

# Upper Souris 09010001

## 8-Digit Hydrologic Unit Profile

September 2007

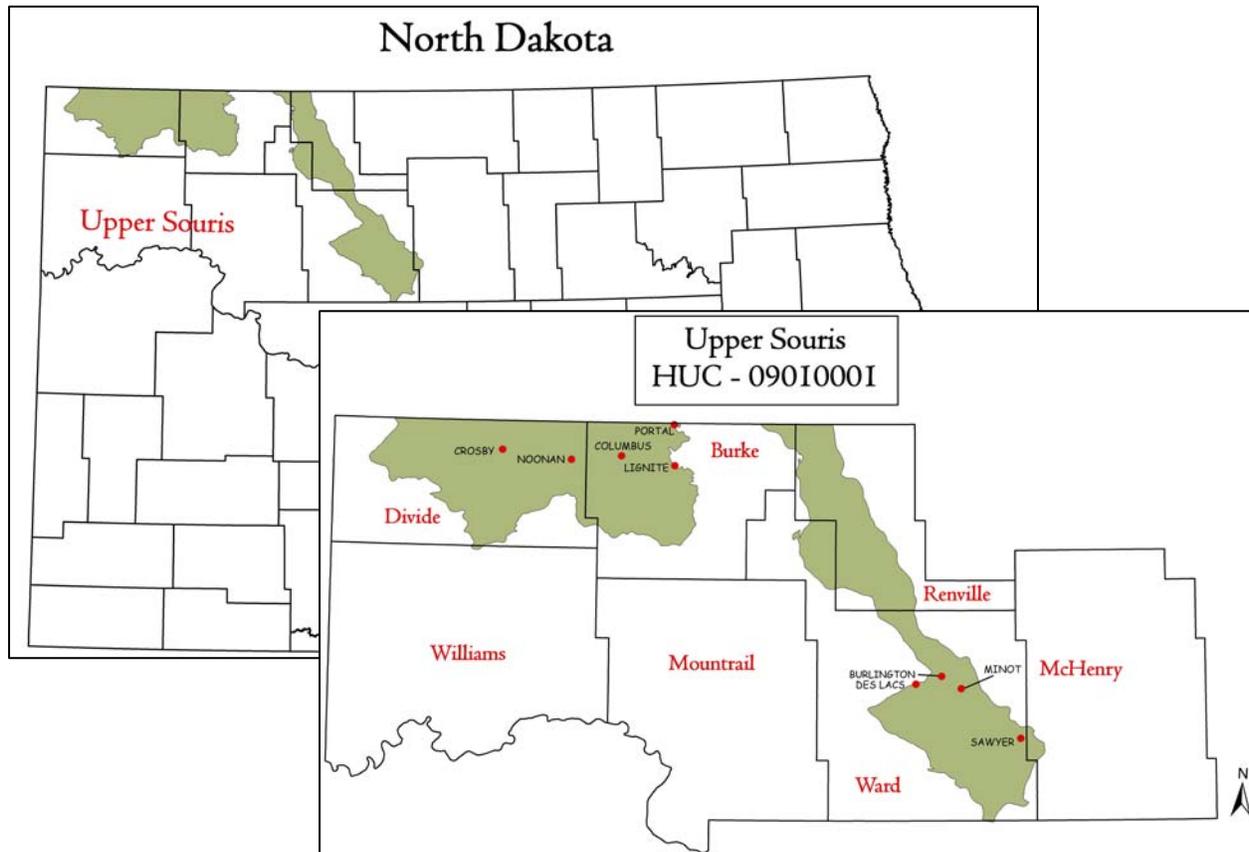
### **Introduction**

The Upper Souris 8-Digit Hydrologic Unit Code (HUC) (09010001) sub-basin includes land in Canada and the United States. There are approximately 1,534,800 acres in the United States (North Dakota) portion of the sub-basin. This sub-basin is located in Souris-Red-Rainy Region, Souris Sub-Region.

This report addresses only the portion located within North Dakota. The Upper Souris is approximately 1,534,800 acres, covering parts of seven counties (Burke, Divide, McHenry, McLean, Renville, Ward, and Williams Counties) in North Dakota. Of the 1,534,800 acres, Divide contains 31%, Ward 30%, Burke 21%, Renville 17%, and McHenry 1%. Both Williams and McLean contain less than 0.5% of the watershed. There are approximately 1,000 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, barley, sunflowers, corn, flax, alfalfa, and pulse crops (peas & lentils) to beef cattle, swine, and bees.

