USDA Natural Resources
Conservation Service

Ecological site EX043B23A128
Lowland (LL) Absaroka Lower Foothills

Last updated: 10/04/2019
Accessed: 05/12/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 043B–Central Rocky Mountains

Major Land Resource Unit (MLRA) 43B: 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) 43B23A: Absaroka Lower 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 A is set for the lower elevations within the foothills with 10 to 14 inches of precipitation. To verify or identify the LRU A (the referenced LRU for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key. This particular LRU occurs along the eastern lower 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 tracks east with the intersection of the Absaroka and Owl Creek Ranges, 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: Aridic Ustic or Ustic Aridic – Progressive Initial mapping has shown that soil correlations completed prior to 2014 were identified as ustic aridic, after further evaluation of climatic and soil taxonomy information the proper moisture regime is aridic ustic. Both are recorded here until an update project is completed to correct the previous correlations.

Temperature Regime: Frigid

Dominant Cover: Rangeland – Sagebrush Steppe (major species is Wyoming Big Sagebrush)
Representative Value (RV) Effective Precipitation: 10-14 inches (254 – 355 mm)
RV Frost-Free Days: 80-110 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

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.b Big Horn Basin and
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 1 to 5 feet, but is below 3 feet for a majority of the growing season.
• Slope is <6%
• Soils are:
o Textures range from loamy sand to clay loams, often soils are stratified in nature with gravels.
o Moderately deep to very deep (20-80+ in. (50-200+ cm)
o Poorly drained
o <10% stone and boulder cover and <10% cobble and gravel cover
o None to Slightly effervescent throughout top 20” (50 cm) of mineral soil surface
o Non-saline, sodic, or saline-sodic

Associated sites

R032XY330WY	**Overflow (Ov) 10-14" East Precipitation Zone** Overflow occurs on higher points within the drainage or floodplain with no influence from the water table but with additional moisture from stream overflow or overland flow from surrounding uplands.
R032XY306WY	**Clayey Overflow (CyO) 10-14" East Precipitation Zone** Clayey Overflow occurs on higher points within the drainage or floodplain with no influence from the water table but with additional moisture from stream overflow or overland flow from surrounding uplands.
R032XY322WY	**Loamy (Ly) 10-14" East Precipitation Zone** Loamy site occur higher in the landscape, on the terrace or landforms above the floodplain or drainages where lowlands occur.
R032XY304WY	**Clayey (Cy) 10-14" East Precipitation Zone** Clayey site occur higher in the landscape, on the terrace or landforms above the floodplain or drainages where lowlands occur.

Similar sites

R032XY128WY	**Lowland (LL) 5-9” Big Horn Basin Precipitation Zone** Lowland 5-9" Big Horn Basin Precipitation Zone is lower in production than this site.
R032XY228WY	**Lowland (LL) 5-9” Wind River Basin Precipitation Zone** Lowland 5-9" Wind River Basin Precipitation Zone is lower in production than this site.

Table 1. Dominant plant species

Tree	(1) *Populus angustifolia*
Shrub	(1) *Ribes*
Herbaceous	(1) *Leymus cinereus* (2) *Elymus trachycaulus*

Legacy ID

R043BX528WY

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.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Flood plain (2) Foothills > Drainageway (3) Foothills > Stream terrace
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Elevation	1,646–2,286 m
Slope	0–6%
Water table depth	91–152 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 10 to 14 inches (254 – 355 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. This amounts to about 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 about April 15th and continues until about July 1st. Cool weather and moisture in September may produce some green up of cool season plants that will continue through late October.

Review of a 30 year trend of data for Average Temperature as well as Average Precipitation, there has been a warming trend, but as the last 12 years graphed, the temperatures have swayed high and low, but overall it has maintained a steady trajectory, neither increasing nor decreasing. Where on the moisture side, the trajectory in trend has been a slow decline. The swings of when spring warm up and first frost hit with the decline in average precipitation have produced a drought effect where the moisture is not being received when the plants and ground is able to utilize the moisture. And in some cases, the late precipitation has encouraged the warm season or mat forming species over the cool season bunchgrasses that are the drivers of the natural system. Early frosts, with dry open winters has created a more arid or desert effect on plants resulting in high rates of winter kill, loss of vigor or overall damage to the plant.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. “Buffalo Bill Dam", "Cody 21SW", "Thermopolis", "Thermopolis 25WNW" and "Wapiti 1NE" are the representative weather stations within LRU D. 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)	64-106 days
Freeze-free period (characteristic range)	101-144 days
Precipitation total (characteristic range)	279-305 mm
Frost-free period (actual range)	46-118 days
Freeze-free period (actual range)	88-147 days
Precipitation total (actual range)	254-330 mm
Frost-free period (average)	80 days
Freeze-free period (average)	117 days
Precipitation total (average)	305 mm

