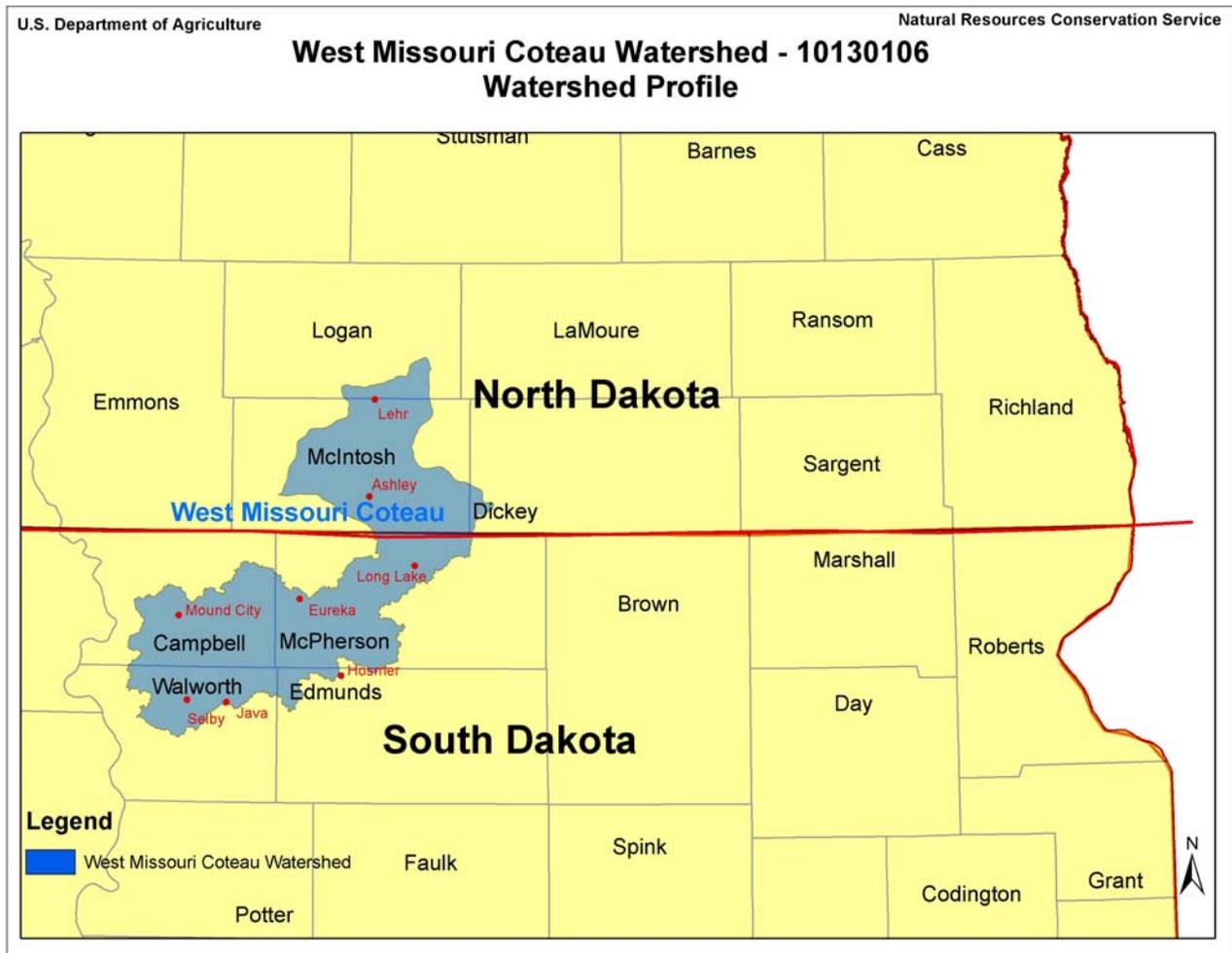


NORTH DAKOTA AND SOUTH DAKOTA Rapid Watershed Assessment



SEPTEMBER 2009

Produced by:

United States Department of Agriculture
Natural Resources Conservation Service

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Huron, South Dakota 57350



WEST MISSOURI COTEAU - 10130106 8-DIGIT HYDROLOGIC UNIT PROFILE

USDA Natural Resources Conservation Service (NRCS)

September 2009

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USDA Natural Resources Conservation Service

September 2009

West Missouri Coteau

North Dakota (ND) and South Dakota (SD)

Rapid Watershed Assessment Project

Sponsored by:

SD Association of Conservation Districts

SD Department of Environment and Natural Resources

SD Department of Agriculture

SD Department of Game, Fish, and Parks

Campbell County Conservation District

Edmunds County Conservation District

McPherson County Conservation District

Walworth Conservation District

ND Department of Health

ND Association of Soil Conservation Districts

James River Soil Conservation District

Logan County Soil Conservation District

McIntosh County Soil Conservation District

Executive Summary

A Rapid Watershed Assessment (RWA) document compiles existing resource information and data within a watershed and is used to assist conservation districts, landowners, and other community organizations and stakeholders to identify where conservation investments are best utilized and set resource conservation goals. The RWA contains summaries of resource concerns and opportunities that are useful for a number of resource conservation activities. Local landowners and organizations can use the RWA as a basis to prioritize resource concerns and estimate the technical and financial resources required to achieve their resource conservation goals within the watershed. The assessment provides information that can be used to develop conservation district annual and long-range plans, or establish a foundation for more detailed watershed, area wide, or site-specific natural resource planning and the development of implementation plans.

A RWA provides sufficient information to help facilitate making some key resource management decisions. The RWA:

- Provides a quick and inexpensive source of information on which to base decisions about conservation priorities, allocation of resources, funding for implementation, and how to report outcomes/results.
- Supplies enough detail to identify conservation activities that can be implemented without waiting on further watershed-level studies or analyses.
- Provides a preliminary source of information for standard environmental evaluations.
- Identifies if there is a need for further detailed analysis or watershed studies.
- Determines if there are infrastructure needs.
- Addresses multiple concerns and objectives of landowners and communities.
- Enhances established local, state, and federal partnerships.
- Enables landowners and communities to decide on the best mix of Natural Resources Conservation Service (NRCS) programs and other funding sources to meet their resource concerns/needs.
- Evaluates availability of conservation program tools (cost-share, easements, and technical assistance).

The RWAs consist of two parts: the watershed profile which provides the physical, biological, and sociological characterization of the watershed resources; and the watershed assessment which defines the identified resource concerns and evaluates the effectiveness, the extent, and the associated costs of the conservation practices that address the identified resource concerns.

The RWAs are developed based on the first six steps of the NRCS conservation resource planning process on a watershed scale. The information is general in nature and is not sufficiently detailed to be used in lieu of an area wide or watershed plan when the identified resource concerns require specific information, for example, flood prevention or control. However, the information does provide a solid starting point for local stakeholders to use should they decide to proceed with a more detailed area wide or watershed planning effort or the development of a watershed implementation plan using existing NRCS conservation programs.

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I. WATERSHED PROFILE

1.0 PURPOSE

The watershed resource profile compiles the most recent, readily-available data which provides a physical, biological, and sociological characterization of watershed resources. The profile inventories the current resource health and condition of the soil, water, plants, animals, and social resources of a watershed and identifies the known resource concerns. The watershed profile also provides a brief overview of the social and economic composition of the watershed.

The profile summary of the resource conditions, concerns, and opportunities is useful for a number of conservation activities. Local landowners and organizations can use the information to prioritize resource concerns and estimate the technical and financial resources required to achieve resource conservation goals within the watershed. The information can be used to develop conservation district annual and long-range plans, establish a foundation for a more detailed watershed, area wide, or site-specific natural resource plan, or the development of an implementation plan.

2.0 INTRODUCTION

The West Missouri Coteau 8-Digit Hydrologic Unit Code (HUC) subbasin is 1,287,800 acres located in three counties in south central ND and four counties in north central SD. The watershed counties include Dickey, Logan, and McIntosh ND and Campbell, Edmunds, McPherson, and Walworth, SD.

The watershed lies along the western edge of the Prairie Pothole Region of the northern Great Plains. This region provides important habitats for migratory waterfowl and other wildlife, supporting more than 50 percent of North America's migratory waterfowl.

The dominant land use in the watershed is rangeland and pasture which accounts for 516,200 acres or 40 percent of the watershed. Beef cattle production is the primary use of pasture and rangeland. Cultivated cropland, approximately 483,900 acres, or 38 percent of the watershed is used to produce corn, small grains, soybeans, and sunflowers. Alfalfa and grass hay are important forage crops and included in some crop rotations. Growing cash crops and hay, raising beef cattle, and dairying are the main agricultural enterprises. Agricultural production is a vital part of the local economic base.

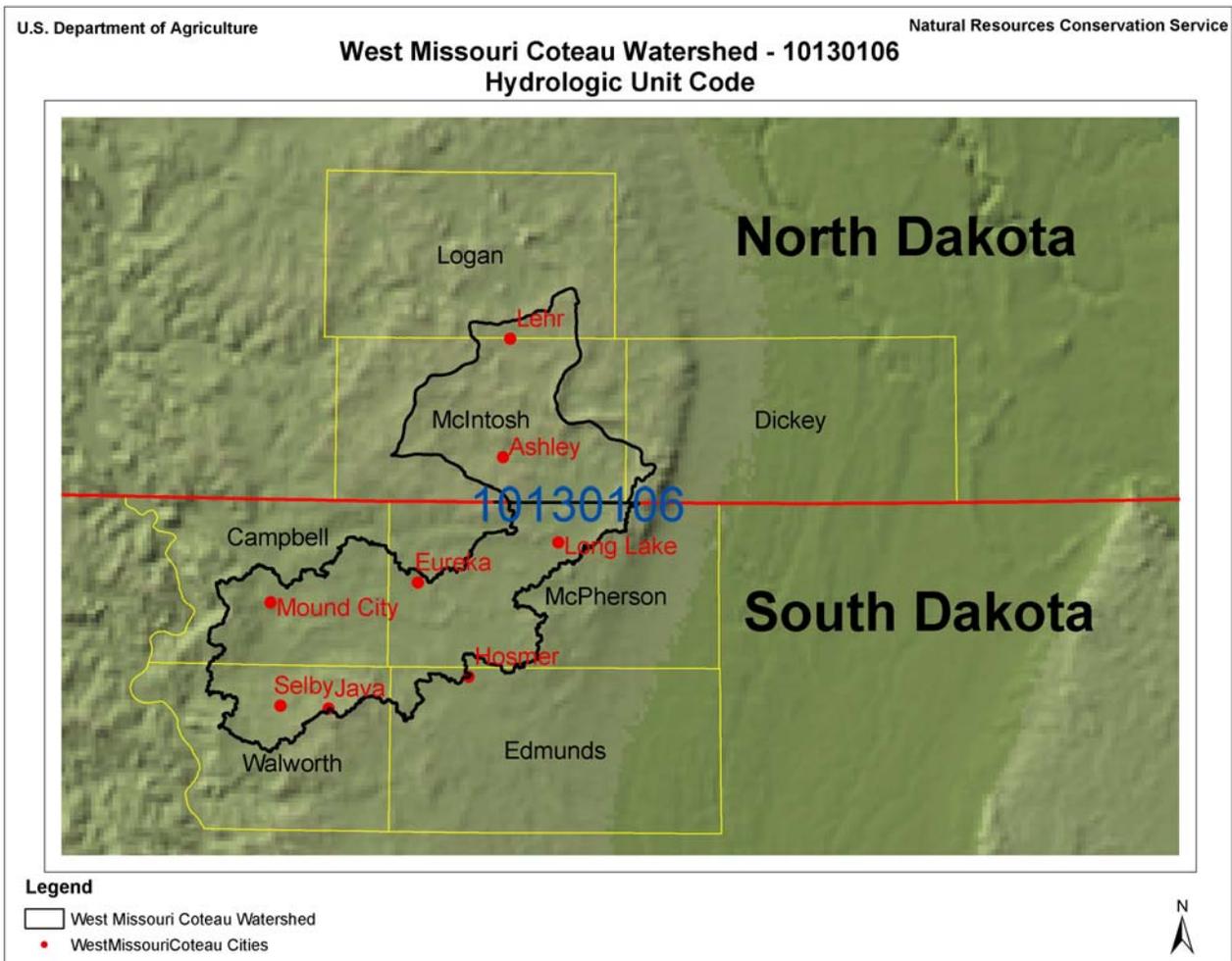
Conservation assistance is provided by seven NRCS service centers, two NRCS Area/Field Support Offices, two Resource Conservation and Development (RC&D) Areas, one RC&D applicant area, and seven Conservation Districts.

3.0 PHYSICAL DESCRIPTION

The physical description of the West Missouri Coteau subbasin provides a general description of the watershed location, geology, topography, precipitation, and climatic ranges.

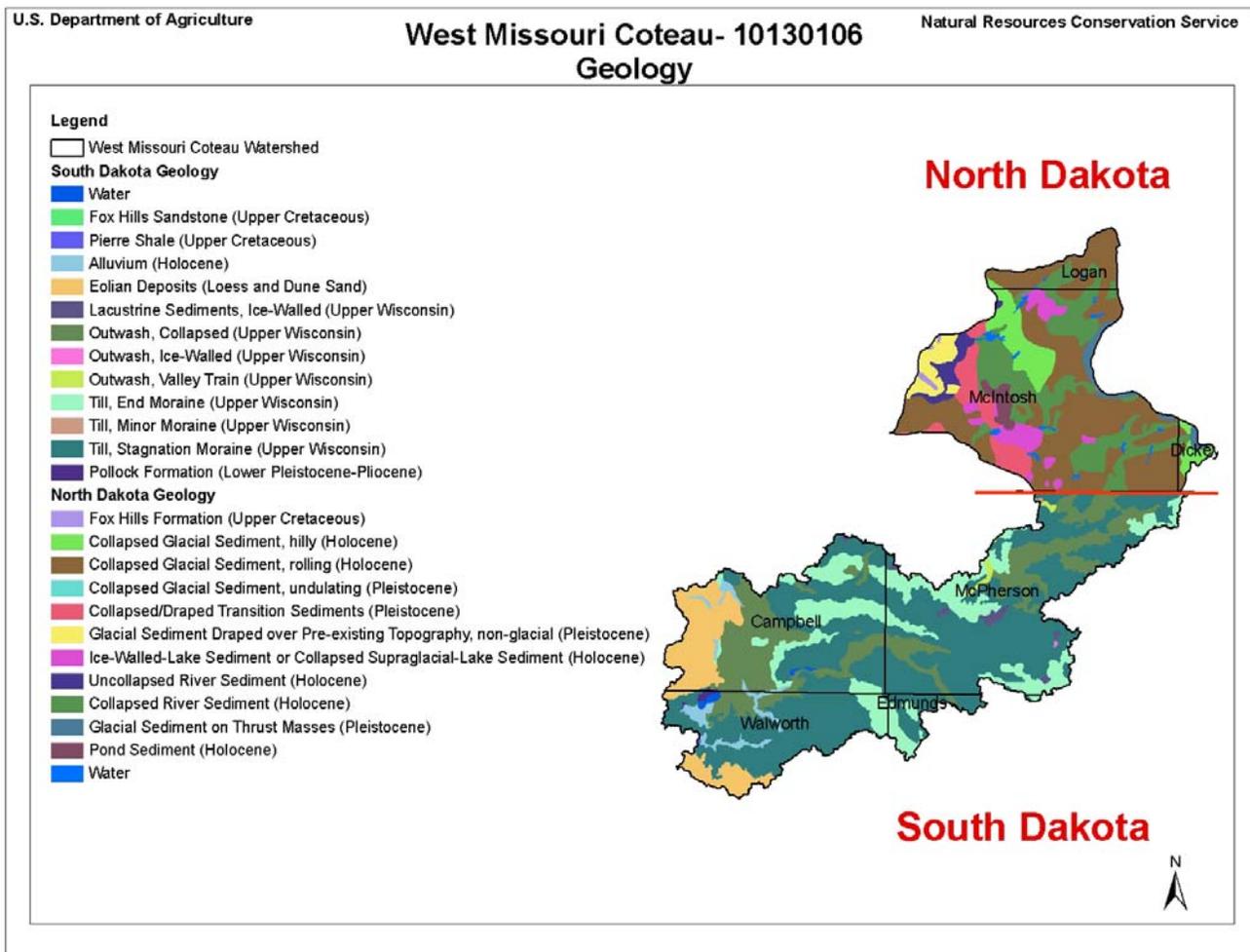
3.1 HYDROLOGIC UNIT CODE (HUC)¹

A HU is part of a multi-level watershed mapping classification system. The HU boundaries are defined by hydrographic and topographic criteria used to delineate areas of land that contribute surface water runoff to a designated outlet point, such as a lake or stream segment. The United States Geological Survey (USGS) designates HU drainage areas as subwatersheds (including smaller drainages) numbered with 12-digit HUCs, nested within watersheds (10-digit HUCs). Watersheds are combined into larger drainage areas called subbasins (8 digits), basins (6 digits), and subregions (4 digits), which make up the large regional drainage basins (2 digits).



