Powder River County
Long Range Plan

Broadus NRCS Field Office

December 26, 2019

Contents

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 2020-2030. 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-governmental organization (NGO) partners. Taking the first step towards our vision, the NRCS and the PRCD hosted Local Working Group (LWG) meetings in February and March 2019 to gather input from stakeholders. Invitations to attend the meeting were sent to over 400 landowners in Powder River County, Powder River Conservation District Supervisors, County Commissioners, the County Weed Board and Weed Control Coordinator, County Extension Agents, the Bureau of Land Management office in Miles City, the US Forest Service Ranger District in Ashland, the Montana Department of Natural Resources and Conservation Eastern Land Office in Miles City, and American Bird Conservancy in Broadus and Miles City. Over 50 citizens and partners took part in the meetings, which were held in different locations throughout the county to encourage participation. The final LWG meeting was held in Broadus. The group discussed and prioritized topics from the previous meetings, creating the final list and prioritization of resource issue (Table 1).

TABLE 1 – RESOURCE CONCERNS DETERMINED BY POWDER RIVER COUNTY LWG MEETINGS, 2019

Meeting Location	1 – highest priority	2	3	4	5 – lowest priority
Ashland	wildfire hazard	Otter Creek sediment imbalance	prairie dogs (soil & plants)		
Biddle	noxious weeds	prairie dogs (soil & plants)	Little Powder River bank erosion, gully erosion		
Powderville	leafy spurge	Cheatgrass invasion	prairie dogs (soil & plants)		
Stacey	noxious weeds	prairie dogs (soil & plants)	forest fuels		
Broadus	**noxious weeds**	**prairie dogs (soil & plants)**	**forest fuels**	**Little Powder River bank erosion, gully erosion in tributaries**	**Otter Creek sediment imbalance**

In 1996, NRCS and PRCD mailed a survey to operators in the county seeking input about resource concerns. The survey yielded five issues: 1. [Inadequate] Livestock Water, 2. Noxious weeds, 3. Predators, 4. Soil Erosion, 5. Water Quality. A survey results document filed in the Broadus NRCS office also includes a statement by the Broadus NRCS District Conservationist at the time, "Because of the interest, I would say pine thinning is rising in concern." The LWG priorities set by the 1996 survey results were reevaluated at annual LWG meetings but were not revised until 2019.

II. NATURAL RESOURCES INVENTORY

GENERAL INFORMATION

Powder River (PR) County is in southeastern Montana and borders Wyoming to the south. Broadus is the county seat (Figure 1). The County has a land area of around 3,200 square miles or about 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, 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[1].

COUNTY DEMOGRAPHICS [2]

The county population has decreased every decade except the 1970's during the Belle Creek oil boom[1]. About 28% 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% have earned a Bachelor of Science degree or higher.

Population	1,716		
Median Household Income	$51,136		
Persons in Poverty	12.2%		
Gender	Female 55%	Male 45%	
Age <5yrs	4.4%		
5-17 yrs	16.7%		
18-64 yrs	51.7%		
65+ yrs	27.2%		

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

AGRICULTURE DEMOGRAPHICS [3]

The United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) defines farms as places with annual sales of agricultural products of $1,000 or more.

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

Total producers	641
Male	385
Female	256

Primary Occupation	
Farming	71%
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 around 88,000 and seventh in number of sheep at about 8,800 head. Combined, the county has roughly 30 sheep or cattle per square mile versus 0.5 people per square mile.

CLIMATE

Except for the relatively flat river bottom of the Powder River Valley, 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 peaks near the Wyoming border range as high as 4,500 feet above sea level. The Powder River runs southwest to northeast, draining the central part of the county into the Yellowstone River in Custer County. At the Powder River on the Custer County line, elevation is about 2,730 feet above sea level. The hilly and rough character of the nearby area contribute to climatic differences, but those differences are not as large or noticeable as in more mountainous parts of Montana farther west.[4]

Powder River County has a modified continental climate that is cold in winter, warm in summer, and has large variations in seasonal precipitation. Because of the agricultural economy, the average length of the growing season is important. The weather station at Broadus records an average of 100 to 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 will sometimes 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, storms may start as a cold rain, then 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.[4] 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, and Figure 3, below shows topographic relief across the county.

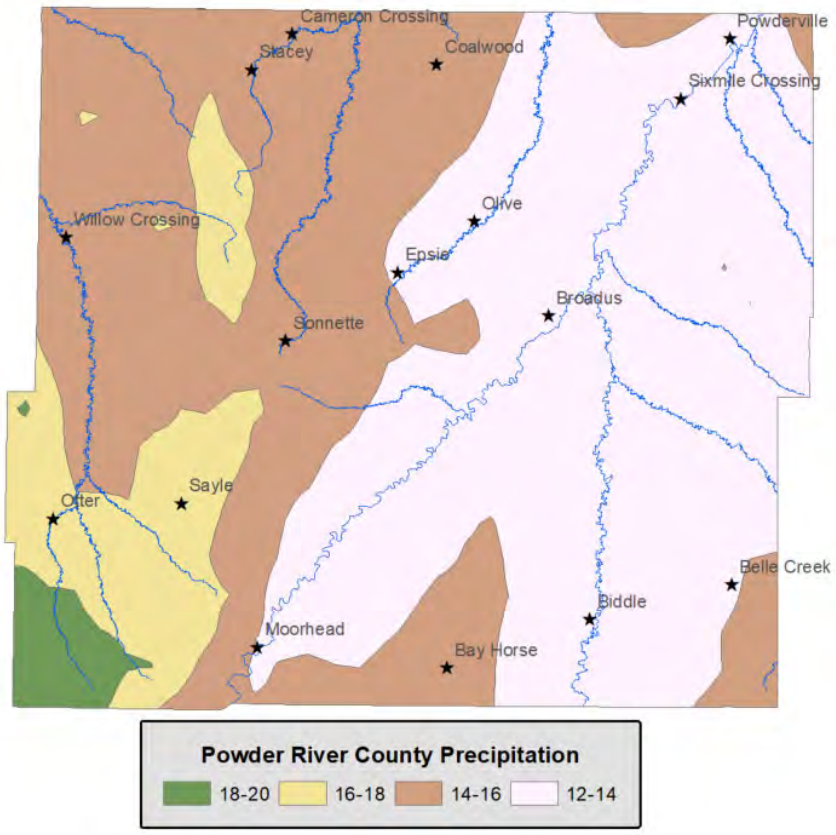

FIGURE 2: POWDER RIVER COUNTY PRECIPITATION

Summers are characterized by warm weather during the day and cooler weather at night. Most nights, even during midsummer, cool down to 60°F or less, so really 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 inches of snowfall annually.[4] Average annual high temperature is 61° F and average annual low is 33° F.[5]

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 Hell Creek and Tongue River Members[4] (Figure 3).

The lower Hell Creek Member 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 aquifer 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 are common, many of which flow.[4]

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 the most common 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 to 500 feet deep and yield four to 25 gallons per minute.[4]

Quaternary alluvium deposits are found along the Powder and Little Powder Rivers and their tributaries and other major streams. Some areas contain stream terraces composed of sand and gravel, and the thicker terraces may contain sufficient ground water for stock and domestic uses.[4]

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.[4]

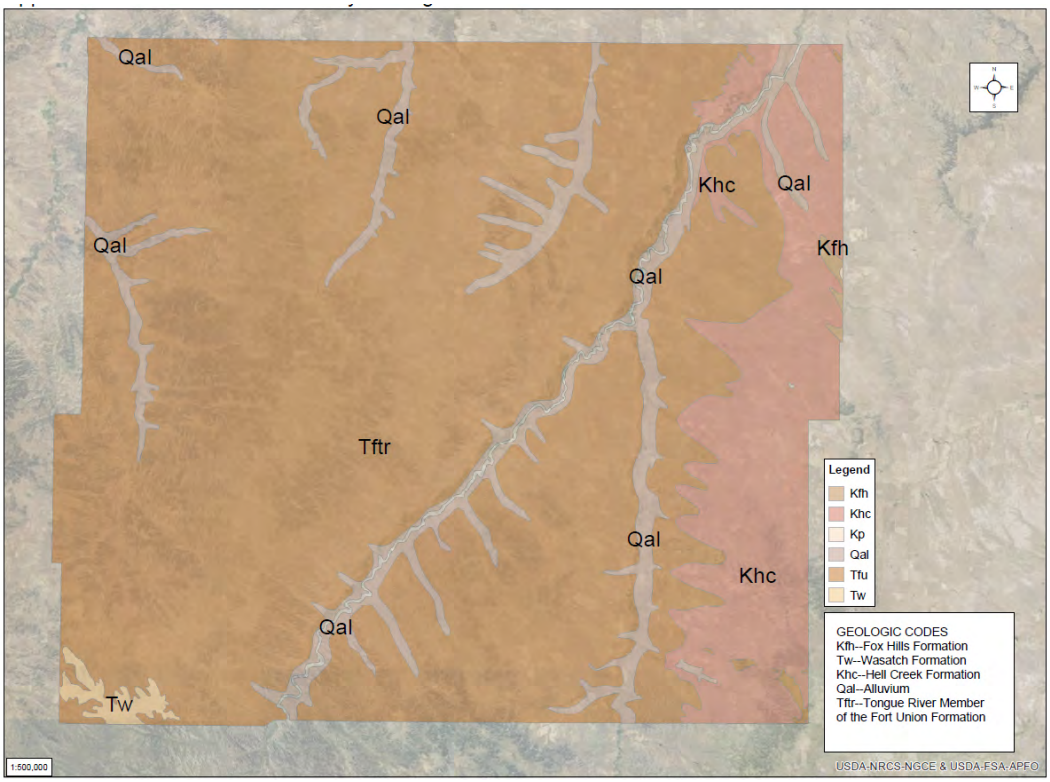

FIGURE 3: POWDER RIVER COUNTY GEOLOGIC FORMATIONS

SOILS[4]

Three soil associations make up about 85% of the Powder River County Soil Survey:

Ringling-Cabba-Midway Association (40% Ringling, 25% Cabba, 20% Midway): Sloping to steep or hilly; shallow salty loams to clay loams underlain by shale; found on uplands. Large areas of this association occur in the western and central parts of the soil survey area. Nearly 45% of the Powder River County soil survey area is covered by this 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; found on uplands; one large area in the eastern part of the county and smaller areas in the western part. The association covers approximately 28% 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; found on uplands; located in the eastern part of the county. The association occupies about 12% of the Powder River County soil survey area.

Six of the seven soils from above, Cabba, Elso, Midway, Ocean Lake, Remmit, and Ringling, are highly erodible in all areas of the county (Figure 4), which equals more than 60% of Powder River County.

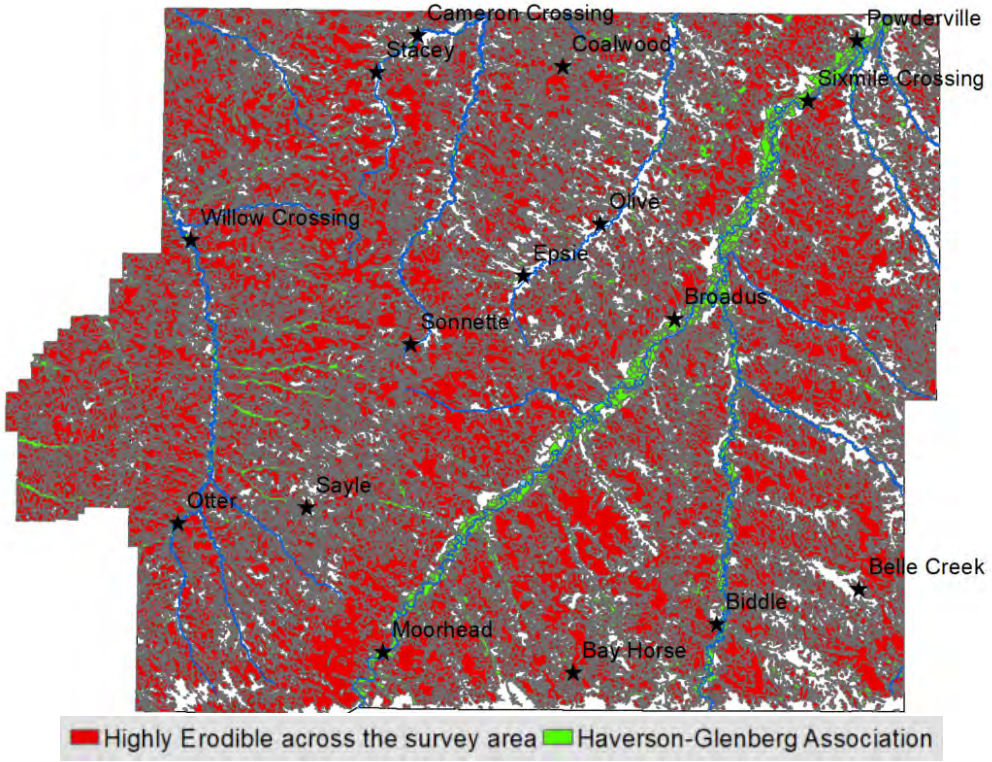

FIGURE 4: POWDER RIVER COUNTY MAJOR SOIL ASSOCIATIONS

The Haverson-Glenberg Association is shown on the map 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 one quarter to two 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 protection for livestock and wildlife.

USDA defines Prime Farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. 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 (Appendix A). 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 (Appendix A). 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 very few official USDA Farm Service Agency (FSA) designated wetlands in the county. Wetlands not on the official FSA record may also exist around springs and perennial or intermittent streams throughout the county.

LAND OWNERSHIP

The majority (65%) of land in Powder River County is privately owned. The remaining 35% is public land, with US Forest Service (USFS) managing the majority of public land in the county.

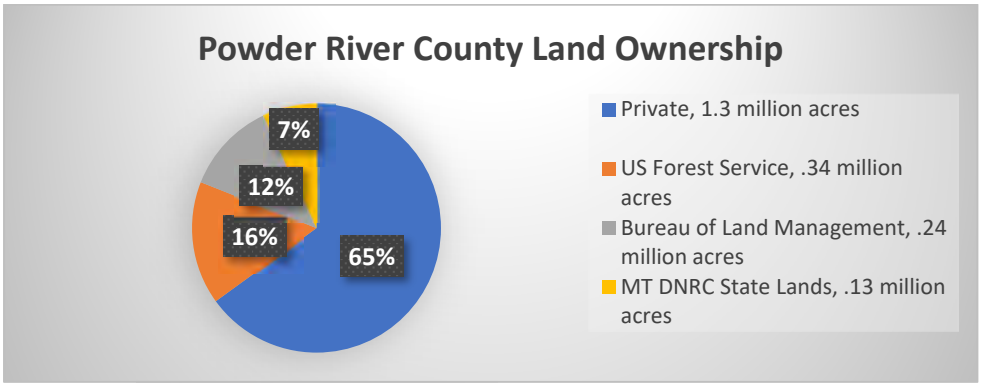

FIGURE 5: POWDER RIVER COUNTY LAND OWNERSHIP

Forest Service land consists of 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 (BLM) 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 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.

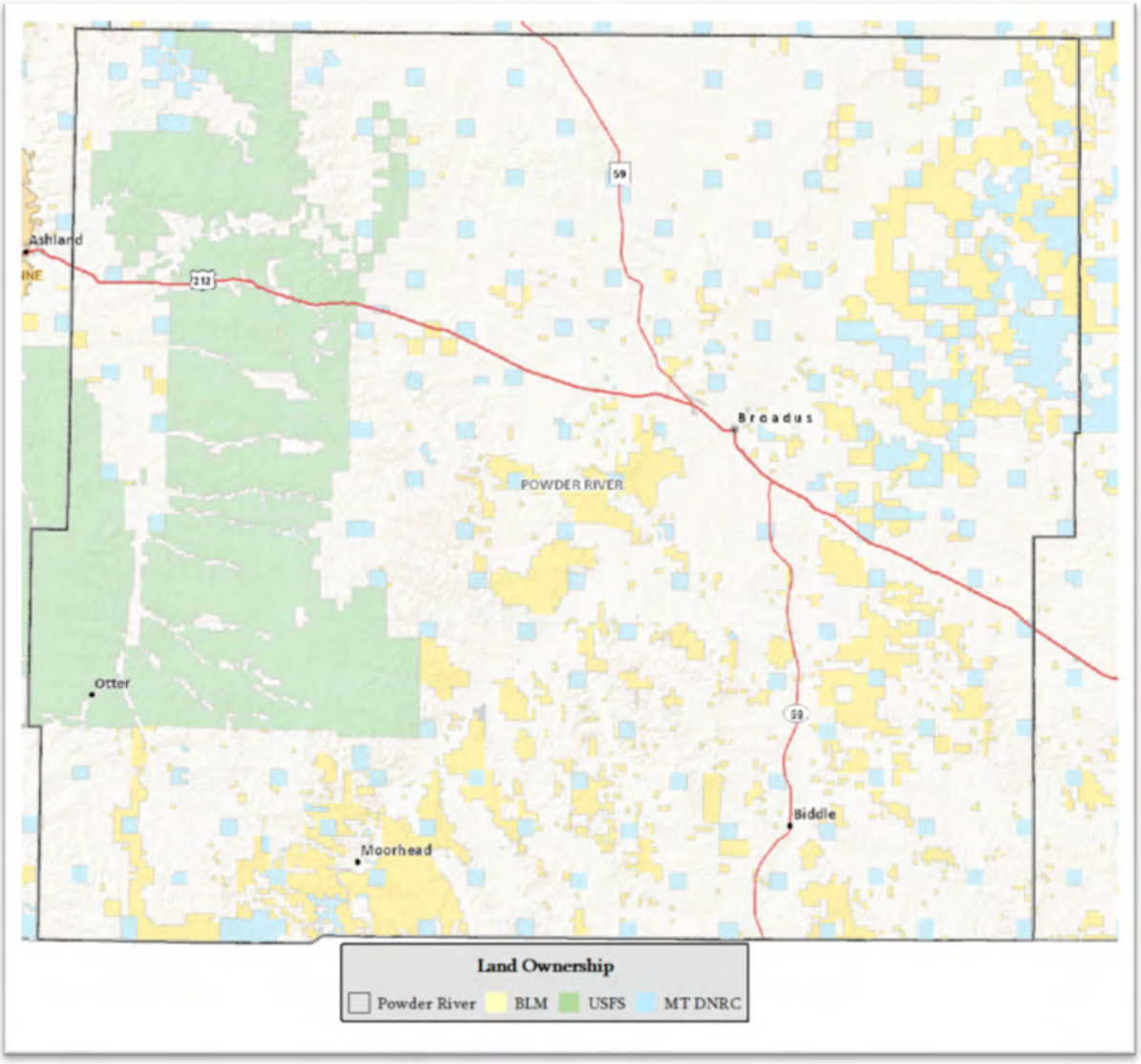

FIGURE 6: LAND OWNERSHIP IN POWDER RIVER COUNTY

LAND USE AND COVER

Grazingland is the dominant land use in Powder River County, followed by forested areas. 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. Figures 7-10 demonstrate ecological diversity across the county.