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



*Produced by  
the Natural  
Resources  
Planning Staff  
Bismarck, ND*

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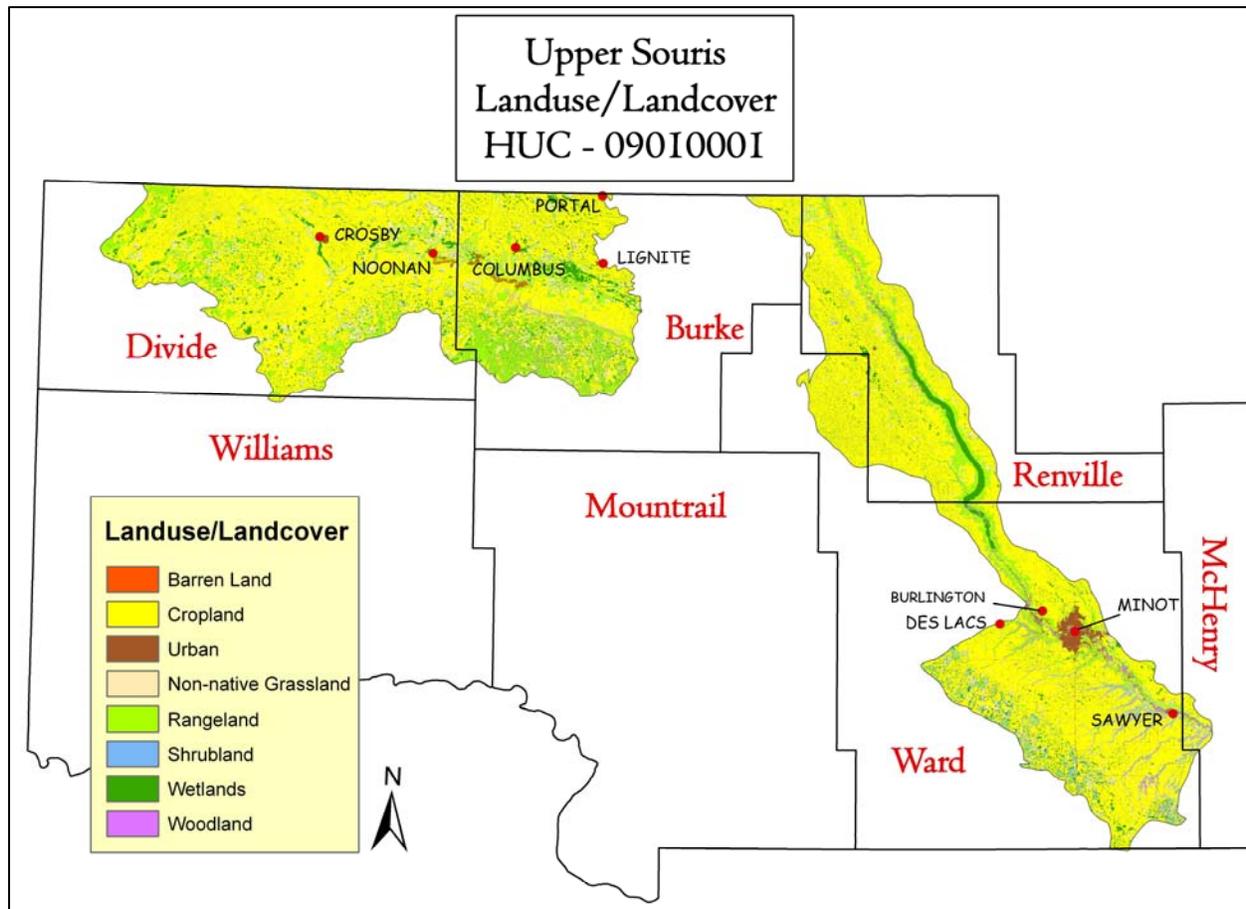
### **Physical Description**

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

<b>Land Use/ Land Cover (National Resources Inventory [NRI])<sup>1</sup></b>	<b>Acres</b>	<b>Percent of HUC</b>
Forestland	1,500	*
Cropland	986,000	64 %
Conservation Reserve Program (CRP) Land <sup>2</sup> <a href="#">a</a>	79,400	5 %
Tame Grass/Hayland	45,300	3 %
Pastureland	16,000	1 %
Rangeland	289,800	19 %
Urban/Farmstead/ Transportation Land	76,900	5 %
Water/Wetlands	19,200	1 %
Federal Lands	20,700	2 %
<b>North Dakota HUC Totals <sup>b</sup></b>	<b>1,534,800</b>	<b>100% *</b>
<p>* Less than one percent of total acres. See below for special considerations.  a: Estimate from Farm Service Agency records and include CRP/CREP.  b: Totals may not add due to rounding and small unknown acreages.</p>		
<b>Irrigated Land</b> <i>(Farm Services Agency)<sup>3</sup></i>	100	<1%

