

## PURPOSE

A rapid watershed assessment (RWA) profile document compiles resource information within a watershed to assist conservation districts, landowners, and other community organizations and stakeholders to identify where conservation investments are best utilized. The RWA can assist landowners and local organizations in determining the technical and financial resources required to achieve their conservation goals within the watershed. This project was completed in cooperation with the Natural Resource Conservation Service, the Belle Fourche River Watershed Partnership and RESPEC.

Beginning in October 2007, the land within this RWA project area will receive higher priority when applying for technical and financial assistance for the Natural Resource Conservation Service (NRCS) conservation cost-share programs such as Environmental Quality Incentive Program (EQIP) and the Wildlife Habitat Incentive Program (WHIP).

The physical, biological, and sociological data acquired to develop this profile are available in an Environmental Systems Research Institute, Inc. (ESRI) Geodatabase.

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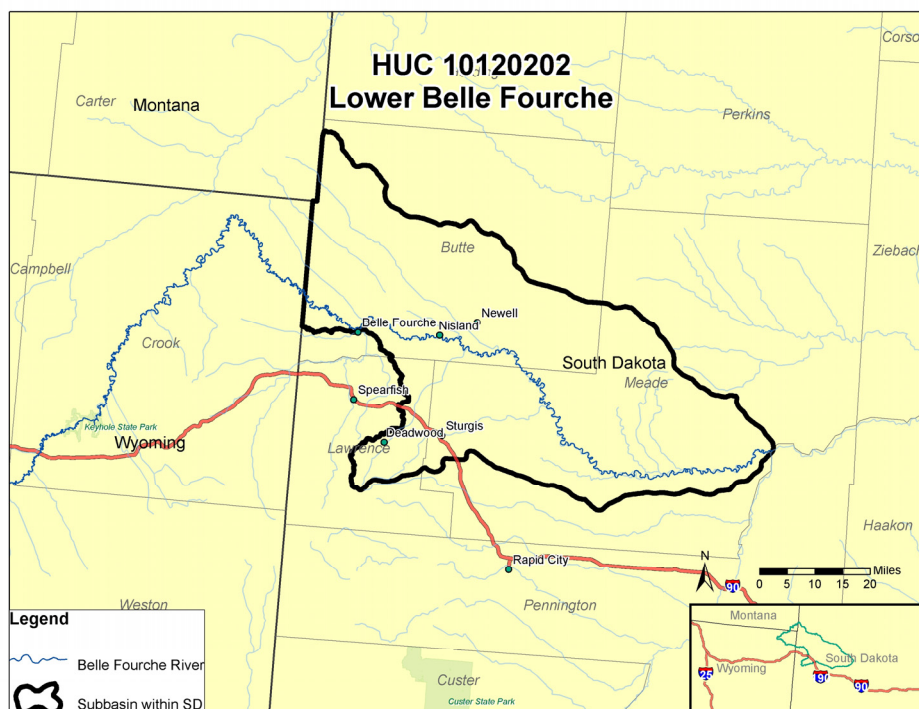
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## INTRODUCTION

The Lower Belle Fourche 8-Digit Hydrologic Unit Code (HUC) subbasin includes areas in western South Dakota, southeastern Montana, and eastern Wyoming. Approximately 85 percent of the HUC, approximately 1,758,000 acres, is located in western South Dakota. This RWA profile includes only the portion of the HUC that falls solely within South Dakota. For the purpose of this report, “the HUC” refers to the portion within South Dakota (Figure 1). The assessment area is located in Meade, Butte, and Lawrence Counties with 48 percent, 45 percent, and 7 percent of the total, respectively.



**Figure 1. Lower Belle Fourche Overview.**

Privately owned farm/ranch operations account for approximately 89 percent of the HUC. The remaining areas are public land and water. The predominant land use of the HUC consists of grasslands for livestock grazing with the remaining areas consisting of shrubland, pasture and hayland, and other small land uses. There are 862 farms and ranches within the area. There are no large residential or commercial developments (less than one percent).

Elevations range from approximately 2,000 feet on the grasslands of the eastern portion of the HUC to over 7,000 feet in the southwestern portion of the HUC which lies within the Black Hills.

Conservation assistance is provided by Belle Fourche River Watershed Partnership, which consists of three soil and water conservation districts and the Belle Fourche Irrigation District. The resource concerns within this HUC are control of weeds and invasive species, groundwater quality, surface water quality, water quantity, need for windbreaks and shelterbelts and soil erosion.

**Table 1. Broad Land Use**

Broad Land Use	% of HUC
Cropland, cultivated	7
Cropland, noncultivated	9
Pastureland	2
Rangeland	64
Forest land	2
Minor land cover/uses	2
Urban and built-up area	2
Rural transportation lands	1
Water, small	1
Water, large	0
Federal land	9
CRP	1

### **PHYSICAL DESCRIPTION**

#### **Land Cover/Land Use and Ownership**

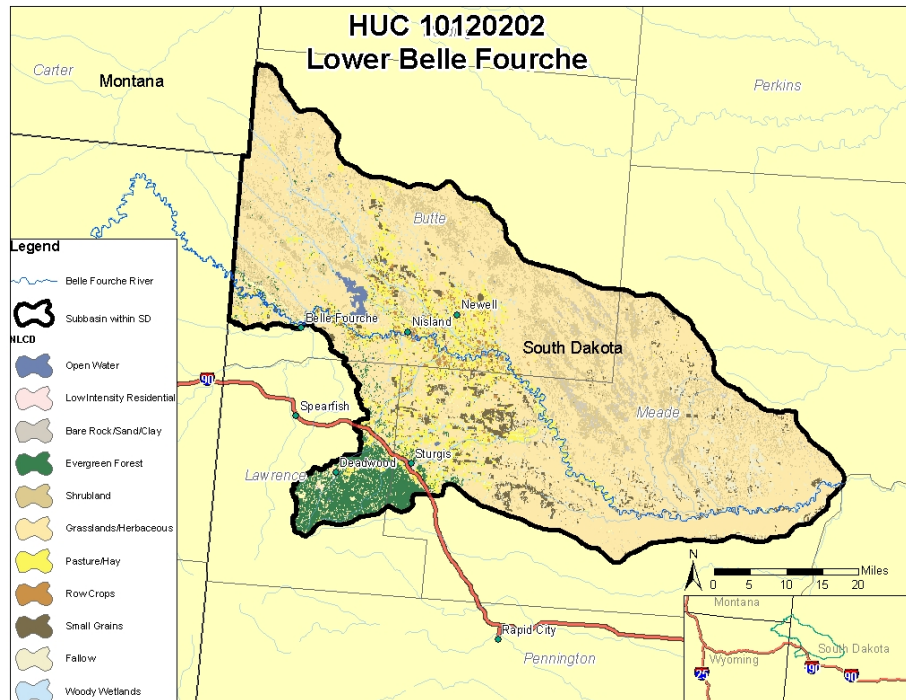
The land cover/land use represents categories of land cover such as vegetation or other type of material to cover the land surface, and categories of land use, which represent the purpose of human activity on the land. The National Resources Inventory (NRI) uses the term “land cover/land use” to identify categories that account for the surface areas of the United States. The NRI is a statistical survey of land use and natural resource conditions and trends on nonfederal lands. The 12 NRI Broad Land Cover/Land Use categories are cultivated cropland, noncultivated cropland, Conservation Reserve Program (CRP) land, pastureland, rangeland, forest land, other rural lands (minor lands), rural transportation, urban lands, small water, large water, and federal land. The CRP is a federal program established under the Food Security Act of 1985 to assist private landowners to convert highly erodible cropland to vegetative cover for 10 years.

According to the NRI information received from the NRCS, the HUC consists of 64 percent rangeland [Natural Resources Conservation Service, 1997]. Table 1 summarizes all broad land use within the HUC.

A more detailed breakdown of land cover/land use was completed by using the National Land Cover Dataset (NLCD). The NLCD is a 21-category land cover classification method that is applied across the United States. The NLCD uses data derived from Landsat thematic mapper imagery and supplemental data [U.S Geological Survey, 1992]. The predominant land

cover/land use of the HUC mainly consists of grasslands for livestock grazing with the remaining areas consisting of shrubland, pasture and hayland, and other small land uses. There are approximately 1,758,500 acres in the HUC. Of those acres, approximately 15,650 acres are categorized as water, leaving approximately 1,743,000 acres of land in the HUC (Figure 2).

Privately owned farm/ranch operations account for approximately 89 percent of the HUC [U.S Geological Survey, 1992; U.S. Geological Survey, 2006a]. The remaining areas are public land and water (Figure 3). Table 2 represents the type of property ownership by NLCD category. Only the categories with greater than 1 percent are listed in the table.



