

# AFFECTED ENVIRONMENT

## INTRODUCTION

This chapter provides a discussion, by resource, of the environment affected by the individual proposals under the various alternatives in this RMP. This information is summarized from the Management Situation Analysis (MSA) on file at the BLM Miles City District and South Dakota Resource Area Office.

### Climate

Western South Dakota has a wide variety of climatic conditions characterized by some extreme weather variations. The Black Hills region receives around 18 to 22 inches of precipitation, while the semi-arid plains surrounding them receive around 13 to 17 inches during an average year. The majority of the precipitation, 70 to 80 percent, occurs during the growing season from April to September. In 2 years out of 10, the rainfall during the growing season could be less than 11 inches. The major source of rainfall is thunderstorms, which are occasionally accompanied by hail. The average seasonal snowfall ranges from 155 inches in the Black Hills to 21 inches in the plains.

Mean annual temperature is about 45°F. Temperatures are lowest in January, with an average low of about 0°F, and the highest in July, with an average high of about 86°F. The frost-free season ranges from 114 to 160 days. Relative humidity in the afternoon averages around 50 percent.

### Topography

The Resource Area is in the Missouri River Plateau of the Great Plains physiographic province. The west-central part is in the Black Hills division. The northern part of the Resource Area is in the Cretaceous Table Lands division, and the remaining area is part of the Pierre Hills division. Outside the Black Hills uplift area are the nearly flat layers of sedimentary rock cut by streams which form a dissected landscape of plateaus, rough breaks, flat bottomed valleys, and rolling plains. Harder sandstones form benches while the softer shales form gentle



slopes or badlands. The Black Hills consist of tree covered mountains that are gently sloping to steep along drainage ways.

The Grand, Moreau, Cheyenne, Bad and White Rivers flow east to the Missouri River. The Belle Fourche River flows into the Cheyenne River in Meade County. The Little Missouri drainage, in the northwestern part of the state, flows north reaching the Missouri River in North Dakota.

Elevations range from 1,200 feet to 7,242 feet above sea level. The highest elevation is Harney Peak in the Black Hills. The lowest elevations are along the Missouri River.

## SOILS

Soils in the Resource Area are derived from marine clay shale, sedimentary siltstone, sandstone, limestone and alluvium. Soils vary considerably over short distances in depth, profile development, and physical and chemical properties; these factors influence the soils manageability. These features reflect the differences in annual precipitation (13-17 inches per year), B. Deep, and underlying bedrock. Most of the soils are low in organic matter and fertility and high in clay and sodium content.

Soils of the area (Map 3-1) are mainly located in five Major Land Resource Areas (MLRAs 58, 60, 61, 62, and 63, Map 3-2). MLRAs differ by location, topographic extent, and various soil properties such as soil depth. Following is an overview of the MLRAs and major associated soils in the area.

*MLRA 58, Northern Rolling High Plains includes:*

A. Deep, moderately well-drained and well-drained, clayey, (Absher, Daglum, Loburn, Rhodes) sodium-affected soils on nearly level to strongly sloping terraces, fans and footslopes. They have slight to moderate erosion hazards. These soils are formed in sodium-affected alluvium from local sources.

B. Shallow and moderately deep, well-drained, loamy (Cabbart, Cabba, Lantry) soils and sandy (Blackhall, Twilight) soils on moderately sloping to steep footslopes, side slopes and ridges. They have moderate to severe erosion hazards. These soils are formed in soft sedimentary siltstones and sandstones.

Soils of this MLRA represent about 10 percent of the planning area.

*MLRA 60, The Pierre Shale Plains and Badlands includes:*

A. Deep, well-drained clayey (Hisle, Kyle, Lohmiller, Stetter) and sandy (Glenberg) soils on nearly level floodplains and low terraces. They have moderate to high erosion hazards. These soils are formed in alluvium from local clay shale and sandstone sources.

well-drained clayey (Absher, Arvada, Oburn, Swanboy, Twotop, Wasa, Winler) and loamy (Archin) soils on nearly level to gently sloping fans and stream terraces. They have low to moderate erosion hazards. These soils are formed in alluvium from local sources and are strongly affected by sodium.

C. Shallow and moderately deep, well-drained, clayey (Midway, Epsie, Lismas, Pierre, Samsil), and loamy (Cabbart, Redig, Scroggin) soils on moderately sloping to steep dissected shale uplands. These soils have moderate to severe erosion hazards. They are formed in soft sedimentary shale, siltstone and sandstone.

Soils of this MLRA represent about 80 percent of the planning area.

*MLRA 61, The Black Hills Footslopes Area includes:*

A. Deep, well-drained, clayey (Lohmiller, Stetter), loamy (St. Onge), sandy (Glenberg, Bankard) and gravelly (Winnetti) soils on nearly level floodplains and low terraces. They have slight erosion hazards. These soils are formed in alluvium from local sources.

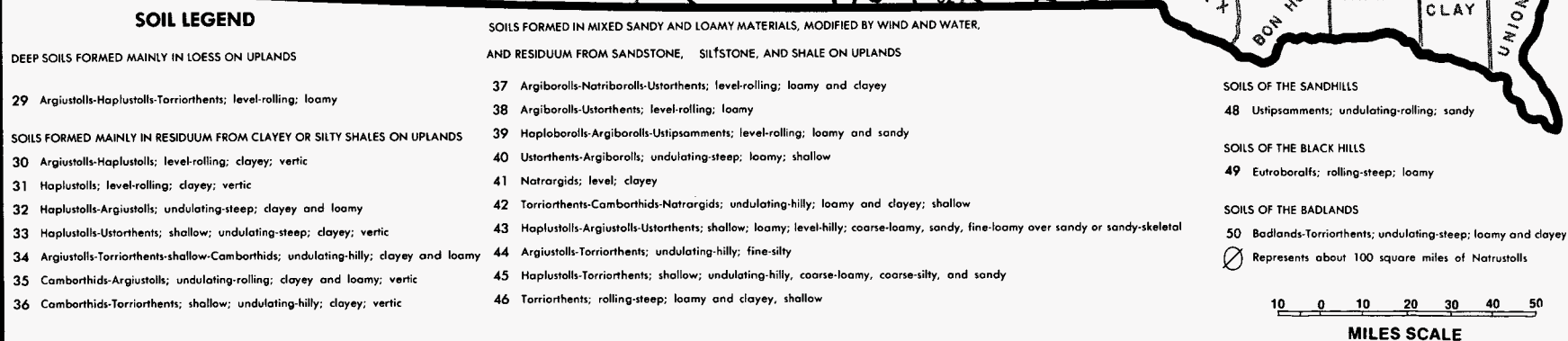
B. Deep and moderately deep, well-drained clayey (Kyle, Hisle) and loamy (Blackpipe, Manvel, Tilford) soils on gently to strongly sloping fans and footslopes. They have slight to severe erosion hazards. These soils are formed in alluvium from local sources. Hisle soils are strongly affected by sodium.

