



# Powder River County

## Long Range Plan

Broadus NRCS Field Office

Nov. 2023

## I. INTRODUCTION

The Powder River County Long Range Plan (LRP) was developed by the Broadus Natural Resources Conservation Service (NRCS) office and Miles City Area Office with input from the Powder River Conservation District (PRCD) and Powder River Local Working Group (LWG). The purpose of the plan is to provide natural resource status in the county, record resource issues according to input from local producers and conservation partners and analyze potential to address resource issues between 2023-2033. The Long Range Plan may be updated annually to reflect changing resource conditions in the county, including resource issues that have been addressed and emerging resource issues.

The vision of our Long Range Plan is to achieve local ownership of addressing conservation priorities in Powder River County, along with private and public land managers and non-government organization partners. The Powder River Conservation District administered a survey of over 500 residents that comprised the 2022 Local Working Group (LWG) meeting. The objective was to seek input from stakeholders. The results of the surveys were compiled, creating a list of resources issues. See graphic below for the list of resource concerns from the 2022 LWG meeting:

Table 1 - 2022 Polling results from Local Working Group

<b>Resource Issue</b>	<b>Frequency</b>
Prairie Dogs Impacts ( <i>Degraded Plant Structure and Composition and Sheet/Rill Erosion</i> )	76 %
Leafy Spurge Expansion	66 %
Annual Grass Invasion ( <i>Cheatgrass, Ventenata, Medusahead, Bulbous Bluegrass</i> )	63 %
Livestock Predators	55 %
Need Reliable Stock Water Quantity and/or Quality	47 %
Field bindweed/Other Weeds in Cropland	47 %
Pine Tree/Juniper Expansion	47 %
Burning Coal Seams	45 %
Dead Standing/Downed Trees	39 %
Lack of New Trees/Shrubs Along Streams/River	29 %
Dysfunctional or Abandoned Flowing Wells	26 %
Need Better Grazing Distribution/Rest Periods	21 %
Streambank Erosion	21 %

\*Frequency numbers indicate percentage of responses that identified corresponding resource concern as an issue within the county

These results build on similar resource issues identified in 1996 and 2019 LWG meetings. Data gathered from those meetings is available at the Broadus NRCS Office.

## II. NATURAL RESOURCE INVENTORY

### GENERAL INFORMATION

Powder River County is in southeastern Montana and borders Wyoming to the south. Broadus is the county seat, shown in Figure 1 below. The County has a land area of ~3,200 square miles or ~2.1 million acres.



Figure 1: Powder River County, Montana

The original native inhabitants lived as hunters and gatherers, following big game as the seasons changed. Fur trappers, buffalo hunters and soldiers arrived in the 1800s as the first non-native residents of the area, followed by cowboys driving cattle from Texas in the late 1800s, and finally the homesteaders who established claims in the early 1900s. Powder River County was created March 17, 1919, from the southern half of Custer County, and Broadus was voted the county seat in 1920. There were approximately 3,400 residents in the newly formed county, primarily agricultural producers<sup>1</sup>.

### COUNTY DEMOGRAPHICS<sup>2</sup>

The county population has decreased every decade except the 70's during the Belle Creek oil boom<sup>1</sup>. About 28 percent of the county's residents live in Broadus, the only incorporated town in the county. Most of the adult residents have at least a high school education; nearly 26 percent have earned a Bachelor of Science degree or higher.

Population	1,716
Median Household Income	\$51,136
Persons in Poverty	12.2%

<u>Age</u>	
<5 yrs	4.4%
5-17 yrs	16.7%
18-64 yrs	51.7%
65+ yrs	27.2%

<u>Gender</u>	
Female	55%
Male	45%

Race

White	95%	Black	0.2%
American Indian/Alaska Native	1.9%	Asian	0.1%
Hispanic or Latino	1.8%	Other/2+ races	2.8%

**AGRICULTURE DEMOGRAPHICS** <sup>3</sup>

Number of Farms	325
Average Farm Size	5,005 ac
Average Producer Age	57.5

<u>Total producers</u>	<u>641</u>	<u>Primary Occupation</u>	
Male	385	Farming	71%
Female	256	Other	29%

Producer Ethnicity	Farms Operated	Acres Operated
Hispanic	6	Not disclosed
American Indian/Alaska Native	8	13,700
Native Hawaiian/Pacific Islander	5	880
White	325	1,626,630

Producer Years on Farm

Less than 10 years	22%
10 years or more	68%

More than 60% of the farms in the county are larger than 1,000 acres. The county ranks sixth in Montana for number of cattle at ~88,000 and seventh in number of sheep at ~8,800 head. Combined, the county has roughly 30 sheep or cattle per square mile versus .5 people per square mile.

**CLIMATE**

Except for the relatively flat river bottom of the Powder River Valley itself, which ranges from one to a few miles wide, the surrounding country is hilly, with numerous creeks and coulees. Some of the hills are quite rough, particularly to the southwest, where some peaks near the Wyoming border range from 4,000 to 4,500 feet above sea level. The Powder River itself runs southwest to northeast, draining the central part of the county into Custer County, about 2,730 feet above sea level at the county line. The hilly and rough character of the nearby area contribute somewhat to climatic differences, but those differences are not as large or noticeable as in more mountainous parts of Montana farther west.<sup>4</sup>

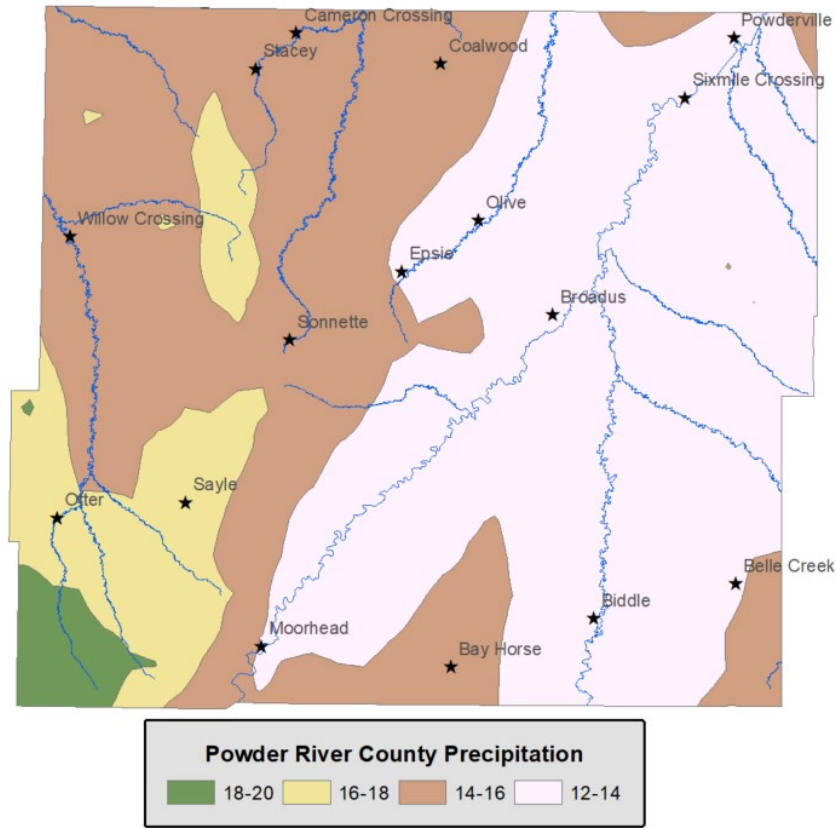
Powder River area has a modified continental climate that is cold in winter, warm in summer, and has large variations in seasonal precipitation. Because of the county’s agricultural background the average length of the growing season is important. The weather station at Broadus records an average of 100-128 days when the temperature is above 32° F, which occurs approximately mid-May to mid-September. In a normal year, about three-fourths of the annual precipitation falls during the growing season from April to September. Summer precipitation almost always occurs as showers, but late spring sometimes will produce general rains of several hours in duration, and late September or October in some years can have a rainstorm of similar general character. June is the month of most frequent occurrence of general rain. Earlier in the spring or later in the fall this type of storm, starting as a cold rain, may change to wet snow; it is this combination that gives the area some weather problems in an occasional year, perhaps with a frequency of about one to two times in ten years. Thunderstorms are fairly common in the general area, probably occurring about 20 to 30 days a year.<sup>4</sup>

Average annual precipitation varies from around 13” inches in the eastern half of the county to 15” inches in the western half, peaking at 20” in the far southwest corner of the county. As a rule of



thumb, the higher the elevation, the more precipitation. Figure 2, below, illustrates precipitation ranges in the county.

Figure 2: Powder River County Precipitation



Summers are characterized by warm weather during the day, but most nights, even during midsummer, cool down to 60°F or less, so oppressive hot spells are not very common. The area generally has winters during which snow does not prevent access of livestock to grazing areas. An occasional cold wave will generate sub-zero temperatures, but these spells seldom last more than a week. Broadus typically receives around 32” of snowfall annually.<sup>4</sup> Average annual high temperature is 61° F and average annual low is 33° F.<sup>5</sup>

### **GEOLOGY**

The geological history of Powder River County includes long periods of sedimentation and erosion. Geologically, the county is on the western edge of the Black Hills uplift and the eastern edge of the Powder River Basin. The occurrence, movement, and quality of ground water in the county is closely related to geological conditions. Formations of importance to the county’s groundwater resources are the Lance Formation of Cretaceous age (65 to 135 million years old), the Fort Union Formation of Tertiary age (one to 65 million years old), and the terrace alluvial deposits of Quaternary age (less than one million years old). One member of each Formation – Hell Creek Member of the Lance Formation and Tongue River Member of the Fort Union Formation – are most important for stock and domestic water in the county.<sup>4</sup> These formations are shown in Figure 3 on page 6.

The Hell Creek Member of the Lance Formation consists of about six hundred feet of sandstone and shale with some thin coal seams. Sandstone layers will yield water to wells, with the lower part of the

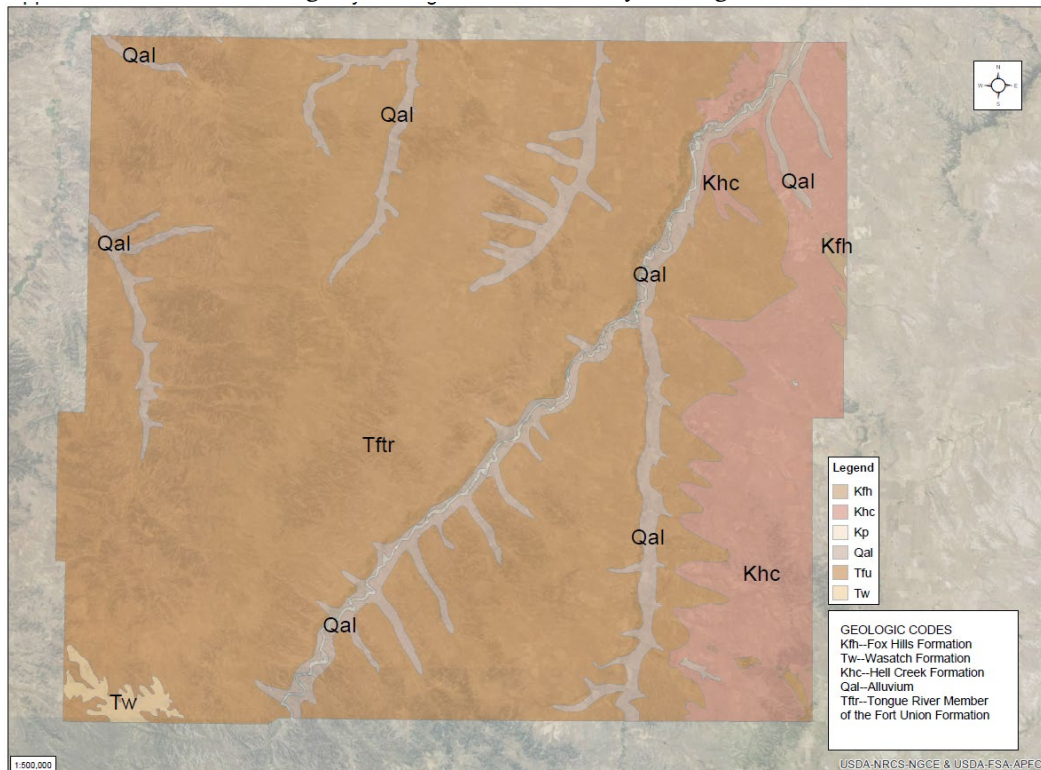
Hell Creek reported to have higher artesian heads and better yields than the upper part. Groundwater is present in the Hell Creek in adequate amounts for stock and domestic purposes and is of fair to poor quality. In the Powder and Little Powder River valleys, artesian wells, many of which flow, are common.<sup>4</sup>

Overlying the Hell Creek Member is the Fort Union Formation, which consists of the Tongue River Member and the Lebo Member. The Tongue River Member is probably the most widely used source of domestic and stock water in Powder River County. The member consists of sandstone and shales with many coal seams. Sandstone and coal beds in the Tongue River Member supply wells that are usually 200-500 feet deep and yield four to 25 gallons per minute.<sup>4</sup>

Along the Powder and Little Powder Rivers and their tributaries and other major streams there are deposits of Quaternary alluvium, and in some areas, stream terrace deposits. Stream terraces are composed of sand and gravel, and the thicker terraces may contain sufficient ground water for stock and domestic uses.<sup>4</sup>

Alluvial deposits along the Powder and Little Powder Rivers consist primarily of sand and silt. Wells in this alluvium yield water, but there have been numerous problems with sand flowing into the wells. Water quality is fair to poor. Where the stream valleys are underlain by shale, the water tends to be poorer quality than where bedrock is sandstone. Groundwater is also present in the alluvium of practically all other large streams in the county.<sup>4</sup>

Figure 3: Powder River County Geologic Formations



## **SOILS<sup>4</sup>**

Three soil associations make up about 85 percent of the Powder River County Soil Survey. A breakdown of the three major soil associations follows.

