

# Rapid Watershed Assessment

## Lower Big Sioux River

### HUC 10170203

This project is supported by the Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation, through a grant from the U.S. Department of Agriculture, Natural Resources Conservation Service. Technical assistance is provided by the U.S. Department of Agriculture, Natural Resources Conservation Service.

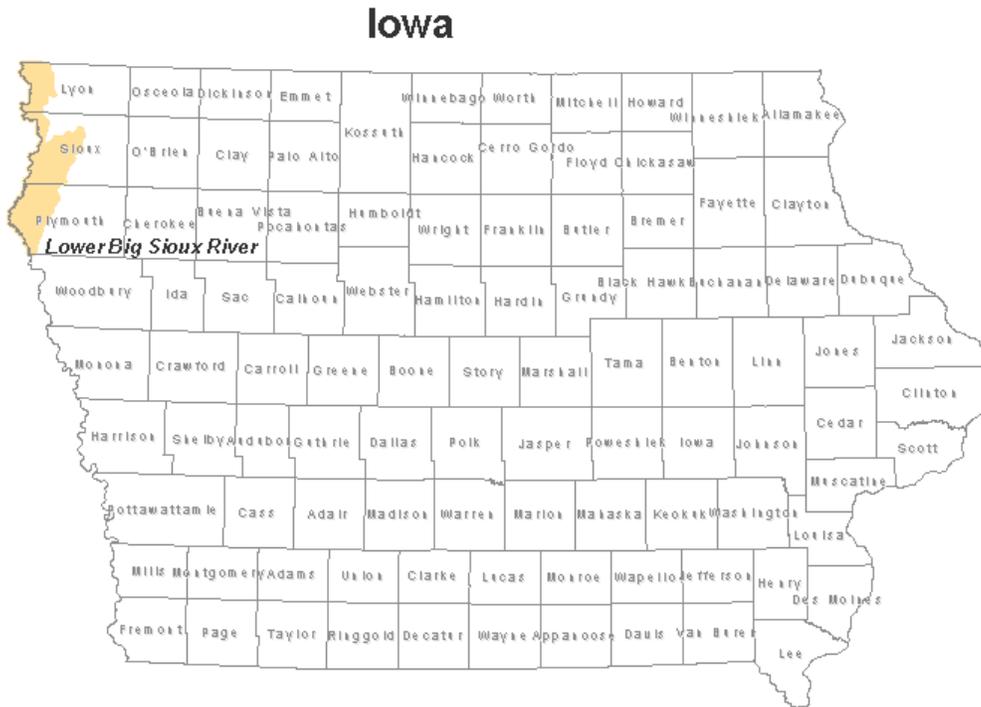
# Lower Big Sioux River—10170203

## 8-Digit Hydrologic Unit Profile

### Introduction

The Lower Big Sioux River 8-Digit Hydrologic Unit Code (HUC) sub-basin is comprised of approximately 384,037 acres in northwestern Iowa. The majority of this sub-basin in Iowa is located in Lyon (20% or 76,807 acres), Sioux (39% or 149,774 acres), and Plymouth (41% or 157,455 acres) counties.

There are 137 miles of river and 486 miles of tributary streams in this sub-basin. Thirty-five percent of the land area is C-slope or greater (from 5 - 45+%).



**Lower Big Sioux River  
HUC - 10170203**



# Lower Big Sioux River—10170203

## 8-Digit Hydrologic Unit Profile

### Physical Description

The physical description on the Lower Big Sioux River sub-basin provides detailed information so the user can better understand the natural resources associated with this geographical land unit.



The majority of the watershed is geologically located in the Northern Iowa Plains landform region; however, the southernmost reach of the watershed consists of the Loess Hills, a 200 mile stretch of extremely erodible hills created by wind blown silt over many thousands of years. This is a very unique and dynamic landscape that contains many endangered plant and animal species. The uniqueness of the landscape and biota led to recognition of portions of the Loess Hills as a National Natural Landmark in 1986 by the U.S. Department of the Interior.<sup>11</sup>