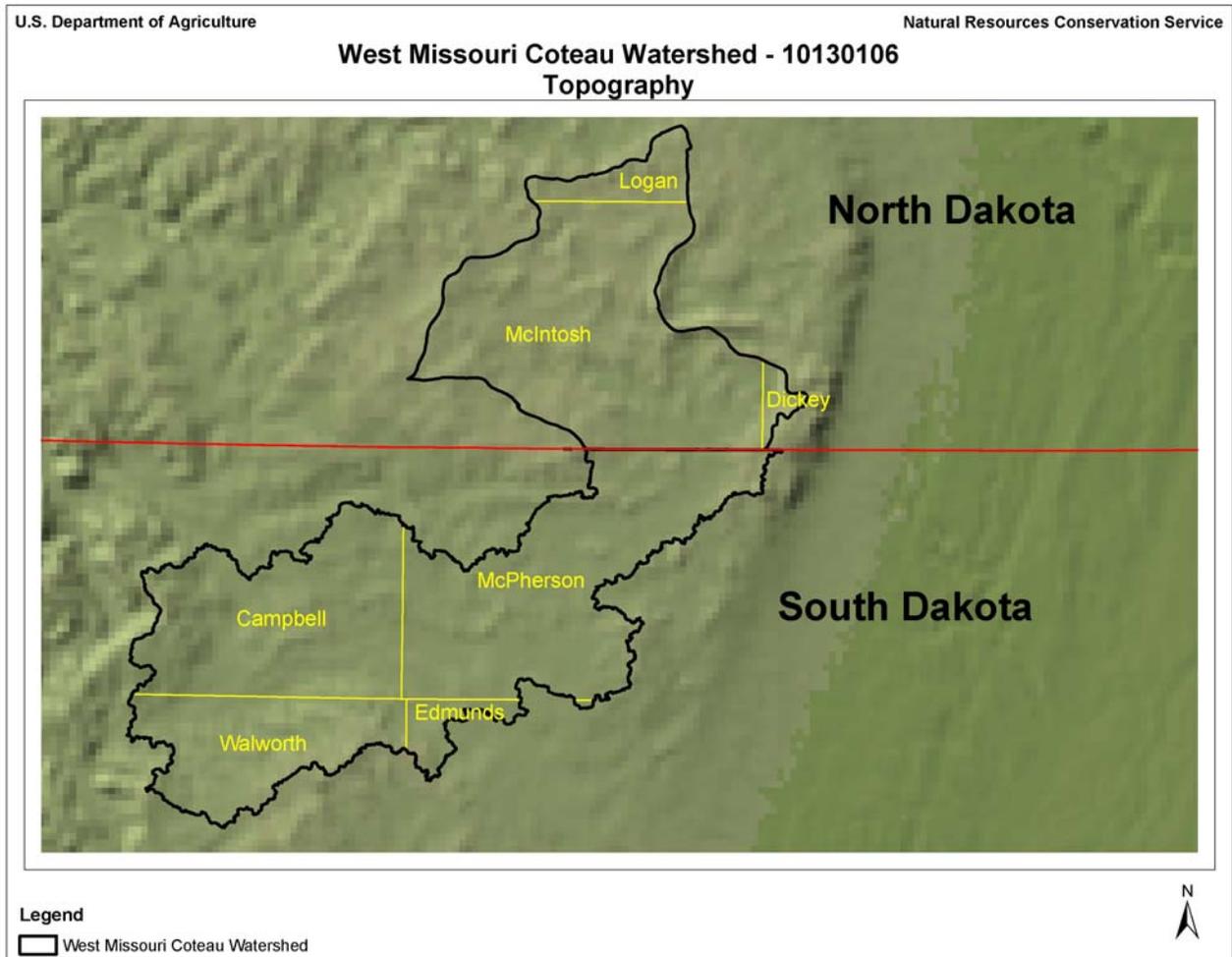
3.2 GEOLOGY^{2 3}

Precambrian metamorphic and igneous rock formations of granite, gneiss, limestone, sandstone, and shist underlie the entire watershed. A complex sequence of Cretaceous sedimentary rocks, predominantly marine in origin, directly overlies the Precambrian bedrock. The surface geology of the watershed was formed by a series of Pleistocene glacial events. Glacial drift, the debris deposited by moving ice and glacial streams, determined the geologic features of the watershed. An accumulation of glacial sediments (glacial till) was deposited directly from the ice as the glaciers advanced and retreated. The glacial till is generally an unconsolidated heterogeneous mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape. Thin sand and gravel layers occur erratically within and between the till layers. Glacial melt water streams formed localized, stratified deposits of well sorted clays, sands, and gravels (glacial outwash) as the glaciers receded. The glacial till commonly ranges between 100 and 300 feet thick, but may be in excess of 1,000 feet thick in some areas of the watershed. The upper 20 to 150 feet of the glacial till has been altered by weathering to gray smectitic clays.



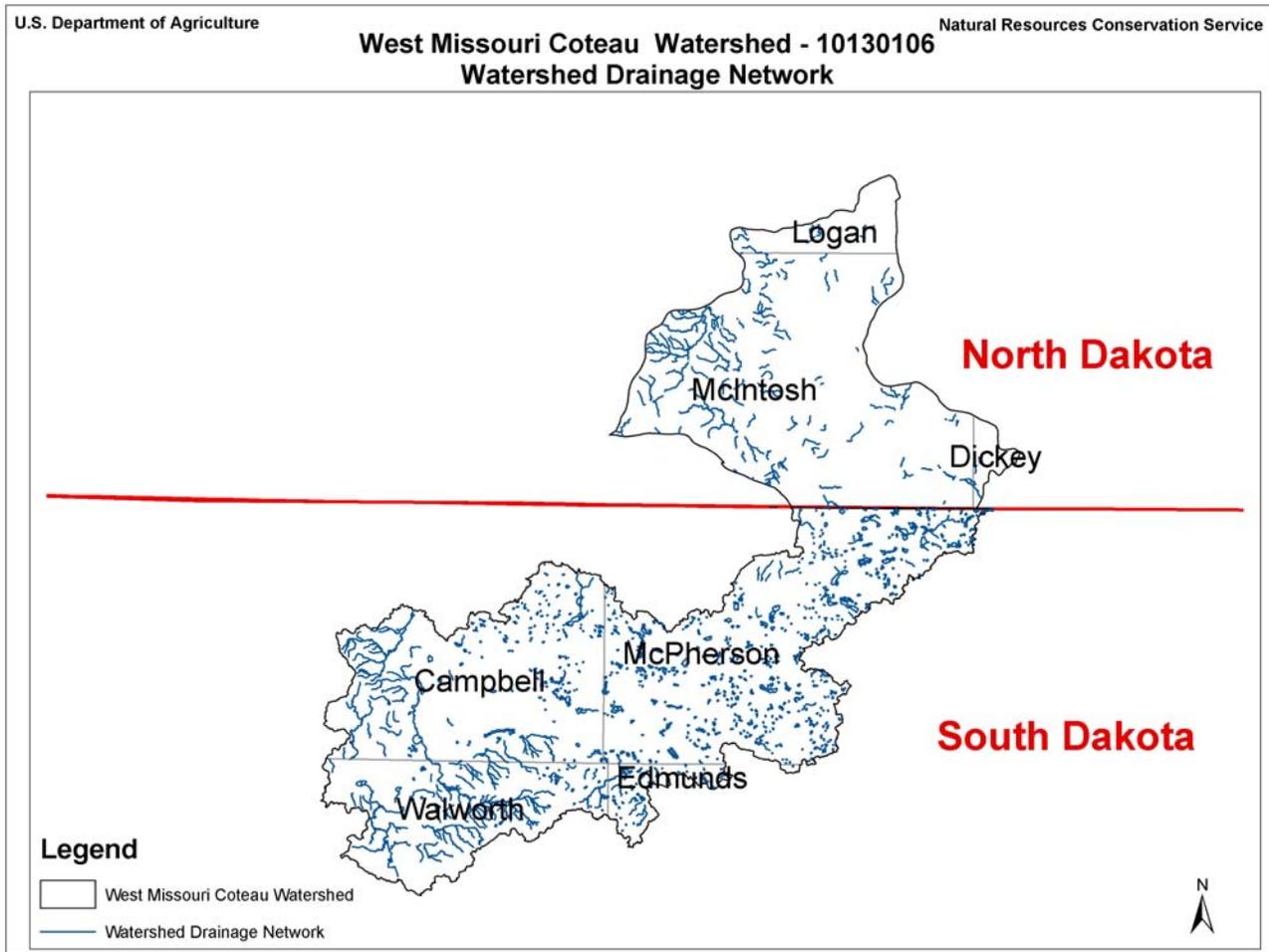
3.3 TOPOGRAPHY¹

The watershed is located in the Great Plains Physiographic Province and lies within the rolling uplands of the western Coteau du Missouri, part of the glaciated Missouri Plateau Region. Topography is gently rolling to steep, characteristic of hummocky glacial terrain.



3.4 DRAINAGE NETWORK

The drainage pattern in the watershed is poorly defined, characterized by many potholes and closed depressions. There are no major water courses within the watershed.



3.5 CLIMATE

The climate of the West Missouri Coteau watershed is semi-humid and continental, characterized by large seasonal fluctuations in temperature, long winters, warm summers with moderate to high relative humidity, and frequent high winds. Storms are generally of moderate intensity and short duration; localized convective, high intensity storms of short duration are common. Recurring periods of drought and near-drought conditions are common. Less frequently, periods of short duration yield higher than normal amounts of precipitation. Warm to hot summer months give way to cold winters. On the average, between 70 and 80 percent of the annual precipitation occurs from April through September, the growing season for most of the crops raised in the area, with the largest amount generally occurring in June. The average growing season ranges from 115 days to 130 days with the last killing frost in mid-May and the first killing frost in mid-September. Many freeze-thaw events occur in the fall and early spring.



WEST MISSOURI COTEAU - 10130106 8-DIGIT HYDROLOGIC UNIT PROFILE

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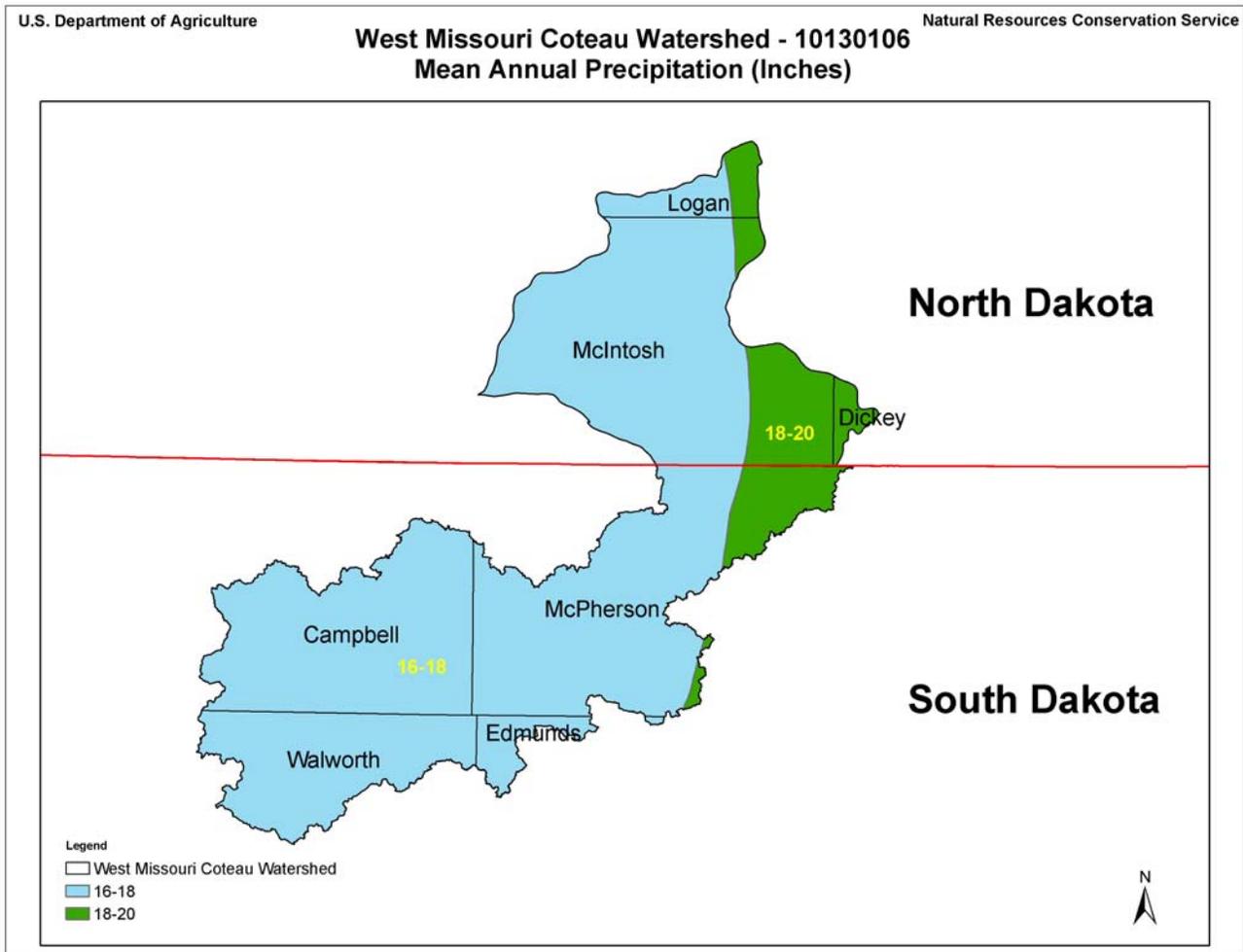
September 2009

It is estimated that more than 75 percent of the annual runoff occurs during the four-month period of March through June. The high runoff in March and April is usually from snowmelt while the runoff in May and June is from rainfall. Heavy runoff during the summer months is caused by brief, intense thunderstorms. Annual runoff can vary widely from year to year; the average annual runoff totals 1.25 inches. Most of the tributaries will show periods of low or no flow almost every year during the fall and winter months.

The historical data records for average temperature, wind speed, and relative humidity data used to represent the watershed are from the Mobridge, SD municipal airport and the Ashley, ND National Weather Service Reporting Station.

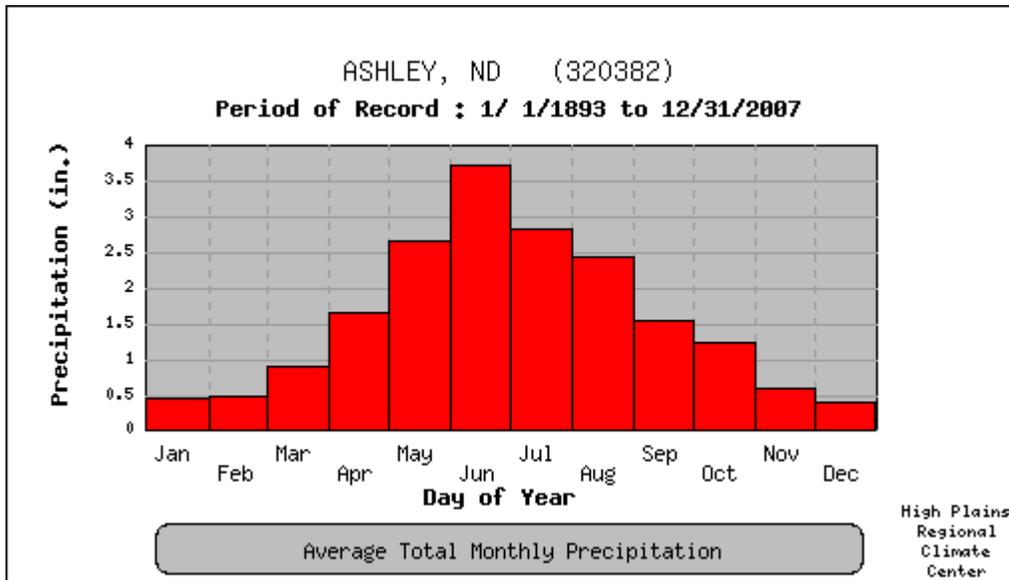
3.5.1 Precipitation⁴

The average annual precipitation for the watershed area is 18.1 inches per year measured at the Ashley, ND Weather Service Reporting Station.