## Physical Description – Continued

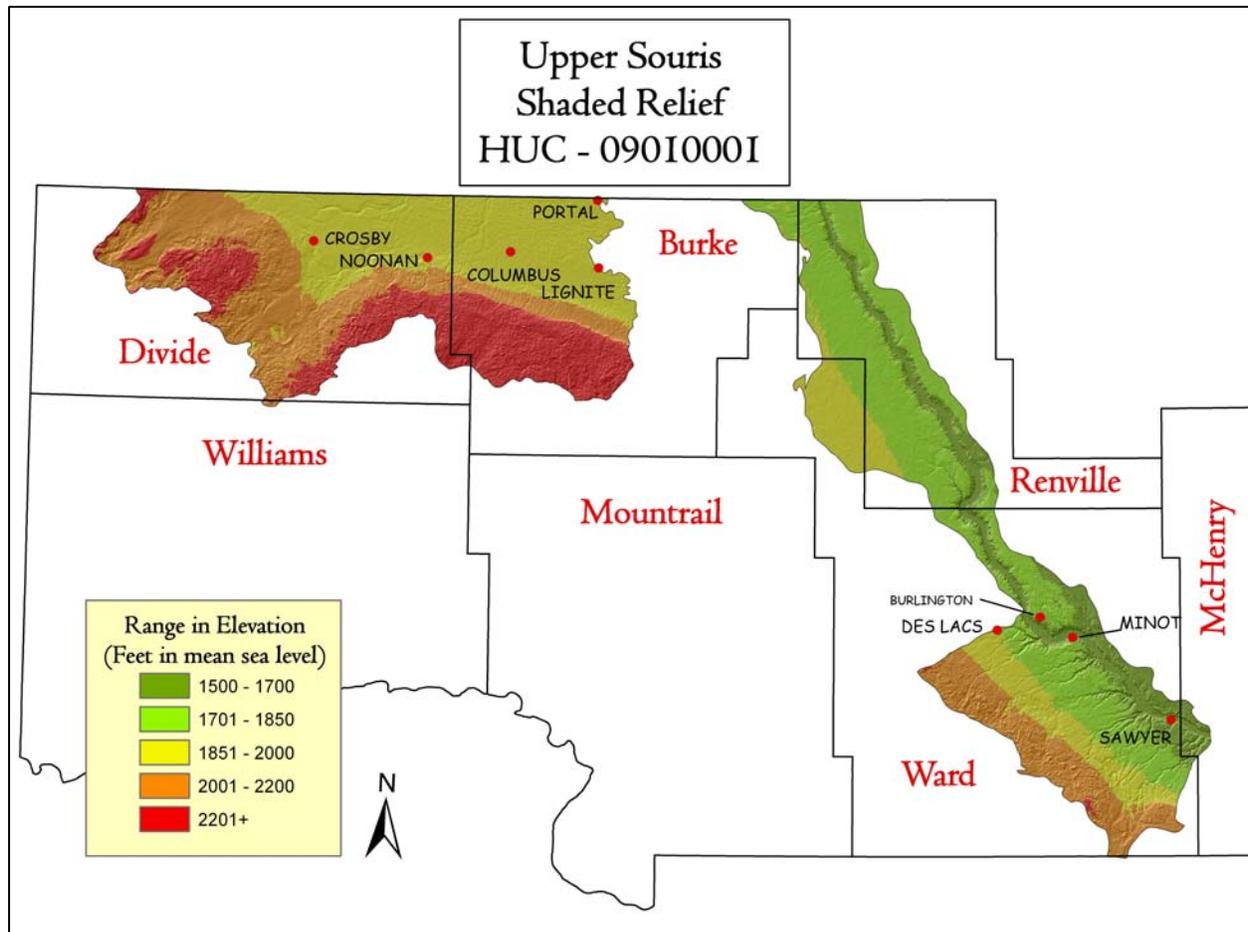
### Land Use/Land Cover Map



The above map was developed from U.S. Geologic Survey's (USGS) ND Gap Analysis Program data.<sup>4</sup>

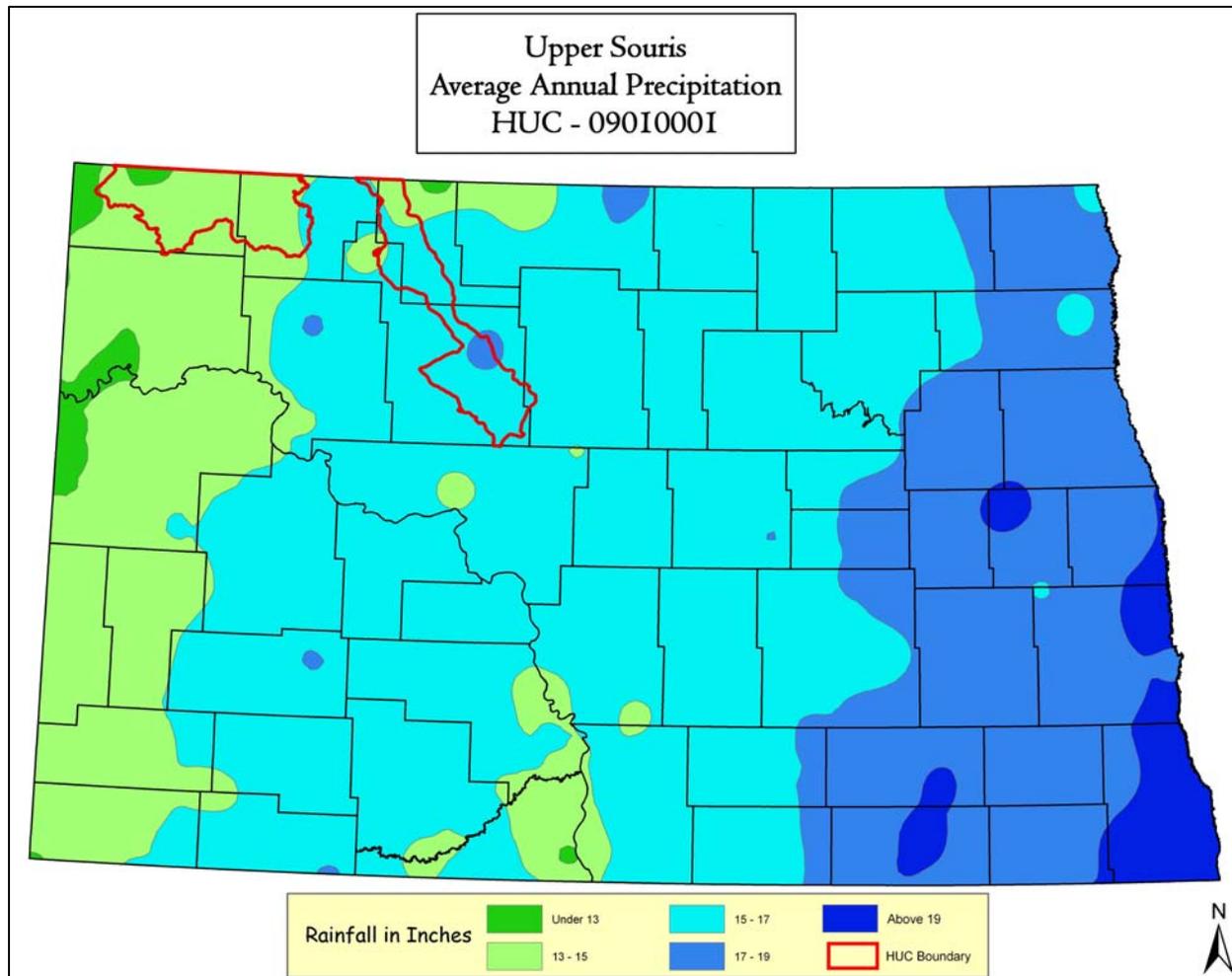
### Physical Description – Continued

The sub-basin is part of the Souris-Red-Rainy River Region - Souris Sub-Region. All drainage patterns flow to the south-east ending at the Souris River, near the City of Velva in McHenry County. From there it flows north, back into Canada. The following map shows the relief for the sub-basin.<sup>5</sup>



