JANUARY 1, 2020

Photo by Blake Rasmussen, Sheridan County Conservation District

SHERIDAN COUNTY LONG RANGE PLAN

USDA NRCS PLENTYWOOD FIELD OFFICE

Contents

SECTION I INTRODUCTION

Vision

Our vision for natural resources conservation in Sheridan County is the realization of increased levels of stewardship on all land uses.

Mission

Our mission is to simultaneously promote environmental and economic sustainability.

Purpose

The purpose of the Sheridan County Long-Range Plan is to identify and prioritize resource concerns in the county then develop strategies to address them.

Partners

The entities who have assisted in the development of the Long-Range Plan are

- USDA Natural Resources Conservation Service Plentywood Field Office
- Sheridan County Conservation District
- USDA Farm Service Agency, Sheridan County Committee
- Sheridan County Weed District
- Montana State University Extension Service
- Montana Fish Wildlife & Parks
- US Fish & Wildlife Service
- Local landowners, farmers, and ranchers

Term

The timeframe for the Long-Range Plan is five years. The plan will be reviewed annually and amended or updated as required.

SECTION II NATURAL RESOURCE INVENTORY

GENERAL INFORMATION

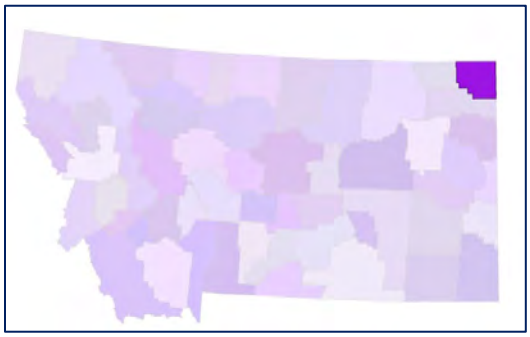


Figure 1. Location of Sheridan County, Montana

Sheridan County sits in the northeast corner of Montana. It borders Saskatchewan, Canada on the north, North Dakota to the east, Daniels County to the west, and Roosevelt County to the south. Sheridan is ranked 41 among Montana counites for land area, encompassing 1,669 square miles, or 1,068,160 acres. It is ranked number 11 for area of surface water, with just over 35 square miles.

Sheridan County was formed by the State Legislature in 1913. In was named in honor of General Philip Sheridan who served as Cavalry Commander under General Ulysses S. Grant in the Civil War. The county seat is Plentywood; other towns are Medicine Lake, Outlook and Westby. Other communities include Antelope, Dagmar, Homestead, Raymond, Reserve, and Redstone. See Appendix A1.

The growing season averages 110 days a year from around the third week of May to the third week of September. Most areas of the county are designated as USDA Plant Hardiness Zone 3b, which indicates that winter low temperatures can be as cold as -30 to -35 degrees Fahrenheit. Other areas are Zone 4a, where winter low temperatures may drop to -25 to -30 degrees Fahrenheit. Precipitation averages between 12 and 15 inches per year with an annual mean of 13.79 inches. Appendix A2 shows average annual precipitation throughout the county. Relative effective precipitation is the portion of the total precipitation which will be available for plant growth. This is depicted in Appendix A3.

PEOPLE

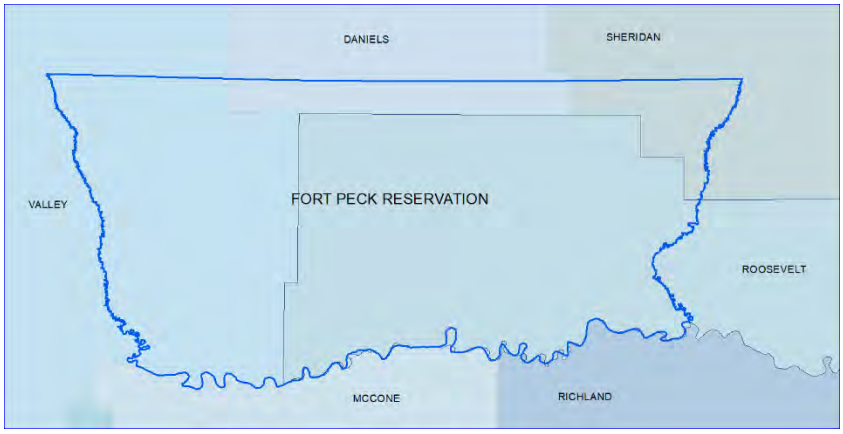
In the early twentieth century, railroads and land for homesteading drew many people to the grasslands of northeastern Montana. In 1920 the population of the County was 13,847 people (Smith, 2013); the population of Plentywood was 1,838 (Stout, 1921). The climate, soils and conditions on the Northern Plains soon proved to be impractical for small-scale dryland farming and the population of the area began to decline. Today, Plentywood is home to 1,734 people. About the same number of people live in the small towns and rural areas of the county.

County-wide, 91.8% of adults have graduated high school and 20.8% hold a bachelor's degree or higher. Eleven percent of residents live in poverty, but unemployment is low. In April of 2019 unemployment was 1.8%, compared to Montana's unemployment rate of 3.2% (US Census Bureau, 2019).

Assiniboine and Sioux Tribe

Fort Peck Reservation is home to the Assiniboine and Sioux people, two separate American Indian Nations composed of numerous bands and divisions. The Sioux divisions are Sisseton/Wahpetons, the Yanktonais, and the Teton Hunkpapa. The Assiniboine bands are the Canoe Paddler and Red Bottom. There are 12,975 members of the tribes; about 6,700 members live on the reservation. Tribal Government is headquartered in Poplar, Montana.

Fort Peck Reservation encompasses 2.1 million acres, an area approximately 100 miles long by 40 miles wide. It covers areas of Daniels, Valley, Roosevelt, and Sheridan Counties as shown in Figure 2.



Approximately 378,000 acres of Reservation land are owned by the Tribes, and 548,000 acres are allotted to individual tribal members. Over half of the land on the reservation is owned by persons or entities who do not belong to the Tribes (Fort Peck Tribes, 2013).

Bison remain important to historic and current culture; the Tribes are working to restore bison to the reservation. With assistance from the NRCS Poplar Field Office, the Tribes have developed rangeland conservation plans for five large rangeland grazing units on over twenty-six thousand acres. The Tribe owns and manages two bison herds; one is a commercial herd and the other a cultural herd of purebred stock. The foundation stock for the cultural herd was imported from Yellowstone Park.

USDA NRCS Conservationist Paul Finnicum reports that there have been observations of several species of ground-nesting birds on the bison range, "that have not been seen here for over one hundred years" (Finnicum, 2019). He attributes their return to the patch-grazing habits of bison, which leave a mosaic of tall, mid and short-stature grasses across the landscape. This provides more types of better nesting and brood-rearing habitat for the birds. See Appendix B, *NRCS Success in Working with the Fort Peck Tribes and Its Members in Rangeland Conservation* for information about The NRCS Field Office and Tribal members' collaborative efforts to promote conservation on the Reservation.

AGRICULTURE

According to the USDA National Agricultural Statistics Service Census of Agriculture (NASS), there were 458 farms in Sheridan County in 2017 operating on 1,064,068 acres. The census definition of a farm is any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. Average farm size is 2,323 acres while 56% of the farms are one thousand acres or more. Ninety-four of the farms are family owned; 312 farms harvest crops and 92 of these grow alfalfa for hay. One hundred twenty-two farms raise 13,488 head of cattle. Eighteen farms are at least partly irrigated, totaling 4,576 irrigated acres (USDA NASS, 2019).

Figure 3 shows the twelve top crops in 2017, the number of farms raising each crop and the acres harvested. Most cropland is used to raise wheat and pulse crops.

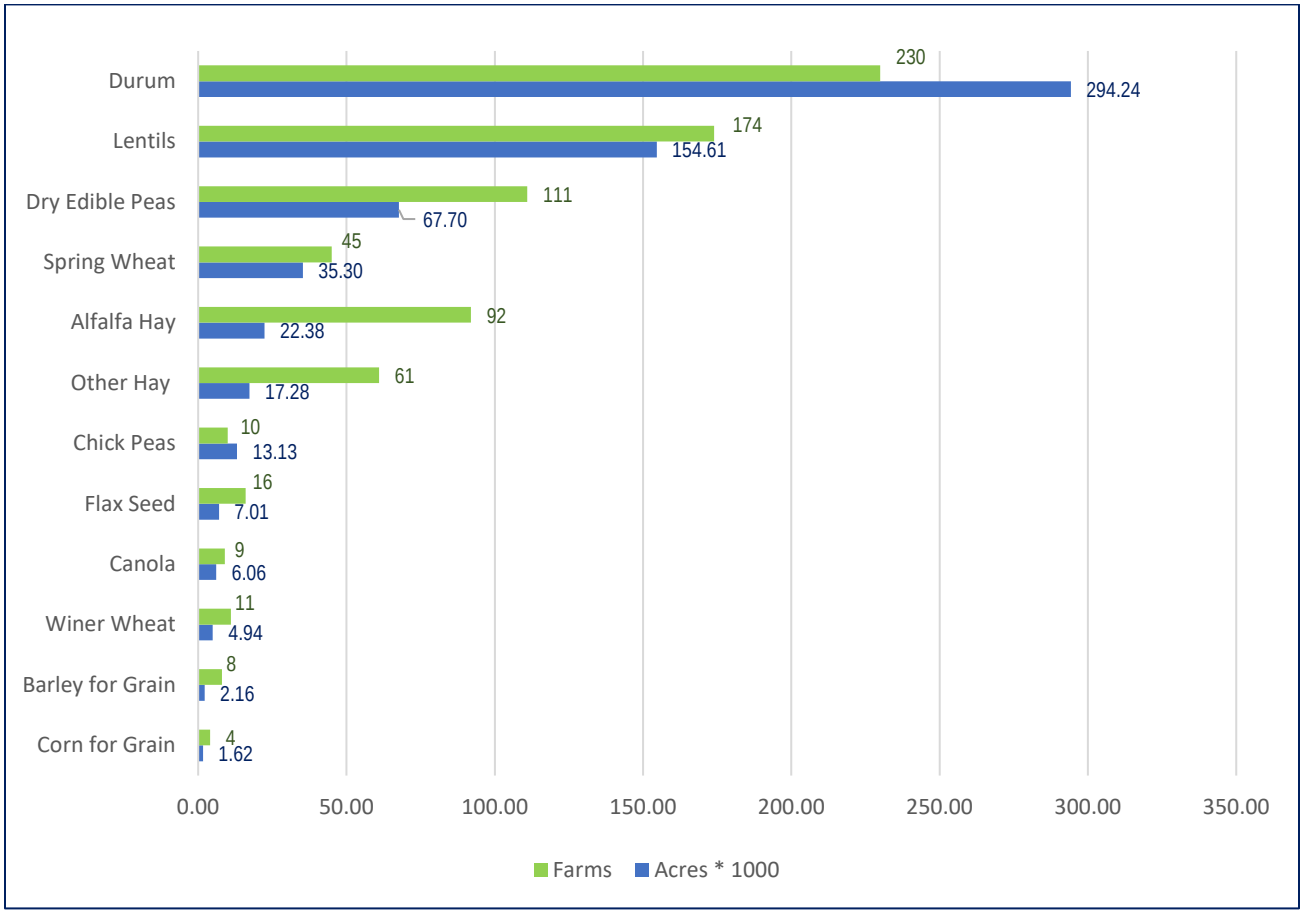


Figure 3. 2017 Crops, Acres Harvested and Number of Farms Producing Each Crop

According to NASS, Sheridan County has 100 new or beginning farmers as principle operators and 29 other new or beginning farmers in business. Of the 705 producers in the county, 247 (more than one-third) are 65 years of age or older (USDA NASS, 2019).

LANDCOVER/LAND USE

LRRs and MLRAs

Land Resource Regions (LRR) are large geographic areas that are characterized by a pattern of soils, climate, water resources and land uses. Major Land Resource Areas (MLRAs) are subregions of the Land Resource Regions and comprise smaller, homogeneous areas. MLRA's represent landscape-level areas with distinct physiography, geology, climate, water, soils, biological resources and land uses. These features are incorporated into the distinctions between ecological sites.

Sheridan County lies entirely within LRR F, Northern Great Plains Spring Wheat Region, shown in lilac in Figure 4. MLRA 53A, Northern Dark Brown Glaciated Plains covers all of Sheridan county. Almost all the MLRA is glacial till plains. Glacial features such as kettle holes, (hollows, typically filled by a lake, that resulted from the melting of a mass of ice trapped in glacial deposits), kames (steep-sided mounds of sand and gravel deposited by a melting ice sheet) and moraines (masses of rocks and sediment deposited by glaciers, typically forming ridges at the edges) are common. Alluvial deposits occur in narrow and discontinuous strips along some major streams. Soils are generally very deep, moderately well drained or well drained and clayey or loamy. Most soils are Inceptisols or Mollisols (NRCS, 2006).

Figure 4. MLRA 53A and LRR F (NRCS, 2006).

Inceptisols are soils of humid and sub-humid regions that exhibit minimal horizon development. They lack the features that are characteristic of other soil orders. Inceptisols are widely distributed and occur across a wide range of ecological settings. They are often found on fairly steep slopes, young geomorphic surfaces and on resistant parent materials. Land use varies considerably with Inceptisols.

Mollisols are the soils of grassland ecosystems. They are characterized by a thick, dark surface horizon. This fertile surface horizon results from the long-term addition of organic materials derived from plant roots. Mollisols are among some of the most important and productive agricultural soils in the world (University of Idaho, 2020).

Landcover Types

MTNHP Land Cover Report for Sheridan County describes five landcover types in Sheridan County. The relative proportions of these systems are shown in Figure 5.

Appendix A4 shows the county landcover with data provided by MTNHP. Many other landcover types appear in this more sophisticated depiction. The scale of the map makes it difficult to discern small areas of certain types such as prairie potholes and wetlands. However, the map provides a clear visual of the extent of cultivated land throughout the county, and the location of the grasslands, badlands and introduced vegetation.

Cultivated cropland is areas used to produce crops, such as corn, soybeans, small grains, sunflowers, or vegetables, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming.

Great Plains Sand Prairie is considered a unique ecological system due to coarse textured soils with exposed caprock sandstone formations occurring across the landscape. Native plant communities are dominated by needle and thread (*Hesperostipa comata*) with little bluestem (*Schizachyrium scoparium*) and threadleaf sedge (*Carex filifolia*) on the finer textured soils. Rhizomatous warm season grasses

prairie sandreed (*Calimovilfa longifolia*), sand bluestem (*Andropogon hallii*) and big bluestem (*Andropogon gerardii*) occur intermittently on coarser soils.

The **Great Plains Mixedgrass Prairie** ecosystem covers much of the eastern two-thirds of Montana. Soils are primarily fine and medium-textured. Canopy cover is typically mostly grasses and western wheatgrass (*Pascopyrum smithii*) is usually dominant. Other species include thickspike wheatgrass (*Elymus lanceolatus*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and needle and thread. Forb diversity is typically high. In areas where sagebrush steppe borders the mixed grass prairie, common plant associations include Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*)—western wheatgrass. Fire and grazing are the primary drivers of this system. Drought can also impact it, in general favoring the shortgrass component at the expense of the mid-height grasses. With intensive grazing, cool season exotics such as Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and field brome (*Bromus arvensis*) increase in dominance.

Wooded draws occur on steeper slopes or canyon bottoms where deep loamy soils and higher moisture levels support Rocky Mountain juniper (*Juniperous scopulorum*) and deciduous species such as green ash (*Fraxinus pennsylvanicus*) and chokecherry (*Prunus virginiana*). Although they are relatively few and scattered, wooded draws are valuable habitat for many species of birds, small mammals and mule deer.

Great Plains Badlands are areas containing highly eroded, rugged and often colorful landforms with sparse vegetation. Soils formed from highly erosive parent material often contain marine and other fossils. Badlands areas provide habitat for mule deer and other wildlife but support only intermittent grazing (MNHP, 2019).

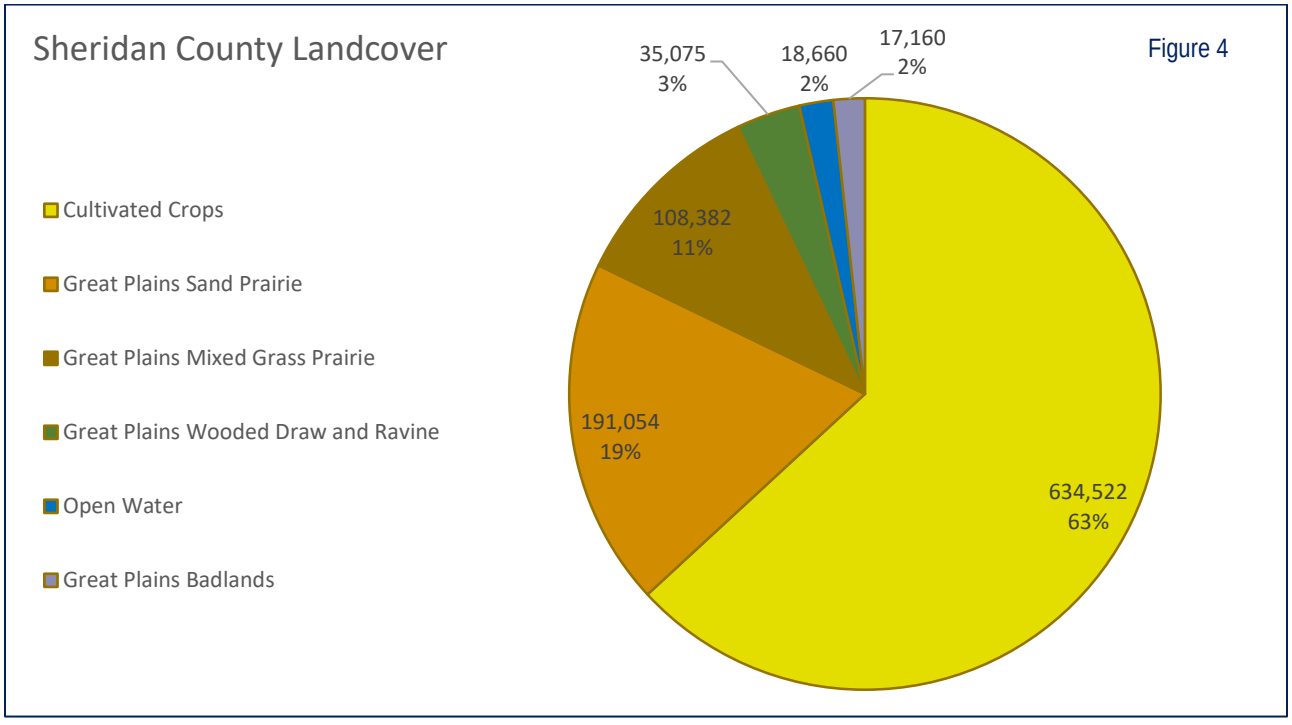


Figure 5. Distribution of Landcover Types in Sheridan County

Land Ownership

About 81 percent of the land in Sheridan County is privately owned. Table 2 shows landowners and the acres that they control. Appendix A5 depicts the locations of non-private lands.

