patches of invasive weeds. Areas of leafy spurge, toadflax (yellow or dalmation) and thistles have been identified. Although early detection/rapid response techniques are applied for land management, limited resources make it difficult to track all current and new infestation sites. Overall, the weed infestation level is not seen as a critical concern, but the threat is growing and being monitored closely.

Characteristics and indicators. Non-native or tame species and invasive species are a concern on the the Lowland soils. The frequent disturbance from spring flood water and fluctuating water table provide opportunity for establishment. The threshold that is crossed to indicate an invaded site is 5 percent composition by cover or by weight. The dominant non-native/invader species are Kentucky bluegrass, smooth brome, thistles, toadflax (Dalmatian, yellow), and swanson's pea. As new species are found, this list will be adapted to include these species.

Resilience management. Non-native and invasive species are resistant to change and resilient following disturbances. This makes a stable community that is difficult to change without significant inputs. The salt-laden soils limit the type of treatment, access, and species adapted to help recovery of the Invaded Community. Kentucky bluegrass, smooth brome, and other non-native species have a high resiliency once they have established in a community. The management of the native species is difficult, and is dependent on what specific species composition exists in the individual community. The removal or treatment of encroaching woody species is best

tackled when they occur at a low intensity, before they may be seen as a concern.

Community 2.1
Non-Native (Tame) Invaded

Figure 18. Smooth brome community under a mature cottonwood gallery.

Figure 19. Kentucky bluegrass in a mature cottonwood gallery.

This plant community is the result of long-term improper grazing use and an interruption in the frequency of flooding or channelization. The disruption, either directly by humans, such as dams or dikes, or indirectly through accelerated erosion and channelization, has caused an interruption in the natural flooding regime. Extended periods of drought will exacerbate this situation. Usually fire has been removed from this plant community as bluegrass is a poor conductor of fire. Non-Native (Tame) Community Phase has maintained a representative sample of the perennial grasses and forbs that are typical of the site with a mixed shrub community. Non-native or tame species have established in the community and are a significant component (five percent or greater by foliar cover or weight), and are prominent (referring to a more wide scale composition, not one isolated patch in an isolated portion of the landscape). This plant community is dominated by a dense grass sod of bluegrass or smooth brome and includes a mosaic of mature balsam poplars, cottonwoods, sagebrush or riparian shrub overstory. In some instances shrubs may be limited in this community. Production of the desired perennial species is generally reduced but the total production is maintained or elevated due to the production potential of the non-native species. The species most common are Kentucky bluegrass and smooth brome. Native species that are less desirable that are common to this community are American licorice and cudweed sagewort. Dandelion is a common non-native forb. The total annual production (air-dry weight) of this state is not provided due to lack of sufficient data as well as the extreme variability between invader species.

Resilience management. This plant community is resistant to change. Plant diversity is moderate to poor. The plant vigor is variable, as both Kentucky bluegrass and smooth brome are sod-forming or tillering species that over time will lose vigor due to being root-bound. Plant litter is noticeably more when compared to reference communities due to the potential biomass produced by the non-native species (species dependent). Soil erosion is variable depending on the species of invasion and the litter accumulation thus associated, this variability also applies to water flow patterns and pedestalling. Infiltration is reduced and runoff is increased due to loss of perennial

vegetation and root density.

Community 2.2
Invasive Invaded

Figure 20. Canada Thistle is an aggressive invader in the Lowland ecological site.

The Invasive Invaded Community Phase has maintained a fractured sample of the perennial grasses and forbs that are typical of the Lowland ecological site, however there is a significant establishment of invasive species. This plant community evolved under frequent and severe grazing as well as the disruption of the hydrologic cycle. The shrub component has been impacted and possibly removed by heavy browsing or human means. Weedy annuals and non-native species are the most dominant plants. Invasive species, most commonly canada thistle, cockle bur, swainson's pea, and perennial pepperweed, hold a significant (5 percent or greater) composition on the landscape, and are prominent (referring to a more wide scale composition, not isolated patches on the landscape). Russian olive may be present, but is not as common as on lower elevations. With the decrease or loss of most desirable grasses, Kentucky bluegrass, smooth brome, slender wheatgrass and rhizomatous wheatgrasses will persist on the site. Cudweed sagewort, western yarrow and other forbs will persist. Noxious weeds such as sow thistle may invade the site if a seed source is available. Production of the desired perennial species is generally reduced but the total production is maintained or elevated due to the production potential of the invasive species.