**Ringling-Cabba-Midway Association** (40% Ringling, 25% Cabba, 20% Midway): Sloping to steep or hilly; shallow salty loams to clay loams underlain by shale; on uplands. Large areas of this association occur in the western and central parts of the soil survey area. Nearly 45 percent of the Powder River County soil survey area is covered by the association.

**Elso-Midway-Thurlow Association** (40% Elso, 20% Midway, 20% Thurlow): Nearly level to steep; silt loams and clay loams that are shallow over stratified sandy, silty, and clayey shale, and deep soils that are dominantly silty clay loam throughout; on uplands; one large area in the eastern part of the county and smaller areas in the western part. The association covers approximately 28 percent of the Powder River County soil survey area.

**Elso-Remmit-Ocean Lake Association** (40% Elso, 20% Remmit, 20% Ocean Lake): Gently sloping to steep; shallow silt loams and fine sandy loams underlain by shale and sandstone and deep soils that have a fine sandy loam subsoil; on uplands; located in the eastern part of the county. The association occupies about 12 percent of the Powder River County soil survey area.

All three associations are best suited as grazingland due to the erosive nature of the individual soils that make up the associations. Six of the seven soils from above - Cabba, Elso, Midway, Ocean Lake, Remmit, and Ringling – are highly erodible in all areas of the county, which equals more than 60 percent of Powder River County. Figure 4 below illustrates the abundance of highly erodible soils in the county.

Figure 4: Powder River County Major Soil Associations

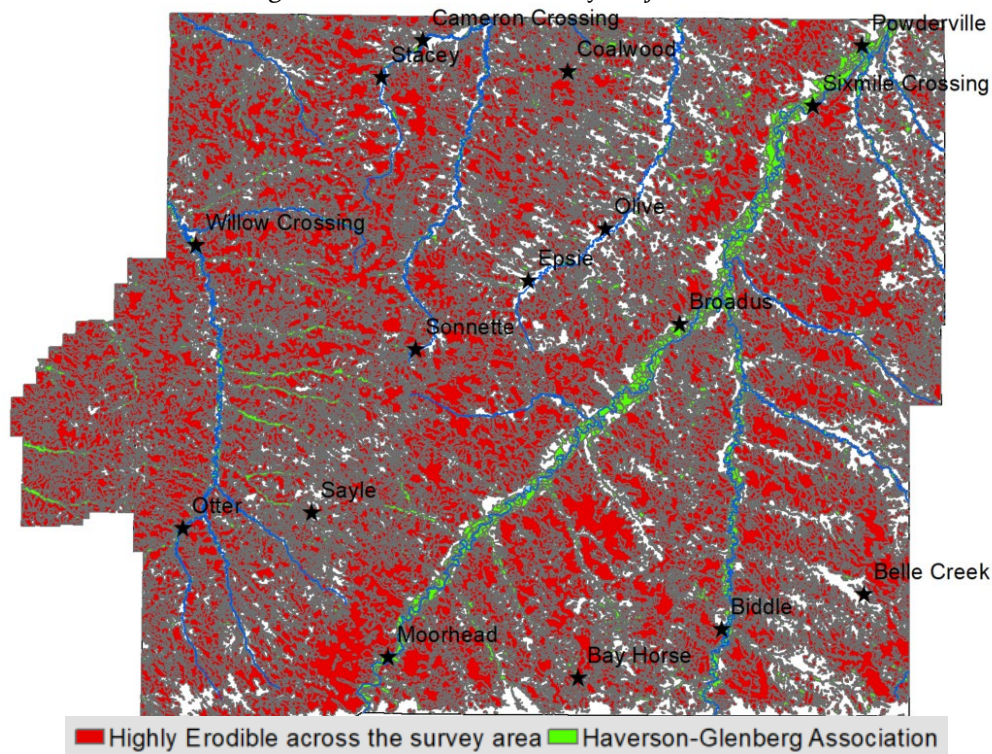




Figure 4 also illustrates the portions of the county where the Haverson-Glenberg Association occurs. It's noted here because of its importance to livestock operations.

**Haverson-Glenberg Association:** This association occupies the flood plains, stream terraces, short smooth valley slopes, and fans along the Powder River, Little Powder River, and creeks, or about 4% of the survey area. These valleys range from ¼ mile to 2 miles in width. The association is a continually changing river plain; the streams and rivers meander from one side of the valley to the other, depositing silt from the uplands. Where accessible by machinery, soils in the association are typically used for growing crops. The association also supports riparian forests that provide winter livestock and wildlife protection.

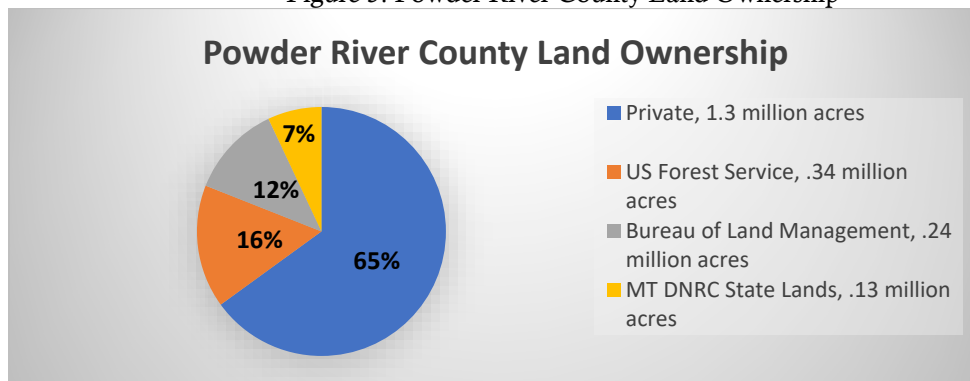
Powder River County has no soils solely designated as Prime Farmland, but 15 map units are Soils of Statewide Importance according to the soil survey, See Appendix A, Powder River Area Soil Survey Information. Soils of Statewide Importance are those that have been determined to be of significance for production of food, feed, fiber, forage, and oilseed crops. These soils have an adequate and dependable water supply from precipitation or irrigation (or water-spreading), favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air, are not excessively erodible or saturated with water for a long period of time, and either do not flood frequently or are protected from flooding. They are available for farming, but could currently be cropland, pastureland, rangeland, forestland, or other land.

The Powder River Area soil survey includes sixteen soils that meet the criteria for hydric soils. See Appendix A, Powder River Area Soil Survey Information for the entire list. Hydric soils are characterized by frequent, prolonged saturation and low oxygen content, which lead to anaerobic chemical environments where reduced iron is present. This definition includes soils that developed under anaerobic conditions in the upper part but no longer experience these conditions due to hydrologic alteration such as those hydric soils that have been artificially drained or protected by ditches or levees. There are only three official Farm Service Agency -designated wetlands in the county. Other areas where wetlands can potentially be found are around springs and perennial and intermittent drainages.

### **LAND OWNERSHIP**

The majority (65%) of Powder River County is privately owned, and the remaining 35% is public land, with US Forest Service managing the majority of public land in the county. Acres of land owned by public and private entity is summarized in Figure 5 below. Figure 6 on page eight maps land ownership in Powder River County.

Figure 5: Powder River County Land Ownership

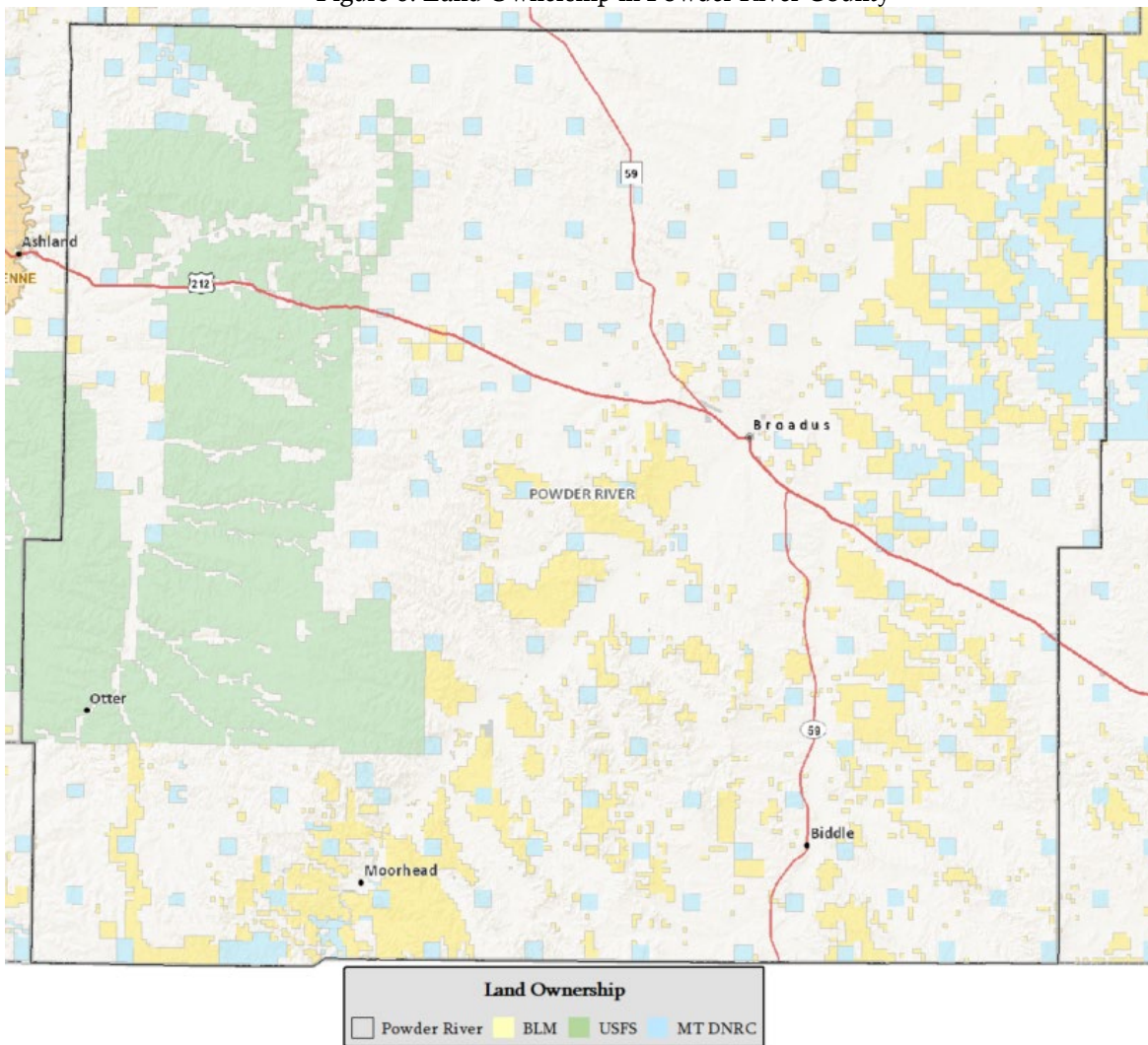




Forest Service land occurs as the Custer National Forest, a 340,000 acre contiguous area in the western part of the county. The Forest is managed as smaller allotments that occur as contiguous units that often border a smaller amount of privately owned land and are leased to ranchers for grazing. Although grazing is a primary use of the productive land, camping, hunting, hiking and photography also draw recreationists to the Custer National Forest.

