

Ecological site DX032X01W128 Lowland (LL) Big Horn Basin Wet

Last updated: 9/05/2019
Accessed: 05/21/2024

General information

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

MLRA notes

Major Land Resource Area (MLRA): 032X–Northern Intermountain Desertic Basins

Major land resource area (MLRA):

032X – Northern Intermountain Desertic Basins – This MLRA is comprised of two major Basins, the Big Horn and Wind River. These two basins are distinctly different and are split by LRU's to allow individual ESD descriptions. These warm basins are surrounded by uplifts and rimmed by mountains, creating a unique set of plant responses and communities. Unique characteristics of the geology and geomorphology single these two basins out.

Further information regarding MLRAs, refer to: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook.

LRU notes

Land Resource Unit (LRU):

32X01W (WY): This LRU is the Big Horn Basin within MLRA 32. This LRU is lower in elevation, slightly warmer and receives slightly less overall precipitation than the Wind River Basin (LRU 02). This LRU was originally divided into two LRU's - LRU A which was the core and LRU B which was the rim. With the most current standards, this LRU is divided into two Subsets. This group is ambiguous of the two official subsets and will be referred to as Subset W, capturing those sites that are a factor of water or other processes outside of the general subset divisions (climate). As the LRU shifts outer edges, aspect and relation to the major bodies of water and taller landforms create minor shifts in soil chemistry influencing the variety of ecological sites and plant interactions. The extent of soils currently correlated to this ecological site does not fit within the digitized boundary. Many of the noted soils are provisional and will be reviewed and corrected in mapping update projects. Other map units are correlated as small inclusions within other MLRA's/LRU's based on elevation, landform, and biological references.

Moisture Regime: Aquic, typic aridic, or ustic aridic.

Temperature Regime: Mesic

Dominant Cover: Rangeland, with Saltbush flats the dominant vegetative cover for this MLRA.

Representative Value (RV) Effective Precipitation: 5-14 inches (127 – 355 mm)

RV Frost-Free Days: 105-150 days

Classification relationships

Relationship to Other Established Classification Systems:

National Vegetation Classification System (NVC):

3 Xeromorphic Woodland, Scrub & Herb Vegetation Class
 3.B Cool Semi-Desert Scrub & Grassland Subclass
 3.B.1 Cool Semi-Desert Scrub & Grassland formation
 3.B.1.NE Western North American Cool Semi-Desert Scrub & Grassland Division
 M169 Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup

Ecoregions (EPA):

Level I: 10 North American Deserts

Level II: 10.1 Cold Deserts

Level III: 10.1.18 Wyoming Basin

Level IV: 10.1.18.g Big Horn Salt Desert Shrub Basin

Ecological site concept

- Site receives 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

R032XY104WY	Clayey (Cy) 5-9" Big Horn Basin Precipitation Zone Clayey sites tend to be upslope, or a step above the lowland site.
R032XY122WY	Loamy (Ly) 5-9" Big Horn Basin Precipitation Zone Loamy sites tend to be upslope, or a step above the lowland site.

Similar sites

R032XY328WY	Lowland (LL) 10-14" East Precipitation Zone Lowland 10-14" Foothills and Basins East P.Z., 032XY328WY has higher production.
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Table 1. Dominant plant species

Tree	(1) <i>Populus angustifolia</i>
Shrub	(1) <i>Artemisia tridentata</i> ssp. <i>tridentata</i>
Herbaceous	(1) <i>Leymus cinereus</i> (2) <i>Elymus trachycaulus</i>

Legacy ID

R032XA128WY

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) Intermontane basin > Alluvial fan (2) Intermontane basin > Drainageway (3) Intermontane basin > Stream terrace
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	1,128–1,829 m
Slope	0–6%
Water table depth	30–152 cm
Aspect	Aspect is not a significant factor

Climatic features

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

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

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	92-115 days
Freeze-free period (characteristic range)	116-138 days
Precipitation total (characteristic range)	178-229 mm
Frost-free period (actual range)	90-118 days
Freeze-free period (actual range)	112-147 days
Precipitation total (actual range)	178-254 mm
Frost-free period (average)	105 days
Freeze-free period (average)	129 days
Precipitation total (average)	203 mm