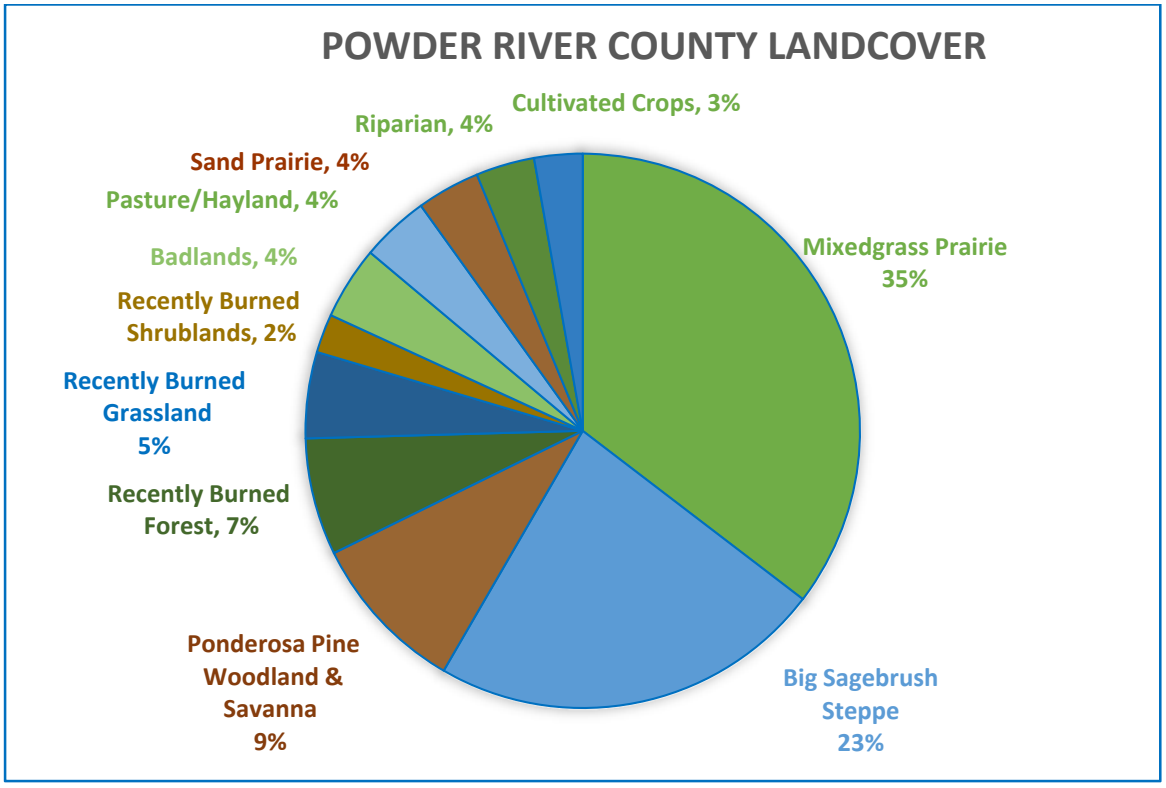

FIGURE 7: LANDCOVER IN POWDER RIVER COUNTY; SOURCE: MONTANA NATURAL HERITAGE PROGRAM

Mixedgrass Prairie[31]

Common plant associations include silver sagebrush /western wheatgrass. Shrub-loving wildlife such as antelope, mule deer, and sage grouse are common. Previously cultivated acres may have been re-vegetated by non-native plants creating associations such as Kentucky bluegrass/western wheatgrass and pure stands of crested wheatgrass. Sites with a strong component of green needlegrass indicate a more favorable moisture balance, although this is one of the most palatable of the mid-grasses. Needle and thread is also an important component; it increases with coarser soil textures, or under heavy grazing at the expense of western wheatgrass. Extreme overgrazing can result in the loss of western wheatgrass from the system, followed by drastic reductions in needle and thread and ultimately, the dominance of blue grama, Sandberg's bluegrass *(Poa secunda*), and prairie junegrass (*Koeleria macrantha*). Common forbs within this system include yarrow (*Achillea millefolium*), scarlet globemallow (*Sphaeralcea coccinea*), western sagewort, (*Artemisia ludoviciana*), boreal sagewort (*Artemisia frigida*), silver lupine (*Lupinus argenteus*), fuzzy beardtongue (*Penstemon eriantherus*), shining penstemon (*Penstemon nitidus*), prairie cinquefoil *(Potentilla gracilis*), Missouri goldenrod (*Solidago missouriensis*) anddalea (*Dalea* species). Shrub species may include western snowberry (*Symphoricarpos occidentalis),*

serviceberry (*Amelanchier alnifolia*), shrubby cinquefoil (*Dasiphora fruticosa*), creeping juniper (*Juniperus horizontalis*), silver sage and Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*).

Big Sagebrush Steppe[31]

Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) is the dominant shrub in this system. Other shrubs present may include basin big sagebrush (*Artemisia tridentata ssp. tridentata*), silver sagebrush (*Artemisia cana*), greasewood (*Sarcobatus vermiculatus*), saltbush (*Atriplex* species), rubber rabbitbrush (*Ericameria nauseosa*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and antelope bitterbrush (*Purshia tridentata*). Overall shrub cover is less than 10 percent. Perennial herbaceous components typically contribute greater than 25% vegetative cover and consist mostly of rhizomatous and bunch-form graminoids, with a diversity of perennial forbs. In Powder River County, the dominant graminoid in this system is western wheatgrass (*Pascopyrum smithii*). Other species include Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), Sandberg's bluegrass *(Poa secunda*), or bluebunch wheatgrass (*Pseudoroegneria spicata*). Dryland rhizomatous sedges such as threadleaf sedge (*Carex filifolia)* and needleleaf sedge (*Carex duriuscula*) are very common and important in the eastern distribution of this system in Montana and Wyoming. Common forbs include Hood's phlox (*Phlox hoodii*), sandwort (*Arenaria* species), prickly pear (*Opuntia* species), scarlet globemallow (*Sphaeralcea coccinea*), purple prairie clover (*Dalea purpurea*), gayfeather (*Liatris punctata*), and milkvetch (*Astragalus* species). Within this system, cheatgrass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*) and other invasive weeds can be abundant where there is frequent disturbance.

Ponderosa Pine[31]

Ponderosa pine is the dominant conifer in this system. In Powder River County, the understory is mostly dominated by grasses, Understory vegetation is more typically fire-resistant grasses and forbs that resprout following surface fires. High shrub cover, understory trees, and downed logs are uncommon. These more open stands support grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), which is usually dominant, prairie junegrass (*Koeleria macrantha*) and needle and thread (*Hesperostipa comata*), as well as dryland sedges like threadleaf sedge (*Carex filifolia*) and sun sedge (*Carex inops* ssp. *heliophila*). On more mesic sites, bluebunch wheatgrass occurs as the dominant graminoid species with Idaho fescue (*Festuca idahoensis*) and rough fescue (*Festuca campestris*). Common herbaceous forbs include yarrow (*Achillea millefolium*), pink pussytoes (*Antennaria rosea*), arrowleaf balsamroot (*Balsamorhiza sagittata),* Indian blanket flower (*Gaillardia aristata*), and silky lupine (*Lupinus sericeus*).

FIGURE 8: RANGELAND IN CENTRAL POWDER RIVER COUNTY; COREY SWENSON

FIGURE 9: RANGELAND IN NORTHWESTERN POWDER RIVER COUNTY; COREY SWENSON

FIGURE 10: RANGELAND IN SOUTHWESTERN POWDER RIVER COUNTY; SHANNA TALCOTT.

Most rangeland analyzed by the NRCS office during conservation planning is less than 60% similar to historic plant communities that existed at the time of European immigration and settlement in North America. 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 (*Pinus ponderosa*) forests occur on shallow soils that contain rock fragments, primarily in the southern and western parts of the county. Ponderosa pine is a lower-value tree for timber compared to the fir and spruce species found in higher elevations in western Montana, which receive more rainfall. Therefore, timber production is typically a secondary management objective of livestock operators in the county, who seldom invest resources in managing conifers since treatment costs are high relative to land value. A century of successful fire suppression has resulted in increased tree, including Rocky Mountain juniper (*Juniperus scopulorum*), densities. Tens of thousands of acres are over-crowded with conifers, and stands containing 3,000 to 5,000 stems per acre are common. 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 (Appendix B: Ashland Ranger District; Custer National Forest Fire Map, 2012).

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 versus disc drills. The small amount of annual cropland, varied field shapes and sizes, and predominance of livestock operations means progression in farming technology is not a priority for most producers.

NOXIOUS WEEDS

Noxious weeds are the most important natural resource concern 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 (*Euphorbia esula*), Canada thistle (*Cirsium arvense*), spotted knapweed (*Centaurea maculosa*), Russian knapweed (*Acroptilon repens*), houndstongue (*Cynoglossum officinale*), field bindweed (*Convolvulus arvensis*), salt cedar (*Tamarix spp*), dalmation toadflax (*Linaria dalmatica*), yellow toadflax (*Linaria vulgaris*), common tansy (*Tanacetum vulgare*), sulfur cinquefoil (*Potentilla recta*), whitetop (*Cardaria draba*), St. Johnswort (*Hypericum perforatum*), cheatgrass (*Bromus tectorum*), and Russian olive (*Elaeagnus angustifolia*). County listed noxious weeds include poison hemlock (*Conium maculatum*), puncturevine (*Tribulus terrestris*), and black henbane (*Hyoscyamus niger*). 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, 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 are found 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. New patches of weeds are a secondary priority to prevent them from spreading further and becoming widespread. Most weed control is accomplished by spraying chemicals that inhibit the plants growth or ability to reproduce. Some noxious weeds in their native home range have natural predators, such as insects, that inhibit plant growth and reproduction. Some of these insects have been researched and released for use as biological controls in the US where the weeds are non-native and don't have any natural ecosystem predators.

Ranchers with land on the southern (upper) reaches of the Powder River claim leafy spurge infestations were containable until the Powder River flooded in 1978. After the flood, which was a 50-year flood event, leafy spurge became widespread and difficult to contain. The Powder River provided an ideal transportation system as well as ideal growing conditions. Although 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 clear into Prairie County where it flows into the Yellowstone River. It reproduces by seed and by very persistent, long-lived stems 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. Common leafy spurge control methods include grazing by sheep and goats, chemical control, and biological

control. Sheep and goats will forage on leafy spurge since their diet consists of a larger quantity and variety of broadleaved species, whereas cattle avoid leafy spurge due to the milky latex it produces.

FIGURE 11: LEAFY SPURGE, YELLOW-GREEN PLANTS, ALONG LITTLE POWDER RIVER; CAROL HILLIARD

Canada thistle prefers productive soils, such as crop fields, hay meadows, floodplains, and draws. It's a biennial, meaning the plant forms a rosette the first year of growth, and the second year will grow a seed stalk. 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 wide-spread in Powder River County, but Canada thistle is more common in the western part of the county which receives 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, but mostly from rhizomes. 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, along roads and Forest Service trails accessed by vehicles, ATVs, and human and animal foot traffic.

As its name suggests, 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.

Cheatgrass and Russian olive are deemed lower priority plants for control on the Montana Noxious Weed List. These regulated plants have the potential to have significant negative impacts. The plant 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 soon. Livestock hoof action created by high density herding is a successful control tool. Chemical control is available, but is not typically economical due to the widespread abundance of cheatgrass.

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. Concerns with Russian olive are that it displaces 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 and Little Powder River corridors, and nearly every major stream corridor.

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 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 goathead and has very thick, prominent spikes which are a nuisance to tires and can injure livestock hoofs. 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 it remains a priority since it's poisonous.

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[7], 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[7]. 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. Due 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)[7].

Groundwater

According to the Ground Water Information Center of the Montana Bureau of Mines and Geology[8], 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. 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 (Figure 12) 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 12: LOW WATER IN JULY ON UPPER REACH OF POWDER RIVER IN SOUTHERN POWDER RIVER COUNTY; COREY SWENSON

The Little Powder River and other major waters (Figure 13), 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 (TDS). Water withdrawals upriver combined with hot, dry weather causes the water to become unfit for irrigation as soon as June in 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 if the water is placed in use by pumping or diversion.

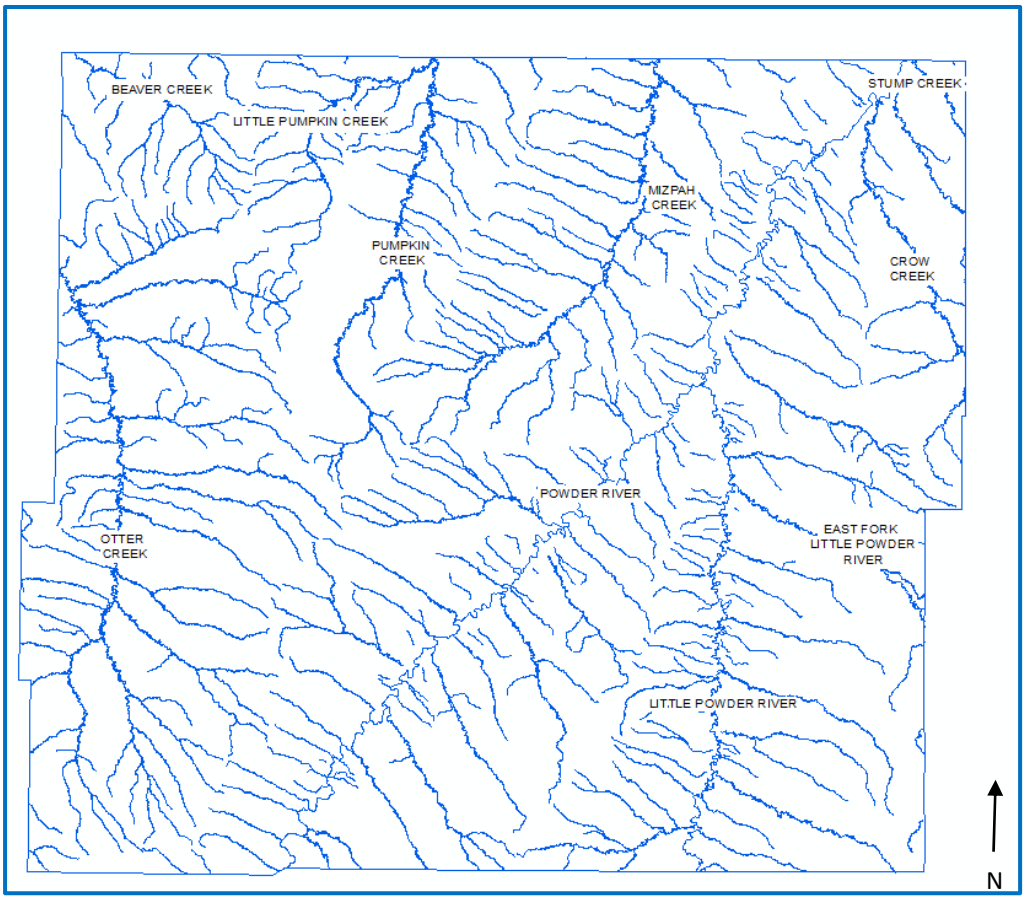

FIGURE 13: POWDER RIVER COUNTY HYDROLOGY

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[9]. 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 14, Powder River Historic Peak Stream Flow. County residents today still talk about the flood during the fall of 1923.

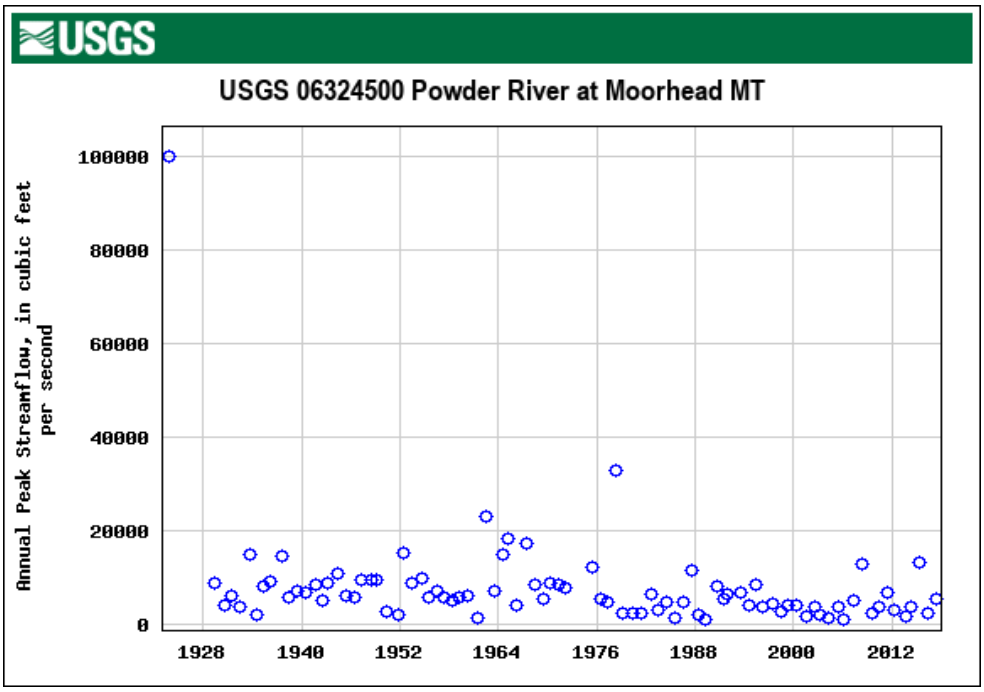

FIGURE 14: POWDER RIVER HISTORIC PEAK STREAM FLOW

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.[4]

TABLE 2: LITTLE POWDER RIVER FLOW ACTIVITY

Gage Location	Period of Activity	Drainage Area (sq. mi.)	Average Discharge	Max Discharge	Min Discharge
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 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.[23] This provided the district the ability to oversee development of water rights for irrigation that have a December 15, 1978 priority date. Other uses of the water reservations included municipal, offstream storage, and instream flow. 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.

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 below.

TABLE 3: DEQ WATER QUALITY INFORMATION FOR POWDER RIVER COUNTY

2018 WATER QUALITY INFORMATION						
Waterbody Name	Area (Miles)	Category	Use Class	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	131.98	5	C-3	Salinity	Natural Sources	Agricultural

(Headwaters to
Corral Creek)

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 date and or information indicate that a water quality standard is not me due to an apparent natural source in the absence of any identified man-mand 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.

Source: Montana DEQ Water Quality Division

Riparian Corridors

Riparian corridors contain native species: plains cottonwood (*Populus deltoides*), narrowleaf cottonwood (*Populus angustifolia*), green ash (*Fraxinus pennsylvanica*), sandbar willow (*Salix exigua*) and invasive species Russian olive and saltcedar. 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 tend to be used each year for winter and calving protection for livestock. 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 germinate. In the Powder River valley, this corresponds to snowmelt and spring precipitation runoff. Damming runoff and sediment from the uplands could be contributing to the lack of cottonwood regeneration in drainages. Throughout the Powder River area numerous small earth dams have been constructed in the uplands to hold runoff for watering stock or irrigation. D. M. Schook et al. report:

> *"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)."*[7]

If ideal conditions provide the fresh sediment that cottonwood seeds require for germination, seedlings then need protection from livestock and wildlife browsing for two to three years to successfully establish.

LIVESTOCK

When Powder River County was formed in 1919, sheep were the most plentiful livestock type[11]. By the time the state of Montana began recording Ag Statistics in 1949, cattle made up the bulk of livestock production in Power River County (Figure 15). 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, raised for meat and wool.

A handful of people raise butcher hogs, and a few raise goats to control nuisance plants. Chickens are commonly raised to provide eggs for home use or small side sales.

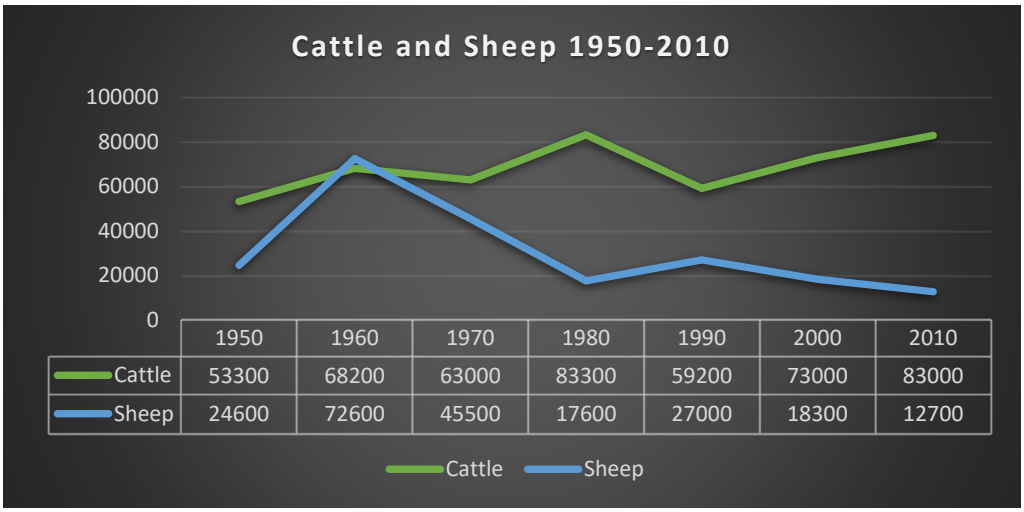

FIGURE 15: POWDER RIVER LIVESTOCK INVENTORY[24]

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, (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. Powder River County does not produce a surplus of forage to support commercial feeding operations. Some producers have the ability to use feedlots to put extra weight on their calves before marketing. 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. 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 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 27 and 16 native warmwater fish species[31], respectively. Game fish in the Powder River include channel catfish, sauger, walleye, and shovelnose sturgeon. Channel catfish is the only game fish found in the Little Powder River. Some larger reservoirs in the county are stocked to support rainbow trout, largemouth bass, yellow perch, northern pike, and crappie. Although water withdrawals and structures impeding fish passage are the main concerns for fish habitat in the Powder River drainage, the undammed river is significant to native fish species downstream. The Montana Fish Wildlife and Parks (FWP) Statewide Fisheries Management Plan[31] reports:

> *"Sauger, channel catfish, paddlefish (during high flow years that accommodate passage at the Intake Diversion on the Yellowstone River) and shovelnose sturgeon are four native game fishes that rely upon increased turbidity and have been documented to aggregate below the Powder River confluence…The Powder River is the last large tributary to the Yellowstone River that provides a natural hydrograph with a naturally high sediment/turbidity*

regime, so it has become an increasingly important pieces of habitat to the native species of the Yellowstone River Drainage."

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[26]. 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 a candidate for protection under the USFWS Threatened and Endangered list. At that time, habitat loss and fragmentation was considered the biggest threat to the species Because a more restrictive listing category could have significant impact to grazinglands in the West, numerous federal, state, local, private, and non-profit stake-holders across Montana and the West have been cooperating to develop strategic plans and dedicate funds to restore and conserve the bird's habitat. It is not known if Powder River County hosts 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 (Figure 16). Outside of the forested areas, 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 typically consist of many groupings of leks, which are the historic breeding grounds the birds return to each spring. 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.