Resilience management. This plant community is resistant to continued herbivory. Annuals and invader species are effectively competing against the establishment of perennial cool-season grasses. Plant diversity is greatly altered and the herbaceous component is not intact. Recruitment of the major perennial grasses is not occurring and the replacement potential is low. The biotic integrity is missing. The state is unstable and is not protected from excessive erosion. Rill channels and gullies may be present on site and adjacent areas are impacted by excessive runoff. Water flow patterns and pedestalling are obvious. The watershed is not functioning.

Pathway CP2.1-2.2
Community 2.1 to 2.2

Non-Native (Tame) Invaded | Invasive Invaded

Seed sources are abundant for both non-native and for invasive invader species. Drought stress, ground/soil disturbance including impacts by grazing large herbivores or recreation create a niche for undesirable weeds to establish, even in the aggressive cover of tame invaders. Overland flow or irrigation practices can also serve as a seed source and means of establishing many invasive species in the community.

State 3
Disturbed

Although to a much smaller extent than in lower elevations, there are areas that have been accessed for irrigation convenience ditches or were part of a homestead. These areas have remnants of introduced species from haylands or have been left to recover and may be in varying stages of succession. There are areas that are heavily impacted by recreational vehicles, parking, trails, roadways, or other land disturbances that have reduced or removed most native perennial vegetation and left a highly disturbed land. The Disturbed State could be drafted as a stand-alone box within the state and transition model diagram. No matter what state a site originally is ranked in, once the site is mechanically disturbed, or suffers a catastrophic or significant natural disaster that alters the soil properties (erosional, depositional, or chemical), the site potential is altered. The most prominent shift for this site tends to be a shift in the natural hydrology that is key to this site. This can include both the loss of or enhancement to the additional moisture to the site (seepage from irrigation ditches). Mechanical disturbances and reclamation practices using non-native species could qualify some stages of this state to be considered as a land use shift. The result is the shift in potential and response in management so that it is no longer similar to the reference community. The potential shifts are highly variable, so a dynamic state was captured to highlight the altered communities that exist on the landscape.

Characteristics and indicators. The soil disturbance and mechanical or physical removal of the vegetative canopy is the key characteristic of the Disturbed State. The initial indicators are the primary successional species that establish following a disturbance including Russian thistle, kochia, and sunflowers. These initial colonizers will then be followed by any seeded species, or other species from within the locations seed bank.

Resilience management. The Disturbed State is highly variable and in a state of flux as the successional processes occur. Continued disturbance of these communities is a potential threat; and the communities are at high risk of transitioning to the Invaded State.

Community 3.1
Disturbed Lands

The title Disturbed Lands is encompassing two broad classifications of these land types. Go-back fields or tilled areas form Type one. The soils were once cultivated or were impacted by cultivation practices and have since been left to natural processes. Abandoned farming sites can be identified on the landscape (through photo-tone shifts in aerial photographs) and are generally a mix of natives and introduced herbaceous species as well as trees. These sites are generally isolated or small in nature and are difficult to reclaim due to the introduced species that persist on the landscape and the shift in hydrology. If reclaimed, they do not respond to the natural disturbance regimes in the same manner that a native, mechanically undisturbed site would respond. The Lowland ecological site is a prime location for homestead crop or hayfields, or irrigation processes. Homesteads or corral systems are common on these areas, due to being connected to water. The extent of this type is limited on the landscape due to the size of the drainages they are associated with. A subset of Type one are those areas that were or currently are being impacted by recreation - camp sites, trails, parking areas, roadways. The varying stages of healing once abandoned, or the level and age of disturbance at each location leave a variable community. In a similar process, lands affected by energy development including transmission and transportation corridors provide a host of successional processes. Many times, these locations are re-exposed to disturbance frequently by mechanical means leaving annual weeds and primary successional species as the dominate canopy. Older, established sites or abandoned locations, have established communities similar to those expected on go-back fields and may be stable in nature. The growth curve of this plant community will vary depending on the species that are selected for seeding. For a more accurate portrait of the growth curve for the seeded community, the species used and the climatic tendencies of the region must be considered.

Resilience management. The plant community is variable and depending on the age of the stand and the stage of successional tendencies that the location is in will determine how stable (resilient/resistant) the community is. Plant diversity is generally strong, but is usually lacking in the structural and functional groups that are desired on the site. Soil erosion is variable depending on the disturbance regime that is occurring on the site and will vary with the specific community that has established on a specific location. Site-specific evaluation is needed to determine the water flow and pedestalling as well as infiltration and runoff potential and associated risks for each community.