Bureau of Land Management and MT Department of Natural Resources and Conservation (DNRC) lands are intermingled with private land, more-so in the eastern part of the county, and are leased to ranchers for grazing. Land managed by DNRC are typically Sections 16 and 36 in a township. DNRC State Lands in Powder River County are managed by the Eastern Land Office in Miles City. A State Forester and a Rangeland Specialist are staffed in the Eastern Land Office to oversee State sections in the county. The State Forester is also able to provide technical assistance to private landowners on their forested areas. BLM staff from the Miles City Field Office oversee BLM units, which are as large as a section (640 acres) to units as small as 40 acres. Both public and private lands in the county are primarily used for agriculture, particularly livestock production.

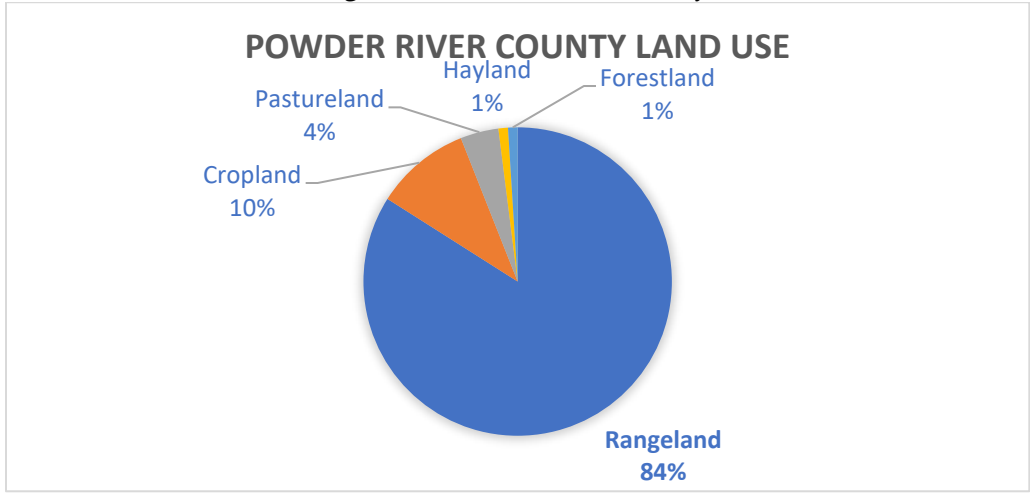
Figure 6: Land Ownership in Powder River County



**LAND USE**

A break-down of how land is used in Powder River County is shown in Figure 7 below.

Figure 7: Powder River County Land Use



Rangeland is the dominant land use in Powder River County. Grassland ecological sites range from shallow to deep, gentle to steep; soils are typically non-saline; and perennial grasses, forbs and shrubs make up the plant communities. Needlegrasses, wheatgrasses, sagebrush, and perennial forbs frequently occur across the ecological sites. Steeper forested terrain is found in the western part of the county, and grassy hills and draws occur in the eastern part. Figure 8 below and Figures 9-10 on page 10 demonstrate ecological diversity across the county.



Figure 8: Typical rangeland in eastern PR County; photo taken June 2019 by Corey Swenson, NRCS.





Figure 9: Typical rangeland in northwestern PR County; photo taken August 2010 by Corey Swenson, NRCS.



Figure 10: Typical rangeland in southwestern PR County; photo taken July 2011 by unknown staff, NRCS.

Most rangeland analyzed by the NRCS office during conservation planning is less than 60% similar to historic climax plant communities. Until the 1990s, producers' grazing management was primarily dependent on stockwater dams, springs, windmills, and perennial creeks, leading to long grazing periods or pastures being grazed during the same seasons each year and causing degraded plant communities. Technological advances in remote power sources, along with conservation technical assistance and financial assistance programs offered by USDA have been instrumental in placing reliable and adequate water sources on rangeland in Powder River County. Combined with additional fences, the result has been increased grazing management options and improved plant communities. Producer interest and NRCS familiarity with resource conditions of rangeland in the county suggest there is need for more infrastructure and technical assistance to encourage producers to continue moving towards more intensive management to decrease grazing duration.

Ponderosa pine occur on shallow, skeletal soils, primarily in the southern and western parts of the county. Ponderosa pine is a lower-value tree compared to the fir and spruce species found in higher elevations with more rainfall in western MT. Therefore, timber production is typically a not a management objective of livestock operators in the county; producers seldom invest resources in managing conifers since treatment costs are high relative to land value.

Productive and accessible land is dedicated as cropland for raising perennial hay or annual crops. Most harvested crops in the county are stockpiled for roughage to feed livestock when forage is limited. 'Pastured cropland' is common, which is where marginal cropland is in perennial vegetation and is hayed in years of normal or above normal precipitation and grazed on years with poor precipitation. Annual crops grown in the county are typically grains such as winter wheat, spring wheat, and barley, commonly managed in a crop-fallow system. Reduced-tillage systems are common, but conventional summer fallow is still used. True no-till systems are rare because a lot of producers still use a cultivator for seedbed preparation, or a hoe-opener style planter is used versus disc drills. The small amount of annual cropland, varied field shapes and sizes, and predominantly livestock-focused operations means progression in farming technology is not a priority for most producers.

## **WATER RESOURCES**

The water resources of the County are one of its most important assets. Water is essential for domestic, agricultural, industrial, wildlife, and recreational uses. A flow reconstruction study completed by D. M. Schook et al. in 2014<sup>7</sup>, studied tree ring cores of 222 trees from cottonwoods in the Powder River Valley, including trees that lived as early as 1740. The tree ring data from the cores and the resulting reconstruction model suggests river flows from 1870 to 1980 were high compared to the previous 150 years and more recent 30 years<sup>7</sup>. This suggests the 'normal' that Powder River County producers are used to can shift to very low flow conditions that existed prior to 1870. The ability to plan and use water as efficiently as possible will become more important than ever. Thanks to the tree ring data and reconstruction, the authors also discovered two nineteenth century droughts that exceeded any in the recorded history of the river's flow (1931-2014)<sup>7</sup>.

### **Groundwater**

According to the Ground Water Information Center of the Montana Bureau of Mines and Technology, there are around 4,000 water wells in Powder River County. The deepest well on record is 2,950 feet; the shallowest is less than five feet. Most of the wells are less than 200 feet deep and only twenty-two are deeper than one thousand feet. About one third of the wells tap into the Tongue River Member of the Fort Union Formation, noted earlier for its importance to water resources in the county. Around twenty percent of wells pull water from the Tullock Member of the same formation. Nearly two thirds of the wells were installed to provide water for livestock.<sup>8</sup> Although well water can be high in sodium content, there are no known significant drinking water quality issues with groundwater in Powder River County.



### Surface Water

The only two rivers in the county, Powder River and Little Powder River, begin in Wyoming and flow north. The Powder River, shown in Figure 11 below, continues north through Custer and Prairie Counties and drains into the Yellowstone River near Terry, Montana. Discharge there averages around 450 cubic feet per second.



Figure 11: Upper reach of Powder River in southern PR County; photo taken July 2006 by Corey Swenson, NRCS.

The Little Powder River and other major waters labeled in Figure 12, are considered perennial streams. The Little Powder River runs north from Wyoming and drains into the Powder River just north of Broadus. Both Big and Little Powder Rivers are high in Total Dissolved Solids, particularly salts. Water withdrawals upriver combined with hot, dry weather causes the water to become unfit for irrigation as soon as June some years. Smaller tributary streams are intermittent except for short distances below springs, which frequently are found where coal beds crop out, or below flowing wells. These may have questionable water quality as well. Thus, Powder River County is technically considered non-irrigable, and the term ‘water spreading’ is used to describe the practice of supplementing crops with water, regardless of if the water is placed in use by pumping or diversion.

Powder River County has one stream gage station operated by the USGS Wyoming-Montana Water Science Center located near Moorhead about thirty-five miles south of Broadus. The drainage area of the Powder River to this point is 8,030 square miles<sup>9</sup>. The highest recorded average annual peak flow was 100,000 cubic feet per second on September 30, 1923 (documented by records maintained at the Powder River Historical Museum); the lowest peak flow was 800 cfs in 1989. See Figure 13, Powder River Historic Peak Stream Flow, on page 15. County residents today still talk about the flood during the fall of 1923.

Figure 12: Powder River County Hydrology

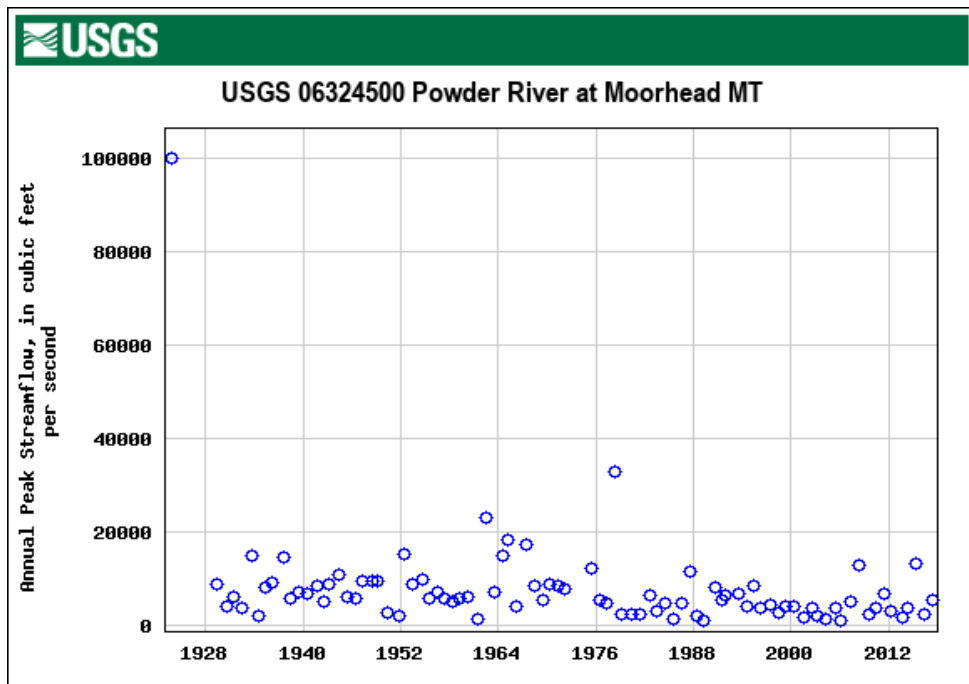
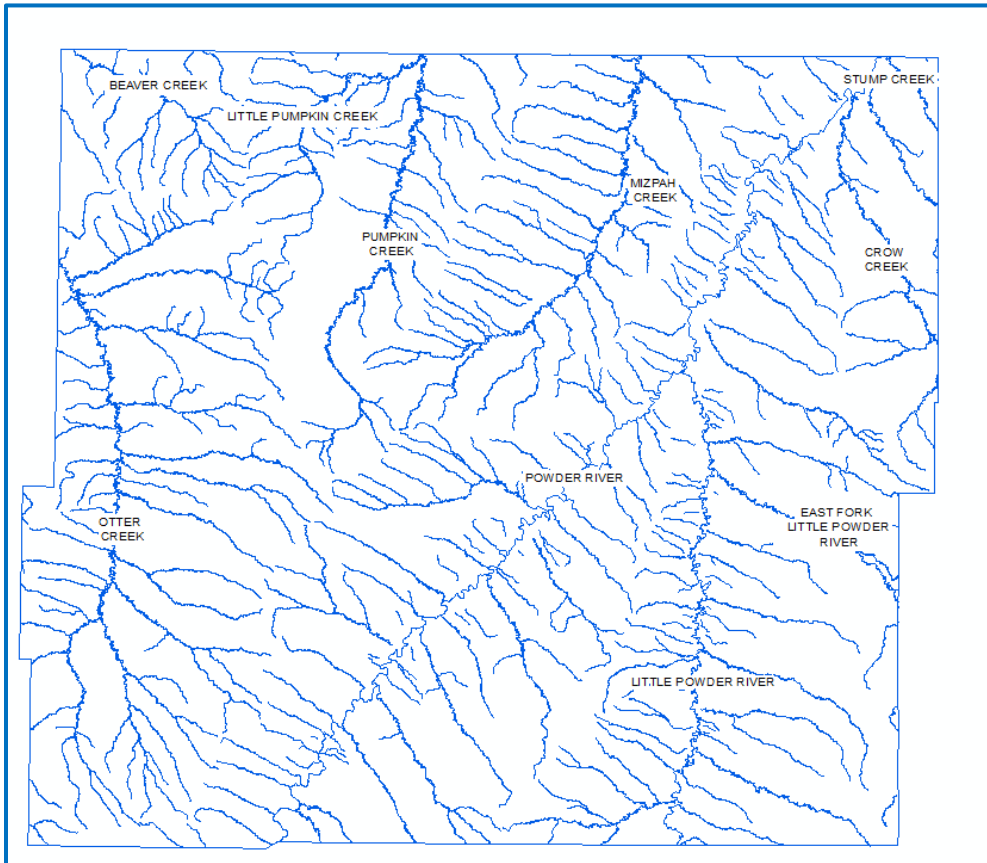