Table 1 Land Ownership

Landowner	*Acres*
Montana Fish, Wildlife and Parks	3103
Montana State Trust Lands	46,681
The Nature Conservancy	1,130
US Bureau of Land Management	295
US Fish and Wildlife Service	32,065
Fort Peck Reservation	124,137
Private Landowners	860,749

The Comertown Prairie Preserve belongs to The Nature Conservancy (TNC). Brian Martin, Montana Grasslands Coordinator for TNC, writes, "The property is a mosaic of depressional wetlands and grassland dominated by native prairie but has some areas of smooth brome invasion. About 300 acres were once farmed but were seeded back to native grass between 2000 [and] 2008. We (TNC) currently lease it to two lessees, which each operate deferred rotation grazing systems that includes our lands and theirs. Generally grazing occurs between June 1 and October 31, with season of use changed between years. Stocking rates are based on NRCS recommended levels by ecological site."

Montana Fish Wildlife & Parks manages Brush Lake and surrounding acreage. Brush Lake is a deep, clear lake with beaches surrounded by grass and crop fields. Public access for swimming is located on the northern portion of the 280-acre lake. A day-use area is situated on the northeast portion of the lake. Due to the high alkali content of the water Brush Lake does not support fish. US Fish and Wildlife Service administers the Medicine Lake National Wildlife Reserve (NWR). The NWR is discussed further under Plants and Animals. USFWS holds many other smaller properties, mostly on the eastern side of the county; the majority of these are part of the Medicine Lake NWR complex.

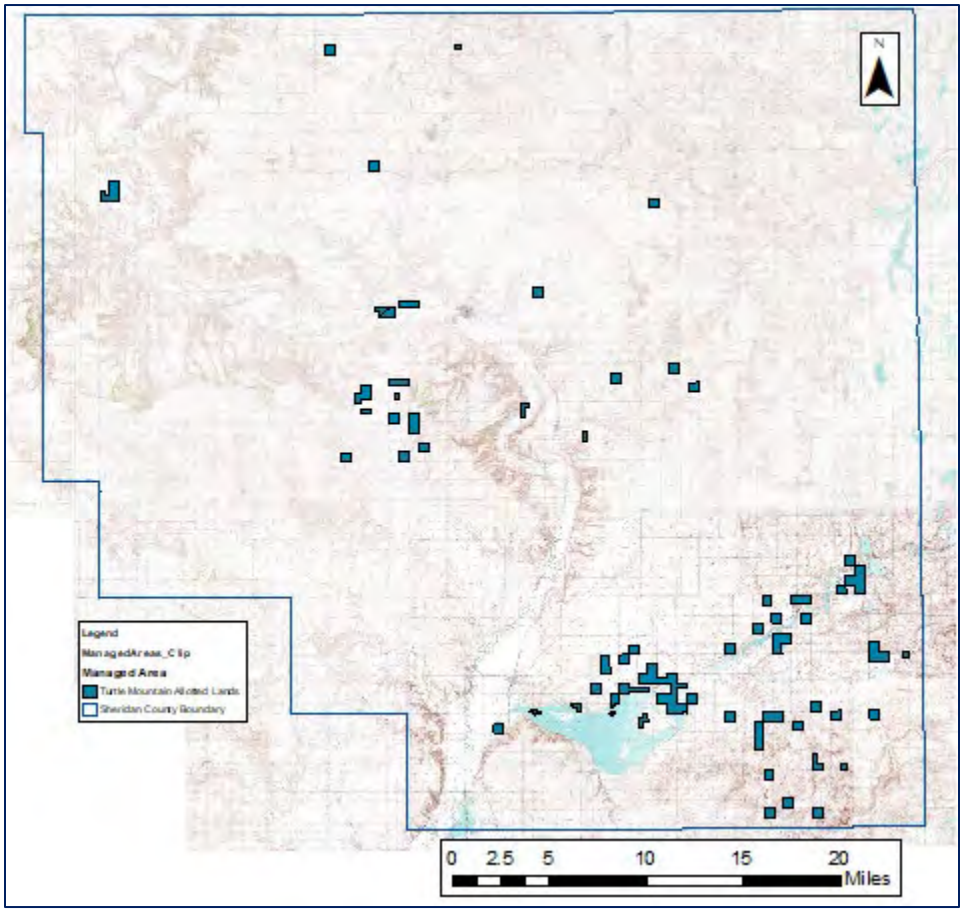
In Sheridan County, the area included in Fort Peck Reservation is approximately 194 square miles or 124,137 acres. Montana Department of Natural Resources Conservation (DNRC) is responsible for around 4.3% of the land in the county; the Bureau of Land Management has only three small holdings.

Turtle Mountain Allotments

The Turtle Mountain Band belongs to the Chippewa Nation of Native Americans. Prior to 1863, the Band claimed lands totaling almost 20 million acres in eastern North Dakota. The Old Crossing Treaty resulted in the loss of nearly all of the Band's land (TMCHC, 2020).

Today, the main part of the Turtle Mountain Reservation is located in Rolette County, North Dakota. encompassing an area of 6 miles by 12 miles. It covers 72 square miles (46,000 acres). Another 26,175 acres of Trust land is located in Rolette County, North Dakota, around the Turtle Mountain Reservation.

Total acres in Rolette County are 72,255 acres; 6,698 acres are managed by the Trenton Indian Service Area and the remaining land, totaling 67,852 acres, is individually owned public domain allotments located Montana, North Dakota, and South Dakota. The total area of the Turtle Mountain Reservation is 146,805 acres (229.383 square miles) (TMCHC, 2020). Figure 6 shows the locations of the Turtle Mountain Allotments in Sheridan County.



SOILS

Soil Associations

Soil associations are made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. A soil association is a landscape that has distinctive proportions and patterns of soils. It usually consists of one or more major soils and at least one minor soil and is named for the major soil(s). Soils in one association may occur in another, but in a different pattern. The Soil Survey of Sheridan County has grouped soils into seven general landscapes and fourteen soil associations.

1. Nearly level to Hilly, well drained and very poorly drained soils, all found on uplands. The soils in this group are formed in glacial till and glaciolacustrine (lakes formed by melting glaciers) material. Soil associations are:

Williams association —Nearly level to gently rolling well drained loams.

Williams-Zahill association—Undulating and gently rolling well-drained loams and clay loams.

Zahill-Williams-Dimmick association —Nearly level to hilly, well-drained and very poorly drained clay loams, loams and silty clays.

Savage-Marias association —Nearly level and gently sloping, well-drained silty clay loams and clays.

2. Nearly level to steep, well-drained to excessively drained soils mainly on upland plains. These soils formed in material deposited by wind and water. On uplands:

Dooley-Parshall association—Nearly level to gently rolling, well-drained fine sand loams.

Blanchard association —Gently rolling to hilly, well-drained fine sands and loamy sands.

Lihen-Parshall association—Nearly level to gently rolling, well-drained loamy fine sand and fine sandy loams.

On outwash plains: **Manning-Wabek association**—Nearly level to steep, excessively drained and somewhat excessively drained gravelly sandy loams and coarse sandy loams.

3. Nearly level to gently rolling, well-drained soils on uplands and stream terraces. Soils in the **Turner-Farnuf association** are nearly level to gently rolling well-drained loams. They were formed in alluvium.

4. Nearly level to moderately sloping, well-drained and moderately well drained soils on floodplains, terraces and alluvial fans. These soils formed in alluvium from the surrounding uplands.

Havrelon-Cherry association. Nearly level to moderately sloping, well-drained silt loams and silty clay loams on flood plains and fans.

Nobe-Lohler-Bowdoin association—Nearly level, moderately well drained clays and silty clays found on flood plains.

5. Moderately steep and steep, well-drained soils on uplands. The soils in the **Lambert-Zahill association** formed in glacial till and other material of mixed origin. They are moderately steep and steep, well drained silty clay loams and clay loams.

6. Nearly level, poorly drained soils on lowlands. Consisting only of the soils in the **McKenzie association**, these are nearly level, poorly drained silty clays loams.

7. Nearly level to steep, excessively drained soils on steep terraces. The **Wabek association** is nearly level to steep, excessively drained gravelly loams on terrace edges and outwash plains (USDA SCS, 1977).

HEL Soils

Soils are designated as highly erodible (HEL) based on their susceptibility to movement caused by the actions wind or water. The Sheridan County Soil Survey includes forty-nine individual soil map units. Of these, 27 soils are highly erodible, adding up to almost 53% of all the soil in the county.

Prime Farmland, Farmland of Statewide Importance and Prime if Irrigated Farmland

Prime farmland is a designation assigned by U.S. Department of Agriculture defining land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these land uses. Sheridan County has no soils designated as Prime Farmland.

Farmland of Statewide Importance Soils

These are soils 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, 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.

In Sheridan County, Farmland of Statewide Importance is twelve soils that occur on 169,835 acres or 15.6% of the county. Table 2 shows four soils that make up 85.5% of all the Farmland of Statewide Importance soils in the county.

Table 2. Farmland of Statewide Importance

Soil Map Unit	Name	Acres
WzB	Williams-Zahill Loams, undulating	87,498
DoB	Dooley Fine Sandy Loam 0-6% slope	27,208
WmC	Williams Loams	19,977
DoC	Dooley Fine Sandy Loam 6-12% slope	10,577
Total		145,260

Prime Farmland if Irrigated Soils

Prime if Irrigated soils are those with the best combination of physical and chemical characteristics for agriculture such as the soil quality and adequate growing season necessary to produce high yields of crops suited to the region but occur in areas of limited rainfall. Thirteen Prime Farmland if Irrigated soils add up to 21.2% of all soils in the county on 296,472 acres. Three soils that total 83.3% of the Prime if Irrigated soils are listed in Table 3.

Table 3. Prime Farmland if Irrigated Soils

Soil Map Unit	Name	Acres
WmB	Williams Loam, undulating	206,686
Ha	Havrelon Silt Loam	23,008
TuB	Turner Loam, 0-4% slope	17,188
Total		246,882

Figure 7 Shows the distribution of Farmland of Statewide Importance and Prime Farmland if Irrigated soils.

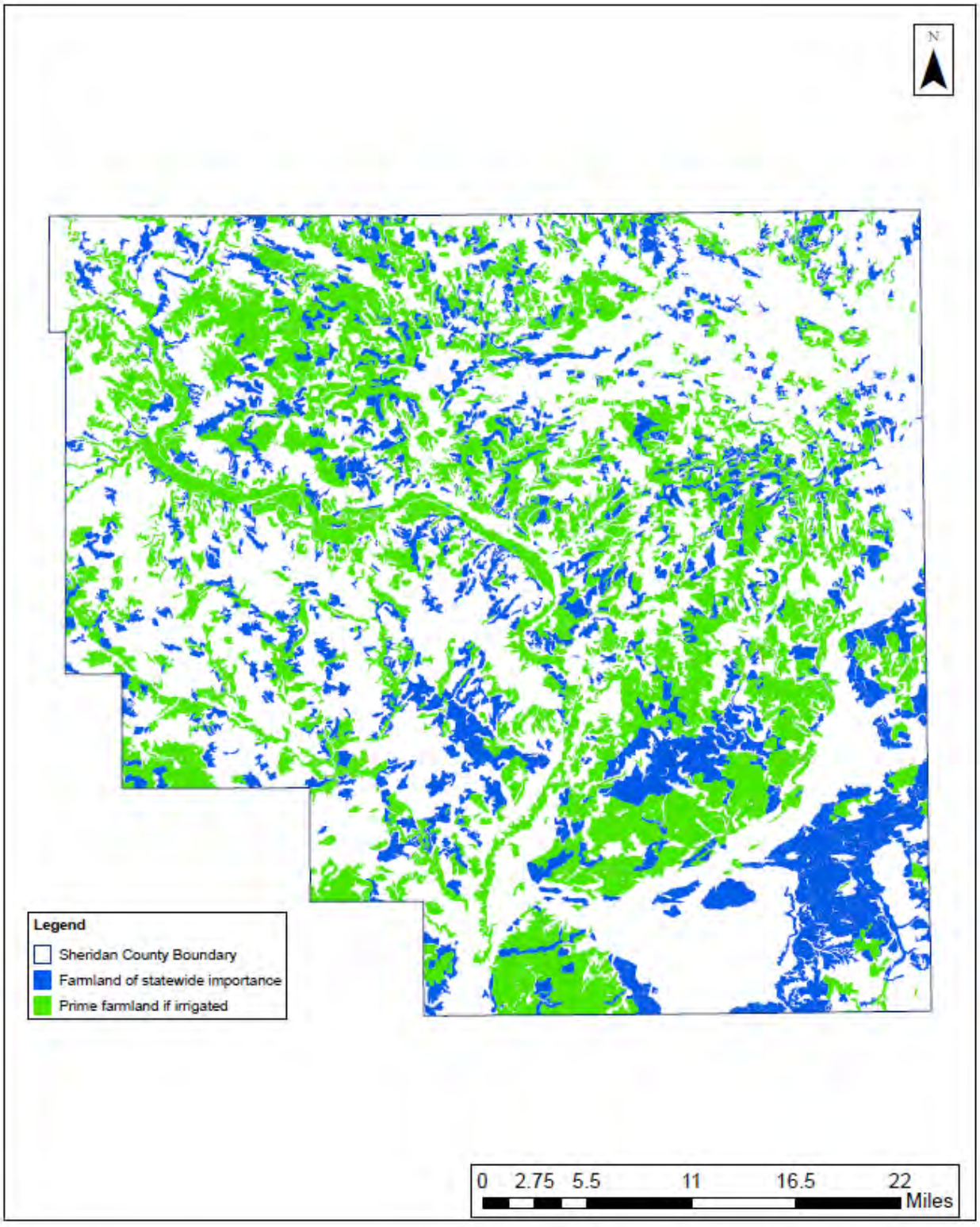


Figure 7. Farmland of Statewide Importance and Prime Farmland if Irrigates Soils, Sheridan County.

Hydric Soils

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 are protected by ditches or levees.

Nearly 2.3% of the soils in Sheridan County meet the criteria for hydric soils. Table 4 shows the 11 soils in Sheridan County that each exhibit hydric characteristics on more than 200 acres. Hydric criteria definitions follow.

Table 4. Hydric Soils

Map Unit Symbol	Name	Acres in the County	% Hydric	Acres of Hydric Soil	Landform	Hydric Criteria
Dm	Dimmick silty clay	4,385	100	4385	kettles	2, 3
Ha	Havrelon silt loam	22,442	2	448.8	flood plains	2, 4
Mz	McKenzie silty clay loam	6,881	95	6537	channels	3
Nh	Nishon loam	1,025	95	973.8	basin floors	2, 3
No	Nobe clay	8,842	5	442.1	flood plains	2, 4
Uf	Ustifluvents, saline	4,038	80	3230.4	flood plains	2, 3
WmB	Williams loam, 0 to 4% slopes	209,276	1	2092.8	ground moraines, closed depressions	2, 3
WmC	Williams-Vida loams, 2 to 8% slopes	20,101	1	201	moraines, closed depressions	2, 3
WzC	Vida-Zahill loams, 2 to 8% slopes	172,316	1	1723.2	moraines, closed depressions	2, 3
ZaD	Zahill-Vida loams, 4 to 15% slopes	29,149	1	291.5	moraines, closed depressions	2, 3
ZwE	Zahill-Williams complex, hilly	81,626	5	4081.3	depressions	

- Criteria 1--All Histels except Folistels and Histosols except Folists.
- Criteria 2--Map unit components that, based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or show evidence that the soil meets the definition of a hydric soil.

- Criteria 3--Map unit components that are frequently *ponded* for long duration or very long duration during the growing season that, based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States or show evidence that the soil meets the definition of a hydric soil.

- Criteria 4--Map unit components that are frequently *flooded* for long duration or very long duration during the growing season that, based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or show evidence that the soils meet the definition of a hydric soil.

Saline Seeps

One of the land use problems in Sheridan County associated with farming practices is saline seep. Most of Sheridan County has the potential for this problem (Smith, Doug, 2013). Many areas of the northern Great Plains contain saline seeps that significantly reduce crop production and inconvenience farming operations on adjacent areas.

Saline seep describes a salinization process accelerated by dryland farming practices. A saline seep is intermittent or continuous saline water discharge at or near the soil surface downslope from recharge areas under dryland conditions that reduces or eliminates crop growth in the affected area because of increased soluble salt concentration in the root zone. Saline seeps can be differentiated from other saline soil conditions by their recent and local origin, saturated root zone profile, shallow water table and sensitivity to precipitation and cropping systems (Brown, 1983).