### Physical Description – Continued

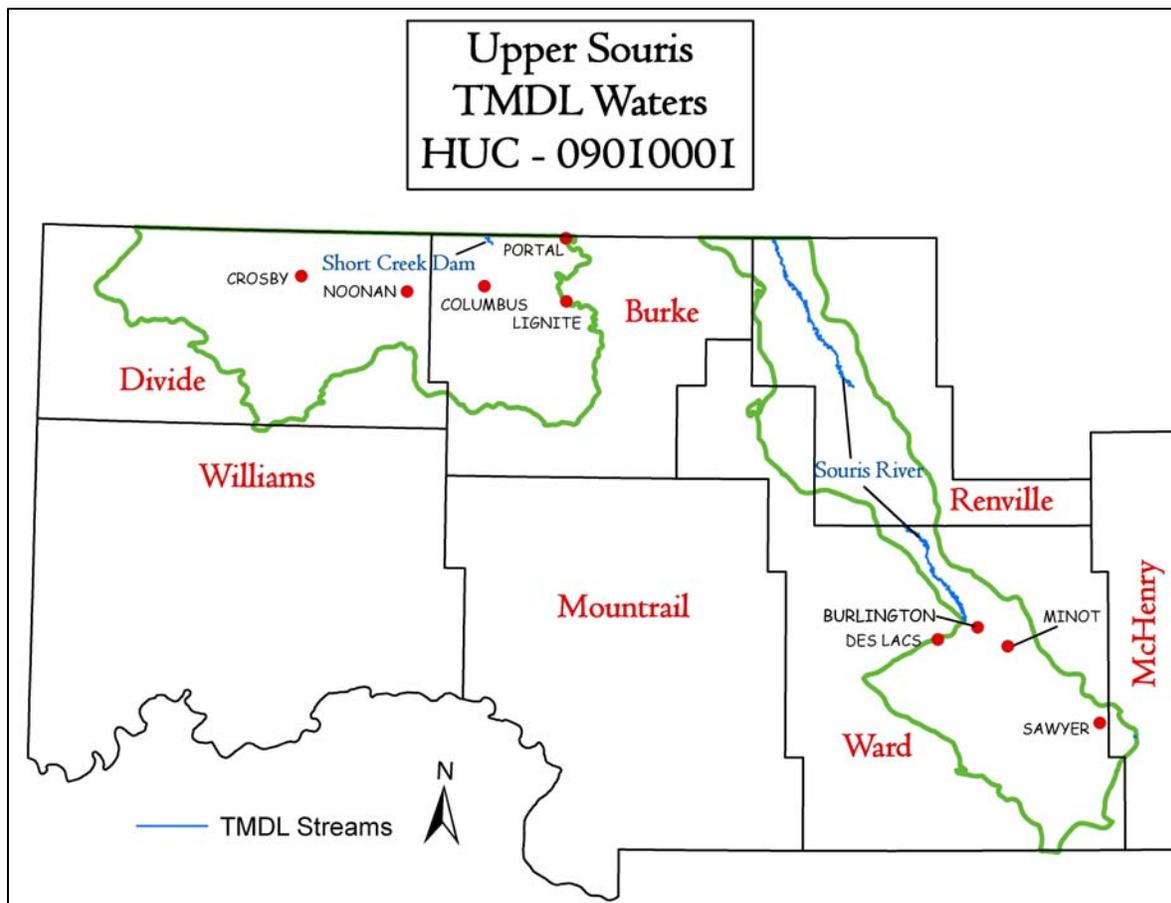
The following map is a plot of 1961-1990 annual average precipitation contours from National Oceanic and Atmospheric Administration (NOAA) Cooperative Stations and (where appropriate) USDA-NRCS Snowpack Telemetry (SNOTEL) Stations. Christopher Daly used the PRISM (**P**arameter-elevation **R**egressions 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	Upper Souris Sub-basin <sup>6</sup>	Upper Souris Impaired Water Quality (303d) <sup>7</sup>	Percent Impaired* Upper Souris
<b>Water Quality Data</b> <i>*Percent of Total Miles and acres in HUC</i>	Total – Major Water Bodies				
	Rivers/Streams	Miles	1,137.9	73.6	6.5
	Lakes/Reservoirs	Acres	8,472.6	96.3	1.1





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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.

<b>Animal Feeding Facilities – North Dakota Department of Health Permit<sup>8</sup></b>					
<b>Animal Type</b>	<b>Dairy</b>	<b>Beef</b>	<b>Swine</b>	<b>Other</b>	<b>Total</b>
<b>Number of Animal Feeding Operations</b>	5	10	11	3	29
<b>Number of Animals</b>	320	1,620	6,862	78	8,880
<b>Number of State Permitted Operations</b>					14

<b>Livestock Numbers (rounded to nearest 100)<sup>9</sup></b>					
	<b>Cattle and Calves</b>	<b>Beef Cows</b>	<b>Dairy Cows</b>	<b>Hogs and Pigs</b>	<b>Sheep and Lambs</b>
<b>North Dakota</b>	1,873,200	982,300	34,500	138,800	114,000
<b>Upper Souris</b>	34,600	23,400	500	2,200	1,200
<b>Upper Souris as a percent of North Dakota</b>	1.8%	2.4%	1.4%	1.6%	1.1%

### 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<sup>10</sup> shows the CRAs for Upper Souris sub-basin with the descriptions below.