Figure 13: Powder River Historic Peak Stream Flow

There are currently no gages in operation on the Little Powder River, but Table 2 below shows flow regimes from two discontinued gages located on the Little Powder River – one gage was three quarters of a mile northeast of Biddle and one gage was five and a half miles southeast of Broadus. There were small diversions for irrigation above each station.<sup>4</sup>

Table 2: Little Powder River Flow Activity

<b>Gage Location</b>	<b>Period of Activity</b>	<b>of Drainage Area (sq. mi.)</b>	<b>Average Discharge</b>	<b>Max Discharge</b>	<b>Min Discharge</b>
Near Biddle	1938-1943	1,540	25.4 cfs	5,700 cfs (Aug 1940)	No flow
Near Broadus	1947-1953, 1957-unknown	1,990	33.3 cfs	2,340 cfs (June 1953)	No flow

### Water Rights

Operators that practice water-spreading do hold State of Montana water rights that document ‘irrigation’ as the purpose. In 1978, the Board of Natural Resources and Conservation granted water reservations to Conservation Districts in the Yellowstone River basin, including Powder River Conservation District.<sup>23</sup> This provided the district the ability to oversee development of water rights for irrigation that have a December 15, 1978 priority date.<sup>23</sup> Other uses of the water reservations included municipal, offstream storage, and instream flow.<sup>23</sup> Uses were prioritized, and water reservations held by the Powder River Conservation District are prioritized as follows: municipal uses first, irrigation second, and instream flow third.<sup>23</sup>

### Impaired Streams

Eleven reaches on five streams appear in the Montana Department of Environmental Quality (DEQ) Clean Water Information Act 303-d Impaired List in Powder River County as either Category 3, Category 5 or Category 5,5N. The five streams are Otter Creek, Beaver Creek, Little Pumpkin Creek, Pumpkin Creek, Little Powder River, Powder River, Stump Creek, and Mizpah Creek. The impairments and probable sources are summarized in Table 3.

Table 3: DEQ Water Quality Information for PR County  
 Source: Montana DEQ Water Quality Division

**2018 Water Quality Information**

Waterbody Name	Area (Miles )	Category	Use Classes	Impairments	Probable Sources	Associated Uses
Otter Creek (Headwaters to mouth of Tongue River)	108.10	5,5N	C-3	Alteration in stream-side or littoral vegetative covers, Iron, Salinity	Grazing in Riparian or Shoreline Zones, Highways, Roads, Bridges, Infrastructure, Site Clearance (Land Development and Redevelopment), Natural Sources, Agriculture	Aquatic Life Agricultural
Beaver Creek (Headwaters to mouth of Tongue River)	32.14	3	C-3	Not evaluated	Not evaluated	Not evaluated
Little Pumpkin Creek (Headwaters to mouth of Pumpkin Creek)	33.59	3	C-3	Not evaluated	Not evaluated	Not evaluated
Pumpkin Creek (Headwaters to mouth of Tongue River)	179.87	5	C-3	Flow Regime Modification, Salinity, Temperature	Crop production (Irrigated), Natural Sources	Aquatic Life, Agricultural
Little Powder River (Wyoming border to mouth of Powder River)	63.31	5	C-3	Salinity	Source Unknown, Natural Sources	Agricultural
Powder River (Wyoming border to mouth of Yellowstone River)	222.54	5	C-3	Salinity	Source Unknown, Natural Sources	Agricultural
Stump Creek (Headwaters to mouth of Powder River)	29.77	5,5N	C-3	Salinity	Natural Sources	Agricultural
Mizpah Creek (Headwaters to Corral Creek)	131.98	5	C-3	Salinity	Natural Sources	Agricultural

**Category**

3 - Insufficient or not data available to determine whether any beneficial use is attained.

5 - Waters where one or more applicable beneficial uses are impaired or threatened and a TDML is required to address the factors causing the impairment or threat.

5N - available data and or information indicate that a water quality standard is not met due to an apparent natural source in the absence of any identified man-made sources.



### Use Class

C-3 – Waters classified as suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

### Riparian Corridors

Riparian corridors contain native species plains cottonwood, narrowleaf cottonwood, green ash, and sandbar willow and invasive species Russian olive and salt cedar. Russian olive is common especially along the Powder River, and salt cedar is rapidly spreading from infestations in Wyoming. Riparian areas cover only around 3% of the land in the county, but they are important for hay production as well as livestock and wildlife forage, cover and habitat. Pastures with riparian cover provide winter and calving protection for livestock and tend to be used each year for this reason. The lack of cottonwood regeneration along the rivers and major streams in the county is regularly brought up as a resource concern for producers and land managers. Cottonwood seedlings need fresh sediment deposits and abundant moisture to establish; in the Powder River valley, this corresponds to snowmelt and/or spring precipitation runoff. Throughout the Powder River area numerous small earth dams have been constructed in the uplands to hold runoff for watering stock or irrigation. Damming runoff and sediment from the uplands could be contributing to the lack of cottonwood regeneration in drainages. D. M. Schook et al. included their thoughts on this topic:

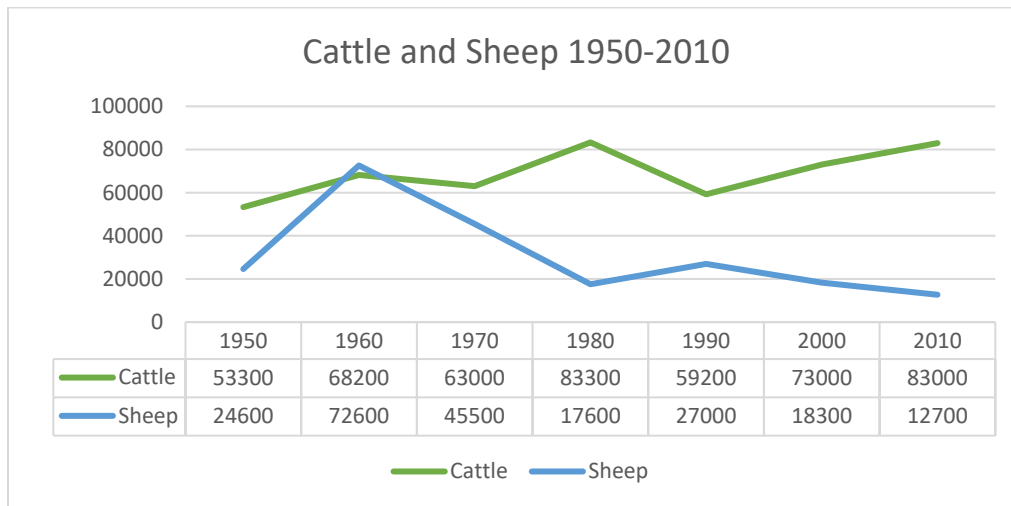
*“Trend analysis revealed that ring widths significantly declined at the Yellowstone and Powder Rivers from 1931 to 2010... The decreased growth period follows the construction of large reservoirs that decreased the proportion of flows occurring during the early-summer reconstruction period (p\_0.03; Table 4; supporting information Table S2) [Chase, 2013].*

*Factors other than early summer flows that may be contributing to growth declines at the Powder and Yellowstone Rivers include decreased vertical infiltration of water on the floodplain caused by reduced flood peaks [Reily and Johnson, 1982], increased evapotranspiration related to higher temperatures, and increased competition for water resulting from introduction of nonnative pasture grasses and the tree Russian olive (*Elaeagnus angustifolia*).”<sup>7</sup>*

### LIVESTOCK

When Powder River County was formed in 1919, sheep were the most plentiful livestock type<sup>11</sup>. By the time the state of Montana began recording Ag Statistics in 1949, cattle made up the bulk of livestock production in Powder River County<sup>11</sup>. Today, cow/calf herds make up the majority of beef operations. Yearling operations are not uncommon, and a handful of registered bull operations and milk cows for non-commercial milk production exist. Sheep are the second most common livestock in the county, both for meat and wool products. A handful of people raise butcher hogs to sell locally or consume, and a few raise goats to control nuisance plants. Chickens are commonly raised to provide eggs for home use or small side sales. Montana Ag Statistics cattle and sheep inventory trends since 1950 are shown in Figure 14.

Figure 14: Powder River Livestock Inventory<sup>24</sup>



The beef cattle inventory in Powder River County is primarily influenced by market conditions and weather patterns. Sheep inventory, on the other hand, tends to be influenced by several more factors, including predation and leafy spurge infestations.

Concentrated animal feeding operations, also known as CAFOs, that house and feed large numbers of animals on a small land area for more than 45 days are not common in Powder River County. Unlike areas such as the Yellowstone River Valley, Powder River County does not produce a surplus of fodder to support commercial feeding operations. Some producers have the ability to background their calves before marketing, and most every livestock producer has corrals where few animals may be confined for a long period, whether for doctoring, calving/lambing, or to fatten an animal for butchering. As is common in eastern Montana, the corrals are often located near a water source that is either perennial, intermittent, or shallow groundwater, and it's not uncommon for the corrals to be in the same place where the original homesteader started their operation.

**FISH AND WILDLIFE RESOURCE**

Powder River County enjoys a boost to the local economy thanks to the diverse wildlife found in the area, which supports harvestable populations of black bear, mountain lion, bobcat, elk, mule deer, white-tailed deer, antelope, pheasants, turkeys, sharp-tailed grouse, sage grouse, and Hungarian partridge. Waterfowl hunting is available at stock ponds and streams throughout the county. The Powder River and Little Powder River support warm water fisheries, and some larger stock reservoirs support Northern pike, small-mouth bass, perch, and crappie.