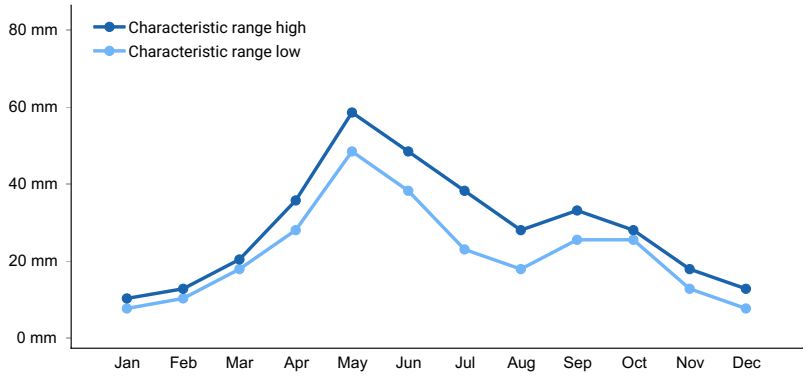


Figure 1. Monthly precipitation range

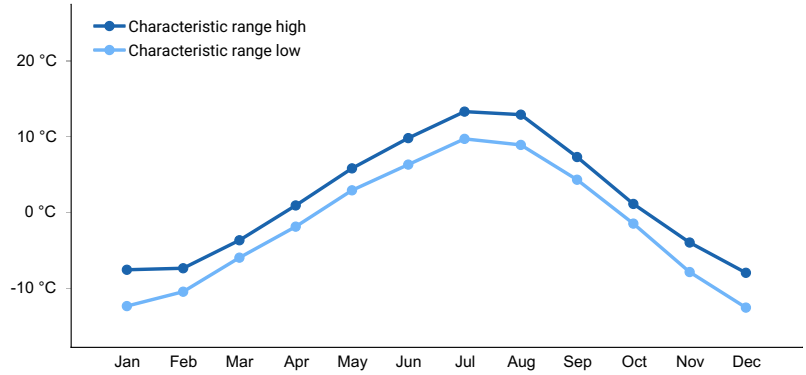


Figure 2. Monthly minimum temperature range

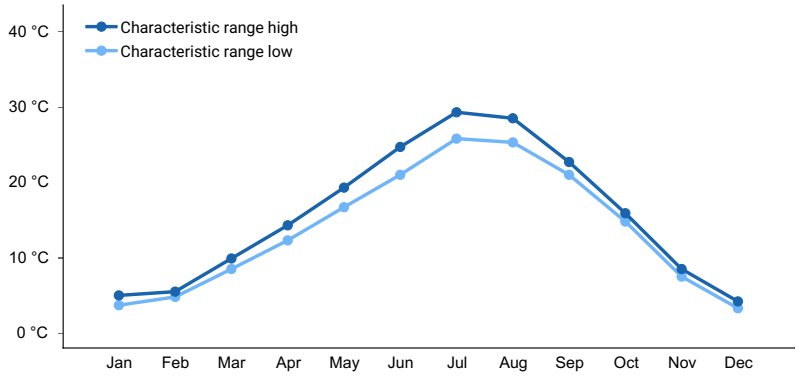


Figure 3. Monthly maximum temperature range

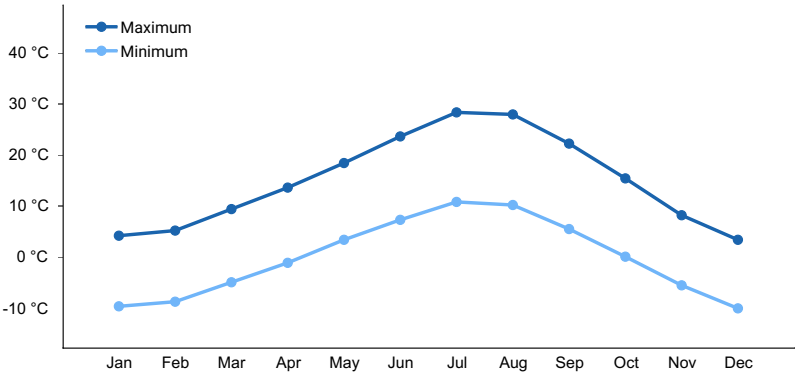


Figure 4. Monthly average minimum and maximum temperature

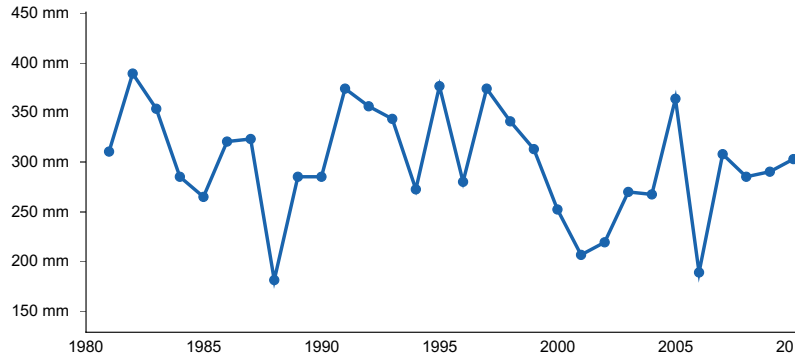


Figure 5. Annual precipitation pattern

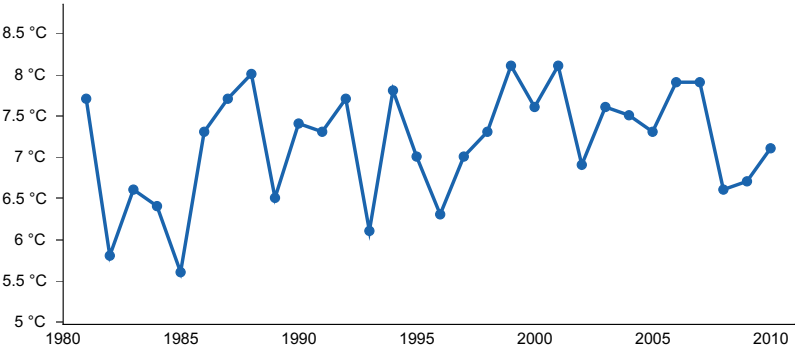


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BUFFALO BILL DAM [USC00481175], Cody, WY
- (2) WAPITI 1NE [USC00489467], Cody, WY
- (3) CODY 21 SW [USC00481855], Cody, WY

- (4) SUNSHINE 3NE [USC00488758], Meeteetse, WY
- (5) THERMOPOLIS 25WNW [USC00488888], Thermopolis, WY
- (6) THERMOPOLIS [USC00488875], Thermopolis, WY

Influencing water features

The characteristics of these bottomland soils have a minor influence from ground water (water table below 36 inches (150 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.