#### **53A.1 – Northern Dark Brown**

**Glaciated Plains:** The Northern Dark Brown Glaciated Plains are gently undulating low relief till plains with many knobs and temporary and seasonal wetlands. The soils are mainly medium textured, well drained, and have a frigid temperature regime. Most of this area is in farms and ranches. Average annual precipitation is 300 to 350 mm. Average annual temperature is 3 to 5° C. Average freeze free period is 90 to 120 days.

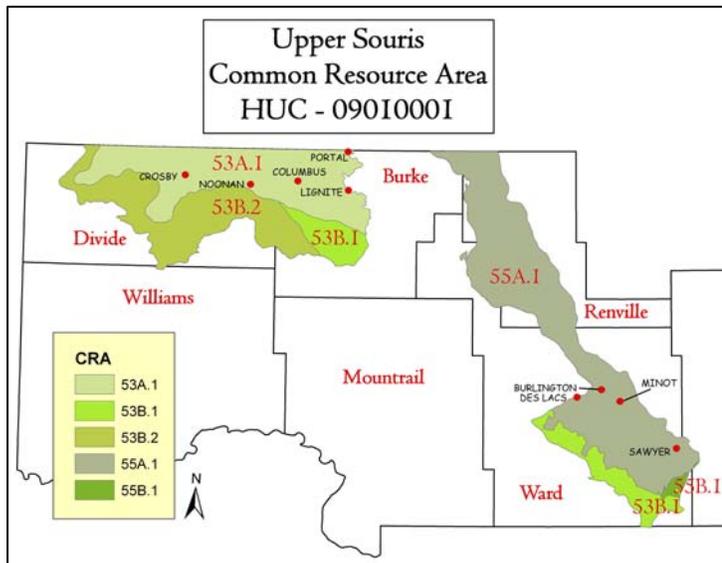
#### **53B.1 Central Dark Brown**

**Glaciated Plains:** The Central Dark Brown Glaciated Plains are nearly level to rolling with steeper areas along rivers. Land use is a mosaic of cropland and rangeland. Soil textures are dominantly loamy in glacial till, sandy in outwash areas, and clayey in lacustrine areas. Most soils are moderately deep or deep, well drained or moderately well drained, and have a frigid temperature regime.

**53B.2 - Central Dark Brown Dry Glaciated Plains:** The Central Dark Brown Dry Glaciated Plains are nearly level to steep. This region marks a transition to drier conditions than the glaciated plains to the south. Land use is a mosaic of cropland and rangeland. Soil textures are dominantly loamy in glacial till, sandy in outwash areas, and clayey in lacustrine areas. Most soils are moderately deep or deep, well drained or moderately well drained, and have a frigid temperature regime.

**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.

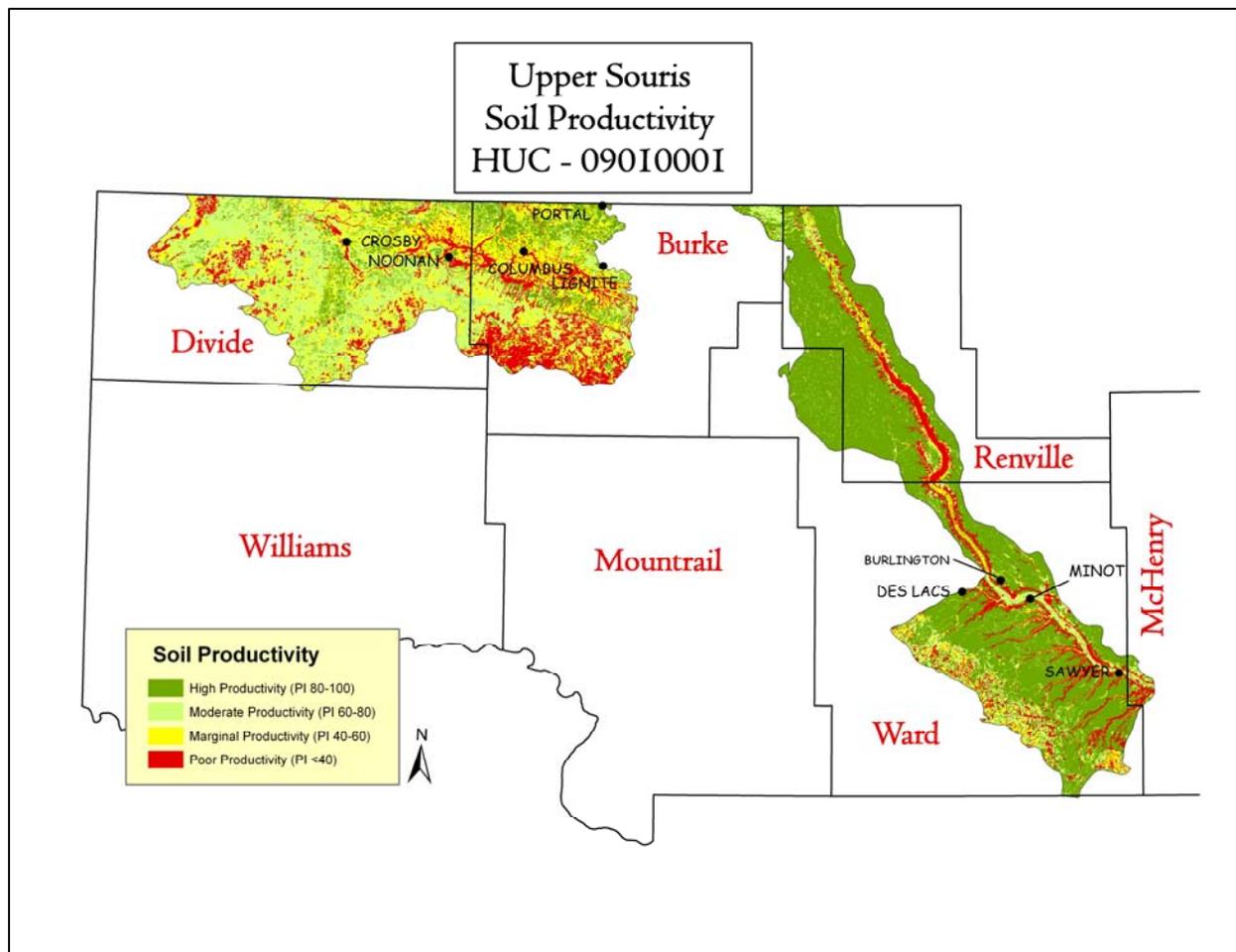
**55B.1 - Central Black Glaciated Drift Plain:** The Central Black Glaciated Drift Plains are a gently rolling to undulating landscape with a thick layer of glacial till. Temporary and seasonal wetlands are numerous throughout the area. These soils are very fertile, but agricultural success is subject 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 <sup>11</sup>