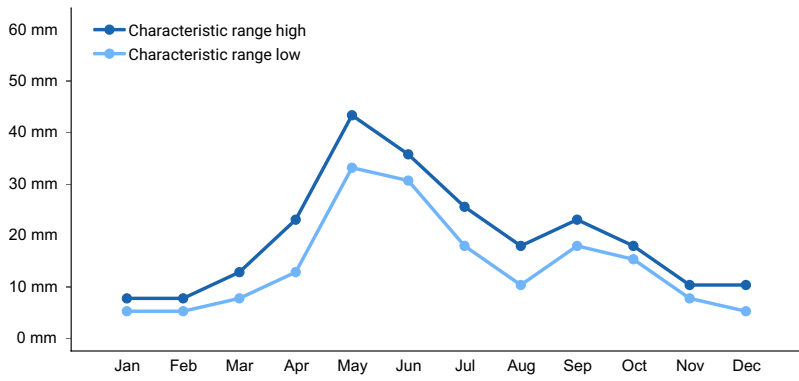


Figure 1. Monthly precipitation range

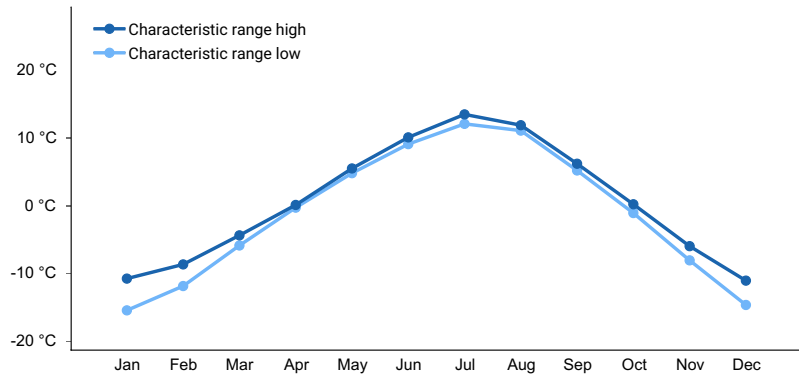


Figure 2. Monthly minimum temperature range

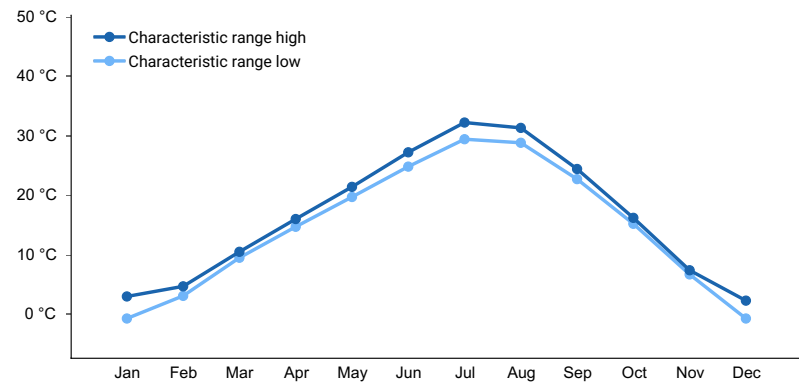


Figure 3. Monthly maximum temperature range

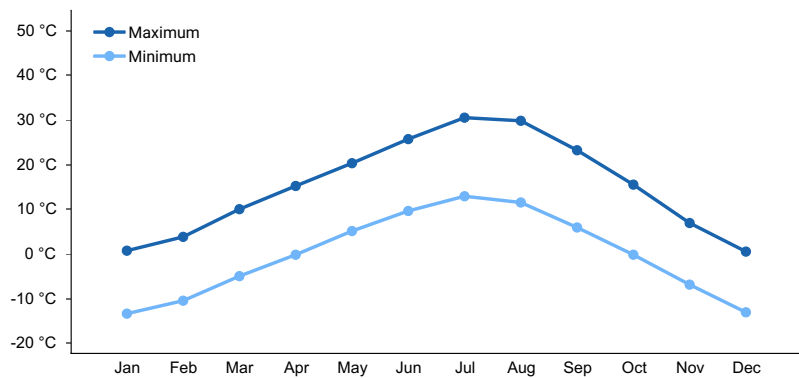


Figure 4. Monthly average minimum and maximum temperature

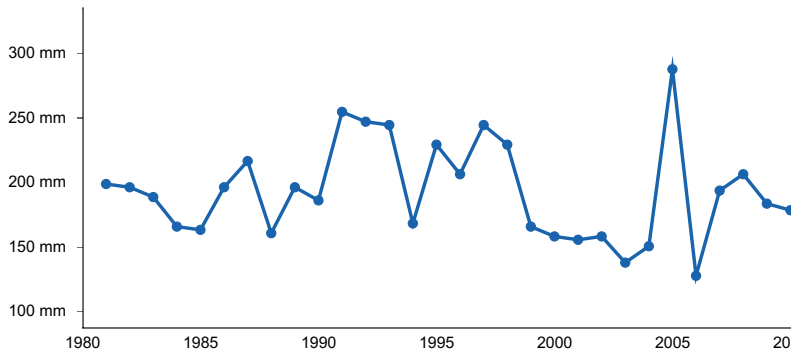


Figure 5. Annual precipitation pattern

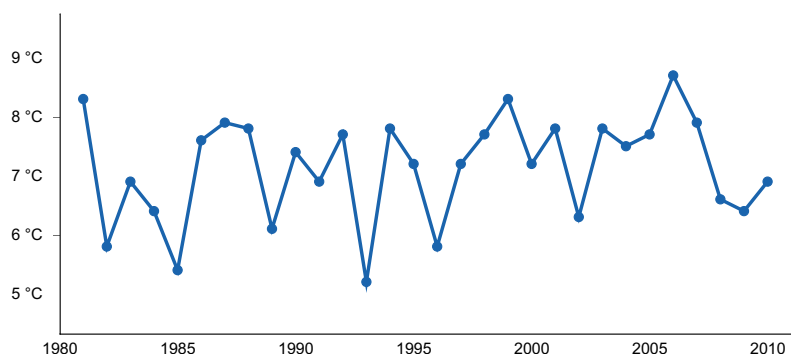


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

A fluctuating water table occurs in these areas and ranges from 1 to 5 feet, but is usually deeper than 3 feet. Overflow during high spring run-off also provides additional moisture to this site. Site is generally adjacent to an active channel (intermittent or perennial).

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 and ranges from 1 to 5 feet, but is usually deeper than 3 feet. 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: Baroid, Fluvents, Glending

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock (2) Alluvium–sandstone and shale