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 3 feet 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: Barnum, Haverdad, Glendive, Hawksell-like, Swims-like, and Yamacall.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Gravelly loam (2) Cobbly clay loam (3) Sandy clay loam (4) Sandy loam (5) Loamy sand (6) Clay
Family particle size	(1) Loamy
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 (0-101.6cm)	2.54–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–13
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

Potential vegetation on this site is dominated by tall and mid 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 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, wild rose, silver buffaloberry, and boxelder will increase. Weedy annuals will invade. Cool season grasses such as basin wildrye, green needlegrass, 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 an important role in this plant community especially due to the addition of tree species as part of the vegetative composition. The intensity of a fire determines vegetative succession and structure. Low intensive, or ground fires, typically result in thinning of cottonwoods and provide microsites, which can quickly be colonized by new saplings and riparian shrubs. These transitions are relatively short lived and tend to be mosaic in nature. As such, these areas maintain a mixed age stand of mature and younger trees with a sapling understory.

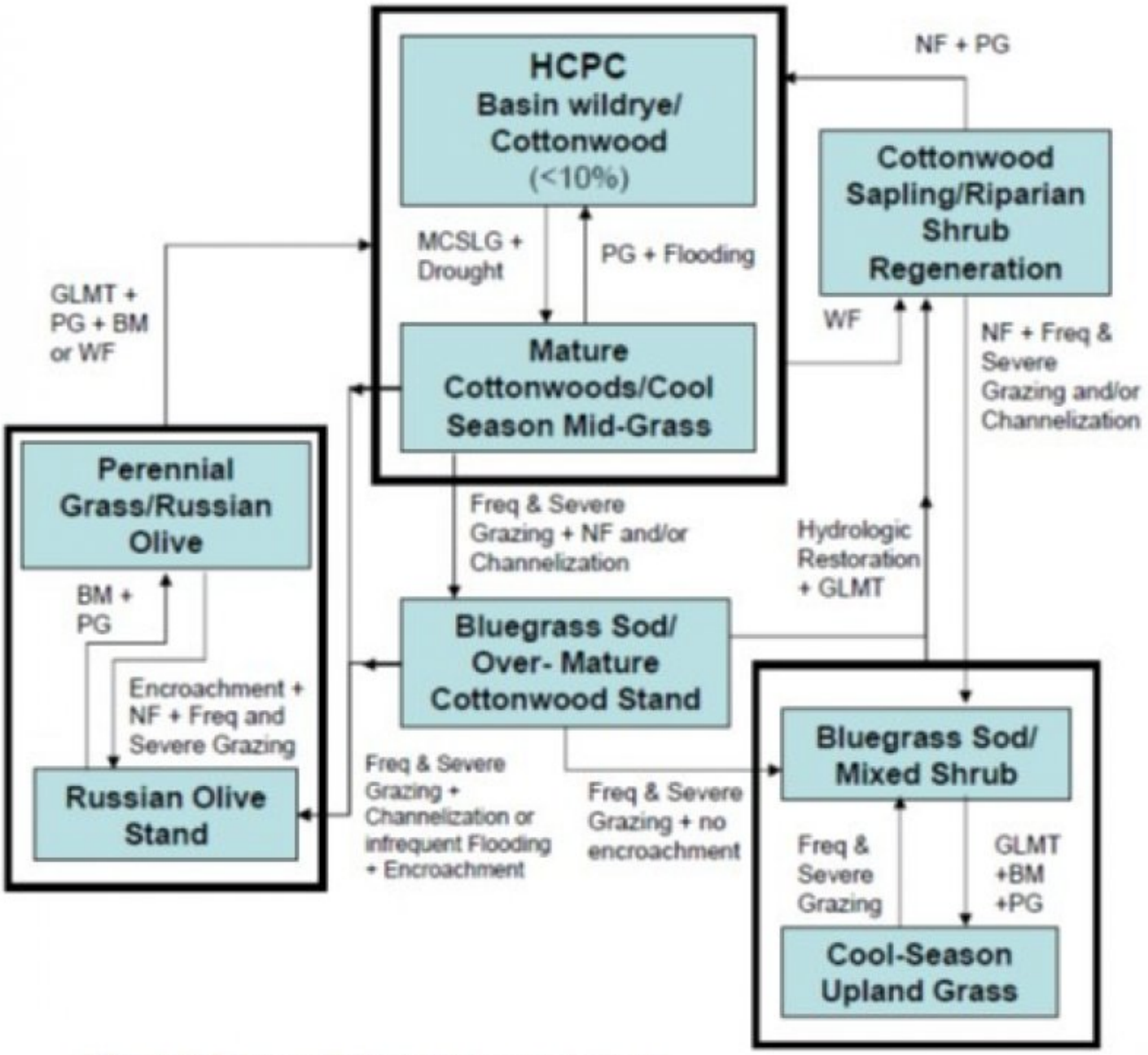
Moderate or severe fires, however, usually result in total stand mortality, as cottonwood trees are not very resistant to high temperatures. Under these scenarios, cottonwood seedlings may or may not quickly become established depending on if the soils are sterilized. Eventually, if the conditions are right, seedlings will establish, but it may take decades to return to a multiage mature stand. As a result of any wildfire, shrubs can also play an important role as to what plants will emerge first and what will the species composition develop into after fire succession. The effects of fire in these plant communities have not been adequately studied and the understanding of fire succession is minimal.

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.

Plant Community Narratives
Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they probably are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities”. According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

State and transition model



BM - Brush Management (fire, chemical, mechanical)
Freq. & Severe Grazing - Frequent and Severe Utilization of the Cool-season Mid-grasses during the Growing Season
GLMT - Grazing Land Mechanical Treatment
LTPG - Long-term Prescribed Grazing
MCSLG - Moderate, Continuous Season-long Grazing
NU, NF - No Use and No Fire
PG - Prescribed Grazing (proper stocking rates with adequate recovery periods during the growing season)
VLTPG - Very Long-term Prescribed Grazing (could possibly take generations)
WF - Wildfire (Natural or Human Caused)

State 1
Basin Wildrye/Cottonwood

Community 1.1
Basin Wildrye/Cottonwood

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores, occasional overflows during flooding events, and periodic fires. Potential vegetation is about 60% grasses or grass-like plants, 15% forbs and 25% woody plants. Cool season tall and mid-grasses dominate this state. The major grasses include basin wildrye, slender wheatgrass, green needlegrass, and rhizomatous wheatgrasses. Other grasses occurring in this state include Canada wildrye, big bluegrass, and prairie sandreed. Narrowleaf cottonwood of various age classes comprises the primary overstory species, while basin big sagebrush and a variety of riparian shrub species comprise the main shrub species. A variety of forbs also occurs in this state and plant diversity is high (see Plant Composition Table). 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 3000 lbs./acre in above average years. This plant community is extremely stable and well adapted to the Northern Intermountain Desertic Basins climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity). Transitions or pathways leading to other plant communities are as follows: • Moderate, continuous season-long grazing and Drought will convert this plant community to the Mature cottonwoods/Cool-Season Mid-Grass Plant Community. Prolonged drought will exacerbate this transition, as periodic flooding of the site will not occur. • Wildfires (if severe) will convert this plant community to the Cottonwood Sapling/Riparian Shrub Regeneration Plant community.