Saline seeps are common in northeastern Montana. The bedrock in northern and eastern Montana has high salt concentrations and acts as an impermeable layer that minimizes vertical ground water movement. As a result, the ground water builds above the bedrock, causing an elevated (or artificial) water table that exerts increased hydraulic pressure on low lying areas. Where the water table is within four feet of the ground surface, a saline seep forms in the discharge area (MSCA, 2019). Figure 8 illustrates the formation of saline seeps.

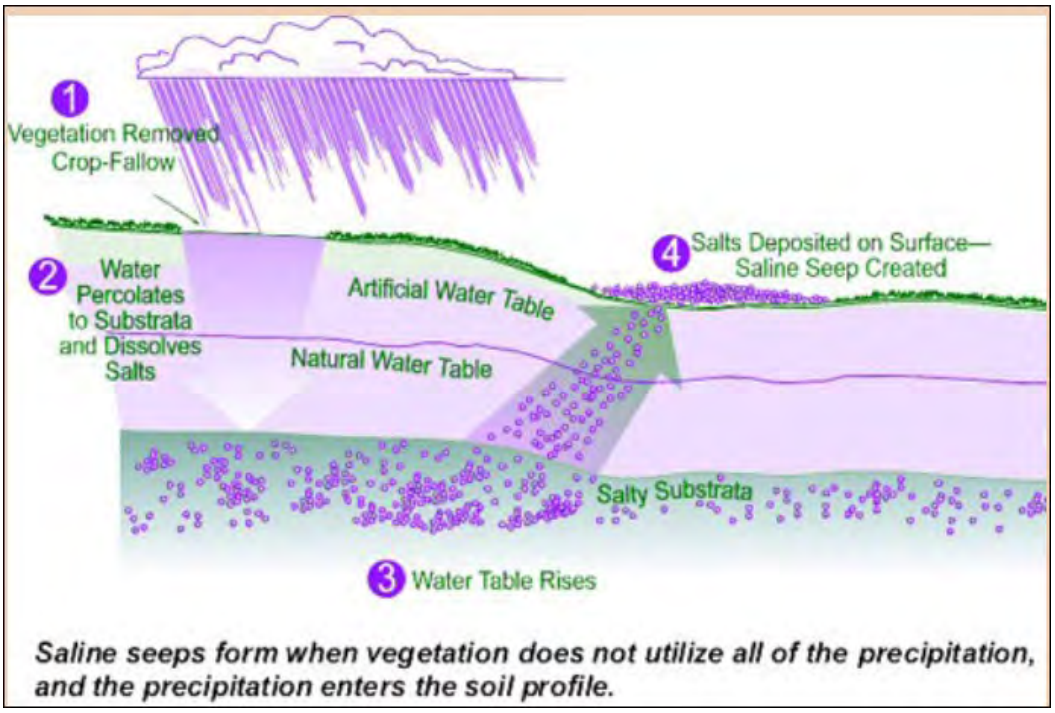


Figure 8. Formation of Saline Seeps (MSCA, 2019)

Many resource concerns are associated with saline seeps.

Saline soils contain large amounts of water-soluble salts that inhibit seed germination.

Plant growth is affected by at least one of three factors:

- Direct physical effects of salt in preventing soil water uptake by plant roots because of increased osmotic tension;
- Direct chemical effects of salt in disrupting the nutritional and metabolic processes of plants;
- The indirect effect of salt in altering soil structure, permeability and aeration.

Water quality can be affected as discharge water may end up in ground water sources, in some cases making the water unsuitable or unusable for livestock (Brown, 1983).

Salinity decreases the overall health of a soil by destroying soil structure, reducing water infiltration and conductance thereby increasing erosion potential, influencing soil pH which can in turn affect nutrient availability and can contaminate drinking water.

Geology

Geologic formations underlying Sheridan County are shown in Appendix A6. A formation in this context is a rock unit that that has a distinctive appearance compared to surrounding layers and is of enough thickness and extension to be plotted on a map. Formations often contain a variety of related or interlayered rock types and are sometimes divided into smaller units called members. Below are brief descriptions of the formations, members and other geologic elements shown on the map.

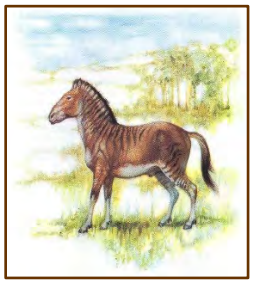
Qac. Alluvium and colluvium (Holocene And Pleistocene epochs). Brown to gray, poorly stratified clay, silt, and sand deposited by sheet-wash on slopes. Color and texture of colluvium reflect parent sediment. Thickness is as much as thirty-five feet but generally less than fifteen feet.

Qal. Alluvium. Sedimentary. Gravel, sand, silt, and clay deposits of stream and river channels, and floodplains.

Qg. Gravel

Qgi. Glacial ice contact. Usually contains kames or eskers (long ridges of gravel and other sediment, typically having a winding course, deposited by rivers of meltwater from a retreating glacier or ice sheet).

Tf. Flaxville Formation. The Flaxville Formation is likely a deposit of the ancestral Missouri River when it flowed northeast in a broad valley towards Canada. It is composed of sand, silt, clay, volcanic ash and gravel. Abundant fossils from the Pliocene age including bones from hipparion, procamelus and mastodon (below, left to right) are found in the formation.



Tfu. Fort Union Formation is a yellowish-brown sequence of interbedded continental deposits of sand, sandstone, siltstone, silt, clay, clayey shale and lignite. The sediments of the Fort Union Formation were deposited by eastward-flowing streams meandering on a broad swampy flood plain. It contains beds of lignite as much as nine feet thick.

Tfle. Lebo Member of Fort Union Formation. The Lebo member is dark gray carbonaceous shale, bentonitic claystone, sandstone, and coal deposited on alluvial plains. Thickness is as much as 607 feet.

Tft. The **Tullock Member of the Fort Union Formation** is yellowish-gray, fine- to medium-grained, trough-cross-bedded to planar-bedded or massive appearing sandstone interbedded with brownish-gray or purplish-gray claystones, dark-gray carbonaceous shale, and thin lenticular coal beds. Its origin is the Paleocene era; the member is about 200 feet thick. The Tullock member was formed in broad alluvial systems consisting of dominant flood plains with swamps and few stream channels. Numerous vertebrate fossils are found throughout.

Tftr. Tongue River Member of Fort Union Formation. This member is composed of yellowish orange sandstone, sandy and silty carbonaceous shale, and coal from ancient alluvial plains. Thickness can be as much as 984 feet.

Tfsb. Sentinel Butte Member of the Fort Union Formation. Dark grey shale with interbedded lignite and grey sandstone. Non-marine in origin. Thickness is 656 feet.

WATER

Surface Water

See Wetlands/Riparian Areas for information about the many small ponds, lakes and prairie potholes that dot the landscape throughout much of the county. There are no rivers in Sheridan County. Major streams are shown in Figure 9**.**

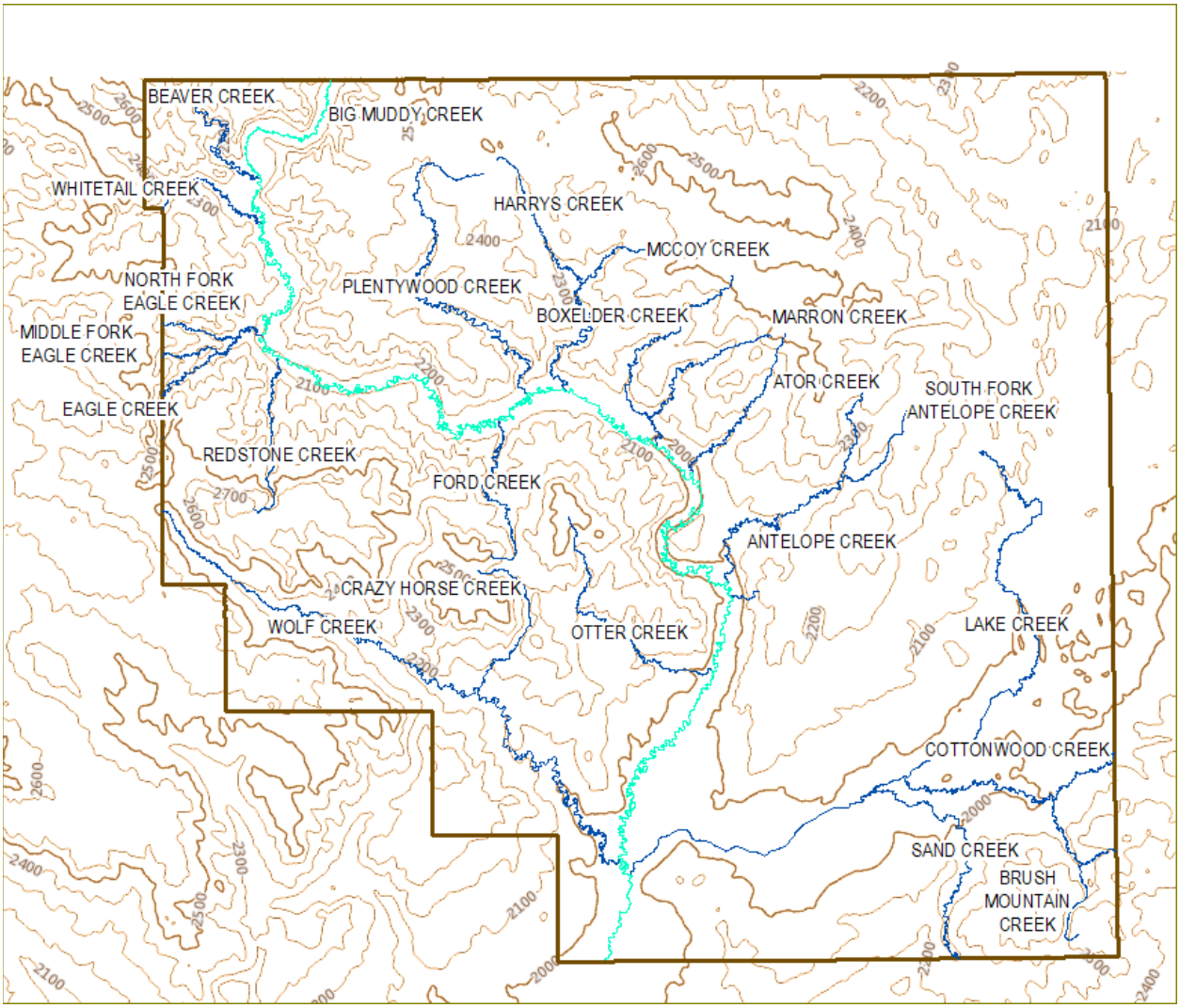


Figure 9. Major Streams in Sheridan County

Montana's State Wildlife Action Plan (SWAP) identifies all streams, rivers, floodplain and riparian, and wetland community types across the state as "Community Types of Greatest Conservation Need". The plan defines this as meaning there is a clear obligation to use resources to implement conservation actions that provide direct benefit to these community types. The plan also provides lists of species of concern associated with each community type. Montana's SWAP is available at http://fwp.mt.gov/fishAndWildlife/conservationInAction/actionPlan.html

In Sheridan County, aquatic community types in greatest need of conservation are Prairie Rivers and Prairie Streams. Big Muddy Creek is considered a prairie river; the smaller creeks are prairie streams. Descriptions of these community types and lists of associated species of greatest conservation need are given in pages 21 and 22 of the SWAP.

USGS Wyoming-Montana Water Science Center in cooperation with U.S. Army Corps of Engineers maintains one stream gauge in Sheridan County as part of the Groundwater and Streamflow Information Program network of Federal Priority Streamgages (FPS). The stream gauge is on the Big Muddy Creek near Antelope, Montana (USGS, 2020).

Annual peak streamflow at the gauging station from 1979 to present is shown in Figure 10. Figure 11 depicts annual average annual flow for the same time.

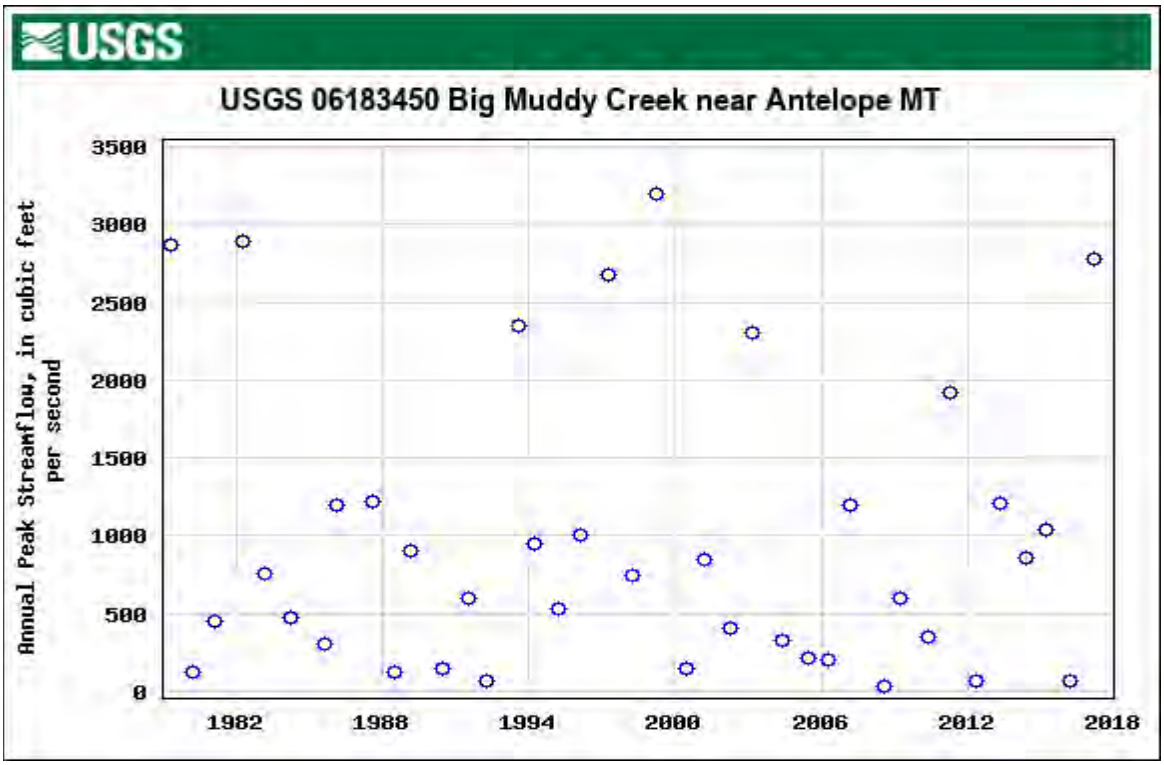


Figure 10. Peak Streamflow at the Big Muddy Station

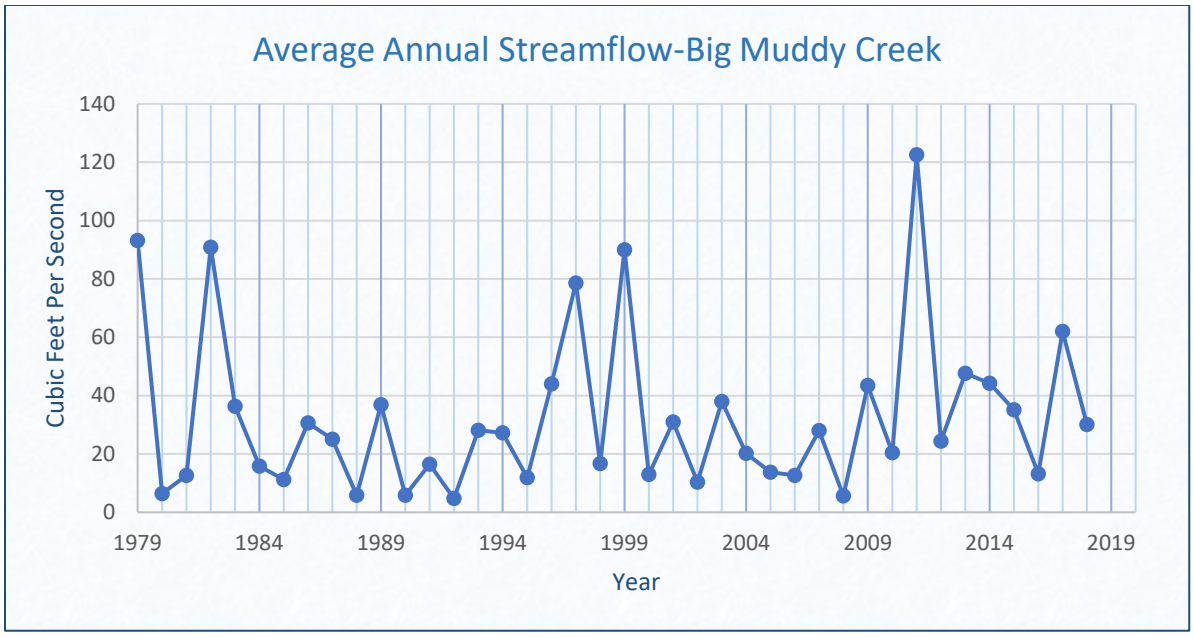


Figure 11. Average Annual Streamflow at the Big Muddy Creek Station.

Hydrology

The Hydrologic Unit Code (HUC) is a numbering system for watersheds developed by the U.S. Geological Survey (USGS) to provide a common coding system for State and Federal agencies. Each unique code is attached to a specific watershed, enabling different agencies to have common terms of reference and to agree on the boundaries of the watershed. The entire country has been mapped with three levels of HUCs: 8-digit HUCs for large watersheds known as sub-regions, 10-digit HUCs for watersheds, and 12-digit HUCs for smaller or sub-watersheds.