Surface texture	(1) Gravelly loam (2) Clay loam (3) Loamy sand (4) Sandy loam (5) Silt loam (6) Silty clay (7) 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)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–10
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 and cottonwood species, which are adapted to occasional periodic flooding and overflow and a fluctuating water table. Other significant vegetation includes a variety of riparian shrubs and forbs. The expected potential composition for this site is about 60% grasses, 10% forbs and 30% 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 wild rose, silver buffaloberry, and big sagebrush will increase. Weedy annuals will invade. Cool season grasses such as basin wildrye, needleandthread and slender wheatgrass will decrease in frequency and production. Cottonwoods mature and become decadent and do not reproduce.

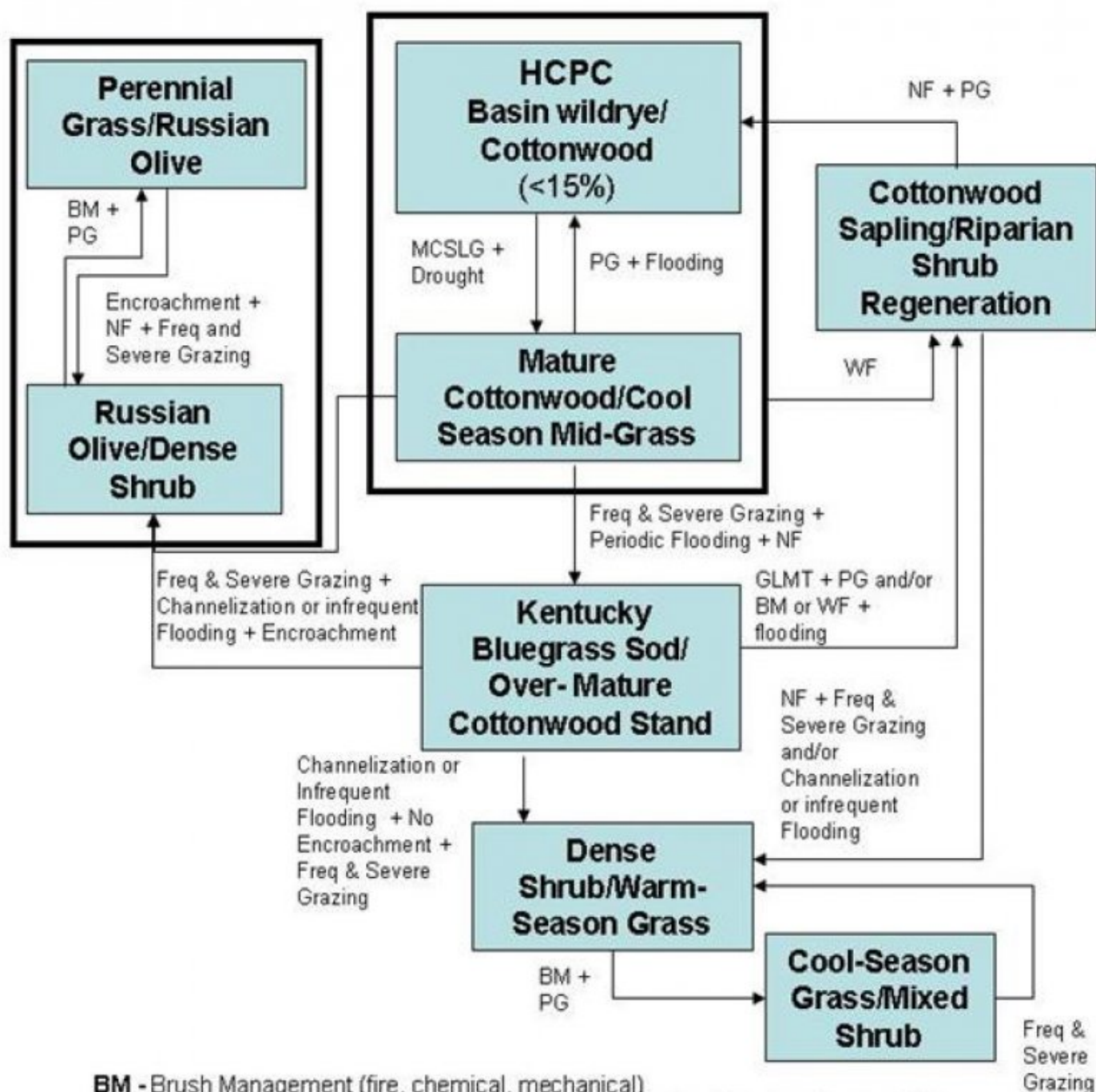
The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical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