**Species of Concern**

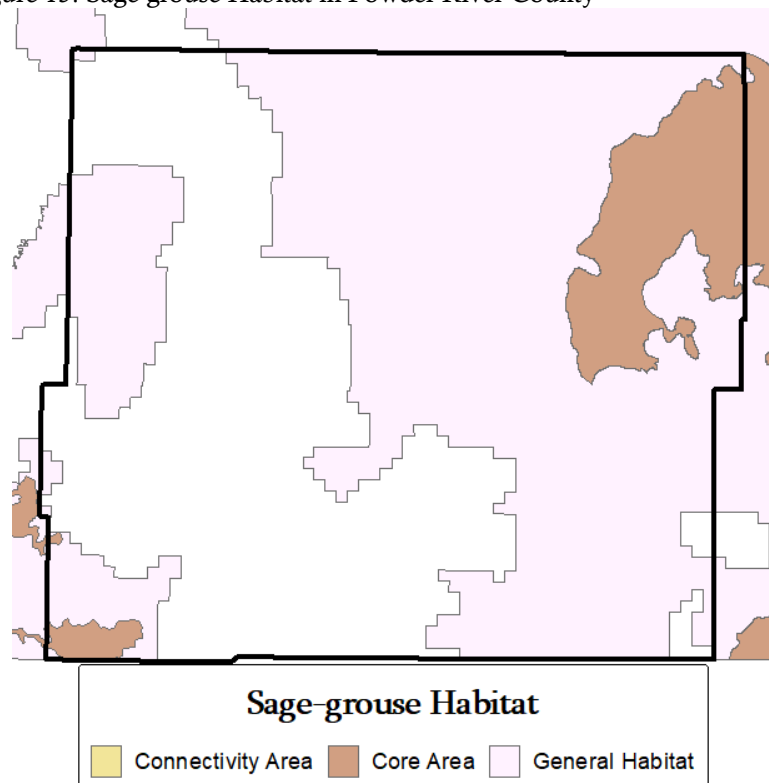
Some animals are not so abundant in their historic range and are included on the US Fish and Wildlife Service's Threatened and Endangered List. The three species currently listed for Powder River County include Whooping Crane, Pallid Sturgeon, and Northern Long-Eared Bat. Appendix D: Threatened and Endangered Species Profiles includes descriptions of each species' status, life cycle, habitat, and threats.

Additional plant and animal species are not threatened by extinction but are experiencing population declines significant enough to be considered Species of Concern by Montana Department of Fish, Wildlife, and Parks. See Appendix E: Powder River County Plant and Animal Species of Concern.

Further information on each species can be accessed at the Montana Fish, Wildlife, and Parks Natural Heritage Program Field Guide at <http://fieldguide.mt.gov/>.

Sage-grouse is one of the species of concern found in Powder River County. Up until 2015 the species was listed as a Candidate on the USFWS Threatened and Endangered list. At that time, habitat loss and fragmentation were considered the biggest threat to the species because a more restrictive listing category could have significant impact to grazing lands in the West, numerous federal, state, local, private, and non-profit stakeholders across Montana and the West have been cooperating to develop strategic plans and dedicate funds to restore and conserve the bird's habitat. Powder River County does not host any migrating sage-grouse populations, but it does provide habitat designated as 'core' in the far southwest corner of the county and a portion of the northeast area of the county, shown in Figure 15 below. Outside of the areas supporting ponderosa pine, the remainder of the county provides general sage-grouse habitat which is of secondary importance for conservation compared to migration corridors and core areas. Core areas are key portions of habitat for sage-grouse designated by Montana Fish Wildlife and Parks & other agencies that, as of 2013, contained ~76% of the displaying males.<sup>26</sup> General habitat can provide nesting cover, brood-rearing habitat, and winter cover in the form of herbaceous and shrub cover, draws and coulees with abundant moisture for forb and insect production, and sagebrush cover, respectively.

Figure 15: Sage-grouse Habitat in Powder River County



## **MINERAL RESOURCES**

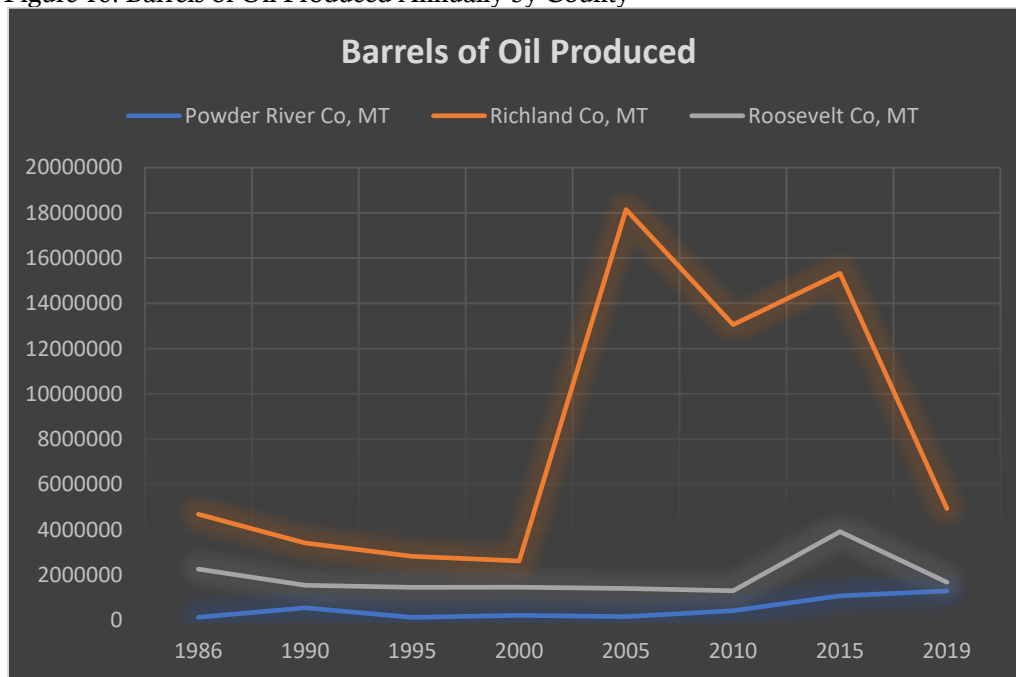
Powder River County is named for the geologic region in southeast Montana and northeast Wyoming known for its coal resources, the Powder River Basin. Powder River county sits at the eastern edge of the Powder River Basin, which covers about 20,000 square miles. It extends north-south from Miles City, MT to Douglas, WY and west to east from Sheridan, WY to Broadus.<sup>12</sup>

Within the Basin, the most significant coal resources are in the Tongue River Member of the Fort Union Formation<sup>12</sup>, which encompasses three quarters of the county, as shown previously in Figure 4. The Tongue River Member of the Fort Union Geologic Formation underlies most of Powder River County, and the Hell Creek Formation lies beneath most of the area east of the Little Powder River.

The Wyoming State Geological Survey states that the Powder River Basin Coal Fields are the most prolific in the world, producing 83.9 million short (2,000 pounds) tons of coal in 2018<sup>13</sup>. A 1981 Powder River County Comprehensive Plan projected population growth and infrastructure needs based on anticipated coal production in four federal land tracts in Powder River County, planned to be mined starting in 1982. The plan suggested the county population would increase by 125 workers at the beginning of construction and peak at 1,892 operation workers eight years later. These figures don't include spouses or dependents. Although the tracts were never mined for coal, the plan illustrates the potential for future growth of some amount, especially if advances in clean coal technology occur.

Oil production in the county, however, experienced extensive growth in the Belle Creek Oil Field in the late 60's and continues to support tax revenues today. According to Montana DNRC Board of Oil and Gas data, there have been around 320 oil wells drilled in the county, and around 50 are still in production<sup>14</sup>, partly due to high pressure CO<sub>2</sub> field-sweeping technology employed in Belle Creek. Board of Oil and Gas oil production statistics for Powder River County and two counties within the famous Bakken Oil Field - Richland and Roosevelt Counties - are graphed below in Figure 16; data is only available as of 1986.

Figure 16: Barrels of Oil Produced Annually by County



Rich coal fields also mean Coal Bed Methane (CBM) gas fields. Coal Bed Methane is a natural gas contained in coal seams as a result of physical and chemical processes; the same processes that produced coal. The gas is trapped in coal seams by water, so the process of retrieving CBM involves drilling a water well into a coal seam and wasting the large volumes of water where the gas is trapped. The Powder River Basin experienced CBM development in the 2000s; sixteen wells were drilled in PR County, and their production ceased in 2014<sup>14</sup>. In the Powder River Basin, the wasted groundwater typically has high sodium levels. Additionally, CBM gas that escapes the retrieval



process travels uphill in the coal seam until it reaches a perforation such as a domestic or stockwater well, where it will outlet with the pumped water and can cause airlocks and water supply issues. Managing the large volume of wastewater, mitigating concentrated salts in the soil where wastewater is applied, and mitigating gas in water supply systems are significant aspects of CBM production in Powder River County.

Sand and gravel resources in the county are quite limited, occurring mostly along the rivers, major streams and in the Pumpkin Creek area. The sands and gravels found in the county are of poor to fair quality because of the high silt content. Potential sand and gravel mines also have to be carefully selected so as not to spread noxious weeds since leafy spurge is a common noxious weed found along the Powder River and its tributaries.

**AIR AND ENERGY**

Montana Department of Environmental Quality Air Quality Bureau maintains an air quality monitoring station in Broadus. It was established in 2010 to track ambient temperature, wind speed and direction and pollutants including NO, NO2, NOX, ozone and particulate matter and to track changes in air quality that may occur due to coal bed natural gas development.<sup>15</sup> There are very rarely any areas of non-attainment in Powder River County, but air quality is rapidly diminished across the county during the fall when lightning-caused wildfires are common. Most significant fires occur in the forested western part of the county and the western parts of North America and Canada, and due to a predominant west wind, smoke causes air quality issues across the whole county during wildfire season.

**UTILITIES**

Tongue River Electric Cooperative (aka TRECO) is the dominant electrical provider in Powder River County although some residents in southern PR County receive electricity from Powder River Energy Corporation out of Campbell County, Wyoming. TRECO was incorporated in January 1946 and currently serves 2,630 members over an area that includes parts of seven counties<sup>16</sup>. Communication services are provided by Range Telephone, Verizon Wireless and AT&T. Most citizens use a cellular phone and have internet to their homes. Water for businesses and residences in the City of Broadus is provided by a municipal water well system. Tests conducted by the water utility and provided to Montana Department of Environmental Quality show no contaminants or pollutants above federal health-based drinking water standards.

**III. CONSERVATION EFFORTS**

In the 2014 and 2018 Farm Bill, the Broadus NRCS Field Office conservation planning efforts resulted in 60 Conservation Program Contracts, valued at \$4.6 million in Farm Bill funding and covering 239,148 acres; see Table 4 below for this breakdown. The Conservation Stewardship Program (CSP) and Environmental Quality Incentives Program (EQIP) have been the most popular Farm Bill programs.

Table 4: Conservation Program Contract Summary in Powder River County – 2014 & 2018 Farm Bill conservation Program Contracts

<b>Program</b>	<b>Number of Contracts</b>	<b>Funding Value</b>	<b>Acres Treated</b>
EQIP	30	\$1,296,508.69	68,125.6
CSP	26	\$3,261,856.89	170,243.7
CSP-GCI	4	\$62,254.80	778.4

A lesser-known program, but definitely not of lesser importance, is the Conservation Technical Assistance (CTA) Program. When a producer requests assistance with improving their operation, NRCS staff work with the producer to develop a Conservation Plan that meets the customer's objectives as well as addresses resource concerns that exist on the operation. This is achieved using the CTA program. Once the Conservation Plan is in place, the producer can apply for financial assistance through Farm Bill Programs like EQIP and CSP to implement activities in the Plan. Applications compete for funding, and not all applications are successfully funded due to limited funding availability. At times, producers will go ahead and implement some activities at their own cost. NRCS is also responsible for providing technical assistance to producers who participate in Farm Service Agency (FSA) programs, such as Conservation Reserve Program (CRP) and Emergency Conservation Program (ECP). CRP is used to restore and conserve sensitive soils as land in perennial vegetation that may otherwise be used for annual cropping. ECP can provide relief for fire, flood, or drought-affected producers to rebuild infrastructure or provide immediate relief measures. Those practices may be reflected in the table below. Finally, Conservation Plans are also developed for producers who want to ensure their farming operations meet Food Security Act criteria for highly erodible land, which enables them to be eligible to participate in USDA programs. The practices that have been completed in Powder River County as a result of CTA planning, but without financial assistance, are in Table 5 below.

Table 5: CTA Practices Applied in Powder River County – CTA Practice Summary Applied 2013-2023

<b>Practice Number</b>	<b>Practice Name</b>	<b>Extent</b>	<b>Unit</b>
315	Herbaceous Weed Treatment	17.8	ac
382	Fence	31,675	ft
383	Fuel Break	1.9	ac
384	Woody Residue Treatment	10	ac
462	Precision Land Forming and Smoothing	2	ac
472	Access Control	4,313	ac
511	Forage Harvest Management	966.5	ac
512	Forage and Biomass Planting	1,226.9	ac
516	Livestock Pipeline	6,030	ft
528	Prescribed Grazing	14,422.5	ac
614	Watering Facility	1	ea
645	Upland Wildlife Habitat Management	8,600.5	ac
666	Forest Stand Improvement	11	ac
797	Invasive Plant Species Control	6	ac

EQIP practices implemented in 2013-2023 were primarily used to improve plant condition and related resource concerns on grazing land. An occasional Special Initiative through EQIP can fund projects to address limited resource concerns, and Powder River County has used such Special Initiative funding for Fire Recovery. Table 6 below summarizes implemented EQIP practices.