Dominant resource concerns

- Sheet and rill erosion
- Classic gully erosion

- Compaction
- Seasonal high water table
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance
- Inadequate livestock water quantity, quality, and distribution

Community 3.2
Restored

The Lowland ecological site has potential for successful establishment of a diverse vegetative cover. Many times these areas are seeded with improved varieties or used as pastures, especially in areas where the fluctuating water table and spring flooding provides significant water. However, many times, these areas have an existing cover of introduced species that limits the ability to move this back to the reference state. The soil disturbance that occurs in the seed bed preparation and seeding also alters the function of the soil so that it does not respond in the same manner as an undisturbed native community.

Resilience management. Encroachment of non-native species such as Kentucky bluegrass as well as smooth brome is a threat until this community is fully established. The resiliency and resistance of the community will be dependent on the seed mixture used, the success rate of the seeding, and the management pre- and post-treatment.

Dominant resource concerns

- Sheet and rill erosion
- Classic gully erosion
- Plant pest pressure
- Inadequate livestock shelter
- Inadequate livestock water quantity, quality, and distribution

Pathway CP4.1-4.2
Community 3.1 to 3.2

Integrated pest management with seed bed preparation and seeding helps to established an improved vegetative cover. Stabilizing the location is key in maintaining the community. Bank stabilization, improved or limited access (recreational impacts), or shifts in grazing management may be needed to fully recover (establish) a community.

Conservation practices

Cover Crop
Critical Area Planting
Prescribed Grazing
Grazing Land Mechanical Treatment
Range Planting
Heavy Use Area Protection
Integrated Pest Management (IPM)

Pathway CP4.2-4.1
Community 3.2 to 3.1

The lack of management of the disturbances that led to the need to restore a community will quickly transition the community back to a disturbed condition. Climatic conditions can cause seeding failure which could also quickly transition the community. Drought, severe

Transition T1-2
State 1 to 2

Frequent and Severe grazing plus encroachment will convert this plant community to an Invaded State. Grazing reduces the vigor and cover of native cover, allowing aggressive non-native species to creep into a community. Soil disturbance and increased activity (by livestock, wildlife, or human) provide a seed source for invaders to establish.

Constraints to recovery. The aggressive nature of invader species limits the ability for a community to overcome their establishment. In many cases, control or removal has not been completed successfully without complete manipulation.

Context dependence. The depth to the water table, frequency of flooding, and any alterations to the flooding cycle are factors affecting both the species of invasion and the ability to control these species.

Transition T1-3
State 1 to 3

An abrupt or catastrophic disturbance will remove or significantly impact the native community and the soil structure, leaving a disturbed and barren site. With time, natural succession will begin the recovery process. However, the soil as well as hydrologic function has been altered in many cases, leaving a Disturbed State. Fire, intensive or continuous, season-long, grazing, recreational impacts as well as intensive flooding can be the driver of this transition.

Constraints to recovery. The inability to restore hydrology or to replace soil stability in function (in the scope of significant bank erosion, head cuts or gullying) limits the recovery potential after significant disturbance.

Context dependence. Reclamation or restoration of the reference community is a challenge due to limitations of seed sources. Seedbed or site preparation is limited by the wetness of the soil, depth to water table and the soil textures. Access to these sites with equipment is limited in areas due to channel form, and wetness of the site.

Restoration pathway R2-3
State 2 to 3

Once a site has transitioned to the Invaded State, the composition of tame and invasive species limits the ability to restore the community without major inputs into the system. Site preparation and seeding with intensive weed and integrated pest management is required. Seeding of both herbaceous as well as woody species may be required depending on the extent of alteration the site has seen. The soil preparation for seeding will affect the response to management and natural disturbances due to the mixing and alteration of the soil profile. Once the community is established, grazing management to maintain this community as well as control of other disturbances is required.

Context dependence. The inability to effectively eradicate the undesirable species is the known limitation or constraint to this site recovering. Seed availability and establishment rates are also considerations needed when looking at the scope of this process.

