USDA Natural Resources
Conservation Service

Ecological site R058AY736MT
Riparian Woodland 10-19

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 058A–Northern Rolling High Plains, Northern Part

MLRA 058A, Northern Rolling High Plains (Northern Part), is an expansive and agriculturally and ecologically significant area encompassing 26 counties in southeast Montana (99 percent) and northeast Wyoming (1 percent). It stretches approximately 290 miles from east to west and 220 miles from north to south and comprises approximately 42,350 square miles (26,875,928 acres). The area is within the Missouri Plateau, Unglaciated, Section of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been eroded. Slopes generally are gently rolling to steep, and wide belts of steeply sloping badlands border a few of the larger river valleys. In some areas flat-topped, steep-sided buttes rise sharply above the general level of the plains. Elevations generally range from 2,950 to 3,280 feet, increasing from east to west and from north to south.

Tertiary continental shale, siltstone, and sandstone of the Fort Union Formation underlie the eastern one-third to one-half of this area. Marine and continental sediments of the Cretaceous Montana Group underlie the rest of the MLRA, generally at the higher elevations. There are also younger Cretaceous sediments of the Livingston Group occurring between the higher elevation Montana Group sediments and the lower elevation Tertiary sediments. The dominant soil orders in MLRA 058A are Entisols and Inceptisols. The soils in the area dominantly have a frigid soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. They range from shallow to very deep and are generally well drained and clayey or loamy.

The area primarily supports native prairie vegetation characterized by a variety of cool-season and warm-season graminoids, forbs, and shrubs. In the western portion of the

area, cool-season grasses such as western wheatgrass and bluebunch wheatgrass are dominant but, in the eastern portion of the area, warm-season grasses such as little bluestem and sideoats grama become dominant. Wyoming big sagebrush, silver sagebrush, and fringed sagewort are common shrub species throughout the area. Forested areas occur in rough hilly areas and river breaks, particularly in areas with higher precipitation. Common tree species are ponderosa pine and Rocky Mountain juniper with scattered pockets of Douglas fir.

More than 75 percent of this MLRA is native rangeland utilized for livestock production and more than 50 percent of the MLRA consists of privately-owned ranches. Approximately 15 percent of the MLRA is used as cropland. Other land uses including forestland, urban development, water, and other uses combine for less than 10 percent of the total land use.

Classification relationships

NRCS Soil Geography Hierarchy
• Land Resource Region: Western Great Plains
• Major Land Resource Area (MLRA): 058A Northern Rolling High Plains, Northern Part

National Hierarchical Framework of Ecological Units (Cleland et al., 1997; McNab et al., 2007)
• Domain: Dry
• Division: Temperate Steppe
• Province: Great Plains-Palouse Dry Steppe Province (331)
• Section: North Central Highlands (331K) and Powder River Basin (331G)

National Vegetation Classification Standard (Federal Geographic Data Committee, 2008)
• Class: Mesomorphic Tree Vegetation Class (1)
• Subclass: Temperate & Boreal Forest & Woodland Subclass (1.B)
• Formation: Temperate Flooded & Swamp Forest Formation (1.B.3)
• Division: Populus deltoides - Fraxinus pennsylvanica - Acer saccharinum Flooded & Swamp Forest Division (1.B.3.Na)
• Macrogroup: Populus deltoides - Fraxinus pennsylvanica / Salix spp. Flooded Forest Macrogroup (1.B.3.Na.4)
• Group: Populus deltoides - Fraxinus pennsylvanica / Pascopyrum smithii Floodplain Forest Group (1.B.3.Na.4.a)
• Alliance: Populus deltoides Floodplain Forest Alliance

Montana Riparian and Wetland Sites (Hansen et al., 1995)
Populus deltoides / Cornus sericea Community Type
EPA Ecoregions
• Level 1: Great Plains (9)
• Level 2: West-Central Semi-Arid Prairies (9.3)
• Level 3: Northwestern Great Plains (9.3.3)
• Level 4: Montana Central Grasslands (43n), River Breaks (43c), and Pine Scoria Hills

(43p)

Ecological site concept

This ecological site occurs on floodplains, alluvial fans, and stream terraces at elevations ranging from 1,900 to 3,500 feet and on slopes ranging from 0 to 2 percent. This site occurs on all aspects, although aspect is not a significant factor. The soils of this ecological site are generally very deep and are well drained. The soil textures are typically loam, sandy loam, or silt loam but can have a wide variation since these soils typically result from water deposition. The distinguishing characteristics of this site are that it is located on floodplains and that it supports woody vegetation such as plains cottonwood, willow and redosier dogwood.