3.5.1a Precipitation Distribution Graph

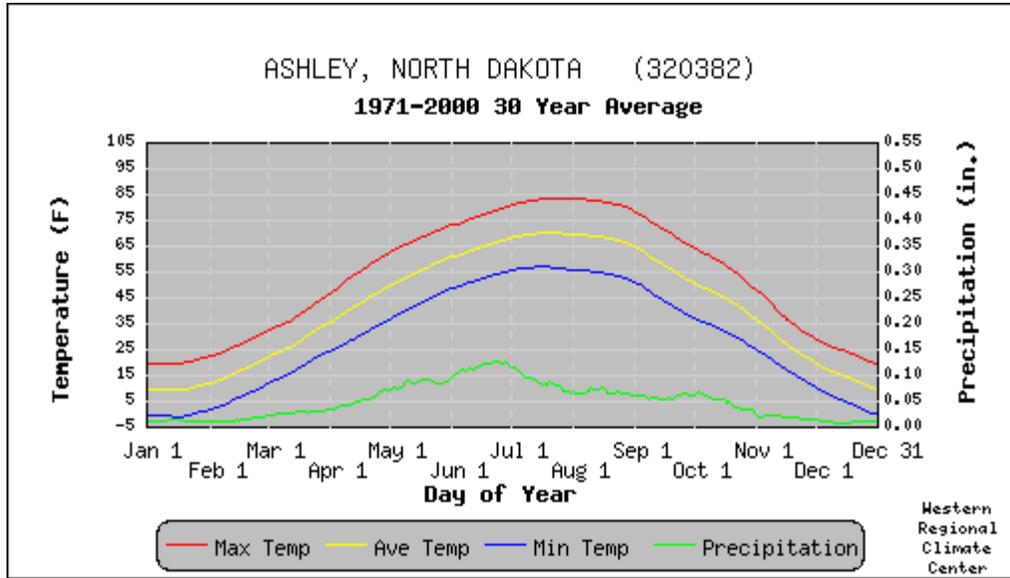
Period of Record - Monthly Average Total Precipitation



 - Average precipitation recorded for the month.

3.5.2 Average Monthly Temperature⁵

Temperatures vary considerably throughout the year. The average winter temperature is 19 degrees F and the average summer temperature is 72 degrees F. Extreme temperatures for the year often range from below zero in the winter to an occasional 100 plus degree summer day.

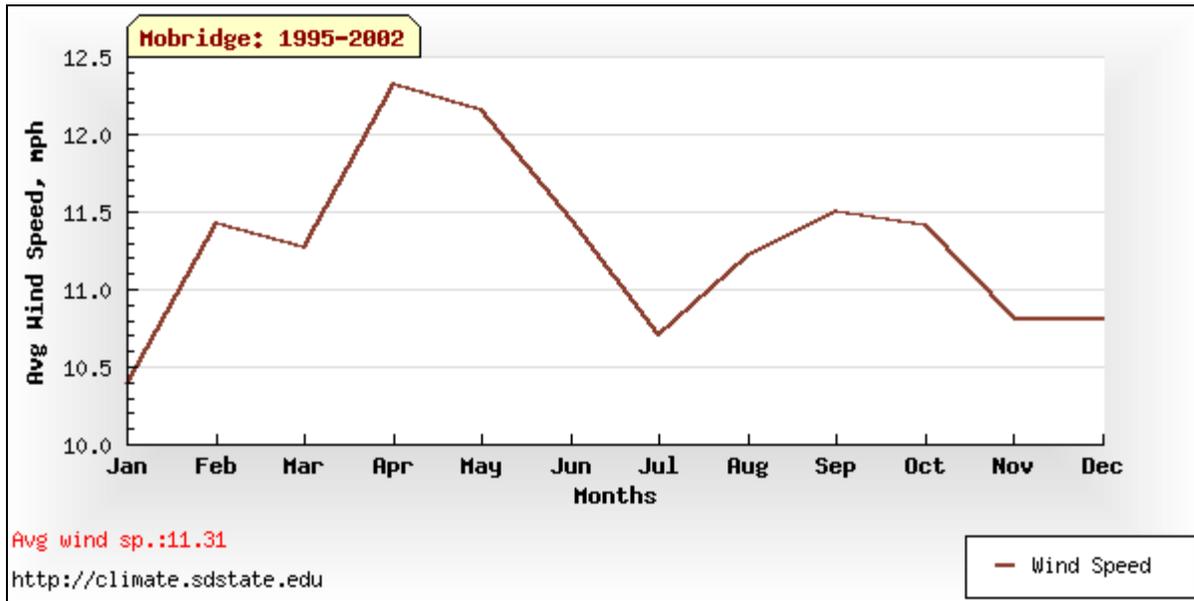


Data is smoothed using a 29 day running average.

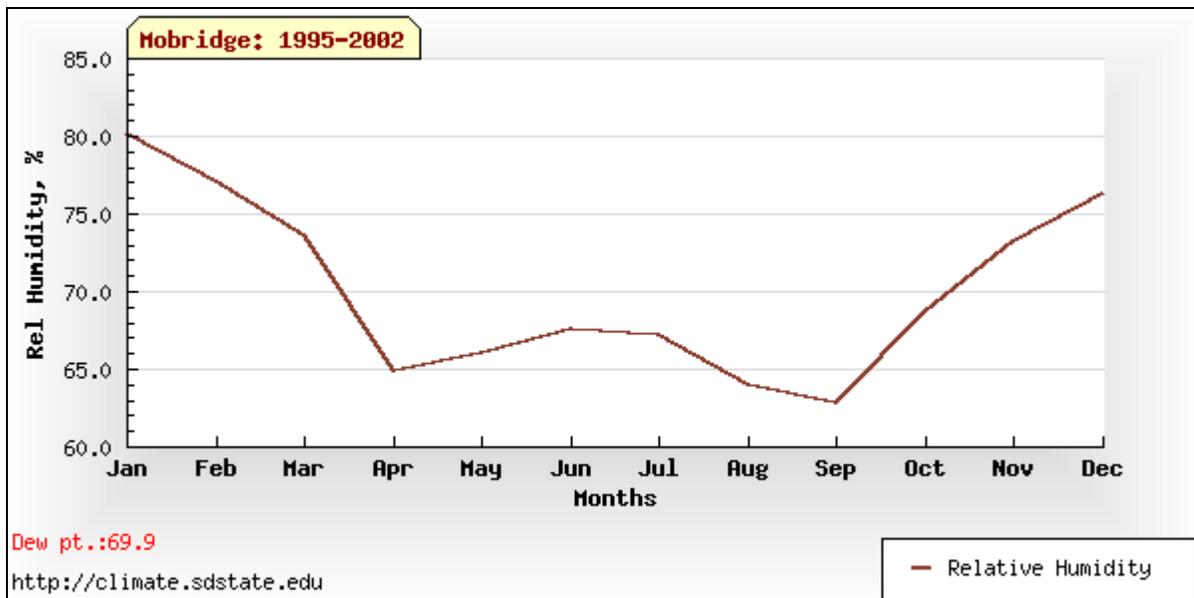
- Maximum Temp. is the average of all daily maximum temperatures recorded for the day of the year between the years 1971 and 2000.
- Average Temp. is the average of all daily average temperatures recorded for the day of the year between the years 1971 and 2000.
- Minimum Temp. is the average of all daily minimum temperatures recorded for the day of the year between the years 1971 and 2000.
- Precipitation is the average of all daily total precipitation recorded for the day of the year between the years 1971 and 2000.

Average Monthly Wind Speed⁵

Average Wind

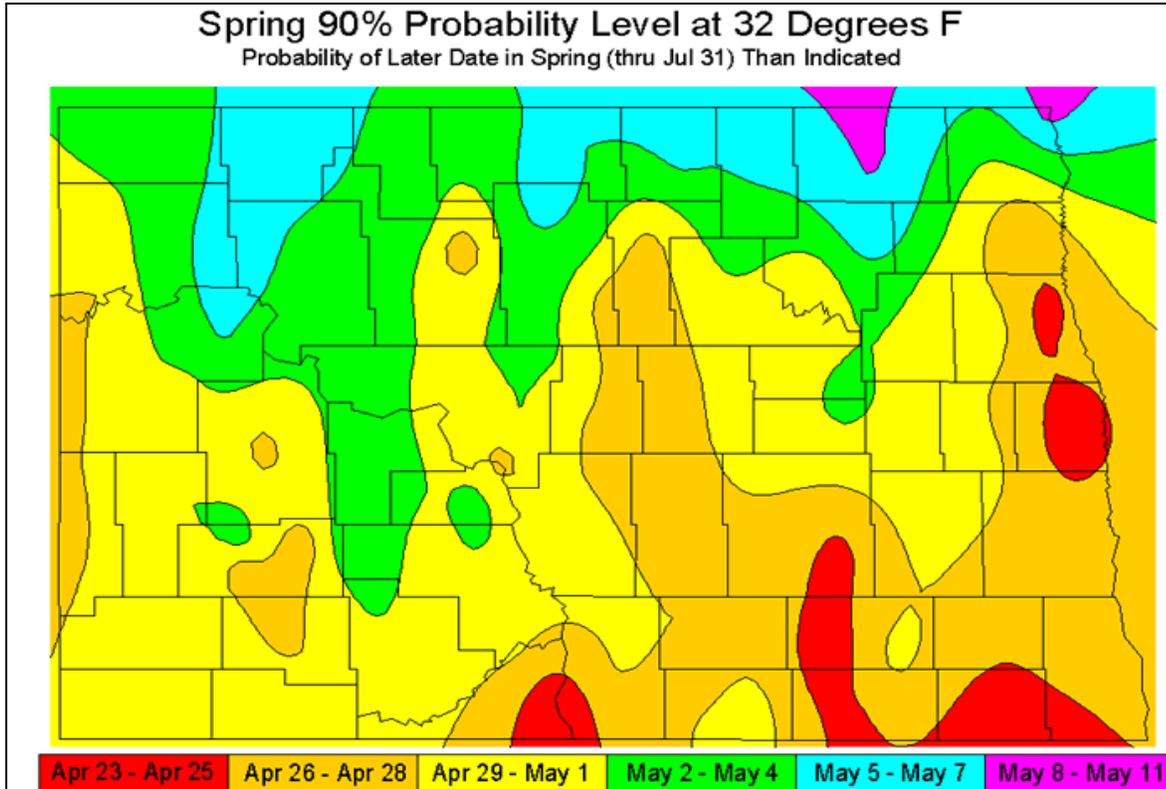


3.5.4 Average Monthly Relative Humidity⁵

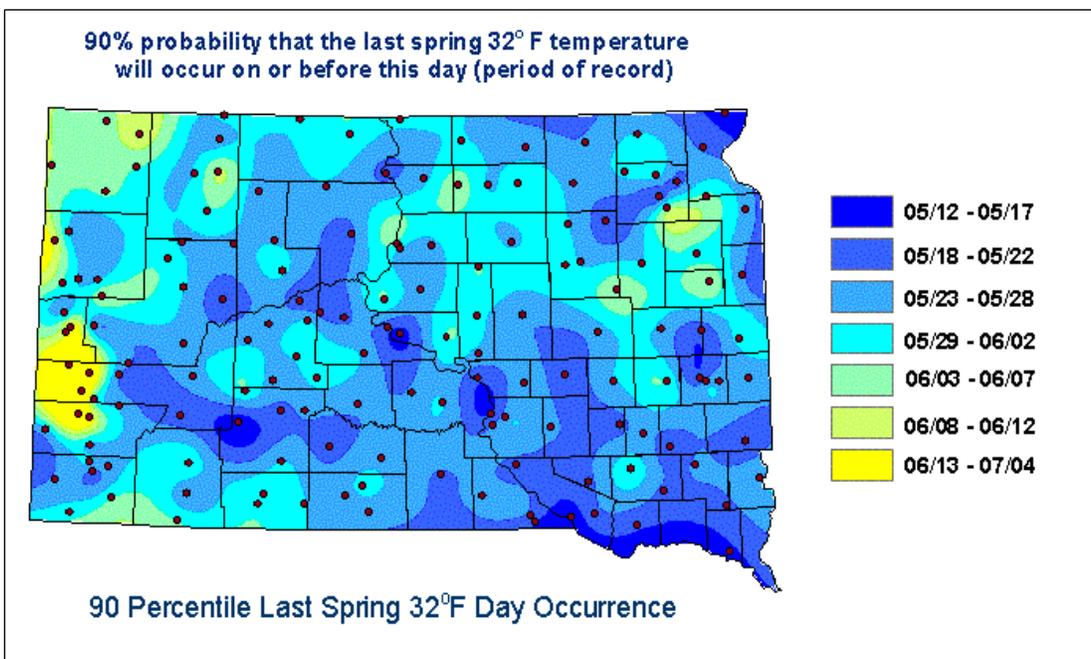


3.5.5 Last Spring Freeze^{5 6}

North Dakota

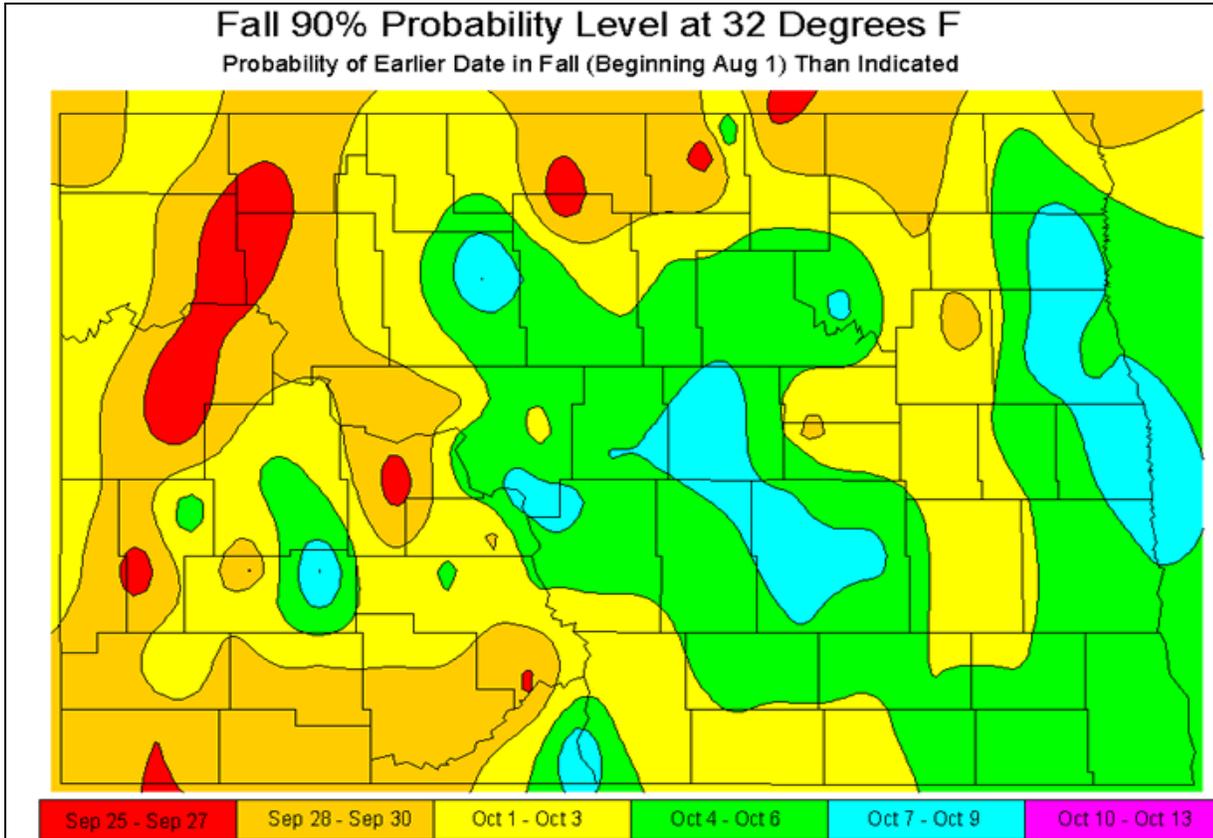


South Dakota

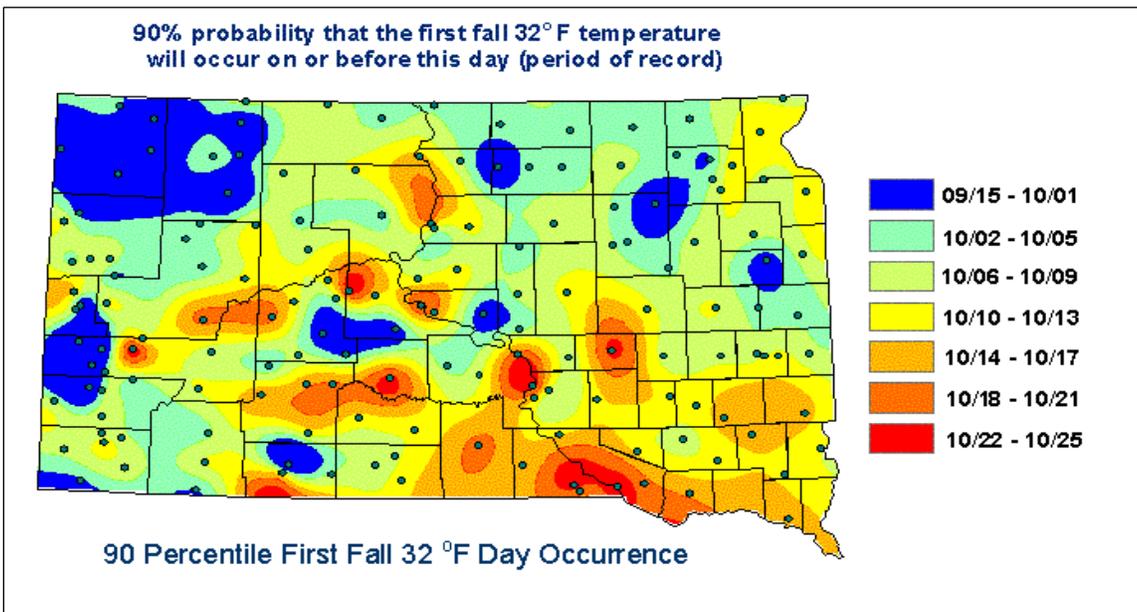


3.5.6 First Fall Freeze^{5 6}

North Dakota



South Dakota



3.5.7 Climate Summary⁷

Overall monthly climatic summary of temperature and precipitation averages for the watershed.