Conservation practices

Critical Area Planting
Prescribed Grazing
Grazing Land Mechanical Treatment
Range Planting
Integrated Pest Management (IPM)
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Controlled Stream access for Livestock Watering
Cut Bank Stabilization

Stream Corridor Improvement

Transition T3-2
State 3 to 2

Once a site has transitioned to the Degraded State, the increased bare ground and weakened plant structure leaves the community at risk of encroachment by non-native species such as Kentucky bluegrass, smooth brome. Thistles, toadflax, and houndstounge are quickly becoming significant problems on areas within these weakened plant communities. A Disturbed Community has lost native cover and is exposed to those invader species that have a seed source present. Restoration attempts for these degraded communities are at risk of failing or being degraded with the lack of management changes. Increasing bare ground and weakening plant community structure leaves the community vulnerable to invader species such as toadflax and houndstongue.

Constraints to recovery. The inability to effectively eradicate the undesirable species is the known financially limiting constraint to this site recovering.

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall-stature Cool-season Grasses**			560–1345	
	basin wildrye	LECI4	*Leymus cinereus*	280–841	10–30
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	112–448	5–20
	mountain brome	BRMA4	*Bromus marginatus*	0–168	0–10
	nodding brome	BRAN	*Bromus anomalus*	0–168	0–10
2	**Mid-stature Cool-season Grasses**			224–560	
	tufted hairgrass	DECE	*Deschampsia cespitosa*	0–224	0–10
	Canada wildrye	ELCA4	*Elymus canadensis*	0–224	0–10
	Idaho fescue	FEID	*Festuca idahoensis*	0–112	0–10
	timber oatgrass	DAIN	*Danthonia intermedia*	0–56	0–5
3	**Rhizomatous Grasses**			56–280	
	Montana wheatgrass	ELAL7	*Elymus albicans*	56–224	5–15
	western wheatgrass	PASM	*Pascopyrum smithii*	0–56	0–5
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–56	0–5
4	**Miscellaneous Grasses/Grass-Likes**			0–112	
	sedge	CAREX	*Carex*	0–56	0–5
	Sandberg bluegrass	POSE	*Poa secunda*	0–56	0–5
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–56	0–5
	threadleaf sedge	CAFI	*Carex filifolia*	0–56	0–5
	Grass, perennial	2GP	*Grass, perennial*	0–56	0–5
Forb					
5	**Forbs**			280–560	
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–168	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–168	–
	yarrow	ACHIL	*Achillea*	0–168	–
	fleabane	ERIGE2	*Erigeron*	0–168	–

	fleabane	ERIGE2	*Erigeron*	0–168	–
	aster	ASTER	*Aster*	0–168	–
	beardtongue	PENST	*Penstemon*	0–168	–
	phlox	PHLOX	*Phlox*	0–168	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–168	–
	buckwheat	ERIOG	*Eriogonum*	0–168	–
	Forb, perennial	2FP	*Forb, perennial*	0–168	–
Shrub/Vine					
6	**Dominant Shrubs**			280–560	
	currant	RIBES	*Ribes*	0–168	0–10
	Woods' rose	ROWO	*Rosa woodsii*	0–168	0–10
	Geyer willow	SAGE2	*Salix geyeriana*	0–168	0–10
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–168	0–10
7	**Miscellaneous Shrubs**			0–280	
	shrubby cinquefoil	DAFR6	*Dasiphora fruticosa*	0–56	0–5
	dogwood	CORNU	*Cornus*	0–56	0–5
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–56	0–5
	willow	SALIX	*Salix*	0–56	0–5
	Shrub, other	2S	*Shrub, other*	0–56	0–5
Tree					
8	**Trees**			–	
	balsam poplar	POBA2	*Populus balsamifera*	–	0–10
	narrowleaf cottonwood	POAN3	*Populus angustifolia*	–	0–5

Animal community

Wildlife Interpretations

Reference Community Phase: The abundant production and proximity to water make this state important favors grazers and mixed-feeders, such as bison, elk, deer, and antelope. This also provides suitable thermal and escape cover for these animals. This plant community may provide brood rearing/foraging areas for upland game birds as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Bald eagles may also frequent this area if adjacent to large streams or rivers and may even nest in this site. Many grassland obligate small mammals would occur here.

Mature trees/Cool Season Mid-Grass: The abundant production and proximity to water make this state important favors grazers and mixed-feeders, such as bison, elk, deer, and antelope. This also provides suitable thermal and escape cover for these animals. This plant community may provide brood rearing/foraging areas for upland birds and sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Bald eagles may also frequent this area if adjacent to large streams or rivers and may even nest in this site. Many grassland obligate small mammals would occur here.