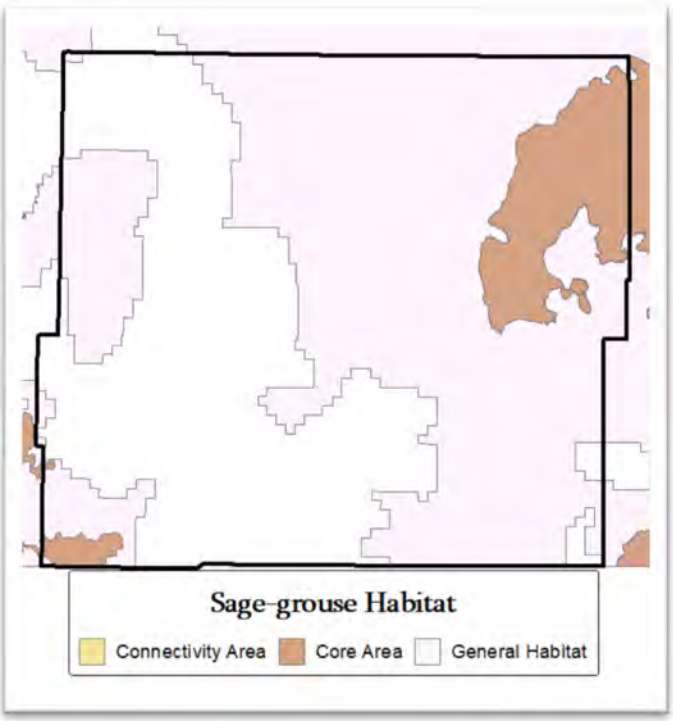

FIGURE 16: SAGE-GROUSE HABITAT IN POWDER RIVER COUNTY

MINERAL RESOURCES

Powder River County is named for the Powder River Basin, a geologic region in southeast Montana and northeast Wyoming known for its coal resources. 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, Montana to Douglas, Wyoming and west to east from Sheridan, Wyoming to Broadus, Montana.[12] Within the Basin, the most significant coal resources are in the Tongue River Member of the Fort Union Formation, which encompasses three quarters of the county, shown previously in Figure 6. The Tongue River Member 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[13]. A 1981 Powder River County Comprehensive Plan[27] 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 operations 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. Around 50 are still in production,[14] partly due to high pressure CO_2 field-sweeping technology employed in Belle Creek. Montana DNRC 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 17. Data is only available as of 1986.

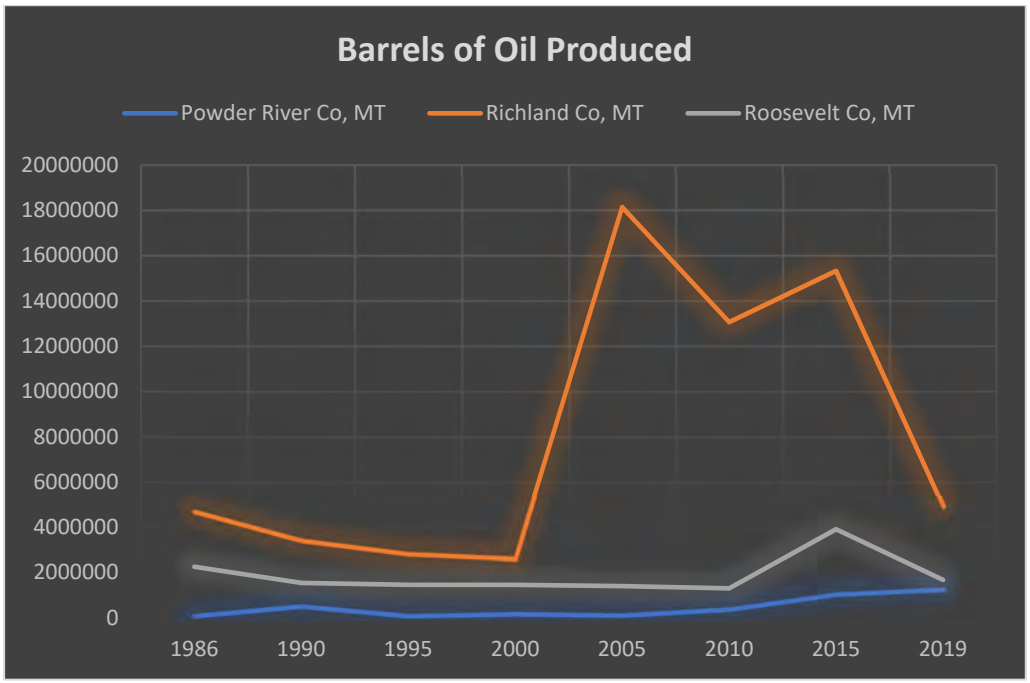

FIGURE 17: BARRELS OF OIL PRODUCED ANNUALLY

Rich coal fields also mean Coal Bed Methane (CBM) gas fields. The Powder River Basin experienced CBM development in the 2000s; sixteen wells were drilled in Powder River County, and their production ceased in 2014[14]. 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 CMB involves drilling a water well into a coal seam and extracting large volumes of water, which reduces pressure on gas and is released. In the Powder River Basin, the extracted groundwater is typically high in sodium, which provides few options for utilizing the extracted water. 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 extracted wastewater; mitigating concentrated salts in the soil where extracted water is wasted; and reducing 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.[15] It was established in 2010 to track ambient temperature, wind speed and direction and pollutants including NO, NO_2, NOX, ozone and particulate matter and to track changes in air quality that may occur due to coal bed natural gas development. 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 American and Canada. Due to a predominant west wind, smoke causes air quality issues across the whole county during wildfire season.

UTILITIES

Tongue River Electric Cooperative (TRECO) is the dominant electrical provider in Powder River County although some residents in parts of the 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[16]. 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. Analysis of water samples collected by the water utility are available on the Montana Department of Environmental Quality's Drinking Water Watch website[28].

III. CONSERVATION EFFORTS

From 2009 to 2019, the Broadus NRCS Field Office conservation planning efforts resulted in 125 Conservation Program Contracts, valued at $7.2 million in USDA Farm Bill funding, covering 385,000 acres; see Table 4. 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

2009-2019 Conservation Program Contracts

Program	Number of Contracts	Funding Value	Acres Treated
EQIP	80	$2,203,000	135,000
CSP	45	$5,013,000	250,000

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 him or her to develop a Conservation Plan that meets the customer's objectives as well as addresses resource concerns that exist on the operation. 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 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 rather than annual cropping. ECP can provide relief for fire, flood, or drought-affected producers to rebuild infrastructure or provide immediate relief measures. Some of those practices are reflected in Table 5. 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 2009-2019			
328	Conservation Crop Rotation	324	ac
380	Windbreak/Shelterbelt Establishment	1,448	ft
382	Fence	54,686	ft
383	Fuel Break	1.9	ac
384	Woody Residue Treatment	10	ac
393	Filter Strip	24	ac
472	Access Control	4,313	ac
511	Forage Harvest Management	1,846	ac
512	Forage and Biomass Planting	1,722	Ac
516	Livestock Pipeline	22,130	ft
528	Prescribed Grazing	38,367	ac
595	Pest Management Conservation System	3	ac
614	Watering Facility	15	ea
642	Water Well	1	ea
644	Wetland Wildlife Habitat Management	10	ac

645	Upland Wildlife Habitat Management	3,408	ac
666	Forest Stand Improvement	167	ac
797	Invasive Plant Species Control	543	ac
ANM09	Grazing management to improve wildlife habitat	785	ac
ANM18	Retrofit watering facility for wildlife escape	3	ea
ANM26	Managing Calving to Coincide with Forage Availability	785	ac
WQL23	Provide Livestock Protection Away from Sensitive Areas	404	ac

EQIP practices implemented in 2009 to 2019 were primarily used to improve plant condition and related resource concerns on range and forest land. Special Initiatives 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 summarizes implemented EQIP practices.

TABLE 6: EQIP PRACTICES APPLIED IN POWDER RIVER COUNTY

EQIP Practice Summary Applied 2009-2019			
315	Herbaceous Weed Control (see also 595 Pest Mgmt)	4	ac
328	Conservation Crop Rotation	100	ac
351	Well Decommissioning	2	ea
362	Diversion	900	ft
378	Pond	2	ea
380	Windbreak/Shelterbelt Establishment	3,200	ft
382	Fence	207,244	ft
383	Fuel Break	5	ac
384	Woody Residue Treatment	45	ac
441	Irrigation System, Microirrigation	.6	ac
472	Access Control	26,643	ac
500	Obstruction Removal	2	ac
512	Forage and Biomass Planting	138	ac
516	Livestock Pipeline	245,345	ft
528	Prescribed Grazing	51,162	ac
533	Pumping Plant	30	ea
561	Heavy Use Area Protection	3	ac
574	Spring Development	1	ea
576	Livestock Shelter Structure	2	ea
578	Stream Crossing	2	ea
587	Structure for Water Control	1	ea
595	Pest Management Conservation System	680	ac
614	Watering Facility	89	ea
634	Vegetated Treatment Area	2	ac
642	Water Well	17	ea
645	Upland Wildlife Habitat Management	1,013	ac
649	Structures for Wildlife	9	ea
666	Forest Stand Improvement	359	ac

Producers who participated in the CSP Program were able to achieve unique objectives for their operations; see Table 7 for a summary of the activities. The financial assistance offered by CSP also required participants to continue maintaining benchmark management of the land through the five year contracts.

TABLE 7: CSP ACTIVITIES APPLIED IN POWDER RIVER COUNTY

CSP Practice Summary Applied 2009-2019			
329	Residue and Tillage Mgmt, No-Till	159	ac
797	Invasive Plant Species Control	11	ac
AIR04	Use drift reducing nozzles, low pressures, lower boom height and adjuvants to reduce pesticide drift	2,246	ac
AIR07	GPS, targeted spray application (SmartSprayer), or other chemical application electronic control tec	1,309	ac
ANM02	Defer crop production on temporary and seasonal wetlands	1	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	5,727	ac
ANM10	Harvest hay in a manner that allows wildlife to flush and escape	5,174	ac
ANM12	Shallow water habitat	1	ac
ANM15	Forest stand improvement for habitat and soil quality	447	ac
ANM17	Monitoring nutritional status of livestock using the NUTBAL PRO System	6,486	ac
ANM18	Retrofit watering facility for wildlife escape	135	ea
ANM24	Forest Wildlife Structures	240	ac
ANM26	Managing Calving to Coincide with Forage Availability	7,193	ac
ANM27	Wildlife Friendly Fencing	14,864	ft
E315134Z	Herbaceous weed control (plant pest pressures) for desired plant communities/habitats	5	ac
E645137Z	Reduction of attractants to human-subsidized predators in sensitive wildlife species habitat	3	ac
ENR01	Fuel use reduction for field operations	610	ac
ENR02	Solar powered electric fence charging systems	1	ea
ENR03	Pumping plant powered by renewable energy	2	ea
ENR04	Recycle 100% of farm lubricants	3	ea
PLT02	Monitor key grazing areas to improve grazing management	21,075	ac
PLT05	Multi-story cropping, sustainable management of nontimber forest plants	15	ac
SOE01	Continuous no till with high residue	1,408	ac
WQL01	Biological suppression and other non-chemical techniques to manage brush, weeds and invasive species	3,099	ac
WQL03	Rotation of supplement and feeding areas	35,612	ac
WQL06	Apply controlled release nitrogen fertilizer	2,866	ac
WQL13	High level Integrated Pest Management to reduce pesticide environmental risk	4,897	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, Watercraft Inspection Station (AIS), 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 (CBM)[28]

As noted earlier, 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.

Forest Understory and Wood Production Response to Ponderosa Pine Thinning Treatments in Southeast Montana

In the 1990's, NRCS and the CD acknowledged Ponderosa pine trees were crowding out grass in grazingland and becoming a formidable wildfire concern. They recognized the need for viable treatment options. At least one landowner in the Stacy community experimented in 1987 with selective thinning in over-stocked Ponderosa pine forest, with seemingly desirable yet undocumented results. The study was from 1996 to 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, some operators have been able to use Farm Bill program funding to improve their forested areas using Practice 666. Producers are often discouraged by the costs of implementing forest improvement practices, since the cost can often be nearly as high as the value of the land. Without financial assistance to offset the cost, forest management practices are a hard sell for conservation planners. However, 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 of many planning discussions. Planting tree stock is an obvious solution. This 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. Through a fairly informal trial process, they tried mechanical ripping using a bulldozer 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. Cottonwood regeneration along the rivers and streams in the county remains a concern with regard to streambank stability, floodplain function, and wildlife habitat.

WIS Station[30]

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 WIS 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 WIS 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 (FSA)

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 is focusing on spraying roadways annually to eradicate new noxious weed infestations. The program staffs a full-time Weed Coordinator and employs seasonal help in the summer. Weed District partners are working to keep each other informed about current and upcoming weed issues. Two new weeds concern to stakeholders are Ventenata and Palmer Amaranth. Ventenata, a winter annual grass listed on the Montana Noxious Weed List (Appendix C), hasn't been detected in Powder River County, but it ss possible it has not been discovered yet. It is confirmed present in Big Horn County to the west, Campbell County to the south, and Carter County to the east. The grass is not palatable to livestock and crowds out native vegetation. It behaves similarly to cheatgrass but is much more invasive. There are few chemical controls available, and none labeled for use in Montana rangeland without a waiver. Palmer Amaranth is a cropland weed not confirmed in Montana yet, although Montana State University Extension Specialists are preparing for its arrival from North Dakota. Richland County MSU Extension stated in a recent e-mail alert, "Palmer Amaranth is one of the most adaptable and dangerously resistant weeds in the country. It can grow 2 to 3 inches a day (to a height of 6 or more feet), produce up to a half million seeds per plant and has demonstrated resistance to nearly all herbicides commonly available to producers for weed management."

US Geological Survey

Since 1978, USGS scientists, John Moody, Bob Meade (retired) and others, have studied fixed 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, which allow less error in studies and modeling. Several of the fixed cross-section locations were developed with help from the PRCD Board due to their 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/downed 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 grazingland 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 grazingland projects often propose changes to grazing systems, and since operations typically include BLM, State Lands, or both, operators and NRCS meet to discuss changes with stakeholders to ensure mutual benefit. Sometimes proposals also include infrastructure such as pipelines, tanks, and fencing on the public

land. These require approval from the public land manager. Operators occasionally receive assistance from BLM to install infrastructure for livestock on public lands.

MT Department of Natural Resources and Conservation (DNRC)

DNRC is involved in many on-going conservation efforts in Powder River County. State Lands Forest Division projects include creating fuel breaks and defensible space of structures, 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, Powder River County Weed District, Powder River County Commissioners, and NRCS to provide information and outreach to producers on topics relevant to agriculture 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; 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 Broadus NRCS office helps NRCS implement USDA Farm Bill programs and provides opportunities for the public to learn about the importance of quality habitat for ground nesting birds. To date, the partnership has produced several Conservation Plans for EQIP funding consideration to increase diversity and plant community health on grazingland. The ABC partner biologist also secured grant monies to implement infrastructure needed to achieve a grazing rotation written by NRCS.

Broadus Volunteer Fire Department (BVFD)

Community member volunteers make up the Broadus Volunteer Fire Department. Along with responding to fire calls, the department also takes a proactive approach to fire risk by doing outreach and presentations in the community about how to make residential structures less susceptible to wildfire. BVFD partnered with the Powder River County Commissioners, USFS, BLM, and community members to develop the Powder River County Community Wildfire Protection Plan (CWPP) in 2004 and a 2016 update subtitled "A Collaborative Approach for Reducing Wildland Fire Risks". Both plans analyze wildfire risk and fire-fighting resources of the county.

IV: NATURAL RESOURCE CONCERNS AND DESIRED FUTURE OUTCOMES

Priority natural resource problems in Powder River County include, in order of importance to the 2019 Local Working Group

1.) Noxious weeds
2.) Soil erosion and degraded plant condition caused by prairie dogs
3.) Forest fuels
4.) Little Powder River bank erosion and gully erosion in tributaries
5.) Sediment imbalance in Otter Creek.

Degraded Plant Condition - Noxious Weeds

The extent of noxious weed infestations in the county is not known. The Weed District and NRCS have knowledge of where weeds occur, but there is no quantitative information about acres or plant densities except for the areas inventoried during the planning process in recent years. This makes it difficult not only to estimate costs of treatment, but also to develop effective plans that involve all stakeholders in certain areas. The Weed District's desired outcome is to keep weeds from spreading, so resources are focused on travel corridors and new infestations. NRCS is charged with addressing resource conditions on private lands, so one of NRCS's objectives is to leverage the Weed District's efforts in conservation plans that address weed management on private lands adjacent to travel corridors.

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 that 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. For example, leafy spurge control could 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 grazingland. Grazing with sheep and goats 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. Predators are also a challenge for goat or sheep herds. Coyotes are the main predator concern in Powder River County, but fox will prey on newborn lambs, and bald eagles are known to take down full-grown rams. Guard dogs, llamas, and herders are effective deterrents, as well as a strong predator control program at the county and rach level.

A working group in Custer County consisting of stakeholders who operate land along the Powder River has been looking into hiring a contractor to bring goats onto the river corridor to graze spurge. 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.

Degraded Plant Structure and Composition and Sheet/Rill Erosion – Prairie Dogs

Soil erosion and degraded plant condition caused by native prairie dogs is a difficult, and often contentious, issue. To demonstrate, Montana FWP determined prairie dogs to be a species of concern due to "declines in abundance and a variety of threats to the population"[32], and Montana Department of Agriculture classified them as Vertebrate Pests that can be managed and suppressed[33].

The animals dig burrows that they dwell in year-round. A widespread area of burrows on the landscape is called a prairie dog town (Figure 18). 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 weedy or no vegetation avoided by livestock.

FIGURE 18: PRAIRIE DOG TOWN NEAR BROADUS; COREY SWENSON

The extent of prairie dog populations in Powder River County is unknown. Participants in all of the LWG meetings said prairie dog towns are expanding on their operations and pointed out other areas along public transportation routes where prairie dog towns appear to be expanding. However, prairie dogs can carry and are susceptible to the plague, and population booms are followed by die-offs. Some livestock producers find the creatures to be pests, 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 prairie dogs alone because they're part of the natural ecosystem and belong in the food chain. Hence, it is a difficult and controversial issue to address on planning units that are larger than one ranch.

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. The NRCS doesn't commit federal resources to extirpate native species, so NRCS participation in addressing this LWG priority would be extremely limited. NRCS would need to consult with federal and state wildlife agencies before determining what resources could be available.

Degraded Plant Condition – Wildfire Hazard; Inadequate Wildlife Habitat Continuity

Fuel load was an issue discussed at the 2019 Stacey and Ashland Local Working Group meetings. There were operators at both meetings whose land burned in the 2012 Ash Creek and more recent fires. Their fuel load

concerns were primarily related to two issues: 1.) standing and down dead trees and 2.) live forests with high tree densities per acre. There was also some discussion at LWG meetings about conifers, Ponderosa pine and rocky mountain juniper, encroaching on rangeland and becoming a wildfire hazard.

Unmanaged stands of Ponderosa pine in Powder River County commonly have 3,000 to 5,000 stems per acre. For most sites in the county, 151 to 222 stems of ponderosa pine per acre (corresponds to 14 to17 feet average spacing) is considered optimal for understory health and wood production when trees are in the 3 to 7 inch diameter class. Unmanaged stands typically represent 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 inches in diameter at breast height (dbh)) represent the perfect 'ladder fuel' to elevate fire to the crowns of mature trees which have commercial value.

The CTA, EQIP, and CSP Practice Summary Tables in Section III summarize conservation efforts made by the Broadus NRCS office in forested areas from 2009 to 2019; practices include Forest Stand Improvement (Code 666), Fuel Break (Code 383), and Woody Residue Treatment (Code 384). Forest Stand Improvement involves harvesting some trees to a desirable spacing. Harvested trees are either piled and burned as slash or are scattered across the site to decompose; this is called Woody Residue Treatment. Fuel Breaks are strategically located around structures or on the landscape to create areas defendable from wildfires, and most or all of the ladder fuels are removed and burned as slash. Figures 19, 20 21, and 22 are two series of progression photos showing overstocked Ponderosa pine forest conditions prior to and after Forest Stand Improvement. The sites are located in the Pumpkin Creek watershed in northwestern PR County.

FIGURE 19: APPROXIMATELY 2,880 PONDEROSA PINE STEMS PER ACRE, BEFORE THINNING TREATMENT; 2007 COREY SWENSON

FIGURE 20: APPROXIMATELY 280 PONDEROSA PINE STEMS PER ACRE; 2008 COREY SWENSON

FIGURE 21: APPROXIMATELY 2,880 PONDEROSA PINE STEMS PER ACRE; 2007 COREY SWENSON

FIGURE 22: APPROXIMATELY 280 PONDEROSA PINE STEMS PER ACRE; 2008 COREY SWENSON

Some of the areas that received Forest Stand Improvement were burned in the Ash Creek Fire and prevented 100% mortality that otherwise unmanaged forest experienced (Figures 23 and 24). 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: AREA BURNED IN 2012 ASH CREEK FIRE, TREATED IN 2008 WITH FOREST STAND IMPROVEMENT; 2018 COREY SWENSON

FIGURE 24: AREA BURNED IN 2012 ASH CREEK FIRE, TREATED IN 2008 WITH FOREST STAND IMPROVEMENT; 2018 COREY SWENSON

To learn more about current landowner concerns related to forested areas following the 2012 fires, NRCS sent a survey in June 2019 to 325 private landowners in Powder River County. The survey area covers 560,000 deeded acres (Figure 25). Survey recipients were identified using publicly available land ownership information from the State of Montana and aerial imagery in ArcGIS. Landowners included in the survey were those who owned contiguous forested parcels and those who owned burned forested parcels. This consisted mostly of the western half and a smattering in the north central and southeast parts of the county. A copy of the survey is included in Appendix G: Forest Health Survey.