ASHLEY, ND (320382)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1893 to 12/31/2007

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	19.9	24.1	36.8	54.9	67.5	76.1	83.6	82.2	71.7	58.4	39.3	25.2	53.3
Average Min. Temperature (F)	-1.3	2.7	15.1	29.7	41.2	51.1	56.2	53.6	43.5	31.9	17.7	5.0	28.9
Average Total Precipitation (in.)	0.42	0.41	0.88	1.58	2.56	3.55	2.76	2.38	1.53	1.20	0.50	0.38	18.14
Average Total Snow Fall (in.)	5.8	4.8	6.6	3.2	0.7	0.0	0.0	0.0	0.1	1.0	4.2	4.7	31.0
Average Snow Depth (in.)	6	7	4	0	0	0	0	0	0	0	1	3	2

Percent of possible observations for period of record:

Max. Temp.: 98.3% Min. Temp.: 98.3% Precipitation: 98.7% Snowfall: 98.1% Snow Depth: 96.2%
Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

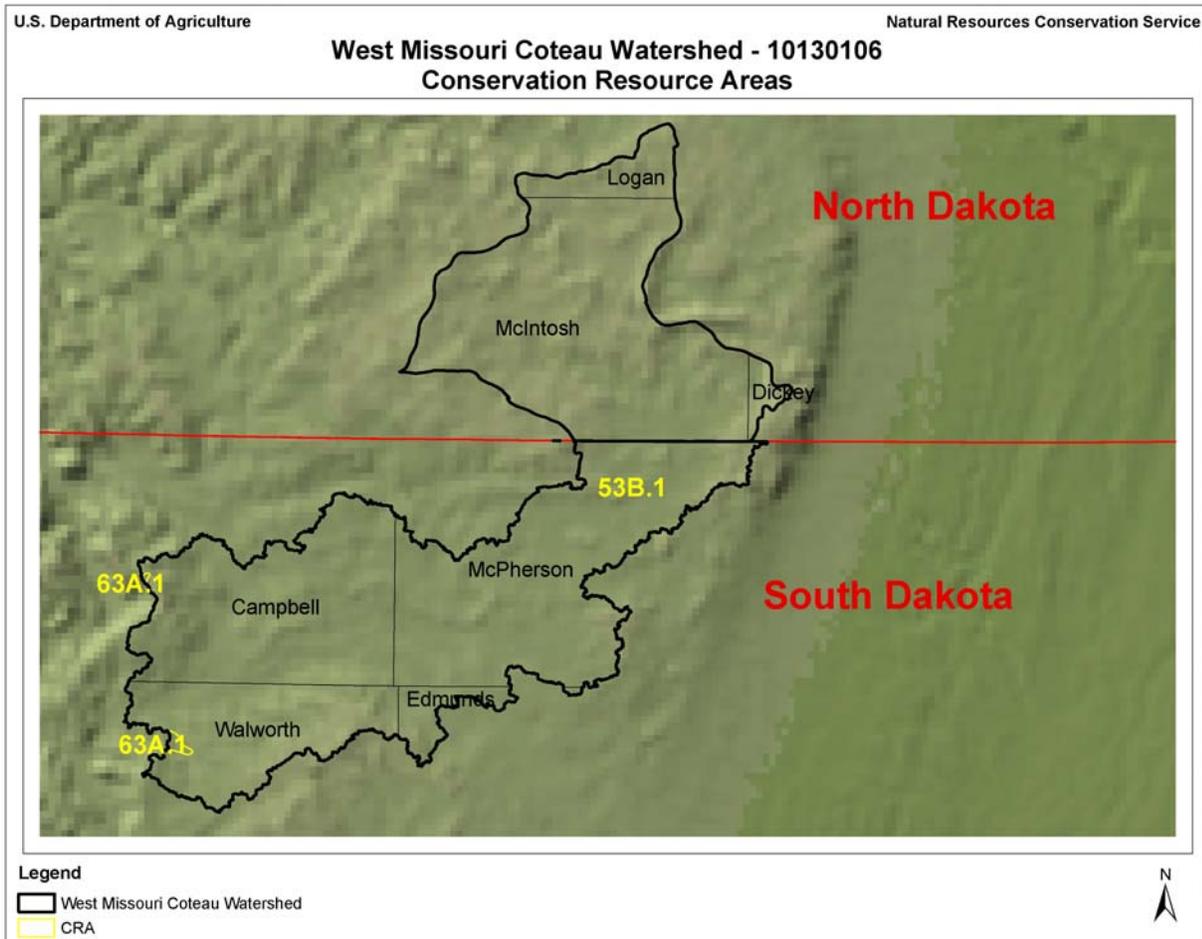
High Plains Regional Climate Center

4.0 RESOURCE INVENTORY

The resource inventory provides a general summary of the existing conditions of the natural resources in the watershed that are related to the soil, water, animals, plants, air, and humans (SWAPA+H). The resource descriptions provide general information on land use, land capability, soils and productivity, and prime farmland.

4.1 MAJOR LAND RESOURCE AREAS (MLRA) AND COMMON RESOURCE AREA (CRA)¹

The MLRA's are a part of a USDA classification system that defines land as a resource for farming, ranching, forestry, engineering, recreation, and other uses. The MLRA is a broad-based geographic area characterized by a uniform pattern of soils, elevation, topography, climate, water resources, potential natural vegetation, and land uses. Large MLRAs may be further subdivided to create smaller more homogeneous resource areas. The CRAs are the basic unit of an MLRA, a subdivision based on significant geographic differences in climate, water resources, or land use and resource concerns where resource problems or treatment needs are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a CRA. In both ND and SD, the MLRA and CRA boundaries coincide.





WEST MISSOURI COTEAU - 10130106 8-DIGIT HYDROLOGIC UNIT PROFILE

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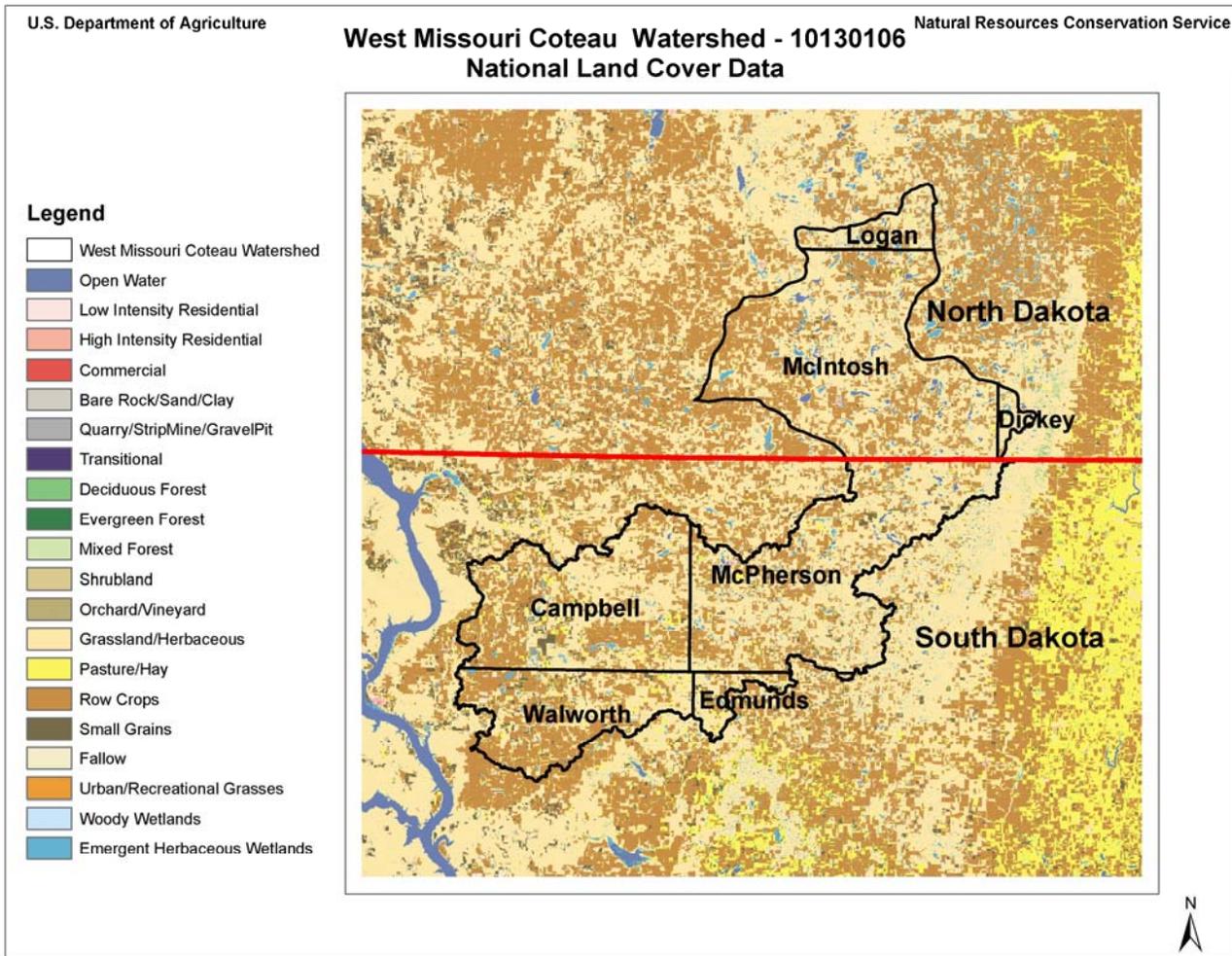
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4.1.1 Common Resource Area Descriptions

Symbol	Name	Brief Description
53B.1	Central Dark Brown Glaciated Plains	Most of this area is in cropland with the major crops being small grain and sunflowers. The more sloping soils are used for livestock grazing. This area is nearly level to rolling till plains. Moderately steep and steep slopes are adjacent to the major streams. Most of the soils are deep, well-drained, and medium textured with a frigid temperature regime and mixed mineralogy.
63A.1	Northern Rolling Pierre Shale Plains	Most of the area is used for livestock production with some cropped areas. Winter wheat is the main crop. Most of these soils are fine and very fine textured with a mesic temperature regime.

4.2 LAND COVER AND LAND USE DISTRIBUTION⁸

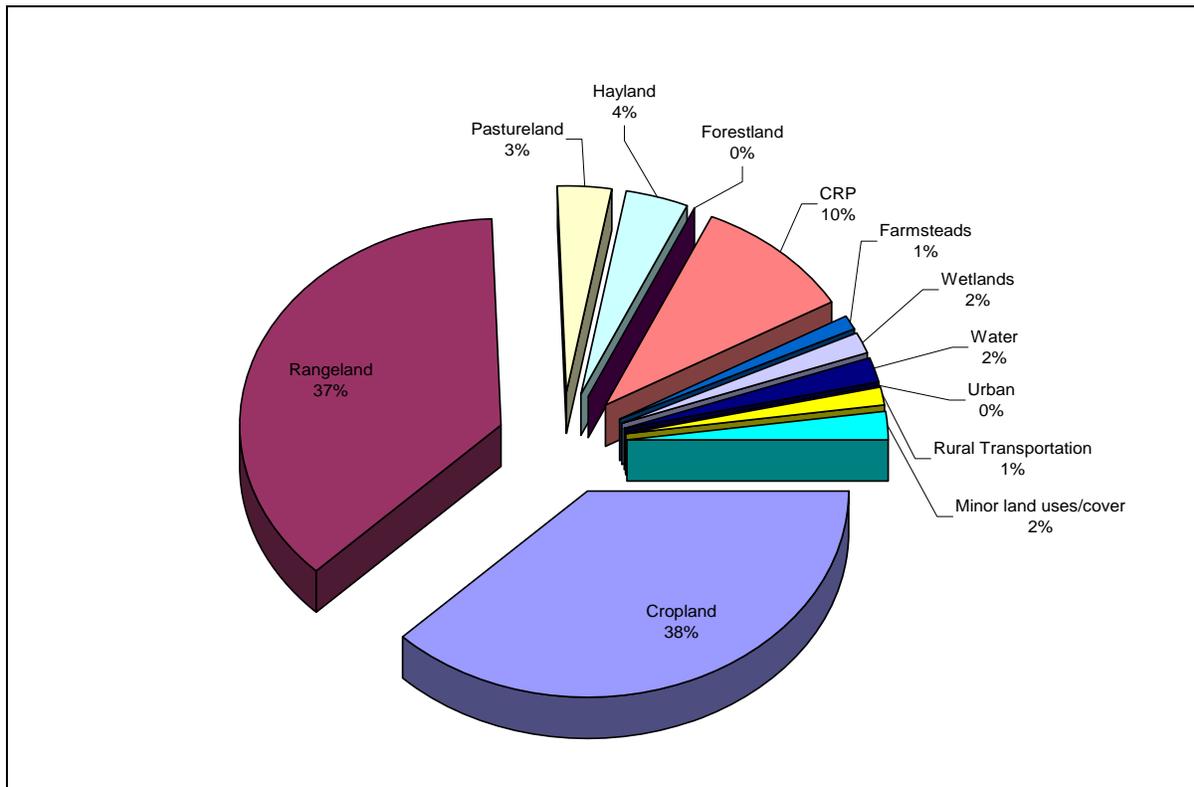
The National Resources Inventory (NRI) uses the term land cover/use to identify the categories that account for all the surface area in the United States. Land cover describes the different types of vegetation or other kind of material that covers the land surface. Land use is defined as the purpose of human activity on the land, it is usually, but not always, related to land cover.



4.2.1 Land Cover and Land Use Summary

Land Cover/Land Use (1997 NRI)	Acres	Percent*
Cropland	483,900	38
Rangeland	473,700	37
Pastureland	42,500	3
Hayland	51,700	4
Forestland	1,400	0
CRP	128,100	10
Farmsteads	14,400	1
Wetlands	22,200	2
Water	22,600	2
Urban	1,600	0
Rural Transportation	17,500	1
Minor land uses/cover	28,200	2
Total	1,287,800	100

*Rounded to the nearest whole number.





**WEST MISSOURI COTEAU - 10130106
8-DIGIT HYDROLOGIC UNIT PROFILE**

USDA Natural Resources Conservation Service (NRCS)

September 2009

Primary Land Uses [NRI-97]

Cropland - A land cover/use category that includes areas used for the production of adapted crops for harvest. Two subcategories of cropland are recognized: cultivated and noncultivated. Cultivated cropland consists land in row crops or close-grown crops and other cultivated cropland, for example, hayland or pastureland that is in a rotation with row or close-grown crops. Noncultivated cropland includes permanent hayland and horticultural cropland.

Pastureland –A land use category managed primarily for the production of introduced or native forage plants for livestock grazing. Pastureland may consist of one species in a pure stand, a grass mixture, or a grass-legume mixture. Management consists of cultural treatments; fertilization, weed control, reseeding or renovation, and controlled grazing. For NRI, this includes land that has a vegetative cover of grasses, legumes, and/or forbs, regardless of whether or not it is being grazed by livestock.)