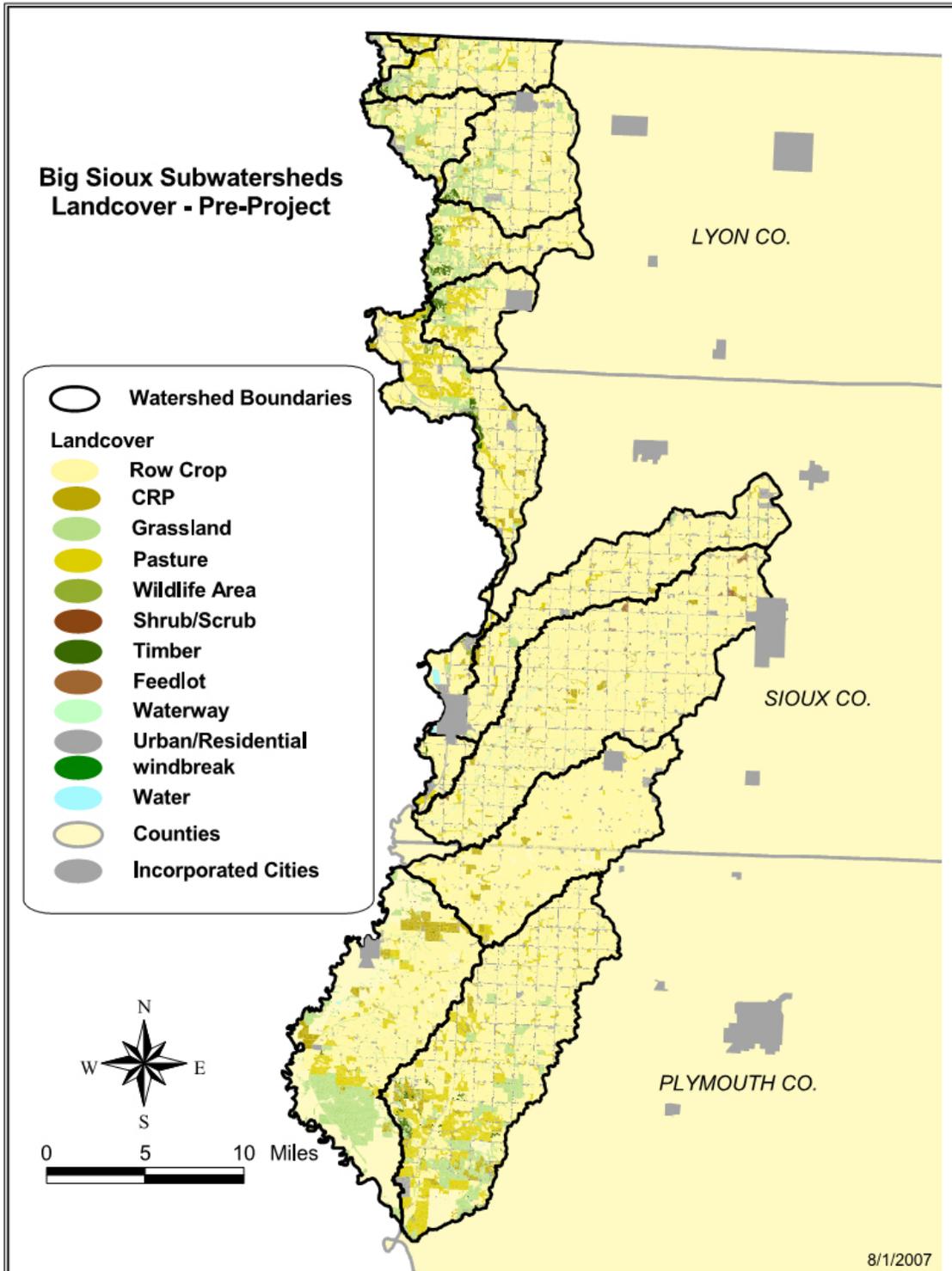
The Lower Big Sioux Watershed contains 16 HUC 12 subwatersheds. Concentrating on these subwatersheds will help make conservation planning and implementation activities more manageable.

	Subwatershed	Acres
<span style="color: grey;">■</span>	Beaver Creek	10,484
<span style="color: pink;">■</span>	Big Ditch Creek	14,728
<span style="color: blue;">■</span>	Blood Run Creek	14,148
<span style="color: green;">■</span>	Broken Kettle Creek -Upper	23,470
<span style="color: red;">■</span>	Broken Kettle Creek - Lower	29,297
<span style="color: purple;">■</span>	Bull Run Creek	10,569
<span style="color: olive;">■</span>	Dry Creek	32,191
<span style="color: darkblue;">■</span>	Indian/Dubois Creek	29,767
<span style="color: cyan;">■</span>	Indian/Unnamed Creek	10,212
<span style="color: brown;">■</span>	Inwood Creek	11,593
<span style="color: yellow;">■</span>	Klondike Creek	26,625
<span style="color: darkpurple;">■</span>	Sixmile Creek - Upper	22,935
<span style="color: lightpurple;">■</span>	Sixmile Creek - Middle	21,123
<span style="color: darkgreen;">■</span>	Sixmile Creek - Lower	24,990
<span style="color: lightred;">■</span>	Westfield Creek	18,763
<span style="color: cyan;">■</span>	Big Sioux River	83,142
	<b>Total Area</b>	<b>384,037</b>



### Physical Description

The vast majority of the Lower Big Sioux watershed is row cropped in a corn/bean rotation. Approximately 6,000 acres in the extreme southern region is grassland with many acres in preserves or conservation easements.



# Lower Big Sioux River—10170203

## 8-Digit Hydrologic Unit Profile

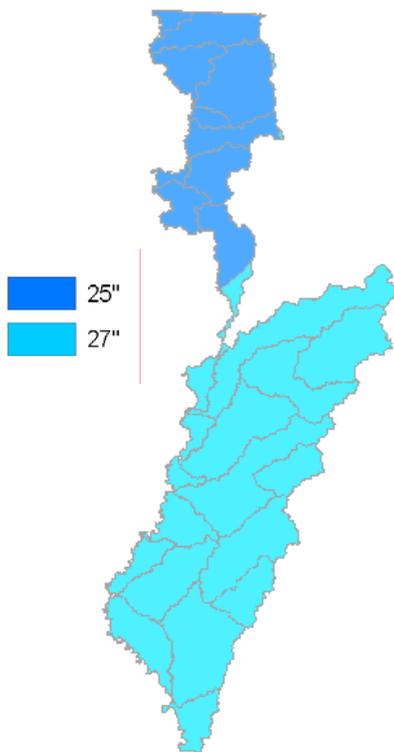
### Physical Description

Average rainfall for this area is between 25 and 27 inches per year. Three quarters of the annual precipitation is received between April and September with June being the peak month.

Temperatures range between a yearly average low of 6° F in January and a yearly average high of 86° F in July.