C. Shallow and moderately deep, well-drained clayey (Canyon, Grummit, Hisle, Lismas, Midway, Pierre, Rekop, Samsil), loamy (Nevee, Spearfish) and gravelly (Nihill, Paunsaugunt), soils on moderately sloping to steep dissected shale and limestone uplands. They have moderate to severe erosion hazards. These soils are formed in clayey shale and local alluvium.

Soils of this MLRA represent about three percent of the planning area.

*MLRA 62, The Black Hills*

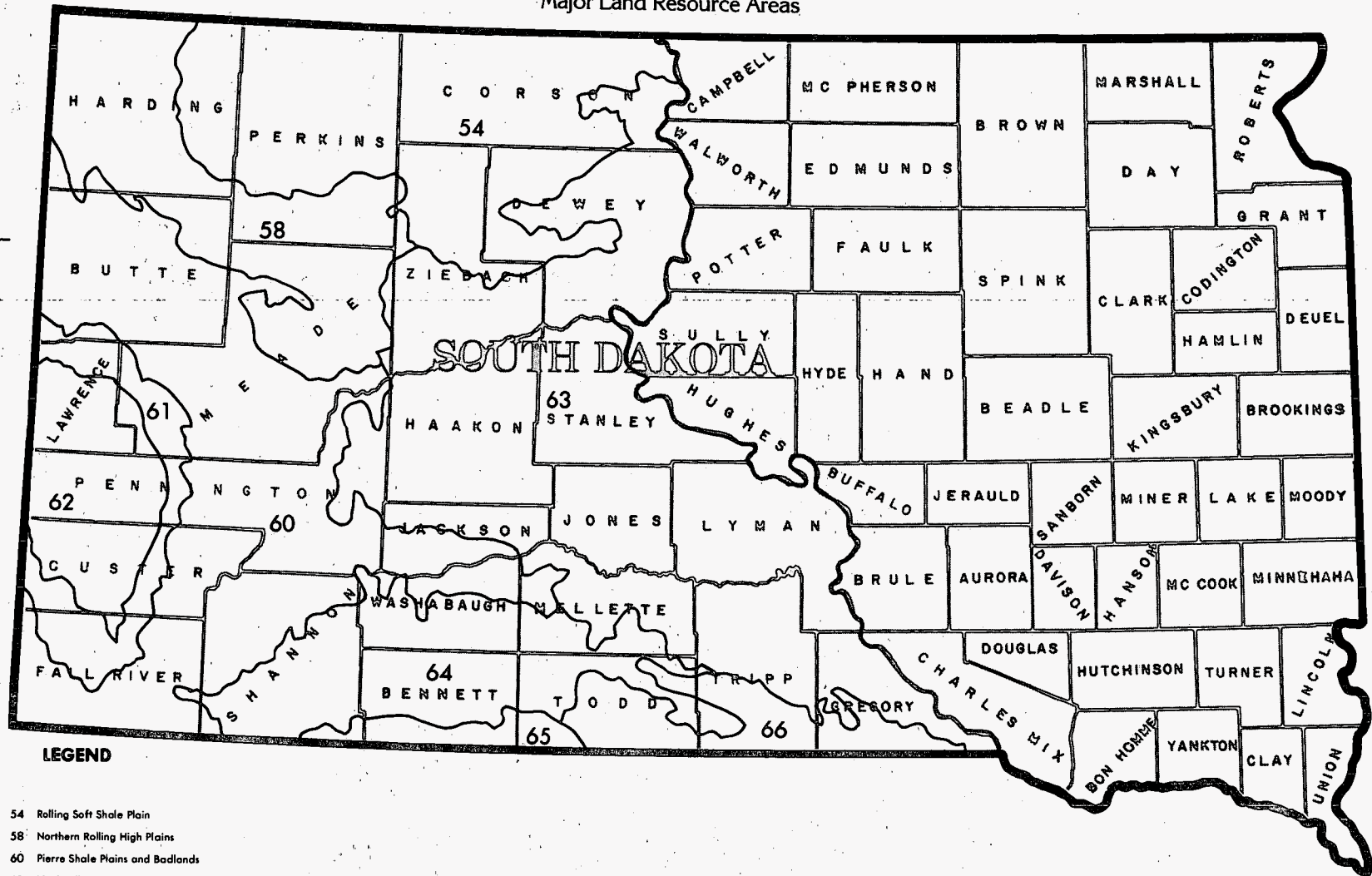
A. Deep, well-drained clayey (Kyle), loamy (Altvan) and gravelly (Winetti, Nihill) soils on





# Western South Dakota

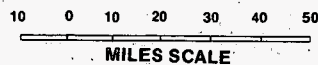
## Major Land Resource Areas



### LEGEND

- 54 Rolling Soft Shale Plain
- 58 Northern Rolling High Plains
- 60 Pierre Shale Plains and Badlands
- 61 Black Hills Footslopes
- 62 Black Hills
- 63 Rolling Pierre Shale Plains
- 64 Mixed Sandy and Silty Tableland
- 65 Nebraska Sand Hills
- 66 Dakota-Nebraska Eroded Tableland

A land resource area is a geographic area of land characterized by a particular combination or pattern of soils (including slope and erosions), climate, water resources, and land use.



Revised 9/85 (BLM)

nearly level floodplains and low terraces. They have moderate to high erosion hazards. These soils are formed in alluvium from local sources.

B. Deep, well-drained clayey (Savo, Kyle), and loamy (Blackpipe, Keith) soils on moderate to strongly sloping fans and footslopes in the uplands. They have moderate to severe erosion hazards. These soils are formed over siltstone, local clayey alluvium and loess.