Associated sites

R058AY711MT	**Overflow 10-14** The Overflow ecological site is adjacent to the Riparian Woodland ecological site, typically on higher terraces where flooding is less frequent and riparian woody plants are rare or absent.
R058AY729MT	**Overflow 15-19** The Overflow ecological site is adjacent to the Riparian Woodland ecological site, typically on higher terraces where flooding is less frequent and riparian woody plants are rare or absent.
R058AY738MT	**Subirrigated 10-19** The Subirrigated ecological site is adjacent to the Riparian Woodland ecological site, typically on lower terraces where ground water is closer to the surface and riparian woody plants are rare or absent.
R058AY723MT	**Wet Meadow 10-19** The Wet Meadow ecological site is adjacent to the Riparian Woodland ecological site, typically in depressions or concave area where flooding is very frequent, and a water table is shallow and persistent.

Similar sites

R058AY726MT	**Woody Draw 15-19** This site differs from the Riparian Woodland ecological site in that it is in upland swales rather than on flood plains. It generally is in steep, V-shaped drainageways and typically contains facultative species such as green ash, box elder, and elm.
R058AY711MT	**Overflow 10-14** This site differs from the Riparian Woodland ecological site in that it occupies higher terraces and is dominated by upland shrubs and herbaceous species. Trees are rare or absent.

R058AY729MT	**Overflow 15-19** This site differs from the Riparian Woodland ecological site in that it occupies higher terraces and is dominated by upland shrubs and herbaceous species. Trees are rare or absent.
R058AY738MT	**Subirrigated 10-19** This site differs from the Riparian Woodland site in that it occupies lower terraces. Depth to a water table is 24 to 40 inches. Trees and shrubs are rare or absent.

Table 1. Dominant plant species

Tree	(1) *Populus*
Shrub	(1) *Salix*
Herbaceous	(1) *Bromus inermis*

Physiographic features

This ecological site occurs on floodplains, alluvial fans, and stream terraces. Slopes typically range from 0 to 2 percent. This site occurs on all aspects. Aspect is not a significant factor.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Alluvial fan (3) Stream terrace
Runoff class	Low to medium
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	579–1,067 m
Slope	0–2%
Aspect	Aspect is not a significant factor

Climatic features

MLRA 058A is a semi-arid region and is considered to have a continental climate characterized by cold winters, hot summers, low humidity, light rainfall, and much sunshine. The climate is the result of the MLRA's location in the geographic center of North America. Temperatures can be extreme. The average annual temperature is 41 to 49 degrees Fahrenheit. Summer daytime temperatures are typically quite warm, generally averaging in the lower to mid 80 degree range for July and August. Summertime temperatures will typically reach 100 degrees or more at some point during the summer

and can reach 90 degrees during any month between May and September. Conversely, winter temperatures can be cold, averaging in the lower teens or less for December and January. There will typically be several days of below zero temperatures each winter. It is not uncommon for temperatures to reach 30 to 40 degrees below zero, or even colder, most any winter.

During an average year, 70 to 75 percent of the annual precipitation falls between April and September, which are the primary growing season months. Most of the rainfall occurs as frontal storms early in the growing season during the months of May and June. Some high-intensity, convective thunderstorms occur in July and August, and some rainfall occurs in autumn. Later summer precipitation is greater in the eastern portion of the MLRA, which effects plant community composition. Winter precipitation occurs as snow although snowfall is not heavy, averaging about 39 inches annually, and snow cover is typically 1 to 3 inches. Heavy snowfall occurs infrequently, usually late in the winter or early spring. The average annual precipitation ranges from 8 to 22 inches but is typically 10 to 19 inches throughout most of the area. Precipitation fluctuates widely from year to year and severe drought occurs 2 out of 10 years on average.

There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature. Spring can be windy throughout the MLRA, with winds averaging over 10 mph about 15 percent of the time. Speeds of 50 mph or stronger can occasionally occur. During the winter months, the western half of the MLRA commonly experiences Chinook winds, which are strong west to southwest surface winds accompanied by abrupt increases in temperature. The Chinook winds are strongest on the western boundary of the MLRA near the Rocky Mountain foothills and decrease eastward. In addition to producing damaging winds, prolonged Chinook episodes can result in drought or vegetation kills due to a reaction of plants to a “false spring” (Oard, 1993).

For local climate station information, refer to https://wrcc.dri.edu/summary/Climsmemt.html.