The overall climate is characterized by marked seasonal variations because of the latitude and interior continental location.<sup>15</sup>

Average Annual Precipitation



Monthly Average Mean Temperature<sup>17</sup>

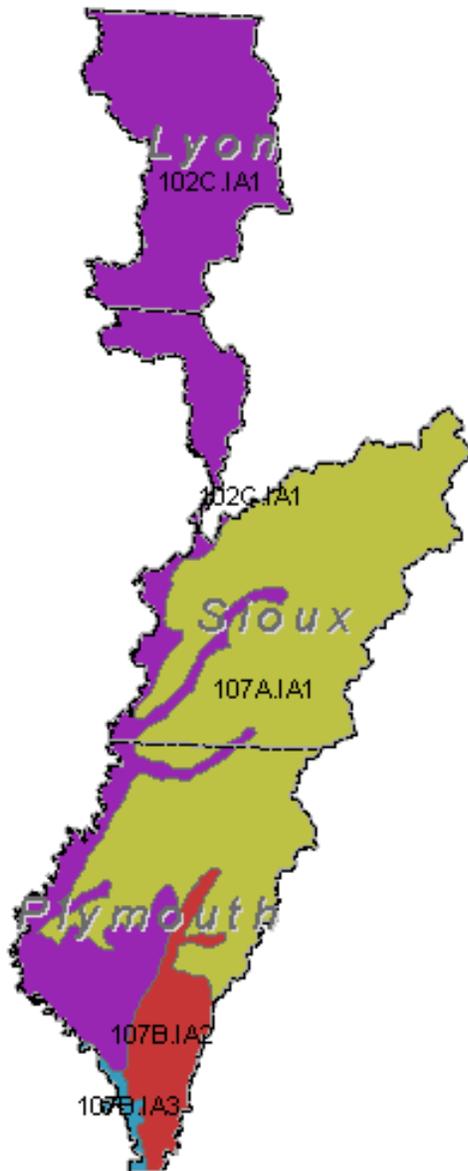
( Last 30 Years )

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1978	6	10	32	48	60	71	74	72	68	51	32	17	45
1979	2	10	30	46	58	70	74	71	65	50	32	30	45
1980	20	20	32	50	61	72	77	74	65	48	38	22	48
1981	24	26	40	56	59	72	74	71	64	50	40	20	49
1982	6	20	33	47	62	66	76	73	63	52	33	26	46
1983	22	27	34	42	57	69	79	80	66	51	36	4	47
1984	18	30	27	46	58	71	74	75	60	51	38	23	48
1985	15	21	40	54	64	68	73	68	62	50	24	12	46
1986	25	22	40	50	63	74	77	68	62	50	30	27	49
1987	26	34	40	54	66	73	76	70	63	46	40	27	51
1988	12	18	38	49	66	76	76	76	64	46	36	25	49
1989	28	14	33	50	60	68	76	72	62	52	32	12	47
1990	29	26	40	49	58	72	72	73	68	50	38	18	49
1991	15	32	39	52	64	74	74	72	64	48	26	26	49
1992	28	32	38	46	60	68	67	66	62	50	32	22	48
1993	16	16	30	45	58	66	71	70	56	48	30	22	44
1994	8	12	36	46	61	70	68	68	64	52	36	22	45
1995	16	24	32	42	54	68	72	74	58	48	28	24	45
1996	12	22	26	42	55	69	70	69	60	49	26	13	43
1997	10	21	32	42	52	70	74	70	63	51	30	26	45
1998	20	33	29	47	64	65	73	72	68	52	37	26	49
1999	16	30	34	48	60	66	75	70	60	49	42	26	48
2000	18	30	40	48	62	66	73	73	62	53	26	9	47
2001	19	14	28	48	60	69	74	72	61	50	45	27	47
2002	25	28	26	47	54	72	78	71	64	42	33	26	47
2003	17	18	32	49	56	68	72	74	60	51	32	26	46
2004	15	20	39	49	58	66	70	66	66	50	38	25	47
2005	15	30	34	51	57	72	74	71	67	52	38	18	48
2006	31	22	34	52	60	70	76	72	58	47	36	28	49
2007	18	14	40	46	64	70	76	74	63	54	36	17	48
2008	12	14	29	M	M	M	M	M	M	M	M	M	M
MEAN	18	22	34	48	60	70	74	72	63	50	34	22	47

## Physical Description

### Common Resource Areas

A Common Resource Area is defined as a geographical area where resource concerns, problems, and treatment needs are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographical boundaries of the common resource area.<sup>14</sup>



**102C.IA1 - Loess Uplands:** Gently undulating to steep soils with long smooth slopes and well defined drainage ways formed in loess mantled uplands. There are some exposures of bedrock. Soils are commonly well drained with some poorly drained upland waterways. Native vegetation was mixed tall and short grass prairie. The primary land use is cropland. Corn, soybeans, grain sorghum, alfalfa and oats are the major crops. Resource concerns are water and wind erosion, nutrient management and water quality.

**107A.IA1 - Loess Mantled Rolling Prairie Till Plain:** Gently undulating to steep soils with long smooth slopes and well defined drainage ways formed in loess mantled uplands. Soils are commonly well drained with some poorly drained upland waterways. Native vegetation was tall and short grass prairie. The primary land use is cropland. Corn and soybeans are the major crops. Resource concerns are water erosion, nutrient management and water quality.

**107B.IA2 - Iowa Deep Loess Hills:** This area is nearly level to strongly sloping soils on ridge tops and moderately sloping to very steep soils on highly dissected side slopes. Native vegetation was nearly pure prairie with thin bands of timber in the valleys and ravines. Corn and soybeans are common crops. Livestock feed lots, swine and poultry are common in this area. Manure utilization is a major concern in this area. Resource concerns are soil erosion, nutrient management, water quality and soil quality.

**107B.IA3 - Iowa and Missouri Deep Loess Hills:** This area is gently undulating to very steep and is distinguished loess (25 to 100 feet, possibly more) over till and bedrock that has been eroded into steep hills and narrow valleys with up to 250 feet of relief. Underlying glacial till and bedrock are not commonly exposed at the surface. Native vegetation was nearly pure prairie with thin bands of timber in the valleys and ravines. Most of the area is used for cropland, with corn and soybeans being the main crops. Resource concerns are water erosion, nutrient management, and water quality.