**Figure 2. Predominant Land Cover/Land Use.**

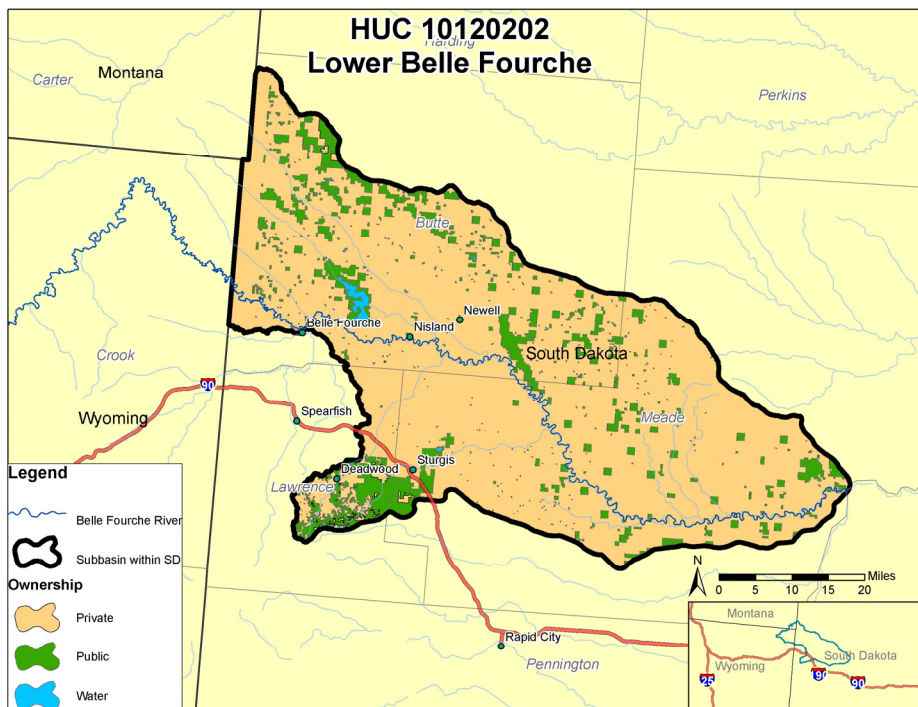
**Table 2. Ownership by National Land Cover Dataset Category**

NLCD Category	Ownership							
	Private		Public		Tribal		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
Bare Rock/Sand/Clay	21,770	1	0	0	0	0	21,770	1
Evergreen Forest	41,533	2	42,771	2	0	0	84,304	4
Shrubland	172,484	10	27,043	2	0	0	199,527	12
Grasslands/Herbaceous	1,003,765	58	116,391	7	0	0	1,120,156	65
Pasture/Hay	124,637	7	0	0	0	0	124,637	7
Row Crops	21,463	1	0	0	0	0	21,463	1
Small Grains	62,191	4	0	0	0	0	62,191	4
Fallow	36,683	2	0	0	0	0	36,683	2
Woody Wetlands	36,584	2	0	0	0	0	36,584	2
Other <sup>(a)</sup>	26,056	2	9,466	<1	0	0	35,522	2
<b>Total<sup>(b)</sup></b>	<b>1,547,166</b>	<b>89</b>	<b>195,671</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>1,742,837</b>	<b>100</b>

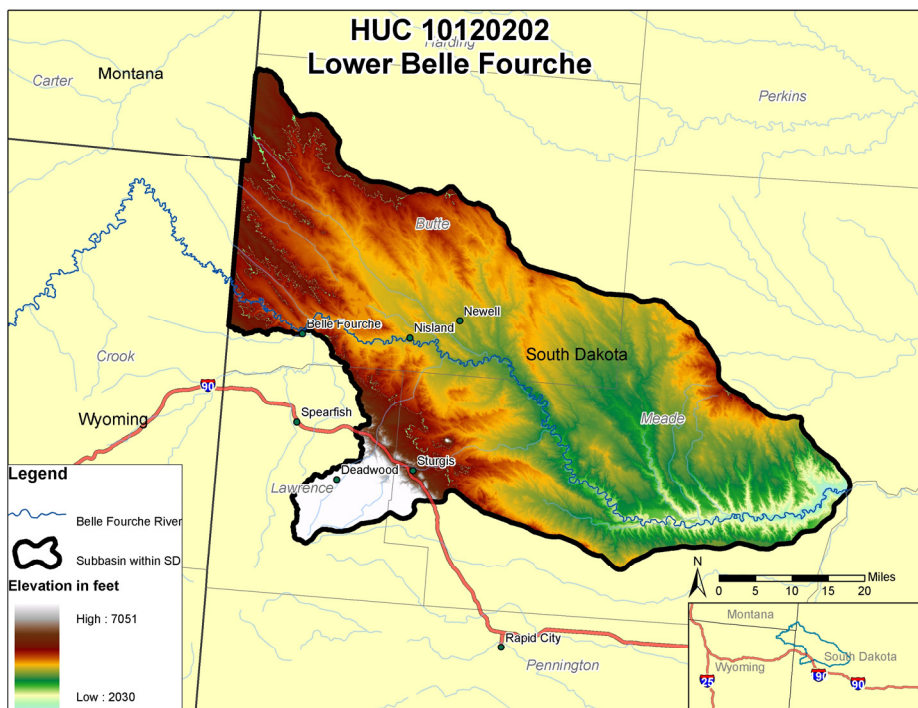
(a) "Other" consists of very small areas of various land use categories.

(b) Totals are approximate due to rounding.

There are 15,650 acres of water, which is less than 1 percent of the HUC.



**Figure 3. Ownership Distribution.**



**Figure 4. Relief.**

### Relief

Elevations range from approximately 2,000 feet on the eastern grasslands portion of the HUC to over 7,000 feet on a small southwestern portion of the HUC, which lies within the Black Hills (Figure 4) [U.S. Geological Survey, 2006b]. Generally, the drainage flows from either the Black Hills or from the northwest to the southeast within the HUC. At the southeastern portion of the HUC, the Belle Fourche River flows into the Cheyenne River.

### Geology

The geology of the HUC consists mainly of Pierre shale, alluvium, and terrace deposits with 51 percent, 14 percent, and 11 percent, respectively (Figure 5, Table 3) [South Dakota Geological Survey, 2004]. Only geologic units with greater than one percent are listed in the table.

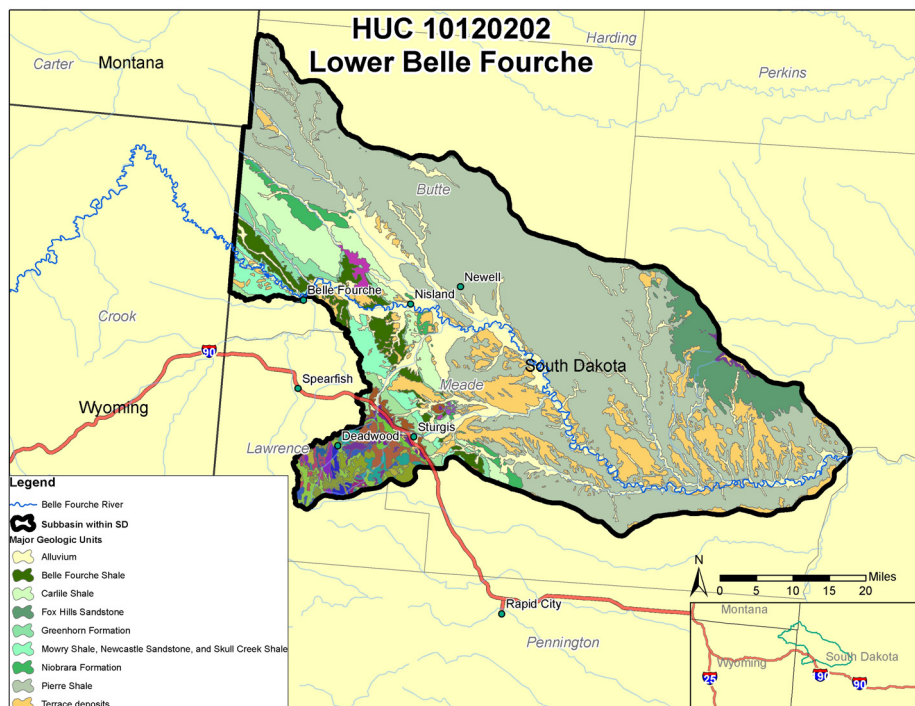
### Slope

The average slope for the HUC is approximately 7 percent (Figure 6) [U.S. Geological Survey, 2006b]. The slopes are higher in the Black Hills portion of the HUC.

### Annual Precipitation

The amount of annual precipitation generally corresponds with the change in elevation (Figure 7). The higher elevations receive higher annual precipitation totals with the majority of the HUC receiving less than 15 inches of precipitation annually [Prism Group, 1990].