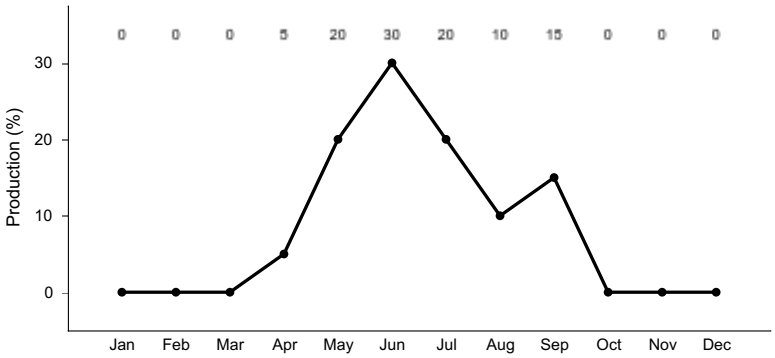


Figure 8. Plant community growth curve (percent production by month). WY0702, 10-14E Extra water sites - LL, SL, Ov, CyO.

State 2
Mature Cottonwoods/Cool Season Mid-Grass

Community 2.1
Mature Cottonwoods/Cool Season Mid-Grass

This plant community evolved under moderate grazing by domestic livestock, periodic flooding, and fire suppression. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Cottonwood, sagebrush, and riparian shrubs comprise >35% of the total annual production of this plant community. Dominant grasses include slender wheatgrass, rhizomatous wheatgrasses, needleandthread, and bottlebrush squirreltail. Grasses of secondary importance include Sandberg bluegrass, big bluegrass, and Canada wildrye. Basin big and silver sagebrush and a variety of riparian species comprise most of the total annual shrub production. Cottonwood stands are still a prominent part of the plant community. When compared to the Historical Climax Plant Community, basin wildrye has decreased. Green needlegrass, rhizomatous wheatgrasses, big bluegrass, and Sandberg bluegrass and other more upland grass species have increased. Willow, basin big sagebrush, snowberry, silver buffaloberry, and wild rose have increased. The percentage of mature cottonwoods to younger aged trees has increased although young saplings and mid aged trees are still healthy and flourish in this site. Cottonwood saplings are not as extensive. The total annual production (air-dry weight) of this state is about 2000 pounds per acre, but it can range from about 1300 lbs./acre in unfavorable years to about 2800 lbs./acre in above average years. 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. Transitional pathways leading to other plant communities are as follows: • Prescribed grazing and reoccurrence of periodic flooding will result in a plant community very similar to the Historic Climax Plant Community. Low intensive fires will hasten this transition. • Wildfires (if severe) will convert this plant community to the Cottonwood Sapling/Riparian Shrub Regeneration Plant community. • Frequent and severe grazing plus channelization and no fire, will convert this plant community to a Bluegrass Sod/Over-Mature Cottonwood Stand Plant Community. • Frequent and severe grazing plus channelization or infrequent flooding plus encroachment, will convert this plant community to the Russian olive Stand Plant community. This transition to a more regulated hydrologic regime favors the proliferation of Russian olive and if a seed source is available, colonization will usually occur.

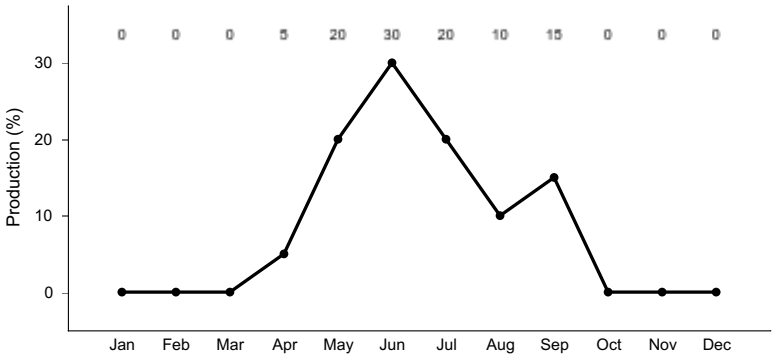


Figure 9. Plant community growth curve (percent production by month). WY0702, 10-14E Extra water sites - LL, SL, Ov, CyO.

State 3
Cottonwood Sapling/ Riparian Shrub Regeneratoin

Community 3.1
Cottonwood Sapling/ Riparian Shrub Regeneratoin

Historically, this plant community was probably 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 cottonwood stand and provided microsites, 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 HCPC. 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 cottonwoods are not very resistant to high temperatures. Subsequently, the regeneration of cottonwood trees to a multiage 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 multiage cottonwood 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. Cottonwood saplings regeneration will depend on availability of seeds and seed bed conditions. Shrubs and cottonwood saplings usually make at least 40% and can even reach to 80% 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 weedy annuals may be extensive. Noxious weeds such as Russian knapweed, Canada thistle, and leafy spurge may also become established and should be treated. When compared to the HCPC 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) of this state varies depending on the stage of the succession but about 1500 pounds per acre is normal. It can range from about 1000 lbs./acre in unfavorable years to about 2000 lbs./acre in above average years. This state 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. Transitional pathways leading to other plant communities are as follows: • No fire plus prescribed grazing will result in a plant community very similar to the Historic Climax Plant Community. Periodic flooding will hasten this transition. • No fire plus frequent and severe grazing and/or channelization or infrequent flooding will convert this plant community to a Bluegrass Sod/Mixed Shrub Plant community. • Fire will keep this in the Cottonwood Sapling/Riparian Shrub Regeneration Plant community.