The isolated western area of the Upper Souris sub-basin is dominated by soils that have moderate to poor productivity indexes (PI). Many of these soils are high in sodium which is evident by the wide expanse of clay pan soils. The part of the sub-basin that is immediately above the Souris River breaks has soils with high PIs. As you move away from the river breaks in the southern part of the sub-basin, the PIs are moderate to poor because of sloping landscapes.

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

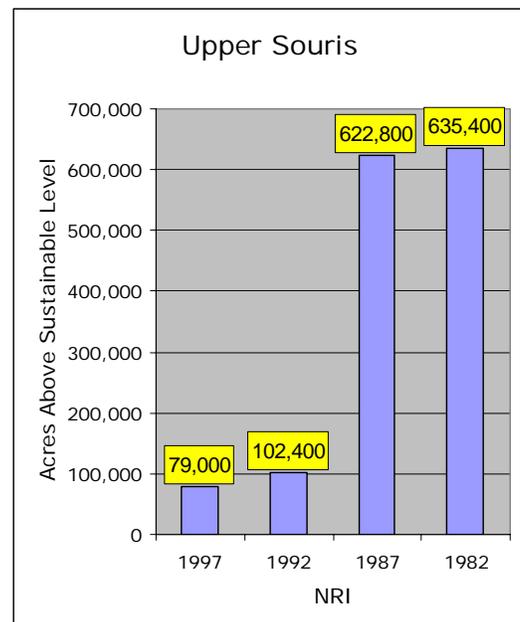
One of the goals of NRCS is to look at an area to help quantify the types and amounts of resources that may be of concern. This helps identify priority areas for the types and amounts of assistance given to a particular watershed.

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
Upper West Souris	Application Withdrawn	Des Lacs- Souris River Basin Study	Completed 1992
Northwest Minot	Application Withdrawn		
NDDH TMDLs		Soil Conservation District Assessments and Studies	
Number Listed		Name	Status
Lakes/Reservoirs - 1	Streams - 2	Short Creek Dam Watershed	Ongoing
EPA 319 Watershed Projects			
Name		Status	
None		NA	

### Soil

- NRI estimates indicate there was a 17 percent reduction from 1987 to 1997 in the amount of Highly Erodible Land (HEL) being farmed.
- The cultivated cropland acreage experiencing erosion rates above sustainable levels decreased to 79,000 acres in 1997, as compared to 635,400 acres in 1982.
- Through NRCS programs, many farmers and ranchers have applied conservation practices to reduce the effects of both wind and water erosion. From 1982 to 1997, the average wind erosion rate reduced from 5.7 tons/acre/year to 1.4 tons/acre/year on all cultivated cropland. The average water erosion rate reduced from 1.8 tons/acre/year to 1.1 tons/acre/year on cultivated cropland.