Hayland - A subcategory of cropland managed for the production of forage crops that are machine harvested. These crops may be grasses, legumes, or a combination. Hayland also includes land in set-aside or other short-term agricultural programs. [NRI-97]

Rangeland - A land cover/use category on which the climax or potential plant cover is composed principally of native grasses, grasslike plants, forbs or shrubs suitable for grazing and browsing, and introduced forage species that are managed like rangeland. This would include areas where introduced hardy and persistent grasses, such as crested wheatgrass, are planted and such practices as deferred grazing, burning, chaining, and rotational grazing are used, with little or no chemicals or fertilizer being applied. Grasslands, savannas, many wetlands, some deserts, and tundra are considered to be rangeland. Certain communities of low forbs and shrubs, such as mesquite, chaparral, mountain shrub, and pinyon-juniper, are also included as rangeland. [NRI-97]

Urban and built-up –Land that is used for residential, industrial, commercial, and institutional land; construction sites; public administrative sites; railroad yards; cemeteries; airports; golf courses; sanitary landfills; sewage treatment plants; water control structures and spillways; small parks (less than 10 acres) within urban and built-up areas; and transportation facilities if they are surrounded by urban areas. This also includes tracts of less than 10 acres that do not meet the above definition but are completely surrounded by urban and built-up land. Two size categories are recognized in the NRI: (i) areas 0.25 to 10 acres, and (ii) areas greater than 10 acres. [NRI-97]

Minor land cover/use includes farmsteads, farm structures, field windbreaks, barren land, and marshland.

Federal land - A land ownership category designating land that is owned by the federal government. It does not include Trust lands administered by the Bureau of Indian Affairs. No data is collected for any year that land is in this ownership category.

Rural transportation land consists of all highways, roads, railroads, and associated right-of-ways outside urban and built-up areas; also includes private roads to farmsteads or ranch headquarters, logging roads, and other private roads (field lanes are not included).

Conservation Reserve Program - (CRP) land is highly erodible or other environmentally sensitive acreage normally devoted to crop production which is converted to long-term vegetative cover.

4.2.2 Land Capability Class (LCC) ERROR! BOOKMARK NOT DEFINED.

Land capability classification (LCC) is a system of grouping soils primarily on the basis of their ability to produce common cultivated crops and pasture plants without the deterioration of the soil resource over a long period of time. The LCC reflects the physical and chemical properties, along with the topographic relief of a soil. The LCC can be used as a guide for land management decisions based on the capability or limitations of the soil.

Land Capability Class (1997 NRI Estimate)	Acres	Percent
I - slight limitations	0	0
II - moderate limitations	481,100	37
III - severe limitations	318,900	25
IV - very severe limitations	191,200	15
V - no erosion hazard, but other limitations	22,900	2
VI - very severe limitations, unsuited for cultivation, limited to pasture, range, forest	133,200	10
VII - very severe limitations, unsuited for cultivation, limited to grazing, forest, wildlife	47,000	4
VIII – misc. areas have limitations, limited to recreation, wildlife, and water supply	23,600	2
Other Acres Not Determined – includes water, rock outcrop, non-soil areas	69,700	5
Total Acres	1,287,600	100

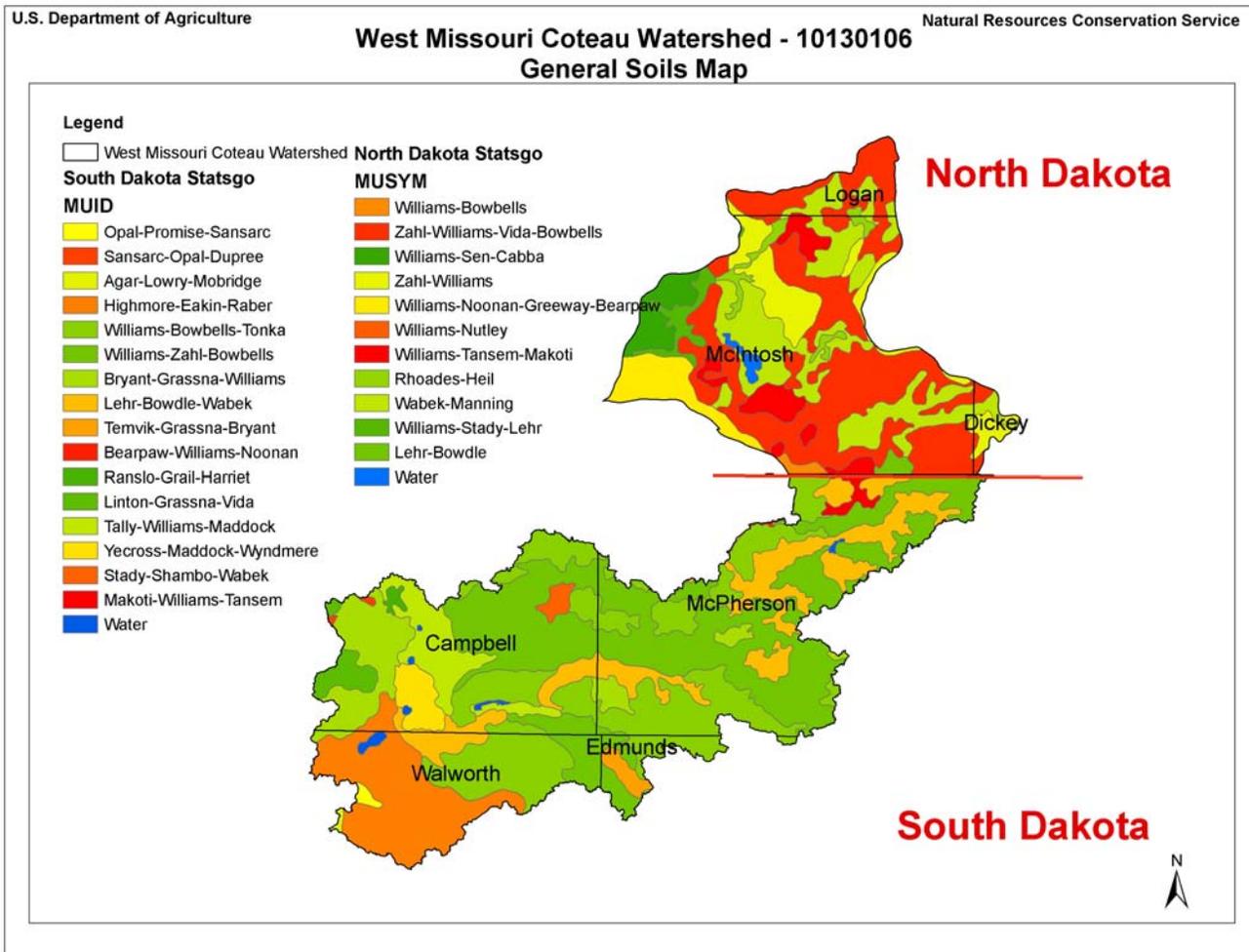
4.2.3 Prime Farmland¹

Prime farmland, as defined by the USDA, is land that has the best combination of physical and chemical characteristics for food, feed, forage, fiber, and oilseed crop production. It must also be available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. Prime farmland soils are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

Prime Farmland – 1997 NRI	Acres	Percent
Total Acres Prime Farmland	41	3
Other Acres	1,247	97

4.3 GENERAL SOILS

Most of the soils in the watershed were formed in the exposed glacial materials which were eroded, transported, and deposited by the repeated movement of ice across the region. The formation of soils is influenced not only by geologic forces but also topographic relief. Factors such as drainage, runoff, erosion, plant cover, and soil temperature cause soils to develop with certain characteristics and qualities.



4.3.1 General Soil Descriptions

Soils in the watershed have been placed into 27 broad groups or associations that are geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit. Each soil association has a distinctive pattern of soils, relief, drainage, and natural landscape. The dominant soils within the watershed are loamy and silty soils formed in glacial till on the uplands, loamy soils over sand and gravel on the outwash plains, and clayey and silty soils formed in alluvium on the floodplains and low terraces.

More detailed information on individual soils is available in the published county soil survey reports. The accompanying map is of a general nature and is not intended for any type of intensive planning and management.

North Dakota Soil Associations

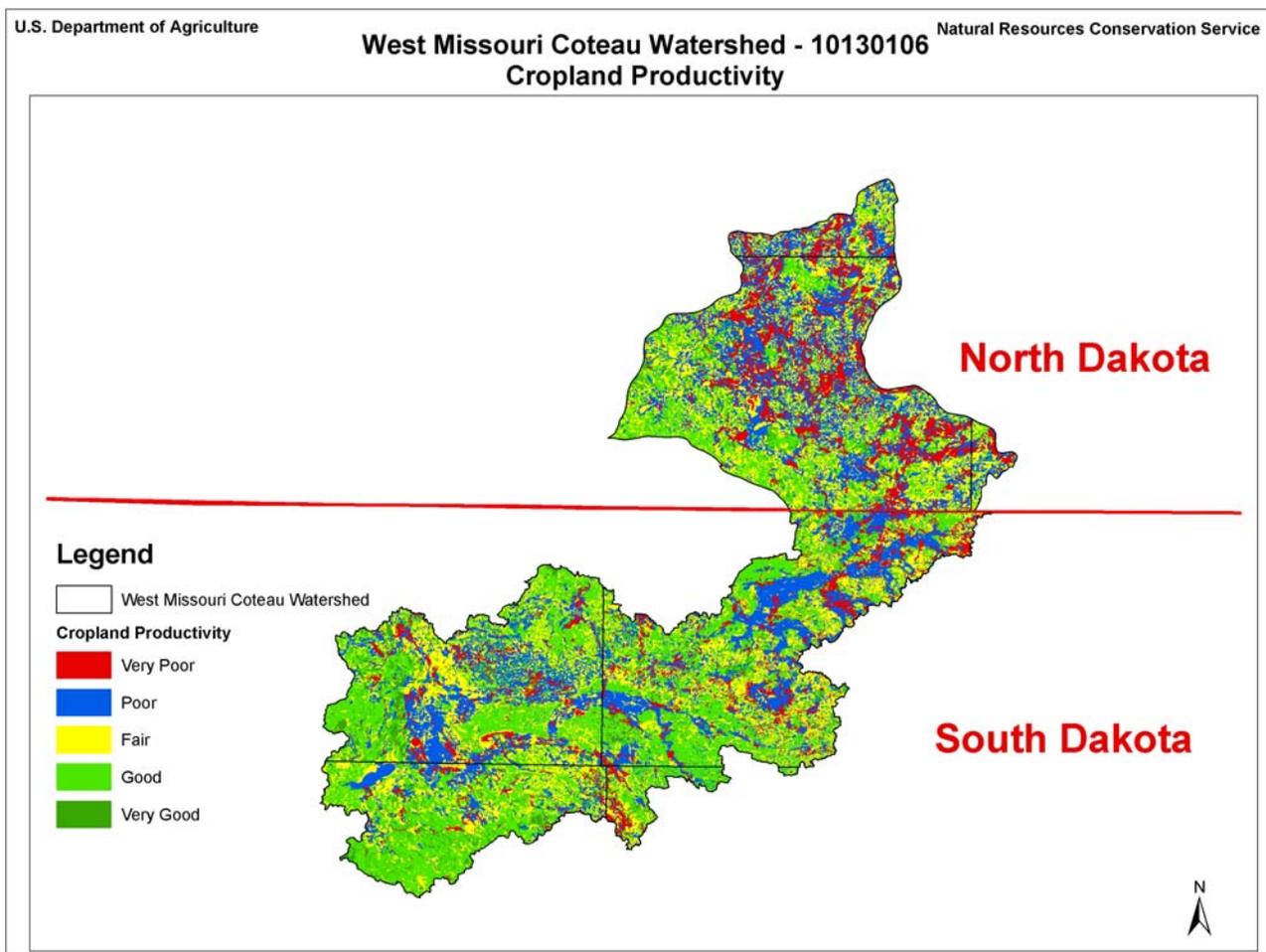
Map Unit Identification	Soil Association Name	General Soils Description
s4786	WILLIAMS-BOWBELLS	Very deep, moderately well to well-drained, level to undulating, loamy soils on glacial till plains.
s4787	ZAHL-WILLIAMS-VIDA-BOWBELLS	Very deep, moderately well to well-drained, level to gently rolling, loamy soils on glacial till plains.
s4789	WILLIAMS-SEN-CABBA	Shallow to very deep, well-drained, nearly level to moderately sloping loamy and clayey soils on ice walled lakes on glacial plains.
s4792	ZAHL-WILLIAMS	Very deep, well-drained, gently sloping to steep, loamy soils on glacial till plains.
s4694	WILLIAMS-NOONAN-GREEWAY-BEARPAW	Very deep. Moderately well and well-drained, nearly level to gently rolling, loamy to clay soils on glacial till plains.
s4798	WILLIAMS-NUTLEY	Very deep, well-drained, nearly level to gently rolling, loamy to clay soils on glacial till plains.
s4799	WILLIAMS-TANSEM-MAKOTI	Very deep, well-drained, nearly level to moderately sloping, loamy and silty soils on ice walled lakes on glacial till plains.
s4818	RHOADES-HEIL	Very deep, moderately well-drained and poorly drained, nearly level sodium affected loamy and clayey soils on depressions, fans, and terraces.
s4819	WABEK-MANNING	Deep, well-drained, to excessively drained, nearly level to strongly sloping loamy soils on outwash plains and terraces.
s4823	WILLIAMS-STADY-LEHR	Very deep, well-drained, level to strongly sloping, loamy soils on terraces and glacial till plains.
s6917	LEHR-BOWDLE	Deep, well-drained, nearly level to strongly sloping loamy soils on outwash plains and terraces.

South Dakota Soil Associations

Map Unit Identification	Soil Association Name	General Soils Description
SD064	OPAL-PROMISE-SANSARC	Shallow to deep, well-drained, nearly level to very steep, clayey soils on shale hills.
SD066	SANSARC-OPAL-DUPREE	Shallow and moderately deep, well-drained, gently sloping to very steep clayey soils on shale hills.
SD075	AGAR-LOWRY-MOBRIDGE	Deep, well and moderately well-drained, level to moderately sloping silty soils on loess plains
SD077	HIGHMORE-EAKIN-RABER	Deep, well-drained, level to moderately sloping, silty, and clayey soils on glacial till plains.
SD150	WILLIAMS-BOWBELLS-TONKA	Very deep, well-drained and poorly drained, level to moderately sloping, loamy and clayey soils on glacial till plains.
SD161	WILLIAMS-ZAHL-BOWBELLS	Very deep, well-drained and moderately well-drained, level to steep, loamy soils on glacial till plains.
SD162	BRYANT-GRASSNA-WILLIAMS	Deep, well-drained and moderately well-drained, level to gently sloping, loamy and silty soils on glacial till plains.
SD164	LEHR-BOWDLE-WABEK	Deep, well-drained to excessively drained, nearly level to strongly sloping loamy soils on outwash plains and terraces.
SD165	TEMVIK-GRASSNA-BRYANT	Deep, well-drained, nearly level to gently sloping silty soils on loess covered glacial till plains.
SD166	BEARPAW-WILLIAMS-NOONAN	Deep, well-drained and moderately well-drained, nearly level to moderately sloping loamy soils on glacial till plains.
SD171	RANSLO-GRAIL-HARRIET	Very deep, moderately well-drained to poorly drained, nearly level to very gently sloping, silty and clayey soils on flood plains and stream terraces.
SD172	LINTON-GRASSNA-VIDA	Very deep, well-drained and moderately well-drained, level to strongly sloping, loamy and silty soils on glacial till plains and terraces.
SD173	TALLEY-WILLIAMS-MADDOCK	Very deep, well-drained and excessively drained, level to gently sloping, sandy and loamy soils on uplands and terraces.
SD174	YECROSS-MADDOCK-WYNDMERE	Very deep, excessively drained to somewhat poorly drained, nearly level to gently sloping sandy and loamy soils on uplands and outwash plains.
SD198	STADY-SHAMBO-WABEK	Very deep, well-drained and excessively drained, nearly level to steep sandy and loamy soils on uplands.
SD256	MAKOTI-WILLIAMS-TANSEM	Very deep, well-drained and moderately well-drained, level to moderately sloping, silty and loamy soils on glacial till and lake plains.

4.4 CROPLAND PRODUCTIVITY¹

Cropland Productivity Index (CPI) is a rating assigned to each soil map unit to rate the soil for cropland production. The rating is based on a scale of 1 to 100, with 100 being the most productive map unit in the county. The CPI assigned to each map unit is based on the physical and chemical properties of each soil type in the map unit. Properties such as slope, organic matter levels, topsoil thickness, soil texture, available water capacity, pH, and salinity levels will directly affect the productivity level of each soil type. The experience of soil scientists and university researchers is used to develop the ratings.