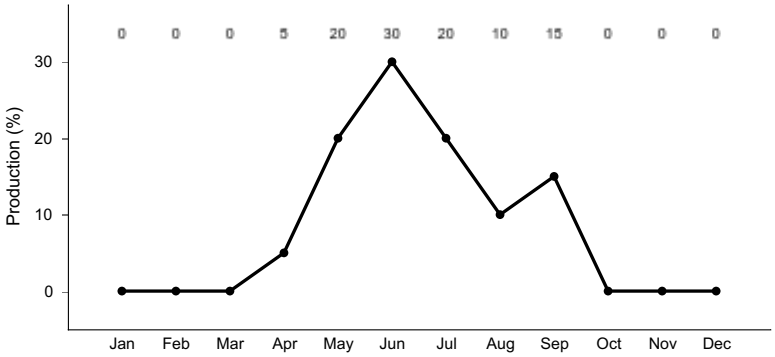


Figure 10. Plant community growth curve (percent production by month). WY0702, 10-14E Extra water sites - LL, SL, Ov, CyO.

State 4
Bluegrass Sod/Over-Mature Cottonwood Stand

Community 4.1
Bluegrass Sod/Over-Mature Cottonwood Stand

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. This plant community is dominated by a dense short grass sod of bluegrass and includes a mosaic of mature cottonwoods, sagebrush and riparian shrub overstory. Weedy forbs are prevalent and noxious weeds such as Russian knapweed, Canada thistle, and leafy spurge may invade the site if a seed source is available. Shrub species include big and silver sagebrushes, rubber rabbitbrush, willows, western snowberry, and wild rose. The cottonwood stands consist of old-growth trees, which are in a state of decline. Standing dead, dying branches and downed trees are evident. When compared to the Historic Climax Plant Community, the tall and medium grasses are mostly absent. Short grasses are dominant and weedy annuals are common. Shrubs will have increased as a percentage of the total production, but will not dominate as the sod prevents a homogeneous shrub cover. Areas of bare ground may have increased in patches and total production has decreased. Russian olive may begin invading this site and if conditions are right and left uncontrolled, will begin the process of displacing cottonwoods as the main tree species. Total production is only slightly reduced as shrubs offset the loss of tall and mid perennial grasses. The total annual production (air-dry weight) of this state is about 1600 pounds per acre, but it can range from about 1200 lbs./acre in unfavorable years to about 2000 lbs./acre in above average years. The sod component of this plant community is extremely resistant to change and continued frequent and severe grazing or the removal of grazing does not seem to affect the plant composition or structure of the plant community. The biotic integrity of this state is mostly not functional as plant diversity is poor, especially the amount of herbaceous species. The vegetative structure is not intact as the cottonwoods are not reproducing due to the sod. The shrub component may still be within a reasonable percentage of the total composition as the HCPC. This sod bound plant community is very resistant to water infiltration. While this sod protects the site itself, excessive runoff increases erosion on bare ground and can cause rill channels and gully erosion. Water flow patterns are obvious in the bare ground areas and shrubs and sod patches are pedestalled. Rill channels are noticeable in the interspaces and gullies may be establishing where rills have concentrated. The watershed is not functioning, as runoff is excessive and erosional processes are accelerated and the season overflow and water table is absent. Transitional pathways leading to other plant communities are as follows • Hydrologic restoration and grazing land mechanical treatment, will convert this plant community in to the Cottonwood Sapling/Riparian Shrub Regeneration Plant community. Restoring the hydrological function of an area is usually very expensive and may take many years. This may require

reintroducing both periodic flooding and an overflow regime. In addition, the bluegrass sod may require grazing land mechanical treatments, such as chiseling and reseeding with natives to accelerate recovery where few desirable plants remain. Fire may also be necessary to open up areas dominated by riparian shrubs so cottonwood seedlings can again become established. • Frequent and severe grazing plus no encroachment, will convert this plant community to the Bluegrass Sod/Mixed Shrub Plant community. • Frequent and severe grazing plus channelization or infrequent flooding plus encroachment, will convert this plant community to the Russian Olive Stand Plant community. This transition to a more regulated hydrologic regime favors the proliferation of Russian olive and if a seed source is available, colonization will usually occur.

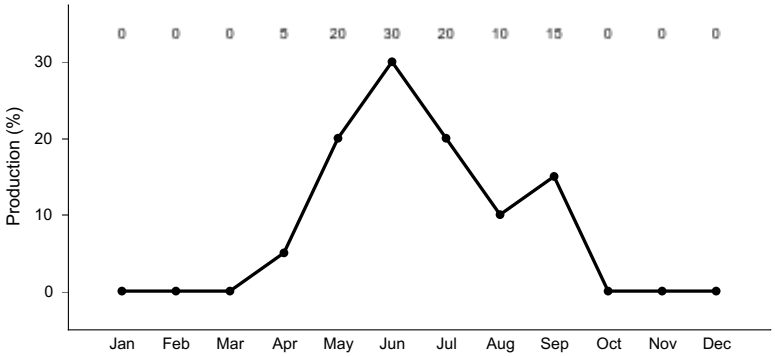


Figure 11. Plant community growth curve (percent production by month). WY0702, 10-14E Extra water sites - LL, SL, Ov, CyO.