Portions of the Big Muddy and Brush Lake Closed Basin sub-regions occur in Sheridan County. These are shown in Figure 12 as polygons with a thick black boundary. Waters in the Big Muddy subregion flow south to the Missouri River. Within the subregion are 10-digit watersheds bordered and labeled in brown. These are divided into 12-digit sub-watersheds, shown on the map as colored polygons without labels. Water to the east of the Big Muddy subregion flow mostly east. Note that all of the Sheridan County portion of Brush Lake Closed Basin subregion is one contiguous 12-digit watershed. A closed or endorheic basin (sometimes also called a terminal basin) is a limited drainage basin that has no outlets such as streams or rivers. Water collects into lakes or swamps, permanent or seasonal; the only losses occur through the soil or by evaporation. Brush Lake Closed Basin also covers extensive territory in western North Dakota.

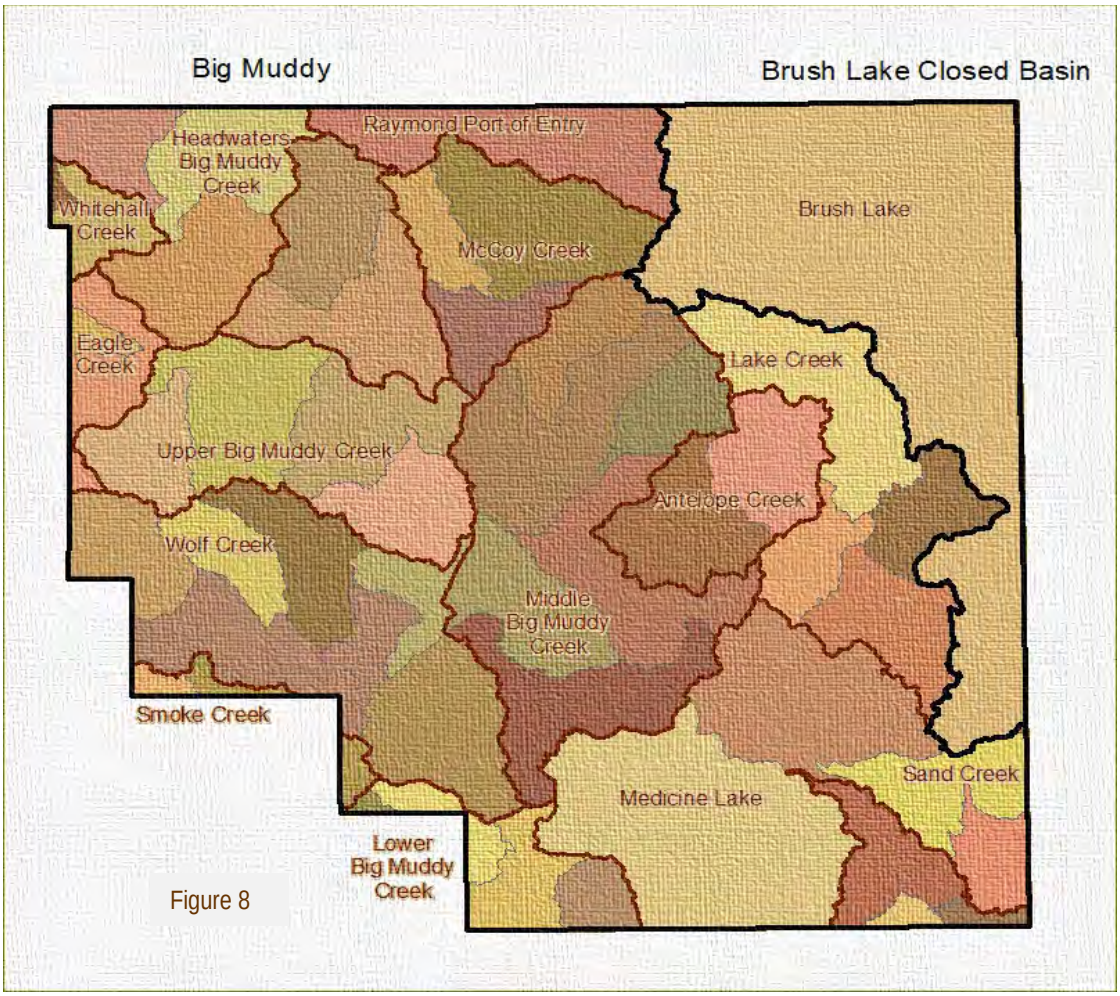


Figure 12. Sub-regions, Watersheds and Sub-watersheds in Sheridan County.

Ground Water

According to the Ground Water Information Data Center (GWIC) for the Montana Bureau of Mines and Geology (MBMG), there are 2,490 water wells in Sheridan County. One hundred sixty-seven are unused; 811 are used for livestock water, and 818 are for domestic use. Two hundred three wells provide irrigation water, 64 are for testing and research, and 504 are monitoring wells. The oldest well on record was drilled in 1902; the deepest well is 1,100 feet. MBMG lists the sources for 1,181 wells in Sheridan County. Groundwater sources are shown in Table 5.

Table 5. Geological Formations and Number of Wells

Groundwater Source	*Number of Wells*
Fort Union Formation	*416*
Glacial Outwash	*323*
Pleistocene Alluvium	*93*
Glacial Till	*90*

Glacial Drift	*74*
Pleistocene Sand & Gravel	*68*
Alluvium	*66*
Other	*51*

MBMG also provides information on the depth ranges for the wells, shown in Table 6. No correlation is given for groundwater sources and depths of the wells.

Table 6. Depth Ranges of Wells

Depth	*Number of Wells*
0-99 feet	*1198*
100-199 feet	*792*
200-299 feet	*326*
300-399 feet	*107*
> 400 feet	*67*

MBMG has twenty monitoring wells in Sheridan County; data is collected to monitor water quality and quantity and changes over time. Information about each well, including hydrographs of static water levels, the aquifer source, locations and average static water levels can be accessed through MBMG's website at http://mbmggwic.mtech.edu/ .

Clear Lake Aquifer

The Clear Lake aquifer lies beneath the what is known as the ancestral Missouri River. Sand and gravel deposited by the river and later by glaciers form a 'complex aquifer system with some areas capable of supporting high-yield irrigation wells' (MBMG, 2020).

Information about natural resource concerns and development of the Clear Lake Aquifer are provided in Appendix D.

303-d Listed Waterbodies

Montana Department of Environmental Quality (DEQ) Clean Water Information Act 303-d List includes only two waterbodies in Sheridan County. Big Muddy Creek, shown in green Figure 8 and Medicine Lake (See Appendix A5) are listed as Category 5.

Category 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.*

The Sheridan County report does not provide information on which beneficial uses are not supported by the impaired waters. These are:

- Big Muddy Creek from the Canadian border to the Fort Peck Reservation boundary is impaired by copper, lead, mercury and zinc from unknown sources and from total nitrogen, total phosphorus and organic enrichment from crop production and grazing along the shoreline and riparian areas.

- Big Muddy Creek from the Fort Peck Reservation boundary to the Missouri River is impaired by total nitrogen, total phosphorus and sedimentation-siltation from grazing near the shoreline or in riparian zones, and from agriculture. Alteration of stream-side or littoral vegetation cover occurs due to the same causes. Flow regime modification impacts are due to hydrostructure flow regulation or modification.

- Medicine Lake contains cadmium from unknown sources, lead from unidentified sources, and mercury from atmospheric deposition, toxins and unknown sources.

AIR AND ENERGY

Petroleum Development

The first oil well in Sheridan County was drilled in 1956. DNRC Board of Oil and Gas Conservation records for oil production in the county go back to 1986 which was the year of highest production in Sheridan County, 3,411,769 barrels. Oil production steadily declined overall; the least oil was produced in 2018, 161,813 barrels. Natural gas production, measured in MCF or thousand cubic feet, has been tracked since 1999; it also peaked early and has experienced overall steady decline as shown in Figure 13.

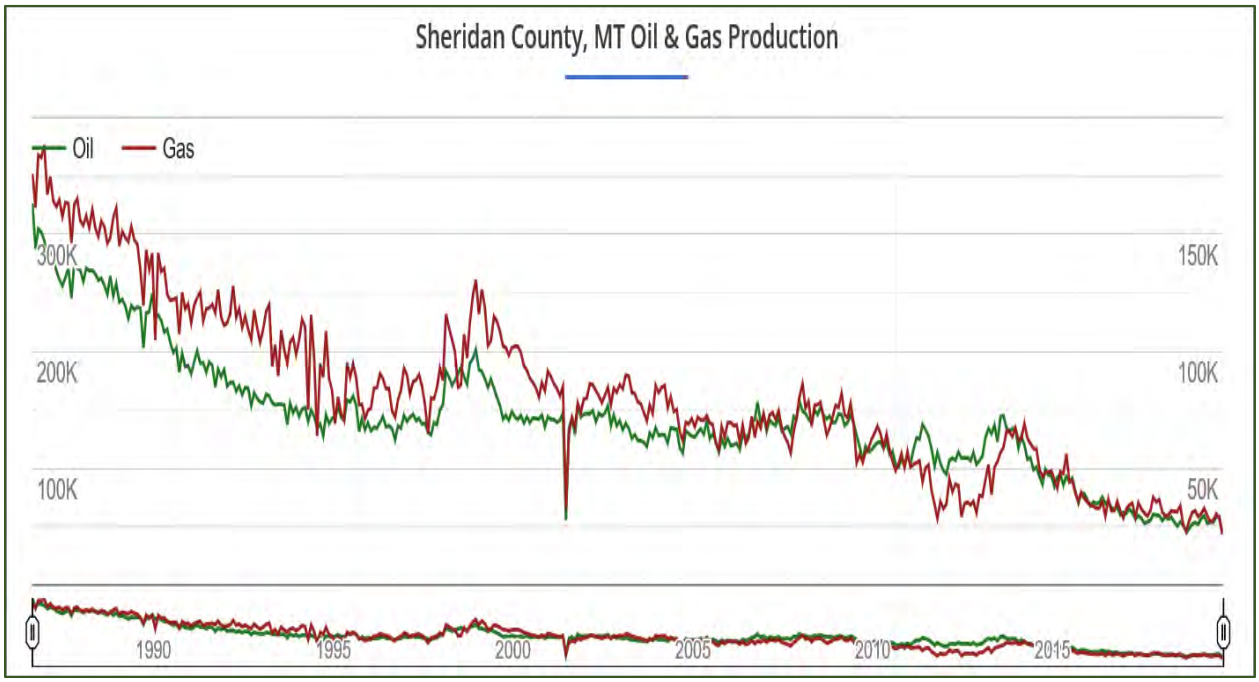


Figure 13. Oil and Gas Production in Sheridan County (MT DNRC BOGC, 2019).

Sheridan County's petroleum industry continues to play a significant part in not only the local, but also the State's economy. Sheridan ranks sixth among Montana counties for oil production and thirteenth for natural gas. There are 133 active oil wells in the county producing 2.69% of the oil in the state (ShaleXP, 2019).

Air Quality

Montana DEQ Air Quality Bureau maintains air quality monitoring stations throughout the state. Nearest to Sheridan County are the stations in Malta and Sidney, Montana. Ambient temperature, wind speed and direction and pollutants including NO, NO2, NOX, ozone and particulate matter are monitored. Air quality is typically good (MT DEQ, 2019).

Utilities

Sheridan Electric Cooperative of Medicine Lake provides electricity to 1,836 members in Daniels, Roosevelt and Sheridan Counties and Williams and Divide Counties in North Dakota. The Coop has been in operations since 1948 and currently services 2,836 miles of powerlines.

Montana Dakota Utilities also provides electricity and natural gas to businesses and residences in Sheridan County. Montana Dakota Utilities provides electric services to parts of Montana, North Dakota, South Dakota and Wyoming in a service area covering more than 168 thousand square miles. MDU has been in business since 1924.

PLANTS AND ANIMALS

Box Elder Creek Reservoir

Box Elder Creek Reservoir is located just one-half mile from the town Plentywood. The 77-acre reservoir is stocked with walleye, rainbow trout and northern pike. Perch (*Perca* spp.) and bullheads (*Ameiurus nebulosus*) also inhabit the reservoir which is open to the public for fishing and recreation. Montana Fish, Wildlife and Parks manages several other much smaller public fishing ponds in Sheridan County, shown and described in Appendix E (Montana Fish, Wildlife & Parks, 2020).

Medicine Lake National Wildlife Refuge Complex

President Theodore Roosevelt established the first National Wildlife Refuge on Pelican Island, Florida in 1903. Since then, "the National Wildlife Refuge System has grown to become the world's most extensive network of public lands and waters dedicated to the conservation of wildlife" (USFWS, 2011).

Medicine Lake National Wildlife Refuge (NWR) is located in northeastern Montana, between the Missouri River and the Canadian border. The Refuge, established in 1935, provides important breeding and stopover habitat for a diverse array of migratory birds. Medicine Lake NWR encompasses 31,702 acres and consists of two separate tracts. The 28,438-acre north tract includes the 8,218-acre Medicine Lake, as well as 17 smaller water units.

Medicine Lake NWR has been designated a Globally Important Bird Area in the United States by the American Bird Conservancy. For information about the 283 species of birds as well as the many other species of wildlife that rely on the complex, visit the U.S. Fish & Wildlife Service (USFWS) Medicine Lake NWR webpage at https://www.fws.gov/refuge/Medicine_Lake/wildlife_and_habitat/wildlife.html

Research Natural Areas

Research Natural Areas (RNAs) are federally protected areas designated to be permanently protected and maintained in their natural condition. RNAs support superior examples of terrestrial or aquatic ecosystems, habitats, and populations of rare or endangered plant or animal species, or unique geological features. They are managed in a way that allows natural processes to operate with minimal human intervention. (USFS, 2020). RNAs are administered by the U.S. Forest Service (USFS).

There are over 450 RNAs in the US. Nearly one-fourth of the acres set aside in RNAs across the country are in USFS Region 1 which includes Montana, North Dakota and most of northern Idaho. Figure 14 shows the location of Teepee Hills, Bruce's Island, Big Island and Homestead RNAs. All are within the Medicine Lake NWR in the southern end of Sheridan County.

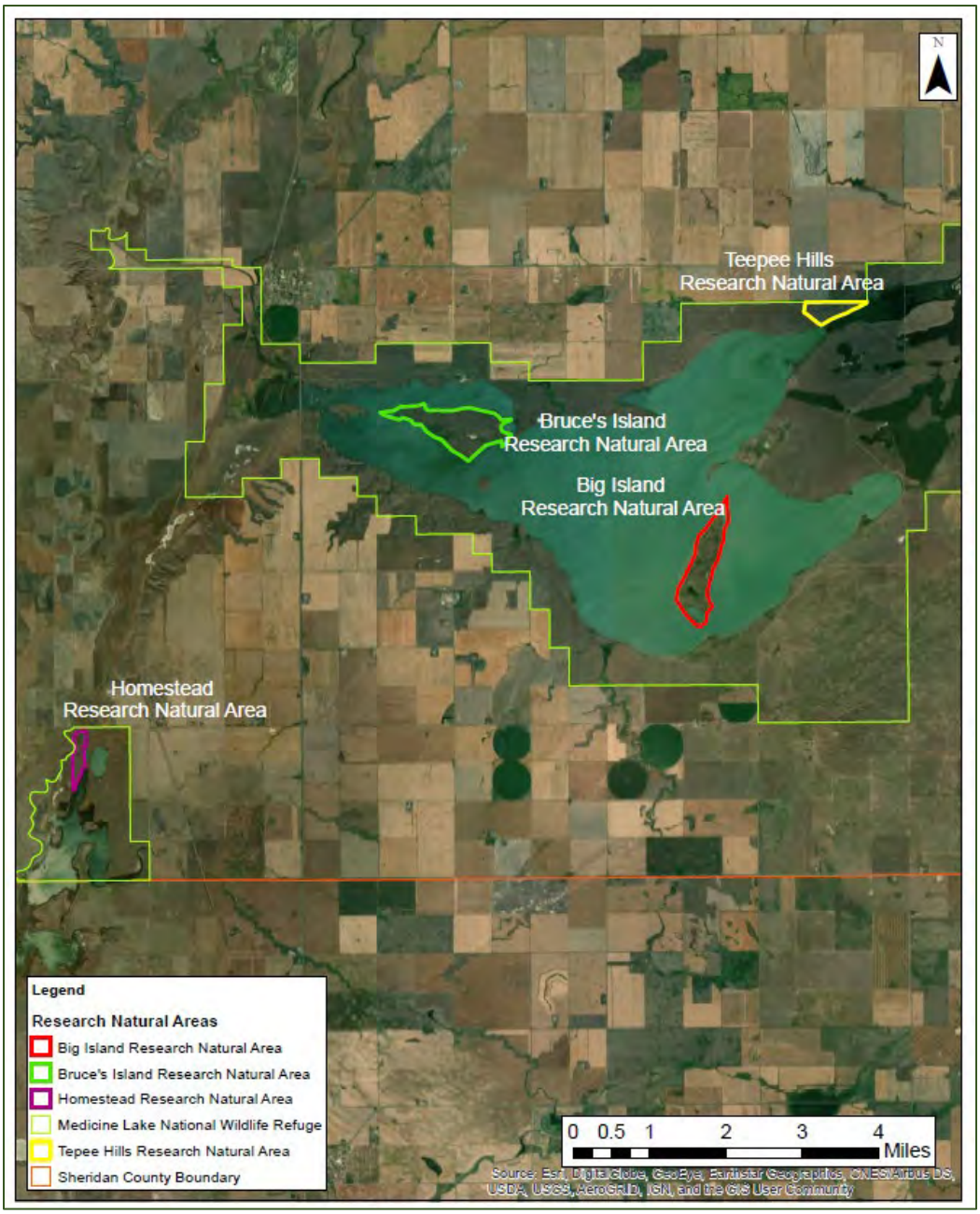


Figure 14. Sheridan County Research Natural Areas.