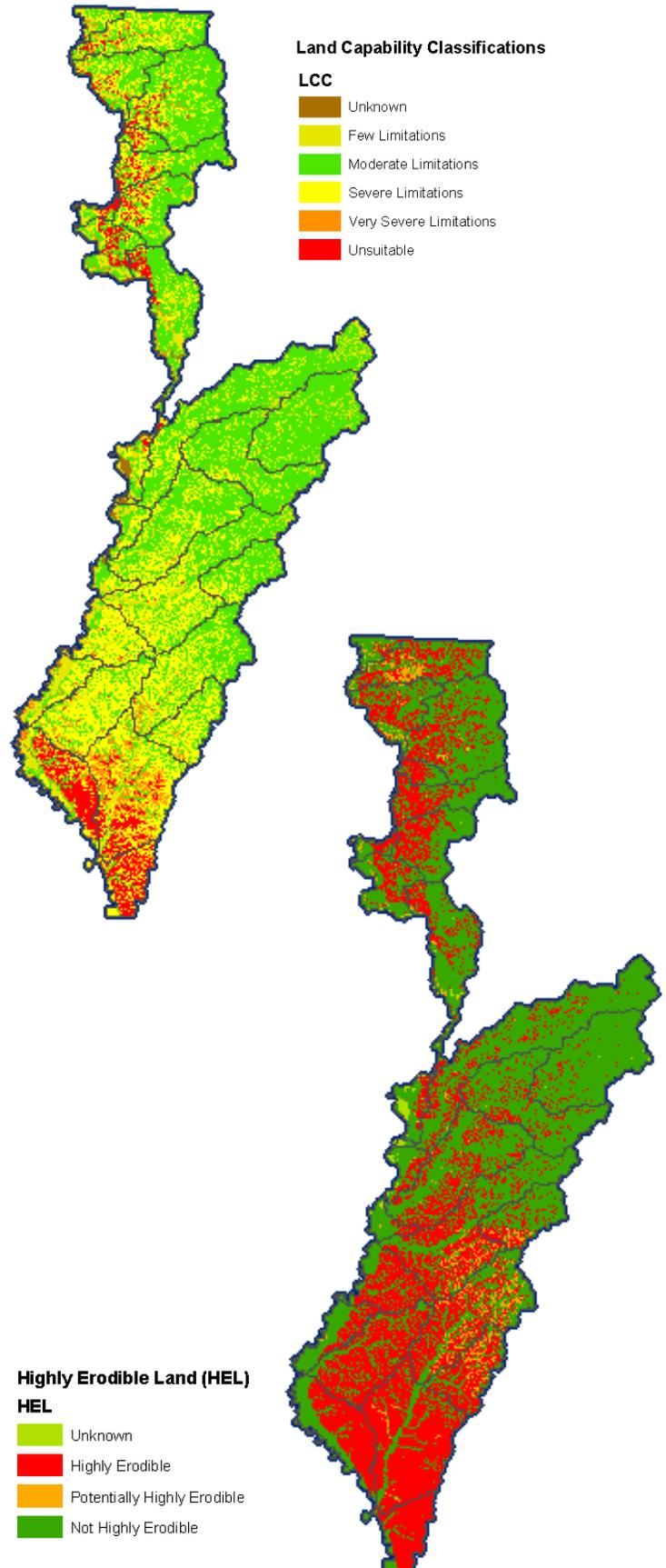
### Physical Description

#### Land Capability Classes<sup>10</sup>

Categories	Land Capability Class	Area
Unknown		4%
Few Limitations	1	6%
Moderate Limitations	2E, 2S, 2W	42%
Severe Limitations	3E, 3S, 3W	37%
Very Severe Limitations	4E, 4S, 4W	6%
Unsuitable	6E, 7E	4%

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. Criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes. The numbers 1 through 7 indicate progressively greater limitations and narrower choices for practical use. The capital letters (E, S, W) indicate the soils' main limitation within one class. There are no subclasses in class 1 because the soils of this class have few limitations.

Fully 46% of the Lower Big Sioux Watershed is Highly Erodible Land (HEL). HEL is defined as land in capability class 4, 6, 7, or 8 or land that, if used to produce an agricultural commodity, would have an excessive annual rate of erosion as determined by the Universal Soil Loss Equation and the wind erosion equation.



**Highly Erodible Land (HEL)**  
**HEL**  
 Unknown  
 Highly Erodible  
 Potentially Highly Erodible  
 Not Highly Erodible

# Lower Big Sioux River—10170203

## 8-Digit Hydrologic Unit Profile

### Physical Description

The Federal Clean Water Act requires the Iowa Department of Natural Resources (IDNR) and the South Dakota Department of Environment and Natural Resources (SD DENR) to develop a Total Maximum Daily Load (TMDL) for waters that have been identified on the state’s 303(d) list as impaired by a pollutant. Five segments of the Big Sioux River have been identified as impaired by the pathogen indicator, *E. coli* for Iowa and fecal coliform for South Dakota. The purpose of these Big Sioux River TMDL’s is to estimate the maximum pathogen indicator “loads” that can be delivered from the watershed and still meet both the Iowa and South Dakota Water Quality Standards (WQS). Complying with the WQS limits for *E. coli* and fecal coliform will provide full support for the river’s designated recreational uses.<sup>13</sup>

The Big Sioux River is on the Iowa Department of Natural Resources’ 303(d) Impaired Waters List. It was originally listed for general fecal coliform bacteria, but the criteria have changed and now *E. coli* is the target organism. Not all strains of *E. coli* are disease causing, but its presence indicates that there may be some pathogenic bacteria in the water.

The Big Sioux has been determined impaired for Class A: Primary Contact Recreational Use and Class B: Warm Water Aquatic Life. According to the DNR website, Class A Primary Contact Recreational Use means prolonged or direct contact with water, including swimming and canoeing. Class B Warm Water Aquatic Life means “uses of water by fish, aquatic and semiaquatic species and wildlife”. Class B impairment includes, but is not limited to, bacterial contamination.