Table 6: EQIP Practices Applied in Powder River County – EQIP Practice Summary Applied 2013-2023

<b>Practice Number</b>	<b>Practice Name</b>	<b>Extent</b>	<b>Unit</b>
315	Herbaceous Weed Treatment	258	ac
342	Critical Area Planting	1	ac
351	Well Decommissioning	4	ea
362	Diversion	900	ft
378	Pond	3	ea
382	Fence	179,325	ft
383	Fuel Break	14.1	ac
384	Woody Residue Treatment	131.8	ac
472	Access Control	32,636.3	ac
500	Obstruction Removal	4.3	ac
512	Forage and Biomass Planting	264.4	ac
516	Livestock Pipeline	185,170	ft
528	Prescribed Grazing	58,772.2	ac
533	Pumping Plant	28	ea
548	Grazing Land Mechanical Treatment	63.3	ac
550	Range Planting	1.5	ac
561	Heavy Use Area Protection	2	ac
574	Spring Development	1	ea
576	Livestock Shelter Structure	3	ea
578	Stream Crossing	2	ea
587	Structure for Water Control	1	ea
614	Watering Facility	63	ea
635	Vegetated Treatment Area	2	ac
642	Water Well	11	ea
645	Upland Wildlife Habitat Management	1,203.3	ac
649	Structures for Wildlife	22	ea
666	Forest Stand Improvement	233.8	ac

Producers who participated in the CSP Program were able to achieve unique objectives for their operations; see Table 7 below for a summary of the activities. The financial assistance offered by CSP also required participants to continue being good stewards of the land for five years.

Table 7: CSP Activities Applied in Powder River County – CSP Practice Summary Applied 2013-2023

<b>Practice Number</b>	<b>Practice Name</b>	<b>Extent</b>	<b>Unit</b>
315	Herbaceous Weed Treatment	44	ac
327	Conservation Cover	0.1	ac
511	Forest Harvest Management	1,319.2	ac
512	Pasture and Hay Planting	56.7	ac
528	Prescribed Grazing	6,373.2	ac
595	Pest Management Conservation System	265	ac
612	Tree/Shrub Establishment	0.3	ac
649	Structures for Wildlife	18	ea
797	Invasive Plant Species Control	11	ac
AIR04	Use drift reducing nozzles, low pressures, lower boom height and adjuvants to reduce pesticide drift	8,064	ac
AIR07	GPS, targeted spray application (SmartSprayer), or other chemical application electronic control tech	3,927	ac
ANM02	Defer crop production on temporary and seasonal wetlands	3	ac
ANM08	Improve the plant diversity and structure of non-cropped areas for wildlife food and habitat	5	ac
ANM09	Grazing management to improve wildlife habitat	10,335	ac
ANM10	Harvest hay in a manner that allows wildlife to flush and escape	20,443	ac
ANM12	Shallow water habitat	1	ac
ANM15	Forest stand improvement for habitat and soil quality	1,341	ac
ANM17	Monitoring nutritional status of livestock using the NUTBAL PRO System	45,139.2	ac
ANM18	Retrofit watering facility for wildlife escape	96	ea
ANM24	Forest Wildlife Structures	400	ac
ANM26	Managing Calving to Coincide with Forage Availability	10,012	ac
ANM27	Wildlife Friendly Fencing	35,006	ft
BRA04	Range Bundle #4	2,308	ac
E300EAP1	Existing Activity Payment—Land Use	57,521.5	ac
E300EAP2	Existing Activity Payment—Resource Concern	132	ea
E315134Z	Herbaceous Weed Control (plant pest pressures) for desired plant communities/habitats	165	ac
E315A	Herbaceous weed treatment to create plant communities consistent with the ecological site	36.5	ac
E327136Z1	Conservation cover to provide food habitat for pollinators and beneficial insects	0.5	ac
E382A	Incorporating “wildlife friendly” fencing for connectivity of wildlife food resources	13,712	ft
E511B	Forage harvest management that helps maintain wildlife habitat cover, shelter or continuity	1,610.5	ac
E512102Z	Cropland conversion to grass-based agriculture to reduce wind erosion	43	ac



E512132Z1	Forage and biomass planting that produces feedstock for biofuels or energy production	39	ac
E512D	Forage plantings that help increase organic matter in depleted soils	27.5	ac
E528118Z2	Grazing management that protects sensitive areas-surface water from nutrients	32,630	ac
E528N	Improved grazing management through monitoring activities	7,052.4	ac
E595B	Reduce risk of pesticides in water and air by utilizing IPM PAMS techniques	530	
E645137Z	Reduction of attractants to human-subsidized predators in sensitive wildlife species habitat	9	ac
E645A	Reduction of attractants to human-subsidized predators in sensitive wildlife species habitat	1	
ENR01	Fuel use reduction for field operations	1830	ac
ENR03	Pumping plant powered by renewable energy	3	ea
ENR04	Recycle 100% of farm lubricants	9	ea
PLT02	Monitor key grazing areas to improve grazing management	56,846	ac
PLT05	Multi-story cropping, sustainable management of nontimber forest plants	8	ac
SOE01	Continuous no till with high residue	1,910	ac
WQL01	Biological suppression and other non-chemical techniques to manage brush, weeds and invasive species	150	ac
WQL03	Rotation of supplement and feeding areas	153,509.5	ac
WQL06	Apply controlled release nitrogen fertilizer	6,715	ac
WQL11	Precision application technology to apply nutrients	4,012	ac
WQL12	Managing livestock access to water bodies/courses	336	ac
WQL13	High level Integrated Pest Management to reduce pesticide environmental risk	35,802.8	ac

### **PARTNER CONSERVATION EFFORTS**

The Powder River Conservation District (PRCD) is a key partner to conservation efforts in Powder River County. The District has supported or been a lead entity in many studies and conservation efforts in the county including numerous Powder River water quality studies, the Coalbed Methane Protection Program, Aquatic Invasive Species (AIS) Station, a Ponderosa Pine Thinning Study, a Fecal Nutrient Study, Cottonwood Regeneration trials, windbreak and conservation species sales and installation, conservation education and outreach, and several Plant Materials Program Planting Trials (Lodgepole Pine, Introduced Pasture Species, and Basin Wildrye). Highlights from some of the efforts follow.

#### **Coalbed Methane Protection Program**

As noted earlier, coalbed methane (CBM) development can cause gas to escape from coal seams and travel uphill until it reaches a perforation such as a water well. The gas can cause airlocks in pipelines as well as interrupt flow supply and diminish the well's purpose. The Coalbed Methane Protection Program was established and funded by the State of Montana Legislature to resolve issues caused by CBM development elsewhere. In the last five years, the program has funded several mitigation projects in southern Powder River County, thanks to the PRCD's involvement and administration of the projects in the county.

### **Ponderosa Pine Thinning Study**

In the 1990's, NRCS and the CD acknowledged ponderosa pine trees were encroaching into and crowding out grazing land and becoming a formidable wildfire concern, and they recognized the need for viable treatment options. At least one landowner in the Stacy community experimented, circa, 1987, with selective thinning in over-stocked ponderosa pine forest, with seemingly desirable yet undocumented effect. A study was completed from 1996-2006 at sites in Carter, Custer, and Powder River Counties to evaluate chemical and mechanical treatments. Results of the study were used to develop Montana NRCS Forestry Technical Note MT-32, attached as Appendix F, as well as spacing requirements in the Montana NRCS Forest Stand Improvement (Practice Code 666) specification. As noted in the EQIP Practice Summary above, some operators have been able to use Farm Bill program funding to improve their treed areas using Forest Stand Improvement. Producers are often discouraged by the cost to implement forest improvement practices, since the cost can often be comparable to land prices. Without financial assistance to offset the cost, forest management practices are a hard sell for conservation planners. Furthermore, the sites that were successfully treated in the thinning study responded so favorably that commercial thinning opportunities become available in as little as 15 years following treatment.

### **Cottonwood Regeneration Trials**

Lack of cottonwood regeneration has been a topic at many producers' tables during planning discussions. Planting tree stock is an obvious solution, which requires labor intensive site preparation, protection, monitoring, and replacing dead trees. The PRCD and NRCS decided to see what could be done to encourage natural cottonwood regeneration. They chose two sites on the Powder River – one near Broadus and one around 20 miles upstream of Broadus. Through a fairly informal trial process, they tried mechanical ripping using a bulldozer in various stands of trees to sever tree roots and stimulate root sprouting. Ripping proved successful in producing sprouts, but apparent competition with established trees and understory vegetation resulted in too much competition for moisture. There was 100% mortality of cottonwood sprouts within two years of ripping, even where wildlife and livestock were excluded. However, cottonwood regeneration along the rivers and streams in the county remains a concern with regard to streambank stability, floodplain function, and wildlife habitat.

### **Aquatic Invasive Species Station (AIS)**

In 2019, the Powder River Conservation District cooperated with the Montana Department of Fish, Wildlife and Parks and a Broadus business to open and maintain a station to inspect aquatic vessels. The station is located at and operated by the business, located in Broadus on Highway 212, which funnels vehicles coming from the central and southeastern parts of the nation into Montana. The objective of the AIS station is to prevent the spread of aquatic invasive species such as zebra and quagga mussels, Eurasian watermilfoil, and others. These species are not known to exist in Powder River County, and the AIS station aims to keep it that way. Invasive mussels attach to and plug infrastructure such as municipal water and sewer supply lines and irrigation pumps and conveyance systems. Watermilfoil displaces native vegetation in water bodies and creates low oxygen levels that cause mortality to fish and aquatic species.

### **Farm Service Agency**

The Farm Service Agency is a close USDA partner of NRCS and the CD, working for private land conservation. The local FSA office provides risk management options, loan options, emergency relief following natural disasters, and conservation program options to producers in the county. Often, NRCS is responsible for providing technical assistance to FSA to assist with implementing their conservation programs.

### **Powder River County Weed District**

The Weed District program staffs a full-time Weed Coordinator and employs seasonal help in the summer. The program is focusing on eradicating new noxious weed infestations of Ventenata and providing weed control services to land managers. They've applied for grant funds to help reduce costs to treat Ventenata.

### **US Geological Survey**

Since 1978, USGS scientists, John Moody, Bob Meade (retired) and others, have studied permanent cross-sections of the Powder River. Their interest in the Powder River is due to its infamous ability to migrate, its propensity to flooding, and its relatively unaltered and undammed characteristics, allowing less error in studies and modeling. Several of the reaches were established due to the PRCD Board's commitment to protecting and learning about the county's water resources.

### **US Forest Service**

The District's projects include some prescribed burning to thin forest stands and clean up standing dead/down trees as well as revegetating conifer stands. NRCS teams up with the US Forest Service on Burned Area Emergency Response (BAER) teams following wildfires. BAER teams assess location and degree of burn damage and develop plans for recovery. These efforts help NRCS determine what and how much infrastructure has burned, how much grazing land has been lost, and if it can recover on its own or if it requires reseeding. This was implemented most recently after the 2012 Ash Creek fire. An EQIP Fire Recovery Special Initiative offset the cost of resting burned pastures and provided some financial assistance for weed control.

### **US Bureau of Land Management**

NRCS grazing-land projects often propose changes to grazing systems, and since operations typically consist of either one or both BLM and State Lands, operators and NRCS meet and discuss changes with stakeholders to ensure mutual benefit. Sometimes proposals also included infrastructure such as pipelines, tanks, and fencing on the public land that require land manager approval. Operators occasionally receive assistance from BLM with installing infrastructure on public lands used by livestock.

### **MT Department of Natural Resources and Conservation**

DNRC is involved in many on-going conservation efforts in Powder River County. State lands forest projects include creating fuel breaks and defensible space, tree thinning for fire mitigation, and clean-up on recently burned areas. DNRC Water Rights Division assists the PRCD with administering water reservations and 310 Permits for dirtwork activities in stream and riverbeds. The DNRC Land Manager also cooperates with producers and NRCS on proposed grazing system changes, similar to BLM.