Table 3. Representative climatic features

Frost-free period (characteristic range)	70-150 days
Freeze-free period (characteristic range)	90-180 days
Precipitation total (characteristic range)	254-483 mm
Frost-free period (average)	121 days
Freeze-free period (average)	143 days
Precipitation total (average)	381 mm

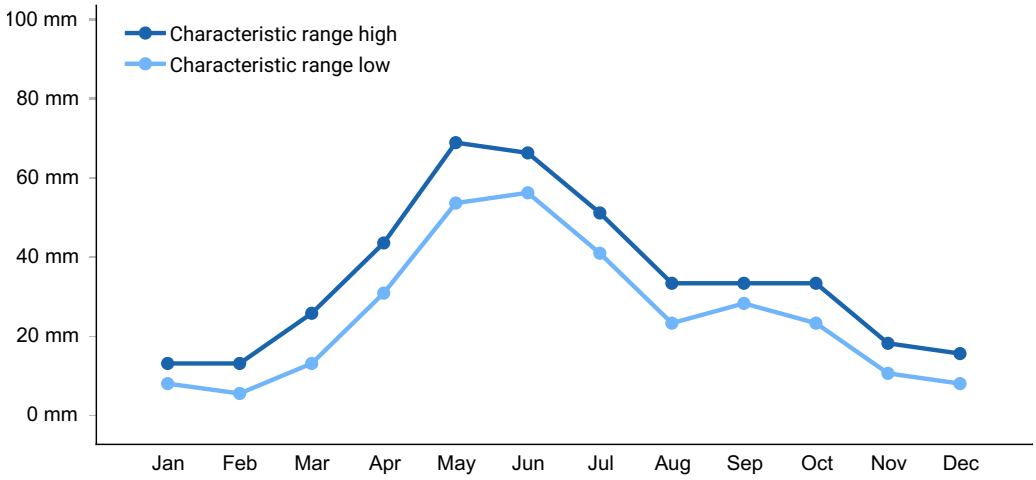


Figure 1. Monthly precipitation range

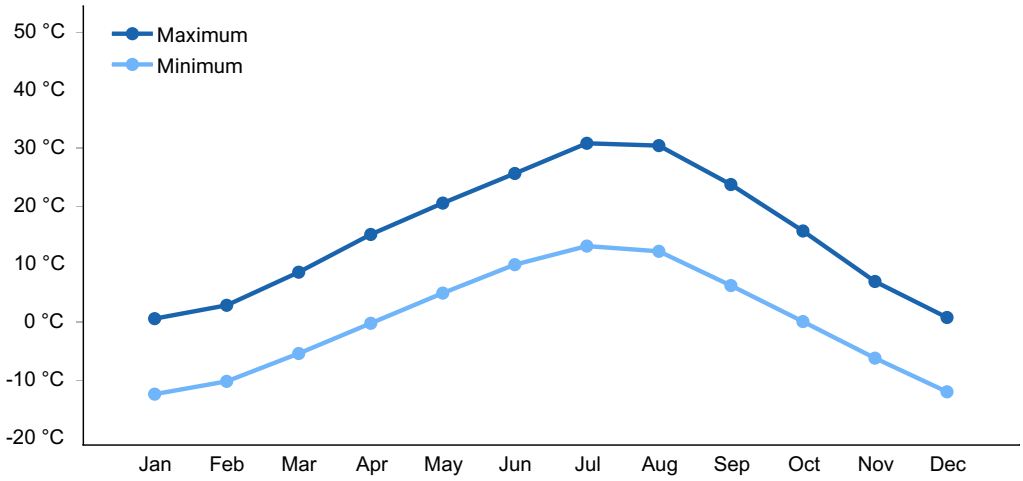


Figure 2. Monthly average minimum and maximum temperature

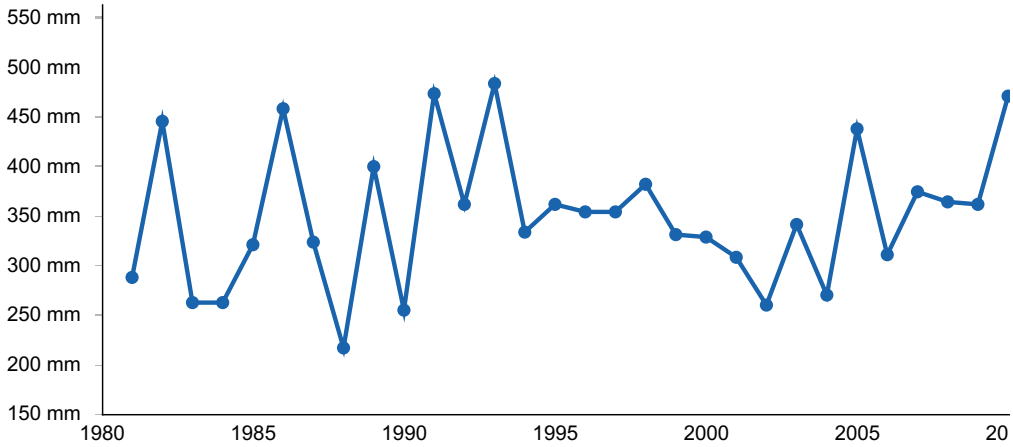


Figure 3. Annual precipitation pattern

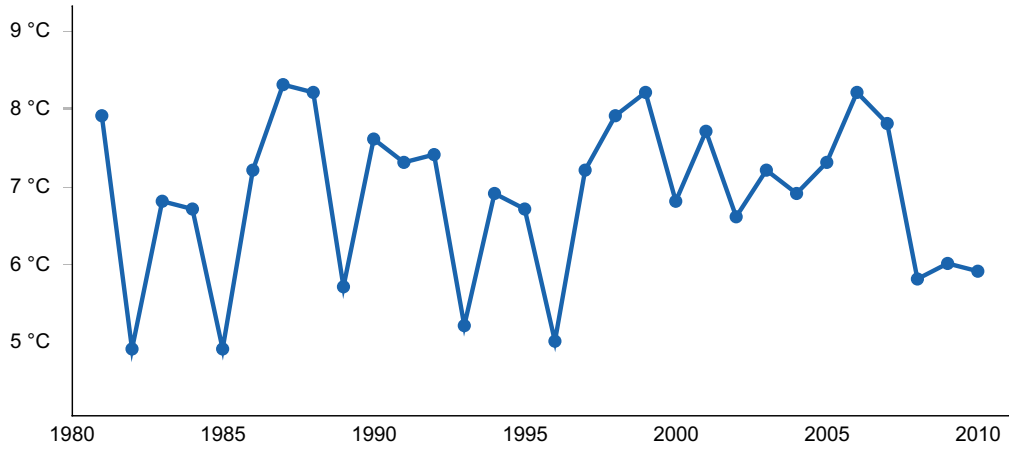


Figure 4. Annual average temperature pattern

Climate stations used

- (1) RAPELJE [USC00246862], Rapelje, MT
- (2) HYSHAM 25 SSE [USC00244364], Bighorn, MT
- (3) BRANDENBERG [USC00241084], Rosebud, MT
- (4) TERRY 21 NNW [USC00248169], Terry, MT
- (5) BLOOMFIELD 5 NNE [USC00240923], Bloomfield, MT
- (6) GLENDIVE [USC00243581], Glendive, MT
- (7) POWDERVILLE 8 NNE [USC00246691], Volborg, MT
- (8) JORDAN 23 ENE [USC00244530], Jordan, MT
- (9) FT PECK PWR PLT [USC00243176], Fort Peck, MT