303(d) Waters	Segment Description	Designated Use Impaired
Big Sioux River	From Brule Cr. (SD) to Indian Cr. in NW Plymouth Co.	Primary Contact & Aquatic Life
Big Sioux River	From Indian Cr. in NW Plymouth Co. to Rock R. in Sioux Co.	Primary Contact
Big Sioux River	From Beaver Cr. (SD) to Ninemile Cr. (SD; W of Larchwood)	Primary Contact
Broken Kettle Creek	From mouth to unnamed tributary in Plymouth Co.	Aquatic Life
Sixmile Creek	From mouth to Sioux Co. tributary	Aquatic Life

# Lower Big Sioux River—10170203

## 8-Digit Hydrologic Unit Profile

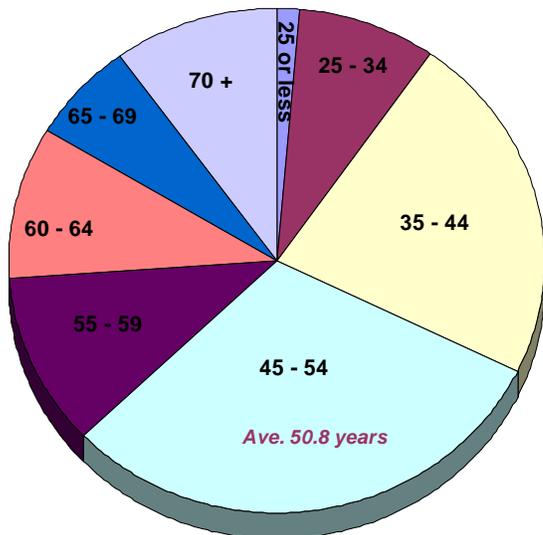
### Census and Social Data<sup>1, 2</sup>

Twelve thousand two hundred twenty-two people reside in the Lower Big Sioux watershed. Sioux county has the largest watershed populations at 47%, Plymouth follows with 29%, and Lyon has 24%. The rural to urban population ratios are as follows: Lyon 1:1.33, Plymouth 1:0.87, Sioux 1:1.85.

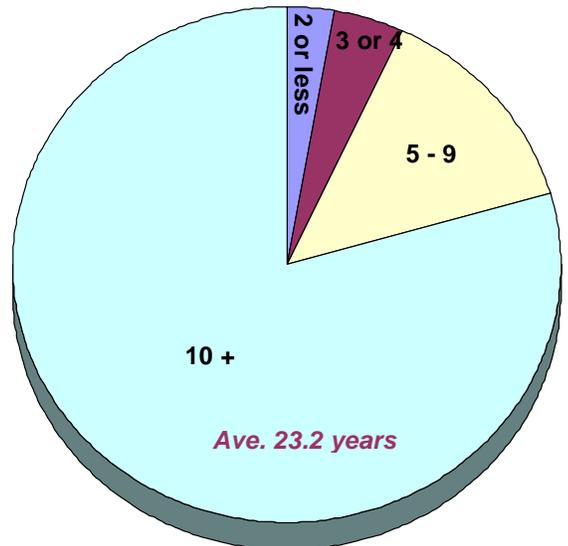
The average age of producers is 50.8 years and most have lived on the same farm for 10 years or more with an average of 23 years.

County	Rural	Urban	Total
<b>Lyon</b>	1,250	1,663	2,913
<b>Plymouth</b>	1,929	1,678	3,607
<b>Sioux</b>	2,004	3,698	5,702
<b>Total</b>			12,222

**Farm Operator Age Groups  
(In Years)**

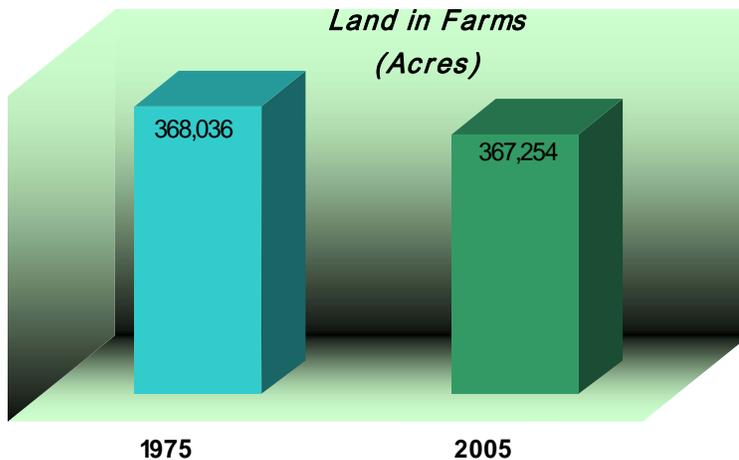
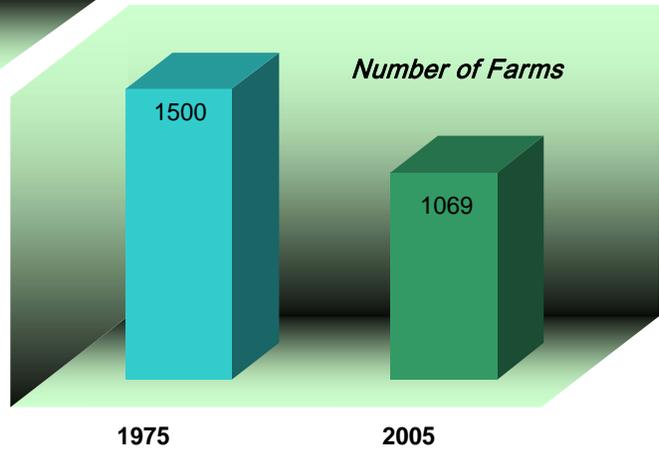
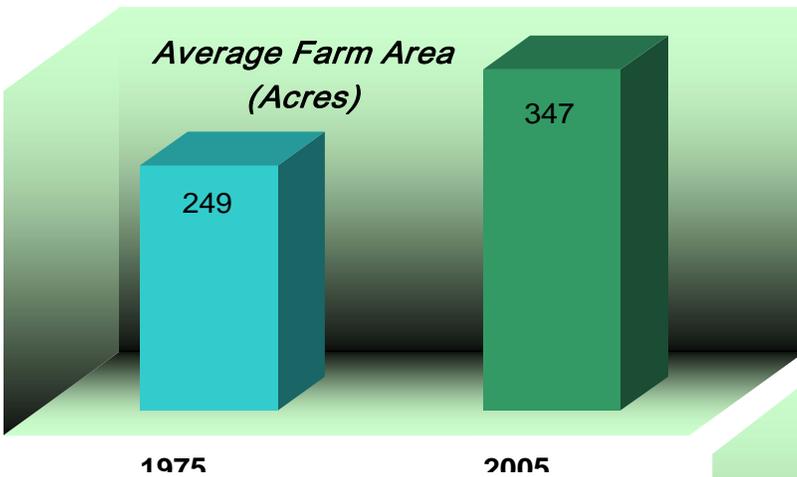