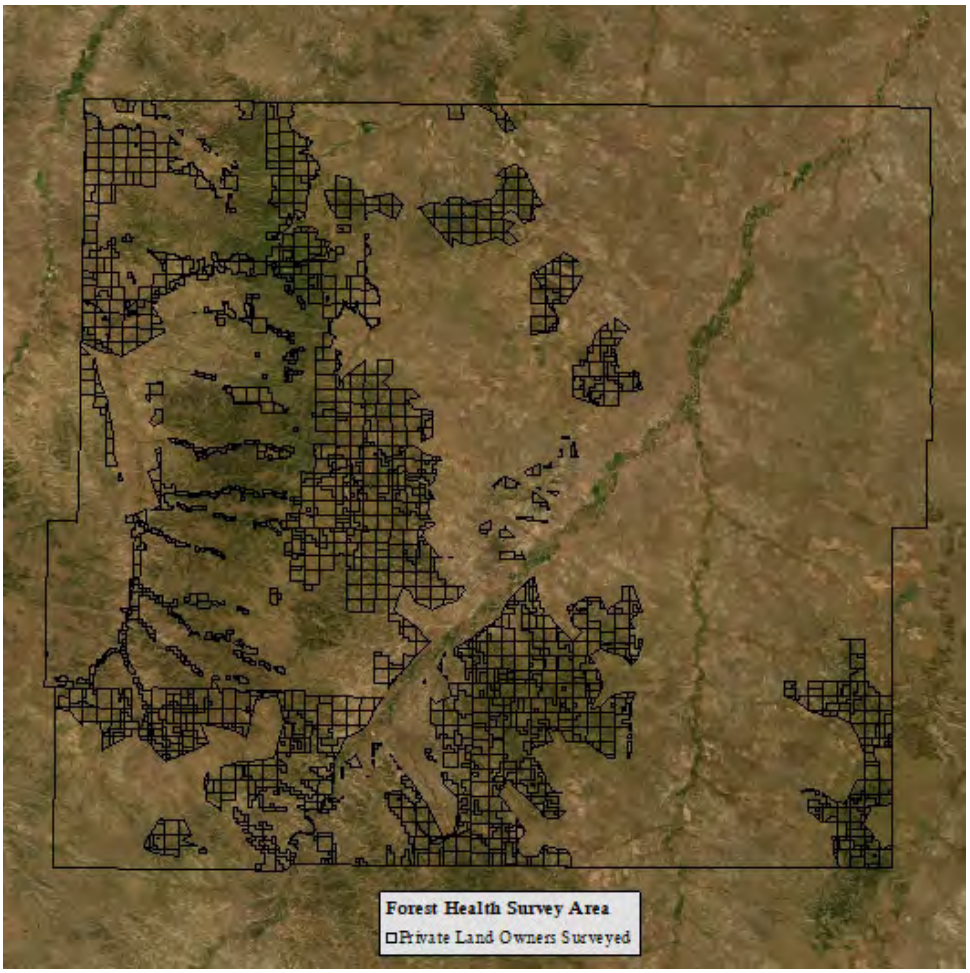

FIGURE 25: FOREST HEALTH SURVEY AREA

There were 28 respondents, which is a response rate of about 10%. The survey asked participants to rank three concerns in order of importance: Burned forest, dense Ponderosa pine stands, and conifer encroachment on rangeland. Half of the respondents rated burned areas as their biggest concern, followed by dense Ponderosa pine stands, and conifer encroachment least important.

Dead standing trees remain in great quantity following fire events like the 2012 Ash Creek fire. This results in heavy fuel loads that eventually fall and damage infrastructure, especially fences, and can also severely limit livestock and human access to ranchlands during and following windy weather. The fallen and standing fuel load is also a continual hazard for other unmanageable fire events (Figure 26).

FIGURE 26: AREA IN PUMPKIN CREEK WATERSHED BURNED IN 2012 ASH CREEK FIRE; SHANNA TALCOTT

The photo above was taken June 27, 2019. The standing dead timber is characteristic of what the Ash Creek Fire left behind. Table 8 below includes survey respondents' feedback about management issues caused by standing dead and downed timber.

TABLE 8: SURVEY RESPONDENTS' RESOURCE CONDITION ISSUES IN GRAZED FOREST

Issues caused by burned standing/downed logs	Issues caused by dense ponderosa pine stands	Issues caused by conifer encroachment on Grazingland
Poor access to land (11)	Grazing loss (18)	Grazing loss (16)
Soil erosion/sterilization (7)	Fire danger (13)	Fire danger (5)
Maintenance issues (6)	Groundwater loss (2)	Pine needle abortion (4)
Weeds (4)	Loss of wildlife habitat (1)	Weeds (2)
Safety concerns (4)	Poor access to land (1)	Access to land (1)
Grazing loss (3)	Noxious weeds (1)	Groundwater loss (1)
	Pine needle abortion (1)*	

*Refers to the occurrence of abortion in beef cattle caused when a cow ingests pine needles that can be toxic to the calf fetus during the 3rd gestational trimester.

In July 2019, NRCS personnel met with the DNRC State Forester staffed in the Eastern Land Office in Miles City. Following the 2012 Ash Creek Fire, DNRC assisted landowners with several salvage logging projects and some fuel breaks along private property bordering public land. The objective of meeting with DNRC was to learn about woody residue treatment methods DNRC used and lessons learned about post-fire clean-up.

With landowner permission, the State Forester gave NRCS staff a tour of what post-fire areas look like without woody residue treatment, and what they can look like with treatment.

The photo below 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 grazingland access for livestock and wildlife, and decrease fuels in the event of a future fire. The plant with purple flowers in the foreground of the photo is Canada thistle. Noxious weed infestations are common on disturbed sites including burns. Weed control is an important part of post-fire management.

FIGURE 27: FUEL REDUCTION TREATMENT IN ASH CREEK BURN AREA; SHANNA TALCOTT

The State Forester noted that timber that burned more than three years prior becomes difficult to predict when handling. This means unsafe working conditions when harvesting and moving standing burned timber. Downed logs can be brittle and break apart as they're moved to slash piles. At this point, salvage logging for commercial use becomes less of an option because both standing and downed timber will likely already be decomposing. Once the logs deteriorate to these conditions, Mr. Miller suggested it may be difficult to find contractors interested in providing woody residue treatment services, or for a landowner to be dedicated to doing the work themselves. The Ash Creek fire burned trees much more than three years ago, and based on what DNRC has experienced, treatment options will be limited. Mr. Miller suggested using prescribed burning and to prioritize treatment in areas of relatively gentle topography that livestock and wildlife would likely graze. Montana NRCS personnel in eastern Montana presently do not have job approval authority to

plan prescribed burns. Technical Service Providers (TSPs) could provide the services to landowners under an agreement with NRCS. There are not any TSPs currently certified by NRCS to write prescribed burn plans in Montana.

Forest Health survey results showed the most common reason private landowners would treat their grazed forest by thinning overstocked stands would be to recover grazingland area. Forest Stand Improvement (also known as precommercial thinning) is generally applied to ponderosa pine trees less than eight inches in diameter at breast height, and the NRCS planning process evaluates the potential for ponderosa stands to respond to thinning treatments. Not all sites are quality candidates for treatment.

The overall desired future outcome for this resource concern is to recover grazingland within the 560,000 acres of privately-owned forests. A secondary objective is for the forests to survive periodic fire events and prevent 100% mortality. This results in forests that are resilient to wildfire and accessible to livestock. NRCS has two objectives to accomplish this:

1. Implement Fuel Breaks to provide defensible space against fires
    - Rough estimate of acres to be treated is .05% of forestland in privately owned operations, 2,800 acres
    - Estimated cost to treat is $970 per acre, equals $2,716,000
    - Fully treated in 2.5 to 5 years if 1,000 acres are treated per year
    - Focus on accessible areas (property boundaries, roads, etc.) and structures.

2. Implement Forest Stand Improvement, where suitable, to improve tree resilience to wildfires
    - About 470,000 acres of the 560,000 forested deeded acres in the county did not burn in 2012. Roughly 2%, or 9,400 acres, is used to estimate the acres of Ponderosa pine stands within favorable site conditions for treatment. There may be areas within the Ash Creek and Taylor Creek fire perimeters suitable for thinning that did not burn and may increase this estimate.
    - Estimated cost to treat is $516 per acre, for a total estimated cost to treat of $4,850,400.
    - Would be fully treated in 10 years if 1,000 acres are treated per year.
    - Focus on sites with suitable soil and topographic conditions to favor positive tree response to thinning.

Woody Residue Treatment slash and burn methods will be used following thinning activities where lopped trees are anticipated to be too dense to lop and scatter. Based on practice implementation rates, NRCS estimates 13% of acres treated with Code 666 will require slash treatment with Code 384, which is 1,200 acres. At a cost to treat of $384 per acre, the total estimated cost to treat is $460,800. Cost estimates above are based on 2019 NRCS practice cost scenarios and are likely to change through time.

The estimated acres and costs to address this resource concern are too significant to attempt to address in one effort. The Broadus NRCS created smaller, more manageable areas called Wildfire Risk Areas (WRA) A, B, C, D (Figure 28). The boundaries were influenced by predominant wind direction, extent and arrangement of public and private land, Ash Creek and Taylor Creek fire boundaries, and existing defensible spaces such as roads and rivers (Table 9).

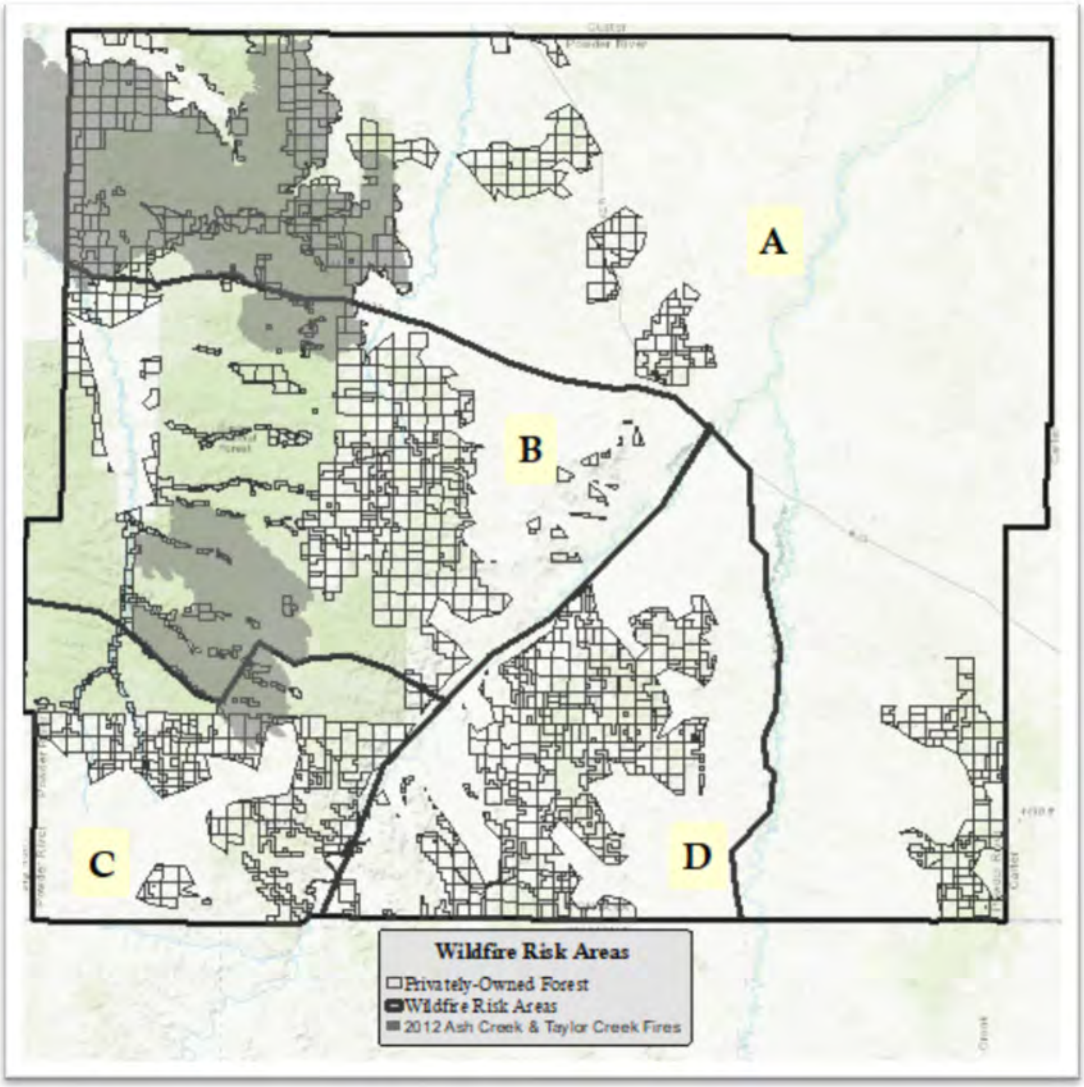

FIGURE 28: WILDFIRE RISK AREAS

TABLE 9: WILDFIRE RISK AREA DESCRIPTIONS

WRA A	WRA B
-Northern/Eastern boundary: county line -Southern boundary: county line in far south PR County, Hwy 59 S, and Hwy 212 W -Western boundary: county line	-Northern boundary: Hwy 212 -Eastern boundary: Powder River -Southern boundary: Bloom Creek Rd, Sayle Rd, Indian Creek, Horse Creek -Western boundary: county line
-~193,000 privately-owned, forested acres; 83,000 of these acres burned in 2012 Ash Creek fire -Standing/downed dead timber is beyond the 1-3 year stage to perform Woody Residue Treatment -No NRCS staff or TSPs available to write prescribed burn plans	-~153,000 privately-owned, forested acres; 7% of these acres burned in 2012 Ash Creek and Taylor Creek Fires -Lies between Ash Creek and Taylor Creek fire boundaries

-Remaining forests are isolated in pockets -383: estimated treatment area = 1,100 ac; estimated cost to treat = $1,067,000; treated in 1 year -666: estimated treatment area = 2,200 ac; estimated cost to treat = $1,234,200; treated in 2 years -384: estimated 286 acres; estimated cost $118,690; treated within same 2 years as 666	-Standing/downed dead timber is beyond the 1-3 year stage to perform Woody Residue Treatment -Majority of forested acres occur as one large contiguous area consisting of both public and private land -Drainages oriented west to east (as is predominant wind direction); similar to pre-2012 conditions in WRA A -383: estimated treatment area = 1,400 ac; estimated cost to treat = $1,348,000; treated in 2 years -666: estimated treatment area = 3,000 ac; estimated cost to treat = $1,683,000; treated in 3 years -384: estimated 390 acres; estimated cost $161,850; treated within same 3 years as 666
WRA C -Northern boundary: Horse Creek, Indian Creek, Sayle Rd, Bloom Creek Rd -Eastern boundary: Powder River -Southern/Western boundary: county line	**WRA D** -Northern boundary: Hwy 212 -Eastern boundary: Hwy 59 south -Southern boundary: county line -Western boundary: Powder River
-~81,000 privately-owned, forested acres; 6,000 of these acres burned in 2012 Taylor Creek Fire. -Most isolated area of the four WRAs, may take longer to respond to fires in this area -Drainage orientation varies greatly (WRA C, continued) -Rocky Mountain juniper more prevalent than in WRA A and B -383: estimated treatment area = 750 ac; estimated cost to treat = $727,500; treated in 1 year -666: estimated treatment area = 1,500 ac; estimated cost to treat = $841,000; treated in 2 years -384: estimated 195 acres; estimated cost $80,925; treated within same 2 years as 666	-~132,000 privately-owned, forested acres -Majority of forested acres occur as one large contiguous unit consisting of both public and private land -Drainages oriented northwest to southeast (WRA D, continued) -Vehicle access to fight fire dependent on operator knowledge and 2-track pasture trails; vehicle access to steep terrain is very limited -Forest includes Rocky Mountain juniper -383: estimated treatment area = 1,300 ac; estimated cost to treat = $1,261,000; treated in 1 year -666: estimated treatment area = 2,700 ac; estimated cost to treat = $1,514,700; treated in 3 years -384: estimated 351 acres; estimated cost $145,665; treated within same 3 years as 666

The Ashland Ranger District has also categorized and prioritized smaller management areas. The District's first priority for forest management efforts lies in an area termed "South Otter Creek Project" containing 292,000 acres. This corresponds to NRCS's WRA B and WRA C. The planned treatments include timber harvests, precommercial thinning, and prescribed burns to reduce fire hazard. The area includes Ten and Fifteen Mile Creeks, Elk Creek, and Bloom Creek, as well as several drainages on the West side of Otter Creek. The District's second priority is a 120,000 acre area mostly north of Highway 212 but also includes a major portion of Three Mile Creek and Home Creek south of Highway 212; this project area is termed "Ash Creek Project". NRCS's WRA A and a very small portion of Northern WRA B lie within this area. There will not be any commercial timber sales offered in the District's plan for this project, but there will be prescribed burns to reduce dead and down fuels, reforestation, and wildlife habitat enhancement projects. The

prescribed burns may encompass private land if it lies within the anticipated burn pattern and the landowner gives permission to include it.

Streambank and Gully Erosion - Little Powder River

Erosion in the Little Powder River watershed is in the list of resource concerns for Powder River County overall. The LWG discussion included concerns about streambank stability on the Little Powder River and gully erosion in its tributaries. Participants noted the lack of native tree recruitment, particularly cottonwoods and willows, as a cause. Broadus NRCS is equipped with very basic streambank and riparian conservation skills including the ability to inventory the stream for structures and obvious issues at a ranch scale. To address concerns at a watershed scale, an interdisciplinary team of experts that specialize in watershed functions would be needed to complete a comprehensive inventory and develop an action plan. This team should consist of biologists, hydrologists, engineers, plant materials specialists, and conservation planners. Potential treatments, locations, and extents are unknown.

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 Local Working Group meetings:

- Cheatgrass infestations on rangeland
- Bulbous bluegrass infestations on rangeland
- Crested wheatgrass winter mortality
- Crested wheatgrass monocultures
- Lack of natural water sources for wildlife and livestock
- Developing waterspreading for irrigation
- Infiltration issues on irrigated hayland
- Degraded plant communities caused by poor grazing distribution and lack of stockwater developments
- Declining water quantity and water quality in the Powder River
- Livestock loss due to predators

Following Local Working Group meetings, the Broadus NRCS office received input from producers about potential resource concerns. Two items that came up were lack of cottonwood regeneration in riparian corridors and flowing wells that could be capped. Broadus NRCS and the PRCD decided the top five priorities produced from the 2019 LWG meetings would remain as resource priorities for the NRCS to work to address.

Prioritized Future Conditions

Reducing forest fuels is the priority for Broadus NRCS to address, particularly reducing the risk of fires like the Ash Creek fire. Work will be prioritized in WRA B starting in 2020, continuing through 2023. NRCS efforts will then focus on WRA D or WRA C, anticipated to take place 2023 to 2026. Wildfire reduction efforts WRA A will take place in 2026 to 2028. Staff has job approval authority and sufficient experience in addressing resource concerns in forested areas. The NRCS objectives and prioritization align well with the Ashland Ranger District's priorities, so we can expect the desired future conditions of private land forests to also be achieved on public lands in WRA B. Additionally, financial incentive from NRCS Farm Bill programs, such as EQIP, can fill a gap in forestry management where private landowners typically don't dedicate their own financial resources. State Foresters with DNRC can provide technical assistance on private land and State Land to help landowners develop forest management plans.

Plant communities degraded by noxious weed invasions is the Broadus NRCS's second resource concern to tackle. LWG participants said they are doing as much as they can to control weeds, including dedicating significant financial resources towards spraying weeds every year. NRCS will collaborate with the Powder River Weed District to determine where Farm Bill program funding would be most effective and result in the most improvement. Most importantly, we'll seek new methods and technologies to enhance producers' pest management tools to gain momentum against noxious weeds

The third priority for the Broadus NRCS office is to acquire more information about the Little Powder River streambank erosion and gully erosion issues. Technical expertise for inventorying the river is needed to ensure a comprehensive understanding of how the river functions, so that actions have long-term success and don't cause issues elsewhere in the system.

Similarly, the fourth priority for the Broadus NRCS office is to understand the Otter Creek sediment imbalance. For the same reasons mentioned above, technical expertise is needed.

The last priority for the Broadus NRCS office is addressing soil erosion and degraded plant condition caused by prairie dogs. It is unknown if, and what, assistance NRCS can offer. In order to address this resource concern, most of the responsibility falls on the land managers to have common objectives. Participants who voiced concern at the LWG meetings admitted this would be the most difficult part.