- (10) CIRCLE [USC00241758], Circle, MT
- (11) BROCKWAY 3 WSW [USC00241169], Brockway, MT
- (12) MILES CITY F WILEY FLD [USW00024037], Miles City, MT
- (13) MIZPAH 4 NNW [USC00245754], Ismay, MT
- (14) SAND CREEK [USC00247342], Roy, MT
- (15) ROCK SPRINGS [USC00247136], Angela, MT
- (16) COHAGEN [USC00241875], Cohagen, MT
- (17) WINIFRED [USC00249033], Hilger, MT
- (18) COLUMBUS [USC00241938], Columbus, MT
- (19) WYOLA 1 SW [USC00249175], Wyola, MT
- (20) EKALAKA [USC00242689], Ekalaka, MT
- (21) MELSTONE [USC00245596], Musselshell, MT
- (22) YELLOWTAIL DAM [USC00249240], Lodge Grass, MT

Influencing water features

This is a riparian site that receives additional moisture from stream overflow and from subsurface hydrology associated with the stream. Streamflow peaks in late spring to early summer and is lowest in fall and winter. During peak flows the site is sometimes flooded for brief durations, with flooding frequency greatest near the channel. Sometimes, a seasonal ground water table is present between 24 and 60 inches below the soil surface,

but this varies depending on proximity to the channel.