C. Shallow, well-drained loamy (Butche, Canyon, Spearfish) soils on moderately sloping to steep side slopes in the uplands. They have severe erosion hazards. These soils are formed over sandstone and siltstone.

Soils of this MLRA represent about 1½ percent of the planning area.

*MLRA 63, Rolling Pierre Shale Plains Area includes:*

A. Deep, well-drained, loamy (Ree) soils on nearly level to gently sloping terraces. Ree has a slight erosion hazard. This soil is formed in regional alluvium.

B. Deep and moderately deep, well-drained, clayey (Hurley, Swanboy) soils on gently to moderately sloping footslopes, upland valleys and terraces. They have slight to moderate erosion hazards. These soils are formed in local clay shale.

C. Shallow and moderately deep, well-drained, clayey (Chantier, Lakoma, Okaton, Opal, and Sansarc) soils on moderately sloping to steep clay shale plains. They have severe erosion hazards. These soils are formed in local clay shale. Chantier soils are sodium-affected.

Soils of this MLRA represent about five percent of the planning area.

Soil mapping has been completed for most of the Resource Area at the Order II level (1:24,000 scale). Soil survey orders (level of detail) vary from Order I, for surface mine plans, to Order V for broad general planning. These county soil surveys are presented on a photo mosaic base and provide a solid foundation for environmental documents such as this RMP. Soil information and interpretations are summarized in Appendices H, I and J. Care and professional expertise must be exercised in using this data for a specific site and use.

**There are about 29,306 acres of fragile soils in M and I allotments in the Resource Area. They are scattered in nature and not in contiguous blocks. Fragile soils are found in land capability classes VI and VII that are in less than good range condition.**

## Erosion

Wind and water erosion is a problem which occurs naturally on many soils in the Great Plains area. The erosion problem increases when areas are further disturbed by cultivation, overuse, road and project construction. These disturbed areas are more susceptible to erosion because of the increased area of bare soil. Soils that already show symptoms of erosion are adversely impacted by any soil-disturbing activities, which do not result in an increase of vegetation. Rehabilitation of these soils is more difficult because of past losses of topsoil and nutrients.

The erosion hazard rating is a measure of the susceptibility of a soil to erosion when bare of vegetation. The soils on public land in the Resource Area have generally severe erosion hazard ratings from both wind and water due to the slope of the land, the kind and amount of ground cover, salt and/or sodium content, and low organic matter content in surface layers. Approximately 28,463 acres of the Resource Area is unsuitable for livestock grazing and no forage is apportioned for these lands due to slopes steeper than 50 percent, sandstone or shale outcrops. This information is presented in Table 3-1 (Class VIII in LCC table).

When plant cover is reduced by grazing or other factors, sheet, rill, gully, and wind erosion usually result. This causes a further loss of soil and vegetative productivity as well as offsite sedimentation damage.

Soil displacement from trampling by livestock and wildlife is a form of erosion similar to water erosion. Like water erosion, trampling displacement is more evident as slopes increase. This form of erosion occurs most readily when the soil is very wet or very dry.

Vegetative ground cover is needed to protect soils from accelerated erosion caused by overgrazing, construction, and other surface disturbance. Runoff and soil loss can be prevented by prudent management. (See Table 3-2 for specific soil cover target values.) The most effective means to control both wind and water erosion is by maintaining a suitable, diverse vegetative ground cover and by minimizing soil disturbance.

Grazing systems that incorporate deferment or rest are more effective in reducing erosion than annual season-long use. If livestock grazing were eliminated or substantially decreased, plants would initially respond with increased vigor, resulting in increased ground cover. This would reduce bare ground and erosion potential.

TABLE 3-1

## LAND CAPABILITY CLASSES FOR M AND I ALLOTMENTS

County	Potential Arable Cropland Acres	Grazing, Watershed and Wildlife Acres					Watershed, Wildlife and Scenic Acres	Total
	II	III	IV	VI	VII	VIII	Unknown <sup>1</sup>	
Butte	—	974	2,782	78,711	7,267	21,197	22	110,953
Fall River	—	102	173	1,110	538	224	13	2,160
Harding	25	361	493	8,046	631	1,776	103	11,435
Meade	—	1,595	2,605	12,667	7,028	3,649	66	27,610
Pennington	—	217	193	1,478	5,238	856	—	7,982
Stanley	35	—	—	1,099	5,592	760	59	7,545
Totals	60	3,250	6,245	103,112	26,293	28,463	263	167,686

<sup>1</sup> These acres include water and soil inclusions which were not given a land capability classification.

Source: SCS—BLM, 1984

TABLE 3-2

SOIL COVER TARGET BY RANGE SITES  
(Percent Ground Cover)

Range Sites*	Major Land Resource Area (MLRA)				
	58	60	61	62	63
Subirrigated	—	—	97	—	—
Overflow	—	—	97	97	—
Loamy Overflow	95 **	95	—	—	—
Clayey Overflow	95	95	—	—	—
Saline Lowland	85	85	—	—	—
Closed Depression	80	80	—	—	—
Loamy Terrace	95	95	—	—	—
Sands	90	90	—	—	—
Sandy	95	95	95	—	—
Silty	95	95	95	95	95
Clayey	95	95	95	95	95
Thin Upland	75	75	80	80	—
Shallow	83	83	83	83	—
Shallow Clay	83	83	—	—	87
Claypan	70	70	—	—	—
Dense Clay	80	80	—	—	80
Shallow to Gravel	70	70	—	—	—
Shallow Dense Clay	60	60	—	—	—
Thin Claypan	50	50	—	—	55
Very Shallow	50	50	—	—	—
Saline Upland	45	45	—	—	—
Porous Clay	—	—	75	—	—
Clay Savannah	—	—	50	—	—

\*Significant soil/range sites.

\*\*These numbers are percent ground cover.

—No data entry indicates that a range site is not mapped on public lands in the MLRA.

Source: SCS Range Site Technical Guides

Table 3-3 presents the average soil losses from all soils and types of management of rangeland by major land resource area. Table 3-4 shows acres within the MLRAs by condition class.

**TABLE 3-3**  
**AVERAGE RANGELAND EROSION RATES**

MLRA	T/A/yr
58	0.5
60	1.3
61	2.3
62	0.7
63	1.7

The allowable soil loss tolerance (T factor) used in the Universal Soil Loss Equation (USLE) is currently under review. This review may well reduce the T factor for rangeland soils.