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Cropland Productivity Index			Descriptions
1-25	Very Poor	Red	Soils with >15 percent slopes; soils with claypan, bedrock or gravels near the surface; high salinity soils
26-50	Poor	Blue	Soils with 9-15 percent slopes; soils with claypan, bedrock, or gravels within 20 inches of the surface
51-75	Fair	Yellow	Soils with 6-9 percent slopes; soils with claypan, bedrock, or gravels at 20 to 40 inches of the surface
76-89	Good	Light Green	Soils with 2-6 percent slopes
90-100	Very Good	Dark Green	Silty or loamy soils with high soil organic matter levels

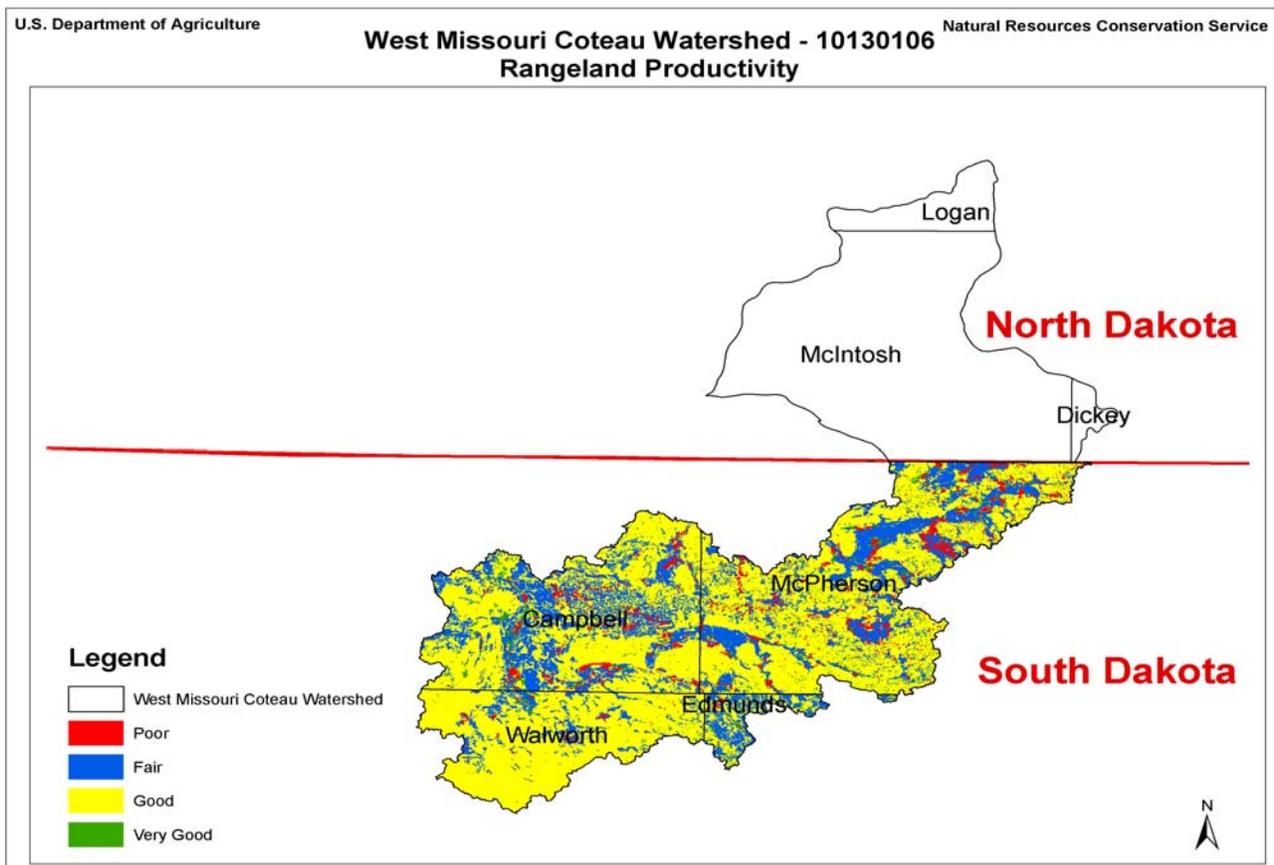
4.5 RANGELAND PRODUCTION (NORMAL YEAR)¹

Rangeland has a native vegetation of grasses, grasslike plants, forbs, and shrubs. In many areas, introduced forage species are also managed as rangeland. The vegetation is suitable for grazing and browsing by animals. Rangeland includes natural grasslands, savannahs, many wetlands and deserts, tundra, and certain shrub and forb communities.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils, vegetation, and water.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It is expressed in pounds per acre of air-dry vegetation for normal years.

Yield and production values are represented as a single value for the map unit. They are calculated based on a weighted average.



The development of the North Dakota Rangeland Productivity data base is in progress.



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Rangeland Normal Year Production			Descriptions
1-1700 lbs/Ac	Poor	Red	Low rainfall areas or shallow soils
1701-2600 lbs/Ac	Fair	Blue	Areas that are high in sodium or salts or shallow to bedrock or gravel
2601-4500 lbs/Ac	Good	Yellow	Areas where there is no additional moisture and the soil properties do not influence the grasses
4501-9000 lbs/Ac	Very Good	Light Green	Low lying areas that receive additional moisture

5.0 RESOURCE CONCERNS

Resource concerns or problems are issues related to the environment that impact the health, productivity, or condition of natural resources in a watershed. The most common resource concerns are associated with the SWAPA+H.

5.1 SUMMARY OF RESOURCE CONCERNS¹

Specific resource concerns have been identified for each major land use at the state level. The following table is a summary of state level concerns. The resource concerns specific to the watershed have been identified and evaluated by land use in the watershed assessments.

SWAPA + H Concerns	Specific Resource Concerns/Issue	Pasture/ Hay	Cropland	Rangeland	Forest	Wildlife
Soil Erosion	Streambank	X	X	X	X	X
	Sheet and Rill		X			
	Wind		X			
	Ephemeral Gully		X			
	Classic Gully		X			
	Shoreline	X	X	X	X	X
	Irrigation Induced	X	X			
Soil Condition	Organic Matter		X			
	Excess Nitrogen		X			
	Excess Phosphorous		X			
	Contaminants – Residual Pesticides	X	X	X	X	X
	Damage from Sediment Deposition	X	X	X	X	X
	Compaction		X			
	Soil Salinity		X			
	Rangeland Site Stability			X		
Water Quantity	Inefficient Water Use on Irrigated Lands		X		X	
	Inefficient Water Use on Nonirrigated Lands		X			
Water Quality	Harmful levels of Pesticides in Ground Water	X	X	X	X	X
	Harmful levels of Pesticides in Surface Water	X	X	X	X	X
	Nutrients and Organics in Ground Water	X	X	X		X
	Nutrients and Organics in Surface Water	X	X	X		X
	Pathogens in Ground Water	X	X	X		X
	Pathogens in Surface Water	X	X	X	X	X
	Suspended Sediment in Surface Water	X	X	X	X	X
Plant Suitability	Plants Not Adapted to Site	X				
Plant Condition	Productivity Health and Vigor	X		X	X	X
	Forage Quality and Palatability	X		X	X	
	Noxious and Invasive Plants	X	X	X	X	X
Domestic Animals	Inadequate Feed and Forage Quantities and Quality	X		X	X	
	Inadequate Stock Water	X		X	X	
Fish and Wildlife	Species of Concern	X	X	X	X	X
	Inadequate Cover and Shelter	X	X	X	X	X
	Inadequate Food	X	X	X	X	X

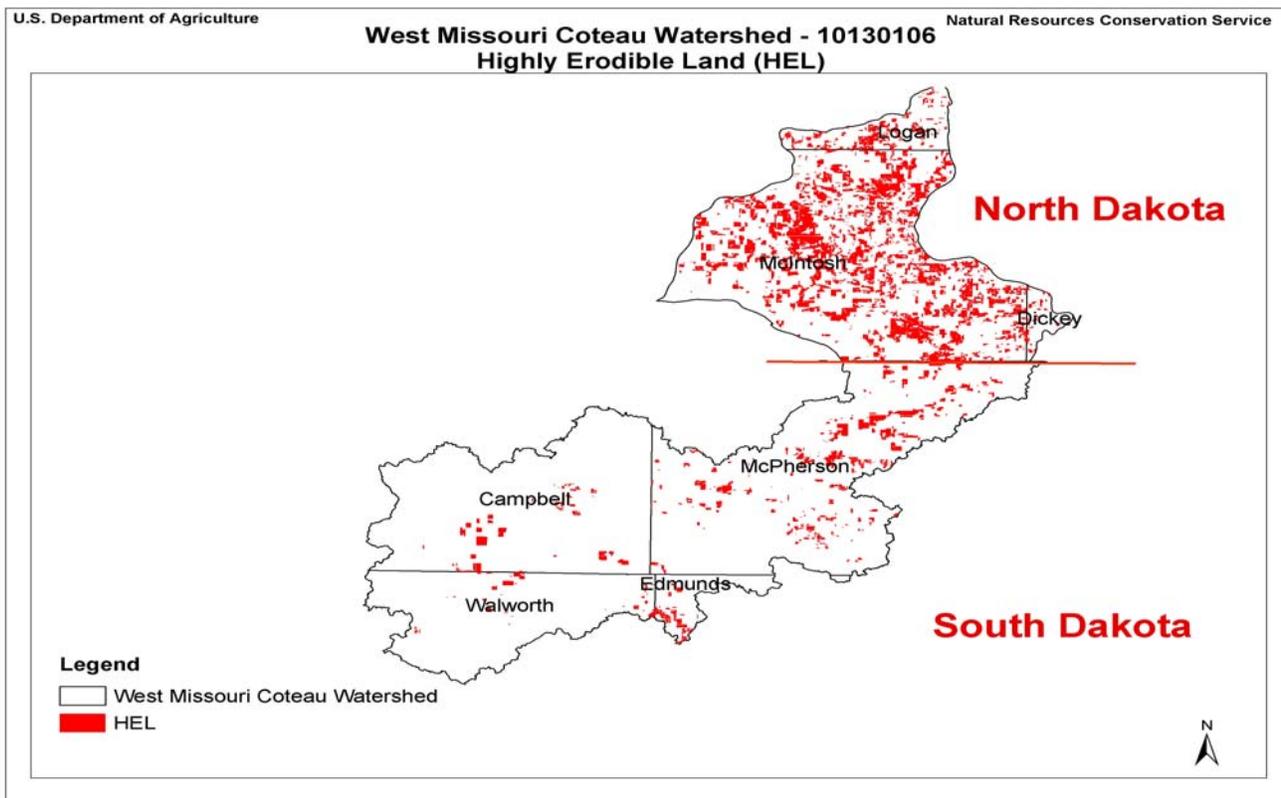
5.2 SOIL EROSION - WIND AND WATER¹

Soil erosion is defined as the detachment and movement of topsoil, or soil material from the upper part of the soil profile, through the action of wind or running water, especially as a result of changes associated with human activity related to agricultural practices. Soil erosion from water includes rill, gully, and sheet.

Soil loss wind and water (cultivated cropland, hayland, pastureland and CRP).	Erosion	Average Annual Erosion Rate (T/Ac/Yr)	Acres	Total (T/Yr)
	Wind (WEQ)	3.0	706,200	2,118,600
Water (USLE)	1.11	706,200	783,882	

5.2.1 Highly Erodible Land (HEL)

The basis for identifying highly erodible land (HEL) is the erodibility index (EI) of a soil map unit. The "EI" of a soil is determined by dividing the potential erodibility for each soil by the soil loss tolerance (T) value established for the soil as of January 1, 1990. The "T" value represents the maximum annual rate of soil erosion that can take place without causing a decline in long-term productivity. A soil map unit with an "EI" of eight or more is a highly erodible soil map unit. Refer to the National Food Security Act Manual (NFSAM) for further guidance.



5.3 WATER RESOURCE CONSIDERATIONS

5.3.1 Water Resources Table Error! Bookmark not defined.

The NRI data collected for streams and water bodies within the watershed.

Water Resources – 1997 NRI	Acres	Percent
Streams <660' wide and water bodies <40 Ac	5,100	0.4
Streams >660' wide and water bodies >40 Ac	17,500	1.4

5.3.2 Peak Stream Flow⁸

There are no major streams within the watershed or USGS gage stations located in this HU.

5.3.3 Daily Discharge⁸

Not applicable.

5.3.4 Groundwater¹

Several major and minor aquifers of varying depths and water quality are utilized for domestic and agricultural purposes. Shallow aquifers tend to be smaller and usually have higher quality water but are also more vulnerable to leaching of nutrients, pesticides, organic waste, and pathogens. Recharge of shallow aquifers occurs primarily from infiltration of precipitation but also from wetlands, lakes, and streams. Deep aquifers often occur between layers of impenetrable bedrock. The quality of this water is often variable but usually of lower quality than that of shallow aquifers. As a result of the restrictive soil layers protecting these aquifers and the depth at which they occur, they are less susceptible to leaching and other surface activities and impacts. Important aquifers within this watershed are:

Glacial Aquifers

Selby
Spring Creek
Grand
Hillsview
Twin Lakes

Bedrock Aquifers

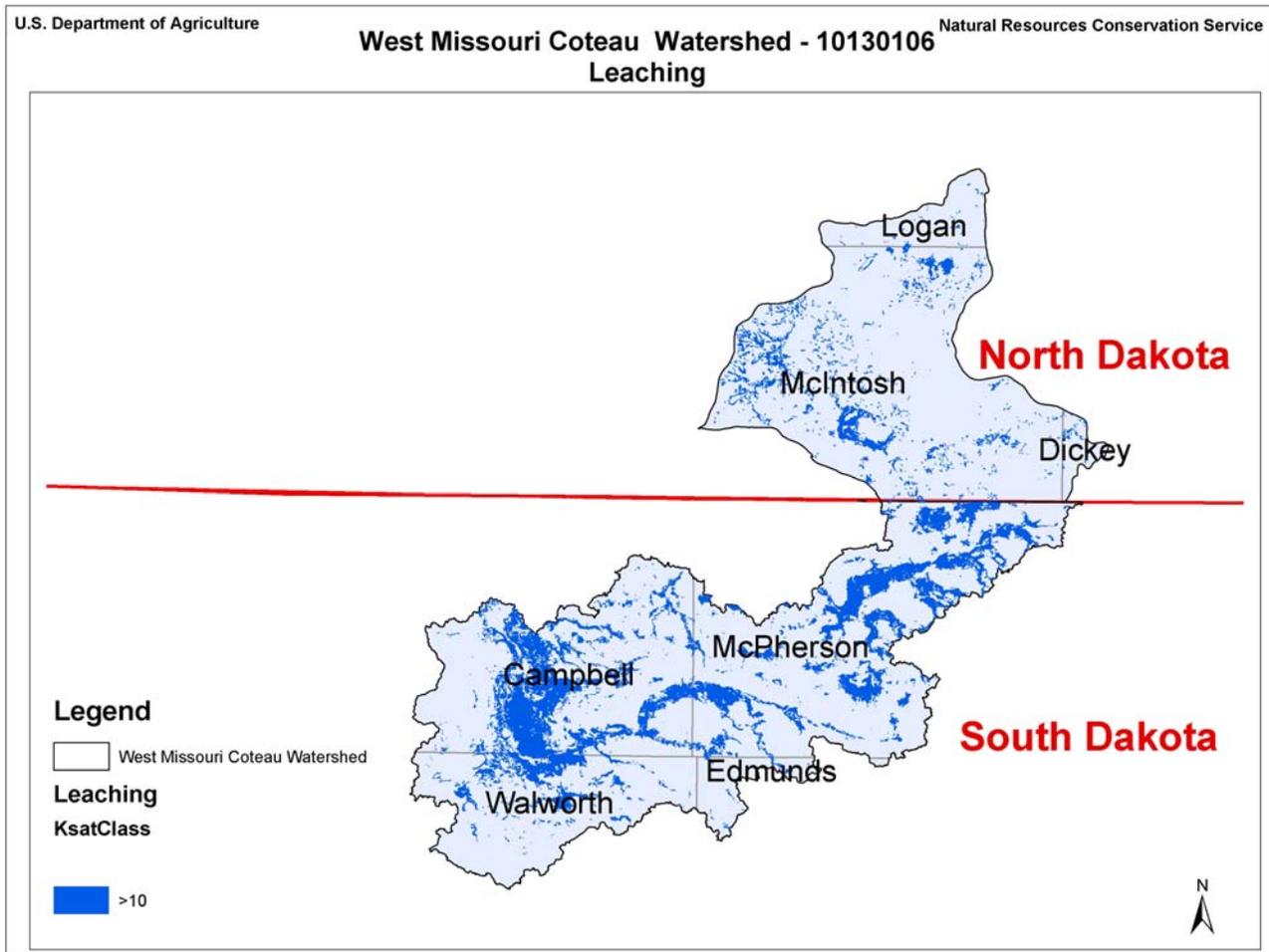
Dakota Sandstone
Fall River Formation
Sundance Formation
Minnelusa Formation

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The NRCS makes groundwater leaching assessments based on a soils “saturated hydraulic conductivity” (Ksat). Ksat refers to the ease with which pores in a saturated soil transmit water and is expressed in terms of micrometers per second. Soil map units that have a Ksat value of 10 micrometers/second or greater and with <6 percent slope would be considered to have a “high leaching risk”.