### **Montana State University Extension – Powder River County**

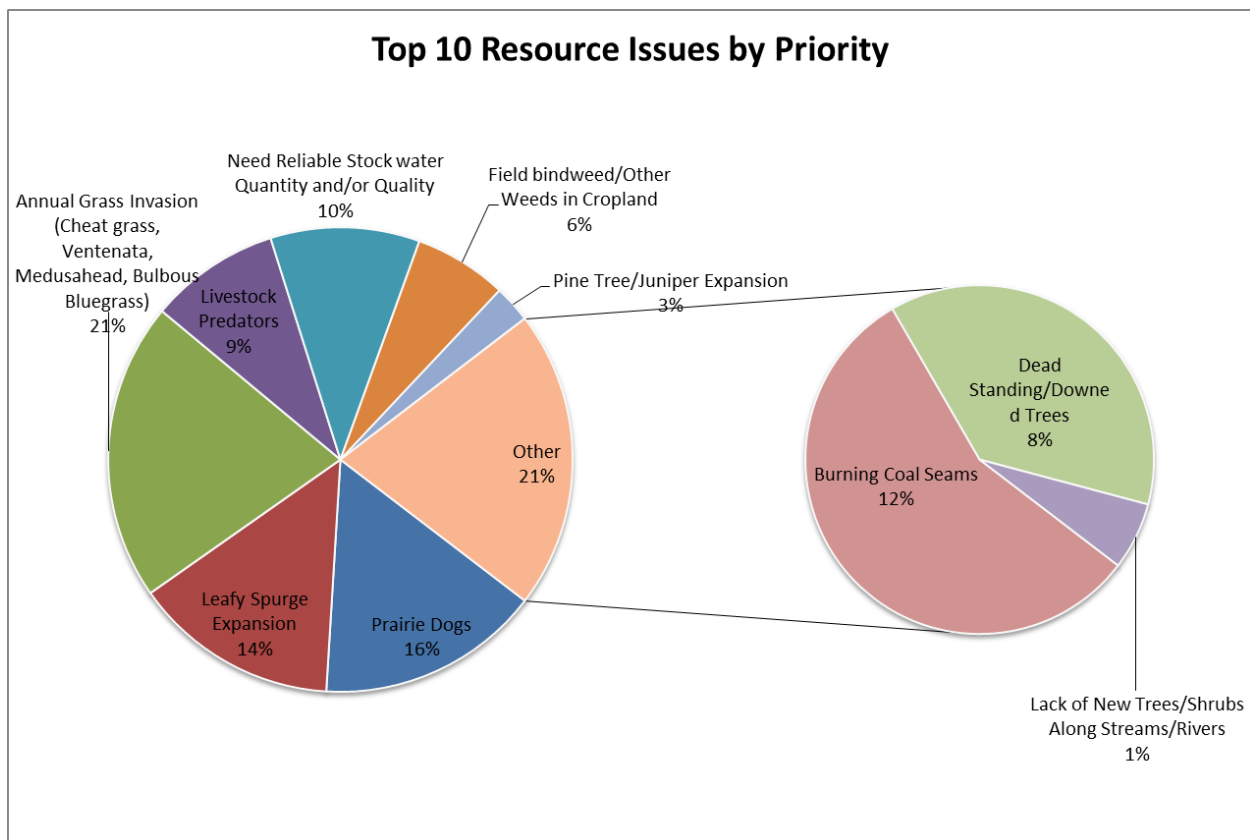
MSU Extension works with other stakeholders in Powder River County including the PRCD, PR County Weed District, PR County Commissioners, and NRCS to educate producers about Ag topics and rural living. The Extension Specialists host an annual Ag winter series of workshops and Annie's Project, which focuses on women in agriculture. They are also at the forefront of crop trials and livestock nutrition studies taking place at Montana State University research centers; they stay on top of weed issues in the county; they provide water quality testing; run the youth 4-H program; and help produce the annual Powder River County Fair.

### American Bird Conservancy

Beginning in 2018, the American Bird Conservancy (ABC) and NRCS entered a partnership to conserve and restore grasslands in Powder River County and surrounding counties. An ABC partner biologist stationed in the Miles City NRCS office helps NRCS implement Farm Bill programs and educate the public about the importance of quality habitat for ground nesting birds. To date, efforts have resulted in grant monies to install infrastructure to enable rotational grazing improvements as well as Conservation Plan development for EQIP funding consideration.

## **IV: NATURAL RESOURCE PROBLEMS AND DESIRED FUTURE OUTCOMES**

Priority natural resource problems in Powder River County are displayed in the graphic below:



### **Plant Pest Pressure – Noxious Weeds & Invasive Annual Grasses**

Noxious weeds are one of the most frequently noted natural resource concerns for producers in Powder River County, due to their wide-spread abundance on any land use type, difficulty to control, lack of natural predators or controls, and their ability to displace vegetation desired by livestock and wildlife. State listed noxious weeds known in the county include leafy spurge, Canada thistle, spotted knapweed, Russian knapweed, houndstongue, field bindweed, salt cedar, dalmation toadflax, yellow toadflax, common tansy, sulfur cinquefoil, whitetop, field bindweed, St. John's wort, cheatgrass, ventenata, and Russian olive, and County listed noxious weeds include poison hemlock, puncturevine, and black henbane. Fact sheets for these weeds is included in Appendix C: Montana Noxious Weed List; Powder River County Noxious Weed List; and Noxious Weed Profiles.

Leafy spurge, Canada thistle, field bindweed, the knapweeds, and houndstongue are the most prevalent and have been established the longest. Most weeds are introduced into the county via major highways as noxious weeds march from west to east or are carried on the westerly wind and then are ultimately spread by wildlife, livestock, and local traffic. Because of this, major roadways are the priority control areas for the Powder River County Weed District. Patches of newly introduced weeds are a secondary priority to prevent them from spreading further and becoming naturalized, or widespread.

Ranchers with land on the southern (upper) reaches of the Powder River claim leafy spurge was introduced to the county from Wyoming, via the Powder River during the flood of 1978, which was a 50-year flood event. The Powder River provided an ideal transportation system as well as ideal growing conditions. Although leafy spurge prefers moist river and streambanks, it's also known to establish in hilly country on shale outcrops and in draws. It is known to exist along the Powder River all the way into Prairie County where it flows into the Yellowstone River. It reproduces by seed and by very persistent, long-lived roots called rhizomes that spread underground and produce new plants. Birds are common distributors; random spurge patches will establish at fenceposts and telephone poles where birds perch. It produces a milky latex not tolerated by cattle.

The Weed District and NRCS understand some weeds, such as leafy spurge, can't be eradicated. It has become so widespread that it will continue to be a part of the ecosystem. It is apparent land manager efforts need to focus on preventing its spread and trying to decrease the plant populations to a manageable threshold for the long term; this may be how we measure results. To accomplish this, the desired future outcome would be for producers to adopt long-term use of integrated pest management tools not currently used. For leafy spurge control, this would include a combination of grazing by sheep or goats, chemical control, and biological control by flea beetles. This combination has proven to be the most effective in keeping leafy spurge from completely taking over large areas of grazing-land. Sheep or goat grazing can be challenging because the animals are difficult to contain in pasture, and adequate herd numbers may not be available to cover all the impacted land. Herders and well-maintained fence are solutions.

A working group in Custer County consisting of stakeholders with land along the Powder River has been looking into hiring an operator to bring goats onto the river corridor to graze spurge under contract. The Bureau of Land Management appears to be interested in supporting the endeavor financially to discourage the spread of spurge onto BLM land. The operator who owns the goats reported to the group that he expects 50% stem reduction by the end of the fifth year of grazing. As this project develops, LWG stakeholders in Powder River County stand to gain knowledge for future local projects.





Figure 18: leafy spurge along Little Powder River; photo taken April 2007 by Carol Hilliard, NRCS.

Canada thistle prefers productive soils, such as crop fields, hay meadows, floodplains, and draws. It is a biennial, meaning the plant forms a rosette the first year of growth, and the second year will grow a seed stock. It reproduces by fluffy seed easily transported on the wind and by rhizomes. There is a biological control agent available for Canada thistle, but chemical control is the most common and effective control type. Thistles are widespread in Powder River County. Canada thistle is more common in the western part of the county receiving higher precipitation. It's also invading irrigated hayland and wet meadows harvested for hay along the Powder River and major streams. Because of this, it spreads easily as contaminated hay.

Spotted knapweed is a short-lived perennial that is a prolific seed producer. Each plant can produce hundreds of seeds that remain viable for several decades. It is adapted to a wide variety of site conditions and can germinate in 24 hours with adequate moisture. It is more common in the county than Russian knapweed and is more difficult to control. Russian knapweed is a long-lived perennial that can reproduce by seed and by rhizomes, but mostly persists from the root system. Common knapweed control methods include hand pulling, biological control, and chemical control. Goats and sheep can also be trained to forage on knapweed. Spotted knapweed is found mostly in the western part of Powder River County, likely spread into the Custer National Forest by recreationists coming from the western part of the state.

As its name suggests, the houndstongue plant leaves resemble a long and wide dog tongue. The plant is adapted to a wide variety of soil conditions, including poor soil and rocky sites. It's biennial, but can be a short-lived perennial, and reproduces by seed. Because the seeds have tiny, hooked ends that attach to fur and clothing, houndstongue communities can be dense and patchy as well as very isolated but numerous. Common control methods are hand-pulling and chemical control. It's been found along roadways throughout the county and is common in the Custer National Forest and western part of the county.

Ventenata, an invasive winter annual grass introduced from Europe and North Africa, was first found in Powder River County in 2021. The known infestations are concentrated in the south-central area of the county. Campbell County Wyoming Weed and Pest Control has been treating the weed across the state border since around 2019. Ventenata is high in silica, which is a glass-like element that decreases palatability and causes grazing animals to avoid using it. It spreads rapidly, only by seed, and dead plants create a layer of plant material that doesn't readily decompose due to the high silica content. Unlike leafy spurge, potential exists to control the annual invasive grass. The key to controlling Ventenata from spreading is to inhibit seed production. Several herbicides are available to disrupt Ventenata's reproductive cycle, including pre-emergent and post-emergent herbicides. The Powder River County Weed Control has treated some sites in that area and is planning with land managers and applying for grant funding to target additional resources on eradicating ventenata. Powder River County Weed Control and partners such as MSU Extension are also doing regular outreach and providing education about identifying and controlling Ventenata.

Cheatgrass and Russian olive are deemed lower priority plants for control on the Montana Noxious Weed List. These plants are not regulated but have the potential to have significant negative impacts. The plants may not be intentionally spread or sold other than as a contaminant in agricultural products. Cheatgrass is a winter annual that reproduces by seed and is found in nearly every ecosystem in eastern Montana. It is palatable to livestock early in the spring, and livestock hoof action created by high density herding is a successful control tool. Chemical remediation is available but is not typically economical due to the widespread abundance of the weed. Researchers are studying possible bio control agents that are applied as soil amendments. Russian olive is a very hardy, drought resistant, shade-tolerant tree introduced by the Soil Conservation Service (predecessor to NRCS) in Montana as a recommended windbreak species. It reproduces by seed in the form of large, olive-sized capsules. When the species escaped its intended windbreak habitat and became established in riparian corridors, it proved to be a weedy species in those environments. Concerns with Russian olive are that it displaces, and shades out native vegetation including cottonwoods and lacks deep and binding roots to hold stream banks, an extremely desirable characteristic of native riparian species. In Powder River County, Russian olive exists in the Powder River and Little Powder River corridors, and nearly every major stream corridor. It has also been found in draws dominated by ponderosa pine, presumably transported by birds.

The Powder River County Noxious Weed List includes three weeds not included on the State List: poison hemlock, puncturevine, and black henbane. Poison hemlock is found along streambanks where soils are productive and moisture is abundant in Powder River County, particularly in the Sayle community and the East Fork of Pumpkin Creek and Wilbur Creek. All parts of the plant are poisonous to stock and humans; it displaces desirable vegetation; and it is very persistent. Puncturevine is common on disturbed areas, including along gravel roads and trails and on edges of city streets. It reproduces by seed, which is shaped like a goathorn and has very thick, prominent spikes which are a nuisance to tires and can injure livestock hooves. Black henbane is another plant poisonous to stock and humans. It prefers disturbed sites and rangeland that is heavily grazed, can be prevented by using proper land management, and can be controlled using chemical or hand pulling. Its distribution in Powder River County is minor but remains a priority since it's poisonous.