T/A/yr — Tons/Acre/Year

MLRA — Major Land Resource Area

Source: U.S.D.A. S.C.S. 1982 Preliminary National Resource Inventory Information

## HYDROLOGY

### Surface Water (Quantity and Quality)

Public lands in the Resource Area are drained by tributaries of the Missouri River. The major tributaries include the Grand, Moreau, Belle Fourche, Cheyenne, Bad, and Little Missouri Rivers.

Runoff from the ephemeral and intermittent tributaries results from snowmelt or intense summer storms. **Many of the watersheds have soils derived from Pierre shale which has heavy clay surface textures. In addition, these watersheds have a high percentage of bare ground (Table 3-2). Runoff is rapid and conditions often change from zero flow to flood stage within short time periods.**

Surface runoff is sometimes used for flood irrigation through a system of detention dams and spreader dikes. Another use is for livestock watering from small retention structures. There are no commercial or municipal uses of surface water on public lands in the Resource Area.

Water quality is variable due to the highly erratic discharge. The water is of relatively poor quality for use most of the time. Total dissolved solids (TDS) range from 200 parts per million (ppm) at high flows to 4000 ppm at low flows. Sodium and sulfate concentrations in the heavy clay soils and irrigation return flows contribute most of the TDS. Major ions include calcium, magnesium, sodium and sulfate (WRD—South Dakota 1982).

### Groundwater

South Dakota is underlain by consolidated to semiconsolidated sedimentary rocks of Paleozoic, Mesozoic and early Tertiary age. These rocks are overlain in western South Dakota by semiconsolidated to unconsolidated sediments of middle and late Tertiary age. Groundwater reservoirs in these rocks constitute a large and

**TABLE 3-4**  
**RANGELAND CONDITION (ACRES)**

MLRA	Excellent	Good	Fair	Other <sup>1</sup>	Total
58	3,844	8,211	1,716	3,675	17,446
60	4,456	76,170	29,477	23,151	133,254
61	—	4,235	547	352	5,134
62	—	2,503	—	47	2,550
63	—	8,022	—	1,238	9,260
<b>TOTAL</b>	<b>8,300</b>	<b>99,141</b>	<b>31,740</b>	<b>28,463</b>	<b>167,644</b>

<sup>1</sup> This includes acres which were not conditionable, e.g., water, barren areas and rock outcrops.

MLRA — Major Land Resource Area

Source: SCS—BLM, 1984



reliable source of water for municipal and industrial use but is generally too deep for stock or domestic use. Most of western South Dakota is underlain by one or more aquifers that yield small to very large supplies of water of varying quality.

Shallow groundwater is absent or scarce in most of the area. Recharge to the shallow aquifers where they do occur is largely through infiltration of precipitation that falls upon the immediate area. The mechanics of recharge to the deeper aquifers are not fully understood, however, some recharge undoubtedly occurs in the Black Hills where streams cross exposed surfaces of the aquifers.

Shallow groundwater can be obtained from the Fox Hills-Hell Creek and Tertiary rocks of the Fort Union formation. The only public lands overlying these aquifers are in Harding and Perkins counties. Small to moderate yields can be expected from the Fox Hills-Hell Creek at depths up to 250 feet. Water quality ranges from highly mineralized to good and is used for stock, domestic and municipal supplies. The Fort Union supplies moderate amounts to farms and ranches from depths to 420 feet. The water is saline, has a high sodium sulfate content and is barely potable.

Shallow water can also be obtained from alluvial deposits located in the larger stream valleys throughout the area. Yields and water quality are highly variable and range from five to over 100 gallons per minute (GPM); however, most wells are in the 10-20 GPM range. The quality ranges from good to highly mineralized, with most wells suitable only for stock use. High concentrations of sodium and sulfate are the principal deterrents for domestic use.

Water from deeper aquifers underlies most of the public land in South Dakota. However, the costs of drilling, pumping and supplying power **generally prohibits the use of deep aquifers for domestic and stockwater purposes. Groundwater will not be affected by any of the alternatives listed in Chapter 2 and will not be discussed further in this plan.**

## Sedimentation

Reasons for high suspended sediment concentrations and discharges are due to locally steep topography, shallow soils, and less resistant types of bedrocks. Concentrations range from 500 ppm in parts of the Black Hills to 30,000 ppm in the Bad River Basin.



*Four-Winged Saltbrush*

Most of the annual sediment discharge occurs during a few days of the year. Ninety percent or more may be discharged during short periods of rapid runoff resulting from summer thunderstorms or rapid snowmelt, although sediment concentrations during snowmelt runoff will generally be less than in an equal volume of runoff generated by thunderstorms. In general, sediment concentration and discharge will increase as streamflow increases.

Nearly all the suspended-sediment load of streams in western South Dakota is silt and clay; very little sand is transported in suspension.

The construction of dams, reservoirs, pits and spreader systems results in marked changes in sediment concentration and discharge. Nearly all the sediment that enters a reservoir on a major stream is trapped. Water released from these reservoirs contains very little sediment.

Sediment concentrations and yields vary greatly within any given watershed. Sediment data collected from a major stream can lead to erroneous conceptions about uniform erosion sediment concentrations and yields throughout a basin. The data for such streams should be considered as a composite of data from innumerable small basins. A large percentage of the sediment load may be coming from a small part of the basin. The data is useful when determining the amount of space that should be allocated for sediment storage in reservoirs, but is not particularly useful for determining the source of sediment within a basin.

**BLM is committed to prevent degradation of water quality and implement Best Management Practices (BMP) to the extent**



practical under the National Nonpoint Source Policy. Sediment is by far the largest single nonpoint source pollutant derived from public lands in South Dakota. The BLM's approach to BMP for sediment reduction will meet multiple-use objectives while still providing an acceptable level of water quality protection.

## Water Rights

The BLM, to date, has 327 water developments on public lands in South Dakota including 314 reservoirs, five wells, five developed springs and three waterspreaders. BLM has in the past complied with the State of South Dakota water rights laws regarding water developments and will continue to do so in the future.