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Appendix A

Powder River Area Soil Survey Information

Prime and Other Important Farmlands

Powder River Area, Montana

Map symbol	Map unit name	Farmland classification
Bw	Bew silty clay, 4 to 8 percent slopes	Farmland of statewide importance
Fe	Farland silt loam, 4 to 8 percent slopes	Farmland of statewide importance
Fm	Farland and Havrelon soils, 4 to 8 percent slopes	Farmland of statewide importance
Fn	Fergus-Relan association, 2 to 8 percent slopes	Farmland of statewide importance
Fs	Fort Collins silt loam, 4 to 8 percent slopes	Farmland of statewide importance
Hf	Haverson soils, channeled	Farmland of statewide importance
Hm	Heldt silty clay loam, 4 to 8 percent slopes	Farmland of statewide importance
Hp	Hesper silty clay loam, 4 to 8 percent slopes	Farmland of statewide importance
Hs	Hopley and Relan loams, 4 to 8 percent slopes	Farmland of statewide importance
Me	McRae silt loam, 4 to 8 percent slopes	Farmland of statewide importance
Re	Relan loam, 4 to 8 percent slopes	Farmland of statewide importance
Th	Thurlow silty clay loam, 0 to 2 percent slopes	Farmland of statewide importance
Tm	Thurlow silty clay loam, 2 to 4 percent slopes	Farmland of statewide importance
To	Thurlow silty clay loam, 4 to 8 percent slopes	Farmland of statewide importance
Vr	Vona-Remmit fine sandy loam, 4 to 8 percent slopes	Farmland of statewide importance
Ba	Bankard fine sandy loam	Prime farmland if irrigated
Bc	Bew silty clay, 0 to 2 percent slopes	Prime farmland if irrigated
Be	Bew silty clay, 2 to 4 percent slopes	Prime farmland if irrigated
Fa	Farland silt loam, 0 to 2 percent slopes	Prime farmland if irrigated
Fd	Farland silt loam, 2 to 4 percent slopes	Prime farmland if irrigated
Fo	Fort Collins silt loam, 0 to 2 percent slopes	Prime farmland if irrigated
Fr	Fort Collins silt loam, 2 to 4 percent slopes	Prime farmland if irrigated
Gf	Glenberg fine sandy loam, 0 to 2 percent slopes	Prime farmland if irrigated
Ha	Haverson loam	Prime farmland if irrigated
Hc	Haverson silt loam	Prime farmland if irrigated
Hd	Haverson silty clay loam	Prime farmland if irrigated
He	Haverson silty clay	Prime farmland if irrigated
Hh	Heldt silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated
Hk	Heldt silty clay loam, 2 to 4 percent slopes	Prime farmland if irrigated
Hn	Hesper silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated
Ho	Hesper silty clay loam, 2 to 4 percent slopes	Prime farmland if irrigated
Mc	McRae silt loam, 0 to 2 percent slopes	Prime farmland if irrigated
Md	McRae silt loam, 2 to 4 percent slopes	Prime farmland if irrigated
Rm	Remmit fine sandy loam, 2 to 4 percent slopes	Prime farmland if irrigated
Rn	Remmit fine sandy loam, 4 to 8 percent slopes	Prime farmland if irrigated
Vo	Vona fine sandy loam, 2 to 4 percent slopes	Prime farmland if irrigated

Acreage and Proportionate Extent of Prime if Irrigated Soils

Powder River Area, Montana

Map symbol	Map unit name	Acres	Percent
Ba	Bankard fine sandy loam	10,950	0.5
Bc	Bew silty clay, 0 to 2 percent slopes	3,101	0.1
Be	Bew silty clay, 2 to 4 percent slopes	5,568	0.3
Fa	Farland silt loam, 0 to 2 percent slopes	1,253	*
Fd	Farland silt loam, 2 to 4 percent slopes	5,849	0.3
Fo	Fort Collins silt loam, 0 to 2 percent slopes	3,101	0.1
Fr	Fort Collins silt loam, 2 to 4 percent slopes	10,220	0.5
Gf	Glenberg fine sandy loam, 0 to 2 percent slopes	16,573	0.7
Ha	Haverson loam	5,061	0.2
Hc	Haverson silt loam	27,298	1.2
Hd	Haverson silty clay loam	19,005	0.9
He	Haverson silty clay	9,551	0.4
Hh	Heldt silty clay loam, 0 to 2 percent slopes	16,576	0.7
Hk	Heldt silty clay loam, 2 to 4 percent slopes	11,665	0.5
Hn	Hesper silty clay loam, 0 to 2 percent slopes	7,759	0.4
Ho	Hesper silty clay loam, 2 to 4 percent slopes	35,156	1.6
Mc	McRae silt loam, 0 to 2 percent slopes	6,226	0.3
Md	McRae silt loam, 2 to 4 percent slopes	15,456	0.7
Rm	Remmit fine sandy loam, 2 to 4 percent slopes	640	*
Rn	Remmit fine sandy loam, 4 to 8 percent slopes	3,667	0.2
Vo	Vona fine sandy loam, 2 to 4 percent slopes	3,337	0.2
Total		218,012	9.9

* Less than 0.1 percent.

Acreage and Proportionate Extent of Soils of Statewide Importance

Powder River Area, Montana

Map symbol	Map unit name	Acres	Percent
Bw	Bew silty clay, 4 to 8 percent slopes	5,320	0.2
Fe	Farland silt loam, 4 to 8 percent slopes	10,817	0.5
Fm	Farland and Havrelon soils, 4 to 8 percent slopes	39,140	1.8
Fn	Fergus-Relan association, 2 to 8 percent slopes	6,549	0.3
Fs	Fort Collins silt loam, 4 to 8 percent slopes	20,090	0.9
Hf	Haverson soils, channeled	24,057	1.1
Hm	Heldt silty clay loam, 4 to 8 percent slopes	14,017	0.6
Hp	Hesper silty clay loam, 4 to 8 percent slopes	47,198	2.1
Hs	Hopley and Relan loams, 4 to 8 percent slopes	10,210	0.5
Me	McRae silt loam, 4 to 8 percent slopes	8,300	0.4
Re	Relan loam, 4 to 8 percent slopes	732	*
Th	Thurlow silty clay loam, 0 to 2 percent slopes	4,143	0.2
Tm	Thurlow silty clay loam, 2 to 4 percent slopes	3,687	0.2
To	Thurlow silty clay loam, 4 to 8 percent slopes	12,121	0.5
Vr	Vona-Remmit fine sandy loam, 4 to 8 percent slopes	19,245	0.9
Total		225,626	10.2

* Less than 0.1 percent.

Hydric Soils

Powder River Area, Montana

[This report lists only those map unit components that are rated as hydric. Dashes (---) in any column indicate that the data were not included in the database. Definitions of hydric criteria codes are included at the end of the report]

Map symbol and map unit name	Component	Percent of map unit	Landform	Hydric rating	Hydric criteria
181:					
Moorhead clay loam, 0 to 6 percent slopes	Felix, ponded	5	Depressions, Playas	Yes	2
265:					
Clarkelen-Draknab-Boruff complex, 0 to 6 percent slopes	Boruff	15	Flood plains	Yes	2
284:					
Haverdad clay loam, 0 to 3 percent slopes	Boruff	5	Flood plains	Yes	2
286:					
Havre-Bigsandy loams, 0 to 3 percent slopes	Bigsandy	35	Flood plains	Yes	2
311:					
Rockypoint-Boruff complex, 0 to 3 percent slopes	Boruff	40	Flood plains	Yes	2
312:					
Rockypoint-Sodawells complex, 0 to 3 percent slopes	Boruff	5	Flood plains	Yes	2
318:					
Sodawells-Pathfinder-Boruff complex, 0 to 6 percent slopes	Boruff	15	Flood plains	Yes	2
Ba:					
Bankard fine sandy loam	Somewhat poorly drained soils	5	Flood plains	Yes	2, 4
Fl:					
Farland-Rockland association, 0 to 6 percent slopes	Poorly drained soils	1	Depressions	Yes	2, 3
Fm:					
Farland and Havrelon soils, 4 to 8 percent slopes	Somewhat poorly drained soils	2	Flood plains	Yes	2, 4
Fn:					
Fergus-Relan association, 2 to 8 percent slopes	Poorly drained soils	1	Depressions	Yes	2, 3
Gf:					
Glenberg fine sandy loam, 0 to 2 percent slopes	Somewhat poorly drained soils	2	Flood plains	Yes	2, 4
Hf:					
Haverson soils, channeled	Somewhat poorly drained soils	2	Flood plains	Yes	2, 4
Hg:					
Haverson soils, saline	Somewhat poorly drained soils	2	Flood plains	Yes	2, 3, 4

Hydric Soils

Powder River Area, Montana

Map symbol and map unit name	Component	Percent of map unit	Landform	Hydric rating	Hydric criteria
Rf:					
Relan association, 5 to 30 percent slopes	Somewhat poorly drained soils	1	Swales	Yes	2, 3
Rw:					
Riverwash	Poorly drained soils	10	Flood plains	Yes	2, 4

Hydric Soils

This table lists the map unit components that are rated as hydric soils in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 2002).

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2003) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and others, 2002).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The criteria for hydric soils are represented by codes in the table (for example, 2B3). Definitions for the codes are as follows:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
   A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
   B. are poorly drained or very poorly drained and have either:
      1) a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
      2) a water table at a depth of 0.5 foot or less during the growing season if permeability is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
      3) a water table at a depth of 1.0 foot or less during the growing season if permeability is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for long or very long duration during the growing season.
4. Soils that are frequently flooded for long or very long duration during the growing season.

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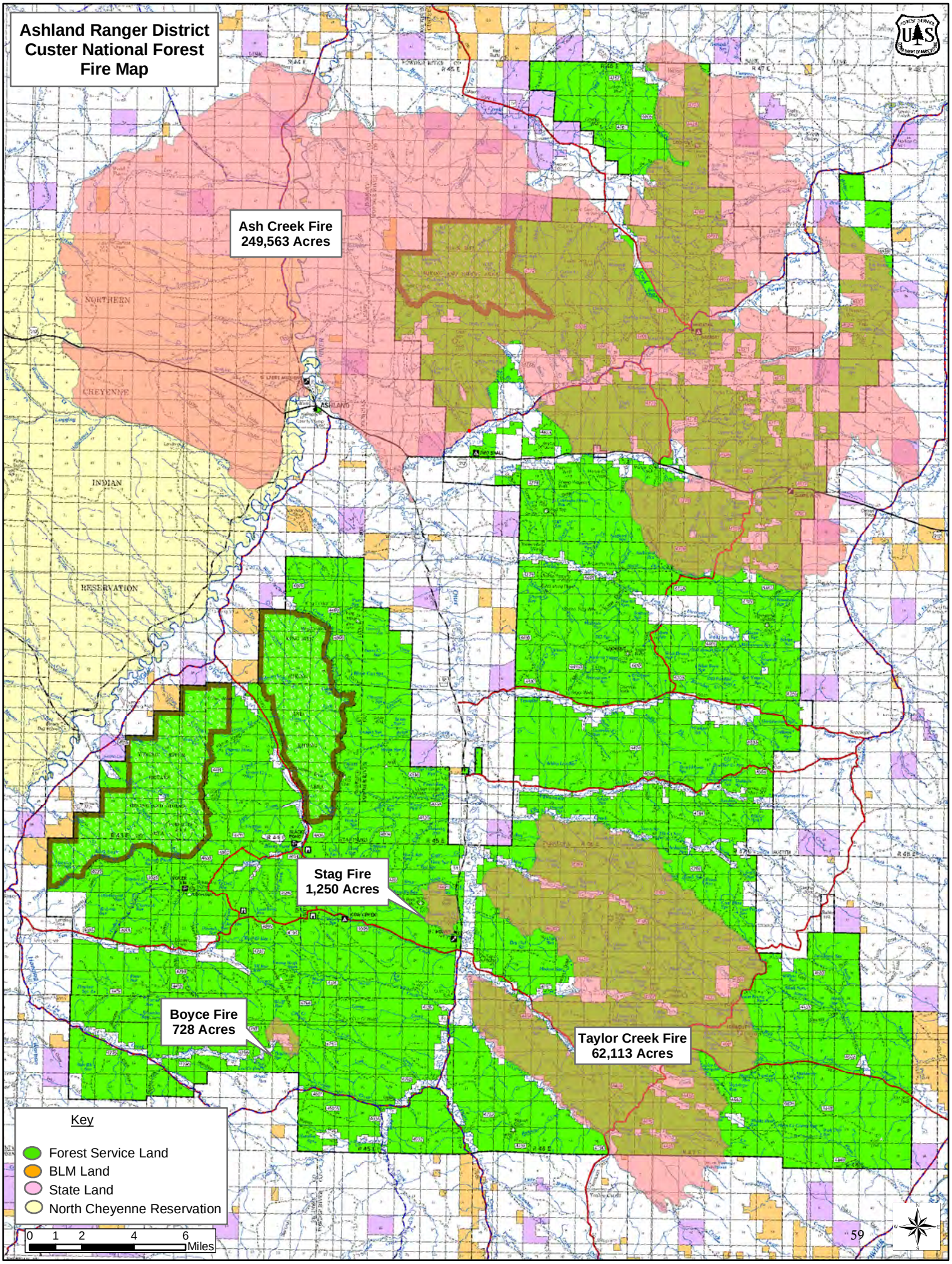
Appendix B

Ashland Ranger District
Custer National Forest Fire Map, 2012


Ashland Ranger District
Custer National Forest
Fire Map
Ash Creek Fire
249,563 Acres
Stag Fire
1,250 Acres
Boyce Fire
728 Acres
Taylor Creek Fire
62,113 Acres
NORTHERN
CHEYENNE
INDIAN
RESERVATION
ASHLAND
Key
Forest Service Land
BLM Land
State Land
North Cheyenne Reservation
0 1 2 4 6
Miles

Appendix C

Montana Noxious Weed List;
Powder River County Noxious Weed List;
and Noxious Weed Profile References

Montana Noxious Weed List[17]

Effective: June 21, 2019

PRIORITY 1A These weeds are not present or have a very limited presence in Montana. Management criteria will require eradication if detected, education, and prevention:

(a) Yellow starthistle (*Centaurea solstitialis*)
(b) Dyer's woad *(Isatis tinctoria*)
(c) Common reed *(Phragmites australis ssp. australis)*
(d) Medusahead *(Taeniatherum caput-medusae)*

PRIORITY 1B These weeds have limited presence in Montana.
Management criteria will require eradication or containment and education:

(a) Knotweed complex (*Polygonum cuspidatum, P. sachalinense, P. × bohemicum, Fallopia japonica, F. sachalinensis, F. × bohemica, Reynoutria japonica, R. sachalinensis, and R.× bohemica*)
(b) Purple loosestrife (*Lythrum salicaria*)
(c) Rush skeletonweed (*Chondrilla juncea*)
(d) Scotch broom (*Cytisus scoparius*)
(e) Blueweed (*Echium vulgare*)

PRIORITY 2A These weeds are common in isolated areas of Montana. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

(a) Tansy ragwort (*Senecio jacobaea, Jacobaea vulgaris*)
(b) Meadow hawkweed complex (*Hieracium caespitosum, H. praealturm, H. floridundum, and Pilosella caespitosa*)
(c) Orange hawkweed (*Hieracium aurantiacum, Pilosella aurantiaca*)
(d) Tall buttercup (*Ranunculus acris*)
(e) Perennial pepperweed (*Lepidium latifolium*)
(f) Yellowflag iris (*Iris pseudacorus*)
(g) Eurasian watermilfoil (*Myriophyllum spicatum, Myriophyllum spicatum x Myriophyllum sibiricum***)**
(h) Flowering rush (*Butomus umbellatus*)
(i) Common buckthorn *(Rhamnus cathartica L.)*
(j) Ventenata *(Ventenata dubia)*

PRIORITY 2B These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

(a) Canada thistle (*Cirsium arvense*)
(b) Field bindweed (*Convolvulus arvensis*)
(c) Leafy spurge (*Euphorbia esula*)
(d) Whitetop (*Cardaria draba, Lepidium draba*)
(e) Russian knapweed (*Acroptilon repens, Rhaponticum repens*)
(f) Spotted knapweed (*Centaurea stoebe, C.maculosa*)
(g) Diffuse knapweed (*Centaurea diffusa*)
(h) Dalmatian toadflax (*Linaria dalmatica*)
(i) St. Johnswort (*Hypericum perforatum*)
(j) Sulfur cinquefoil (*Potentilla recta*)
(k) Common tansy (*Tanacetum vulgare*)
(l) Oxeye daisy (*Leucanthemum vulgare*)
(m) Houndstongue (*Cynoglossum officinale*)
(n) Yellow toadflax (*Linaria vulgaris*)
(o) Saltcedar (*Tamarix spp*.)
(p) Curlyleaf pondweed (*Potamogeton crispus*)
(q) Hoary alyssum (*Berteroa incana*)

PRIORITY 3 Regulated Plants: (NOT MONTANA LISTED NOXIOUS WEEDS)
These regulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. The state recommends research, education and prevention to minimize the spread of the regulated plant.

(a) Cheatgrass (*Bromus tectorum*)
(b) Hydrilla (*Hydrilla verticillata*)
(c) Russian olive (*Elaeagnus angustifolia*)
(d) Brazilian waterweed (*Egeria densa*)
(e) Parrot feather watermilfoil (*Myriophyllum aquaticum or M. brasiliense*)

Powder River County Noxious Weed List[18]

	Present	Not Present
Priority A		
Yellow Starthistle (*Centaurea solstitialis*)		X
Dyers Woad (*Isatis tinctorial*)		X
Priority 1B		
Japanese Knotweed Complex (*Polygonum* spp.)		X
Purple Loosestrife (*Lythrum salicaria*)		X
Rush Skeletonweed (*Chondrilla juncea*)		X
Scotch Broom (*Cytisus scoparius*)		X
Priority 2A		
Tansy Ragwort (*Senecio jacobaea*)		X
Meadow Hawkweed (*Hieracium* spp.)		X
Orange Hawkweed (*Hieracium aurantiacum*)		X
Tall Buttercup (*Ranunculus acris*)		X
Perennial Pepperweed (*Lepidium latifolium*)		X
Yellowflag Iris (*Iris pseudacorus*)		X
Blueweed (*Echium vulgare*)		X
Hoary Alyssum (*Berteroa incana*)		X
Priority 2B		
Canada thistle (*Cirsium arvense*)	X	
Field Bindweed (*Convolvulus arvensis*)	X	
Leafy Spurge (*Euphorbia esula*)	X	
Whitetop (*Cardiaria draba*)	X	
Russian knapweed (*Acroptilon repens*)	X	
Spotted knapweed (*Centaurea maculosa*)	X	
Diffuse Knapweed (*Centaurea diffusa*)		X
Dalmation Toadflax (*Linaria dalmatica*)	X	
St. John'swort (*Hypericum perforatum*)	X	
Sulfur Cinquefoil (*Potentilla recta*)	X	
Common Tansy (*Tanacetum vulgare*)	X	
Oxeye Daisy (*Leucanthemum vulgare*)		X
Houndstongue (*Cynoglossum officinale*)	X	
Yellow Toadflax (*Linaria vulgaris*)	X	
Saltcedar (*Tamarisk* spp.)	X	
Flowering Rush (*Butomus umbellatus*)		X
Eurasian Watermilfoil (*Myriophyllum spicatum*)		X
Curlyleaf Pondweed (*Potamogeton crispus*)		X
Priority 3		
Cheatgrass (*Bromus tectorum*)	X	
Hydrilla (*Hydrilla verticillata*)		X
Russian Olive (*Elaeagnus angustifolia*)	X	
Priority 4		
Poison Hemlock (*Conium maculatum*)	X	
Puncturevine (*Tribulus terrestris*)	X	
Black Henbane (*Hyoscyamus niger*)	X	

Noxious Weed Profile Resources for Common Noxious Weeds in Powder River County

Black Henbane
Black Henbane Identification and Management, Colorado Department of Agriculture
https://alamosarec.org/docs/jb_black henbane.pdf

Canada Thistle
Ecology and Management of Canada Thistle, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Common Tansy
Ecology and Management of Common Tansy, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Dalmation Toadflax
Ecology and Management of Dalmation Toadflax, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Field Bindweed
Ecology and Management of Field Bindweed, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Houndstongue
Ecology and Management of Houndstongue, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Leafy Spurge
Ecology and Management of Leafy Spurge, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Poison Hemlock
Poison Hemlock, Montana State University Extension
http://msuextension.org/publications/AgandNaturalResources/MT200013AG.pdf

Puncturevine
Puncturevine Identification and Management, Colorado Department of Agriculture
https://colorado.gov/pacific/sites/default/files/Puncturevine Factsheet.pdf

Russian Knapweed
Ecology and Management of Russian Knapweed, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Russian Olive, Saltcedar
Best Management Practices for Montana; Biology, Ecology, and Management of Russian Olive and Saltcedar, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Spotted Knapweed
Ecology and Management of Spotted Knapweed, USDA NRCS

https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

St. Johnswort
Ecology and Management of St. Johnswort, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Sulfur Cinquefoil
Ecology and Management of Sulfur Cinquefoil, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Whitetop
Ecology and Management of Whitetop, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Yellow Toadflax
Ecology and Management of Yellow Toadflax, USDA NRCS
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/technical/ecoscience/invasive/nrcs144p2_056849/

Appendix D

Threatened and Endangered Species Profiles

United States Department of the Interior
Fish and Wildlife Service
Ecological Services
Montana Field Office
585 Shepard Way. Suite 1
Helena. Montana 59601-6287
Phone: (406) 449-5225. Fax: (406) 449-5339

ENDANGERED, THREATENED, PROPOSED AND CANDIDATE SPECIES
MONTANA COUNTIES*
Endangered Species Act

October 8, 2019

C = Candidate
LT = Listed Threatened
LE = Listed Endangered
P = Proposed

PCH = Proposed Critical Habitat
CH = Designated Critical Habitat
XN = Experimental non-essential population

*Note: Generally, this list identifies the counties where one would reasonably expect the species to occur, not necessarily every county where the species is listed

County/ Scientific Name	Common Name	Status
POWDER RIVER		
Grus americana	Whooping Crane	LE
Scaphirhynchus albus	Pallid Sturgeon	LE
Myotis septentrionalis	Northern Long-eared Bat	LT

[19]**PALLID STURGEON (*Scaphirhynchus albus)***

Photo by South Dakota Game, Fish and Parks; Sam Stukel

Description: Pallid sturgeons have a unique dinosaur-like appearance. They have a flattened snout, long slender tail and are armored with lengthwise rows of bony plates instead of scales. Their mouth is toothless and positioned under the snout for sucking small fishes and invertebrates from the river bottom. Pallid sturgeons can weigh up to 80 pounds and reach lengths of 6 feet, whereas the closely related shovelnose sturgeon rarely weights more than 8 pounds. The back and sides of pallid sturgeons are grayish-white versus the brown color of the shovelnose sturgeons.