State 5
Bluegrass Sod/Mixed Shrub

Community 5.1
Bluegrass Sod/Mixed Shrub

This plant community evolved under frequent and severe grazing as well as the disruption of the hydrologic cycle. The cottonwood trees have been mostly removed with the exception of a few mature trees near the new incised stream channel. Short grasses and shrubs dominate, but species composition depends on the characteristic of the site. Shrub species frequency can range from a dominant basin big sagebrush plant community on drier warmer sites to a mixture of sagebrush and riparian species on cooler wetter sites. Tall and medium cool season grasses have been reduced or eliminated. Dense sod patches of bluegrass and/or upland warm season grasses occur amongst the shrubs and bare ground. The annual grasses and forbs, such as cheatgrass, kochia, halogeton, and Russian thistle, are prevalent along with noxious weeds such as Russian knapweed. Total annual production is mostly from shrubs and these grasses. Shrubs can make up to 40% of the total annual production. When compared with the Bluegrass Sod/Over-Mature Cottonwood Stand Plant Community or HCPC, the annual production is reduced as more bare ground is now exposed but the bluegrass and shrub component makes up for some of this loss in total production. The total annual production (air-dry weight) of this state is about 1250 pounds per acre, but it can range from about 1000 lbs./acre in unfavorable years to about 1500 lbs./acre in above average years. This plant community is resistant to change as the sod and shrubs become more dominant. These areas may actually become less susceptible to severe fire as the sod becomes denser. Continued frequent and severe grazing or the removal of grazing does not seem to affect the plant composition or structure of the plant community. Short grasses, weedy species and bare ground compromise the biotic integrity. Plant diversity is poor and the potential for native grasses to reproduce is absent. The shift in the vegetative structure and function is extreme and the biotic integrity is lost. The soil of this state is somewhat protected where the sod patches are located and the dense shrubs occur, but erosion has accelerated in places between the patches where bare ground may be common. Water flow patterns and pedestalling are obvious. Infiltration is reduced and runoff is increased. Rill channels may be noticeable in the interspaces. Transitional pathways leading to other plant communities are as follows: • Grazing Land Management Treatment plus brush management plus prescribed grazing will convert this plant community to a Cool-Season Upland Grass Plant Community. • Hydrologic restoration and grazing land mechanical treatment, will convert this plant community in to the Cottonwood Sapling/Riparian Shrub Regeneration Plant community. Restoring the hydrological function of an area is usually very expensive and may take many years. This may require reintroducing both periodic flooding and an overflow regime. In addition, the bluegrass sod may require grazing land mechanical treatments, such as chiseling and reseeding with natives to accelerate recovery where few desirable plants remain. Fire may also be necessary to open up areas dominated by riparian shrubs so cottonwood seedlings

can again be established.

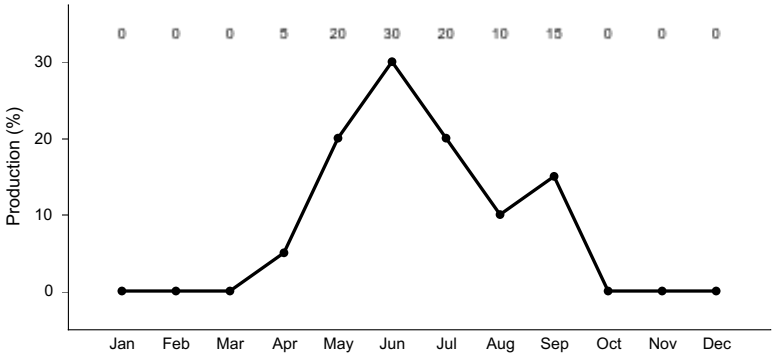


Figure 12. Plant community growth curve (percent production by month). WY0702, 10-14E Extra water sites - LL, SL, Ov, CyO.

State 6
Cool-Season Upland Grass

Community 6.1
Cool-Season Upland Grass

This plant community can occur where the Bluegrass Sod/Mixed Shrub Plant Community undergoes grazing land mechanical treatment, brush management and prescribed grazing but the hydrology has not be restored. Preferred cool season grasses have been established and shrubs have been controlled, but the upland plants are more the dominant species. 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 basin big sagebrush, rubber rabbitbrush, and silver sagebrush. Small patches of riparian shrubs may remain where moisture can accumulate. Perennial cool season mid-grasses have been established such as rhizomatous wheatgrasses, Indian ricegrass, needleandthread, and bottlebrush squirreltail. Other important grasses include Sandberg bluegrass and blue grama. Basin wildrye and slender wheatgrass may also be reestablishing in small pockets where additional moisture accumulates but will be infrequent. Patches of annuals such as cheatgrass and other weedy annual forbs such as halogeton, Russian thistle, and kochia, may persist on this site. Noxious weeds such as Russian knapweed may also remain, if not treated. The interspaces between plants will have diminished in size. When compared with the HCPC, 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 about 1800 pounds per acre, but it can range from about 1200 lbs./acre in unfavorable years to about 2400 lbs./acre in above average years. 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. Transitional pathways leading to other plant communities are as follows: • Frequent and severe grazing will convert this plant community to the Bluegrass Sod/Mixed Shrub Plant community. Prolonged drought will exacerbate this transition. • Hydrologic restoration and grazing land mechanical treatment, will convert this plant community in to the Cottonwood Sapling/Riparian Shrub Regeneration Plant community. Restoring the hydrological function of an area is usually very expensive and may take many years. This may require reintroducing both periodic flooding and an overflow regime. In addition, the bluegrass sod may require grazing land mechanical treatments, such as chiseling and reseeding with natives to accelerate recovery where few desirable plants remain. Fire may also be necessary to open up areas dominated by riparian shrubs so cottonwood seedlings can again be established.

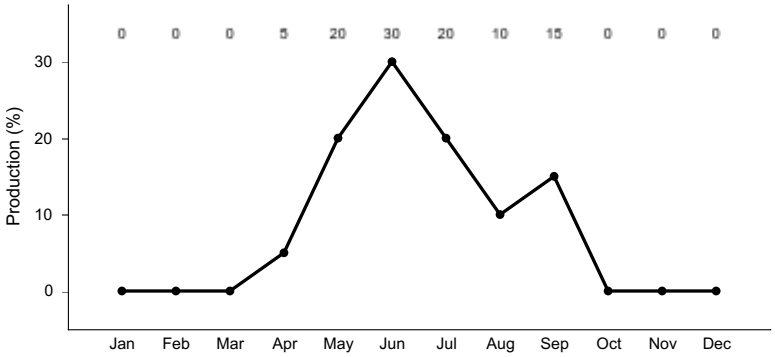


Figure 13. Plant community growth curve (percent production by month). WY0702, 10-14E Extra water sites - LL, SL, Ov, CyO.