## RANGE

### Vegetation

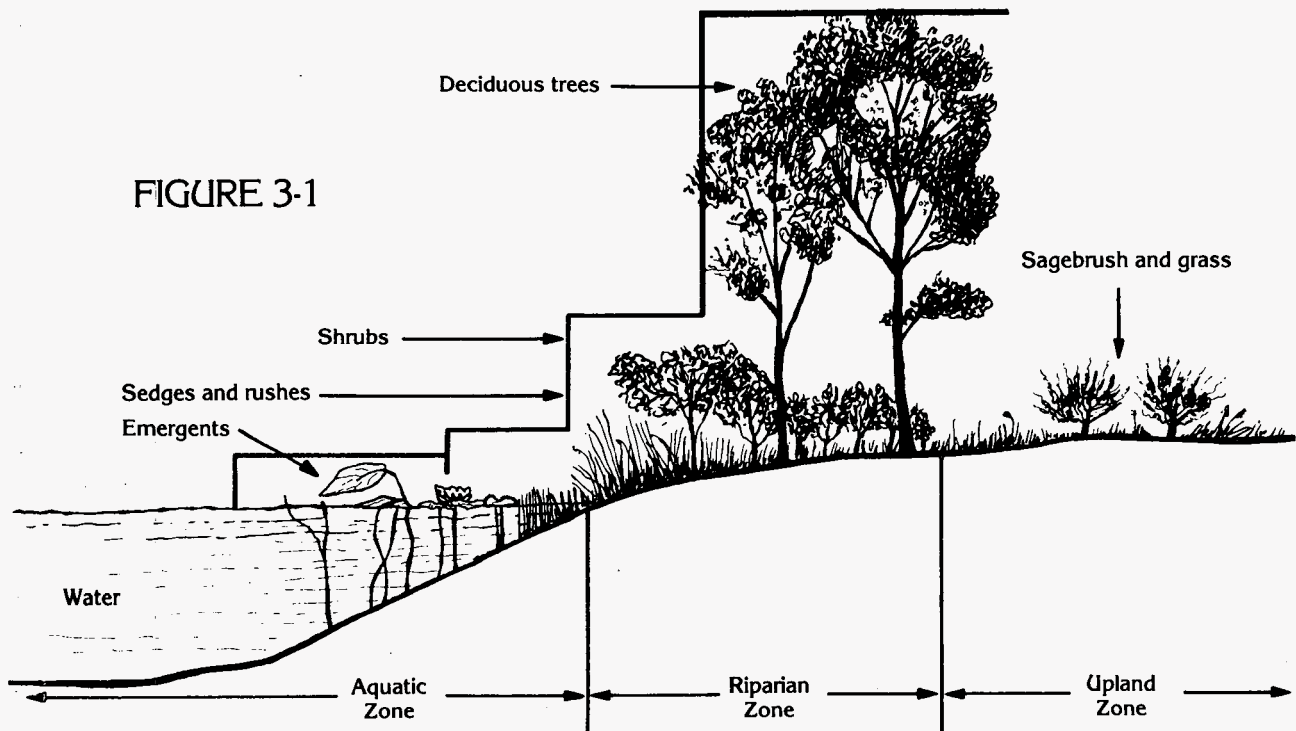
The vegetation community on public lands within the Resource Area is comprised of the following major types: wheatgrass-needlegrass, wheatgrass, wheatgrass-grama grass,

wheatgrass-grama grass-buffalo grass (badlands), sagebrush-grass, pine-savannah, Black Hills pine forest, and Sand Hills prairie. (See Map 3-3.) From these types, an apportionment of forage to livestock, wildlife and watershed is made to benefit vegetation management. The dominant grass on most of the public lands is wheatgrass. Areas within the Resource Area which have more than 10 percent canopy cover of trees are classed as grazable woodlands.

Riparian zones, totaling 1,560 acres, are defined as a specialized form of wetland producing specific vegetation types. (See Figure 3-1.) Riparian zones may include wet or subirrigated areas with vegetation common to wetland, sub-irrigated, saline lowland on closed depression range sites. The relative vegetation composition (by weight) of grasses, forbs, and trees and shrubs on each range site is shown in Table 3-5.

Riparian zones are used disproportionately more than any other vegetation type for livestock grazing, watering, shade, travel, and wildlife habitat.

Riparian woody vegetation may include silver sagebrush, snowberry, rose, willow, lead plant, skunkbrush, buffaloberry, box elder, elm, chokecherry, cottonwood, etc. Floodplains and



Riparian zones are identified by the presence of vegetation that requires large amounts of free or unbound water.

From: Thomas, J.W.; Maser, C.; and Rodier, J.E. 1979. Riparian zones in managed rangelands — their importance to wildlife. *In* Forum — Grazing and Riparian/Stream Ecosystems. Ed. Oliver B. Cope, Trout Unlimited.

## Natural Vegetation



- |   |                                 |    |   |
|---|---------------------------------|----|---|
| 1 | BLUESTEM PRAIRIE                | 6  | WHEATGRASS—GRAMAGRASS—BUFFALOGRASS (BADLANDS) |
| 2 | WHEATGRASS—BLUESTEM NEEDLEGRASS | 7  | SAGEBRUSH—GRASS                               |
| 3 | WHEATGRASS—NEEDLEGRASS          | 8  | PINE—SAVANNAH                                 |
| 4 | WHEATGRASS                      | 9  | BLACK HILLS PINE FOREST                       |
| 5 | WHEATGRASS—GRAMAGRASS           | 10 | SAND HILLS PRAIRIE                            |

A horizontal scale bar labeled "MILES SCALE" with markings at 10, 0, 10, 20, 30, 40, and 50.

**TABLE 3-5**  
**RIPARIAN RANGE SITE VEGETATION COMPOSITION**  
**(Percentage by Weight)**

Range Site	Grasses	Forbs	Trees and Shrubs
Wetland	85-95	5-10	0-5
Subirrigated	90-100	0-10	0-5
Saline Lowland	65-95	5-10	5-25
Closed Depression	90-100	0-10	—

From: USDA-SCS South Dakota Technical Guides for MLRAs 54, 58D, 60A, 61, 62 and 63.

overflow range sites are often adjacent to riparian zones and have vegetation typical of upland sites which receive additional moisture from overland flow.