Federally Listed Species

The USFWS has determined that there are four species of native animals listed endangered or threatened under the Endangered Species Act in Sheridan County as of June 10, 2020.

Whooping Crane *(Grus americana)* –Endangered
Whooping cranes are the world's rarest crane and the tallest birds in North America. Adult height is about five feet; wingspan can be up to seven- and one-half feet. Average adult weight is about fifteen pounds. Once found throughout North America, the last wild flock of whooping cranes had been reduced to fewer than 20 birds by the 1940's due to habitat loss and hunting. Intensive conservation efforts and international cooperation between Canada and the United States rescued the species from extinction, but they remain extremely rare.

Habitat loss remains one of the biggest threats facing wild whooping cranes. Collisions with wind turbines and power lines are an ongoing threat. Whooping crane utilize migratory habitat in eastern Montana, but their main migratory corridor is to the east in the Dakotas. They are not known to breed in the state (Audubon, 2019). Observations of these birds in the state have been in grain and stubble fields, wet meadows, and wet prairie habitat (MTNHP).

Interior Least Tern (*Sternula antillarum*)— Endangered
Least terns are North America's smallest tern. These little shorebirds are easily recognized by their yellow bills and legs. The interior population has been listed as endangered because of loss of habitat. The interior population declined by about 88% between 1966 and 2015; Interior Least Tern have been federally listed as endangered since 1985.

Least terns often nest in colonies; nesting sites are shallow scrapes on open ground near lake shores, on sandbars or along the riverside. Unfortunately, prime nesting habitat is often used by humans for recreation or residential development. Additionally, alterations to stream flows caused by dams, reservoirs, water diversion and other changes to river systems have eliminated most historic Least Tern nesting habitat. Wide channels dotted with sandbars, which are preferred by least terns, have been replaced by narrow, armor-banked rivers with highly altered flows. Fluctuating water levels from reservoir releases often destroy nesting sites (MTNHP, 2019). Least terns nest on unvegetated sand-pebble beaches and islands of large reservoirs and rivers in northeastern and southeastern Montana, specifically the Yellowstone and Missouri river systems (MTNHP).

Piping plover populations are also in decline due to habitat loss caused by alterations to river systems. These small shorebirds are distinguished by a single black band around their necks and very short yellow-to-orange bills with black tips. Piping plovers nest on shorelines and islands of alkali lakes in North Dakota and Montana and on sandbar islands and reservoir shorelines along the Missouri Rivers. Dam construction, water diversion and water withdrawals change river flow and drastically reduce the amount of available nesting habitat. Human activity has increased predation which decreases nest success and chick survival. USFWS Range map of breeding and wintering habitat shows piping plover use the northwest area of the county for breeding habitat (USFWS, 2019). Appendix A8 is the USFWS map of piping plover critical habitat in Sheridan County.

Red Knot (*Calidris canutus rufa*)— Threatened. The red knot is a medium-sized bulky sandpiper that exhibits distinctive reddish plumage during the breeding season. These birds migrate between their arctic tundra breeding grounds and marine winter habitat as far south as Tierra del Fuego. They commonly use stopover sites in the Northern Great Plains. Most observations in Montana occur in May; these have been rare. Red knots are a global species; there are three subspecies in North America, and

they all appear to be in decline (USFWS, 2020). According to the USFWS, red knots depend on suitable habitat, food and weather conditions at sites across the Western Hemisphere. They must be able to find favorable conditions at stopover sites within narrow seasonal windows as they migrate (USFWS, 2020). Human development is one cause of the species' decline. Climate change is known to be another as it affects the arctic tundra ecosystem, the quality and availability of coastal habitats and the invertebrate food resources throughout the birds' range (MTNHP, 2019).

Animal Species of Concern

MTNHP defines Montana Animal Species of Concern as, "native taxa that are at risk due to declining population trends, threats to their habitats, restricted distribution and/or other factors." The list of 41 designated species is included in Appendix C1.

Plant Species of Concern

MTNHP applies the same definition to Plant Species of Concern. The MTNHP Species of Concern Report, last updated on April 16, 2020, lists 17 plant species of concern in Sheridan County, see Appendix C2.

Wetlands/ Riparian Areas

Wetlands are areas where water covers the soil or is present at or near the surface of the soil all year or for periods of time during the year, including during the growing season. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promotes the development of characteristic wetland (hydric) soils.

Wetlands play an integral role in the ecology of the landscape. The combination of shallow water, high levels of nutrients and primary productivity is ideal for the development of organisms that form the base of the food web. Many species of birds and mammals rely on wetlands for food, water and shelter, especially during migration and breeding. Wetlands also function as sponges, retaining water on the landscape through periods of drought, and as a source of recharge for aquifers. They act as filters where sediment often containing fertilizer or chemicals can settle out before reaching creeks and streams; they absorb rain, snowmelt and floodwaters, reducing the risk of downstream flooding (EPA, 2019).

Appendix A7 is an image of Township 36 North, Range 57 East. Most the county's most common wetland types appear in this area. The smaller, isolated freshwater emergent wetlands are prairie potholes, depressional wetlands found in formerly glaciated landscapes. These are common throughout the county although many have been eliminated by conversion to agriculture.

Prairie potholes that remain on the landscape often support small freshwater marshes. Some marshes are temporary, while others may be essentially permanent. The Prairie Pothole region of North America provides breeding and nesting habitat for upwards of two-thirds of the ten to twelve million waterfowl in the continental US (EPA, 2019).

Figure 15 illustrates the most common wetland types in Sheridan County and the acres of each. Descriptions follow.

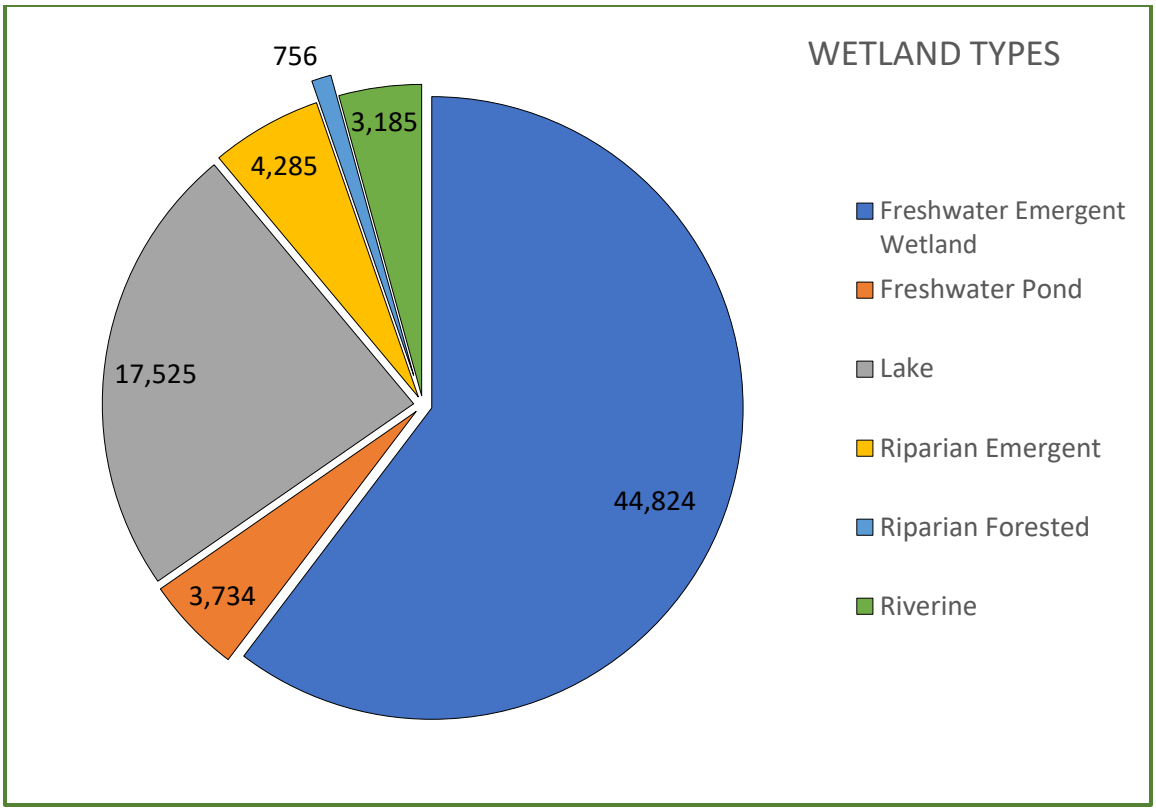


Figure 15. Wetland and Riparian Area Types in Sheridan County

- Freshwater Emergent wetlands are those that are dominated by erect, rooted, water-loving plants. They may be persistent or ephemeral.
- Riparian Emergent wetlands have erect, rooted herbaceous vegetation during most of the growing season.
- Riparian Forested systems are wetlands dominated by woody vegetation greater than six feet tall.
- Riverine areas are perennial streams comprised of the deep-water habitat contained within a channel; they do not include adjacent floodplains.
- Lakes are water bodies that are 20 acres in size or greater.
- Freshwater Ponds are water bodies that are fewer than 20 acres in size.

Noxious Weeds

Canada thistle (*Cirsium arvense*) and leafy spurge (*Euphorbia esula*) occur throughout Sheridan County. These species are Priority 2B category weeds on the Montana Noxious Weeds List, meaning they are abundant in Montana and widespread in many counties. Every county in the NRCS Miles City Area battles these two introduced, invasive weeds. At one time baby's breath was grown as a crop near Westby; it is a problem in that area as well as around Plentywood. Although baby's breath is not yet on the Montana State Noxious Weeds List, it is on the Sheridan County Noxious Weed List. It spreads aggressively, displacing grass and other native species and causing problems with crop production. According to Sheridan County Weed District Coordinator Craig Underwood, baby's breath is declining, but is still a priority for management. Hawksbeard is also a concern in some areas of the county.

The Weed District collects and distributes Aphthona species flea beetles (Figure 16) for biological control of leafy spurge. In previous years, Aphthona were collected near Grass Range, North Dakota. It is hoped that in the future it will be possible to collect adequate numbers of beetles locally. About 12 landowners receive the beetles to be dispersed on private land.

Figure 16. Aphthona

The District works with the Montana Department of Transportation (MDT) to control noxious weeds along State highways and with Montana Fish, Wildlife & Parks to manage weeds in State Parks. U.S. Fish & Wildlife Service has engaged Sheridan County Weed District to take care of invasive terrestrial plant species on Medicine Lake NWR. Underwood reports that attempts to control leafy spurge, Canada thistle, field bindweed and spotted knapweed on the NWR have been pretty successful. There are no known hounds tongue infestations in Sheridan County. Currently, the county has no designated Noxious Weed Priority Areas or Cooperative Weed Management Areas (Underwood, 2020).

SECTION III CONSERVATION ACTIVITIES

USDA Farm Bill Programs

Conservation Reserve Program

The Conservation Reserve Program (CRP) is a land conservation program administered by the Farm Service Agency (FSA). In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.

Figure 17 depicts the number of acres enrolled in the Conservation Reserve Program in fiscal years 1996 through 2014.

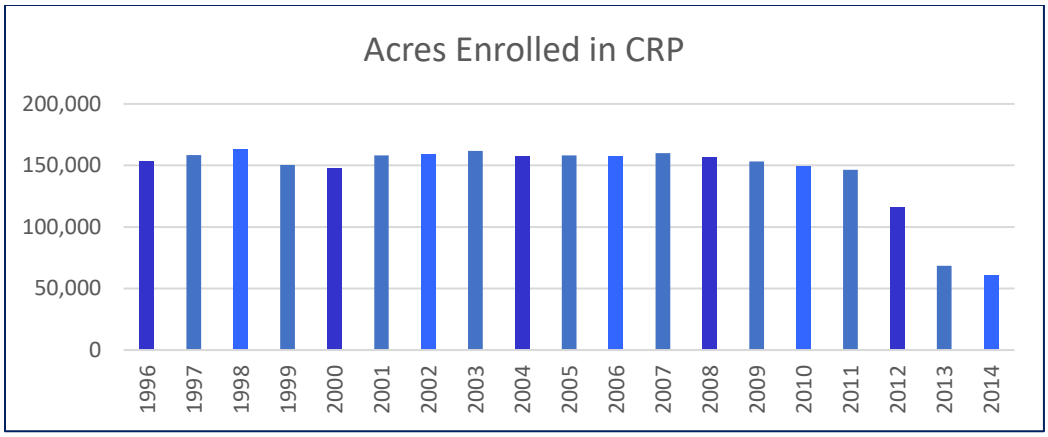


Figure 17. Acres in CRP, 1996 to 2014.

In addition to the conversion of cropland and land rental, many landowners also applied conservation practices to land enrolled in CRP. Table 8 shows the seven most common CRP practices (by acre) and the number of acres on which each practice was applied between 2008 and 2018.

Table 7. CRP Practices in Sheridan County, 2008 Through 2018.

CRP Conservation Practice	Acres
Conservation Cover	89,872
Integrated Pest Management	29,167
Access Control	25,592
Upland Wildlife Habitat Management	9,818
Prescribed Grazing	5,027
Forage & Biomass Planting	19,218
Range Planting	3,963

Conservation Technical Assistance (CTA)

Conservation Technical Assistance (CTA) is the help provided by NRCS, employees of other entities or agencies under the technical supervision of NRCS, to clients to address opportunities, concerns, and problems related to the use of natural resources. The CTA Program provides land users with proven conservation technology and the delivery system needed to achieve the benefits of a healthy and productive landscape.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program that promotes agricultural production and environmental quality as compatible goals. Through EQIP, agricultural producers receive financial and technical assistance to implement structural and management conservation practices that optimize environmental benefits on working agricultural land. From Fiscal Year 2010 through Fiscal Year 2019, the Plentywood Field Office County wrote and administered 51 EQIP contracts. Table 9 shows those practices that were implemented through EQIP.

Table 8. EQIP Practices Implemented in Sheridan County 2008-2018.

Conservation Practice	Count	Total	
Access Control	2	630	ac
Conservation Cover	1	82	ac
Cover Crop	40	9,736	ac
Critical Area Planting	1	8	ac
Fence	10	65,483	ft
Forage and Biomass Planting	7	958	ac
Forage Harvest Management	3	234	ac
Groundwater Testing	1	1	no
Heavy Use Area Protection	2	322	ac
High Tunnel System	3	5,520	sq. ft
Irrigation System, Micro irrigation	3	1	ac
Irrigation Water Management	3	1	ac
Livestock Pipeline	11	26,605	ft
Nutrient Management	22	16,374	ac
Prescribed Grazing	9	6,407	ac
Pumping Plant	9	9	no
Range Planting	1	20	ac
Residue & Tillage Mgmt., No-Till	24	31,553	ac
Salinity and Sodic Soil Management	3	616	ac
Spring Development	3	3	no
Tree/Shrub Establishment	1	1	ac
Upland Wildlife Habitat Management	25	3,021	ac
Water Well	6	402	no
Watering Facility	15	19	no
Windbreak/Shelterbelt Establishment	3	25,210	ft

Conservation Stewardship Program (CSP and CStwP)

CSP is a program to help producers to enhance or advance their existing conservation plan and improve their business operation. Participants maintain their current level of stewardship for resource concerns met at the time of application and apply activities to meet or exceed at least one additional resource concern on each land use in their operation. CStwP is the current version of the Conservation Stewardship Program. Practices and enhancements in CStwP are more numerous and more specific. Table 10 shows those conservation measures implemented through fiscal year 2019.

Table 9. CStwP Practices Implemented in Sheridan County 2008-2018.

Conservation Practice	Count	Total

Conservation cover	1	0.4	ac
Conservation cover to provide for pollinators and beneficial insects	8	42.3	ac
Conservation crop rotation	44	23600.1	ac
Cover crop	4	5606.2	ac
Cropland conversion to grass-based agriculture	4	79.2	ac
Enhanced field border along the edge(s) of a field	4	15.1	ac
Enhanced wildlife habitat on expired grass/legume covered CRP acres	2	169	ac
Establish monarch butterfly habitat	1	0.5	ac
Extend existing filter strip to reduce excess sediment in surface water	1	7.8	ac
Forage and biomass planting that produces feedstock	6	64.7	ac
Forage harvest management	3	196.7	ac
Forage harvest management that helps maintain wildlife habitat	10	13033.7	ac
Grassed waterway	1	18.7	ac
Grassland conservation initiative	2	233.8	ac
Harvest of crops (hay or small grains) using measures that allow desired species to flush or escape	20	30535.4	ac
Herbaceous weed control (plant pest pressures) for desired plant communities/habitats	1	5	ac
Herbaceous weed treatment	6	476.8	ac
Improving nutrient uptake efficiency and reducing risk of nutrient losses	3	10263.9	ac
Incorporating "wildlife friendly" fencing for connectivity of wildlife food resources	5	30755	ft
Leave standing grain crops unharvested to benefit wildlife	22	668	ac
Maintaining quantity and quality of forage for animal health and productivity	10	10573.3	ac
Modifications to improve soil health and increase soil organic matter	15	18063.1	ac
No till system to increase soil health and soil organic matter content	2	571.8	ac
Nutrient management	13	16559.2	ac
Pest management conservation system	22	34392.7	ac
Prescribed grazing	8	8927.8	ac
Range planting for increasing/maintaining organic matter	1	118.4	ac
Reduce risk of pesticides in surface water by utilizing precision pesticide application techniques	4	3400.1	ac
Salinity and sodic soil management	3	124.9	ac
Structures for wildlife	9	22	no
Tree/shrub establishment	2	0.3	ac
Tree/shrub planting for wildlife food	1	1.5	ac
Upland wildlife habitat management	6	8162.2	ac
Use of multi-species cover crops to improve soil health and increase soil organic matter	4	3552.1	ac
Use of SHA to assist with development of cover crop mix to improve soil health and increase SOM	4	6657.97	ac

Partnerships

Sheridan County Conservation District

The main focus of the Sheridan County Conservation District is to assists producers in application for irrigation development grants through Montana DNRC. Grants range from $300 to $20,000 and are available to private for profit, private nonprofit, government and Tribal entities and individuals and groups in Montana. DNRC states, "Irrigation is the dominant commercial use of Montana's water… accounting for 96% of surface and ground water withdrawals. The irrigation development grant program was created to increase the value of irrigated crops while preserving natural resources and the environment for future generations."