Current Range and Status: Today, pallid sturgeons are scarce in the upper Missouri River above Ft. Peck Reservoir; scarce in the Missouri and lower Yellowstone Rivers between Ft. Peck Dam and Lake Sakakawea; very scarce in the other Missouri River reservoir reaches; scarce in the Missouri River downstream of Gavins Point Dam; scarce but slightly more common in the Mississippi and Atchafalaya Rivers; absent from other tributaries.

Habitat: Pallid sturgeons evolved and adapted to living close to the bottom of large, silty rivers with natural a hydrograph. Their preferred habitat has a diversity of depths and velocities formed by braided channels, sand bars, sand flats and gravel bars.

Life History and Reproductive Biology: Sexual maturity for males is estimated to be 7-9 years, with 2-3 year intervals between spawning. Females are not expected to not reach sexual maturity until 7-15 years, with up to 10-year intervals between spawning. Pallid sturgeons are long lived, with individuals perhaps reaching 50 years of age.

Reasons for Decline: All of the 3,350 miles of riverine habitat within the pallid sturgeon's range have been adversely affected by man. Approximately 28% has been impounded, which has created unsuitable lake-like habitat; 51% has been channelized into deep, uniform channels; the remaining 21% is downstream of dams which have altered the river's hydrograph, temperature and turbidity. Commercial fishing and environmental contaminants may have also played a role in the pallid sturgeon's decline.

Recovery Activities: In 1997, through the combined effort of two Fishery Assistance offices, two National Fish Hatcheries, one Ecological Services office, and two State game and fish departments (North Dakota and Montana), two female and three male pallid sturgeons were spawned. Spawning pallid sturgeons from the upper Missouri River had been attempted since 1988, but to no avail. Currently, approximately 5,000 young pallid sturgeons are being reared at Gavins Point NFH. In August, 1998, the Fish and Wildlife Service and state game and fish departments from North Dakota and Montana will stock up to 1,500 of these fish in two areas; at sites near the Missouri and Yellowstone River confluence, and in the Missouri River upstream of Ft. Peck Reservoir in

Montana. This release will be the first under a multi-agency 6-year plan to augment doomed adult populations. Since pallid sturgeons do not reach maturity and spawn for several years, we must stock now so that we have adults in the wild as habitats are restored. Without artificial propagation in hatcheries and subsequent population augmentation, this population will likely be extirpated. The juvenile pallid sturgeon we stock under this plan will be the founder population for recovery.

[20]**WHOOPING CRANE (*Grus Americana*)**

Description: The most noticeable characteristic of the whooping crane is the large red patch on the head. The red patch extends from the cheek along the bill and over the top of the head. The red patch is made of skin and is almost featherless. Aside from the patch of red, whooping cranes are almost entirely white. The body and wing feathers are a bright white, except on the tips of the outer wings. The tips of the primary feathers are black.

Whooping cranes have yellow eyes and thin, black legs.

With a height of approximately five feet (1.5 meters), whooping cranes are the tallest birds in North America. Whooping cranes have a 7.5-foot (2.3-meter) wingspan. They are lean birds, and despite their height, weigh only about 15 pounds (6.8 kilograms).

Range: Whooping cranes like wetlands, marshes, mudflats, wet prairies and fields. Researchers believe that whooping cranes once bred throughout the upper Midwest and northwestern Canada, and they wintered along the Gulf Coast near Texas. Today there are two migratory populations and one non-migratory population of whooping cranes. The largest flock is also the only natural migratory flock. It spends winters in Aransas National Wildlife Refuge in Texas and breeds in Wood Buffalo National Park in Canada. The non-natural migratory flock winters at the Chassahowitzka National Wildlife Refuge in Florida and breeds in the Necedah National Wildlife Refuge in Wisconsin. The non-migratory flock was formed in Florida as a reintroduction program. They live near Kissimmee in Florida year-round.

[21]**Northern Long-eared Bat *(Myotis septentrionalis)***

Appearance: The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches but a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*.

Winter Habitat: Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible.

Photo by New York Department of Environmental Conservation; Al Hicks

Summer Habitat: During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. This bat has also been found rarely roosting in structures, like barns and sheds.

Reproduction: Breeding begins in late summer or early fall when males begin to swarm near hibernacula. After copulation, females store sperm during hibernation until spring. In spring, they emerge from their hibernacula, ovulate and the stored sperm fertilizes an egg. This strategy is called delayed fertilization.

After fertilization, pregnant females migrate to summer areas where they roost in small colonies and give birth to a single pup. Maternity colonies of females and young generally have 30 to 60 bats at the beginning of the summer, although larger maternity colonies have also been seen. Numbers of individuals in roosts, typically decreases from pregnancy to post-lactation. Most bats within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth. Maximum lifespan for the northern long-eared bat is estimated to be up to to 18.5 years.

Feeding Habits: Like most bats, northern long-eared bats emerge at dusk to feed. They primarily fly through the understory of forested areas feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation or by gleaning motionless insects from vegetation.

Range: The northern long-eared bat's range includes much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. The species' range includes the following 37 States and the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

Threats:

1.) **White-nose syndrome.** No other threat is as severe and immediate as the disease, white-nose syndrome. If this disease had not emerged, it is unlikely the northern long-eared bat would be experiencing such a dramatic population decline. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest and Southeast; an area that includes the core of the northern long-eared bat's range where it was most common before this disease. Numbers of northern long-eared bats (from hibernacula counts) have declined by up to 99 percent in the Northeast. Although there is uncertainty about the rate that white-nose syndrome will spread throughout the species' range, it is expected to spread throughout the United States in the foreseeable future. Montana is currently outside the white-nose syndrome mapped area.

2.) **Other Sources of Mortality:** Although no significant population declines have been observed due to the sources of mortality listed below, they may now be important factors affecting this bat's viability until we find ways to address white-nose syndrome.

3.) **Impacts to Hibernacula:** Gates or other structures intended to exclude people from caves and mines not only restrict bat flight and movement, but also change airflow and internal cave and mine microclimates. A change of even a few degrees can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating. Arousal during hibernation causes bats to use up their already reduced energy stores, which may lead to individuals not surviving the winter.

4.) **Loss or Degradation of Summer Habitat:** ***Loss or Degradation of Summer Habitat:*** Highway construction, commercial development, surface mining, and wind facility construction permanently remove habitat and are activities prevalent in many areas of this bat's range. Forest management benefits northern long-eared bats by keeping areas forested rather than converted to other uses. But, depending on type and timing, forest management activities can cause mortality and temporarily remove or degrade roosting and foraging habitat.

5.) **Wind Farm Operation:** Wind turbines kill bats, and, depending on the species, in very large numbers. Mortality has been documented for northern long-eared bats, although a small number have been found to date. However, there are many wind projects within a large portion of the bat's range and many more are planned.

Appendix E

Powder River County Species of Concern[22]

Montana Natural Heritage - SOC Report Species List Last Updated **09/25/2018**

Animal Species of Concern

51 Species of Concern
1 Special Status Species
Filtered by the following criteria:
County = Powder River (based on mapped Species Occurrences)

MONTANA Natural Heritage Program

A program of the **Montana State Library's Natural Resource Information System** operated by the **University of Montana.**

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Introduction

Species of Concern

Species of Concern
51 Species
Filtered by the following criteria:
County = Powder River (based on mapped **Species Occurrences**)

MAMMALS (MAMMALIA)

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE
Antrozous pallidus Pallid Bat	**Vespertilionidae** Bats	G4	S3		Sensitive - Known on Forests (CG)	SENSITIVE	SGCN3	0%	6%
		Species Occurrences verified in these Counties: Carbon, Musselshell, Powder River, Rosebud, Yellowstone **State Rank Reason:** Species is rare within range and data to assess threats and population trends does not exist. Limited distribution and low fecundity make this vulnerable to threats.							
Corynorhinus townsendii Townsend's Big-eared Bat	**Vespertilionidae** Bats	G4	S3		Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)	SENSITIVE	SGCN3	5%	87%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Fergus, Flathead, Galla Jefferson, Judith Basin, Lake, Lewis and Clark, Lincoln, Madison, Mccone, Meagher, Mineral, Missoula, Musselshell, Park, Phillips, Powder River, Powell, Prairie, R Rosebud, Sanders, Silver Bow, Stillwater, Treasure, Valley, Yellowstone **State Rank Reason:** Species is widespread, but uncommon and appears to occur at low densities. Disturbance of cave and mine roosts and the hard closure of occ term persistence.							
Cynomys ludovicianus Black-tailed Prairie Dog	**Sciuridae** Squirrels	G4	S3		Sensitive - Known on Forests (CG)	SENSITIVE	SGCN3	15%	71%
		Species Occurrences verified in these Counties: Big Horn, Blaine, Carbon, Carter, Cascade, Chouteau, Custer, Fallon, Fergus, Garfield, Golden Valley, Hill, Jeffe Clark, Liberty, Mccone, Musselshell, Petroleum, Phillips, Powder River, Prairie, Richland, Rosebud, Stillwater, Sweet Grass, Toole, Treasure, Valley, Wheatland, Y **State Rank Reason:** Across much of eastern Montana this species occurs in areas with suitable soil and topography. However sylvatic plague has caused the specie colony size and dynamics. Ongoing threats from disease and persecution due to perceived competition with grazing make long-term status of this species uncertai							
Euderma maculatum Spotted Bat	**Vespertilionidae** Bats	G4	S3		Sensitive - Known on Forests (BD, CG)	SENSITIVE	SGCN3, SGIN	5%	27%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Cascade, Chouteau, Dawson, Fergus, Gallatin, Jefferson, Ju Madison, Musselshell, Phillips, Powder River, Richland, Rosebud, Silver Bow, Stillwater, Treasure, Yellowstone **State Rank Reason:** Little is known about this species in Montana. Although widely distributed, the species is quite rare in almost all of its range. Little is known a abundance or occupancy, or life history.							
Lasiurus borealis Eastern Red Bat	**Vespertilionidae** Bats	G3G4	S3					0%	46%
		Species Occurrences verified in these Counties: Big Horn, Blaine, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Fergus, Garfield, Glacier, Hill, Judith Bas Musselshell, Park, Petroleum, Phillips, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sweet Grass, Toole, Valley, Wheatland, Yellowstone **State Rank Reason:** Recent surveys using acoustic detectors have shown this species to be present across much of central and eastern Montana during the summe species, including the Eastern Red Bat, are commonly killed at wind farms, which presents a substantial threat to the long-term viability of populations within the							
Lasiurus cinereus Hoary Bat	**Vespertilionidae** Bats	G3G4	S3				SGCN3	2%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer L Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Mi Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, T Valley, Wheatland, Wibaux, Yellowstone							
Myotis lucifugus Little Brown Myotis	**Vespertilionidae** Bats	G3	S3				SGCN3	3%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer L Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Lincoln, Madison, Mccone, Meagher, Mineral, Mi Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Wheatland, Wibaux, Yellowstone **State Rank Reason:** Species is common and widespread, but under significant threat of catastrophic declines due to White-Nose Syndrome, a fungal disease respo populations of this species in the eastern US.							
Myotis thysanodes Fringed Myotis	**Vespertilionidae** Bats	G4	S3			SENSITIVE	SGCN3	0%	64%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Custer, Deer Lodge, Fergus, Flathead, Gall Judith Basin, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Mineral, Missoula, Powder River, Powell, Prairie, Ravalli, Rosebud, Sanders, Silver Bow, Teton, Tr **State Rank Reason:** Although this species is distributed across much of Montana, recent surveys have found it to be uncommon within range. Species occasionally threats to persistence from White-Nose Syndrome are a concern, but due to its western distribution the extent of impacts are as yet unknown.							
Sorex merriami Merriam's Shrew	**Soricidae** Shrews	G4	S3				SGCN3	9%	57%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Carbon, Carter, Cascade, Chouteau, Custer, Hill, Mccone, Park, Petroleum, Phillips, Pow Sweet Grass, Teton, Valley, Wheatland							
Vulpes velox Swift Fox	**Canidae** Wolves / Coyotes / Foxes	G3	S3			SENSITIVE	SGCN3	1%	69%
		Species Occurrences verified in these Counties: Blaine, Carter, Custer, Fallon, Garfield, Glacier, Hill, Phillips, Pondera, Powder River, Prairie, Valley							

BIRDS (AVES)

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE

Accipiter gentilis Northern Goshawk	**Accipitridae** Hawks / Kites / Eagles	G5	S3	MBTA			SGCN3	2%	68%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Broadwater, Carbon, Carter, Cascade, Deer Lodge, Fergus, Flathead, Gallatin, Glacier, G Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Park, Pondera, Powder River, Powell, Ravalli, Rosebud, Sanders, Silver Bow, S Teton, Wheatland							
Aquila chrysaetos Golden Eagle	**Accipitridae** Hawks / Kites / Eagles	G5	S3	BGEPA; MBTA; BCC17		SENSITIVE	SGCN3	3%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Deer Lodge, Fa Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Missoula, Mus Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Trea Wibaux, Yellowstone							
Ardea herodias Great Blue Heron	**Ardeidae** Bitterns / Egrets / Herons / Night-Herons	G5	S3	MBTA			SGCN3	3%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Deer Lodge, Fa Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Mineral, Miss Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Wibaux, Yellowstone **State Rank Reason:** Small breeding population size, evidence of recent declines, and declining regeneration of riparian cottonwood forests due to altered hydrolo							
Athene cunicularia Burrowing Owl	**Strigidae** Owls	G4	S3B	MBTA; BCC17	Sensitive - Known on Forests (CG) Sensitive - Suspected on Forests (HLC)	SENSITIVE	SGCN3	2%	82%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Fallon, Fergus, Golden Valley, Hill, Jefferson, Lewis and Clark, Liberty, Madison, Mccone, Musselshell, Petroleum, Phillips, Pondera, Powder River, Prairie, Ravalli, Roosevelt, Ros Teton, Toole, Treasure, Valley, Wheatland, Yellowstone **State Rank Reason:** Species has a negative short-term population trend.							
Buteo regalis Ferruginous Hawk	**Accipitridae** Hawks / Kites / Eagles	G4	S3B	MBTA; BCC10; BCC17		SENSITIVE	SGCN3	11%	95%
		Species Occurrences verified in these Counties: Beaverhead, Blaine, Broadwater, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Fallon, Fergus, Gallatin, Valley, Hill, Jefferson, Judith Basin, Lewis and Clark, Liberty, Madison, Mccone, Meagher, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Prairie, I Stillwater, Teton, Toole, Valley, Wheatland, Wibaux, Yellowstone							
Calcarius ornatus Chestnut-collared Longspur	**Calcariidae** Longspurs and Snow Buntings	G5	S2B	MBTA; BCC11; BCC17		SENSITIVE	SGCN2	32%	67%
		Species Occurrences verified in these Counties: Big Horn, Blaine, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Fallon, Fergus, Garfield, Glacier Basin, Lewis and Clark, Liberty, Mccone, Musselshell, Petroleum, Phillips, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Wheatland, Wibaux, Yellowstone **State Rank Reason:** Species has a negative short-term population trend and faces threats from loss of native prairie grassland habitats and altered frequency, inte distribution of grazing and fire regimes it is dependent on.							
Catharus fuscescens Veery	**Turdidae** Thrushes	G5	S3B	MBTA		SENSITIVE	SGCN3	6%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Cascade, Chouteau, Custer, Deer Lodge, Fergus, Flathead, (Jefferson, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, P Roosevelt, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Wheatland, Yellowstone							
Centrocercus urophasianus Greater Sage-Grouse	**Phasianidae** Upland Game Birds	G3G4	S2		Sensitive - Known on Forests (BD) Sensitive - Suspected on Forests (CG, HLC)	SENSITIVE	SGCN2	17%	75%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Ferg Valley, Hill, Madison, Mccone, Meagher, Musselshell, Park, Petroleum, Phillips, Powder River, Prairie, Rosebud, Silver Bow, Stillwater, Sweet Grass, Treasure, Vall Yellowstone							
Centronyx bairdii Baird's Sparrow	**Passerellidae** New World Sparrows	G4	S3B	MBTA; BCC11; BCC17		SENSITIVE	SGCN3	27%	67%
		Species Occurrences verified in these Counties: Blaine, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Fallon, Fergus, Glacier, Hill, Judith Basin, Lewis ar Meagher, Musselshell, Petroleum, Phillips, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley Yellowstone **State Rank Reason:** Montana populations were declining until recently and the species is declining in most or the surrounding states and provinces.							
Certhia americana Brown Creeper	**Certhiidae** Creepers	G5	S3	MBTA			SGCN3	4%	53%
		Species Occurrences verified in these Counties: Beaverhead, Broadwater, Carbon, Carter, Cascade, Chouteau, Deer Lodge, Fergus, Flathead, Gallatin, Glacier, Jefferson, Judith Basin, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Mineral, Missoula, Park, Powder River, Powell, Ravalli, Rosebud, Sanders, Silver Bow, S Teton, Wheatland							
Coccothraustes vespertinus Evening Grosbeak	**Fringillidae** Finches	G5	S3	MBTA			SGCN3	3%	100%
		Species Occurrences verified in these Counties: Beaverhead, Broadwater, Carbon, Carter, Cascade, Chouteau, Fergus, Flathead, Gallatin, Glacier, Golden Valle Basin, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Pondera, Powder River, Powell, Ravalli, Sanders, Silver Bow, Stillwa Wheatland **State Rank Reason:** Populations in Montana and across North America have experienced rangewide declines, although the causes of these declines are unclear (Bo							
Coccyzus americanus Yellow-billed Cuckoo	**Cuculidae** Cuckoos	G5	S3B	PS: LT; MBTA; BCC10	Threatened on Forests (BRT, LOLO)	SENSITIVE	SGCN3, SGIN	1%	50%
		Species Occurrences verified in these Counties: Big Horn, Carbon, Carter, Chouteau, Custer, Gallatin, Lake, Madison, Missoula, Phillips, Powder River, Richland, Yellowstone							
Coccyzus erythropthalmus Black-billed Cuckoo	**Cuculidae** Cuckoos	G5	S3B	MBTA; BCC11; BCC17			SGCN3, SGIN	4%	95%
		Species Occurrences verified in these Counties: Big Horn, Cascade, Chouteau, Custer, Dawson, Fallon, Fergus, Garfield, Mccone, Musselshell, Petroleum, Phillip Richland, Roosevelt, Rosebud, Stillwater, Treasure, Valley, Wibaux, Yellowstone							
Dolichonyx oryzivorus Bobolink	**Icteridae** Blackbirds	G5	S3B	MBTA			SGCN3	9%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Fallon Garfield, Glacier, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petroleum, Phillip Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Stillwater, Sweet Grass, Teton, Valley, Wheatland, Wibaux, Yellowstone **State Rank Reason:** Species has undergone recent large population declines in Montana and a patchwork of declines and increases have been documented in surro							
Gymnorhinus cyanocephalus Pinyon Jay	**Corvidae** Jays / Crows / Magpies	G3	S3	MBTA; BCC17			SGCN3	5%	55%
		Species Occurrences verified in these Counties: Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Fergus, Gallatin, Garfield, Golden Va Clark, Musselshell, Park, Petroleum, Phillips, Powder River, Rosebud, Stillwater, Sweet Grass, Wheatland, Yellowstone							
Haemorhous cassinii Cassin's Finch	**Fringillidae** Finches	G5	S3	MBTA; BCC10			SGCN3	11%	62%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Broadwater, Carbon, Cascade, Chouteau, Custer, Deer Lodge, Fergus, Flathead, Gallatin Granite, Jefferson, Judith Basin, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Powder River, Powel Silver Bow, Stillwater, Sweet Grass, Teton, Wheatland, Yellowstone **State Rank Reason:** Data show recent short-term declines in population for this species							

Lanius ludovicianus Loggerhead Shrike	**Laniidae** Shrikes	G4	S3B	MBTA; BCC10; BCC17		SENSITIVE	SGCN3	4%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Fallon Glacier, Golden Valley, Hill, Jefferson, Liberty, Madison, Mccone, Meagher, Musselshell, Petroleum, Phillips, Pondera, Powder River, Prairie, Richland, Roosevelt, Stillwater, Sweet Grass, Teton, Toole, Valley, Wheatland, Wibaux, Yellowstone								
Melanerpes erythrocephalus Red-headed Woodpecker	**Picidae** Woodpeckers	G5	S3B	MBTA; BCC11; BCC17		SENSITIVE	SGCN3	4%	60%
		Species Occurrences verified in these Counties: Carter, Custer, Dawson, Fallon, Mccone, Musselshell, Phillips, Powder River, Prairie, Richland, Roosevelt, Roseb Valley, Wibaux, Yellowstone							
Melanerpes lewis Lewis's Woodpecker	**Picidae** Woodpeckers	G4	S2B	MBTA; BCC10; BCC17		SENSITIVE	SGCN2	8%	78%
		Species Occurrences verified in these Counties: Big Horn, Carter, Cascade, Deer Lodge, Flathead, Granite, Jefferson, Lake, Lewis and Clark, Lincoln, Missoula, Powell, Ravalli, Rosebud, Sanders, Sweet Grass, Yellowstone							
Nucifraga columbiana Clark's Nutcracker	**Corvidae** Jays / Crows / Magpies	G5	S3	MBTA	Species of Conservation Concern on Forests (FLAT)		SGCN3	9%	84%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Deer Lodge, Fergus, Flathead, Valley, Granite, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pond Ravalli, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Wheatland, Yellowstone								
Numenius americanus Long-billed Curlew	**Scolopacidae** Sandpipers	G5	S3B	MBTA; BCC10; BCC11; BCC17		SENSITIVE	SGCN3	19%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer L Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Madison, Mccone, Meagher, Missoula, M Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley Yellowstone								
Oreoscoptes montanus Sage Thrasher	**Mimidae** Thrashers / Mockingbirds / Catbirds	G4	S3B	MBTA; BCC10; BCC17		SENSITIVE	SGCN3	9%	84%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Broadwater, Carbon, Carter, Chouteau, Custer, Fallon, Gallatin, Garfield, Golden Valley, Madison, Musselshell, Park, Petroleum, Phillips, Powder River, Prairie, Richland, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Valley, Wheatland, Yellow								
Picoides arcticus Black-backed Woodpecker	**Picidae** Woodpeckers	G5	S3	MBTA	Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)	SENSITIVE	SGCN3	2%	49%
		Species Occurrences verified in these Counties: Broadwater, Flathead, Gallatin, Lewis and Clark, Lincoln, Madison, Mineral, Missoula, Powder River, Powell, Ra							
Pipilo chlorurus Green-tailed Towhee	**Passerellidae** New World Sparrows	G5	S3B	MBTA			SGCN3	3%	60%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Chouteau, Custer, Deer Lodge, Fergus, Gallatin, Garfield, G Basin, Lewis and Clark, Madison, Meagher, Musselshell, Park, Petroleum, Phillips, Powder River, Silver Bow, Stillwater, Sweet Grass, Valley, Wheatland, Yellowsto **State Rank Reason:** Populations in Montana and across the Northern Rockies have undergone recent declines.								
Spizella breweri Brewer's Sparrow	**Passerellidae** New World Sparrows	G5	S3B	MBTA; BCC10; BCC17		SENSITIVE	SGCN3	12%	100%
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Ferg Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petrole River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Ye **State Rank Reason:** Species faces threats from loss of sagebrush habitats it is dependent on as a result of habitat conversion for agriculture and increased frequer encroachment and drought.								