5.3.5 Public Water Supply Systems^{9 10}

Approximately 670 public water systems (PWS) currently exist in SD and 515 in ND. The public water supply systems within this watershed rely on both surface and ground water sources. These systems meet the needs of rural and municipal households as well as industrial and agricultural needs. Protection and conservation of both surface and groundwater sources is critical.

North Dakota

The following description is from the NDDH Ground Water website:
The North Dakota Source Water Protection Program was developed in response to the 1996 Safe Drinking Water Act amendments that require all states to define and assess the source waters of public water systems. All public water systems that have wells or intakes are participants in the Source Water Protection Program. Three elements of the Source Water Protection Program are federally-mandated requirements and are completed by the Department of Health, while the remaining elements can be pursued voluntarily by the governing body of the public water system. The North Dakota Source Water Assessment Strategic Plan was approved by EPA in 1999.

The Source Water Protection Program strives to meet several goals:

- (1) Prevent contamination of public water supplies;
- (2) Encourage the placement of certain activities in areas less likely to contaminate public water supplies; and,
- (3) Raise public awareness of water resources used for public water supplies.

Mandatory Program Elements - completed for the public water system:

- (1) Delineation of a wellhead protection area
- (2) Contaminant Source Inventory
- (3) Susceptibility Analysis

Voluntary Program Elements - pursued voluntarily by the public water system:

- (1) Development of Management Strategies
- (2) Development of Contingency Plans
- (3) Public Awareness
- (4) New Well Locations

South Dakota

Primary enforcement of the federal Safe Drinking Water Act (SDWA) began in 1983. The SD Drinking Water Program, part of the Department of Environment and Natural Resources (DENR), develops and enforces the SD Drinking Water Regulations (<http://www.state.sd.us/denr/des/drinking/regs.htm>) that apply to public water systems in the state. To see a list of drinking water contaminants that the Drinking Water Program regulates visit the Drinking Water Standards Web page at <http://www.state.sd.us/denr/des/drinking/standard.htm>. Plans and specifications reviews are part of the department's regulatory efforts to protect the state's surface and groundwater resources and public health. The areas of responsibility include design criteria development, technical assistance, and plan approvals for the Drinking Water, Groundwater Quality, Minerals and Mining, Surface Water and Waste Management Programs within the Division of Environmental Services.

5.3.6 Surface Waters - Designated Beneficial Uses^{9 10}

North Dakota

In ND, beneficial uses are assigned based on the *Standards of Quality for Waters of the State* (NDDH, 2006). These regulations define the protected beneficial uses of the state's rivers, streams, lakes and reservoirs. The six beneficial uses assessed for purposes of Section 305(b) reporting and Section 303(d) listing are:

- (1) Aquatic life
- (2) Recreation
- (3) Drinking water
- (4) Fish consumption
- (5) Agriculture
- (6) Industrial

All streams and lakes in ND are assigned the beneficial uses (1) and (2). All streams are also assigned to beneficial uses (5) and (6) unless available data exists providing evidence of impairment. Beneficial use (4) has been assigned to all Class I, IA, and II rivers and streams, to those Class III streams known to provide a sport fishery and to all Class 1 through 4 lakes.

South Dakota

Surface waters in SD are classified for one or more of the following beneficial uses:

- (1) Domestic water supply waters;
- (2) Cold water permanent fish life propagation waters;
- (3) Cold water marginal fish life propagation waters;
- (4) Warm water permanent fish life propagation waters;
- (5) Warm water semipermanent fish life propagation waters;
- (6) Warm water marginal fish life propagation waters;
- (7) Immersion recreation waters;
- (8) Limited contact recreation waters;
- (9) Fish and wildlife propagation, recreation, and stock watering waters;
- (10) Irrigation waters; and
- (11) Commerce and industry waters.

All streams, in SD, are assigned the beneficial uses (9) and (10) unless otherwise stated. All lakes, in SD, are assigned the beneficial uses of (7), (8), and (9).

5.3.7 Total Maximum Daily Loads (TMDLs) 2008 Report^{9 10}

Section 303(d) of the federal Clean Water Act requires that states develop TMDLs for water bodies that are impaired. The NDDH and SD DENR are responsible for managing the monitoring of water bodies and development of TMDLs in each respective state. The TMDLs are calculations to determine the sum allowable load of a pollutant from all contributing point and nonpoint sources, that a waterbody can receive and still meet the applicable water quality standards. The TMDLs must be developed for water bodies that do not meet the water quality standards. The TMDLs developed by NDDH and SD DENR are required to be approved by the Environmental Protection Agency (EPA) and to public notice the TMDL.

The following data was presented by the NDDH in “North Dakota 2008 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads” and DENR in “THE 2008 SOUTH DAKOTA INTEGRATED REPORT FOR SURFACE WATER QUALITY ASSESSMENT.” This information represents the current status of water quality for waters within the West Missouri Coteau Watershed.

West Missouri Coteau					
Segment or Lake Name	Stream/River Segment or Lake Location	Impairment	Status	Status Date	Initial Listing
SD Lakes					
Eureka Lake	McPherson County	Some Uses Met; Insufficient Data to Determine Support for Others	Not Assessed	2008	Not Listed
Lake Hiddenwood	Walworth County	All Uses Met	TMDL Not Required	2008	Not Listed

Impairments	
DO -	Dissolved Oxygen, results from the photosynthetic and respiratory activities of the biota in the water body. DO is essential for aquatic life.
pH -	Acidity/Alkalinity the measure of the hydrogen ion concentration. pH can affect many chemical reactions in water.
TSI -	Carlson's (1977) Trophic State Indices (TSI), Carlson's TSI is a measure of productivity in a lake or reservoir. Typically Secchi depth, chlorophyll <i>a</i> , and phosphorus measurements are used to calculate a mean TSI value.
TSS -	Total Suspended Solids, the organic and inorganic material left on a standard glass fiber filter (0.45 micron) after a water sample is filtered through it. TSS can be used to measure the volume of solids in a water body. Too much suspended solids can be harmful to the biota in a stream.

TMDL Project Status	
Assessment Initiated -	Data for developing the TMDL is being collected.
Delist -	A water body has been removed from the TMDL list. Delisting may occur when a TMDL is approved by EPA, water quality standards are met, a water body was listed in error, additional state effluent controls address water quality problems, reservoirs have been breached and are no longer a viable water body, or data assessment methodologies have been modified.
Delist* -	Water quality standards have been met; however, a TMDL was completed because an assessment had already been initiated while the segment was previously listed.
Not Initiated -	Projects are proposed and waiting final funding to begin assessment.
Special Approvals -	A water body that had sufficient data to write a TMDL before the first 303(d) list was published.
TMDL in Public Notice -	During the public notice phase, a TMDL has been developed and is ready for public review and comment. Comments received are reviewed and considered before submitting a final TMDL to EPA for approval.
TMDL Public Noticed -	The public notice comment period has passed. Comments received are being reviewed and considered before submitting a final TMDL to EPA for approval.
TMDL Approved -	EPA has approved a TMDL as submitted by the state.
TMDL Not Required -	Water body is meeting its beneficial uses.

Watershed Projects, Plans, Studies, and Assessments

West Missouri Coteau Watershed Projects, Plans, Studies, and Assessments					
ND NRCS Watershed Project			ND NRCS Watershed Plans, Studies, and Assessments		
Name	Status	Goals:	Name	Status	Goals:
None	NA	NA	None	NA	NA
NDDH Water Quality Projects or ND Soil Conservation District Watershed Projects			NDDH or ND Soil Conservation District Watershed Plans, Studies or Assessments		
Name	Status	Goals:	Name	Status	Goals:
None	NA	NA	None	NA	NA
NDDH – EPA 319 Watershed Projects					
Lake Hoskins Watershed	Ongoing				
SD NRCS Watershed Projects			SD NRCS Watershed Plans, Studies, and Assessments		
Name	Status	Goals:	Name	Status	Goals:
None	NA	NA	None	NA	NA
SD DENR or Conservation District Water Quality Projects			SD DENR or SD Conservation District Water Quality Assessments or Studies		
Name	Status	Results:	Name	Status	Results:
None	NA	NA	None	NA	NA



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5.3.8 Confined Animal Feeding Operations (CAFO)^{10 11}

The NDDH and SD DENR are the state agencies responsible for regulating animal feeding operations. A CAFO is a lot or facility that stables or confines and feeds or maintains animals for a total of 45 days or more in any 12-month period and meets the criteria for either a large, medium, or small concentrated animal feeding operation. Concentrated Animal Feeding Operations are regulated by a general water pollution control permit. Producers must submit plans for manure management systems to the respective state agency. These plans must meet design requirements and be approved by a department engineer.

Livestock production is an important industry within the West Missouri Coteau Watershed. Farms and ranches raise beef cattle, dairy cattle, and swine.

North Dakota

Animal Feeding Facilities – North Dakota Department of Health Permit					
Animal Type	Dairy	Beef	Swine	Other	Total
Number of Animal Feeding Operations	2	2	0	0	4
Number of Animals	125	2,400	0	0	2,525
No. of State Permitted Operations					3

South Dakota

CAFO Watershed Summary South Dakota Department of Environment and Natural Resources					
Animal/Operation Type	Cattle	Sheep	Swine	Poultry	Not Specified
Number of Permitted Farms					
- Number of Permitted Animals					
- Permitted Acres for Waste Management					
Partially Permitted Farms			1		
- # of Animals Permitted			11,700		
- Total Animals			36,416		
- # of Acres			6,274		
Approved Farms Not yet permitted					
- # of Animals					
- # of Acres					
Other Acres Not Specified					63

Current as of August 2009



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5.4 RESOURCES OF SPECIAL CONCERN

In support of federal actions proposed by the NRCS, the agency prepares programmatic, policy, legislative, and other Environmental Assessments (EA) or Environmental Impact Statements (EIS), as necessary, for environmental compliance with federal regulations. All conservation programs administered by the agency have a program level EA or EIS. Additionally, the NRCS policy requires that for all projects or conservation practices where the NRCS provides financial or technical assistance, a site-specific environmental evaluation (EE) of practice effects is completed to ensure the proposed action has been sufficiently analyzed in an existing NRCS environmental document.

Both the ND and SD NRCS site-specific EE reviews and evaluates the proposed activity impacts with regard to the following federal laws, Executive Orders, regulations, or agency policy as applicable:

- National Historic Preservation Act (1966), as amended, and implementing regulations found at 36 CFR Part 800;
- Endangered Species Act (1973), as amended;
- Fish and Wildlife Coordination Act (1943), as amended;
- Executive Order 11988 (1987) - Floodplain Management;
- Executive Order 13112 (1999) - Invasive Species;
- Migratory Bird Treaty Act (1918), as amended, and Executive Order 13186 – Responsibility of Federal Agencies to Protect Migratory Birds;
- The NRCS policy General Manual (GM), Title 190, Part 410.23 - Natural Areas;
- Farmland Protection Policy Act and 7 CFR 658.5 regulations;
- The NRCS policy GM, Title 190, Part 411.03(d) Riparian Areas;
- Clean Water Act and Waters of the U.S. (1972);
- Executive Order 11990 “Protection of Wetlands,” the Food Security Act of 1985, revised NRCS Wetland Technical Assistance Policy - 7 CFR Part 650 (1997);
- Wild and Scenic Rivers Act – PL 90-542.

5.4.1 Endangered and Threatened Species Error! Bookmark not defined.

Status of federally and state listed threatened and endangered species in the watershed.

Scientific Name	Common Name	Federal Status	State Status
<i>Haliaeetus leucocephalus</i>	Bald Eagle		Threatened
<i>Canus lupus</i>	Gray wolf	Endangered	
<i>Phoxinus neogaeus</i>	Northern Redbelly Dace		Threatened
<i>Charadrius melodus</i>	Piping plover	Threatened	Threatened
<i>Grus americana</i>	Whooping Crane	Endangered	Endangered



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5.5 RESOURCE ACCOMPLISHMENTS

5.5.1 Performance Results Systems (PRS) Data

The PRS is an Integrated Accountability System (IAS) application that collects practice-based information for NRCS conservation programs. Currently, the PRS program is used by NRCS employees and partners to record performance data on conservation plans and practices that are planned and applied.



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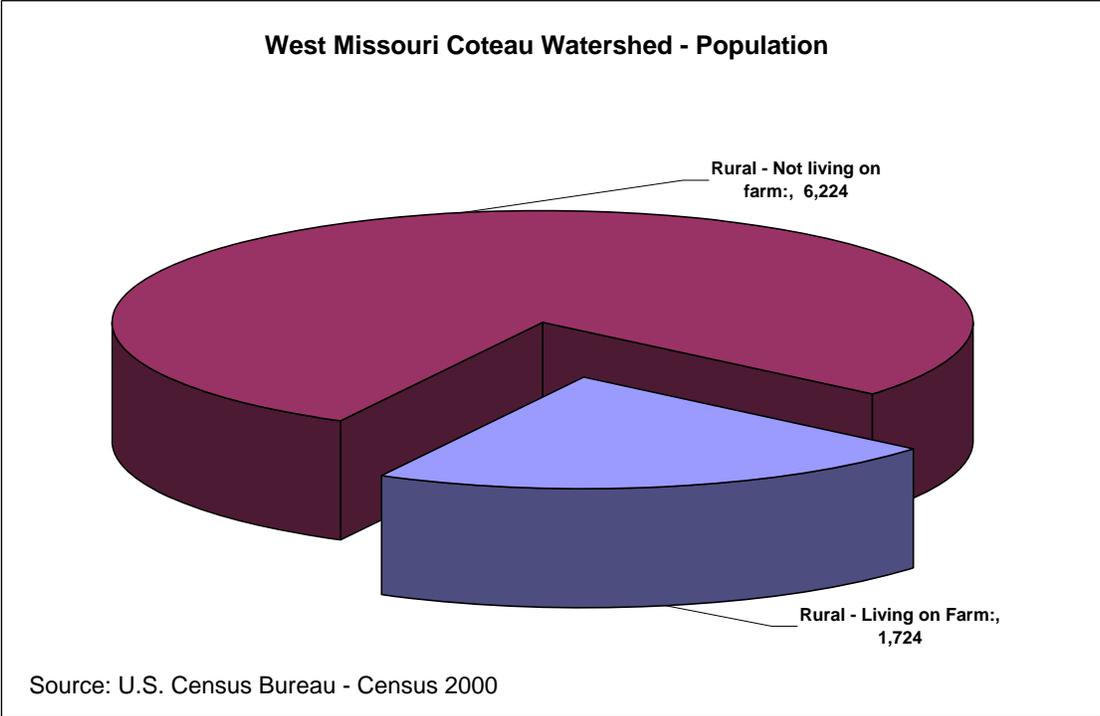
PRS Data	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09
Applied Conservation Treatment (Units/Acres)						
Access Control (472) (ac)	146	12	153	2,613	949	174
Conservation Cover (327) (ac)	1,172	1,368	3,518	4,226	5,551	2,329
Conservation Crop Rotation (328) (ac)	420	110	3,531	3,005	5,560	77
Contour Buffer Strips (332) (ac)				2		
Cover Crop (340) (ac)		24			205	
Critical Area Planting (342) (ac)	5	19				
Early Successional Habitat Development/Mgmt (647) (ac)				2	262	
Fence (382) (ft)	53,683		16,271	57,533	79,596	11,748
Filter Strip (393) (ac)	55		44	24	8	
Forage Harvest Management (511) (ac)	159	735	108	602	429	45
Heavy Use Area Protection (561) (ac)	9					
Hedgerow Planting (422) (ft)	2,500				466	
Irrigation System, Sprinkler (422) (ac)			733			
Irrigation Water Conveyance, Pipeline, Low Pressure, Underground, Plastic (430EE) (ft)			2,600			
Irrigation Water Conveyance, Pipeline, Steel (430FF) (ft)			3			
Irrigation Water Management (449) (ac)				529		
Mulching (484) (ac)		9	57	46	42	1
Nutrient Management (590) (ac)	1,249	5,941	2,562	2,774	373	200
Pasture and Hay Planting (512) (ac)	60	24	225	382	155	
Pest Management (595) (ac)	1,639	5,717	3,334	2,566	2,815	1,793
Pipeline (516) (ft)	21,667	11,827	48,168	14,516	45,147	
Pond (378) (no)	1		2	1	1	
Prescribed Grazing (528) (ac)	4,116	2,659	6,297	7,228	7,241	63
Pumping Plant (533) (no)				1	3	
Range Planting (550) (ac)			85	13	20	40
Residue Management, Mulch Till (345) (ac)	745	221		1,633		
Residue Management, No-Till/Strip Till/Direct Seed (329) (ac)	1,122	6,038	3,432	408	1,851	148
Residue Management, Seasonal (344) (ac)	178	11		2,806	152	
Restoration and Management of Declining Habitats (643) (ac)				211		
Riparian Herbaceous Cover (390) (ac)	1	10	2			
Salinity and Sodic Soil Management (610) (ac)				20		
Sediment Basin (350) (no)	6					
Spring Development (574) (no)			3			
Upland Wildlife Habitat Management (645) (ac)	494	344	487	3,547	801	559
Waste Storage Facility (313) (no)					1	
Waste Utilization (633) (ac)				311		
Water Well (642) (no)	4				1	
Watering Facility (614) (no)	16	8	17	14	21	1
Wetland Creation, Enhancement, and Restoration (658, 659, 657) (ac)	42	43	29			9
Wetland Wildlife Habitat Management (644) (ac)	3			12	5	
Windbreak/Shelterbelts (380 and 650) (ft)	63,474	14,556	39,643	38,373	564,213	623