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

State and transition model

Site Type: Rangeland
MLRA: 32 – Northern Intermountain Desertic Basins

Lowland 5-9 P.Z. BH
032XY128WY



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 Plant Community

Community 1.1

Basin Wildrye/Cottonwood Plant Community

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores, periodic flooding, and fires. Potential vegetation is about 60% grasses or grass-like plants, 10% forbs and 30% woody plants. Cool season tall and midgrasses dominate this state. The major grasses include basin wildrye and slender wheatgrass. Other grasses occurring in this state include rhizomatous wheatgrasses, Canada wildrye, bottlebrush squirreltail and needleandthread. Cottonwood species of various age classes are the primary tree species, while basin big sagebrush and a variety of riparian shrubs 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 1800 pounds per acre, but it can range from about 1400 lbs. /acre in unfavorable years to about 2400 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 fewer flooding events will occur. • Wildfires will convert this plant community to the Cottonwood Sapling/Riparian Shrub Regeneration Plant Community. Usually cottonwood sapling regeneration is relatively rapid unless the soils are sterilized. In this case, revegetation of the site is slow and may take many years. Low intensity or ground fires will result in thinning of the cottonwood stand and provide microsites, which can be quickly colonized by new saplings. These fires usually result in a mixed-aged stand of mature or younger trees with a sapling understory. Moderate or severe fires, however, usually will result in total stand mortality as cottonwoods are not very resistant to high temperatures. Under these scenarios, cottonwood seedlings can still quickly become established if the soils are not sterilized and an even aged stand will result. As with any wildfire, shrubs 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.

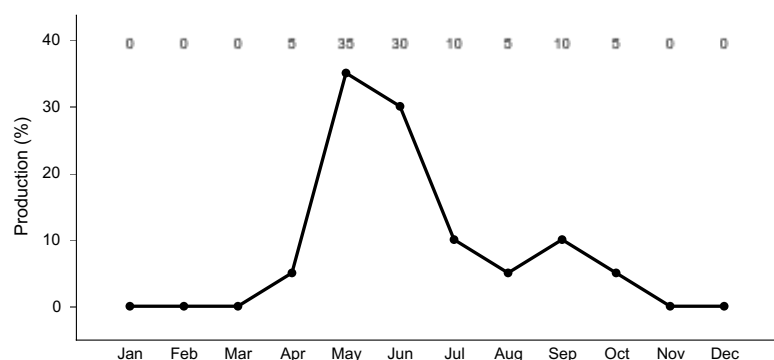


Figure 8. Plant community growth curve (percent production by month). WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

State 2

Mature Cottonwoods/Cool-Season Mid-Grass Plant Community

Community 2.1

Mature Cottonwoods/Cool-Season Mid-Grass Plant Community

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, basin big sagebrush and riparian shrubs comprise up to one-third to one-half 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. Big

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. Needleandthread and Sandberg bluegrass and other more upland grass species have increased. Big sagebrush, 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 1500 pounds per acre, but it can range from about 1000 lbs. /acre in unfavorable years to about 2000 lbs. /acre in above average years. This state is stable and protected from excessive erosion. 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. 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. • Wildfires will convert this plant community to the Cottonwood Sapling/Riparian Shrub Regeneration Plant Community. Usually cottonwood sapling regeneration is relatively rapid unless the soils are sterilized. In this case, revegetation of the site is slow and may take many years. Low intensive or ground fires will result in thinning of the cottonwood stand and provide microsites, which can be quickly colonized by new saplings. These fires usually result in a mixed-aged stand of mature or younger trees with a sapling understory. Moderate or severe fires, however, usually will result in total stand mortality as cottonwoods are not very resistant to high temperatures. Under these scenarios, cottonwood seedlings can still quickly become established, if the soils are not sterilized and an even aged stand will result. As a result of any wildfire, shrubs can also play an important role as to what plants will emerge first and what the species composition will develop into after fire succession. • Frequent and severe grazing and flooding with no fire will convert this plant community to a Kentucky Bluegrass Sod/ Riparian Shrub Plant Community. • Frequent and severe grazing plus channelization or infrequent flooding plus encroachment, will convert this plant community to the Russian Olive/Dense Shrub 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.