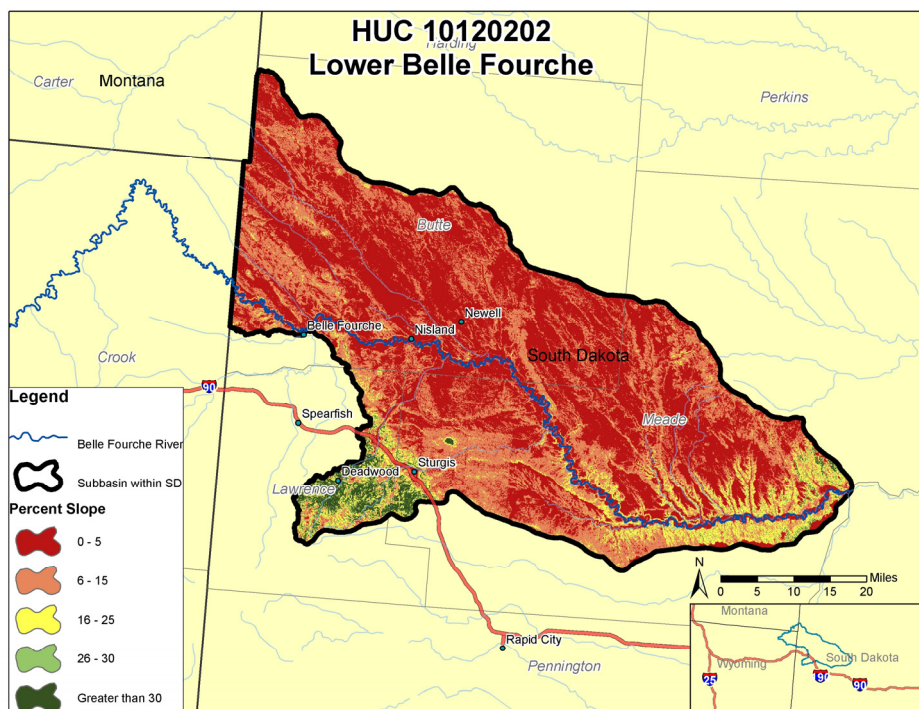


**Figure 5. Geologic Units.**

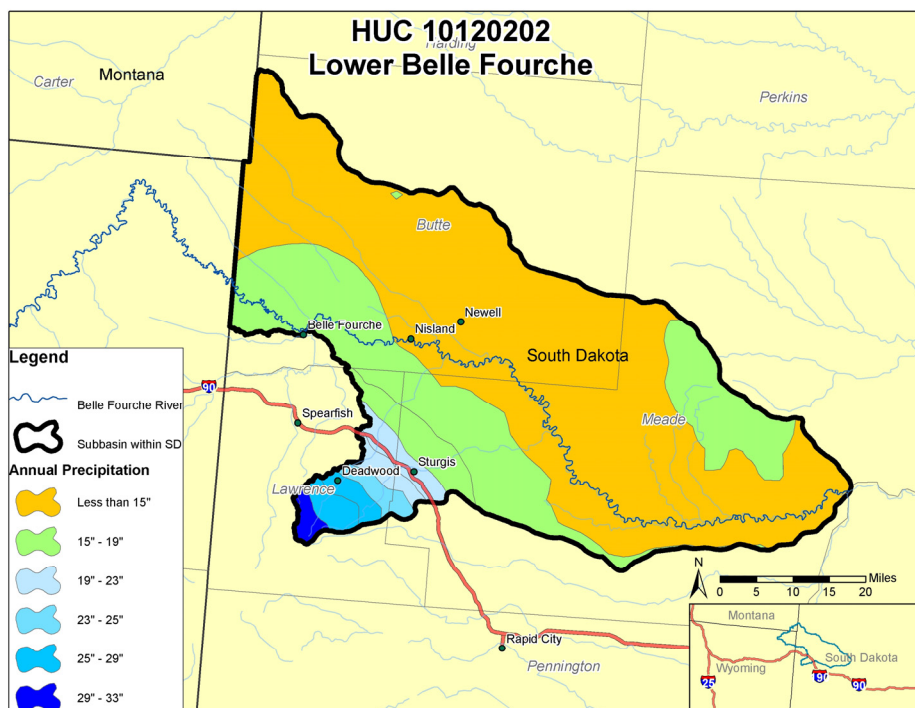
**Table 3. Geology**

Code	Description	Area	
		Acres	%
Kp	Pierre Shale	907,822	51
Qal	Alluvium	240,879	14
Qt	Terrace deposits	195,439	11
Kfh	Fox Hills Sandstone	80,048	5
Kc	Carlile Shale	79,665	5
Kb	Belle Fourche Shale	49,156	3
Kms	Mowry Shale, Newcastle Sandstone, and Skull Creek Shale	42,479	2
Kg	Greenhorn Formation	25,638	1
Kn	Niobrara Formation	24,862	1
Other <sup>(a)</sup>		128,682	7
<b>Total</b>		<b>1,774,669</b>	<b>100</b>

(a) "Other" consists of various geologic units with less than 1 percent of the total HUC area.



**Figure 6.** Slope Distribution.



**Figure 7.** Annual Precipitation.

### Streamflow Summary

All the streams in the National Hydrography Dataset (NHD) 100K flowlines layer [U.S. Geological Survey, 2006c] were buffered by 100 feet on each side of the stream. The land cover/land use and the ownership within this buffered area were tabulated. Approximately 61 percent of the land cover/land use within the buffered area on each side of the streams is grasslands and 91 percent of the buffered area on each side of the stream is privately owned (Table 4).

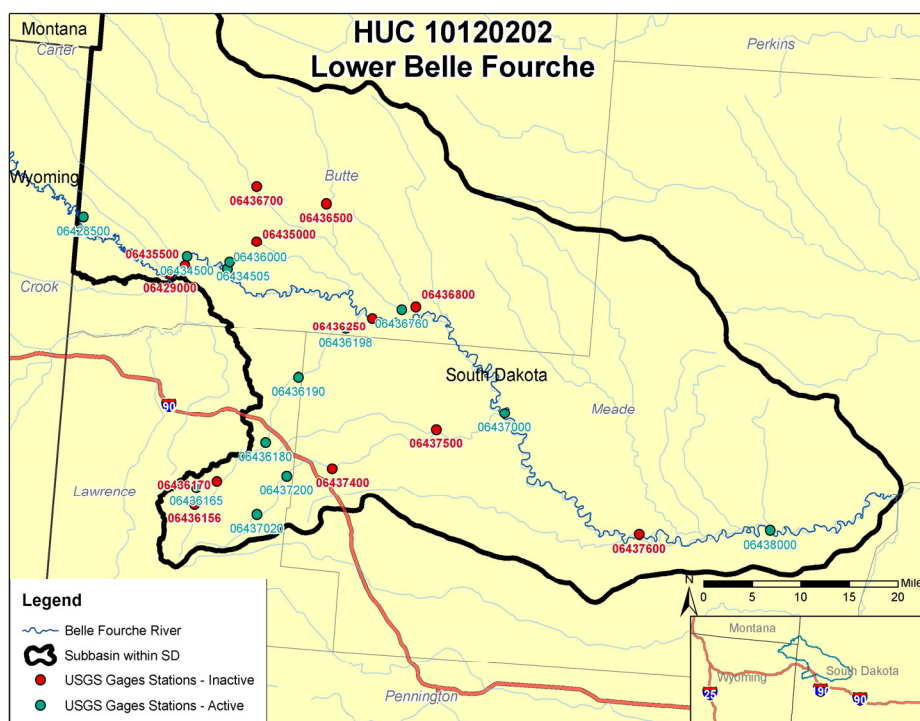
**Table 4. Ownership by National Land Cover Dataset Category Within 100 Feet of Streams**

Land Cover/ Land Use	Ownership							
	Private		Public		Tribal		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
Bare Rock/Sand/Clay	1,663	1	0	0	0	0	1,663	1
Evergreen Forest	2,135	2	1,460	1	0	0	3,595	3
Shrubland	8,469	7	1,212	1	0	0	9,681	8
Grasslands/Herbaceous	67,232	55	7,311	6	0	0	74,543	61
Pasture/Hay	8,084	6	0	0	0	0	8,084	6
Row Crops	1,278	1	0	0	0	0	1,278	1
Small Grains	3,316	3	0	0	0	0	3,316	3
Woody Wetlands	10,383	9	0	0	0	0	10,383	9
Emergent Herbaceous Wetlands	5,966	5	0	0	0	0	5,966	5
Other <sup>(a)</sup>	1,802	2	1,063	1	0	0	2,865	3
<b>Total<sup>(b)</sup></b>	<b>110,328</b>	<b>91</b>	<b>11,046</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>121,374</b>	<b>100</b>

(a) "Other" consists of very small areas of various land use categories.

(b) Total are approximate due to rounding.

There are 3,650 acres of water which is approximately 3 percent of the buffered area.



The average annual runoff measured within the HUC is 3 inches per year and ranges from 0 to 11 inches per year. There are 25 gage stations (maintained by the United States Geological Survey (USGS)) located within the HUC; however, only 13 stations remain active (Figure 8, Table 5) [U.S. Geological Survey, 2006d]. There are approximately 5,190 stream miles in the HUC, of which about 554 miles are considered perennial streams [U.S. Geological Survey, 2006c].

**Figure 8. Active and Inactive USGS Stations.**

**Table 5. Gage Stations Data**

Site No.	Station Name	Drainage Area (acres)	Status	Average Flow (cfs)	Percentile <sup>(a)</sup>			Yield (acre-ft/yr)	Runoff (in/yr)
					10 <sup>th</sup> (cfs)	50 <sup>th</sup> (cfs)	90 <sup>th</sup> (cfs)		
06437020	Bear Butte Creek near Deadwood, SD	10,679	Active	7.35	0.8	2.5	18	5,324	6
06436156	Whitetail Creek at Lead, SD	3,936	Inactive	4.79	0.8	2	11	3,466	11
06437600	Belle Fourche River near Hereford SD	NA <sup>(b)</sup>	Inactive	- <sup>(c)</sup>	-	-	-	-	-
06436165	Deadwood Creek at Central City, SD	3,110	Active	0.80	0.4	0.8	1.4	581	2
06438000	Belle Fourche River near Elm Springs	4,614,400	Active	370.30	20	109	655	268,087	1
06436170	Whitewood Creek at Deadwood, SD	25,984	Inactive	26.98	9.6	14	45	19,529	9
06437200	Bear Butte Creek near Galena, SD	33,152	Active	11.72	0	0	60	8,482	3
06437400	Bear Butte Creek at Sturgis, SD	47,104	Inactive	5.19	1.2	3.3	8.6	3,755	1
06436180	Whitewood Creek above Whitewood, SD	36,032	Active	27.74	8.6	16	56	20,086	7
06437500	Bear Butte Creek near Sturgis, SD	122,880	Inactive	13.93	0	2	23	10,084	1
06437000	Belle Fourche River near Sturgis, SD	3,756,800	Active	279.39	25	112	528	202,272	1
06436190	Whitewood Creek near Whitewood, SD	49,536	Active	29.89	7.3	17	61	21,637	5
06436198	Whitewood Creek above Vale, SD	65,280	Active	30.87	5.6	17	65	22,349	4
06436250	Belle Fourche River at Vale, SD	3,219,200	Inactive	-	-	-	0	-	-
06436760	Horse Creek above Vale, SD	296,960	Active	47.38	1.8	9	69	34,303	1
06436800	Horse Creek near Vale, SD	339,200	Inactive	62.91	2.7	14	131	45,544	2
06429000	Belle Fourche River at Belle Fourche, SD	2,150,400	Inactive	-	-	-	-	-	-
06435500	Belle Fourche River near Belle Fourche, SD	2,758,400	Inactive	-	-	-	-	-	-
06436000	Belle Fourche River near Fruitdale, SD	4,540,640	Active	90.39	3.1	7	263	65,437	0
06434505	Inlet Canal above Belle Fourche Reservoir SD	NA	Active	149.36	1.5	159	262	108,129	* <sup>(d)</sup>
06434500	Inlet Canal near Belle Fourche, SD	NA	Active	162.38	26	140	286	117,556	*
06435000	Belle Fourche Reservoir near Belle Fourche, SD	NA	Inactive	-	-	-	-	-	-
06428500	Belle Fourche River at WY-SD State Line	2,099,200	Active	88.18	4	34	196	63,839	0
06436500	Horse Creek near Newell, SD	42,880	Inactive	4.50	0	0.01	1.6	3,255	1
06436700	Indian Creek near Arpan, SD	201,600	Inactive	19.82	0	0	19	14,349	1