Irrigation Grant projects typically address one or more objectives:

- Increase irrigation efficiencies through water conservation
- Expand or sustain irrigated acreage
- Increase production of high-value crops
- Improve management of irrigation systems
- Improve inter-basin cooperation among all water users.

Sheridan County Conservation District personnel monitor 122 wells twice a year using data loggers to record changes in water levels in the Clear Lake Aquifer. MBMG assists with interpretation of data. Based on the information collected, the Conservation District has granted over 7,726 acre-feet of water to local producers for beneficial use, mostly irrigation for agriculture production. For more information on the Sheridan County Ground-Water Management Program and map of the Clear Lake Aquifer Management Area see Appendix D.

The Conservation District owns a no-till drill which is rented to county agriculture producers for smaller no-till projects such as pollinator habitats. Every year the District hosts a conservation tree sale. The District assists the Field Office as needed with outreach and to provide information about natural resources conservation to the community.

The Plentywood Field Office also communicates often with Sheridan County Extension, Montana Fish Wildlife & Parks, and the US Fish & Wildlife Service about program availability and opportunities for conservation in Sheridan County.

SECTION IV NATURAL RESOURCE ISSUES & DESIRED OUTCOMES

The Sheridan County Local Working Group met in 2019 to discuss and prioritize natural resource concerns. Considering the results of the meeting, conservation assistance requests, and trends in resource use and agriculture, the Field Office has selected the following as priority resource concerns.

Soil Erosion – Continuous Cover

Sheridan County is the number one county in Montana for both lentil acreage and dry pea acreage (2018, per Montana Agricultural Statistics, Volume LVI). Although a pea crop leaves behind more residue than that of a lentil crop, both crops are considered low residue crops, leaving little residue cover throughout the winter months. Fallow is not a typical Sheridan County practice but does still occur. Fields that have been hailed often leave very little residue over winter. As fields continue to get larger,

topsoil could be lost in one of the previously mentioned occurrences, or a combination thereof. Soil erosion on marginal cropland could be eliminated if areas of typically poor crop production were planted to stands of perennial grass, forbs and legumes. A desired future outcome would be to increase awareness of soil erosion, promote soil health, encourage crop producers to farm smaller fields, and restore perennial vegetation on marginal cropland.

Water Quality – Precision Agriculture, Soil Testing

Water Quality is improved when the correct amount of fertilizer is applied to meet crop nutrient needs and therefore, not leached down into groundwater or runoff into surface waters. Soil testing can be done to identify what nutrients are currently in the soil and available to the plant. Nutrient budgets then identify how much nutrients are needed to grow a targeted crop. Precision Ag equipment is then used to precisely apply nutrients based on soil types and crop needs. A desired outcome would be a combination of any of these practices to increase water quality by using the right rate, the right source, the right method, and right placement of nutrients to minimize nutrient loss to ground and surface water.

Soil Quality Limitations – Crop Rotation

Sheridan County grows 40% of Montana's durum crop. Durum, peas, and lentils are Sheridan County's primary crops. All of these are cool season crops. A durum-pulse rotation is most commonly used. Soil quality could be increased by diversifying crop rotations. Chickpeas, flax, canola, and mustard are crops that producers have been incorporating into their rotations. Hemp and soybeans have also been grown in portions of the county the last couple years, both of which are warm season crops. Cover crops add a lot of diversity and are great for soil health but are not widely used. A desired outcome to increase soil quality would be to add more crops to crop rotations, possibly incorporating perennial crops more often.

Degraded Plant Condition – Grazing Rotation, Weed Control

Canada thistle, leafy spurge, baby's breath, and hawksbeard are the most problematic weeds in Sheridan County. Leafy spurge is a problem along the Big Muddy, primarily and baby's breath is generally a concern in the Westby-area. Canada thistle and hawksbeard are concerns county-wide. Weeds displace grass and native species and cause problem with crop production, degrading plant condition in all land uses. Decreased tillage, increased grazing management, and pest management are weed management practices that could increase desired plant condition.

There is a lot of potential for increased management on rangeland in the county. Inadequate livestock water and lack of rotational grazing are the leading factors contributing to uneven grazing distribution; some areas tend to be over-utilized while others are only lightly grazed or not grazed. This causes a shift in the plant community replacing quality forage grasses and wildlife habitat with invasive or undesirable species. Watering facilities, water wells, pipelines, and prescribed grazing are all practices that can be utilized to help meet this resource concern.

Small or Odd-Shaped Crop Fields

The size of farm equipment continues to increase as the industry attempts to maximize efficiency in crop production. Equipment has outgrown the ability to farm on every acre causing farmers to go over each acre more times a year. Some fields are now just too small and some areas in larger fields are too

oddly shaped to economically crop. These types of fields occur throughout all of Sheridan County, and continue to occur as agricultural equipment gets bigger. As equipment gets large, efficiency drops on small and odd-shaped fields. There is a need, and much interest in converting small, odd-shaped, or marginal annual cropland to perennial cover in Sheridan County. There are many conservation benefits by converting these marginal areas to perennial cover.

- Optimizing field designs will maximize the advantages of GPS guidance systems.
- Energy will be conserved by eliminating machinery operations on non-profitable acres and doubling up on fertilizer, seed, chemicals, and compaction.
- Perennial systems require far fewer nutrients and chemical inputs than annual crops.
- Nutrient and sediment runoff will decrease. Perennial plantings in areas along water features would act as a buffer to keep runoff out of the aquatic habitat.
- Soil erosion will be reduced.
- Perennial crop systems can reduce carbon emission, creating carbon-negative energy systems.
- Bird species richness and diversity and the diversity of plant and animal species, pollinators and methanotrophs[1] will increase. (Griffel, 2020).
- In some areas, soil salinity can be ameliorated by planting salt-tolerant perennial species.
- Better defined crop edges to prevent Canada thistle and other noxious weeds.

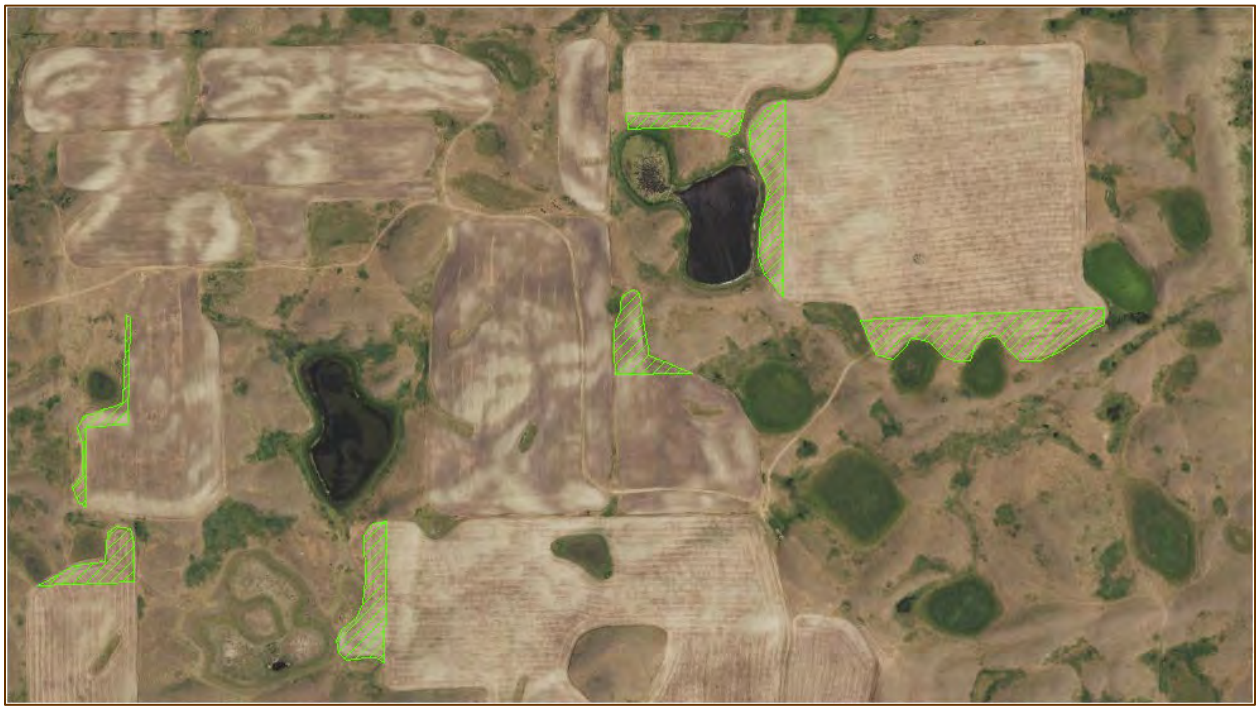


Figure 18. Example of the Application of Practices to Convert Subfields to Perennial Cover.

[1] Prokaryotes that metabolize methane as their source of carbon and energy. They can be either bacteria or archaea, can grow aerobically or anaerobically and require single-carbon compounds to survive.

Figure 18 shows randomly selected areas that could be converted to perennial cover to achieve the benefits described. In some cases, similar treatment could be applied to areas of fields that are susceptible to ephemeral gully erosion.

A desired outcome would be to develop conservation plans for any producer in Sheridan County who wishes to convert non-productive or difficult to access areas to perennial grass production or wildlife habitat to promote healthier soils, decrease nutrient and sediment loss, decrease energy use and expenses, and increase habitat for wildlife, pollinators, beneficial insects and soil micro fauna.

SECTION V NATURAL RESOURCE PRIORITIES

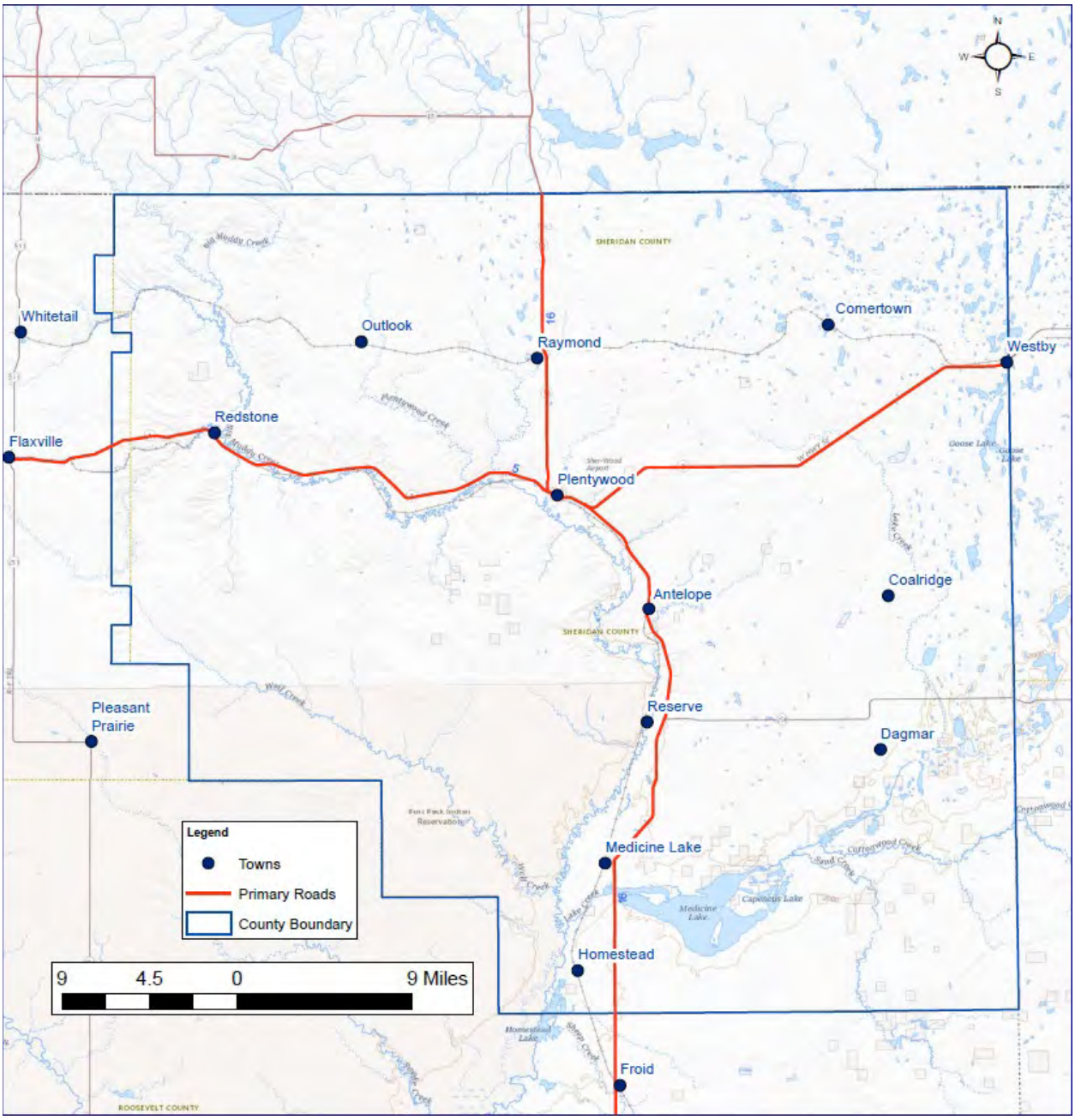
The Plentywood Field Office Long-Range Plan represents a dynamic resource conservation strategy. Long-Range planning is the new model for conservation delivery throughout Montana, but it must be recognized that the Field Office also has many other responsibilities, such as conservation compliance, emergency programs, Natural Resource Inventory (NRI), et cetera, which must be accomplished concurrently. The resource concerns below are listed in priority order, knowing that these will change over time as resource concerns in targeted areas are addressed or as new resource concerns are identified, and as other issues continue to influence natural resources conservation in Sheridan County.

The Sheridan County Local Working Group met in 2019 to discuss and prioritize natural resource concerns. Considering the results of the meeting, requests for assistance with resource conservation in the county and trends in resource use and agriculture, the Field Office has selected the following as priority resource concerns:

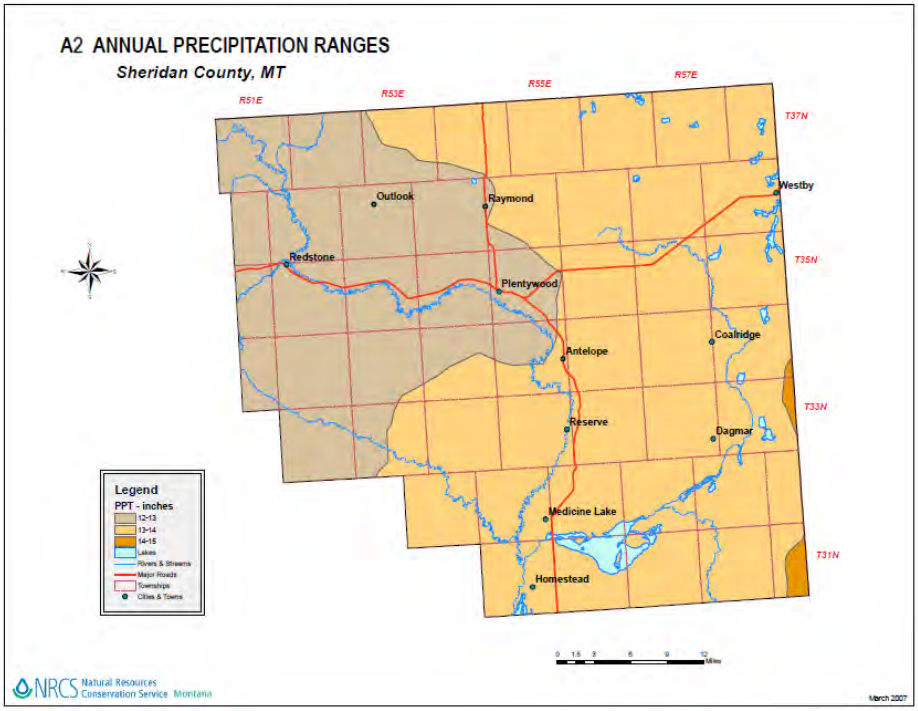
1. Soil Quality Limitations
2. Degraded Plant Condition
3. Terrestrial Habitat

