Willow Creek
09010004
8-Digit Hydrologic Unit Profile

March 2008

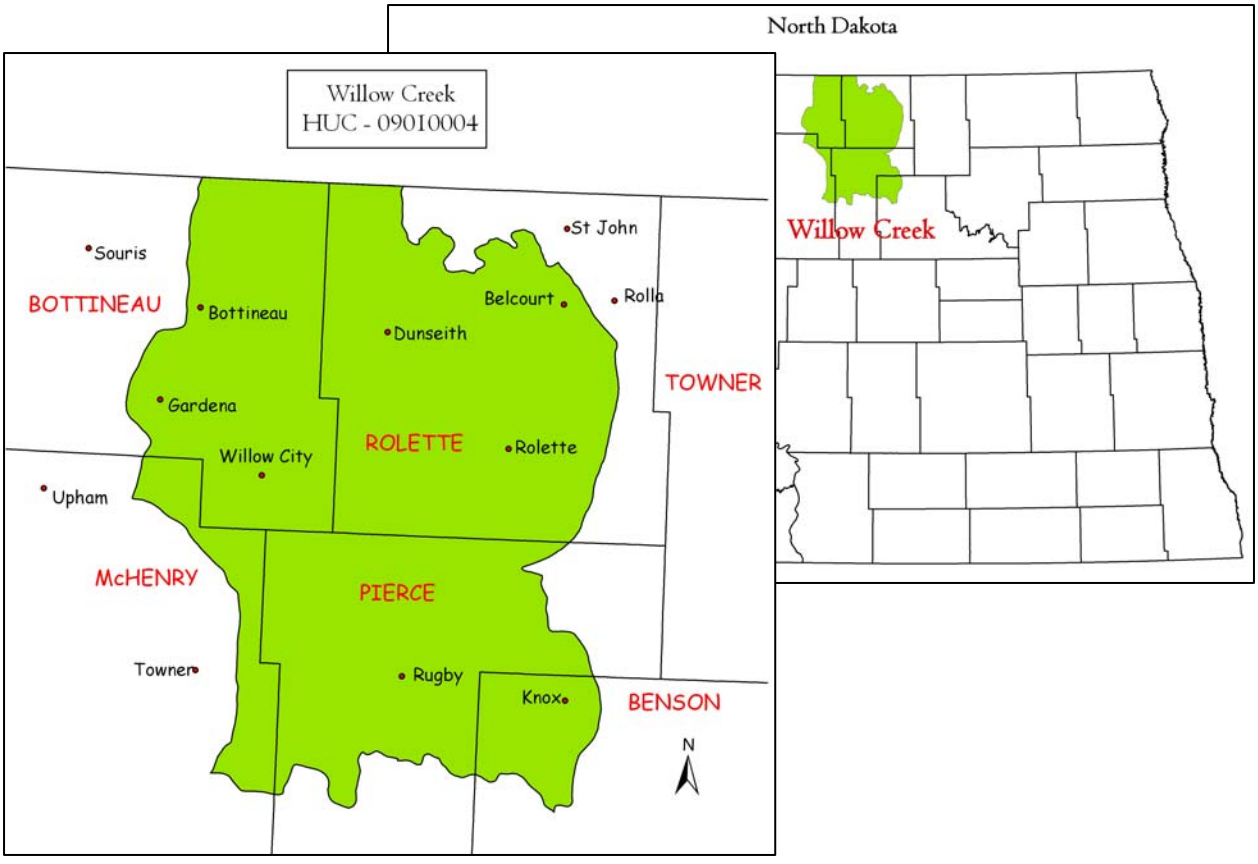
Introduction

The Willow Creek 8-Digit Hydrologic Unit Code (HUC) (09010004) sub-basin includes land in North Dakota and Canada. There are approximately 1,135,600 acres in the North Dakota portion of the sub-basin. This sub-basin is located in the Souris-Red-Rainy Region, Souris Sub-Region.

This report addresses only the portion located within North Dakota. The Willow Creek 8 Digit Hydrologic Unit Code (HUC) (09010004) subbasin is approximately 1,135,600 acres covering portions of five counties (Rolette, Pierce, Bottineau, Benson, and McHenry). Of the 1,135,600 acres, Rolette County contains 38%, Pierce 27%, Bottineau 24%, Benson 6%, and McHenry 5%. There are approximately 914 farms in the sub-basin. The following two maps show the entire sub-basin and also the portion of the sub-basin located within North Dakota.

This sub-basin encompasses commodities ranging from canola, wheat, durum, barley, sunflowers, pulse crops, and soybeans to beef cattle, swine, poultry, and bees.

Conservation assistance is provided by five Natural Resources Conservation Service (NRCS) Service Centers and two Resource Conservation & Development (RC&D) Offices.



Produced by the Natural Resources Planning Staff Bismarck, ND

Physical Description

The following table and map show land use / land cover within the sub-basin.