REPTILES (REPTILIA)

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE
Chelydra serpentina Snapping Turtle	**Chelydridae** Snapping Turtles	G5	S3			SENSITIVE	SGCN3, SGIN	1%	26%
	Species Occurrences verified in these Counties: Big Horn, Carbon, Carter, Custer, Dawson, Fallon, Garfield, Mccone, Phillips, Powder River, Prairie, Richland, R Stillwater, Treasure, Wibaux, Yellowstone **State Rank Reason:** Little is known about native populations of this species in Montana, which makes assessment of threats and trends difficult. This species has a recruitment, making populations vulnerable to extirpation.								
Heterodon nasicus Plains Hog-nosed Snake	**Colubridae** Colubrid Snakes	G5	S2		Sensitive - Known on Forests (CG)	SENSITIVE	SGCN2, SGIN	8%	63%
	Species Occurrences verified in these Counties: Big Horn, Blaine, Carter, Cascade, Chouteau, Custer, Dawson, Fallon, Garfield, Hill, Mccone, Musselshell, Petrol Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Toole, Treasure, Valley, Yellowstone								
Lampropeltis gentilis Western Milksnake	**Colubridae** Colubrid Snakes	G5	S2		Sensitive - Known on Forests (CG)	SENSITIVE	SGCN2	2%	51%
	Species Occurrences verified in these Counties: Big Horn, Blaine, Carbon, Custer, Dawson, Fergus, Garfield, Musselshell, Petroleum, Phillips, Powder River, Rose								
Phrynosoma hernandesi Greater Short-horned Lizard	**Phrynosomatidae** Sagebush / Spiny Lizards	G5	S3		Sensitive - Known on Forests (CG) Sensitive - Suspected on Forests (HLC)	SENSITIVE	SGCN3, SGIN	19%	66%
	Species Occurrences verified in these Counties: Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Fergus, Gallatin, Garfield, Lewis and Clark, Liberty, Mccone, Musselshell, Petroleum, Phillips, Pondera, Powder River, Prairie, Richland, Roosevelt, Rosebud, Silver Bow, Stillwater, Sweet Gr Valley, Wheatland, Wibaux, Yellowstone								

AMPHIBIANS (AMPHIBIA)

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE
Anaxyrus cognatus Great Plains Toad	**Bufonidae** True Toads	G5	S2		Sensitive - Known on Forests (CG)	SENSITIVE	SGCN2	8%	62%
	Species Occurrences verified in these Counties: Big Horn, Blaine, Carter, Cascade, Chouteau, Custer, Garfield, Golden Valley, Hill, Lewis and Clark, Liberty, Mc Phillips, Powder River, Prairie, Rosebud, Sheridan, Stillwater, Toole, Valley, Yellowstone **State Rank Reason:** Current trend is unknown due to a scarcity of observations, but long-term declines are possible due to declines in ephemeral waterbodies (bis threats from habitat loss including development of native habitat, and reduced availability of burrows due to black-tailed prairie dog declines.								

FISH (ACTINOPTERYGII)

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE
Cycleptus elongatus Blue Sucker	**Catostomidae** Suckers	G3G4	S2S3				SGCN2-3	1%	7%
		Species Occurrences verified in these Counties: Blaine, Cascade, Chouteau, Custer, Dawson, Fergus, Garfield, Hill, Liberty, Mccone, Petroleum, Phillips, Powde Roosevelt, Rosebud, Treasure, Valley, Wibaux **State Rank Reason:** The Blue Sucker is currently listed as an "S2S3" species of concern in Montana because they are potentially at risk of extirpation in the state, declining numbers, range and/or habitat, even though it may be abundant in some areas.							
Etheostoma exile Iowa Darter	**Percidae** Perches	G5	S3			SENSITIVE	SGCN3	1%	9%
		Species Occurrences verified in these Counties: Blaine, Carter, Chouteau, Daniels, Dawson, Fallon, Glacier, Hill, Liberty, Mccone, Phillips, Powder River, Richla Toole, Valley, Wibaux **State Rank Reason:** The Iowa Darter is currently listed as an "S3" species of concern in Montana because they are potentially at risk because of limited and/or dec habitat, even though it may be abundant in some areas.							
Macrhybopsis gelida Sturgeon Chub	**Cyprinidae** Minnows	G3	S2S3			SENSITIVE	SGCN2-3	17%	7%
		Species Occurrences verified in these Counties: Blaine, Cascade, Chouteau, Custer, Dawson, Fergus, Mccone, Petroleum, Phillips, Powder River, Prairie, Richlar Valley, Wibaux **State Rank Reason:** The Sturgeon Chub is currently listed as an "S2S3" species of concern in Montana because they are potentially at risk of extirpation in the stat declining numbers, range and/or habitat, even though it may be abundant in some areas. Population losses from the Fort Peck Section of the Missouri River and th permanent, but recent losses from the Powder River basin are being reversed through recolonization (Stagliano 2014).							
Sander canadensis Sauger	**Percidae** Perches	G5	S2			SENSITIVE	SGCN2	1%	15%
		Species Occurrences verified in these Counties: Big Horn, Blaine, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Fallon, Fergus, Garfield, Hill, Liberty, Mc Petroleum, Phillips, Powder River, Prairie, Richland, Roosevelt, Rosebud, Stillwater, Teton, Treasure, Valley, Wibaux, Yellowstone **State Rank Reason:** The Sauger is currently listed as an "S2" species of concern in Montana because they are at risk of extirpation in the state, because of limited range and/or habitat, even though it may be abundant in some areas. Population losses from the reservoir sections of the Missouri River and the Bighorn River are Competition and hybridization from the introduced walleye is another threat to native sauger populations.							
Scaphirhynchus albus Pallid Sturgeon	**Acipenseridae** Sturgeons	G2	S1	LE		ENDANGERED	SGCN1	10%	1%
		Species Occurrences verified in these Counties: Blaine, Cascade, Chouteau, Custer, Dawson, Fergus, Garfield, Mccone, Petroleum, Phillips, Powder River, Prairi Rosebud, Valley, Wibaux **State Rank Reason:** The Pallid Sturgeon is currently listed as "S1" in MT due to extremely limited and/or rapidly declining population numbers, range and/or habit vulnerable to global extinction or extirpation in the state. The pallid sturgeon is one of the rarest fishes in North America and was federally listed as endangered has been declining during at least the past 50 years with only about 200 adults remaining in the upper Missouri River and limited natural reproduction.							

INVERTEBRATES - INSECTS

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE
BUTTERFLIES									
Polygonia progne Gray Comma	**Nymphalidae** Brush-footed Butterflies	G5	S2						50%
		Species Occurrences verified in these Counties: Carter, Custer, Dawson, Fallon, Liberty, Madison, Powder River, Richland, Toole, Valley							
DRAGONFLIES									
Stylurus intricatus Brimstone Clubtail	**Gomphidae** Clubtail Dragonflies	G4	S1					10%	54%
		Species Occurrences verified in these Counties: Powder River, Prairie, Richland, Roosevelt **State Rank Reason:** This dragonfly is currently listed as an "S1" Species of Concern in MT due to extremely limited and/or rapidly declining population numbers, ra it highly vulnerable to extirpation in the state. Currently only known from a few locations, mostly from larval collections and require shifting prairie river sandbar damming a large river occurs.							
MAYFLIES									
Anepeorus rusticus A Sand-dwelling Mayfly	**Heptageniidae** Heptageniid Mayflies	G2	S1					50%	2%
		Species Occurrences verified in these Counties: Custer, Powder River, Prairie **State Rank Reason:** This sand-dwelling mayfly is currently listed as "S1" Species of Concern in MT due to extremely limited and/or rapidly declining population nu making it highly vulnerable to extirpation in the state. This large river species has probably lost miles of habitat due to dams on the Milk, Tongue, Bighorn, and Mi limited by intact large, prairie river habitat and potentially may be threatened by coal bed natural gas (CBNG) development in the Powder River basin of Wyoming							
Homoeoneuria alleni A Sand-dwelling Mayfly	**Oligoneuriidae** Oligoneurid Mayflies	G4	S2					20%	5%
		Species Occurrences verified in these Counties: Custer, Powder River, Richland **State Rank Reason:** This sand-dwelling mayfly is currently ranked "S2" in Montana, because it is at risk of extirpation in the state due to very limited and/or poter numbers, range and/or habitat.							
Lachlania saskatchewanensis A Sand-dwelling Mayfly	**Oligoneuriidae** Oligoneurid Mayflies	G4	S1					33%	5%
		Species Occurrences verified in these Counties: Dawson, Hill, Powder River, Richland **State Rank Reason:** This sand-dwelling mayfly is currently listed as "S1" Species of Concern in MT due to extremely limited and/or rapidly declining population nu making it highly vulnerable to extirpation in the state. This large river species has probably lost miles of habitat due to dams on the Milk, Tongue, Bighorn, and Mi							
Raptoheptagenia cruentata A Mayfly	**Heptageniidae** Heptageniid Mayflies	G4	S2			SENSITIVE		50%	5%
		Species Occurrences verified in these Counties: Custer, Powder River **State Rank Reason:** This mayfly is currently listed as an "S2" species of concern in Montana because they are potentially at risk of extirpation in the state, due to numbers, range and/or habitat, even though it may be abundant in some areas. This species is limited by intact large, prairie river habitat and potentially may be natural gas (CBNG) development in the Powder River basin of Wyoming (Stagliano 2012).							

Potential Species of Concern

Special Status Species

Additions To Statewide List

Species Removed From Statewide List

Species of Greatest Inventory Need

Citation for data on this website:
Montana Animal Species of Concern Report. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Retrieved on 10/17/2019, from http://mtnhp.org/SpeciesOfConcern/?AorP=a

Montana Natural Heritage - SOC Report Species List Last Updated **09/25/2018**

Plant Species of Concern

14 Species of Concern
4 Potential Species of Concern - Species Occurrences are not maintained for Animal PSOC, therefore we cannot filter these species geographically
Filtered by the following criteria:
County = Powder River (based on mapped Species Occurrences)

A program of the **Montana State Library's Natural Resource Information System** operated by the **University of Montana.**

Expand All | Collapse All

Introduction

Species of Concern

Species of Concern
14 Species
Filtered by the following criteria:
County = Powder River (based on mapped **Species Occurrences**)

FLOWERING PLANTS - DICOTS (MAGNOLIOPSIDA)

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	OTHER NAMES	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	MNPS THREAT CATEGORY
Astragalus barrii Barr's Milkvetch		**Fabaceae** Pea Family	G3G4	S3		Sensitive - Known on Forests (CG)		2
			Species Occurrences verified in these Counties: Big Horn, Carbon, Carter, Powder River, Rosebud **State Rank Reason:** Barr's Milkvetch is endemic to southwestern South Dakota, northeastern Wyoming, Nebraska and southeaste known from numerous watersheds, several of which contain large, expansive populations. The habitat occupied by this species i grazing, and the location of its habitat makes it less vulnerable to all but large-scale developments. Proposed resource extracti eventually impact the species. Invasive weeds have the potential to be a threat but currently are not posing problems to the sp					
Astragalus ceramicus var. filifolius Painted Milkvetch	Pottery Milkvetch	**Fabaceae** Pea Family	G4T4	S3				
			Species Occurrences verified in these Counties: Big Horn, Carter, Dawson, Powder River, Sheridan **State Rank Reason:** *Astragalus ceramicus* variety *filifolius* is associated with sandy soils of the sandhills and sandstone outcrops known from about 20 occurrences observed mostly from 1983 to 2000. Some populations occur in State Parks. The Flora of the C it rare for the region except in the Nebraska sandhill area where it was somewhat common. Based on aging data, limited distrib specific habitat types it is considered a Species of Concern. Current data on locations, populations sizes, and threats is greatly n					
Bacopa rotundifolia Roundleaf Water-hyssop		**Plantaginaceae** Plantain Family	G5	S3?				3
			Species Occurrences verified in these Counties: Cascade, Fergus, Garfield, Phillips, Powder River, Yellowstone **State Rank Reason:** A rare species known in Montana from only a few observations in the central and eastern portions of the sta widely distributed and appears tolerant of brackish waters as well as some degree of nutrient enrichment. As such, it is unclear viability is at risk in the state and whether it responds negatively to human-induced impacts to water quality. Additional popula to occur in Montana.					
Chenopodium subglabrum Smooth Goosefoot	**Chenopodium leptophyllum var. subglabrum**	**Amaranthaceae** Amaranth (Pigweed) Family	G3G4	S2				4
			Species Occurrences verified in these Counties: Carter, Cascade, Custer, Fergus, Garfield, Mccone, Phillips, Powder River, Sh **State Rank Reason:** Smooth goosefoot is known from just a few locations in Montana, one of which may be extirpated. It occupi habitat that is vulnerable to loss of natural disturbance regimes such as fire and flooding. Invasion of exotic plants may also pos and trend monitoring data are lacking though the populations likely flucuate widely from year to year.					
Cirsium pulcherrimum Wyoming Thistle		**Asteraceae** Aster/Sunflowers	G5	S3				
			Species Occurrences verified in these Counties: Big Horn, Carbon, Powder River, Prairie **State Rank Reason:** Known in Montana from one badlands area of Powder River County with a small number of scattered indivic reported for Dawson and Garfield Counties by Flora of the Great Plains and 1 collection from each of Carbon and Custer Countie					
Eriogonum visheri Visher's Buckwheat		**Polygonaceae** Buckwheat Family	G3	S2			SENSITIVE	3
			Species Occurrences verified in these Counties: Carter, Powder River **State Rank Reason:** *Eriogonum visheri* is a regional endemic known in Montana since 1997 from only one area in Carter County. sparsley vegetated alluvial outwash in badlands topography and as such does not appear to be threatened by weeds, livestock o time.					
Mentzelia nuda Bractless blazingstar		**Loasaceae** Blazingstar / Stickleaf Family	G5	S1S2				
			Species Occurrences verified in these Counties: Big Horn, Custer, Dawson, Powder River, Roosevelt, Rosebud, Valley **State Rank Reason:** Rare and peripheral in Montana, where it is known from a few locations in the eastern half of the state. Ad levels and trends are needed.					
Physaria brassicoides Double Bladderpod		**Brassicaceae** Mustards	G5	S3				3
			Species Occurrences verified in these Counties: Carbon, Carter, Custer, Petroleum, Phillips, Powder River, Stillwater **State Rank Reason:** Double bladderpod is endemic to a restricted area of the northern Great Plains, and is known in Montana or populations. Populations occur on a mix of federal, state and private ownerships. Impacts to the species from livestock grazing minimal at this time as the typically steep, sparsely-vegetated habitat is not conducive to grazing. Yellow sweetclover was obse may eventually have a negaitive impact on the species.					
Physaria ludoviciana Silver Bladderpod	**Lesquerella ludoviciana**	**Brassicaceae** Mustards	G5	S2S3				
			Species Occurrences verified in these Counties: Carbon, Carter, Cascade, Chouteau, Fallon, Fergus, Garfield, Golden Valley, I Petroleum, Phillips, Powder River, Prairie, Rosebud, Sheridan, Teton, Valley **State Rank Reason:** Rare in Montana. Primarily a plains species which barely enters eastern Montana where it is restricted to sa one site and threats to the species' viability appear to be minimal at this time.					
Triodanis leptocarpa Slim-pod Venus'-looking-glass	**Specularia leptocarpa**	**Campanulaceae** Bellflower Family	G5?	S3				
			Species Occurrences verified in these Counties: Big Horn, Carter, Cascade, Chouteau, Custer, Park, Petroleum, Phillips, Powd Sweet Grass, Valley **State Rank Reason:** Triodanis leptocarpa is common in the southern Great Plains and extends into eastern and central Montana grass-dominated rocky slopes, and sagebrush-dominated grasslands. It has been found in grazed and ungrazed lands and appears disturbance. Approximately 14 locations were documented prior to 1958 and occur in central Montana. Approximately 14 locatic 1974 and mostly occur in eastern Montana. Re-visits to known locations and current population data is greatly needed.					

FLOWERING PLANTS - MONOCOTS (LILIOPSIDA)

COUNTY = POWDER RIVER (based on map

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	OTHER NAMES	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	MNPS THREAT CATEGORY

Carex gravida Heavy Sedge		**Cyperaceae** Sedges	G5	S3		Sensitive - Known on Forests (CG)		2
			Species Occurrences verified in these Counties: Big Horn, Carter, Fallon, Mccone, Powder River, Richland, Rosebud **State Rank Reason:** *Carex gravida* has been found at a few widely scattered locations in eastern Montana, and is not generally a However, it is likely that the species is more abundant than the current data shows. Habitats include moist, green ash woodland livestock, and it may be particularly vulnerable to moderate grazing because of its cespitose growth form. These habitats are al invasion by non-native plants.					
Cyperus schweinitzii Schweinitz's Flatsedge	Schweinitz Flatsedge	**Cyperaceae** Sedges	G5	S2				4
			Species Occurrences verified in these Counties: Carter, Cascade, Custer, Powder River, Roosevelt, Sheridan **State Rank Reason:** Rare in Montana, where it is currently known from a few widely scattered sandy sites.					
Dichanthelium oligosanthes var. scribnerianum Scribner's Panic Grass	**Panicum oligosanthes var. scribnerianum, Panicum scribnerianum**	**Poaceae** Grasses	G5T5	S1S2				
			Species Occurrences verified in these Counties: Carter, Lake, Powder River, Sanders **State Rank Reason:** Scribner's panic grass is a plant of dry woodlands, known from widely separated sites in southeastern and n one large-sized population is known in the state, two others are very small, and the fourth occurrence is known only from a hist Occurrences in eastern Montana may be negatively impacted by cattle grazing. The largest occurrence in the state lies adjacent impacts associated with expansion of the highway is likely. Invasive weeds and forest encroachment are also problems at this si					
Lilium philadelphicum Wood Lily		**Liliaceae** Lillies	G5	S3				
			Species Occurrences verified in these Counties: Carbon, Carter, Fergus, Lewis and Clark, Lincoln, Pondera, Powder River, Stil **State Rank Reason:** Lilium philadelphicum has a patchy, but wide distribution in Montana, and is often found in specialized hab Montana have not been made since the 1930's and 1940's. This species is vulnerable to extirpation in Montana because of its attr over-collected, and habitat requirements. Native lilies have rarely survived in gardens. Current information on known locations, counties, is greatly needed.					