### Range Condition, Production and Trend

Ecological range condition expressed as excellent, good, fair, poor or unclassified, reflects the current vegetation composition of the rangeland in relation to the potential climax plant community. The ecological range condition of the public lands is 9% excellent, 60% good, 17% fair and the remaining 14% are either not grazable or the condition is unknown **using the ecological site concept**. (See Table 3-6.) Those areas in less than good condition are generally the result of several factors such as livestock concentration areas, noxious weeds or prairie dogs. Such areas are not generally the result of an overapportionment of vegetation, but of localized overuse.

The opportunity for improving range condition and production by grazing management is greatest on clayey and/or loamy sedimentary uplands, alluvial terraces and floodplains. Grazing systems that are designed to provide for the needs of the vegetation would generally improve range condition in a relatively short time.

Range sites vary widely in production because of differences in soils. Silty and clayey are the dominant range sites and are among the more productive and responsive sites.

Vegetation production on rangelands varies widely with fluctuations in precipitation. Timing of precipitation is critical. Production is lower than normal when precipitation is low, runs off or occurs during plant dormancy periods. Critical rainfall periods are in the fall



*Blue Grama*



**TABLE 3-6**  
**ACRES OF PUBLIC LAND BY RANGE CONDITION CLASS,**  
**MANAGEMENT CATEGORY AND COUNTY<sup>4</sup>**

County <sup>3</sup>	Mgmt Cat	Condition					Total
		Excellent	Good	Fair	Unknown <sup>1</sup>	None <sup>2</sup>	
Brule	C		505			15	520
Butte	C	2,359	19,623	8,999	1,060	2,272	34,314
	I			7,712		1,442	9,154
	M	1,486	67,528	13,030		19,755	101,799
Custer	C		2,509	466	150	454	3,579
Fall River	C	40	2,609	2,348			4,997
	I		947	547		147	1,641
	M		442			78	520
Haakon	C		600		569		1,169
Harding	C	10,924	6,886		931	29	18,770
	M	4,562	2,959	2,138		1,776	11,435
Jackson	C	160	240				400
Lawrence	C				2,425*		2,425
Meade	C	1,082	8,968	1,697	2,696		14,443
	I		5,552	7,143		3,081	15,775
	M	1,385	9,839			568	11,792
Pennington	C	240	6,443	530	1,016	161	8,390
	I	655	1,082	495		294	2,526
	M	212	4,006	675		562	5,455
Perkins	C		7,484	131		347	7,962
Stanley	C		8,462			58	8,520
	M		6,785			760	7,545
<b>TOTAL</b>		<b>23,105</b>	<b>163,469</b>	<b>45,911</b>	<b>8,847</b>	<b>31,799</b>	<b>273,131</b>

<sup>1</sup>Condition class is unknown on these areas.

<sup>2</sup>These acres are Land Capability Class VIII lands, and not rangeland, therefore not condition classed.

<sup>3</sup>Lyman County is not included in this table because the 80 acres of public land is unleased.

<sup>4</sup>The methodology for determining range condition was described in the National Range Handbook. The range condition criteria used were those published in the cited SCS Technical Guides.

\*These are woodland acres and range condition ratings do not apply.

Source: SCS—BLM, 1984

before freeze-up and in the spring during early plant growth of the dominant cool season grasses.

Range trend is defined as the direction of change in range condition observed over time. Generally, the trend on public lands is in a stable or slightly upward direction: 73% stable, 10% improving, 2% downward and 15% either unknown or without range trend. Trend specifics are shown in Table 3-7.

Methods of determining trend include photograph trend plots, point transects, comparison of recurrent surveys and professional judgment.

Canada thistle is a perennial weed which has created a serious problem by infesting western South Dakota ranges, including public lands. It is generally found in small isolated patches, spreads rapidly and is difficult to eradicate. The acres of occurrence are unknown on the public

lands. Other noxious weeds in significant amounts are: hoary cress, leafy spurge, perennial sow thistle and Russian knapweed.

Vegetation production, plant vigor and ground cover are greatly reduced on prairie dog towns. Range condition on prairie dog towns is usually poor because of the continual clipping of vegetation and the conversion of the plant community to invader and low successional plants.

No endangered plant species are known to occur in South Dakota. Two threatened species (both orchids) have been found on moist meadows in eastern South Dakota. Forty-six rare plant species occur in the area (Van Bruggen 1980).

## Livestock

There are 444 grazing allotments in the Resource Area. (See Appendix B.) Eighty-two

**TABLE 3-7**  
**ACRES OF PUBLIC LAND BY MANAGEMENT STATUS, TREND, COUNTY**

County <sup>3</sup>	Mgmt Cat	TREND					Total
		Increasing	Stable	Declining	Unknown <sup>1</sup>	None <sup>2</sup>	
Brule	C				505	15	520
Butte	C	1,430	28,631	921	1,060	2,272	34,314
	I	1,442	7,712				9,154
	M	8,302	73,405			20,092	101,799
Custer	C	1,909	1,066		150	454	3,579
Fall River	C	79	3,000	1,918			4,997
	I		1,494			147	1,641
	M		442			78	520
Haakon	C	160	360		649		1,169
Harding	C	3,249	14,295	266	931	29	18,770
	M		9,659			1,776	11,435
Jackson	C		400				400
Lawrence	C				2,425		2,425
Meade	C	1,624	9,507	616	2,696		14,443
	I	5,541	7,153			3,081	15,775
	M		11,224			568	11,792
Pennington	C	798	6,415		1,016	161	8,390
	I	517	1,715			294	2,526
	M		4,893			562	5,455
Perkins	C	108	5,897	1,610		347	7,962
Stanley	C		8,462			58	8,520
	M	2,190	4,595			760	7,545
TOTAL		25,970	200,324	5,331	9,432	32,136	273,131

<sup>1</sup>Trend is unknown on these areas.

<sup>2</sup>These lands are Land Capability Class VIII lands, and not rangeland, therefore not classified for trend.

<sup>3</sup>Lyman County is not included in this table because the 80 acres of public land is unleased.

Source: SCS-BLM, 1984

percent of the allotments run cattle, 16% sheep and the remaining 2% run more than one class of stock. These allotments, which include all of the M, I and C category allotments, are authorized to graze a total of 73,778 AUMs. The M and I allotments are authorized to graze a total of 45,305 AUMs.

The 444 allotments are separated into three categories: Maintain (M), Improve (I), and Custodial (C). There are 55 M, 13 I, and 376 C allotments. (See Table 3-8.)