**Years on Present Farm**



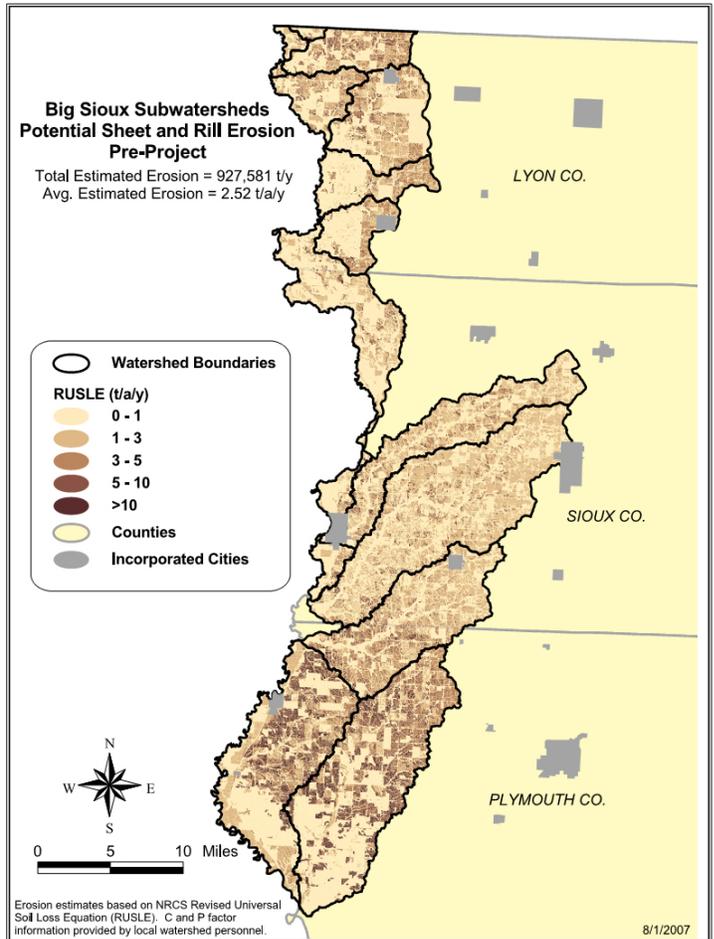
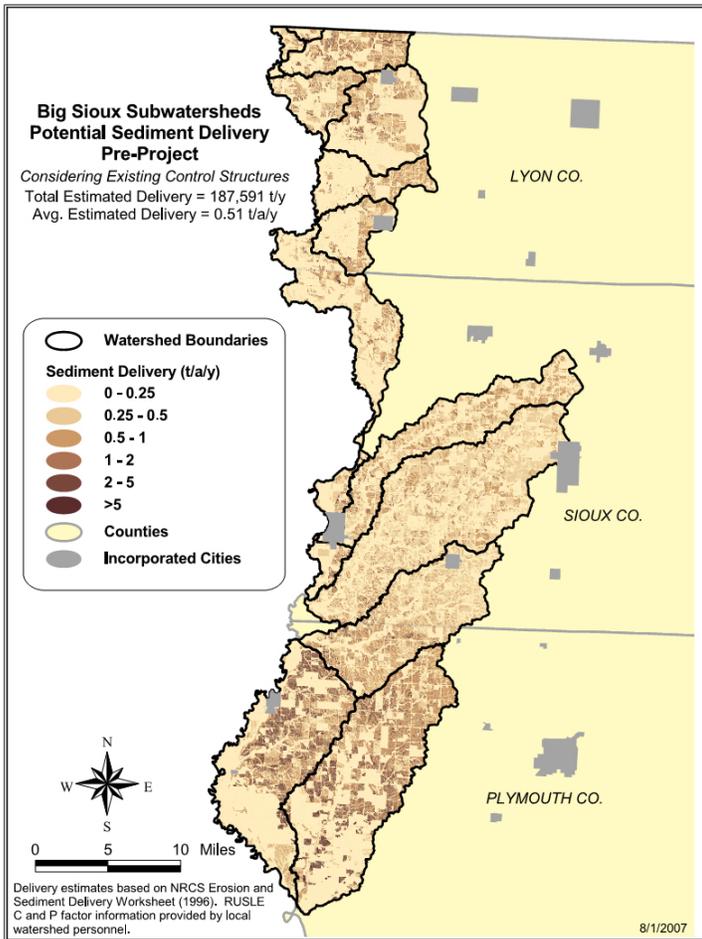
### Census and Social Data<sup>1,2</sup>

There are approximately 1069 farms in this area averaging an estimated 347 acres each. Land area farmed has remained fairly steady for the last 30 years, however farm numbers have dropped by 29%. Relatively, farm size has increased by 39%.