Wetland description

Not Applicable

Soil features

Soils for this ecological site are typically very deep (greater than 60 inches to bedrock), well drained, and derived from stratified calcareous loamy alluvium. These soils usually occur on lower stream terraces and receive additional moisture from occasional flooding. Surface horizon textures are typically loam, sandy loam, or silt loam but are highly variable. Underlying horizons consist of thin layers of clay loam, fine sandy loam, or silt loam that have a loam texture when mixed. Gravelly or very gravelly layers may be present at depths greater than 40 inches. The soil temperature regime is primarily frigid, with smaller areas of mesic present. The soil moisture regime is aridic ustic or typic ustic. The following figure shows a typical soil profile for this ecological site.

Soil Series:	Horizon	Depth	Textur
Havre, Occasionally Flooded	A	0-8	Loam
Havre, Frequently Flooded	C1	8-36	loam consisting of of fine sandy loam and clay loam
	C2	36-60	loam consisting of of clay loam, fine and silt loam

Figure 5. Typical Soil Profile

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loam (2) Fine sandy loam (3) Silt loam
Drainage class	Well drained
Permeability class	Moderate
Surface fragment cover <=3"	0–3%

Surface fragment cover >3"	0%
Available water capacity (0-152.4cm)	11.43–17.78 cm
Calcium carbonate equivalent (0-152.4cm)	0–10%
Electrical conductivity (0-10.2cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-10.2cm)	0–12
Soil reaction (1:1 water) (0-152.4cm)	7–8.4
Subsurface fragment volume <=3" (101.6-182.9cm)	15–60%
Subsurface fragment volume >3" (101.6-182.9cm)	0–3%

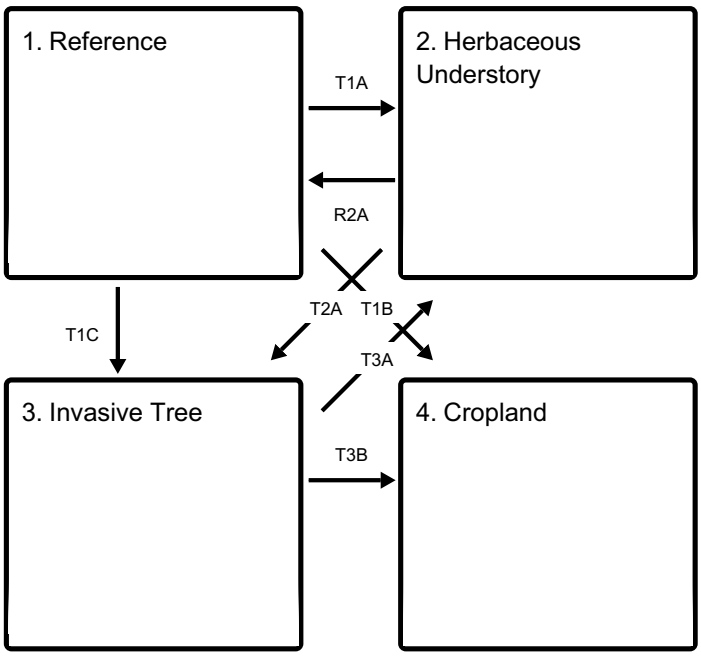
Ecological dynamics

Interpretations are primarily based on the Reference state, which is used as a reference in order to understand the original potential of the site. This ecological site developed under the combined influences of climatic conditions, flooding, periodic fire activity, grazing by large herbivores, and impacts from small mammals and insects. Changes may occur to the Reference state due to management actions such as improper grazing management, climatic conditions such as drought, and natural events such as wildfire and floods. The reference state for this ecological site is dominated by a diversity of tall to medium height trees and shrubs, which are tightly intermixed and well distributed over the site. Various grasses and forbs occur in the understory on this site. The Reference state is not necessarily the management goal, as other vegetative states may be considered desired plant communities as long as critical resource concerns are met.

In addition to the Reference state, other plant communities can occur on this site and are usually the result of historic management practices. Long term overgrazing on this ecological site results in a decrease in shrub diversity and in an increase of less palatable forbs and shrubs. Tree and shrub densities increase in the absence of prescribed fire and wildfire. More frequent fire intervals decrease the tree and shrub density resulting in an increase in herbaceous species. There are various transitional stages which may occur on this ecological site.