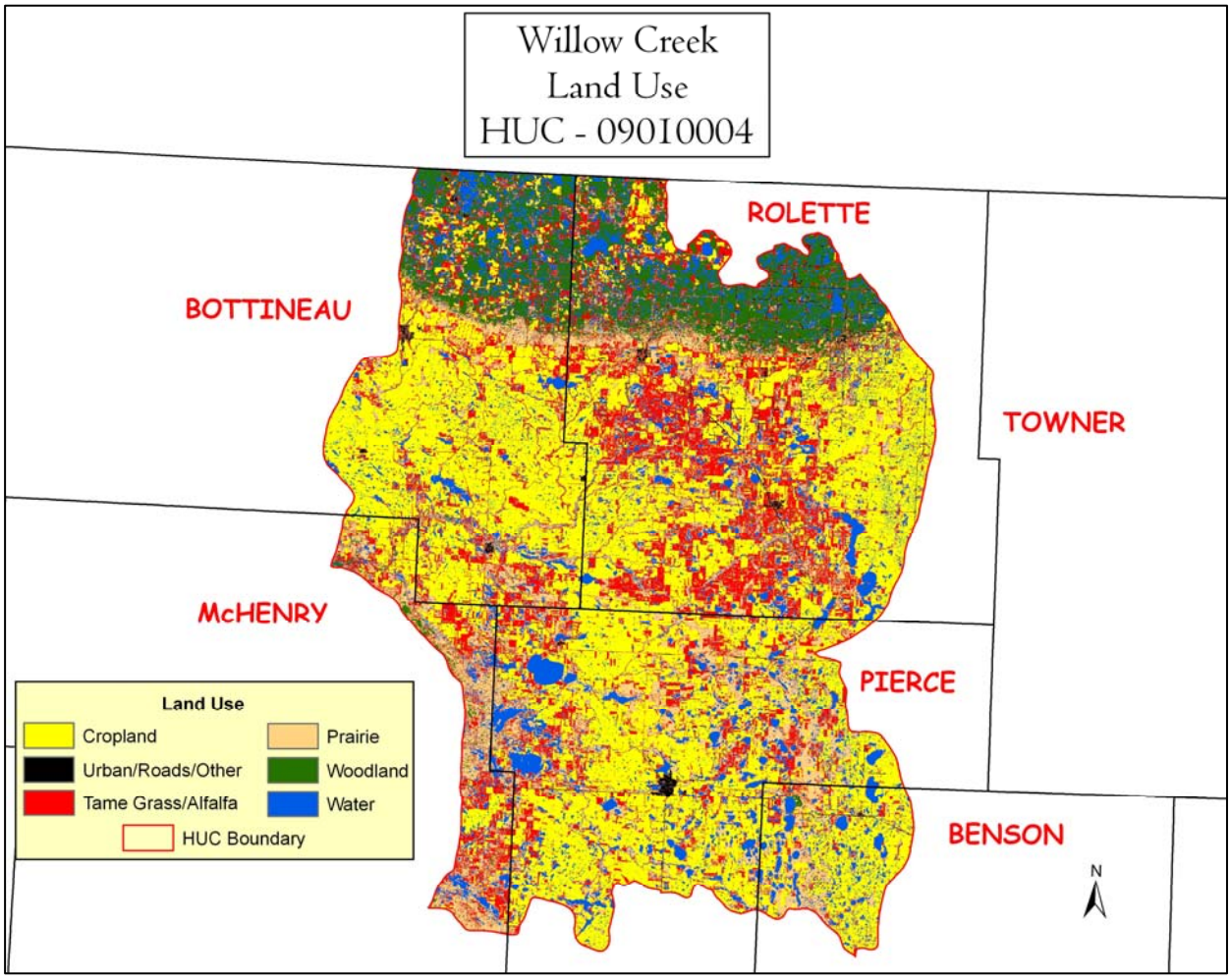
Land Use / Land Cover *(National Resources Inventory [NRI])*[1]	Acres	Percent of HUC
Forestland	87,300	8%
Cropland	495,700	44%
Conservation Reserve Program (CRP) Land [2] [a]	94,100	8%
Tame Grass/Hayland	91,700	8%
Pastureland	43,000	4%
Rangeland	211,800	19%
Urban/Farmstead/ Transportation Land	60,200	5%
Water/Wetlands	39,000	3%
Federal Lands	12,800	1%
Minor Lands **		
North Dakota HUC Totals [b]	1,135,600	100%

** Less than one percent of total acres. See below for special considerations.*
*** Minor land includes farmsteads, windbreaks, marshland, etc.*
a: Estimate from Farm Service Agency records and include CRP/CREP.
b: Totals may not add due to rounding and small unknown acreages.