### Resource Concerns – Continued

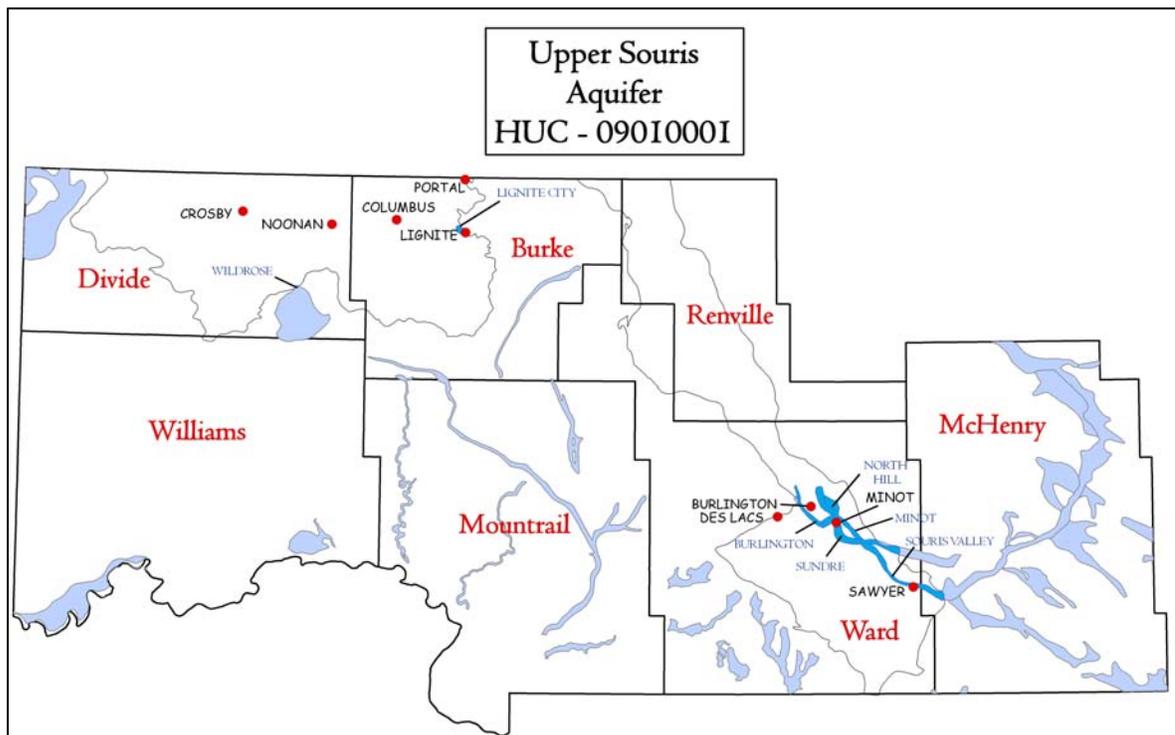
#### Soil - Continued

- Fine textured clayey and sandy soils still require conservation practices to control excessive wind erosion.
- Soil erosion and low organic matter remain resource concerns.
- Soil health on rangeland sites as it relates to the stability of redistributing and losing nutrients and organic matter.
- More utilization of soil fertility testing is still needed to reduce nutrient loading in the soil profile.
- Salt build-up in soil profile remains a production issue.
- Sandy and the irrigated soils still require conservation practices to control excessive wind erosion.
- Reduced tillage systems and improved cropping systems are still needed.
- Ephemeral gully erosion is still a resource concern on sloping fields.

#### Water

- **Aquifers**<sup>12</sup> - There are seven glacial drift aquifers (NE Missouri Buried Channel, Yellowstone Buried Channel, Columbus, North Hill, Burlington, Minot, and Sindre) underlying the Upper Souris sub-basin. These aquifers are the source of water for the cities of Fortuna, Columbus, Burlington, Minot, Sawyer, and Velva; as well as the Talbott Trailer Court, Colony Park, and Country Acres developments near Minot.

### Resource Concerns – Continued



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### **Water - Continued**

- **Wellhead Protection Areas**<sup>13</sup> – There are nine protection areas located in the sub-basin that are designated to protect the municipal water supplies in the sub-basin.
- A stream section of the Souris River, from the International border to Lake Darling, was placed on the 303(d) list for exceeding set levels of dissolved oxygen, sedimentation/siltation, and total fecal coliform.
- Short Creek Dam Reservoir is on the 303(d) list for loss of the designated uses of “Fish and Other Aquatic Biota” and “Recreation”. These impairments are due to excessive nutrients/eutrophication, low dissolved oxygen, and excessive sediment/siltation.
- The stream segment from Lake Darling to the confluence of the Souris and Des Lacs Rivers lost its designated use for “Fish and Other Aquatic Biota” due to biological indicators being impaired.
- Conservation practices used to address these water quality issues include grazing management, erosion control, nutrient and ag waste management, and riparian buffers.
- Lack of adequate riparian buffer width and health are impacting water quality and stream health.
- Summer flooding does occasionally occur and impacts crop production.
- Water conservation and water quality (potential for pesticide contamination) are issues on irrigated cropland.

### **Air**

- Objectionable odors are minimal with some feedlot or wintering areas having noticeable odor during certain times of the year.
- Visibility is reduced during winter months from blowing snow.
- A better awareness of green house gases and their impact is needed; especially as it relates to the Canadian coal fired power plant located near Estevan, Saskatchewan.

### **Plants**

- Maintaining rangeland productivity, health, and vigor are of major concern.
- Past utilization of non adapted or suited species has resulted in invasive plant species among native plant communities and declining forage yields.
- There are concerns about controlling invasive weeds and maintaining good pasture condition.
- Noxious weeds and poor range condition reduce productivity for livestock and wildlife.
- Maintaining forage quality and palatability are needed to sustain the livestock base and provide plant community sustainability.