State and transition model

Ecosystem states



T1A - Prolonged improper grazing in combination with lack of flooding disturbance

T1C - Establishment of invasive tree species (primarily Russian olive)

T1B - Clear cutting, tillage or herbicide application, and seeding of cultivated crops (often combined with irrigation practices)

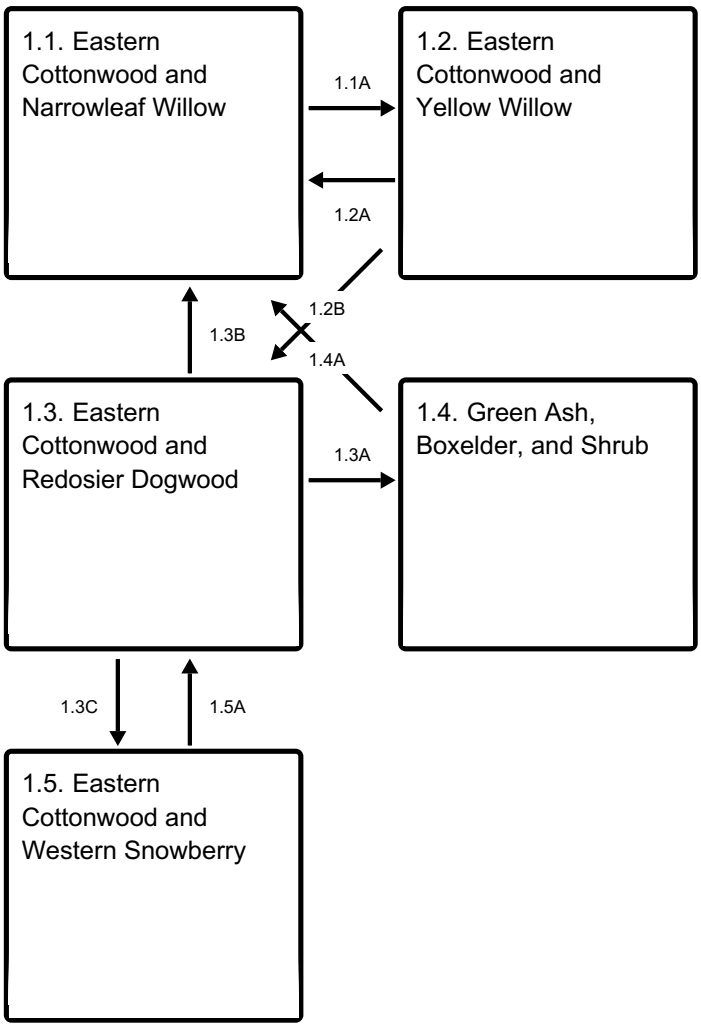
R2A - Proper grazing management, tree/shrub planting, intensive weed management (management intensive and costly)

T2A - Establishment of invasive tree species (primarily Russian olive)

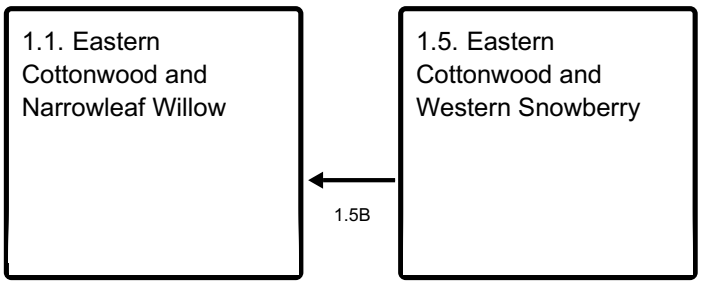
T3A - Removal of invasive tree species, sometimes combined with tree/shrub planting (management intensive and costly)

T3B - Clear cutting, tillage or herbicide application, and seeding of cultivated crops (often combined with irrigation practices)

State 1 submodel, plant communities



Communities 1 and 5 (additional pathways)



1.1A - Lack of disturbance, natural plant growth, and bank building

1.2A - Flooding, bank scouring, or a combination of these factors

1.2B - Lack of disturbance, bank building, and lowering of water table

1.3B - Major flooding or stand-replacing fire in combination with bank scouring/slumping

1.3A - Lack of disturbance, lowering of water table, cottonwood mortality

1.3C - Improper grazing management

1.4A - Major flooding or stand-replacing fire in combination with bank scouring/slumping

1.5B - Major flooding or stand-replacing fire in combination with bank scouring/slumping

1.5A - Proper grazing management

State 2 submodel, plant communities

2.1. Eastern Cottonwood and Smooth Brome

2.2. Eastern Cottonwood and Noxious Weeds

State 3 submodel, plant communities

3.1. Russian Olive and Shrub

3.2. Russian Olive and Noxious Weed

State 4 submodel, plant communities

4.1. Cropland

State 1
Reference

The Reference state for this ecological site consists of five communities and evolved under the combined influences of climatic conditions, flooding, periodic fire activity, grazing by large herbivores, and impacts from small mammals and insects. The Reference state is the plant communities in which interpretations are primarily based and is used as a reference in order to understand the original potential of the site.