APPENDIX A

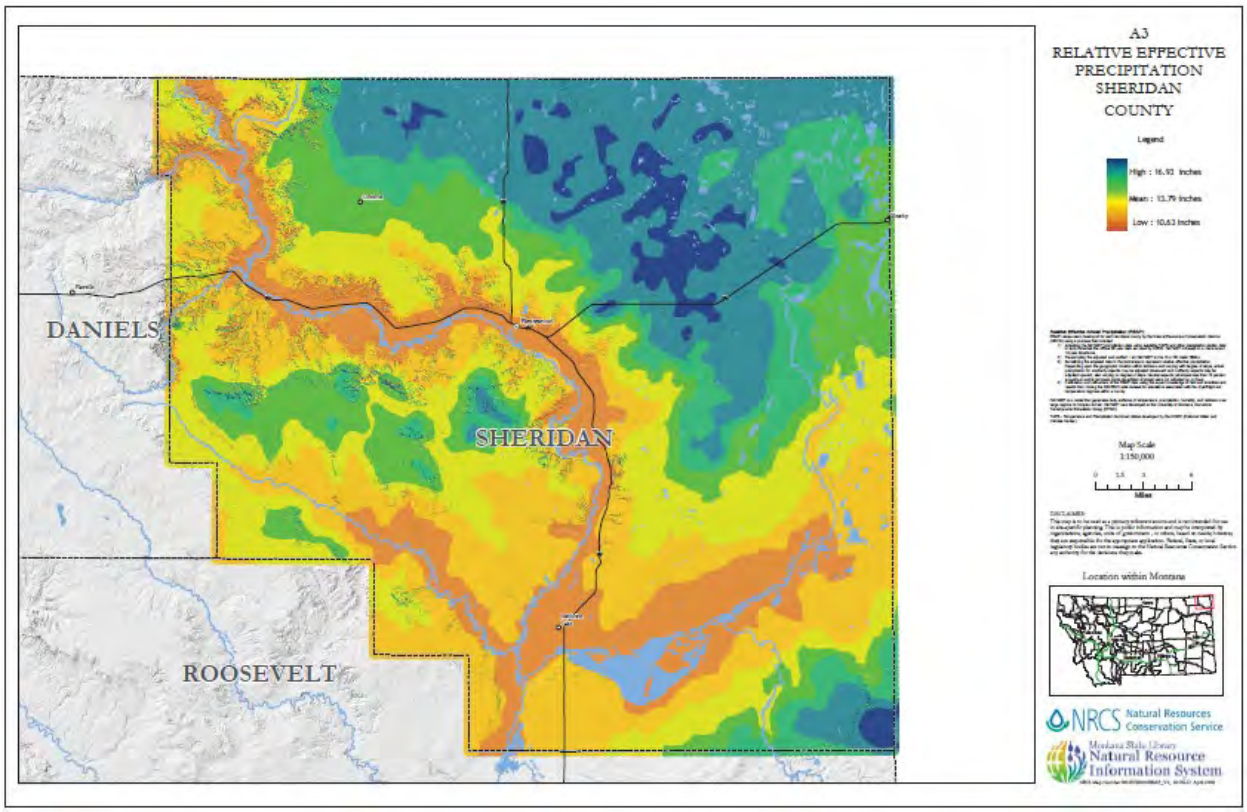
A1 Sheridan County



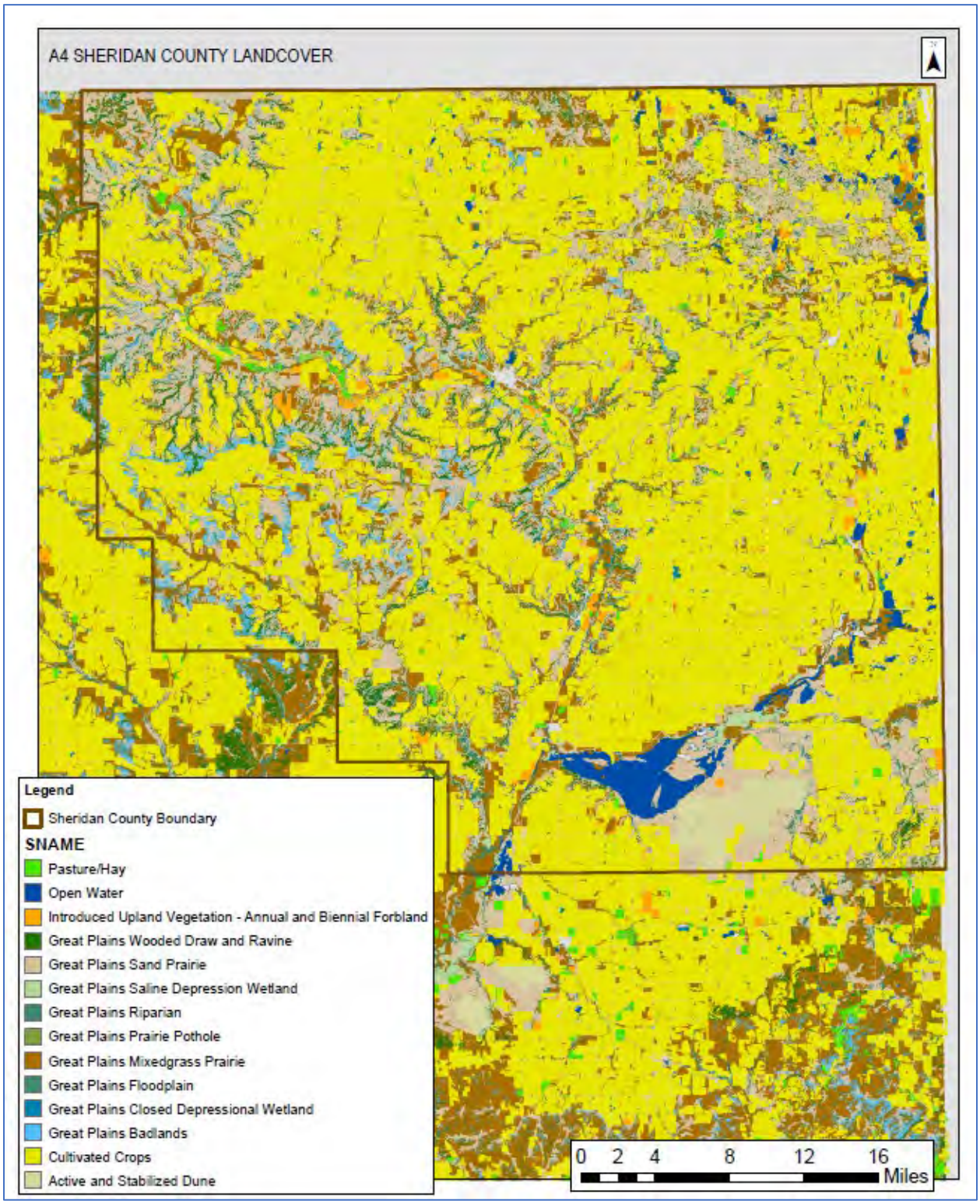
A2 Annual Precipitation



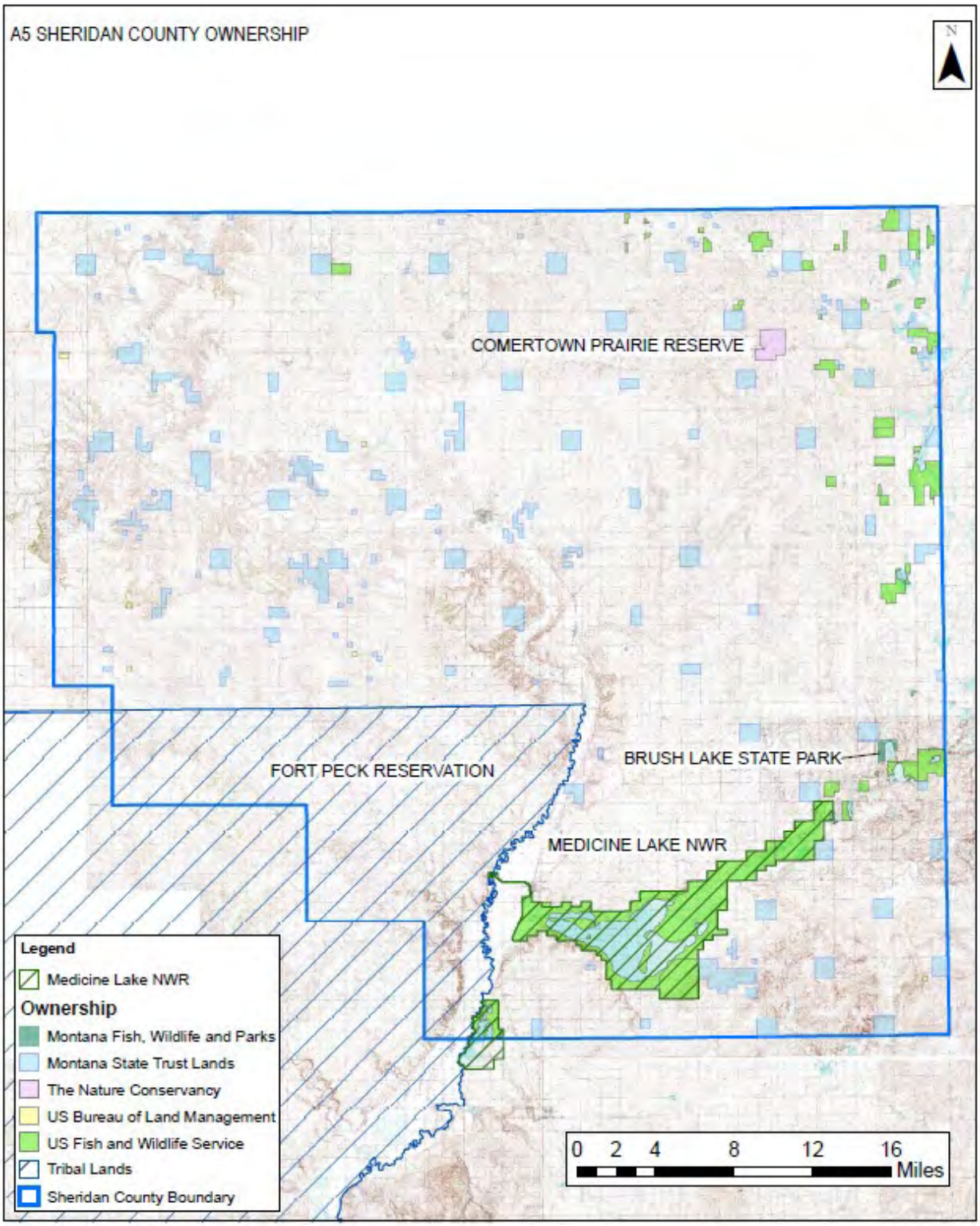
A3. Relative Effective Precipitation Sheridan County