### **Degraded Plant Condition: Plant Structure and Composition and Wind & Water – Prairie Dogs**

Soil erosion and degraded plant condition caused by native prairie-dwelling prairie dogs is a difficult, and often contentious, issue to tackle. The animals dig burrows that they dwell in year-round. A widespread area of burrows on the landscape is called a prairie dog town. The prairie dogs eat rangeland plant roots as much for food as for eliminating standing vegetation within the towns. This

allows them to have a good view of their surroundings and keep an out for predators on land and in the sky. The combination of digging burrows and eliminating ground cover contributes to site conditions that favor soil erosion and cause shifts in native plant communities from desirable and grazable forage to bare ground or undesirable species, which are avoided by livestock.



Figure 17: prairie dog town near Broadus; photo taken August 2016 by Corey Swenson, NRCS.

It's obvious why some livestock producers find the creature to be a pest, but there are also reasons some operators prefer to leave them alone. Prairie dog hunting and wildlife viewing can be profitable enterprises for livestock operators. Some operators leave the prairie dog alone because it's part of the natural ecosystem and belongs in the food chain. Participants of the 2019 Local Working Group discussed these facts, and pointed out the challenges for operators controlling prairie dogs in some areas while land managers in other areas prefer not to control prairie dogs. Hence, this issue is a difficult and controversial one to address on planning units larger than the ranch scale. However, there may be opportunity to assist operators with common goals who are adjacent to each other.

The extent of prairie dog populations in Powder River County is unknown. According to LWG participants and NRCS personnel observations, prairie dog populations are increasing. Along Highway 59 between Broadus and Miles City, prairie dog towns are spreading. However, prairie dogs can carry and are susceptible to the plague, and population booms are followed by population die-offs. This cycle is normal and is mother-nature's supply and demand economics. More prairie dogs mean more hosts for plague-infected fleas.

Desirable future condition depends on land manager objectives, but to the 2019 Local Working Group, their desired condition would be to exterminate prairie dogs from their operations. In order to achieve this in any particular area, NRCS's objective would be to get 100% participation within the target area, including public land management. Participants would be responsible for exterminating the animals, and NRCS could offer technical and financial assistance to revegetate the sites to desirable native vegetation.

### **Fire Management – Wildfire Hazard from Biomass Accumulation**

Wildfire hazard created by excessive fuel loading was a prevalent concern noted by the 2022 Local Working Group survey respondents and in the 2019 LWG meetings. Wildfire concerns are primarily related to issues: 1) standing and down dead trees and 2) high live-tree densities per acre and 3) coal seam fire ignitions. Coal seam fire ignitions will be discussed individually the next section, whereas fuel loading from increases in woody material are discussed below.

Under natural conditions, most areas supporting ponderosa pine in this area should have a fire return interval of 12-14 years. Therefore, a century of successful fire suppression has resulted in ponderosa pine and Rocky Mountain juniper densities far exceeding what the system typically supported. Tens of thousands of acres are over-stocked with these species and both species have also increased in range, and without human management or frequent fire, will continue to do so.

Much of the transition zone between the higher elevation forests and lower elevation grasslands and sagebrush steppe should contain a mosaic of meadows, savannah, and varying densities of trees relative to soils, aspect, and slope of the dissected landscape. Instead, the savannah component has almost completely been lost on the landscape, meadows are filling in with pine and juniper regeneration, and areas that should support trees are over-dense.

Conifers shade out grass and shrub species, reducing herbaceous production as trees out-compete grasses and forbs for sunlight and soil resources. This lost production has impacts on habitat quality, water storage, and biodiversity for native rangeland species.

It is common for unmanaged stands of ponderosa pine in Powder River County to have 3,000-5,000 stems per acre. For most sites in the county, 151-222 stems of ponderosa pine per acre (corresponds to 14-17' average spacing) is considered optimal for timber production when trees are in the 3-7" diameter class. Stands being managed for forage production, wildlife habitat, or to more closely mimic pre-fire suppression stocking levels would even fewer stems per acre and much greater tree spacing depending as determined by site specific conditions. It is not uncommon to find historical evidence of trees spacings of 80 – 100 ft+ where pine savannahs were once common and maintained by natural fire return intervals.

Unmanaged stands typically present a fuel hazard in that the interlocking crowns of the trees make an easy avenue for wildfire to travel. In addition, dense stands of ponderosa pine seedlings (trees up to 5" diameter at breast height or dbh) represent the perfect 'ladder fuel' to elevate fire to the crowns of mature trees that have commercial value.

Thus, current concerns are the potential for increased and widespread fire hazards due to higher crown fuel loads as well as suppressed herbaceous ground cover and decreased ecological diversity. Powder River County residents unfortunately experienced such an outcome in 2012 when approximately 250,000 acres of public and privately-owned land in Rosebud and Powder River Counties burned in the Ash Creek fire. A third of the burn, or around 80,000 acres, occurred on privately-owned land in Powder River County. The Taylor Creek fire burned around 62,000 acres in Powder River County in the same year. See Appendix B: Ashland Ranger District; Custer National Forest Fire Map, 2012.





Figure 19: approximately 2,880 ponderosa pine stems per acre, before thinning treatment; photo taken 2007 by Corey Swenson, NRCS.



Figure 20: approximately 280 ponderosa pine stems per acre, after thinning treatment; photo taken April 2008 by Corey Swenson, NRCS.





Figure 21: approximately 2,880 ponderosa pine stems per acre, before thinning treatment; photo taken 2007 by Corey Swenson, NRCS.



Figure 22: approximately 280 ponderosa pine stems per acre, after thinning treatment; photo taken April 2008 by Corey Swenson, NRCS.



Some of the areas that were thinned using NRCS Conservation Practice Forest Stand Improvement were burned in the Ash Creek Fire and prevented 100% mortality that otherwise unmanaged timber areas experienced, illustrated by Figures 23 and 24 below. The sites are within the same operation as the sites pictured above, in the Pumpkin Creek watershed. The Ash Creek Fire burned through the entire areas pictured.



Figure 23 (above) and Figure 24 (below): areas burned in 2012 Ash Creek Fire; both sites received Forest Stand Improvement treatment in 2008; photos taken August 2018 by Corey Swenson, NRCS.





Following catastrophic fire events, such as the 2012 Ash Creek Fire, dead standing trees remain in great quantity; with time and weather events, these will eventually fall, contributing to fuel loading on the ground and potentially damaging infrastructure, like fences. They can also severely limit livestock and human access to ranchlands. The standing dead and downed trees pose a continual hazard for another un-manageable fire event. Figure 25 shows an example of these conditions.



Figure 25: area in Pumpkin Creek watershed, burned in 2012 Ash Creek Fire; photo taken June 2019 by Shanna Talcott, NRCS.

Figure 26 was taken July 23, 2019, in an area burned by the 2012 Ash Creek Fire in the Pumpkin Creek watershed in northwestern Powder River County. The area in the center of the photo was treated by removing all woody fuels for a width of 200 feet along the property boundary fence line; the purpose was to create a fuel break and provide access for fence and land maintenance and defensible space to fight a future fire. The area to the left in the photo is untreated burned forest. The area to the right in the photo was treated by salvage logging burned timber; the purpose was to utilize some of the burned timber, provide better grazing-land access for livestock and wildlife, and decrease fuels in the event of a future fire.



Figure 26: fuel reduction treatment in Ash Creek burn area; photo taken July 2019 by Shanna Talcott, NRCS;

### **Wildfire Hazard - Burning Coal Seams**

Burning coal seams are a third wildfire risk resource concern noted by approximately 50% of 2022 Local Working Group survey respondents. An examination of coal seam formation helps illustrate how they are a resource issue in Powder River County.

The Powder River basin was formed when the Rocky Mountains and Black Hills began uplifting in the Late Cretaceous Period. Rivers and streams carried massive amounts of sediment from the uplifting mountains to the shallow inland seas, swamps, marshes, and deltas of the basin. During this process, swamp vegetation and peat were covered and compacted by the sediment, forming coal. The resulting geological formation, Tongue River Member of the Fort Union formation, is known as one of the most valuable coal deposits in the world due to the quantity and quality of coal it contains. Within Powder River County, the Tongue River Member lies west of the Powder River and Mizpah Creek.<sup>1</sup>

As the landscape further developed, streams cut through and exposed the various layers of the soft sedimentary deposits, including layers, or seams, of coal. Exposed coal seams are often ignited by lightning strikes and wildfires. Burning tree roots can also ignite coal seams underground during wildfires. Coal seams can remain burning for decades, and some in the county are said to have been burning for centuries. Therefore, coal seams are actively burning ignition sources. Some of these ignition sources are exposed at the surface. Under ideal conditions, which includes dry, hot weather and some wind, they frequently ignite nearby fuel (such as grass, brush, and trees) causing wildfires.

Powder River County recorded a total of 23 wildfire starts in 2021. Of those, four started from coal seams, and 16 were ignited by lightning. However, coal seam fires burned 971 acres and the 16 lightning ignited fires burned 1778 acres. A total of 4,116 acres burned in Powder River County in 2021, and of that approximately 24 percent can be attributed to coal seams. Even more notable in 2021 was the number of acres burned in neighboring Rosebud County, where 17 coal seam ignited wildland fires burned 128,403 acres, compared to the 17 lightning ignitions which burned a total of 680 acres.

In summary, across the Eastern Montana Fire Zone, there were 183 ignitions attributed to lightning for a total of 34,551 acres, and 51 ignitions due to coal seams totaling 200,820 acres. The Broadus Volunteer Fire Department documented the importance of coal seam ignitions in a Community Wildfire Protection Plan, stating, "...the importance of coal seam ignitions (which may burn for years in place before starting a wildfire) is probably as high as lightning or human causes."

### **Streambank and Gully Erosion - Little Powder River**

Erosion in the Little Powder River watershed was the lower priority for the Local Working Group at the Biddle meeting, but it is in the overall list of resource concerns for Powder River County. The LWG discussion included concerns about streambank stability directly along the Little Powder River and gully erosion in its tributaries. Participants noted the lack of native tree recruitment along the river, particularly cottonwoods and willows, as a cause. Conservation planning efforts could be focused on inventorying streambank erosion, plant condition, and alternative water source quality and distribution. Potential treatments may include developing site-specific conservation plans that allow land managers to control the frequency and duration of grazing along the river corridor. Providing livestock water in the uplands and some fencing could help achieve this and decrease animal trailing and over-use that may be leading to gully formations.

### **Excessive Sediment – Otter Creek**

The Local Working Group participants at the Ashland meeting described resource conditions in parts of Otter Creek as having too much sediment settling in the creek. The areas they described contain cattails and mud and little to no overland flow to move the sediment through the system. Participants noted the floodplain was also soggy, causing difficulty accessing the native meadows typically harvested for hay. One of the causes mentioned included sediment washing off burned and barren uplands into the creek after high rainfall storm events. Broadus NRCS does not have working knowledge of the extent of this issue. In working with individual landowners in the Otter Creek watershed, NRCS staff has observed cattails and wetland vegetation in Otter Creek. Without having a comprehensive inventory, it's difficult to determine which resource concerns exist and what treatment options are recommended on a watershed scale. Again, an interdisciplinary team of experts that specialize in watershed functions (biologists, hydrologists, engineers, plant materials specialists, and conservation planners) would be useful for completing a comprehensive inventory and developing an action plan for this issue. Potential treatments, locations, and extents are unknown.

### **Other**

Other topics discussed at the 2019 LWG meetings, not encompassed by the 2022 LWG responses:

- Crested wheatgrass winter mortality
- Crested wheatgrass monocultures
- Lack of natural water sources for wildlife and livestock
- Developing water spreading for irrigation
- Infiltration issues on irrigated hayland
- Declining water quantity and water quality in the Powder River
- Dysfunctional or uncontrolled flowing wells

### **Prioritized Future Conditions**

Priorities for the Broadus NRCS office to address within the next five years are invasive annual grasses, inadequate livestock water, excessive fuels and wildfire risk, and degraded plant communities. Staff have experience identifying these resource concerns and developing treatment options in most cases.



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