Dominant plant species

- eastern cottonwood (*Populus deltoides*), tree
- narrowleaf willow (*Salix exigua*), tree
- yellow willow (*Salix lutea*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- redosier dogwood (*Cornus sericea*), shrub

Community 1.1
Eastern Cottonwood and Narrowleaf Willow

This plant community is characterized by a cottonwood seedling community with tree

diameters at less than 3 inch DBH. The understory plant community is dominated by narrowleaf willow. Non-native herbaceous species such as Kentucky bluegrass and smooth brome are common in the understory.

Community 1.2
Eastern Cottonwood and Yellow Willow

This plant community is characterized by a cottonwood tree community with tree diameters from 3 to 11 inch DBH and a diverse shrub understory component. The understory shrub component may include species such as yellow willow, narrowleaf willow, and redosier dogwood. Non-native herbaceous species such as Kentucky bluegrass and smooth brome are common in the understory.

Community 1.3
Eastern Cottonwood and Redosier Dogwood

This plant community is characterized by a mature cottonwood tree community with tree diameters of 12 inches and greater DBH and a diverse shrub understory component. The understory shrub component may include species such as redosier dogwood, western snowberry, Woods rose, silver buffaloberry, chokecherry, currant, and yellow willow. Non-native herbaceous species such as Kentucky bluegrass and smooth brome are common in the understory.

Community 1.4
Green Ash, Boxelder, and Shrub

This plant community is characterized by an overstory consisting of green ash and box elder with a diverse shrub understory component. This shrub component may include species such as redosier dogwood, western snowberry, Woods rose, silver buffaloberry, chokecherry, currant, and yellow willow. Cottonwood are rare or absent. Non-native herbaceous species such as Kentucky bluegrass and smooth brome are also common in the understory.

Community 1.5
Eastern Cottonwood and Western Snowberry

This plant community is characterized by a mature cottonwood tree community with tree diameters of 12 inches and greater DBH and a simple shrub understory component. The understory component is dominated by western snowberry and Wood’s rose. Species such as redosier dogwood, silver buffaloberry, chokecherry, currant, and yellow willow are rare or absent. Non-native herbaceous species such as Kentucky bluegrass and smooth brome are also common in the understory. This plant community occurs when site conditions decline due to improper grazing management practices such as continuous season-long or year-long grazing.

Pathway 1.1A
Community 1.1 to 1.2

Community 1.1 will transition to community 1.2 through a lack of flooding disturbance, natural plant growth, bank building, or a combination of these factors. Time periods with little or no disturbances permit natural growth of the overstory. The stream channel typically is migrating away from the site at this time. Distance to the water table increases, and some shade-tolerant shrubs start to inhabit the understory.

Pathway 1.2A
Community 1.2 to 1.1

Flooding, bank scouring by ice jams, or a combination of these factors will shift community 1.2 to community 1.1.

Pathway 1.2B
Community 1.2 to 1.3

Decades of low disturbance, bank building, and lowering of the water table will shift community 1.2 to community 1.3. The cottonwood overstory matures and begins to self-thin. The canopy starts to open, promoting understory growth.

Pathway 1.3B
Community 1.3 to 1.1

Major flooding that causes the river channel to migrate or a stand-replacing fire that exposes the bank to scouring and collapse will shift community 1.3 to community 1.1. The site reverts back to an alluvial bar and the process of succession begins over again.

Pathway 1.3A
Community 1.3 to 1.4

Approximately 80 to 100 years of low disturbance, bank building, and lowering of the water table will shift community 1.3 to community 1.4. The majority of the cottonwood stand has died out and has been replaced by green ash, box elder, and facultative shrubs.

Pathway 1.3C
Community 1.3 to 1.5

Improper grazing management such as continuous season-long or year-long grazing, or a combination of these factors can shift community 1.3 to community 1.5. These factors favor a decrease in shrub diversity and an increase in unpalatable shrubs such as western snowberry (Hansen et al., 1995).

Pathway 1.4A
Community 1.4 to 1.1

Major flooding that causes the river channel to migrate or a stand-replacing fire that exposes the bank to scouring and collapse will shift community 1.4 to community 1.1. The site reverts back to an alluvial bar and the process of succession begins over again.

Pathway 1.5B
Community 1.5 to 1.1

Major flooding that causes the river channel to migrate or a stand-replacing fire that exposes the bank to scouring and collapse will shift community 1.5 to community 1.1. The site reverts back to an alluvial bar and the process of succession begins over again.