(a) The numbers in the 10<sup>th</sup>, 50<sup>th</sup>, and 90<sup>th</sup> percentile column indicate the percent of flow less than the value in column.

(b) NA denotes drainage area was not available through the United States Geological Society (USGS).

(c) - denotes water quality station only, therefore, no flow data is available.

(d) \* denotes drainage area and/or yield was not available through the USGS and runoff could not be calculated.

### Aquifers

Several major and minor aquifers of varying depth and quality are utilized within the HUC. Shallow aquifers tend to be smaller and generally have good water quality but can be 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 with variable water quality. As a result of the restrictive soil layers protecting these aquifers and the depth at which they occur, these aquifers are less susceptible to leaching and other surface activities and impacts.

The aquifers that utilized within the HUC are within the following formations: Fox Hills, Madison, Deadwood Minnelusa, Spearfish. Inyan Kara, Lakota, and pre-Cambrian metamorphic and crystalline bedrock [Gestring, 2007].



### Public Water Supply Systems

The South Dakota Department of Environment and Natural Resources (SD DENR) Drinking Water Program enforces the Federal Safe Drinking Water Act and the South Dakota Drinking Water Regulations that apply to the approximately 760 public water systems in South Dakota. Approximately 88 percent of the public water systems (PWS) utilize water from groundwater sources while the remaining 22 percent utilize surface water sources [South Dakota Department of Environment and Natural Resources, 2007a].

To prevent contamination of the public water systems, the SD DENR Source Water Assessment and Protection Program performs an assessment of each PWS to determine the land area contributing water to the PWS and the potential source of contaminants within that land area. Based on the assessment information, a source water protection area is defined for each PWS [South Dakota Department of Environment and Natural Resources, 2007a].

There are 23 active PWS within the HUC that utilize the aquifers identified above [Gestring, 2007]. Three of the PWS utilize surface water sources including springs.

### Irrigated Lands

Irrigated land consists of approximately 20 percent of the HUC [Natural Resources Conservation Service, 1997]. Most of the irrigation occurs on uncultivated cropland which includes hayland (Table 6). The primary sources of the irrigation are from a pond, lake, or reservoir, which is delivered to the irrigated land by canals or ditches [Natural Resources Conservation Service, 1997].

**Table 6. Irrigated Lands**

<b>Land Use</b>	<b>Acres</b>	<b>% of Irrigated Land</b>	<b>% of HUC</b>
Cultivated Cropland	130,100	37	7
Uncultivated Cropland	165,900	47	10
Pastureland	39,600	11	2
Conservation Reserve Program	15,700	5	1
<b>Total Irrigated Land</b>	<b>351,300</b>	<b>100</b>	<b>20</b>

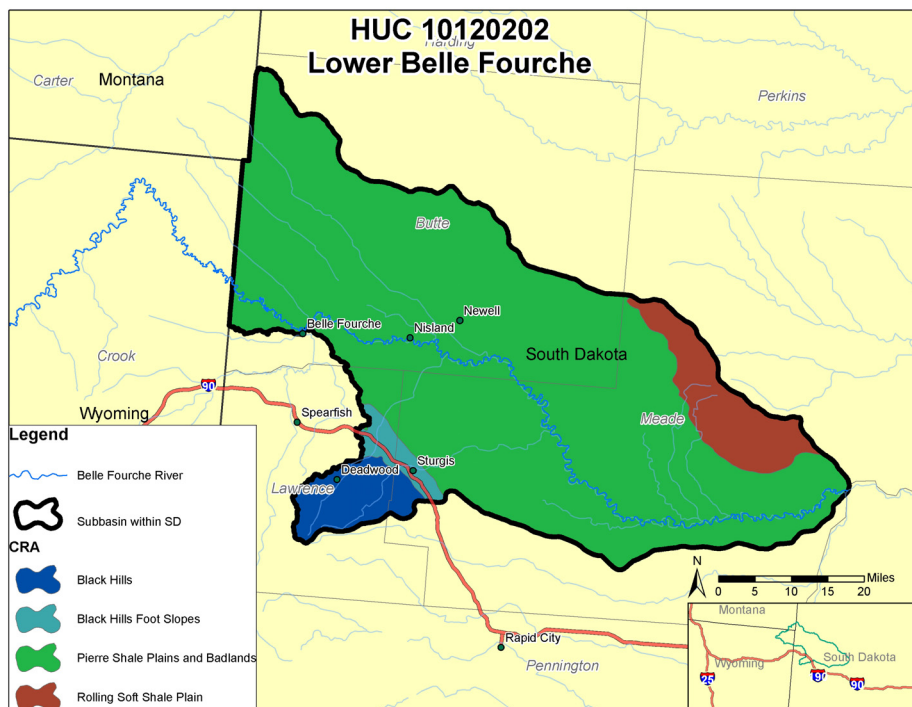
The SD DENR is responsible for managing the appropriation and use of the state's water resources. All water uses in South Dakota except for certain domestic uses require a permit to appropriate water. The majority of the water appropriated for irrigation comes from surface water sources (Table 7) [Buhler, 2007].

**Table 7. Irrigation Water Rights**

<b>Source</b>	<b>No. of Appropriations</b>	<b>Flow Rate (cfs)</b>	<b>Irrigated Area (acres)</b>	<b>Annual Appropriations (acre-ft)</b>
Groundwater	116	40	1,193	4,836
Surface Water	302	2,955	93,864	272,100
Both	7	6	437	1,123

## Common Resource Areas

National Coordinated 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 are used to determine the geographic boundaries of a CRA [National Resources Conservation Service, 2002]. The predominant CRA is the Pierre Shale Plains and Badlands, which consists of 86 percent of the HUC (Figure 9, Table 8).



**Figure 9.** Common Resource Areas.

**Table 8. Common Resource Area Codes and Descriptions**

CRA Code	% of HUC	CRA Name	Description
54.SD1	7	Rolling Soft Shale Plain	The Rolling Soft Shale Plain is a semiarid rolling plain with soils formed from shale, siltstone, and sandstone. Native grasses cover areas of steep or broken topography, while cultivated and forage crops dominate other parts of the landscape. Most soils are moderately deep and deep, well drained and moderately well drained, loamy and clayey, and have a frigid temperature regime. The area was largely unaffected by glaciation and retains a moderately dissected stream drainage pattern.
60A.SD1	86	Pierre Shale Plains and Badlands	These smooth shale plains are mostly gently sloping to strongly sloping. Along drainages and streams, slopes are moderately steep to steep. Badlands are scattered throughout. Soils are mostly fine textured and have a frigid temperature regime. Most of this area is used for grazing livestock. Some small nearly level to moderately sloping tracts are farmed to winter wheat. Average annual precipitation is 11 to 14 inches. Average annual temperature is 38 to 39°F. Average frost-free period is 110 to 120 days. This area supports natural mixed prairie vegetation.
61.SD1	2	Black Hills Foothills	The Black Hills Foothills slopes are mostly hilly to steep. The soils are mostly deep to shallow and fine textured to medium textured and have a mesic temperature regime. Most of this area is native grass and used mainly for livestock grazing. Some of the less sloping parts are farmed mainly to alfalfa and small grains for livestock feed. Average annual precipitation is 15 to 18 inches. Average annual temperature is 38 to 41°F. Average frost-free period is 90 to 100 days. This area supports grassland and Ponderosa pine forest.
62.SD1	5	Black Hills	Black Hills slopes are moderate on some high plateaus to very steep along drainageways and on peaks and ridges. Narrow valleys are gently sloping to strongly sloping. The soils have montmorillonitic mineralogy. Most of the area is used for mining, recreation, and hunting. Small farms, ranches, and rural homes are on small acreages scattered throughout. Average annual precipitation is 18 to 26 feet. Average annual temperature is 35 to 39°F. Average frost-free period is 60 to 90 days. This area supports open to dense Ponderosa pine and Black Hills spruce forests.