Irrigated Land *Farm Services Agency*[3] *Estimates*	892	<1%

Physical Description – Continued

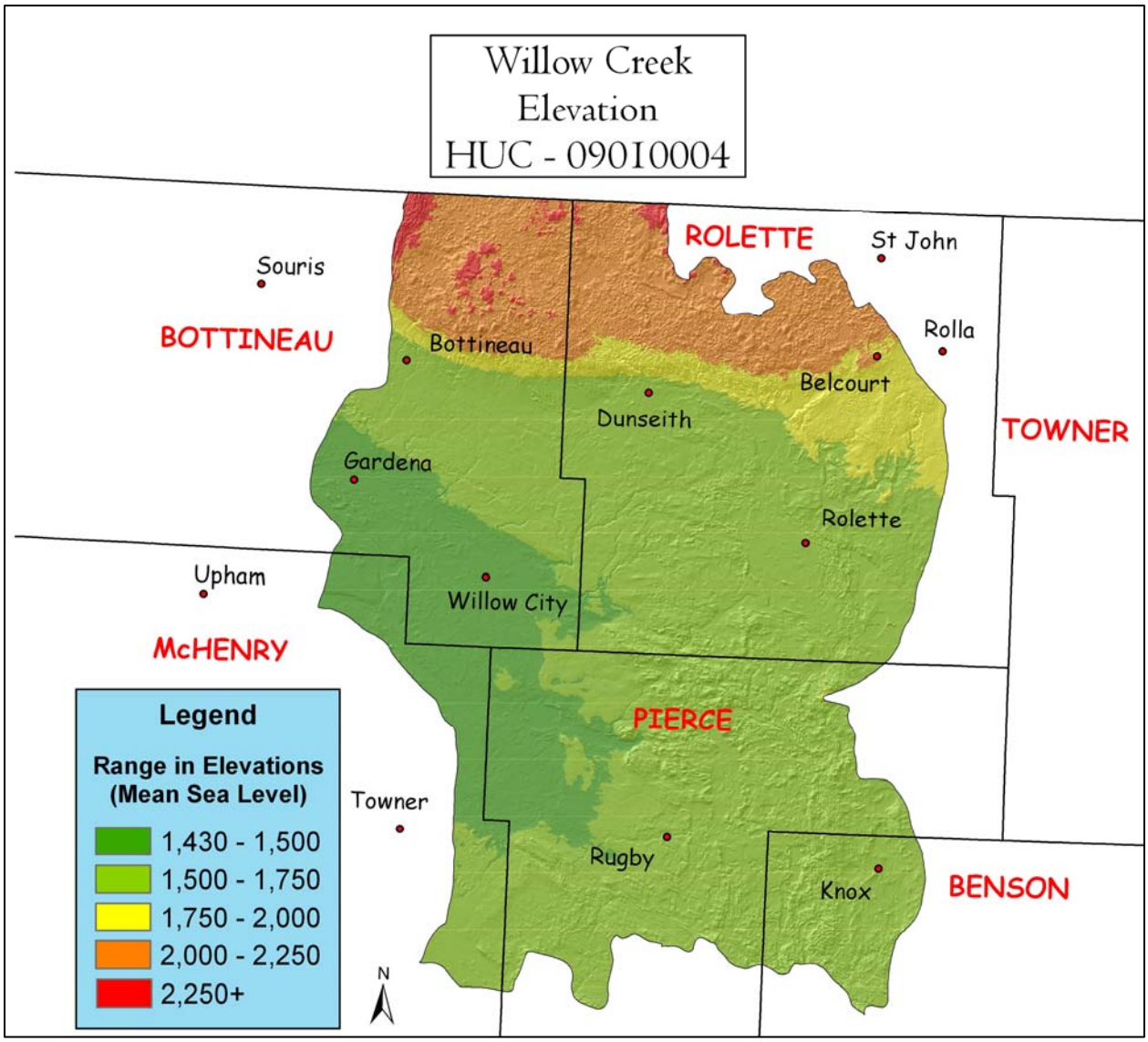
Land Use/Land Cover Map



The above map was developed from U.S. Geologic Survey's (USGS) ND Gap Analysis Program data.[4]