BLM administers four AMPs. Rest rotation grazing is applied to about 28,000 acres, while about 5,700 acres are under deferred rotation.

Grazing may begin as early as March and extend through December on some allotments. For most operations, the total grazing period on public and private lands is April-November, a total of 7 to 8 months. Livestock are generally fed hay and supplements on winter pastures. The overall average dependency upon public lands is less than 20 percent, although many operations depend heavily on the public lands, especially during spring and summer.

**TABLE 3-8**  
**ALLOTMENTS BY CATEGORY AND COUNTY**

	C	I	M	Total
Brule	1	0	0	1
Butte	73	5	33	111
Custer	13	0	0	13
Fall River	36	2	1	39
Haakon	14	0	0	14
Harding	89	0	7	96
Jackson	4	0	0	4
Lawrence	11	0	0	11
Meade	61	6	8	75
Pennington	30	3	5	38
Perkins	34	0	0	34
Stanley	26	0	6	32
Area Total	376	13	55	444

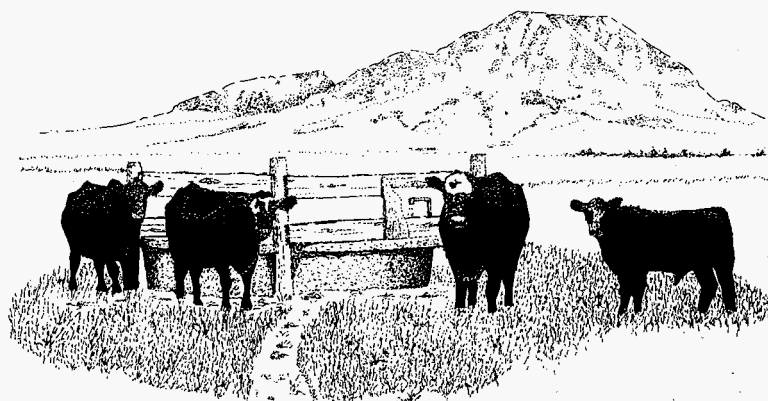
\*This table shows the number of allotments in each category and county. Some allotments lie in more than one county, therefore, column totals will not equal the number of allotments in each category.

Source: BLM, 1984

The availability and quality of water are limiting factors on some allotments and may cause disruptions to grazing during unusually dry years.

There are 692 range improvements of record on the public lands which have been developed for watershed and livestock management. An average of 10 range improvements have been replaced or maintained in each of the past 5 years (an average of two fence projects and eight water developments per year). Tables 3-9a and 3-9b show the type and size of projects, respectively.

Range surveys and adjudications in the late 1950s and early 1960s established current livestock and wildlife apportionments.



**TABLE 3-9a**  
**NUMBER OF EXISTING PROJECTS BY COUNTY, TYPE AND PURPOSE**

Purpose and Type	County												
	015	019	033	047	055	063	071	081	093	103	105	117	Total
Stock Management													
3-wire fences		18		2		18		4	14	8	5	9	78
4-wire fences		74	2	3		21		1	9	3	2		115
Woven wire fences		108				20			4		1		133
Total Fence Projects		200	2	5		59		5	27	11	8	9	326
Enclosure/Exclosure		8							1				9
Corrals		2							1				3
Cattleguards		1							3				4
Passes						1			3				4
Road								1					1
Springs									5				5
Wells						1			4				5
Reservoirs		239		2		26			32	3		12	314
Pipelines						1			4				5
Catchments									1				1
Watershed													
Brush Clearing*		4							1				5
Contour Furrowing		4											4
Retention Dams						1							1
Dikes/Diversions		2				1							3
Drop Structures		1							1				2
(Totals)	0	461	2	7	0	90	0	6	83	14	8	21	692

\*These projects are generally associated with the contour furrowing as a pretreatment

Legend:

County No.	County Name	County No.	County Name
015	Brule	071	Jackson
019	Butte	081	Lawrence
033	Custer	093	Meade
047	Fall River	103	Pennington
055	Haakon	105	Perkins
063	Harding	117	Stanley

Source: BLM, 1984a



**TABLE 3-9b**  
**SIZE (LENGTH OR ACRES) OF PROJECTS BY COUNTY, TYPE AND PURPOSE**

Purpose and Type	County												Total
	015	019	033	047	055	063	071	081	093	103	105	117	
Stock Management													
3-wire fence		21		2		10		13	9	7	3	10	75
4-wire fence		75	4	4		13		1	21	1	1		120
Woven Wire		140				14			11		1		166
TOTAL MILES		236	4	6		37		14	41	8	5	10	361
Watershed													
Brush Removal*		656							10				666
Contour Furrowing		773											773
TOTAL ACRES		1429							10				1439
Dikes/Diversions		1459				1650							3109
TOTAL FEET		1459				1650							3109

\*These projects are generally associated with contour furrowing as a pretreatment. Water developments are shown on Table 3-9a.

**LEGEND:**

County No.	County Name	County No.	County Name
015	Brule	071	Jackson
019	Butte	081	Lawrence
033	Custer	093	Meade
047	Fall River	103	Pennington
055	Haakon	105	Perkins
063	Harding	117	Stanley

Source: BLM, 1984a

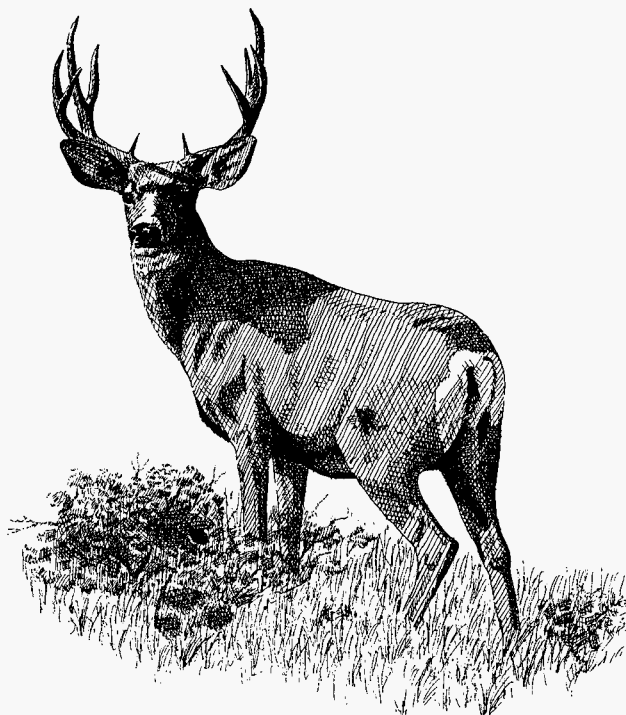
## WILDLIFE

Public lands are a major source of wildlife habitat in portions of western South Dakota. Public land, which is often in a natural or seminatural state, provides the diversity of habitat needed by wildlife for food and cover. It is the policy of the BLM (FLPMA 1976) to consider wildlife habitat in its multiple use management. Habitat management, not species or population management, is a primary responsibility.