### Land Capability Classification

Land capability classification (LCC) is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period. The majority of the HUC falls within severe to very severe limitations, which restrict land use (Table 9) [Natural Resources Conservation Service, 1997].

**Table 9. Land Capability Class**

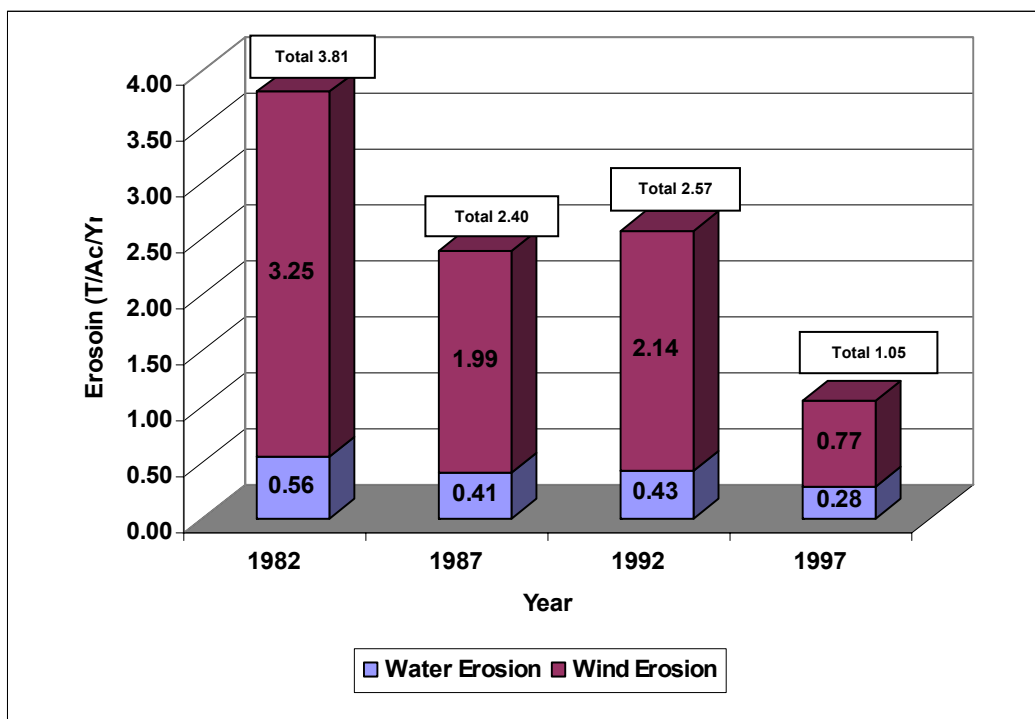
<b>LCC</b>	<b>Description</b>	<b>Acres</b>	<b>%</b>
I	Slight limitations	100	0
II	Moderate limitations that reduce the choice of plants or require moderate conservation practices	38,500	2
III	Severe limitations reduce the choice of plants or require special conservation practices, or both	211,900	12
IV	Very severe limitations restrict the choice of plants, require very careful management, or both	305,200	17
V	No erosion hazard, but other limitations impractical to remove that limit their use largely to pasture, range, woodland, or wildlife food and cover	–	0
VI	Severe limitations, unsuited to cultivation, limited to pasture or range, woodland, or wildlife food and cover	634,600	36
VII	Very severe limitations, unsuited for cultivation, restricted largely to grazing, woodland, or wildlife	338,400	19
VIII	Miscellaneous areas have limitations, limited to recreation, wildlife, water supply or to esthetic purposes	20,000	1
Other	Federal land, water, and unassigned barren lands	224,000	13
<b>Total</b>		<b>1,772,700</b>	<b>100</b>



## **RESOURCE CONCERNS**

### **Erosion Estimates**

The NRI soil and water erosion data from 1982, 1987, 1992, and 1997 (most current available) were reviewed to determine the extent and potential trends of erosion for cropland, pasture, and CRP land within the HUC [Natural Resources Conservation Service, 1997]. Soil erosion by both water (nearly 50 percent reduction) and wind (76 percent reduction) has generally decreased since 1982 likely through the use of conservation practices (Figure 10).



**Figure 10.** Soil Erosion by Water and Wind for Cropland, Pasture, and CRP.

### **Concentrated Animal Feeding Operation**

The SD DENR requires permits for concentrated animal feeding operations (CAFOs) in South Dakota to protect waters from improper waste disposal practices. The facilities are permitted as small, medium, or large based on the number and type of animals at the facility. There are five permitted CAFOs within the HUC [Woodmansey, 2006] with 10,050 animals (Table 10). Of these facilities, two are permitted, one is approved, and the remaining two are still under review for approval.

**Table 10. Concentrated Animal Feeding Operations**

No. of Facilities	Total No. of Animals	Beef Cattle	Dairy Cattle	Horses	Other
5	10,050	10,050	0	0	0

Note: The animal count for the facilities under review has not been included.

### Livestock Distribution

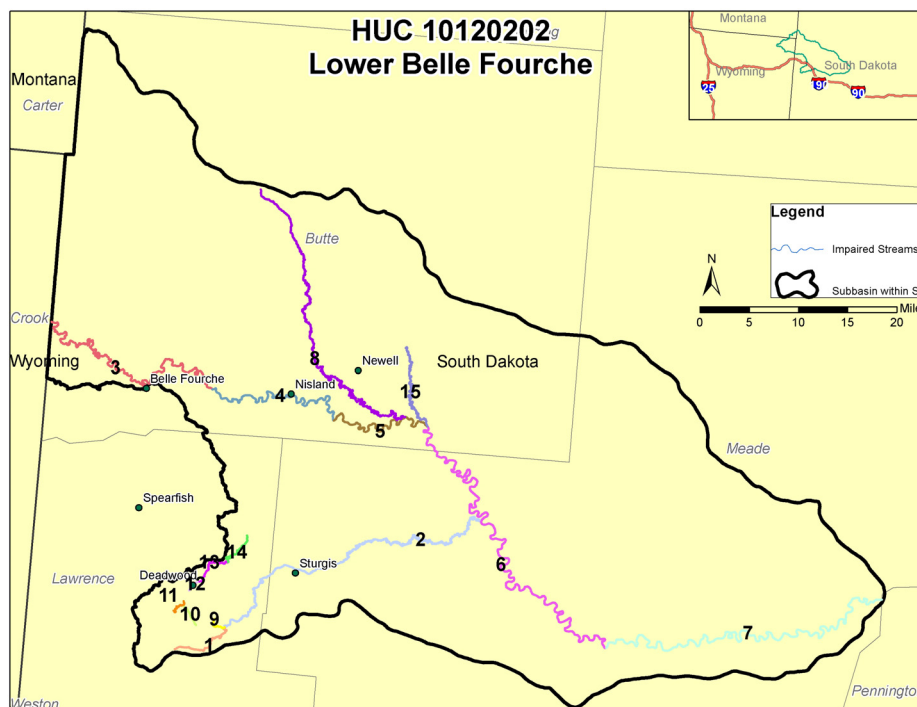
The livestock within the HUC consists mainly of beef cattle and sheep [National Agricultural Statistics Service, 2002]. The number of animals in each county was obtained by adjusting the total number of animals in the county by the percent of the HUC within the county (Table 11).

**Table 11. Livestock Distribution**

<b>Cattle and Calves Inventory</b>	<b>Beef Cows</b>	<b>Dairy Cows</b>	<b>Hogs and Pigs Inventory</b>	<b>Sheep and Lambs Inventory</b>
83,760	49,300	1,560	475	36,525

### Impaired Waterbodies

Section 303(d) of the Clean Water Act states that waterbodies that are not meeting their designated uses because of pollutants must be placed on an impaired water list. The SD DENR maintains a list of impaired waterbodies in South Dakota [Brich, 2006]. The SD DENR is required to develop Total Maximum Daily Loads (TMDLs) for waterbodies on this list. Currently, there are 338 impaired stream miles but no impaired lakes within the HUC. The impaired stream miles are 7 percent of the total stream miles within the HUC. The potential causes of impairment are from grazing in riparian zones, improper pasture grazing management, crop production, acid on-site septic treatment systems, natural sources, some unknown sources and mine drainage, and combined sewer overflows. Figure 11 shows the locations of impaired. Table 12 summarizes the impaired stream segment, including the length of impairment, its designated use, the TMDL status, and the criteria violated in 2006.