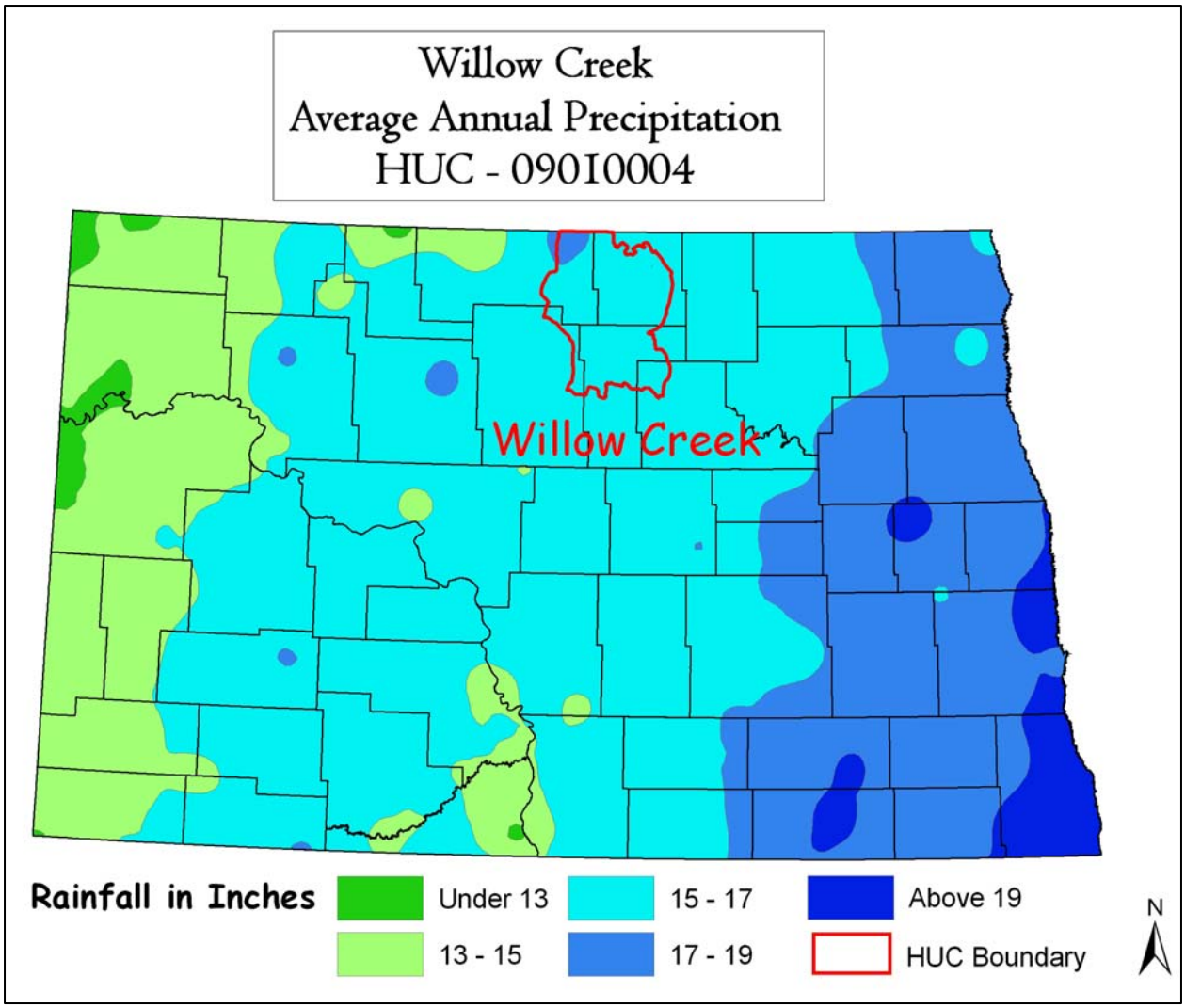
Physical Description – Continued

The sub-basin is part of the Souris-Red-Rainy River Region – Souris Sub-Region and Souris Basin. All drainage patterns flow to the west ending at the Souris River, which then flows north into Canada. The following map shows the relief for the sub-basin.[5]



Physical Description – Continued

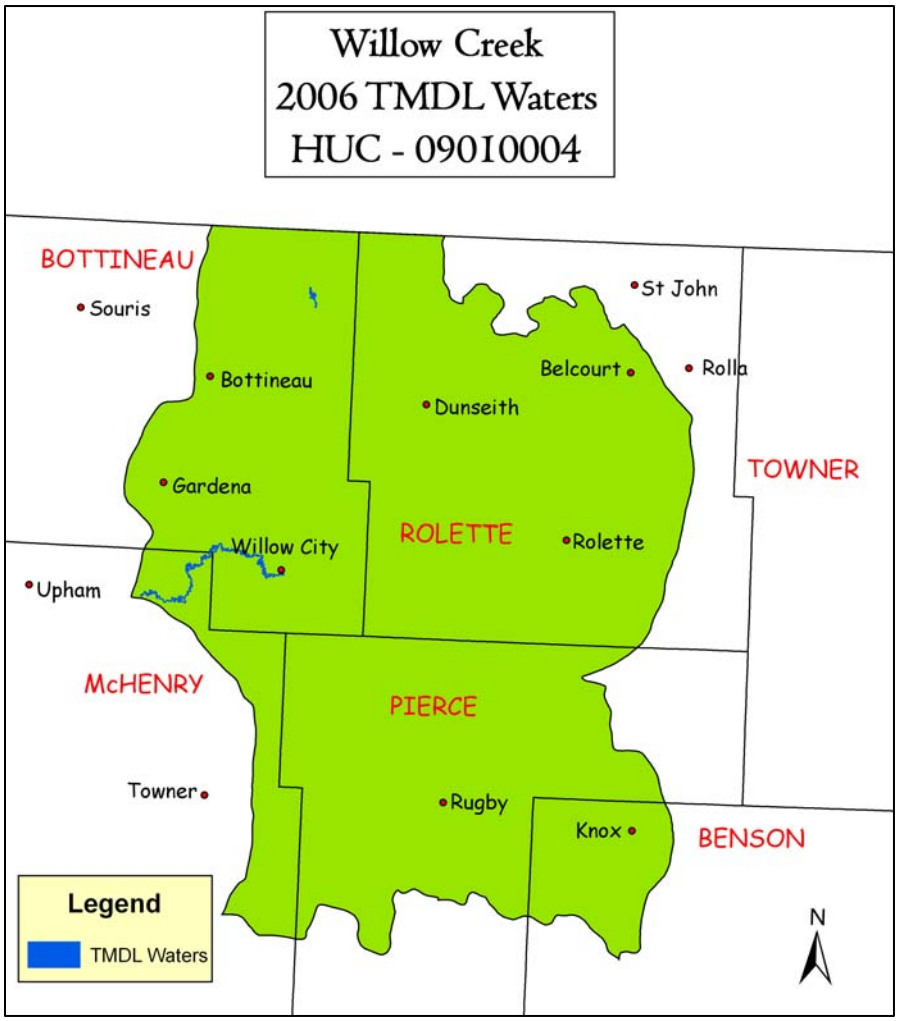
The following map is a plot of 1961-1990 annual average precipitation contours from National Oceanic and Atmospheric Administration (NOAA) Cooperative Stations and (where appropriate) USDA-NRCS Snowpack Telemetry (SNOTEL) Stations. Christopher Daly used the PRISM (**P**arameter-elevation **R**egressions on **I**ndependent **S**lopes **M**odel) model to generate the gridded estimates from which this map was derived: the modeled grid was approximately 4x4 km latitude/longitude, and was resampled to 2x2 km using a Gaussian filter. Mapping was performed by Jenny Weisberg and Nathaniel DeYoung. Funding was provided by USDA-NRCS National Water and Climate Center. (4/20/98)



Physical Description – Continued

The North Dakota Department of Health collects water quality data on major water bodies. The following table shows the total miles of streams and acres of lakes/reservoirs within the sub-basin and also the miles and acres with a water quality limitation. A map showing the Total Maximum Daily Load (TMDL) waters within the watershed follows the table. TMDL is the amount of a particular pollutant a stream, lake, estuary, or other waterbody can "handle" without violating State water quality standards.