Poplar Sapling/Riparian Shrub Regeneration: This plant community may be useful for the same large grazers that would use the Historic Climax Plant Community. Usually after a fire, young succulent plants are preferred as are young shrubs by these large ungulates. Once reestablished this site may provide foraging and nesting opportunities for upland game birds as well as songbirds. Many grassland obligate small mammals would occur here.

Cool-Season Upland Grass: The proximity to water makes this state important for wildlife such as birds, mule deer, and whitetail deer. The plant community composition is diverse, able to meet the seasonal needs of these animals. It will provide some foraging opportunities for upland game birds and sage grouse. Good grasshopper habitat

equals good foraging for birds. Many grassland obligate small mammals would occur here.

Invaded State: The proximity to water makes this state important for wildlife such as birds, mule deer, and whitetail deer. Grazers may find the tame grasses or invader species preferable, however, mixed-feeders will find less diverse and productive plants. Some thermal and escape cover exists but is not as common as found in some of the other states. It may provide some foraging opportunities for upland game birds and sage grouse. Good grasshopper habitat equals good foraging for birds. Many grassland obligate small mammals would occur here.

Animal Community – Grazing Interpretations

The following table lists suggested stocking rates for cattle under continuous season-long grazing with 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*
The Carrying capacity is calculated as the production (normal year) X .25 efficiency factor / 912.5 # /AUM to calculate the AUM's/Acre.

Plant Community Description Title Lbs./Acre AUM/Acre* Acres/AUM*
Below Ave. Normal Above Ave.

Plant Community Production Carrying Capacity*
(lb./ac) (AUM/ac)
1.1 - Reference Community Phase 2000-2500-3300 .7 1.5
1.2 - Mature Poplar/Cool-season Mid-stature Grasses 1600-2300-3100 .6 1.6
1.3 - Sapling/Riparian Shrub 1300-1800-2300 .5 2.0
1.4 - Cool-Season Upland Grass ** ** **
2.1 - Non-Native (Tame) Invader ** ** **
2.2 - Invasive Invader ** ** **
3._ - Disturbed State ** ** **

* - Carrying Capacity is figured for continuous, season-long grazing by cattle under average growing conditions.
** - Sufficient data for invaded and reclaimed communities has not be collected or evaluated, at this time, so no projection of a stocking rate recommendation or production range will be established at this time.

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.

Distance to water, shrub density, and slope can affect carrying capacity (grazing capacity) within a management unit. Adjustments should be made for the area that is considered necessary for reduction of animal numbers. For example, 30 percent of a management unit may have 25 percent slopes and distances of greater than one mile from water; therefore, the adjustment is only calculated for 30 percent of the unit (i.e. 50 percent reduction on 30 percent of the management unit).

Fencing, slope length, management, access, terrain, kind and class of livestock, and breeds are all factors that can increase or decrease the percent of graze-able acres within a management unit. Adjustments should be made that incorporate these factors when calculating stocking rates.

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 rapid. 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

Boxelder and cottonwood trees have no real commercial value. A limited amount of wood could be harvested as firewood.

Other products

none noted

Inventory data references

Information presented here has been derived from NRCS inventory data, Field observations from range trained personnel, and the existing range site descriptions. Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Blaise Allen, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. 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 IV, and USDA NRCS Soil Surveys from various counties.

Inventory Data References:
Ocular field estimations observed by trained personnel were completed at each site. Then sites were selected where a 100 foot tape was stretched and the following sample procedures were completed by inventory staff. For full sampling protocol and guidelines with forms please refer to the Wyoming ESI Operating Procedures, compiled in 2012 for the Powell and Rock Springs Soil Survey Office, USDA-NRCS.
• Double Sampling Production Data (9.6 hoop used to estimate ten points, clipped a minimum of three of the estimated points, with two 21-foot X 21-foot square extended shrub plots).
• Line Point Intercept (over story and understory captured with soil cover). Height of herbaceous and woody cover is collected every three feet along established transect.)
• Continuous Line Intercept (Woody Canopy Cover, with minimum gap of 0.2 of a foot for all woody species and succulents. Intercept height collected at each measurement.),
• Gap Intercept (Basal Gap measured with a minimum gap requirement of 0.7 foot.),
• Sample Point (ten – 1 meter square point photographs taken at set distances on transect. Red using the sample point computer program established by the High Plains Agricultural Research Center, WY).
• Soil Stability (Slake Test – surface and subsurface samples collected and processed according to the soil stability guidelines provided by the Jornada Research Center, NM.)

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Approval

Kirt Walstad, 3/04/2024

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.