**Figure 11. Impaired Waterbodies.**

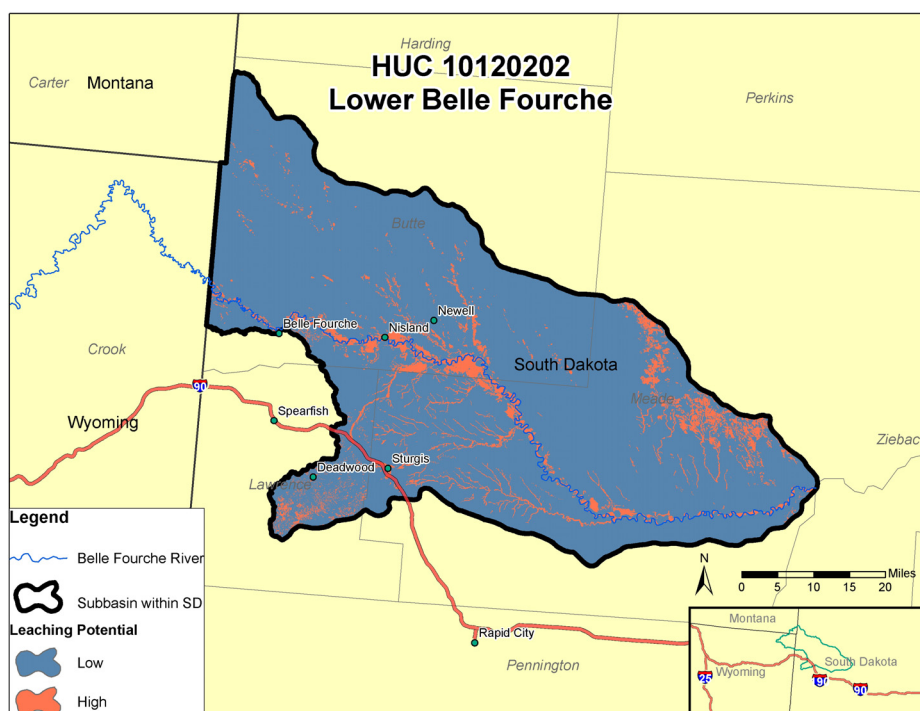
**Table 12. Impaired Streams**

<b>Figure ID<sup>(a)</sup></b>	<b>Impaired Streams</b>	<b>Miles</b>	<b>Use Description</b>	<b>TMDL Status</b>	<b>Criteria Violated</b>
1	Bear Butte Creek	8.1	Coldwater Permanent Fish Life Propagation Waters	Impaired Without Approved TMDL	Temperature, water
2	Bear Butte Creek	52.18	Coldwater Permanent Fish Life Propagation Waters	Impaired Without Approved TMDL	Total Suspended Solids
3	Belle Fourche River	39.87	Immersion Recreation Waters	Impaired Without Approved TMDL	Fecal Coli form
4	Belle Fourche River	23.57	Warmwater Permanent Fish Life Propagation Waters	Impaired With Approved TMDL	Total Suspended Solids
5	Belle Fourche River	16.9	Warmwater Permanent Fish Life Propagation Waters	Impaired With Approved TMDL	Total Suspended Solids
6	Belle Fourche River	59.76	Warmwater Permanent Fish Life Propagation Waters	Impaired With Approved TMDL	Total Suspended Solids
7	Belle Fourche River	50.49	Warmwater Permanent Fish Life Propagation Waters	Impaired With Approved TMDL	Total Suspended Solids
8	Horse Creek	54.19	Irrigation Waters	Impaired Without Approved TMDL	Specific Conductance
9	Strawberry Creek	2.07	Coldwater Marginal Fish Life Propagation Waters	Impaired Without Approved TMDL	pH
10	West Strawberry Creek	2.61	Coldwater Permanent Fish Life Propagation Waters	Impaired Without Approved TMDL	Temperature, water
11	Whitewood Creek	2.32	Coldwater Permanent Fish Life Propagation Waters	Impaired Without Approved TMDL	Temperature, water
12	Whitewood Creek	1.45	Immersion Recreation Waters	Impaired Without Approved TMDL	Fecal Coliform
13	Whitewood Creek	5.02	Immersion Recreation Waters	Impaired Without Approved TMDL	Fecal Coliform
14	Whitewood Creek	4.93	Coldwater Marginal Fish Life Propagation Waters	Impaired Without Approved TMDL	pH
15	Willow Creek	14.79	Irrigation Waters	Impaired Without Approved TMDL	Specific Conductance
<b>Total Impaired Miles</b>		<b>338.25</b>			
<b>% of Total Miles</b>		<b>7</b>			

(a) Figure ID number is used to reference stream segment on Figure 11.

## Groundwater Leaching

Soils with shallow aquifers are considered vulnerable for contaminate leaching. The saturated hydraulic conductivity (Ksat, micrometers per second) refers to the ease with which pores in a saturated soil transmit water. Soils with a Ksat value of greater than 10 micrometers per second [Natural Resource Conservation Service, 2007a] with slopes less than 6 percent are considered to have a high leaching risk [Natural Resource Conservation Service, 2007b]. There are areas of high leaching potential within the HUC (Figure 12).



**Figure 12. Leaching Potential.**

## Soil, Water, Air, Plants, and Animals

Two hundred fifty resource concern surveys (of approximate 475 sent in the area) were returned by landowners within the HUC [Butte County Conservation District, 2007]. Results of the resource concerns survey indicate the highest priority resource concerns are control of weeds and invasive species, groundwater quality, surface water quality, water quantity, need for windbreaks and shelterbelts and soil erosion (Table 13). As part of the landowner survey, there was an “Other” category where additional concerns were listed. Some other resource concerns listed were urbanization of productive land, development too close to waterways, wildfire mitigation, need for regulation of small feedlots, irrigation systems upgrades, urbanization impacts to water resources, need for rural water system and arsenic and other toxic material from mining activities in the surface water. Table 14 summarizes the results of the resource concerns by land use survey completed by local district conservationist [Lantz, 2007]. An “X” indicates a resource concern in Table 14.



**Table 13. Landowner Resource Concerns Survey Result**

Conservation Practice	Rank <sup>(a)</sup>
Need to Control Weeds and Invasive Species	1
Groundwater Quality	2
Surface Water Quality	3
Water Quantity for Livestock, Wildlife and Recreation	3
Windbreaks and Shelterbelts	3
Soil Erosion	4
Need for Rotational Grazing Systems	5
Prairie Dog Infringement	5
Riparian Area and Stream Bank Stabilization	5
Proper Nutrient Management	5
Forest Management	6
Loss of Wetlands and Wildlife Habitat	6
Air Quality	6
Loss of Conservation Reserve Program Acres Returned to Cropland/Grazing	6

(a) Rank of resource concern in order of importance.

**Table 14. Resource Concerns/Issues by Land Use (Page 1 of 2)**

SWAPA + H Concerns	Specific Resource Concerns/Issues	Pasture	Hayland	Dry Crops	Surface Irrigated Crops	Sprinkler Irrigated Crops	Rangeland	Grazed and Ungrazed Forest	Wildlife	Urban
<b>Soil Erosion</b>	Sheet and rill			X	X	X				X
	Ephemeral gully			X	X	X				X
	Classic gully	X	X	X	X	X	X	X	X	X
	Wind	X		X	X	X	X			X
	Streambank	X		X	X	X	X			X
	Irrigation induced				X	X				
<b>Soil Condition</b>	Organic matter depletion	X	X	X	X	X	X	X	X	X
	Compaction		X	X	X	X				X
	Rangeland site stability						X			
<b>Water Quantity</b>	Inefficient use on irrigated lands				X	X				
<b>Water Quality, Surface</b>	Excessive suspended sediments and turbidity	X					X	X	X	X
	Excessive nutrients and organics			X	X	X				X
	Harmful levels of pesticides			X	X	X				X
<b>Water Quality, Ground</b>	Excessive nutrients and organics			X	X	X			X	X
	Harmful levels of pesticides			X	X	X			X	X
<b>Air Quality</b>	Particulate matter			X	X	X				X
	Odor									X
<b>Plant Condition</b>	Productivity, health, and vigor	X	X	X	X	X	X	X	X	X
	Noxious and invasive plants	X	X	X	X	X	X	X	X	X
	Wildfire hazard	X					X	X	X	X
	Forage quality and palatability	X	X				X	X		

**Table 14. Resource Concerns/Issues by Land Use (Page 2 of 2)**

SWAPA + H Concerns	Specific Resource Concerns/Issues	Pasture	Hayland	Dry Crops	Surface Irrigated Crops	Sprinkler Irrigated Crops	Rangeland	Grazed and Ungrazed Forest	Wildlife	Urban
<b>Animals, Fish &amp; Wildlife</b>	Inadequate water						X	X	X	
	Inadequate food						X	X	X	
	Inadequate cover/shelter						X	X	X	X
	Inadequate space						X	X	X	X
	Plant community fragmentation						X	X	X	X
<b>Animals, Domestic</b>	Inadequate quantity of quality of feed and forage	X	X				X	X	X	X
	Inadequate stock water	X					X	X	X	X
	Inadequate shelter	X								
<b>Human Economics</b>	High risk and uncertainty									
	High capital/financial costs									
	Low or unreliable profitability									

### Threatened, Endangered, and Candidate Species

Table 15 summarizes the threatened and endangered species that are located throughout the HUC [Natural Resources Conservation Service, 2007c]. Not all species are in all portions of the HUC. In addition, the sage grouse is on the Bureau of Land Management Sensitive Species List. Research is being conducted to monitor the needs of the sage grouse during breeding season to help stabilize or increase their populations [Berdan, 2007].

### Wildlife Habitat Quality Rating

The wildlife habitat quality rating is a guide designed to evaluate the quality of habitat for a variety of wildlife species. The rating system is not species specific and is designed to evaluate habitat in general terms. The rating system is used to determine if an area meets the quality criteria established for wildlife. To meet the criteria for the Resource Management System (RMS) for wildlife habitat, the assessment area must receive a habitat quality rating of 0.5 or greater [Natural Resources Conservation Service, 2007d]. The Lower Belle Fourche HUC received a wildlife habitat quality rating of 0.49.

### Other Watershed Project, Assessments, Studies, and Plans

The United States Geological Society (USGS) has conducted numerous surface and groundwater resources studies within the HUC [U.S. Geological Survey, 2007]. The SD DENR has conducted Total Maximum Daily Load (TMDL) projects within the HUC [South Dakota Department of Environment and Natural Resources, 2007b].