		Units	Willow Creek Sub-basin[6]	Willow Creek Impaired Water Quality (303d)[7]	Percent Impaired* Willow Creek
Water Quality Data **Percent of Total Miles and acres in HUC*	Total – Major Water Bodies				
	Rivers/Streams	Miles	517.1	39.4	7.6%
	Lakes/Reservoirs	Acres	6,815	287	4.2%



Physical Description – Continued

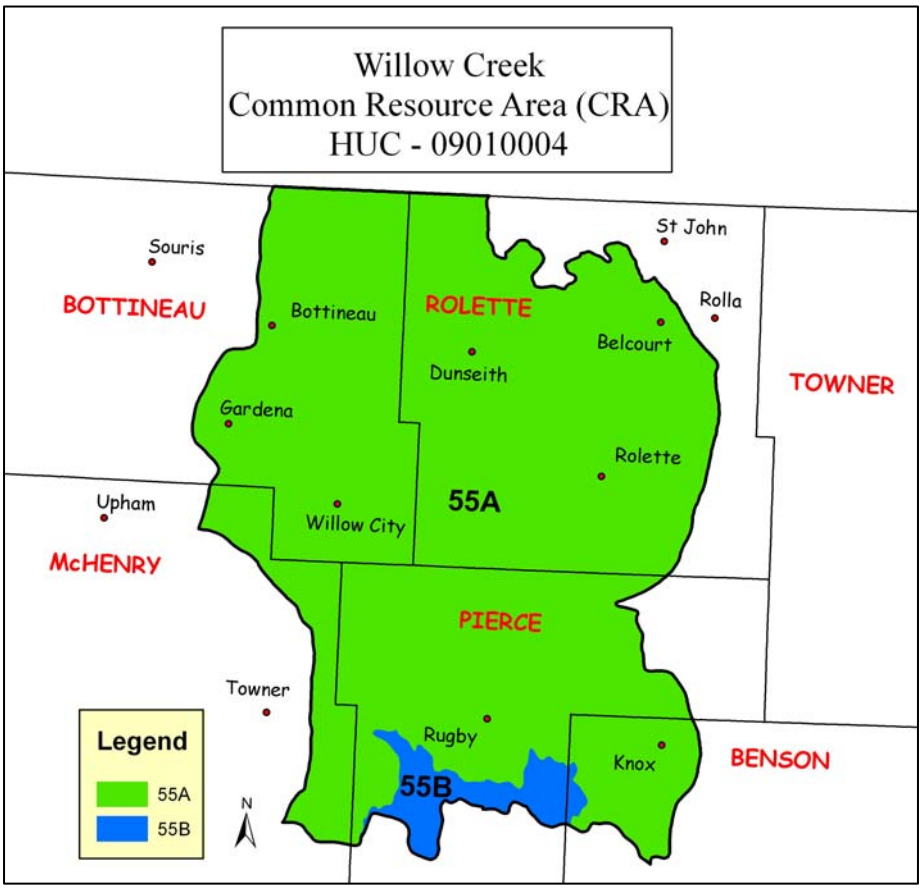
The following two tables show feeding operations, permitted operations, and livestock numbers. The first table lists the number of animal feeding operations and animals as tracked by the North Dakota Department of Health. The second table shows livestock numbers for all cattle, beef cows, dairy cows, hogs and pigs, and sheep and lambs. These livestock numbers were extrapolated from 2002 Agricultural Census county data to 8-digit HUC's.

Animal Feeding Facilities – North Dakota Department of Health Permit[8]					
Animal Type	**Dairy**	**Beef**	**Swine**	**Other**	**Total**
Number of Animal Feeding Operations	3	9	0	1	13
Number of Animals	210	3,980	0	7	4,197
Number of State Permitted Operations					7

Livestock Numbers (rounded to nearest 100)[9]					
	Cattle and Calves	Beef Cows	Dairy Cows	Hogs and Pigs	Sheep and Lambs
North Dakota	1,873,200	982,300	34,500	138,800	114,000
Willow Creek	43,100	21,500	800	200	100
Willow Creek as a percent of North Dakota	2.3%	2.2%	2.3%	0.1%	1.2%

Physical Description – Continued

Common Resource Areas (CRAs) are geographical areas where resource concerns, problems, or treatments are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information were used to determine the geographic boundaries. CRAs are subsets of Major Land Resource Areas. The following map[10] shows the CRAs for Willow Creek sub-basin with the descriptions below.