State 7
Russian Olive Stand

Community 7.1
Russian Olive Stand

This plant community is the result of a disruption in the hydrologic system of the watershed and usually improper grazing use. 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. Normal flooding patterns are no longer possible, which is a main feature of this ecological site and a must for cottonwood recruitment. Without normal flooding Russian olive proliferates and colonizes the site. Shrubs can be common and dense, but the composition varies depending on the available moisture and soil texture. Past cottonwood galleries now are comprised mostly of mature dying trees or standing dead. Russian olive is the main tree-like overstory species and basin big sagebrush, silver sagebrush, and rubber rabbitbrush comprise the main shrub species. The understory is made-up of primarily short grasses or cheatgrass. Noxious weeds will have likely invaded the site such as Russian knapweed, Canada thistle, and leafy spurge. The interspaces between plants increase in size leaving mostly bare ground, which is exposed to erosion or further invasion by weedy plants. Plant diversity is poor. When compared with the HCPC, the annual production is reduced as the tall and mid-grasses have been replaced, but the Russian olive and shrub production compensates for some of the decline in the herbaceous production. The total annual production (air-dry weight) of this state is about 1250 pounds per acre, but it can range from about 1000 lbs./acre in unfavorable years to about 1500 lbs./acre in above average years. This plant community is resistant to change as the Russian olive stand becomes more dominant. These areas may actually be more resistant to fire as less fine fuels are available and the bare ground between the shrubs is increased. Continued frequent and severe grazing or the removal of grazing does not seem to affect the plant composition or structure of the plant community. Russian olives, annual grasses, weedy species and bare ground compromise the biotic integrity. Plant diversity is poor and the potential for native tall and mid perennial grasses to reproduce is absent. The shift in the vegetative structure and function is extreme and the biotic integrity is lost. The watershed is not functioning correctly, as the normal flooding regime is eliminated. Infiltration is reduced and excessive runoff is common. The biotic integrity is lacking and invasive species are widespread. Transitional pathways leading to other plant communities are as follows • Brush management plus prescribed grazing and seeding if necessary will convert this plant community to a Perennial Grass/Russian Olive Plant community. Russian olive plants will continue to be a main component of this community as suppression or containment of this plant is usually temporary and will not result in total eradication. • Grazing land mechanical treatment, brush management, and prescribed grazing may convert this plant community to the Historic Climax Plant Community, but recovery is mostly impractical as both the return to a natural hydrologic regime and the total removal of Russian olive is both expensive and typically not obtainable. Russian olive will still probably persist as suppression and containment of this plant is optimal. Any methods of control should be followed by revegetation to reduce regeneration of this plant and other weedy species.

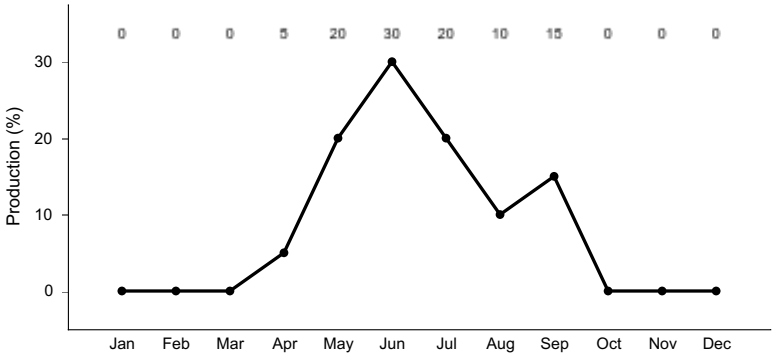


Figure 14. Plant community growth curve (percent production by month). WY0702, 10-14E Extra water sites - LL, SL, Ov, CyO.

State 8
Perennial Grass/ Russian Olive

Community 8.1
Perennial Grass/ Russian Olive

This plant community occurs where control of Russian olive has been successful, but the natural hydrologic regime has not and will not return to pre-channelization or to a periodic flooding regime. Russian olives if controlled are confined to localized patches. Mid upland grasses have been established, but the tall grasses associated with riparian areas have been removed. Upland species are now the dominant plants. These plants make up the understory species in this plant community. Dominant grasses include rhizomatous wheatgrasses, needleandthread, and bottlebrush squirreltail. Other grasses include Sandberg bluegrass, blue grama and threadleaf sedge. Forbs commonly found in this plant community include smooth woodyaster, scarlet globemallow fringed sagewort, hairy goldaster, and phlox. Willows may be present in small patches, but most have been replaced as have the other riparian shrubs. When compared to the Historical Climax Plant Community, the production of perennial grasses and total production have been greatly reduced. The total annual production (air-dry weight) of this state is about 1500 pounds per acre, but it can range from about 1200 lbs./acre in unfavorable years to about 2000 lbs./acre in above average years. This plant community is mostly resistant to change, but species composition can be altered by encroachment and improper grazing. The herbaceous component is stable, but does not comprise the composition of HCPC. Plant vigor and replacement capabilities are sufficient. The biotic community is not intact because the tall grasses associated with the riparian areas are absent and Russian olive is still a part of the plant community. Plant diversity is moderate. Soils are mostly stable and recent soil loss is minimal. Water flow patterns and litter movement is stable. Incidence of pedestalling is improving. The watershed is not functioning due to disruption in the hydrologic regime. Transitional pathways leading to other plant communities are as follows: • Frequent and severe grazing plus encroachment will convert this plant community to the Russian olive Stand Plant community. Drought will exacerbate this conversion. • Grazing land mechanical treatment, brush management, and prescribed grazing may convert this plant community to the Historic Climax Plant Community, but recovery is mostly impractical as both the return to a natural hydrologic regime and the total removal of Russian olive is both expensive and typically not obtainable. Russian olive will still probably persist as suppression and containment of this plant is optimal. Any methods of control should be followed by revegetation to reduce regeneration of this plant and other weedy species.