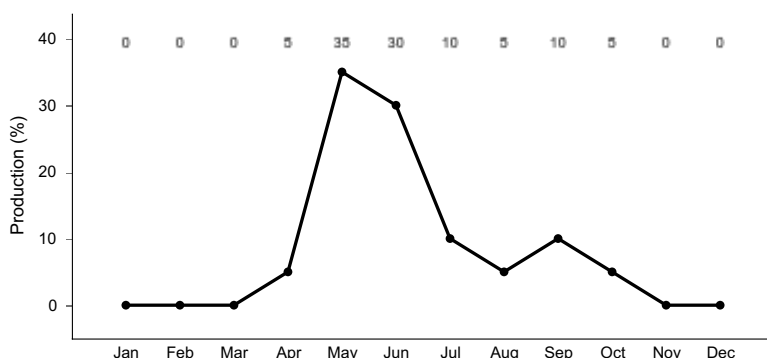


Figure 9. Plant community growth curve (percent production by month).
WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

State 3

Cottonwood Sapling/Riparian Shrub Regeneration Plant Community

Community 3.1

Cottonwood Sapling/Riparian Shrub Regeneration Plant Community

Historically, this plant community is the result of a natural fire regime within a riparian community. These plant communities existed as part of the natural fire regime and were relatively short lived and were usually less intense. Currently, fire suppression management has resulted in more fuels and when fire does occur these fires are more intense. Subsequently, many areas today burn hotter and revegetation succession is prolonged. Cottonwoods are normally a relatively rapid regenerator as are many of the riparian shrubs, unless the soils are sterilized during severe and high intensive fires. Low intensive or ground fires will result in thinning of the cottonwood stand and provide microsites, which can be quickly colonized by new saplings. These fires usually result in a mixed-aged stand of mature or younger trees with a sapling understory. Moderate or severe fires, however, usually will result in total stand mortality as cottonwoods are not very resistant to high temperatures. Under these scenarios, cottonwood seedlings can still quickly become established, if the soils are not sterilized and an even aged stand will result. 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. As this is a dynamic community, the plant composition will vary. The effects of fire in these plant communities have not been adequately studied and the understanding of fire succession is minimal. Dominant grasses may include streambank wheatgrass, rhizomatous wheatgrasses, needleandthread, and bottlebrush squirreltail. Grasses of secondary importance include Sandberg bluegrass and big bluegrass. A variety of riparian species will regenerate and may become dense during this regeneration process. Cottonwood stands will be variable depending on the intensity of the fire. Weeds such as cheatgrass or noxious weeds such as Russian knapweed, Canada thistle, and leafy spurge may become established and should be treated. The total annual production (air-dry weight) of this state varies depending on the stage of the succession but about 800 pounds per acre is normal. It can range from about 1800 lbs. /acre in unfavorable years to about 600 lbs. /acre in above average years. This state is not stable and is part of a transition. Erosion may be excessive until the site is revegetated. Erosion control may be necessary if soil loss is excessive, however, be aware that cottonwood regeneration depends on exposed bare soil. The biotic integrity of this plant community is 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 Dense Shrub/Warm Season Grass Plant Community. • Fire will keep this in the Cottonwood Sapling/Riparian Shrub Regeneration Plant Community.

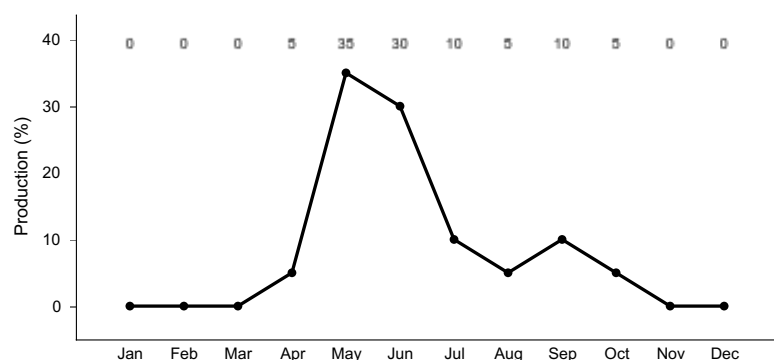


Figure 10. Plant community growth curve (percent production by month).
WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