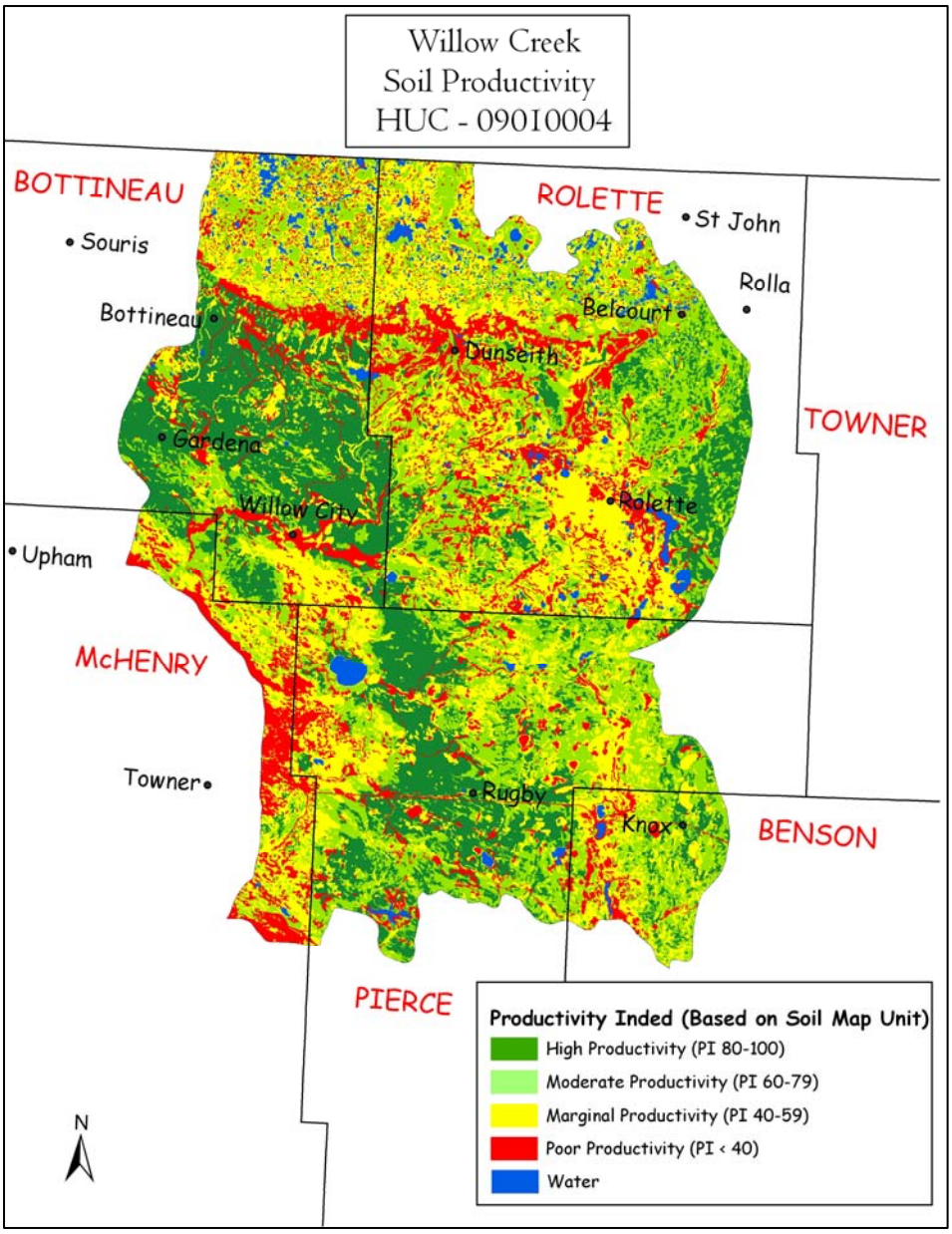
55A.1 - Northern Black Glaciated Drift Plain: The Northern Black Glaciated Drift Plain is a nearly level to undulating landscape composed of glacial till and lacustrine sediments. Temporary and seasonal wetlands are numerous throughout the area. Agriculture is limited by a very short growing season and the coldest January temperatures in the Northern Plains.

55B.1 - Central Black Glaciated Drift Plain: The Central Black Glaciated Drift Plains are a gently rolling to undulating landscape with a thick layer of glacial till. Temporary and seasonal wetlands are numerous throughout the area. These soils are very fertile, but agricultural success is subject to annual climatic fluctuations. Most of the soils are deep, well drained and moderately well drained, sandy to clayey, and have a frigid temperature regime.

Soil Productivity [11]

The area in Bottineau County, generally north of Willow City and South of the Turtle Mountains, has soils with high productivity indexes. These fertile soils developed from sediments of glacial Lake Souris. The east central edge of the sub-basin in Towner County and an area around Rugby in Pierce County has soils with moderate to high productivity indexes. These soils developed in loamy glacial till. The remainder of the sub-basin has soils with marginal to poor productivity indexes. These soils range from wind blown sands, to hilly loamy and clayey soils of the Turtle Mountains.

The term "Productivity Index" used in this document reflects soil properties and the inherent production capacity of the soil to produce spring wheat.



Common Land Unit

The entire sub-basin has the common land unit digitized by Farm Services Agency (FSA).

Resource Concerns

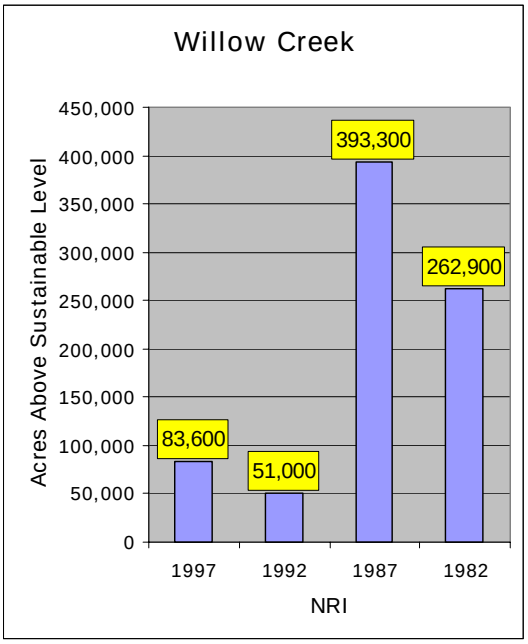
One of the goals of the NRCS is to help quantify the types and amounts of resources that may be of concern in an area. This helps identify priority areas for the types and amounts of assistance given to a particular watershed.

The following table shows the different projects, plans, studies, and assessments conducted within the sub-basin.