### Resource Concerns

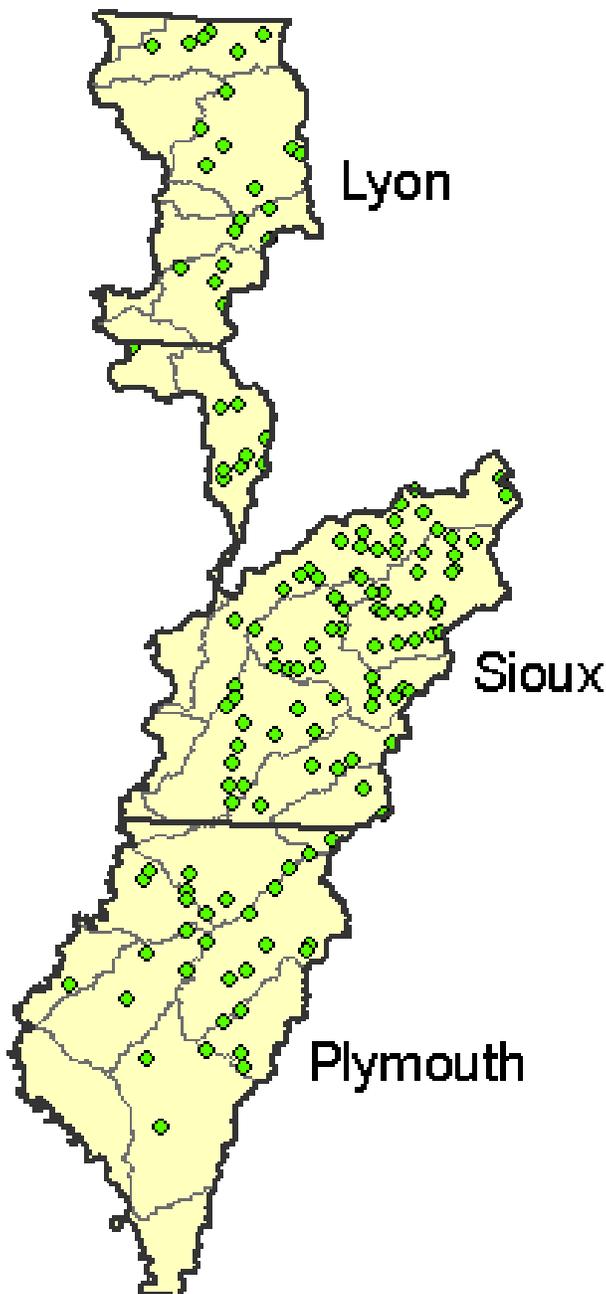
The two main resource concerns in the Lower Big Sioux watershed are soil erosion and surface water quality. Soil erosion concerns include sheet, rill, and ephemeral gully erosion. Surface water quality concerns pertain to excessive nutrients and organics, harmful levels of pathogens, and excessive suspended sediment and turbidity.



### Resource Concerns

The high concentration of open feedlots and confined animal feeding operations (CAFOs) are another major resource concern within the Lower Big Sioux watershed. The abundance of these facilities creates a large nutrient management problem on the ground and in the water as well as increased probability of waterborne pathogens. Sioux county ranks # 1 in the state for livestock production with Lyon and Plymouth not far behind.

**Confined Animal Feeding Operations**



**Open Feedlots<sup>9</sup>**



# Lower Big Sioux River—10170203

## 8-Digit Hydrologic Unit Profile

### Resource Concerns

Iowa's endangered and threatened species law was enacted in 1975. The current law, entitled Endangered Plants and Wildlife is Chapter 481B of the Code of Iowa. The Natural Resource Commission and the Director of the DNR are responsible for administration of Chapter 481B.<sup>18</sup>

The following table contains threatened and endangered species found in the Lower Big Sioux Watershed and documented by the Iowa DNR.

### DOCUMENTED THREATENED AND ENDANGERED SPECIES (IOWA DNR)

Locations of T & E Species in the LBS\_RWA



SCIENTIFIC NAME	SPECIES COMMON NAME
AGASTACHE FOENICULUM	BLUE GIANT HYSSOP
AMORPHA NANA	FRAGRANT FALSE INDIGO
ARTEMISIA FRIGIDA	PRAIRIE SAGEWORT
ASCLEPIAS LANUGINOSA	WOOLY MILKWEED
ASTRAGALUS MISSOURIENSIS	MISSOURI MILK-VETCH
ATRYTONE AROGOS	AROGOS SKIPPER
ATRYTONOPSIS HIANNA	DUSTED SKIPPER
BOTRYCHIUM CAMPESTRE	PRAIRIE MOONWORT
CAREX SAXIMONTANA	ROCKY MOUNTAIN SEDGE
COENONYMPHA TULLIA	RINGLET
CROTALUS VIRIDIS	PRAIRIE RATTLESNAKE
ERYNNIS BAPTISIAE	WILD INDIGO DUSKY WING
EUCHLOE OLYMPIA	OLYMPIA MARBLE
HESPERIA LEONARDUS	LEONARD'S SKIPPER
HESPERIA LEONARDUS PAWNEE	PAWNEE SKIPPER
HESPERIA OTTOE	OTTOE SKIPPER
HETERANTHERA LIMOSA	BLUE MUD-PLANTAIN
HETEROTHECA VILLOSA	GOLDEN ASTER
LOMATIUM ORIENTALE	EASTERN ORIENTAL LOMATIUM
MARSILEA VESTITA	HAIRY WATER-CLOVER
MENTZELIA DECAPETALA	TEN PETALED MENTZELIA
NOTROPIS TOPEKA	TOPEKA SHINER
OPUNTIA FRAGILIS	BRITTLE PRICKLY PEAR
PENSTEMON ALBIDUS	BEARDTONGUE
PENSTEMON GRACILIS	SLENDER PENSTEMON
PEROGNATHUS FLAVESCENS	PLAINS POCKET MOUSE
POANES MASSASOIT	MULBERRY WING
POTENTILLA PENNSYLVANICA	PENNSYLVANIA CINQUEFOIL
PSORALIDIUM LANCEOLATUM	LANCE-LEAF SCURF-PEA
SATYRIUM CARYAEVORUM	HICKORY HAIRSTREAK
SATYRIUM EDWARDSII	EDWARDS' HAIRSTREAK
SCHEDONNARDUS PANICULATUS	TUMBLE GRASS
SELAGINELLA RUPESTRIS	LEDGE SPIKEMOSS
SHEPHERDIA ARGENTEA	SILVER BUFFALO-BERRY
SPEYERIA IDALIA	REGAL FRITILLARY
SPHAERALCEA COCCINEA	RED GLOBE-MALLOW
SPILOGALE PUTORIUS	SPOTTED SKUNK
TALINUM PARVIFLORUM	SMALL-FLOWERED FAME FLOWER
TALINUM RUGOSPERMUM	ROUGH-SEEDED FAME FLOWER
WOODSIA OREGANA	OREGON WOODSIA