State 4

Kentucky Bluegrass Sod/Over-Mature Cottonwood Stand Plant Community

Community 4.1

Kentucky Bluegrass Sod/Over-Mature Cottonwood Stand Plant Community

This plant community is the result of long-term improper grazing use. The hydrologic features of this site are relatively still functioning as flooding is occurring at similar frequency as in the past. This plant community is dominated by a dense short grass sod of Kentucky bluegrass and includes a mosaic of mature cottonwoods 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, silver buffaloberry, willows, western snowberry, and wild rose. The cottonwood stands consists 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 reduced or absent. Short warm season 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 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 Kentucky bluegrass offsets the loss of tall and mid perennial grasses. The total annual production (air-dry weight) of this state is about 1200 pounds per acre, but it can range from about 900 lbs. /acre in unfavorable years to about 1600 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 may or may not be functioning, as runoff is excessive and erosional processes are accelerated. Transitional pathways leading to other plant communities are as follows • Grazing land mechanical treatment, plus prescribed grazing and/or brush management or wildfire will convert this plant community in to the Cottonwood Sapling/Riparian Shrub Regeneration Plant Community. This sod is extremely resistant to change and will require grazing land mechanical treatments, such as chiseling to revert to a more preferred state. Reseeding areas with native plant species is also recommended as well as implementing proper grazing management to accelerate recovery where few desirable plants remain. Fire may also be necessary to open up areas dominated by riparian shrubs so cottonwood seedling can again be established. • Frequent and severe grazing plus channelization or infrequent flooding plus no encroachment, will convert this plant community to the Dense Shrub/Warm-Season Grass Plant Community. • Frequent and severe grazing plus channelization or infrequent flooding plus encroachment, will convert this plant community to the Russian Olive/Dense Shrub 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.

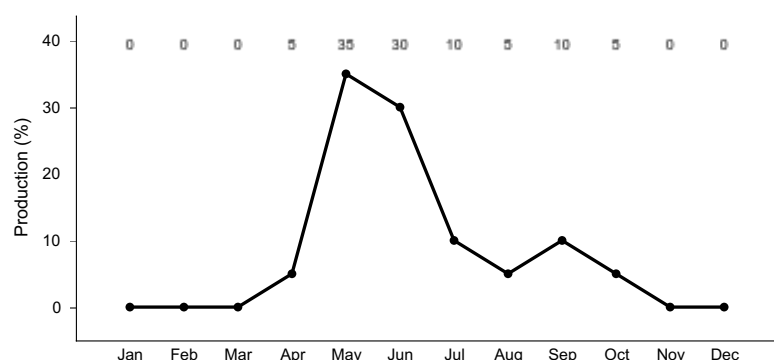


Figure 11. Plant community growth curve (percent production by month). WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

State 5

Dense Shrub/Warm-Season Grass Plant Community

Community 5.1

Dense Shrub/Warm-Season Grass Plant Community

This plant community evolved under frequent and severe grazing and an interruption in the frequency of flooding or channelization and no encroachment of Russian olive. The disruption, either directly by humans, such as dams or dikes, or indirectly through accelerated erosion and down cutting of the hydrologic system, has caused channelization and an interruption in the natural flooding regime. Extended periods of drought will exacerbate this situation. Shrubs dominate but the composition depends on the characteristic of the site. Sites with coarser soils are usually dominated by both basin big sagebrush and silver sagebrush and heavier soils by both basin big sagebrush and rubber rabbitbrush. Tall and medium cool season grasses have been reduced or eliminated. Dense sod patches of blue grama 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 warm-season grasses. Shrubs make up more than 35% of the total annual production. When compared with the HCPC, the annual production is reduced but the dense shrub component makes up for some of this loss in total production. The total annual production (air-dry weight) of this state is about 800 pounds per acre, but it can range from about 500 lbs. /acre in unfavorable years to about 1200 lbs. /acre in above average years. This plant community is resistant to change as the stand becomes more decadent. 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. Warm-season 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 but erosion has accelerated between these patches

where bare ground is common. Water flow patterns and pedestalling are obvious. Infiltration is reduced and runoff is increased. Rill channels may be noticeable in the interspaces and gullies may be establishing where rills have concentrated. Transitional pathways leading to other plant communities are as follows: • Brush management plus prescribed grazing will convert this plant community to a Cool-Season Grass/Mixed Shrub Plant Community. • Recovery to near Historic Climax Plant Community condition is impractical as the hydrologic regime has been disturbed.

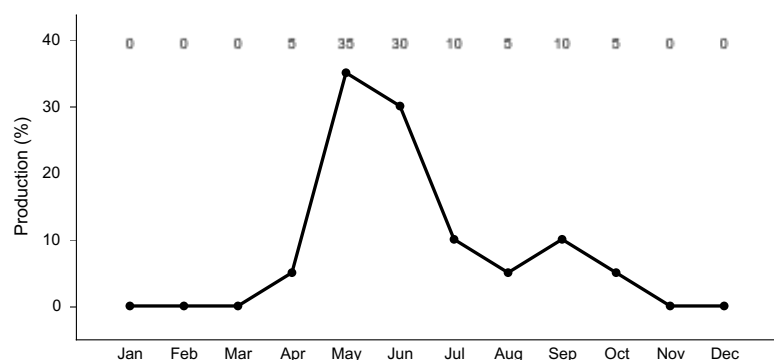


Figure 12. Plant community growth curve (percent production by month).
WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