Pathway 1.5A
Community 1.5 to 1.3

Proper grazing management such as deferred or rotational grazing can shift community 1.3 to community 1.1.

State 2
Herbaceous Understory

The Herbaceous Understory state occurs when the shrub understory has been removed due to long-term improper grazing management practices such as continuous season-long or year-long grazing. Once the stand has transitioned from a shrub dominated understory to an herbaceous dominated understory, returning the site to its former state is very difficult. The Herbaceous Understory state consists of two communities.

Dominant plant species

- eastern cottonwood (*Populus deltoides*), tree
- smooth brome (*Bromus inermis*), grass

Community 2.1
Eastern Cottonwood and Smooth Brome

This plant community is characterized by an open, decadent, cottonwood overstory and an understory dominated by smooth brome, a non-native, herbaceous species. Shrubs species such as redosier dogwood, chokecherry, western snowberry, and silver buffaloberry are rare or absent.

Community 2.2
Eastern Cottonwood and Noxious Weeds

This plant community is characterized by an open, decadent, cottonwood overstory and an understory dominated by noxious weeds. Shrubs species such as redosier dogwood, chokecherry, western snowberry, and silver buffaloberry are rare or absent. The understory is dominated by noxious weed species such as leafy spurge and Canada thistle.

State 3
Invasive Tree

The Invasive Tree state occurs when occurs when invasive tree species, particularly Russian olive, establish and dominate the site. Russian olive is a highly competitive non-native tree that commonly forms dense thickets at the exclusion of native species. On sites with more open stands, Russian olive may occur in conjunction with widely scattered cottonwood stands and native shrubs, such as snowberry and Woods rose. The Invasive Tree state consists of two communities.

Dominant plant species

- Russian olive (*Elaeagnus angustifolia*), tree

Community 3.1
Russian Olive and Shrub

This plant community is characterized by a Russian olive dominated overstory and a native shrub understory with a low diversity of species. Non-native, herbaceous species such as smooth brome are common.

Community 3.2
Russian Olive and Noxious Weed

This plant community is characterized by a Russian olive thicket. Native shrubs are rare or absent. The understory is dominated by noxious weed species such as leafy spurge and Canada thistle.

State 4
Cropland

The Cropland state occurs when cultivation occurs to the land. The Cropland state consists of one community.

Community 4.1
Cropland

The land is typically used for non-native, perennial grass hay with annual, cool-season cereal grains such as spring wheat, winter wheat, and barley used in crop rotation

practices. Corn is occasionally grown for silage.

Transition T1A
State 1 to 2

The absence of flooding disturbance in combination with prolonged improper grazing management such as continuous season-long or year-long grazing weaken the resilience of the Reference state and drive its transition to the Herbaceous Understory state.

Transition T1C
State 1 to 3

Establishment of invasive tree species, particularly Russian olive, transitions the Reference state to the Invasive Tree state.

Transition T1B
State 1 to 4

Clearcutting, tillage or application of herbicide, and seeding of cultivated crops (such as wheat, corn, or introduced hay) transitions the Reference state to the Cropland state.

Restoration pathway R2A
State 2 to 1

A change in management alone may not be sufficient to restore the Herbaceous Understory state to the Reference state. Proper grazing management in combination with tree/shrub planting, herbaceous weed control, and normal or above-normal moisture can transition the Herbaceous Understory state back to the Reference state. These restoration methods are labor intensive, costly, and may not be a practical in all situations.

Conservation practices

Prescribed Grazing

Transition T2A
State 2 to 3

Establishment of invasive tree species, particularly Russian olive, transitions the Herbaceous Understory state to the Invasive Tree state.

Transition T3A
State 3 to 2

Removal of invasive tree species transitions the Invasive Tree state to the Herbaceous

Understory state. Typically, tree/shrub planting is required to reestablish native woody species and intensive weed management is critical to control noxious weeds. Removal of the overstory will release understory growth and cause noxious weed populations to increase exponentially. This transition is very costly and labor intensive and may not be practical in all situations.

Transition T3B
State 3 to 4

Clearcutting, tillage or application of herbicide, and seeding of cultivated crops (such as wheat, corn, or introduced hay) transitions the Reference state to the Cropland state.

Additional community tables

Inventory data references

Specific field data was not obtained for this provisional ecological site description. Existing field data were used in conjunction with a review of the scientific literature and professional experience to approximate the plant communities, states, and transitions. All community phases are considered provisional based on the sources identified in this ecological site description.

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Approval

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	05/20/2025
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**