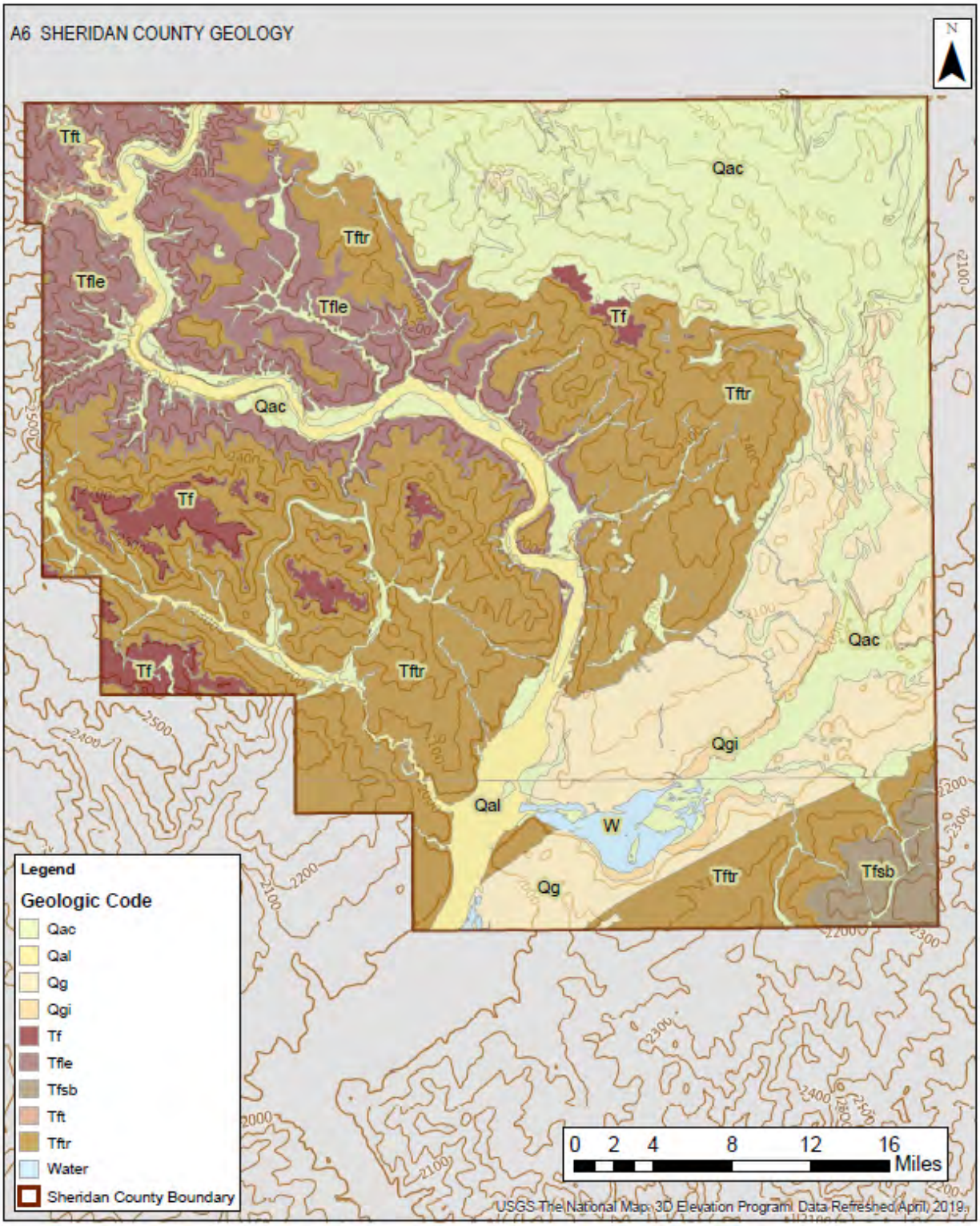
A4 Landcover



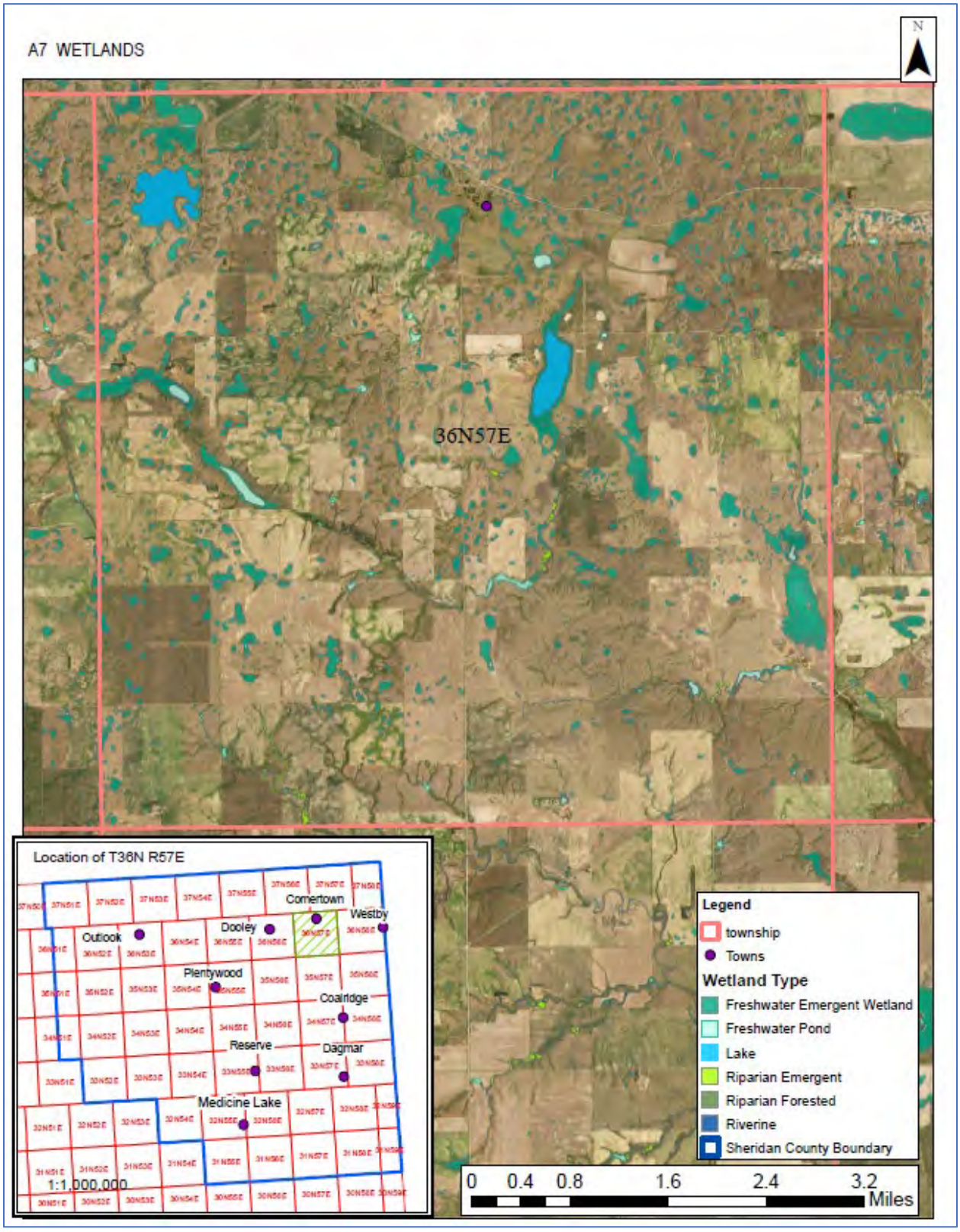
A5 Ownership



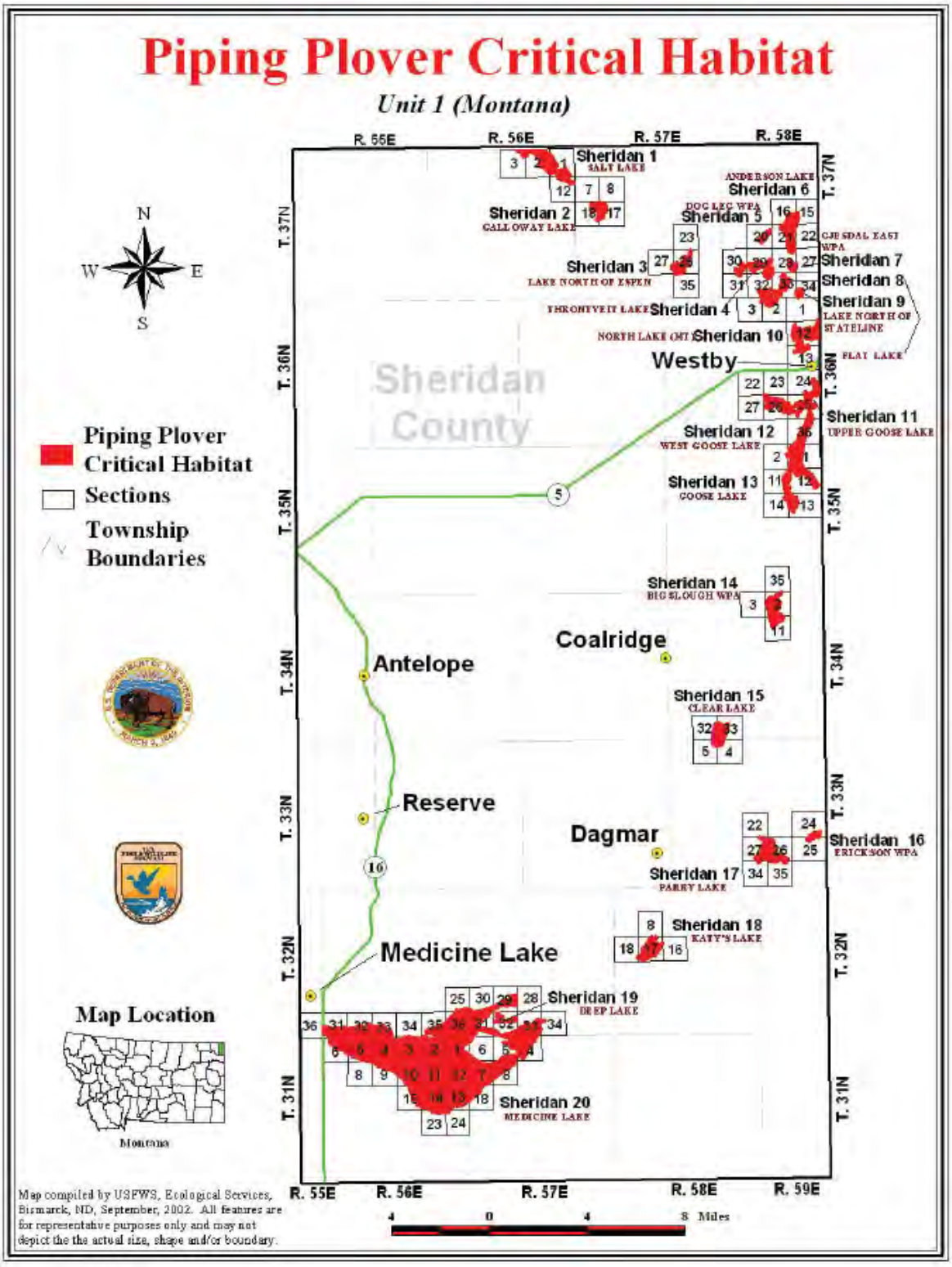
A6 Geology


A6 SHERIDAN COUNTY GEOLOGY
N
Tft
Qac
Tftr
Tfle
Tfle
Tf
Tftr
Qac
Tf
Tf
Tftr
Qac
Qgi
Qal
W
Tftr
Tfsb
Qg
Legend
Geologic Code
Qac
Qal
Qg
Qgi
Tf
Tfle
Tfsb
Tft
Tftr
Water
Sheridan County Boundary
0 2 4 8 12 16
Miles
USGS The National Map: 3D Elevation Program. Data Refreshed April, 2019.

A7 Wetlands


A7 WETLANDS
N
36N57E
Location of T36N R57E
Cornertown
Westby
Dooley
Outlook
Plentywood
Coalridge
Reserve
Dagmar
Medicine Lake
1:1,000,000
Legend
township
Towns
Wetland Type
Freshwater Emergent Wetland
Freshwater Pond
Lake
Riparian Emergent
Riparian Forested
Riverine
Sheridan County Boundary
0 0.4 0.8 1.6 2.4 3.2
Miles

A8 Piping Plover Critical Habitat



APPENDIX B

NRCS Success in Working with the Fort Peck Tribes and Its Members in Rangeland Conservation.

Paul Finnicum, USDA NRCS District Conservationist

With the assistance of the NRCS, the Fort Peck Tribes were one of the first Tribal governments to adopt an Agricultural Resource Management Plan (ARMP) which spelled out how the Tribes and its members wanted their natural resources to be taken care of. As a result of the adoption of the ARMP in 2014, the Tribes have developed a new land use policy, drought management plan, cultural resource review policy, and a programmatic Environmental Assessment tool, relying on NRCS standards and specifications to demonstrate how the land should be cared for meeting NEPA compliance. In 2014, the Tribes contributed $300,000 to start implementing the provisions of their ARMP on their native rangelands, specifically their 94 range units comprising over 320,000 acres. In 2015, they decided to apply for federal cost share assistance through the Environmental Quality Incentive Program (EQIP).

Since 2015, utilizing EQIP funding, the NRCS has accomplished the following working with the Tribes and its members:

- EQIP contracts on 20 Range Units with 18 different operators.
- Obligated $4,032,441.50 through EQIP, including $655,000 for fy19.
- Installed over 305 miles of wildlife friendly fence to facilitate management practices.
- Developed Prescribed Grazing Plans with a minimum of 4 pastures on 20 range units comprised of 75,140 acres.
- Performing range monitoring on all range units, including exclusions and photo plots on all 94 units totaling 320,000 acres.
- Controlled Noxious Weeds on over 100 acres.
- The Tribes have employed nearly 130 Tribal members to install the wildlife friendly fence since 2014.

The Fort Peck Tribes also have established their own cost share program for range improvements. The Tribes dedicate $3.00 per AUM from range fees for conservation called the Range Improvement Fund. In the past 5 years, utilizing NRCS conservation planning, standards & specifications, they have installed 62 miles of wildlife friendly fence on 20 range units made up of 12,776 acres with prescribed grazing plans containing a minimum of 4 pastures, including monitoring and numerous water developments.

Totals with NRCS Conservation Planning and Financial Assistance:

- Wildlife friendly fence to facilitate management- 367 miles
- Prescribed Grazing Plans with minimum of 4 pastures – 40 Range Units – 87,916 acres
- Rangeland Monitoring for utilization and distribution utilizing both exclusions and photo plots- 320,000 acres.
- Noxious Weed Control- 100 acres.
- Expanded the Tribal Buffalo herd from 44 animals on 2500 acres, to nearly 500 head on nearly 26,000 acres.

APPENDIX C

C1 Sheridan County Animal Species of Concern

Species	Scientific Name	Common Name	Habitat
Mammals	*Blarina brevicauda*	Northern Short-tailed Shrew	Wetlands
	Lasiurus cinereus	Hoary Bat	Riparian and forest
	Myotis lucifugus	Little Brown Myotis	Generalist
	Sorex arcticus	Arctic Shrew	Wet meadows
	Sorex preblei	Preble's Shrew	Sagebrush grassland
Birds	*Ammospiza leconteii*	LeConte's Sparrow	Prairie wetland
	Ammospiza nelsoni	Nelson's Sparrow	Prairie wetland
	Anthus spragueii	Sprague's Pipit	Grasslands
	Aquila chrysaetos	Golden Eagle	Grasslands
	Ardea herodias	Great Blue Heron	Riparian forest
	Athene cunicularia	Burrowing Owl	Grasslands
	Botaurus lentiginosus	American Bittern	Wetlands
	Buteo regalis	Ferruginous Hawk	Sagebrush grassland
	Calcarius ornatus	Chestnut-collared Longspur	Grasslands
	Centronyx bairdii	Baird's Sparrow	Grasslands
	Charadrius melodus	Piping Plover	Prairie lakes & river shorelines
	Chlidonias niger	Black Tern	Wetlands
	Cistothorus platensis	Sedge Wren	Prairie wetland
	Coturnicops noveboracensis	Yellow Rail	Wetlands
	Dolichonyx oryzivorus	Bobolink	Moist grasslands
	Grus americana	Whooping Crane	Wetlands
	Hydroprogne caspia	Caspian Tern	Large rivers, lakes
	Lanius ludovicianus	Loggerhead Shrike	Shrubland
	Leucophaeus pipixcan	Franklin's Gull	Wetlands
	Numenius americanus	Long-billed Curlew	Grasslands
	Nycticorax nycticorax	Black-crowned Night-Heron	Wetlands
	Pelecanus erythrorhynchos	American White Pelican	Lakes, ponds, reservoirs
	Plegadis chihi	White-faced Ibis	Wetlands
	Podiceps auritus	Horned Grebe	Wetlands
	Rhynchophanes mccownii	McCown's Longspur	Grasslands
	Spizella breweri	Brewer's Sparrow	Sagebrush
	Sterna forsteri	Forster's Tern	Wetlands
	Sterna hirundo	Common Tern	Large rivers, lakes
Reptiles	*Chelydra serpentina*	Snapping Turtle	Prairie rivers and streams
	Heterodon nasicus	Plains Hog-nosed Snake	Friable soils
	Opheodrys vernalis	Smooth Greensnake	Wetlands
Amphibian	*Anaxyrus cognatus*	Great Plains Toad	Wetlands, floodplain pools
Fish	*Chrosomus eos*	Northern Redbelly Dace	Small prairie rivers
	Etheostoma exile	Iowa Darter	Small prairie rivers
	Margariscus nachtriebi	Northern Pearl Dace	Small prairie streams
Insects	*Hesperia ottoe*	Ottoe Skipper	Grasslands

C2 Sheridan County Plant Species of Concern

Family	Common Name	Scientific Name	Habitat
Aster/Sunflowers	Alkali Marsh Aster	*Almutaster pauciflorus*	Mesic grasslands
Milkweeds	Ovalleaf Milkweed	*Asclepias ovalifolia*	Prairie
Pea Family	Pottery Milkvetch	*Astragalus ceramicus var. filifolius*	Sandy sites, sand dunes
Myrsine Family	Chaffweed	*Centunculus minimus*	Wetland/Riparian
Amaranth (Pigweed) Family	Smooth Goosefoot	*Chenopodium subglabrum*	Sandy sites
Borage Family	Fendler Cat's-eye	*Cryptantha fendleri*	Sandy sites
Pea Family	Silky prairie clover	*Dalea villosa*	Sandy sites
Bellflower Family	Kalm's Lobelia	*Lobelia kalmii*	Wetland/Riparian
Bellflower Family	Pale-spiked Lobelia	*Lobelia spicata*	Moist meadows
Mustards	Silver Bladderpod	*Physaria ludoviciana*	Sandy sites
Primrose Family	Mealy Primrose	*Primula incana*	Wetland/Riparian
Sedges	River Bulrush	*Bolboschoenus fluviatilis*	Wetland/Riparian
Sedges	Small-winged Sedge	*Carex stenoptila*	Grasslands
Sedges	Many-headed Sedge	*Carex sychnocephala*	Wetland/Riparian
Sedges	Schweinitz's Flatsedge	*Cyperus schweinitzii*	Sandy sites
Sedges	Slender Bulrush	*Schoenoplectus heterochaetus*	Wetland/Riparian
Irises	Northern Blue-eyed-grass	*Sisyrinchium septentrionale*	Wetland/Riparian

APPENDIX D

D1 Sheridan County Ground-Water Fact Sheet

FACT SHEET

SHERIDAN COUNTY GROUND-WATER MANAGEMENT PROGRAM
MANAGING A WATER RESERVATION FROM THE CLEAR LAKE AQUIFER
BY MONITORING IMPACTS OF IRRIGATION

- A very significant water resource in eastern Montana occupies a broad valley formed by the ancestral Missouri River. The Clear Lake aquifer contains sand and gravel deposited by the ancestral Missouri River and by later glacial meltwater streams. These deposits form a complex aquifer system with some areas capable of supporting high yield irrigation wells.

- Of concern is the fact that close to 1,000 oil wells have been drilled in Sheridan County over the underlying aquifer. Lakes and wetlands cover thousands of acres overlying the Clear Lake aquifer. These lakes are important habitat for migratory birds and other wildlife. The U.S. Fish and Wildlife Service (USFWS) Medicine Lake Wildlife Refuge manage many of these lakes and wetlands. The USFWS is concerned that irrigation withdrawals will deplete water from the wetlands and lakes diminishing the value of the habitat.

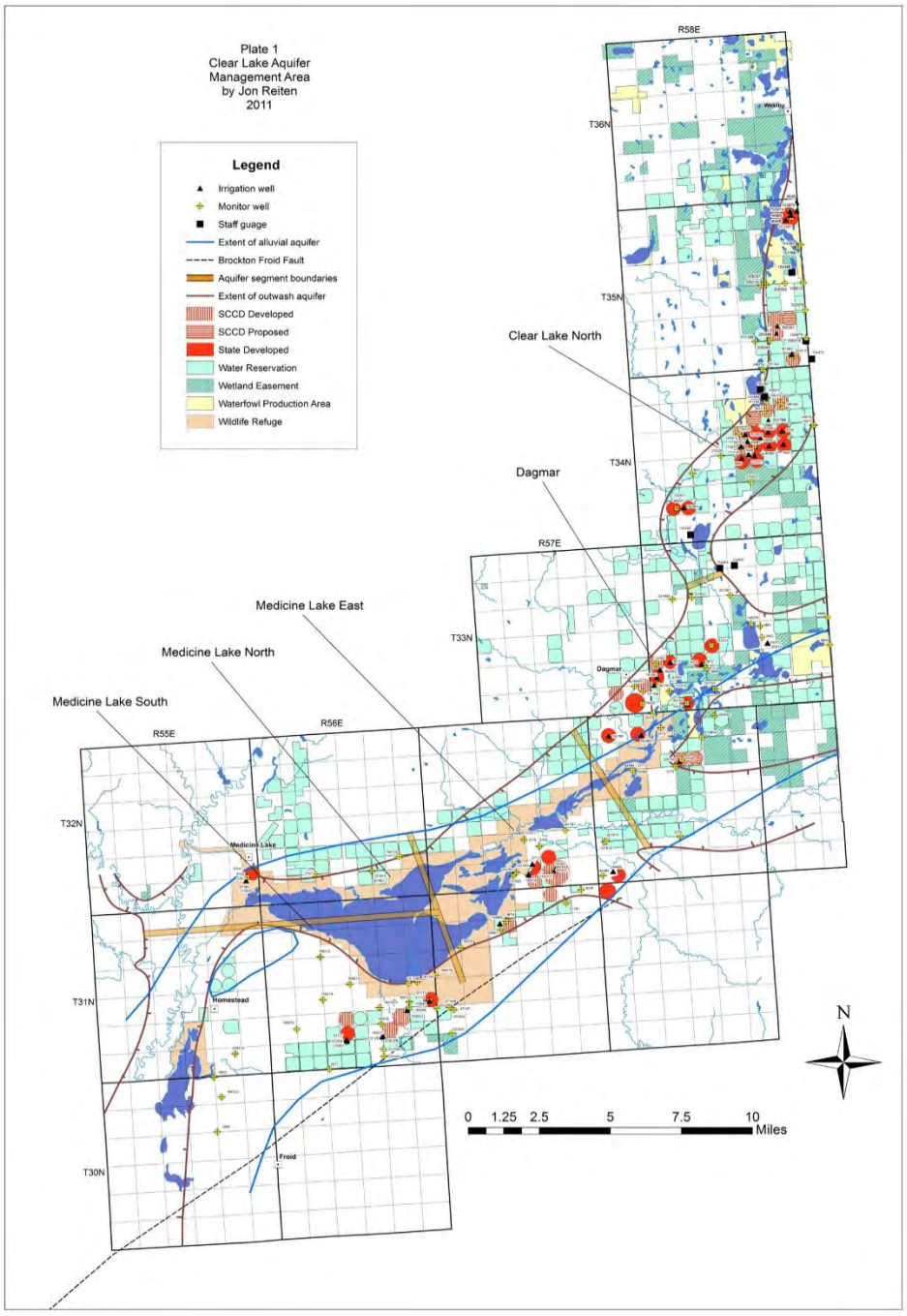
- The Sheridan County Conservation District (SCCD) was authorized to manage 15,479-acre-feet of water from the Clear Lake aquifer as part of a water reservation in 1994. DNRC stipulated that the SCCD could begin permitting for the use of up to 10,000 acre-feet of the water. Once this cap was reached permitting would be suspended until it was shown that allocating additional water would not negatively impact other water resources. As the result of these mandates the SCCD has been evaluating and carefully addressing potential concerns related to increased groundwater development through their permitting system. Continued groundwater and surface-water data need to be collected and interpreted to determine if the additional water can be developed.

- The SCCD, though its technical advisory committee, has developed an effective water management and monitoring program that provides data, interpretations, and recommendations to allocate water from the Clear Lake aquifer. Maintaining this monitoring program is critical to evaluate existing and future applications, determining multi-aquifer (both quality and quantity), and evaluating impacts on other water uses.

- Funding to support this program has come from the DNRC Renewable Resource Grant Program and through the USFWS. The DNRC has stated that no more funds would be available from this source. The USFWS continues to offer some funding on a year by year basis.

- A new source of state supported funding needs to be developed to continue this management and monitoring effort. A similar level of monitoring and management, in the past, has cost $50,000 per year. The SCCD has determined that $35,000 per year is needed to maintain this critical program.

D2 Clear Lake Aquifer Management Area Map



(Reiten, 2011)

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