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Date	04/01/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to nonexistent, but variable depending on precipitation events. This site is subject to frequent disturbance caused by seasonal flooding with its' associated soil scouring and deposition activities. Where rills are present they should be less than 1 inch deep, somewhat widely spaced (10 to 15 feet), and may be connected. They will often run the length of the streambank to a point of depositional interruption. An increase in rill development may be observed following large storm events or spring runoff periods. Rill development may also increase where the site is adjacent to other sites that produce large amounts of runoff (i.e. steeper sites).

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2. **Presence of water flow patterns:** Water flow patterns sometimes evident in floodplain zone where this site occurs. They may be straight and/or sinuous and wind around perennial plant bases. They may be long (15 to 25 feet), 1 to 3 fee wide, and spaced from 5 to 20 feet apart. They should become somewhat stable between flooding events. These become ideal locations for the establishment of new riparian vegetation.

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3. **Number and height of erosional pedestals or terracettes:** Rare to nonexistent. However, plants are expected to show some pedestalling where they are adjacent to water flow patterns. Exposed roots may be present where scouring has occurred. Terracettes are also typically present following flooding events. They often develop behind debris such as twigs and tree branches that act as dams within water flow patterns.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is variable on this site, but should range from 0 to 25%. Bare ground openings should be approximately 1 to 3 feet in size and may be connected as flow channels. Adapted rhizomatous riparian vegetation will often re-populate these opening between flood events.

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:** No evidence of wind generated soil movement. Wind caused blowouts and depositional areas are not present.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter accumulates in place at the base of plant canopies between flood events. Following significant flood events, litter is expected to be transported downstream by water. Considerable accumulation is observed behind obstructions such as rocks and woody debris.

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 4.0 or greater. Surface textures will typically vary from sand loams and gravels in depositional areas to loams and clay loams on stable soils.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Typically an A-horizon of 8 to 20 inches (20-50 cm) with highly variable structure and color. Organic matter is typically 1 to 5%.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 50-70% grasses, 20% forbs, and 10-30% shrubs/trees. Dense plant canopy (75-100%) and litter plus moderate to rapid infiltration rates result in minimal to nonexistent runoff. Basal cover is typically greater than 5% for this site and does effectively reduce runoff on this site. Surface gravels are common on this site, which provide site stability, but reduce infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. This site will normally have textural variation within its' soil profile. These should not be mistaken for compaction layers.

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 bunchgrasses (2 Species)

    Sub-dominant: Trees (1 species) >cool season rhizomatous grasses (1 species) = perennial shrubs = perennial forbs

    Other: Community 1.1 = Perennial Cool-Season bunchgrasses > Trees > cool season rhizomatous grasses > Perennial Forbs = Shrubs

    12b. F/S Groups not expected for the site: Annual Grass
    12c. Number of F/S Groups: 5 groups
    12d. Species number in Dominate and Sub-dominate F/S Groups: 4 species

    Additional: Disturbance regimes include seasonal flooding, insects, and infrequent fire. Temporal variability can be

caused by fires, droughts, insects, etc. Spatial variability can be caused by periodic flooding, soil pH, and topography. ollowing a recent disturbance such as drought, or flooding damage that removes woody vegetation, forbs and perennial grasses and grasslikes may dominate the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase on the site, reducing herbaceous species. Yearly variations in flow and large floods that scour vegetation and deposit sediment on floodplains are ideal microsites for willow and cottonwood seedlings. These conditions may reflect community phases within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There should be no mortality or decadence in either trees, shrubs or grasses during years with average to above average precipitation. During severe (multi-year) droughts that affect groundwater levels, up to 15% of the trees and shrubs may die. Minor mortality of perennial grasses and grasslikes may also occur during these drought periods. There may be partial mortality of individual grasses, grasslikes and shrubs during less severe droughts.

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14. **Average percent litter cover (%) and depth (in):** Litter ranges from 10-30% of total canopy measurement with total litter (including beneath the plant canopy) from 75-100% 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: 2000-3000 lb/ac (2242-3363 kg/ha); with an average annual total production of 2500 pounds per acre (2802 kg/ha).

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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 50% or noxious weed invasion are the most common indicators of a threshold being crossed. Basin big sagebrush, silver buffaloberry, boxelder and woods rose are common increasers. Perennial pepperweed, annual mustards, Canada thistle, Russian knapweed, and Kentucky bluegrass are common invasive species.

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17. **Perennial plant reproductive capability:** All species are capable of reproducing, except in drought years.