State 6

Cool-Season Grass/Mixed Shrub Plant Community

Community 6.1

Cool-Season Grass/Mixed Shrub Plant Community

This plant community can occur where the Dense Shrub/Warm-Season Grass Plant Community under goes brush management treatment and a prescribed grazing management practice is implemented. Preferred cool season grasses have reestablished and shrubs have been controlled but are still a part of the community. Upland plants now dominate as the hydrologic regime has been disrupted and only infrequent or no flooding occurs. This site is dominated by an overstory of a variety of shrubs, such as basin big sagebrush, rubber rabbitbrush, and silver sagebrush. Perennial cool season mid-grasses have once again reestablished such as rhizomatous wheatgrasses, needleandthread, and bottlebrush squirreltail. Other important grasses include Sandberg bluegrass and blue grama. Patches of annuals such as cheatgrass and other weedy annual forbs such as halogeton, Russian thistle, and kochia, will 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 species are clearly unique. The total annual production (air-dry weight) of this state is about 1000 pounds per acre, but it can range from about 600 lbs./acre in unfavorable years to about 1400 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 Dense Shrub/Warm-Season Grass Plant Community. Prolonged drought will exacerbate this transition. • Recovery to near Historic Climax Plant Community condition is impractical as the hydrologic regime has been disturbed.

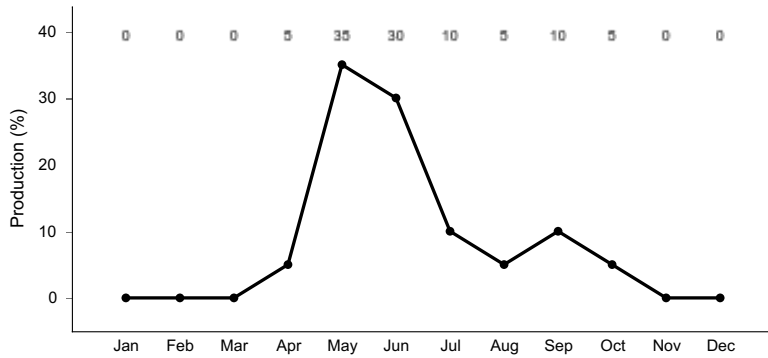


Figure 13. Plant community growth curve (percent production by month). WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

State 7

Russian Olive/Dense Shrub Plant Community

Community 7.1

Russian Olive/Dense Shrub Plant Community

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 down cutting of the hydrologic system, has caused channelization and 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 proliferate and colonize the site. Shrubs can be common and dense, but the composition varies depending on the characteristic of the site. Sites with coarser soils are usually dominated by both basin big sagebrush and silver sagebrush and heavier soils by both basin big sagebrush and rubber rabbitbrush. Past cottonwood galleries now are comprised mostly of mature dying trees or standing dead. Russian olive comprise the main overstory tree-like species and basin big sagebrush, silver sagebrush, and rubber rabbitbrush comprise the main shrub species. The understory is made up of primarily short warm season grasses or cheatgrass. Noxious weeds have invaded the site such as Russian knapweed, Canada thistle, and leafy spurge. The interspaces between plants increases 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 1000 pounds per acre, but it can range from about 750 lbs./acre in unfavorable years to about 1200 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 olive, 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. • Recovery to near Historic Climax Plant Community condition is impractical as the return to a natural hydrologic regime is too expensive or not possible. Any methods of Russian olive control should be followed by revegetation to reduce regeneration of this plant and other weedy species.

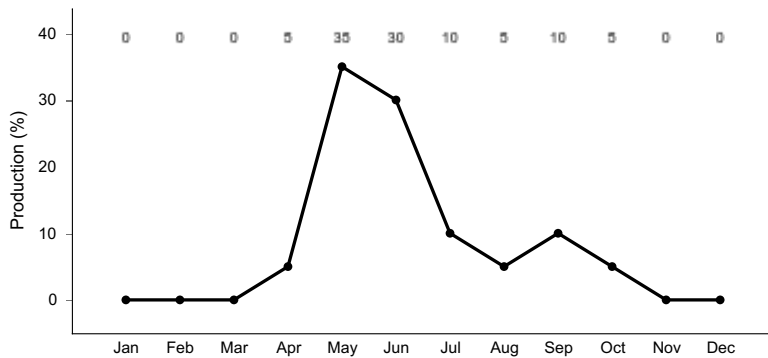


Figure 14. Plant community growth curve (percent production by month).
WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

State 8

Perennial Grass/Russian Olive Plant Community

Community 8.1

Perennial Grass/Russian Olive Plant Community

This plant community occurs where control of Russian olive and/or shrubs 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 are confined to localized patches. Mid-grasses have returned 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 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 1000 pounds per acre, but it can range from about 600 lbs./acre in unfavorable years to about 1600 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/Dense Shrub Plant Community. Drought will exacerbate this conversion. • Recovery to near Historic Climax Plant Community is impractical as the return to a natural hydrologic regime is too expensive or not possible.