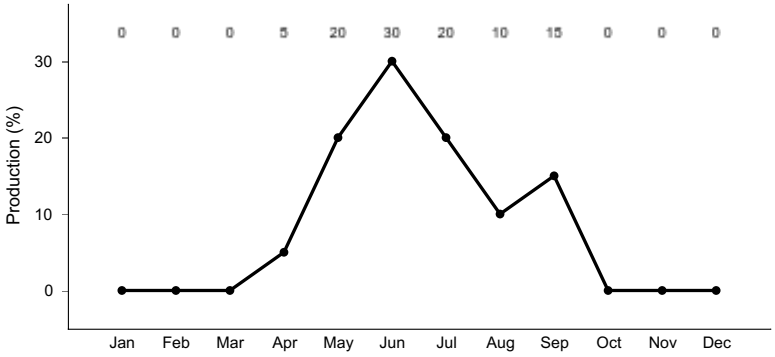


Figure 15. Plant community growth curve (percent production by month).

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				387–773	
	basin wildrye	LECI4	*Leymus cinereus*	387–773	–
2				129–387	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	129–387	–
3				129–387	
	green needlegrass	NAVI4	*Nassella viridula*	129–387	–
4				129–387	
	western wheatgrass	PASM	*Pascopyrum smithii*	129–387	–
5				0–258	
	Grass, perennial	2GP	*Grass, perennial*	0–129	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–129	–
	sedge	CAREX	*Carex*	0–129	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–129	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–129	–
Forb					
6				129–387	
	Forb, perennial	2FP	*Forb, perennial*	0–129	–
	silverweed cinquefoil	ARAN7	*Argentina anserina*	0–129	–
	milkvetch	ASTRA	*Astragalus*	0–129	–
	Indian paintbrush	CASTI2	*Castilleja*	0–129	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0–129	–
	larkspur	DELPH	*Delphinium*	0–129	–
	aster	EUCEP2	*Eucephalus*	0–129	–
	lupine	LUPIN	*Lupinus*	0–129	–
	phlox	PHLOX	*Phlox*	0–129	–
	dock	RUMEX	*Rumex*	0–129	–
	clover	TRIFO	*Trifolium*	0–129	–
Shrub/Vine					
7				129–258	
	narrowleaf cottonwood	POAN3	*Populus angustifolia*	129–258	–
8				258–387	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–129	–
	boxelder	ACNE2	*Acer negundo*	0–129	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–129	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–129	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–129	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–129	–
	golden currant	RIAU	*Ribes aureum*	0–129	–

	Woods' rose	ROWOW	*Rosa woodsii var. woodsii*	0–129	–
	willow	SALIX	*Salix*	0–129	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–129	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–129	–

Animal community

Animal Community – Wildlife Interpretations

Historic Climax Plant Community: 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 Cottonwoods/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.

Cottonwood 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.

Bluegrass Sod/Over-Mature Cottonwood Stand: The proximity to water makes this state important for wildlife such as birds, mule deer, and whitetail deer. Grazers may find the sod grass 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.

Bluegrass Sod/Mixed Shrub: The proximity to water makes this state important for wildlife such as birds, mule deer, and whitetail deer. However, the plant community composition is less diverse and productive, and thus, less apt to meet the seasonal needs of these animals. The shrub cover does provide good thermal and escape cover for both large animals and upland birds. However, it provides little foraging opportunities for upland game birds, as fewer forbs are available. 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.

Russian Olive Stand: The proximity to water makes this state important for wildlife such as birds, mule deer, and whitetail deer. This is useful for the same large grazers that would use the Historic Climax Plant Community. The low production of herbaceous understory of this plant community decreases the foraging potential and cover for many wildlife species. The increase in tall shrubs, however, makes this an attractive site for thermal and escape cover for large grazers and upland birds. It can provide foraging and nesting opportunities for songbirds. Some species utilize the Russian olive berries for food and are attracted to these colonized areas.

Perennial Grass/Russian Olive: The abundant production and proximity to water make this state important for wildlife such as birds, mule deer, and whitetail deer. This plant community is useful for the same large grazers that would use the Historic Climax Plant Community. The increase in tall shrubs production makes this even more

attractive to some wildlife due to the increase in thermal and escape cover. It can provide foraging and nesting opportunities for upland game birds and songbirds. Some species utilize the Russian olive berries for food and are attracted to these colonized areas.

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 (lb./ac)	Carrying Capacity* (AUM/ac)
Historic Climax Plant Community	1600-3000	.60
Mature Cottonwoods/Cool Season Mid-Grass	1300-2800	.50
Cottonwood Sapling/Riparian Shrub Regeneration	1000-2000	.35
Bluegrass Sod/O-M Cottonwood Stand	1200-2000	.22
Bluegrass Sod/Mixed Shrub	1000-1500	.15
Cool-Season Upland Grass	1200-2400	.35
Russian Olive Stand	1000-1500	.15
Perennial Grass/Russian Olive	1200-2000	.22

* - 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 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 in the original site description was derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in developing the original 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.

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 developing the Loamy range site include: Chris Krassin, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist.

Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Ray Gullion, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Jack Mononi, Range Management Specialist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS.

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 10 points, clipped a minimum of 3 of these 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 (10 – 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

Scott Woodall, 10/04/2019

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

Indicators

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

2. **Presence of water flow patterns:** Water flow patterns sometimes evident in 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 0-20%.

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 4.0 or greater.

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):** No compaction layer exists.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: mid-size, cool season bunchgrasses

    Sub-dominant: tall, cool season bunchgrasses = cool season rhizomatous grasses = perennial shrubs = perennial forbs

    Other: treesshort, cool season bunchgrasses

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal decadence, typically associated with shrub/tree component.

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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: 1600-3000 lb/ac (2300 lb/ac average); Metric: 1792-3360 kg/ha (2576 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 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.