### Status of Resources

A conservation system is a combination of one or more conservation measures or management practices. When applied to the land, the conservation system will bring about either a substantial reduction in soil erosion, or in the case of land converted from native vegetation, allow for no substantial increase in soil erosion. Conservation systems must be based on local resource conditions, available conservation technology, and the standards and guidelines contained in the local Field Office Technical Guide. <sup>16</sup>

Information included in this section was compiled using the NRCS Performance Results System (PRS).

Conservation Systems		
Fiscal Year	Planned (ac)	Applied (ac)
2007	38,921	38,364
2006	9,488	8,971
2005	8,604	9,724
2004	<i>Information Unavailable</i>	
2003	18,343	4,803

Conservation Measures/ Management Practices								
Fiscal Year	Grassed Waterways (ac)	Terraces (ft)	Field Borders (ft)	Filter Strips (ac)	Water & Sediment Control Basins (ea)	Grade Stabilization Structures (ea)	Nutrient Management Plans (ea)	Wetlands Reserve Program (ea)
2007	57	268,055		372	5	0	6,061	0
2006	49	62,250	6,950	85	1	0	3,832	0
2005	59	112,810		128	4	1	1,139	31
2004	35	71,700	6,400	68	0	1	1,083	0
2003	37	120,450	14,700	199	0	0	2,066	14
<b>Totals:</b>	237	635,265	28,050	852	10	2	14,181	45

### Footnotes and References

All data is provided "as is". There are no warranties, express or implied, including the warranty of fitness for a particular purpose, accompanying this document. Use for general planning purposes only.

1. National Agricultural Statistics Service. <http://www.nass.usda.gov/>.  
Data were obtained by adjusting the 2006 average numbers per county by the percent of each county in the HUC.
2. The Census of Agriculture. <http://www.agcensus.usda.gov/>.  
Data obtained were from 1975, 1997, 2002, 2005, and 2006 Census Quick Stats.
3. State Data Center of Iowa. <http://www.iowadatacenter.org>.
4. Iowa Department of Natural Resources (DNR) Interactive Mapping. <http://csweb.igsb.uiowa.edu/imgate/maps>.
5. Multi-Resolution Land Characteristics (MRLC) Consortium. National Land Cover Dataset (2002). [http://www.mrlc.gov/zones/show\\_data.asp?szone=11](http://www.mrlc.gov/zones/show_data.asp?szone=11).
6. Soil Data Mart. <http://soildatamart.nrcs.usda.gov/>.
7. NRCS Electronic Field Office Technical Guide. <http://efotg.nrcs.usda.gov/>.
8. Common Resource Area (CRA) Geographic Database.  
[ftp://ftp-fc.sc.egov.usda.gov/NSSC/CRA/national\\_cra\\_legend\\_v1.2\\_011604.xls](ftp://ftp-fc.sc.egov.usda.gov/NSSC/CRA/national_cra_legend_v1.2_011604.xls).
9. Iowa DNR Natural Resources Geographic Information Systems Library. <http://www.igsb.uiowa.edu/nrgislib/>.
10. Iowa State University Iowa Agriculture and Home Economics Experiment Station University Extension Service. Iowa Soil Properties and Interpretations Database (ISPAID) Version 7.0. 30 January 2004.  
<http://icss.agron.iastate.edu/ispaid70man.pdf>.
11. U.S. Geological Survey. Geology of the Loess Hills, Iowa. 1999. <http://pubs.usgs.gov/info/loess>.
12. U.S. Geological Survey National Water Information System: Web Interface. <http://waterdata.usgs.gov/nwiss>.
13. Iowa Department of Natural Resources (DNR). Total Maximum Daily Loads For Pathogen Indicators Big Sioux River, Iowa and South Dakota. [http://www.iowadnr.gov/water/watershed/tmdl/files/draft/big\\_sioux\\_07.pdf](http://www.iowadnr.gov/water/watershed/tmdl/files/draft/big_sioux_07.pdf).
14. NRCS General Manual. GM.450.401.C - Subpart C - Resource Management System Quality Criteria and Guidance Documents. Section 401.21 - Definitions. <http://policy.nrcs.usda.gov/viewDirective.aspx?id=2589>.
15. National Oceanic and Atmospheric Administration. Climate of Iowa. 2001. [http://crh.noaa.gov/images/dvn/downloads/Clim\\_IA\\_01.pdf](http://crh.noaa.gov/images/dvn/downloads/Clim_IA_01.pdf).
16. USDA NRCS eDirectives. Manuals: Title 180—Conservation Planning and Application: National Food Security Act Manual, Fourth Edition: Part 512—Conservation Systems and Plans: Subpart A—Conservation Systems. April 2004. <http://policy.nrcs.usda.gov/viewRollUp.aspx?id=2246>.
17. Iowa State University Department of Agronomy. Iowa Environmental Mesonet: Climatology. <http://mesonet.agron.iastate.edu/climodat/>.
18. Iowa Department of Natural Resources (DNR). Iowa's Threatened and Endangered Species Program. [www.iowadnr.com/other/threatened.html](http://www.iowadnr.com/other/threatened.html).