6.0 CENSUS AND SOCIAL DATA^{12 13}

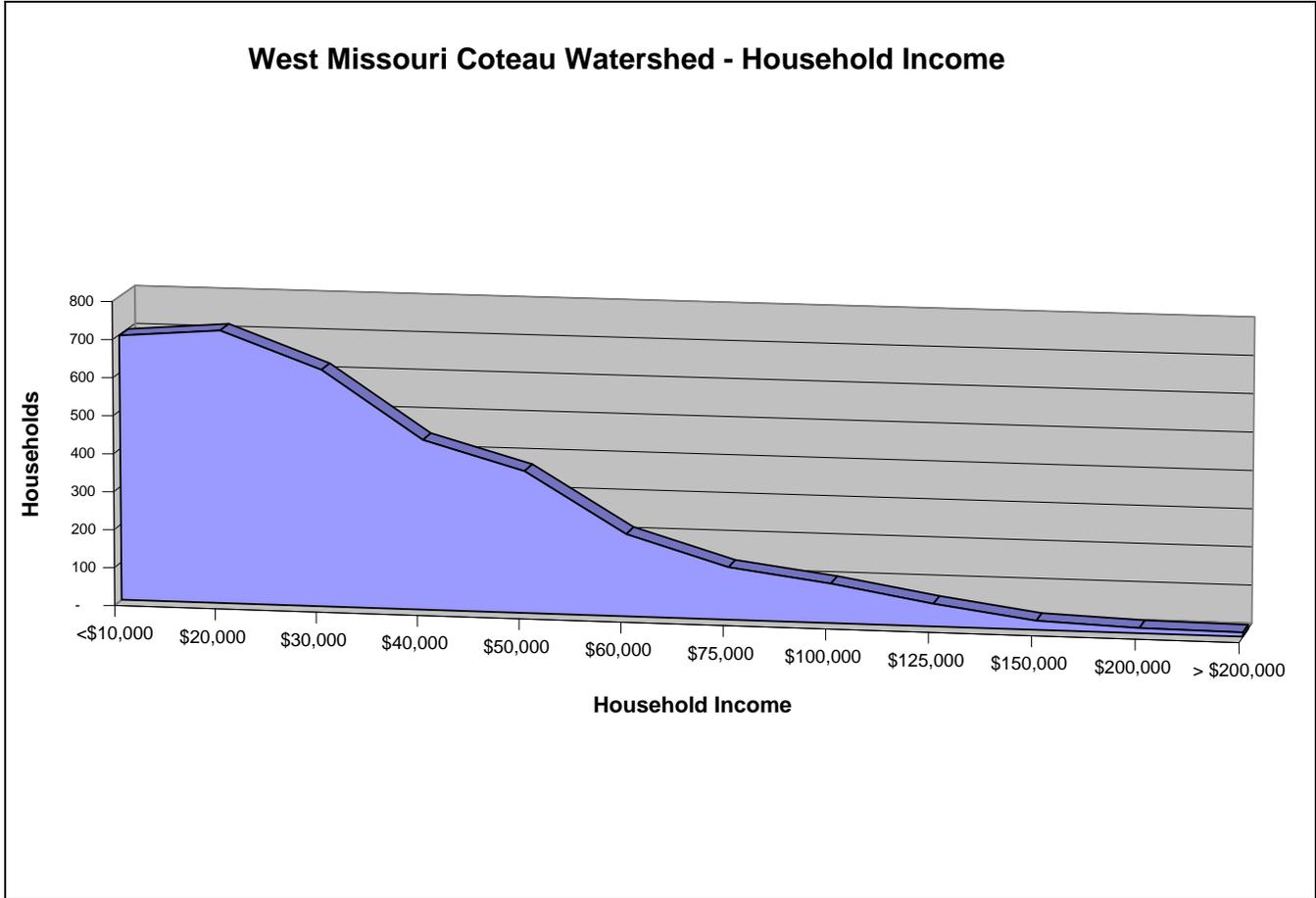
This section provides basic social data gathered through the 2007 Census of Agriculture and United States Census 2000.

6.1 POPULATION CHART

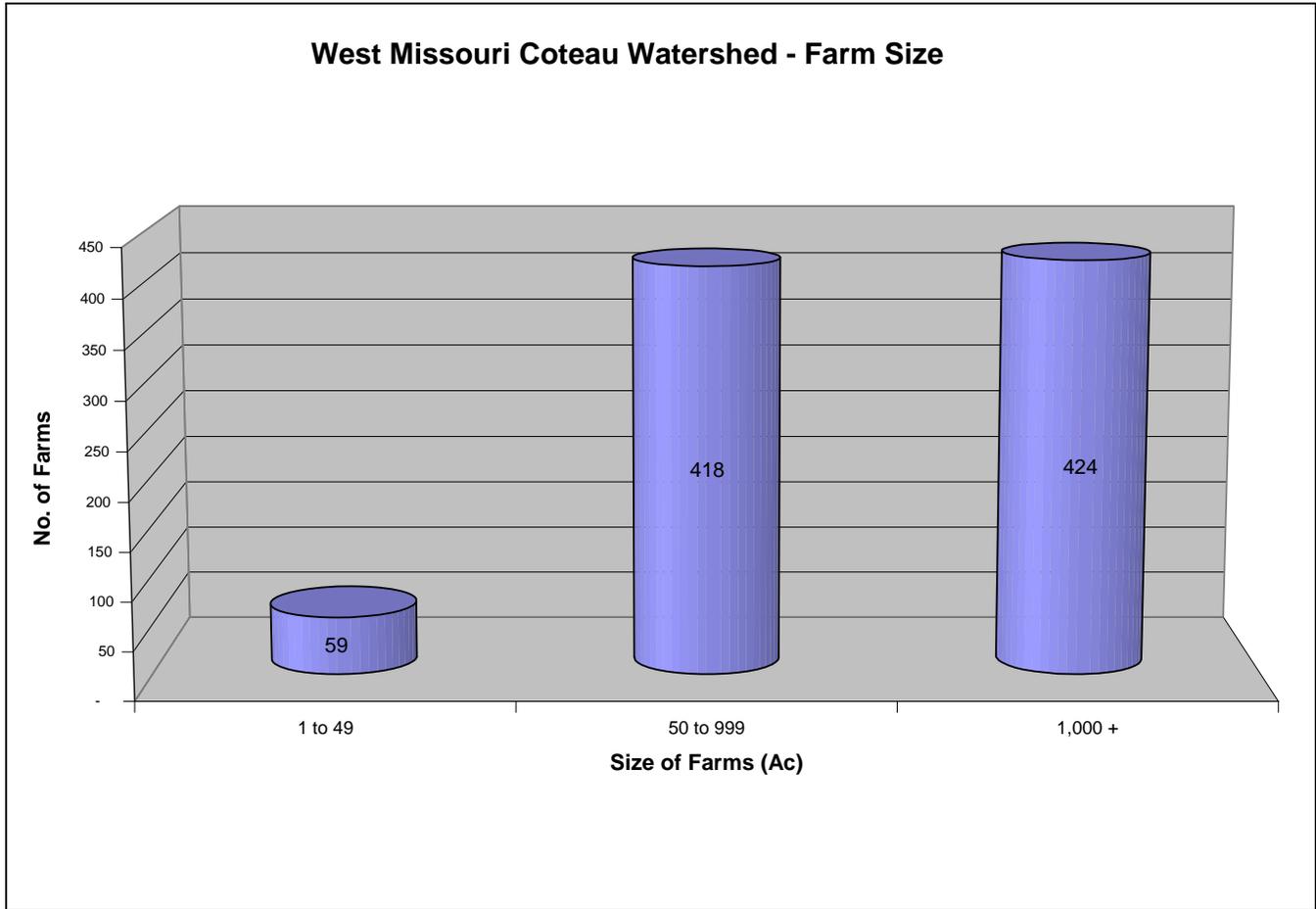
Census data for the rural and urban population within the watershed.



6.2 HOUSEHOLD INCOME

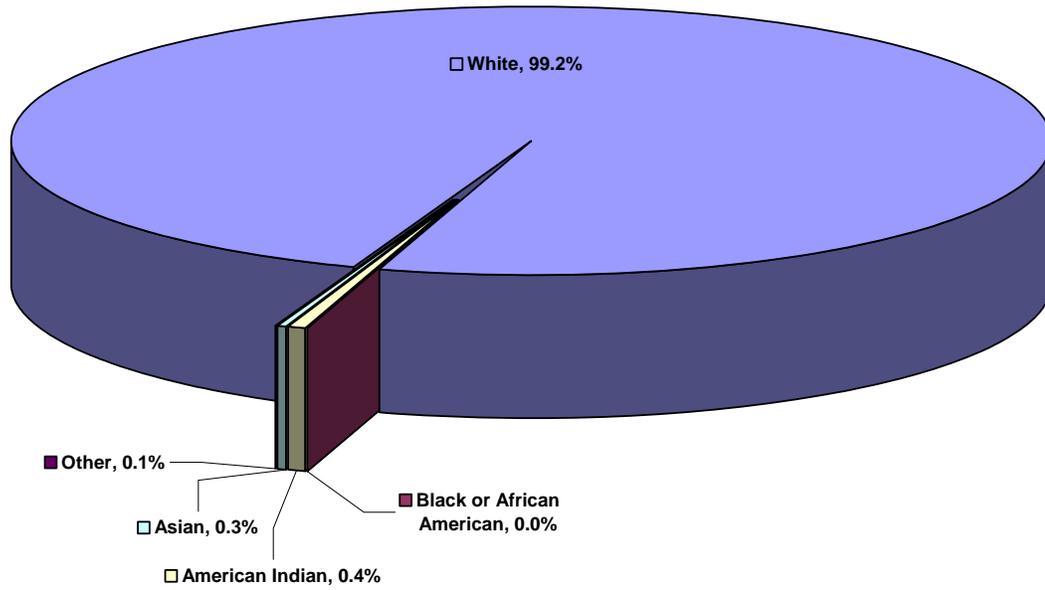


6.3 FARM SIZE

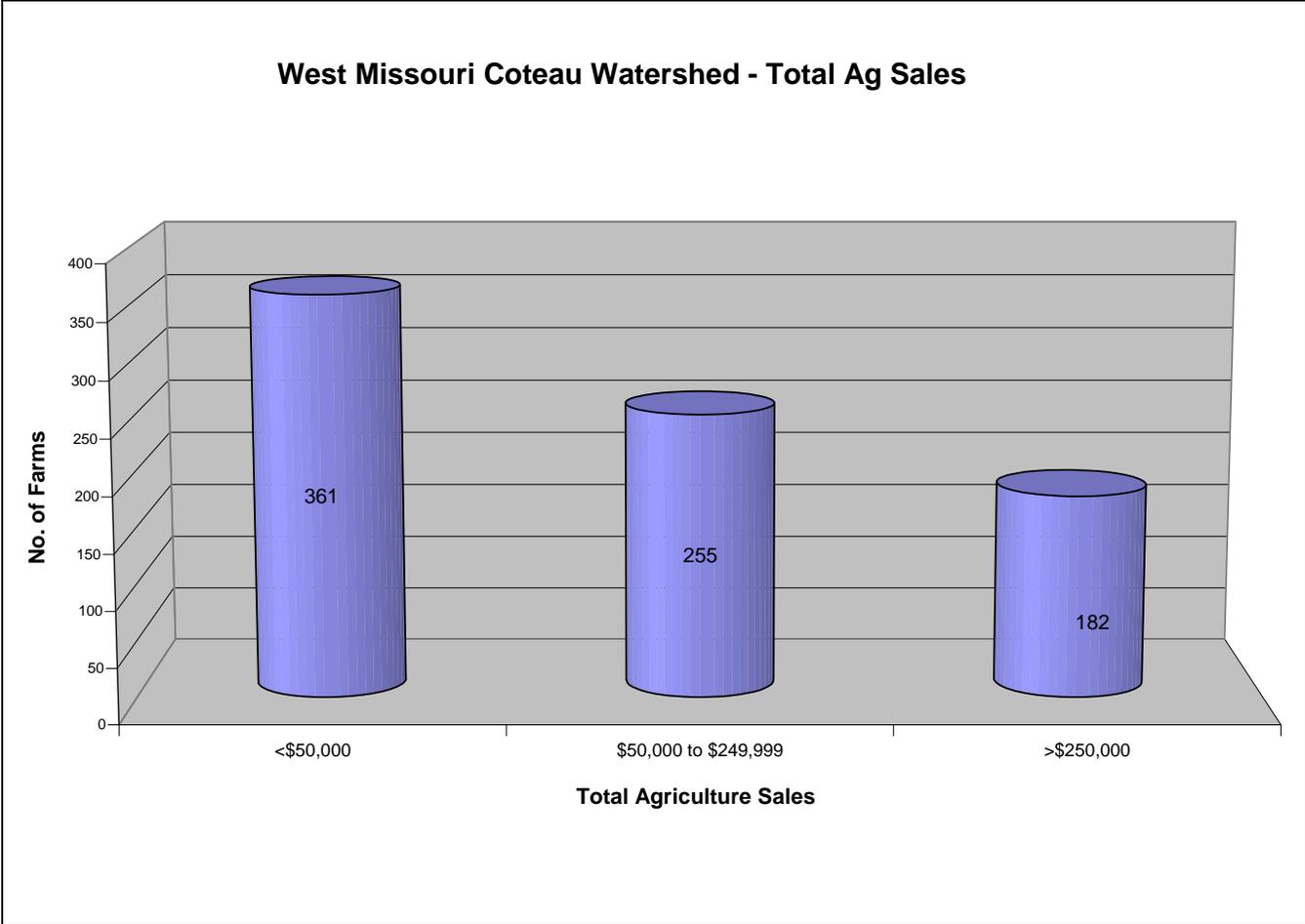


6.4 DEMOGRAPHICS

West Missouri Coteau Watershed - Demographics



6.5 TOTAL AGRICULTURAL SALES



7.0 REFERENCES/PREPARERS

7.1 LIST OF PREPARERS - This RWA was prepared by an interdisciplinary team composed of the following personnel:

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7.2 REFERENCES

¹ Natural Resources Conservation Service
² South Dakota Geological Survey, 2004
³ North Dakota Geological Survey
⁴ Prism Group, 1990, south Dakota Annual Precipitation Data 1961-1990
⁵ South Dakota State University, 2007. South Dakota Office of Climatology
⁶ North Dakota State University, 2009. North Dakota Climate Office
⁷ High Plains Regional Climate Center, 2007
⁸ United States Geological survey – Originator of National Land Cover Dataset
⁹ South Dakota Department of Environment and Natural Resources (SD DENR)
¹⁰ North Dakota Department of Health – Division of Water Quality
¹¹ SD DENR – Surface Water Quality
¹² 2007 Census of Agriculture, National Agricultural Statistics Service. Adjusted by percent of HUC in the county or by percent of zip code in the HUC, depending on the level of data available.
¹³ United States Census 2000, United States Census Bureau. Adjusted by percent of HUC in the county or by percent of the census block in the HUC, depending on the level of data available.