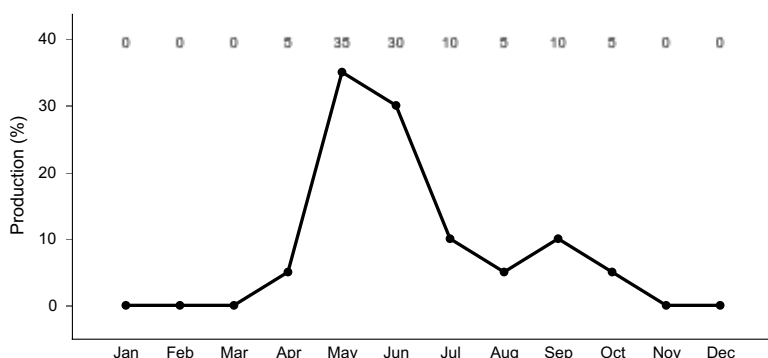


Figure 15. Plant community growth curve (percent production by month).
WY0502, 5-9BH Extra water sites - LL, Ov, CyO, SL.

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				202–504	
	basin wildrye	LECI4	<i>Leymus cinereus</i>	202–504	–
2				101–202	
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	101–202	–
3				202–504	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	202–504	–
4				101–303	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	101–303	–
5				0–202	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–101	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–101	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–101	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–101	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	0–101	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–101	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–101	–
Forb					
6				0–202	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–101	–
	aster	EUCEP2	<i>Eucephalus</i>	0–101	–
	phlox	PHLOX	<i>Phlox</i>	0–101	–
	dock	RUMEX	<i>Rumex</i>	0–101	–
Tree					
7				202–404	
	narrowleaf cottonwood	POAN3	<i>Populus angustifolia</i>	202–404	–
	narrowleaf cottonwood	POAN3	<i>Populus angustifolia</i>	202–404	–
Shrub/Vine					
8				0–303	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–101	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–101	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–101	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–101	–
	Woods' rose	ROWOW	<i>Rosa woodsii</i> var. <i>woodsii</i>	0–101	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–101	–

Animal community

Animal Community – Wildlife Interpretations

Historic Climax Plant Community: The abundant production and proximity to water 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 Cottonwood/Cool Season Mid-Grass: The abundant production and proximity to water 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.

Kentucky 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.

Dense Shrub/Warm-Season Grass: 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 dense 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 Grass/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 thus, less apt to meet the seasonal needs of these animals. 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.

Russian Olive/Dense Shrub: 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 Carrying Capacity*

(lb. /ac) (AUM/ac)

Historic Climax Plant Community 1400-2400 .4

Mature Cottonwood/Cool Season Mid-Grass 1000-2000 .33

Cottonwood Sapling/Riparian Shrub Regeneration 600-1800 .33

Kentucky Blue. Sod/O-M Cottonwood Stand 900-1600 .33

Dense Shrub/Warm-Season Grass 500-1200 .1

Cool-Season Grass/Mixed Shrub 600-1400 .2

Russian Olive/Dense Shrub 750-1200 .05

Perennial Grass/Russian Olive 600-1600 .2

* - 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 variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Inventory data references

Information presented here has been derived from NRCS inventory data. Field observations from range trained personnel were also used. Other sources used as references include: USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Inventory Data References

Data Source Number of Records Sample Period State County

SCS-RANGE-417 19 1965-1986 WY Park & others

Approval

Scott Woodall, 9/05/2019

Rangeland health reference sheet

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

Author(s)/participant(s)	Ray Gullion
Contact for lead author	ray.gullion@wy.usda.gov
Date	02/19/2008
Approved by	Marji Patz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.

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

3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 15-25% occurring in small areas throughout site

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:** None

7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Plant cover and litter is at 75% or greater of soil surface and maintains soil surface integrity. Soil Stability class is anticipated to be 5 or greater.

-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use Soil Series description for depth and color of A-horizon
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Grass canopy and basal cover should reduce raindrop impact and slow overland flow providing increased time for infiltration to occur. Healthy deep rooted native grasses enhance infiltration and reduce runoff. Infiltration is moderately slow to moderate.
-
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 or soil surface crusting should be present.
-
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 stature Grasses
- Sub-dominant: Shrubs Trees
- Other: Forbs Short Grasses/grasslikes
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Some decadence and mortality among tree species
-
14. **Average percent litter cover (%) and depth (in):**
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1800 lbs/ac
-
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:** Wild rose, Silver buffaloberry, Big sagebrush, Greasewood, Russian olive, Kentucky bluegrass, Smooth Brome, Annuals, other exotics, and Species found on Noxious Weed List
-
17. **Perennial plant reproductive capability:** All species are capable of reproducing.
-