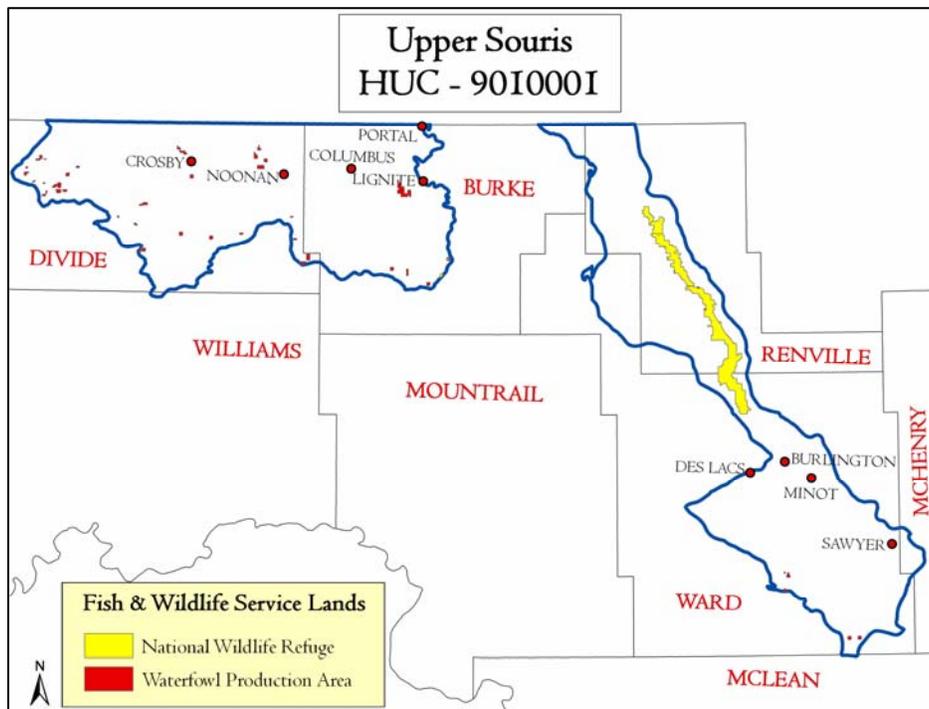
### Resource Concerns – Continued

#### Animals

- Inadequate food, cover/shelter, and water is a concern for maintaining wildlife populations.
- Habitat fragmentation, including loss of old field and farmstead windbreaks has resulted in lost cover and shelter for certain wildlife species as well as domestic livestock.
- 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	Gray Wolf	None
Birds	Piping Plover	Whooping Crane	None
Fish	None	None	None
Invertebrates	None	None	Dakota Skipper
Plants	None	None	None
Critical Habitat – Piping Plover			

- The following map shows the US Fish and Wildlife Service (FWS) land. The FWS land is separated into the following designations: National Wildlife Refuge (32,300 acres) and Waterfowl Production Areas (7,300 acres).

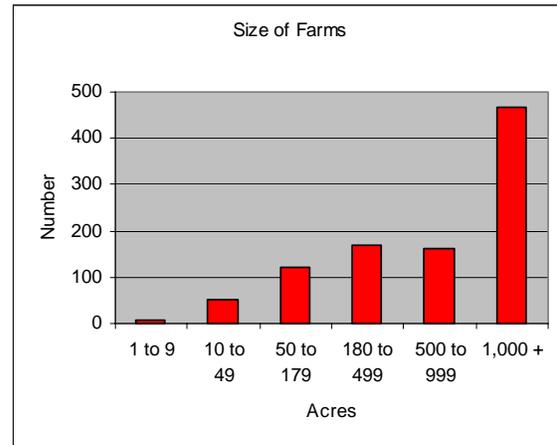
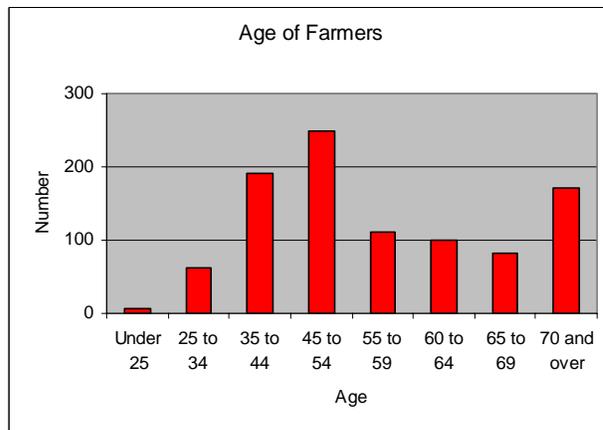


### Census and Social Data<sup>14</sup>

**Number of Farms: 1,000**

**Number of Operators:**

- Average Age: 55
- Full-Time Operators: 75%
- Part-Time Operators: 25%



### Limited Resource and Beginning Farmer

Approximately five percent of the operators are minority producers. Limited Resource Farmers are estimated at 11 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.

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### **References**

- <sup>1</sup> USDA-NRCS, NRI data.
- <sup>2</sup> USDA-Farm Services Agency, Common Land Unit GIS data layer, 2005.
- <sup>3</sup> USDA-Farm Services Agency, Common Land Unit GIS data layer, 2005.
- <sup>4</sup> USDI-US Geologic Services, ND GAP analysis data, 2005.
- <sup>5</sup> USDA-NRCS, Natural Resources Planning Staff, 30 meter Relief Data GIS data layer, 2002.
- <sup>6</sup> ND Department of Health, Environmental Health Section, Water Quality Division, National Hydrography GIS layers, June 2006.
- <sup>7</sup> 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.
- <sup>8</sup> ND Department of Health, Environmental Health Section, Water Quality Division, Animal Feeding Operations Program data, 2006.
- <sup>9</sup> 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.)
- <sup>10</sup> USDA-NRCS, Natural Resources Planning Staff, Common Resource Area GIS data layer, 2004.
- <sup>11</sup> USDA-NRCS, Natural Resources Planning Staff, Soils Productivity GIS data layer, 2006.
- <sup>12</sup> ND Department of Health, Environmental Health Section, Water Quality Division, Ambient Ground Water Monitoring Program data, 1997.
- <sup>13</sup> ND Department of Health, Environmental Health Section, Water Quality Division, Source Water Protection Program data, 2003.
- <sup>14</sup> 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.)