Potential Species of Concern

Special Status Species

Additions To Statewide List

Species Removed From Statewide List

Citation for data on this website:
Montana Plant Species of Concern Report. Montana Natural Heritage Program. Retrieved on 10/17/2019, from http://mtnhp.org/SpeciesOfConcern/?AorP=p

Appendix F
Forest Understory and Wood Production Response to Ponderosa Pine Thinning Treatments in Southeast Montana

United States Department of Agriculture
NATURAL RESOURCES CONSERVATION SERVICE
Forestry Technical Note No. MT-32
September 2007

FORESTRY TECHNICAL NOTE

Forest Understory and Wood Production Response to Ponderosa Pine Thinning Treatments in Southeast Montana

Robert D. Logar, State Staff Forester

INTRODUCTION

A ten year study was performed in Southeast Montana to document the effects of pre-commercially thinning Ponderosa pine stands. Part of the study was to evaluate the potential for chemical thinning. The results from this study will assist planners and producers in estimating the effects of pre-commercial thinning on forest understory and wood production. The results from the study will also provide information on chemical pre-commercial thinning -- kind, rate, cost, limitation.

GENERAL

Background – There is approximately 1.65 million acres of forestland in 14 southeastern Montana counties. A conservative estimate is that ten percent or approximately 165,000 acres are overstocked stands of trees that are in need of thinning.

Purpose – The project demonstrates forest understory and wood production response to several Ponderosa pine thinning techniques. Two thinning techniques will be compared – mechanical and chemical thinning. A cost analysis for each of the methods along with an evaluation of the success of the chemical thinning will be made.

Procedure – Forestland sites were selected in Carter, Custer and Powder River counties. Sites were characterized as having moderately deep- to deep-loamy or heavier-textured soils. Slopes were generally less than 15 percent. Efforts were made to maintain consistent aspects at all sites. Average annual precipitation for the sites ranged from 15 to 19 inches.

The following six treatments were used at each site.

1. Mechanical thinning at 10-foot spacing
2. Mechanical thinning at 16-foot spacing
3. Chemical thinning at 10-foot spacing
4. Chemical thinning at 16-foot spacing
5. Un-thinned site to quantify wood and forage production
6. A site without trees to quantify the forage production.

Each replication was about one-quarter to one acre in size. Treatments were installed in the spring of 1996. Monitoring and characterization of the treatment responses occurred one, two, three, five, and ten years after the treatments were installed.

RESULTS

Mechanical Thinning

There was 100% mortality to the trees that were removed mechanically. The cost to mechanically thin increased with the number of stems removed. The attached Graph # 1 displays the costs per acre to mechanically thin based on the number of trees per acre removed. The cost to remove 2,000 trees per acre is about $140 per acre. The cost to remove 6,000 trees per acre is about $300 per acre. A typical thinning operation removes about 2,000 to 4,000 trees per acre.

Chemical Thinning

Two Dow chemicals were used as a comparison for effectiveness and cost analysis. Garlon and Pathfinder were the two chemicals used. Garlon is a concentrate that is mixed with a carrier. Pathfinder is a pre-mixed herbicide. The labels indicate that they can be used on both ponderosa pine and Douglas fir seedlings and saplings. Both were applied using backpack sprayers. A six-inch zone of herbicide was sprayed on three sides of the stem of a sapling. Foliage applications were applied to seedlings. There was about 90 percent mortality on the seedling/saplings using Garlon with diesel as a carrier. There was about 50 percent mortality on the seedling/saplings using Pathfinder. The chemicals were most effective on stems less than three inches in diameter breast height. Diameters greater than three inches resulted in greatly reduced mortality. The costs associated with chemical tree removal are displayed in the attached Graph # 2. The cost to remove 2,000 trees per acre is about $60 per acre. The cost to remove 6,000 trees per acre is about $170 per acre. About three-quarters of the costs in chemical thinning is labor-involved, not the chemical.

The most effective rate was seven ounces of Garlon per gallon of diesel. Use about one gallon of mix to treat one acre averaging 2,000 - 3,000 stems per acre.

Forest Understory Response

Clipping data was taken in the fall of 1997, 1999, 2001, and 2006. Overall, the sites showed a significant increase in forage production in the thinned stands as compared to the un-thinned stands. Plots that were mechanically thinned to ten-foot spacing produced an average increase of understory vegetation of 121 percent compared to those in the un-thinned sites. Those mechanically thinned to 16-foot spacing produced an average increase of understory vegetation of 153 percent compared to those in the un-thinned sites. Plots that were thinned chemically resulted in a 119 percent increase on the 10-foot spacing and 102 percent on the 16-foot spacing. The reduced amount in the 16-foot spacing chemical treatment was due to reduced kill of trees greater than three inches in diameter.

Wood Production Response

There was a significant increase in wood production as a result of the thinning. The mechanical thinning showed the most consistent response and largest increase in volume as a result of the thinning. The trees were generally taller and at least twice the diameter on the thinned sites when compared to the control (un-thinned sites). There was generally twice the volume on the thinned sites then the control tree sites. This is especially the case in the trees that were thinned and spaced 16 feet apart. The attached Table # 1 shows the results of the sites and measures the percent change in height and diameter after the thinning.

SUMMARY

1. There was 100 percent mortality to the trees that were removed mechanically.

    a) The cost to remove 2,000 trees per acre is about $140 per acre.

SUMMARY--continued

2. There was about 90 percent mortality on the seedling/saplings using Garlon with diesel as a carrier.

    a) Chemical thinning was most effective on stems less than three inches in diameter breast height. Greater than this the results dropped dramatically.
    b) The most effective rate was seven ounces of Garlon per gallon of diesel. Use about one gallon of mix to treat one acre averaging 2,000 - 3,000 stems per acre.
    c) The cost to remove 2,000 trees per acre is about $60 per acre.

3. Overall the sites showed a significant increase in forage production in the thinned stands when compared to the un-thinned stands.

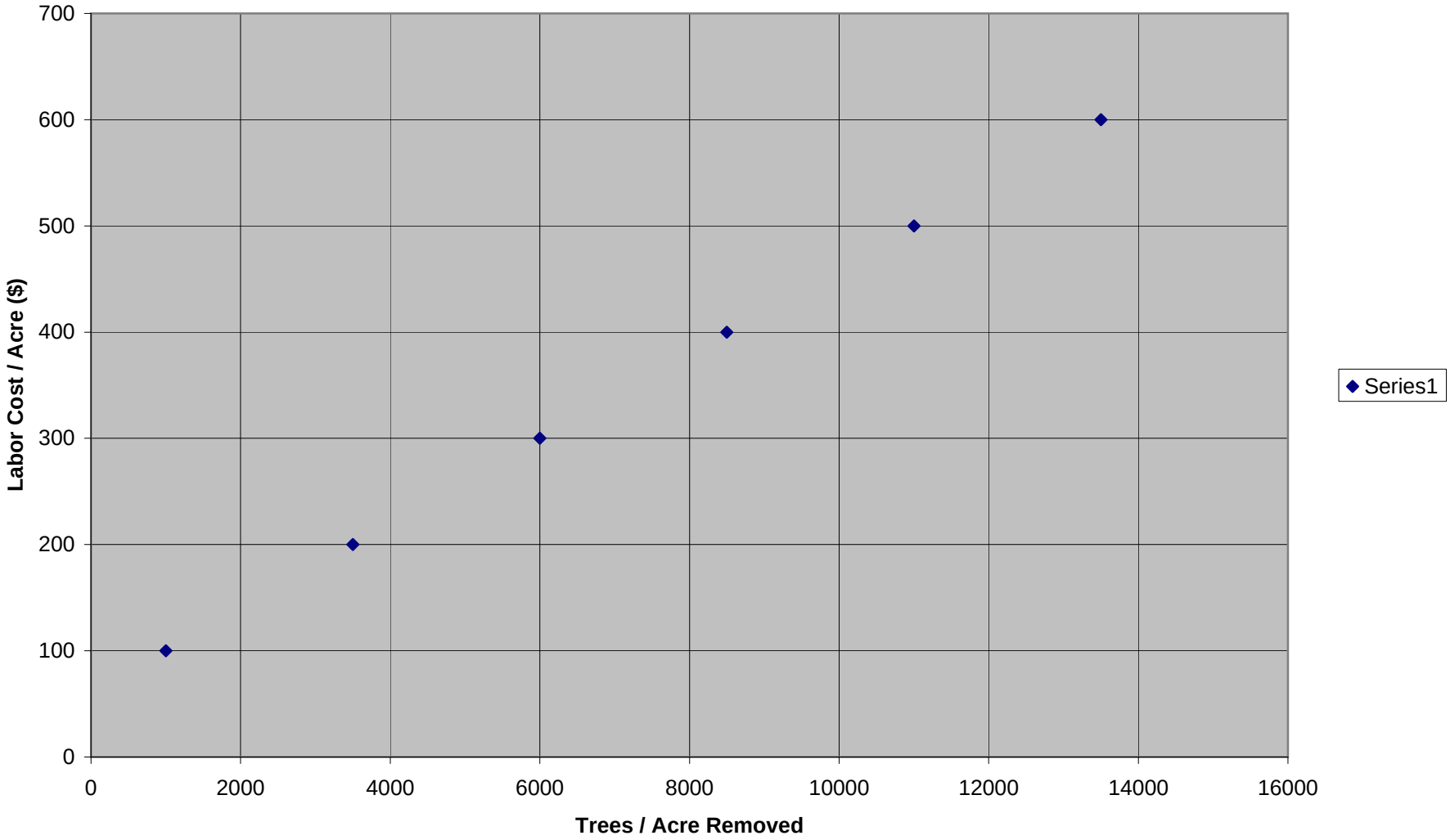
4. There was about twice the wood production on the thinned sites when compared to the control (un-thinned sites).

    a) The mechanical thinning showed the best response to the thinning and largest increase in wood production.

5. Ten and 16-foot spacing were both effective for increasing forage and wood production. However, the 10-foot spacing canopy was starting to close after the ten year evaluation period. Recommend using the wider 16-foot spacing to continue good forage and wood production.

Chemical and mechanical thinning increased the amount of forage and wood production on the site. Chemical thinning was effective and was about one-half the cost of mechanical thinning. Garlon with diesel was the most effective chemical. There was about twice the wood production on the sites that were thinned. Forage production was significantly greater on the mechanically thinned sites when compared to the control (un-thinned sites).

Graph #1 - Mechanical Tree Removal Cost Per Acre (Diameter Range 1.8 - 2.5")
Labor Rate $13/Hour



Graph #2 - Chemical Tree Removal Cost Per Acre (Diameter Range 1.25 - 2.45")
Labor Rate $13/Hour
Chemical Cost $100/Gallon

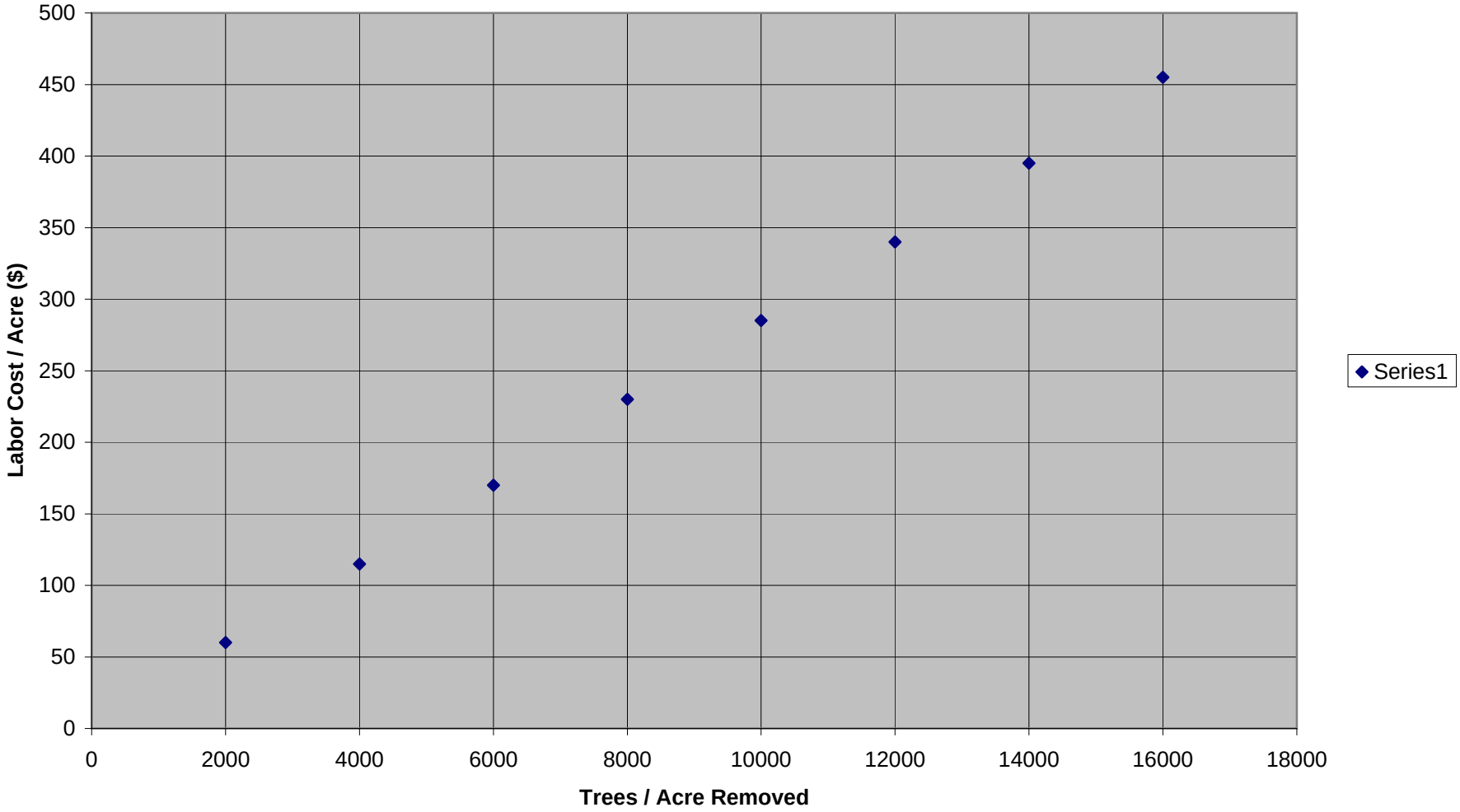


Table # 1 - Percent Change in Height and Diameter - 1997 to 2006

Muggli (Custer Co.)

	Average Height 1997 (feet)	Average Height 2006 (feet)	% Change
Mechanical 10 foot	11.73	19.72	68
Mechanical 16 foot	13.31	23.55	77
Tree Control	10.87	16.1	48
	Average Diameter 1997 (inches)	Average Diameter 2006 (inches)	
Mechanical 10 foot	2.63	5.53	110
Mechanical 16 foot	3.26	7.29	124
Tree Control	1.83	2.67	46

Fulton (Powder River Co.)

	Average Height 1997 (feet)	Average Height 2006 (feet)	% Change
Mechanical 10 foot	11.33	17.44	54
Mechanical 16 foot	11.31	16.7	48
Tree Control	11.69	18.15	55
	Average Diameter 1997 (inches)	Average Diameter 2006 (inches)	
Mechanical 10 foot	2.05	3.97	94
Mechanical 16 foot	2.23	4.55	104
Tree Control	2.22	3.59	62

Kolka (Powder River Co.)

	Average Height 1997 (feet)	Average Height 2006 (feet)	% Change
Mechanical 10 foot	11.76	18.55	58
Mechanical 16 foot	7.61	14.75	94
Tree Control	10.07	16.35	62
	Average Diameter 1997 (inches)	Average Diameter 2006 (inches)	
Mechanical 10 foot	2.41	3.97	65
Mechanical 16 foot	1.34	3.71	177
Tree Control	1.78	2.64	48

Table # 1 - Percent Change in Height and Diameter - 1997 to 2006

Smith (Powder River Co.)

	Average Height 1997 (feet)	Average Height 2006 (feet)	% Change
Mechanical 10 foot	9.29	18.45	99
Mechanical 16 foot	7.09	14.86	110
Tree Control	7.46	14.78	98
	Average Diameter 1997 (inches)	Average Diameter 2006 (inches)	
Mechanical 10 foot	2.85	5.5	93
Mechanical 16 foot	1.36	4.18	207
Tree Control	1.33	2.76	108

Pierce (Carter Co.) *

	Average Height 1997 (feet)	Average Height 2006 (feet)	% Change
Mechanical 10 foot	8.38	14.44	72
Mechanical 16 foot	12.72	20.25	59
Tree Control	10.12	19.2	90
	Average Diameter 1997 (inches)	Average Diameter 2006 (inches)	
Mechanical 10 foot	1.32	3.8	188
Mechanical 16 foot	2.76	6	117
Tree Control	1.95	4.31	121

* - Major hail damage occurred fall 1996 affecting growth of trees

Appendix G

Forest Health Survey

USDA
United States Department of Agriculture

Natural Resources
Conservation Service

Broadus Field Office

114 N Lincoln St
PO Box 180
Broadus
Montana, 59317

Voice 406.436.2321
Fax 855.510.7026

June 19, 2019

Greetings Powder River County landowner!

The Powder River County Local Working Group meetings earlier this year in Stacey, Powderville, Ashland, Broadus, and Biddle were very well attended. The purpose of the public meetings was to gain local input about where the Broadus Natural Resources Conservation Service (NRCS) staff should focus to address natural resource issues in the county. Over 50 attendees prioritized these five natural resource issues in order of importance:

1.) Noxious weeds
2.) Degraded plant communities and soil erosion caused by prairie dogs
3.) Forest health
4.) Streambank erosion/gully erosion along Little Powder River
5.) Sediment in Otter Creek

NRCS will work towards building resources to inventory and solve these issues, or we'll identify ways to help partners who are already working on these issues. Obviously, some of these issues are more complex than others and will require more time and resources to remedy.

In 2019, Broadus NRCS staff has the resources to start focusing on improving forest health. The Local Working Group attendees had three concerns related to forest health: standing dead and fallen timber in recently burned areas, pine tree density in unburned forests, and conifer encroachment into grazed range.

The purpose of this letter is to ask for your input related to those three forest health concerns. The enclosed survey will help NRCS tremendously in deciding what the critical needs are, where, and to what extent. If your ranchland does not have any areas that are or were stocked with conifers, you may disregard the enclosed questionnaire.

We understand it's a busy time, so we appreciate your feedback in advance! We hope this mailing saves time and miles rather than conducting another meeting to get the information we need to proceed effectively. We would be grateful to receive your input by July 15th and have enclosed a self-addressed envelope for convenience. Thank you for your attention to this and for your valuable input.

Additional copies of the survey can be picked up from the NRCS office at 114 North Lincoln Street or can be mailed or e-mailed upon request by contacting NRCS at 406-436-2321 x3. More information about focused conservation work in Montana, the concept behind our efforts, is enclosed.

Sincerely,

Shanna Talcott, Corey Swenson, Elizabeth Emeline, Libby Olson
NRCS Broadus Field Office

NRCS Forest Health Survey

June 2019

Section A: Description of Operating Unit – **Please check all that apply**

☐ My operation contains standing dead/fallen timber in areas burned in 2009 or later.
☐ On private land ☐ On public land

☐ My operation contains very dense ponderosa pine trees that need to be thinned.
☐ On private land ☐ On public land

☐ My operation contains Rocky Mountain juniper and/or ponderosa pine encroaching on grazed range.
☐ On private land ☐ On public land

☐ My operation had conifer density issues that have already been sufficiently addressed.
☐ On private land ☐ On public land

Section B: Burned areas – **Please answer relative to Private Land within your operation**

What year(s) did these areas burn?_____

The timber that burned is mostly ☐ standing ☐ fallen ☐ decomposing

In the burned areas that concern you the most, what is growing?
☐ desirable grass/shrubs ☐ undesirable grasses such as cheatgrass ☐trees
☐ noxious weeds ☐very little of anything ☐ other_____

Estimate how many acres within your operation are currently negatively impacted by dead timber or fire(s). _____

What are the negative impacts from recent fires that exist today?
_____
_____

If you are interested in reducing the amount of dead timber in recently burned areas, describe anticipated benefits to your operation, and rate them by importance to you (1 = most important).
____ _____
_____
____ _____
_____
____ _____
_____

Section C: Dense ponderosa pine – **Please answer relative to Private Land within your operation**

Estimate how many acres within your operation have very dense ponderosa pine tree stands that you believe need to be thinned._____

What negative impacts to your operation are dense pine tree stands causing?

_____

_____

If you're interested in thinning these stands, please describe anticipated benefits to your operation, and rate them by importance to you (1 = most important).

____ _____

_____

____ _____

_____

____ _____

_____

Section D: Encroachment into Grazed Range – **Please answer relative to Private land within your operation**

Estimate how many acres within your operation are negatively impacted by juniper or pine trees encroaching into grazed range._____

What negative impacts to your operation are encroaching conifers causing?

_____

_____

If you're interested in reducing conifers encroaching on your grazed range, please describe anticipated benefits to your operation, and rate them by importance to you (1 = most important).

____ _____

_____

____ _____

_____

____ _____

_____

Section E: Summary - Please rate the three forest health issues in order of importance to you (1 = most important).

_____Burned areas
_____Dense pine trees
_____Encroachment

Thank you for your time!

Please include your name & phone number on this survey if you are interested in developing a conservation plan with NRCS to address any of the forest health issues on your operation.