Watershed Projects, Plans, Studies and Assessments			
NRCS Watershed Projects		**NRCS Watershed Plans, Studies & Assessments**	
Name	**Status**	**Name**	**Status**
Oak Creek Watershed	Application	Oak Creek Stream Visual Assessment	Final Draft
Willow Creek Watershed	Application	Des Lacs – Souris River Basin Study	Complete
Ox Creek Watershed	Application	Oak and Willow Creek Floodplain Study	Complete
		City of Willow City Floodplain Study	Complete
NDDH TMDLs		**Soil Conservation District Assessments and Studies**	
Number Listed		**Name**	**Status**
Lakes/Reservoirs - 1	Streams – 1	NDDH - Oak Creek Water Quality Assessment	Ongoing
EPA 319 Watershed Projects			
Name		**Status**	
None		NA	

Soil

- NRI estimates indicate there was a 40 percent reduction from 1987 to 1997 in the amount of Highly Erodible Land (HEL) being farmed (112,700 to 68,100).
- The cultivated cropland acreage experiencing erosion rates above sustainable levels decreased to 83,600 acres in 1997, as compared to 393,300 acres in 1987.
- Controlling erosion not only sustains the long-term productivity of the land, but also affects the amount of soil, pesticides, fertilizer, and other organic material that move into the basin's waters.



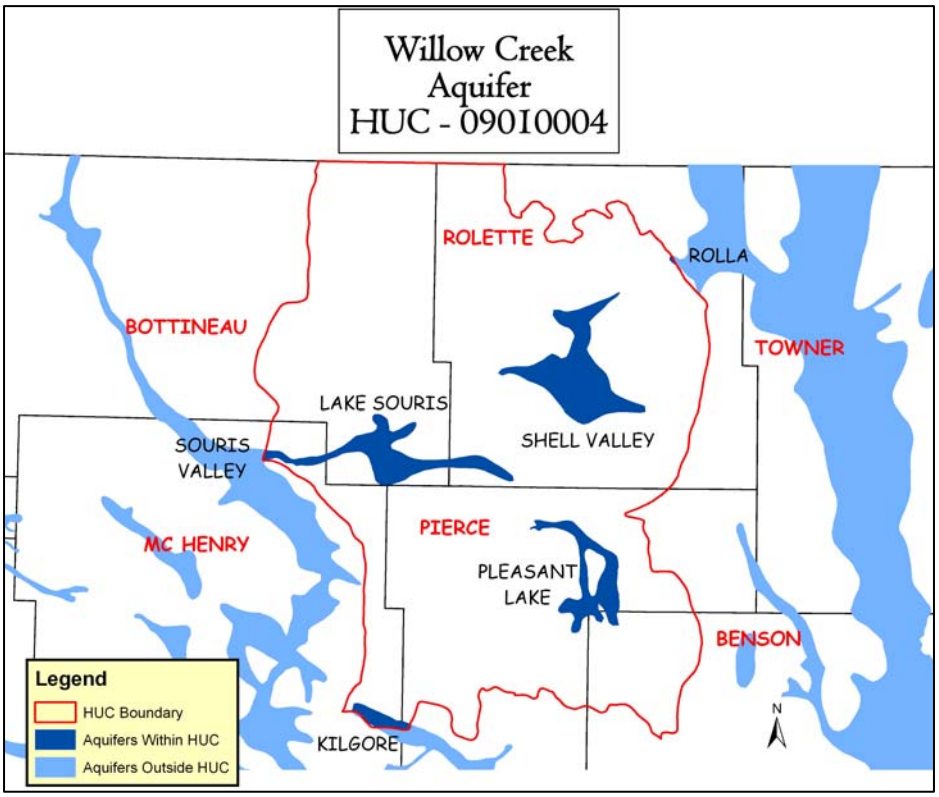
Resource Concerns - Continued

Soil - Continued

- Through NRCS programs, many farmers and ranchers have applied conservation practices to reduce the effects of both wind and water erosion. From 1987 to 1997, the average wind erosion rate reduced from 8.6 tons/acre/year to 2.4 tons/acre/year on all cultivated cropland. The average water erosion rate reduced from 1.2 tons/acre/year to 0.9 tons/acre/year on cultivated cropland.
- Sandy soils and irrigated soils still require conservation practices to control excessive soil erosion.
- Soil condition, especially compaction on silty and clayey soils and loss of organic matter on sandy soils are major resource concerns.
- Soil contaminants from feeding and grazing on sandy soils causing the leaching of excess N, P & K into the soil profile of sensitive areas.
- Lack of cover on cropland and overgrazing of range and pastureland are major soil erosion concerns.
- Lack of vegetation is causing shoreline erosion of area lakes.
- Windbreak plantings, reduced tillage systems, and improved cropping systems are still needed.

Water

- **Aquifers**[12] - There are four glacial drift aquifers (Lake Souris, Souris Valley, Pleasant Lake, and Shell Valley) underlying the Willow Creek sub-basin. These aquifers are the source of water for the All Seasons Water Users Association – System IV, and the cities of Belcourt, Dunseith, Willow City, Rugby, Leeds, Rolette, and Dunseith.



Resource Concerns - Continued

Water (cont.)

- Wellhead Protection Areas – there are thirty protection areas located in the sub-basin. They are designated to protect the municipal water supply for the cities of Belcourt, Dunseith, Willow City, Rugby, Leeds, Rolette, and Dunseith, as well as the All Seasons Water Users Association – System IV. The other wellhead protection areas are associated with small rural businesses located throughout the basin; especially in the Turtle Mountains.
- The stream section on the 303(d) listed in hydrologic unit code 09010004 is listed for fecal coliform.
- Long Lake is listed for nutrients/eutrophication and dissolved oxygen.
- The basin consists of many lakes that are small and have not been analyzed for inclusion on the 303(d) Total Maximum Daily Load (TMDL) list.
- Conservation practices that can be used to address water quality issues include grazing management, erosion control, nutrient, Ag waste management, and riparian buffers.
- Willow Creek has water quality impacts from sedimentation and siltation along with livestock fecal coliforms.
- Feeding and farming practices near wetlands and watercourses are degrading water quality.
- Lack of adequate riparian buffer width and health are impacting water quality and stream health along the Oak, Ox, and Willow Creeks.
- Summer flooding occasionally occurs and impacts crop production.