**Table 15. Threatened and Endangered Species**

<b>Name</b>	<b>Scientific Name</b>	<b>Federal Status</b>	<b>State Status</b>
<b><i>Fishes</i></b>			
Finescale dace	<i>Phoxinus neogaeus</i>		State Endangered
Longnose sucker	<i>Catostomus catostomus</i>		State Threatened
Sturgeon chub	<i>Macrhybopsis gelida</i>		State Threatened
<b><i>Birds</i></b>			
American dipper	<i>Cinclus mexicanus</i>		State Threatened
Bald eagle	<i>Haliaeetus leucocephalus</i>	Federal Threatened	State Threatened
Interior least tern	<i>Sterna antillarum athalassos</i>	Federal Endangered	State Endangered
Osprey	<i>Pandion haliaetus</i>		State Threatened
Peregrine falcon <sup>a</sup>	<i>Falco peregrinus</i>		State Endangered
Whooping crane	<i>Grus Americana</i>	Federal Endangered	State Endangered
<b><i>Mammals</i></b>			
Black bear <sup>b</sup>	<i>Ursus americanus</i>		State Threatened
Black-footed ferret	<i>Mustela nigripes</i>	Federal Endangered	State Endangered
Gray wolf <sup>b</sup>	<i>Canis lupus</i>	Federal Endangered	
River otter	<i>Lontra canadensis</i>		State Threatened
Swift fox	<i>Vulpes velox</i>		State Threatened

(a) Peregrine falcons are occasional migrants through South Dakota.

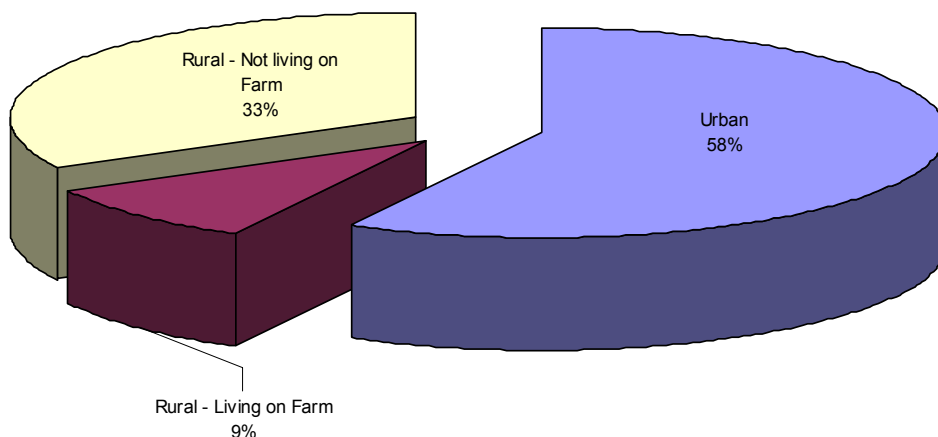
(b) Black bear and gray wolves are rare transients in South Dakota.

### **CENSUS AND SOCIAL DATA**

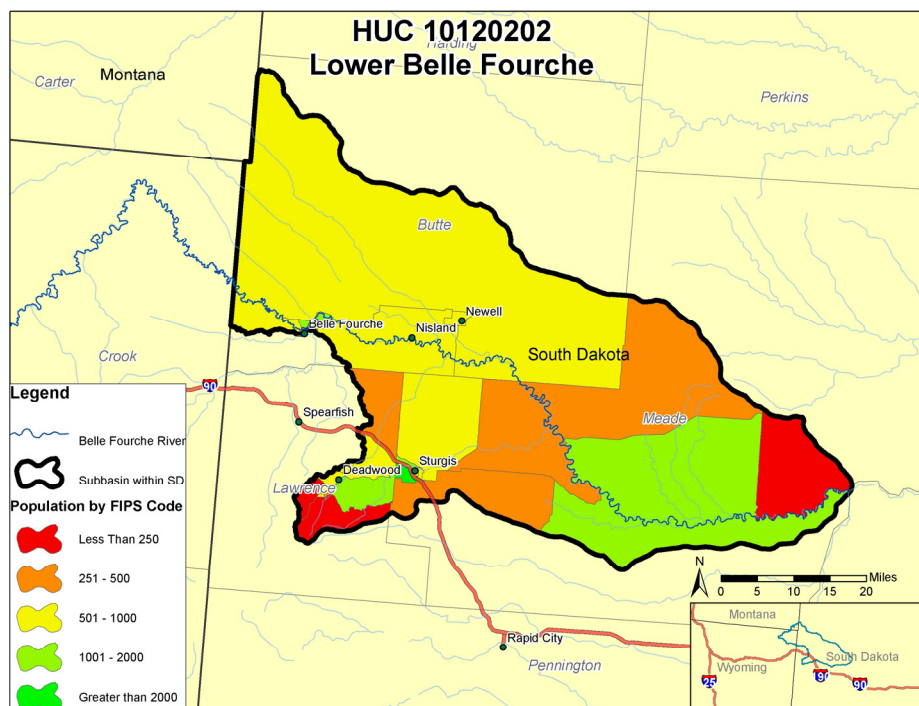
Based on the 2000 Census Data scaled to the percent of the area within the HUC, the population of the HUC is approximately 21,359. Urban population consists of more than one-half of the HUC population (Figure 13). The population distribution by census block group and population per square mile within the HUC are shown on Figure 14 and Figure 15 respectively. There are approximately 8,678 households within the HUC with the majority of the households earning between \$25,000 and \$49,999 per year (Figure 16). Population and income statistics were obtained from the 2000 Census data [U.S. Census Bureau, 2000].

There are 862 farms/ranches in the HUC with 646 primary operators and 287 part time operators. The majority of the farms/ranches are greater than 50 acres in size [National Agriculture Statistics Service, 2002]. Figure 17 shows the farm/ranch size distribution.