Air

- Visibility is reduced during winter months from blowing snow.
- Increased wind speeds due to tree/shelterbelt removal.
- Larger feed operations are causing malodors.

Plants

- Controlling invasive plants to help maintain the native plant communities is a major resource concern.
- Conventional tillage systems are still utilized throughout the basin.
- Noxious weeds and poor range condition reduce productivity for livestock and wildlife.
- Season long grazing on or near water courses are of a concern.
- This basin has the largest forestland areas in the State of North Dakota: however, it is not actively managed for timber production or wildlife.

Resource Concerns - Continued

Animals

- Animals that are threatened and endangered can be seen in the following table of threatened and endangered species.

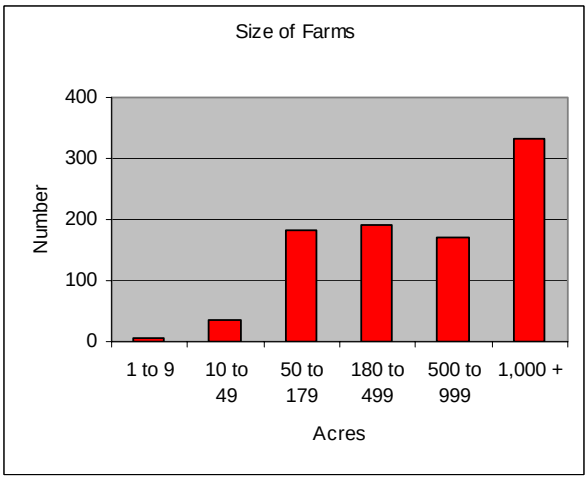
Federally Listed Threatened And Endangered Species			
Species Category	Threatened	Endangered	Candidate
Mammals	None	None	None
Birds	Piping Plover	Whooping crane	None
Fish	None	None	None
Invertebrates	None	None	Dakota Skipper
Plants	None	None	None
Critical Habitat – Piping Plover			

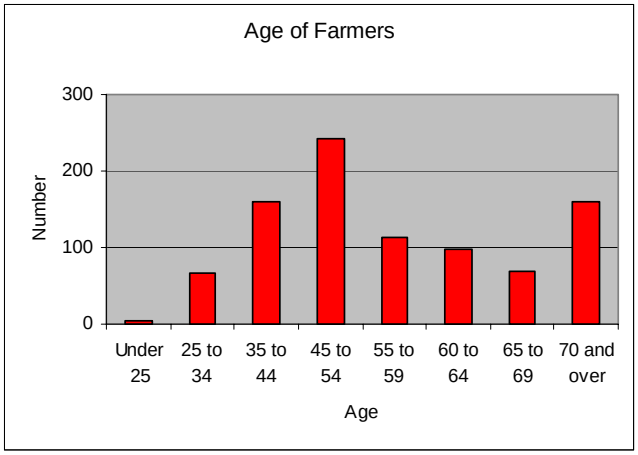
Census and Social Data[13]

Number of Farms: 914

Number of Operators:

- Average Age:
- Full-Time Operators: 67%
- Part-Time Operators: 33%





Limited Resource and Beginning Farmer

Approximately 11.1 percent of the operators are minority producers. Limited Resource Farmers are also estimated at 3.3 percent. Although rather low percentages, these facts point to the potential need for special technical assistance targeted to reach people who (1) may lack experience with government farm programs, (2) have good stewardship intentions but lack management skills, and (3) lack the time to visit an NRCS field office and seek assistance.

References

[1] USDA-NRCS, NRI data.
[2] USDA-Farm Services Agency, Common Land Unit GIS data layer, 2005.
[3] USDA-Farm Services Agency, Common Land Unit GIS data layer, 2005.
[4] USDI-US Geologic Services, ND GAP analysis data, 2005.
[5] USDA-NRCS, Natural Resources Planning Staff, 30 meter Relief Data GIS data layer, 2002.
[6] ND Department of Health, Environmental Health Section, Water Quality Division, and National Hydrography GIS layers, June 2006.
[7] ND Department of Health, Environmental Health Section, Water Quality Division, List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota, 2006.
[8] ND Department of Health, Environmental Health Section, Water Quality Division, Animal Feeding Operations Program data, 2006.
[9] 2002 Census of Agriculture, North Dakota, State and County Data Volume 1, Geographic Area Series Part 34, U.S. Department of Agriculture, National Agricultural Statistics Service, June 2004. (County data was prorated to HUC by the percent of a HUC in a county.)
[10] USDA-NRCS, Natural Resources Planning Staff, Common Resource Area GIS data layer, 2004.
[11] USDA-NRCS, Natural Resources Planning Staff, Soils Productivity GIS data layer, 2006.
[12] ND Department of Health, Environmental Health Section, Water Quality Division, Ambient Ground Water Monitoring Program data, 1997.
[13] 2002 Census of Agriculture, North Dakota, State and County Data Volume 1, Geographic Area Series Part 34, U.S. Department of Agriculture, National Agricultural Statistics Service, June 2004. (County data was prorated to HUC by the percent of a HUC in a county.)