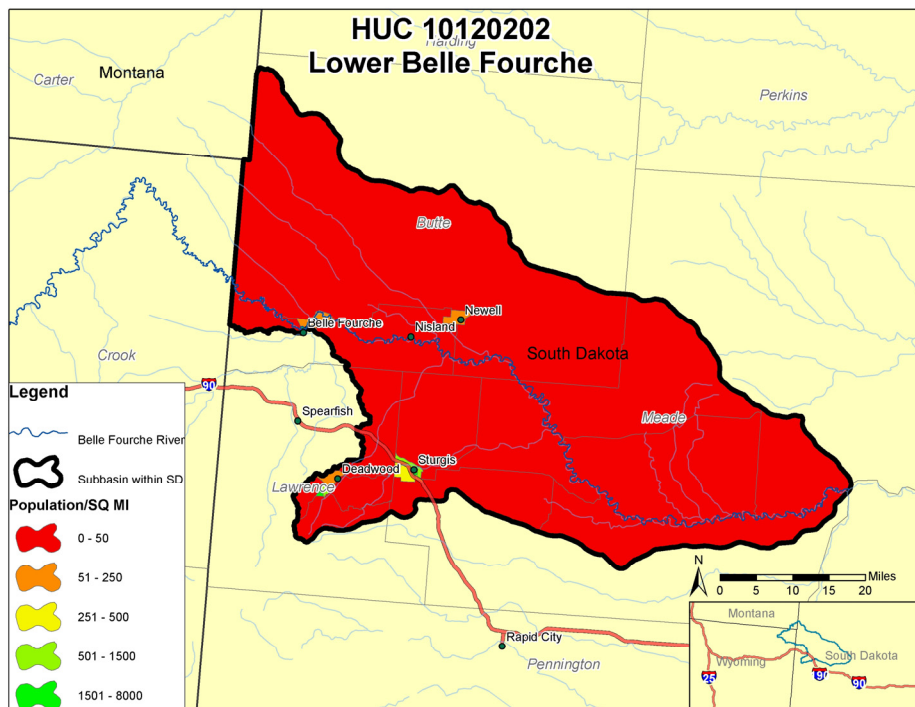


**Figure 13.** Urban and Rural Population.

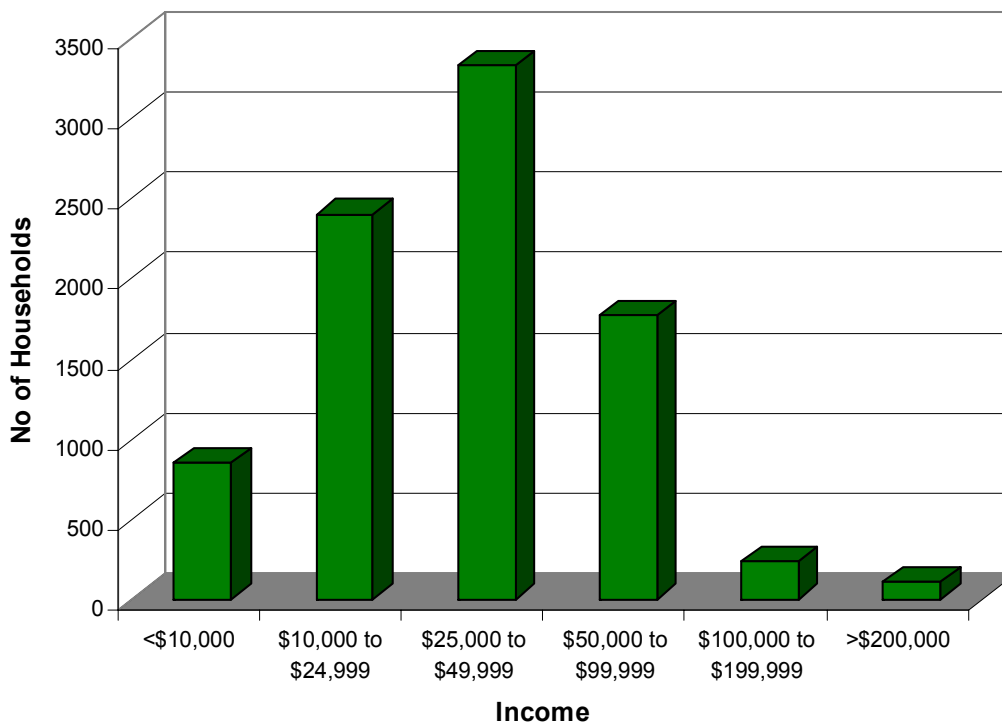


**Figure 14.** Population Distribution by Census Block.

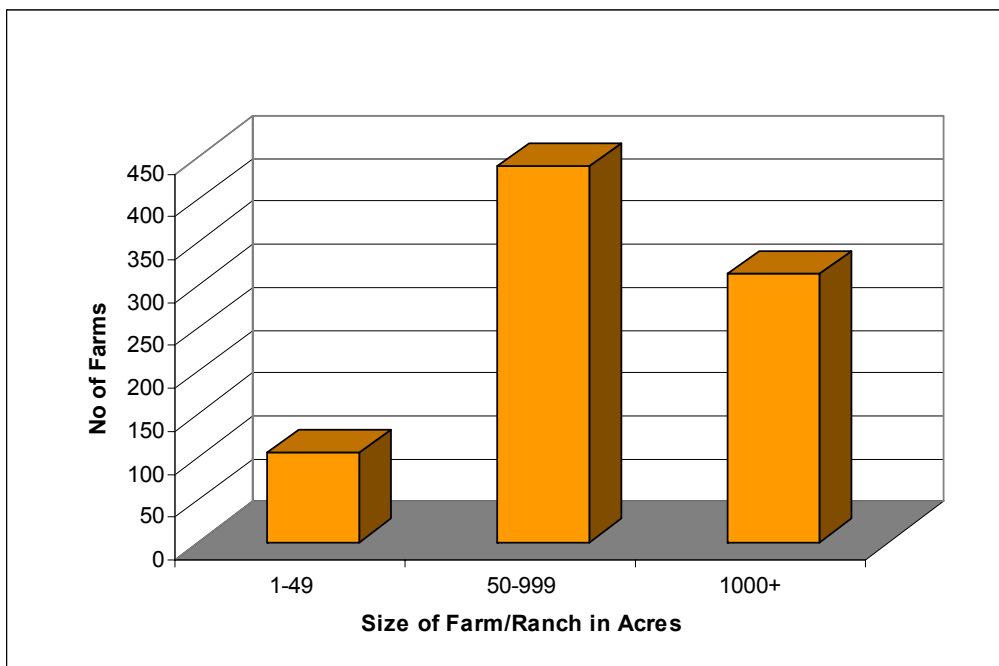
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**Figure 15. Population per Square Mile.**



**Figure 16. Income Distribution.**



**Figure 17. Farm/Ranch Size Distribution.**

## **CONSERVATION PROGRESS**

### **Reported Conservation Progress**

The NRCS Performance Results Systems (PRS) tracks conservation progress on addressing resource issues. The data are from the National Conservation Planning Database [Natural Resources Conservation Service, 2007e]. However, additional information regarding “Lined Waterways or Outlets” was obtained from the Belle Fourche Irrigation District, and the “Irrigation Systems, Sprinkler” was obtained from the NRCS field office in Belle Fourche, South Dakota.

The conservation systems that are planned or applied are attributed to the NRCS, Conservation Districts, Resource Conservation and Development (RC&D) councils, state agencies, or other (other individual or joint partnerships) agencies. Table 16 summarizes the conservation systems acres (planned and applied) submitted to PRS for all land uses and all resource concerns. Approximately 60 percent of the planned conservation systems were applied from 2002 through the first quarter of 2007. Table 17 summarizes the implementation accomplishments for all conservation practices for all land uses and resource concerns. The fiscal year shown on Tables 16 and 17 starts October 1.

Based on the applied conservation practices summary, the most progress was made by installation of fences to control the movement of animals; installation of pipelines to convey water from a source to points of use for livestock, wildlife, or recreation; prescribed grazing to manage the controlled harvest of vegetation with grazing animals; and the establishment of windbreaks/shelterbelts to reduce erosion and to provide shelter for livestock and wildlife.

### **Lands Removed From Production Through Farm Bill Programs**

There are 15,700 acres of CRP land removed from production within the HUC. Although the land removed from production may not be used for farm bill commodity crops (e.g. corn, beans), it may be used for other productive uses.

**Table 16. Conservation Systems Summary**

	Fiscal Year						Total
	2002	2003	2004 <sup>(a)</sup>	2005	2006	2007 <sup>(b)</sup>	
Total Conservation Systems Planned (acres)	214,296	148,387	93,014	123,842	71,729	2,113	653,381
Total Conservation Systems Applied (acres)	64,270	92,884	72,526	97,972	51,251	5,922	385,737

- (a) The report from 2004 was presented by county rather than by HUC. Therefore, the numbers were adjusted by the percentage of the county within the HUC.
- (b) The report from 2007 is for the first quarter only.



**Table 17. Applied Conservation Practices Summary (Page 1 of 2)**

Conservation Practices	Code	Fiscal Year						Total
		2002	2003	2004	2005	2006	2007 <sup>(a)</sup>	
Total Erosion Control (acres)	*(b)	16,582	3,680	0	0	0	0	20,262
Total Irrigation Management (acres)	*	492	613	0	0	0	0	1,105
Total Nutrient Management (acres)	*	1,649	1,138	0	0	0	0	2,787
Total Residue Management (acres)	*	0	984	0	0	0	0	984
Total Salinity/Alkalinity Control (acres)	*	54	0	0	0	0	0	54
Total Wetlands Created/Restored/Enhanced (acres)	*	8	2	0	0	0	0	10
Total Wildlife Habitat	*	3,730	259	0	0	0	0	3,989
Conservation Cover (acres)	327	0	0	0	665	924	0	1,589
Conservation Crop Rotation (acres)	328	0	0	96	78	0	0	174
Fence (ft)	382	0	0	41,827	50,008	95,198	7,307	194,340
Forage Harvest Management (acres)	511	0	0	96	96	152	0	344
Grazing Land Mechanical Treatment (acres)	548	0	0	0	0	102	0	102
Irrigation Land Leveling (acres)	464	0	0	0	0	5	0	5
Irrigation System, Sprinkler (number) <sup>(c)</sup>	442	0	0	0	3	4	0	7
Irrigation System, Surface and Subsurface (acres)	443	0	0	0	0	70	0	70
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic (ft)	430DD	0	0	7,778	5,901	4,089	0	17,768
Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic (ft)	430EE	0	0	0	5,849	128	0	5,977
Irrigation Water Management (acres)	449		0	0	0		0	0
Lined Waterway or Outlet (ft) <sup>(d)</sup>	468	0	0	1,600	1,800	0	0	3,400
Nutrient Management (acres)	590			96	0	1,125	0	1,221
Obstruction Removal (acres)	500	0	0	0	0	30	0	30
Pasture and Hay Planting (acres)	512	0	0	628	743	2,139	0	3,510
Pest Management (acres)	595		0	96	0	251	0	347
Pest Management (acres)	595A	13,229	9,904	0	0	0	0	23,133
Pipeline (ft)	516	0	0	256,144	608,704	300,874	35,943	1,201,665
Pond (number)	378	0	0	6	3	4	0	13

**Table 17. Applied Conservation Practices Summary (Page 2 of 2)**

Conservation Practices	Code	Fiscal Year						Total
		2002	2003	2004	2005	2006	2007 <sup>(a)</sup>	
Prescribed Grazing (acres)	528	0	0	4,408	0	1,353	1,659	7,420
Prescribed Grazing (acres)	528A	32,059	23,581	0	0	0	0	55,640
Pumping Plant (number)	533	0	0	5	6	13	3	27
Range Planting (acres)	550	0	0	10	13	0	0	23
Residue Management, Mulch Till (acres)	329B	0	0	96	0	0	0	96
Residue Management, Seasonal (acres)	344	0	0	0	78	0	0	78
Riparian Forest Buffer (acres)	391	0	0	0	0	26	0	26
Sediment Basin (number)	350	0	0	0	0	3	0	3
Spring Development (number)	574	0	0	4	2	1	0	7
Subsurface Drain (ft)	606	0	0	1,300	2,130	0	0	3,430
Tree/Shrub Establishment (acres)	612	0	10	0	0	0	0	10
Upland Wildlife Habitat Management (acres)	645	0	0	0	4	2757	0	2,761
Use Exclusion (acres)	472	0	0	0	0	396	0	396
Waste Storage Facility (number)	313	0	0	0	0	4	0	4
Waste Utilization (acres)	633	0	0	0	0	1,125	0	1,125
Water Well (number)	642	0	0	9	11	10	2	32
Watering Facility (number)	614	0	0	85	162	72	13	332
Windbreak/Shelterbelt Establishment (ft)	380	0	0	7,110	23,905	9,802	0	40,817

- (a) The report from 2007 is for the first quarter only.
- (b) \* denotes that these conservation practices were listed on the 2002 and 2003 reports only and no codes were listed.
- (c) Conservation Practice information received from NRCS Belle Fourche Field Office.
- (d) Conservation Practice information received from the Belle Fourche Irrigation District.



# Lower Belle Fourche – 10120202 South Dakota Portion of 8 Digit Hydrologic Unit Profile



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BELLE FOURCHE  
RIVER WATERSHED  
PARTNERSHIP

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