Four major habitat types which support a wide variety of wildlife species occur on public land. These habitat types include: grasslands, grassland/shrubland, coniferous forest and riparian.

Grasslands are the most widespread habitat type within the Resource Area. Common plants found on grasslands include: western wheatgrass, green needlegrass, little bluestem, Kentucky bluegrass, junegrass, blue grama, sedges, yellow sweetclover and numerous other forbs.

The grassland/shrubland habitat type consists of areas where shrub species occur along with grasses. In addition to the plants listed above, one or more of the following shrubs would be



present: big sagebrush, silver sagebrush, greasewood or four-winged saltbush.

The coniferous forest habitat type consists of areas where ponderosa pine or western juniper comprise a large portion of the canopy cover. Most of the ponderosa pine areas occur within the foothills of the Black Hills, while western juniper is found in the Belle Fourche and Cheyenne River breaks.

The riparian habitat type is characterized by one or more species of hardwood trees. Commonly found trees include cottonwood, American elm, green ash, willows and bur oak. In most instances, riparian habitat types will be found in conjunction with stream or river bottoms.

There is an extremely scattered land pattern of federal ownership throughout the Resource Area. This scattered land pattern makes it all but impossible to determine wildlife numbers on federal land. Little data is available from the South Dakota Department of Game, Fish and Parks for the Resource Area. Most information comes from the county conservation officers. This information is mostly in the form of educated guesses and very little information is documented. Few critical areas for wildlife have been identified on the public land. This is not to say that critical areas do not occur on the public land, but that little emphasis has been directed to locating these areas.

## Threatened and Endangered Species

The black-footed ferret, bald eagle, peregrine falcon, whooping crane and Eskimo curlew are on the Federal Endangered Species list. Prairie dog towns on the public land may provide suitable habitat for the ferret. Bald eagles migrate through the area and winter along the Belle Fourche River, Cheyenne River, Missouri River, Bad River, Redwater River, and Bear Butte Creek. Potential nest sites do occur on public land for the peregrine falcon. Whooping cranes migrate through the state and occasionally are seen on stock dams. Potential habitat for the Eskimo curlew exists throughout the prairie. Osprey and buff-breasted sandpipers may be found near any large body of water. The interior least tern may be found along any of the rivers. Like the ferret, the northern swift fox is closely associated with prairie dog towns. River otters may be associated with any of the perennial rivers and streams.

There is no known resident mountain lion population in the Resource Area. However, they may be observed in the area.

Potential habitat may occur in the rivers and creeks for the following species of fish: pallid sturgeon, sturgeon chub, sicklefin chub, northern redbelly dace, finescale dace, longnose sucker and plains topminnow. The finescale dace and longnose sucker could be found in the Black Hills while the others would probably be restricted to the larger rivers.

The South Dakota Department of Game, Fish and Parks identified species as threatened or endangered, which includes the species on the Federal Threatened and Endangered Species list. These species are as follows:

ENDANGERED	THREATENED
Black-footed ferret	Northern swift fox
Bald eagle	River otter
Peregrine falcon	Mountain lion
Whooping crane	Black bear
Eskimo curlew	Osprey
Central mud minnow	Buff-breasted sandpiper
Pearl dace	Blandings turtle
Banded killifish	False map turtle
Interior least tern	Spiny softshell turtle
	Eastern hognose snake
	Brown snake
	The lined snake
	Northern red-bellied snake
	Pallid sturgeon
	Sturgeon chub
	Sicklefin chub
	Northern redbelly dace
	Fine scale dace
	Longnose sucker
	Trout-perch
	Plains topminnow

## Big Game

Antelope are found throughout the Resource Area. They are normally associated with grasslands or grassland/shrublands habitat types. Forbs are very important in their diet in the early spring. Sagebrush is used year-round and its availability may be critical during severe winters. Antelope are considered to be generally nonmigratory in South Dakota, however; some seasonal movement may occur.

Mule deer can be found in all habitat types in the Resource Area. They tend to prefer the grassland/shrubland, coniferous forest, and riparian

habitat types. Mule deer seem to seek out the rougher, more broken land. Browse is an important part of their yearly diet. Some seasonal movement does occur in parts of the Resource Area.

Whitetail deer are associated with riparian and coniferous forest habitat types. They are normally found in ponderosa pine forests and are rarely found among the western junipers. River bottoms are particularly important within the Resource Area. Migration is limited throughout most of the state. Some seasonal movement does occur in the Black Hills area.

## Game Birds

Probably no species in South Dakota is more dependent upon the public land than the sage grouse. Sage grouse are limited to Harding, Butte and Fall River counties. In Butte County there are eight known active leks, six of which are located on or within one-half mile of public land. Sage grouse are considered generally nonmigratory. A two-mile radius around leks is considered critical on a year-round basis. This distance could be greater in some instances. Sagebrush is critical habitat year-round, especially in the spring as nesting cover and in the winter for food and cover.

Sharptail grouse are widely distributed throughout the Resource Area and are generally found on the grasslands where brushy draws are present. Only three leks have been identified in the Resource Area. Several more may exist but have never been documented.

Turkeys are associated with coniferous forest and riparian habitats. Hunttable populations occur along the Cheyenne, Belle Fourche, Moreau, Little Missouri, and Missouri River bottoms, as well as throughout the Black Hills area.

Waterfowl are found statewide. Production is keyed to suitable habitat around stock dams, lakes and rivers. Ducks are found on most stock dams, while geese are found on the larger reservoirs or along the rivers. One pair of swans is known to nest near a reservoir located on public land within the Resource Area.

No other game birds exist in significant numbers in the Resource Area on BLM administered lands to warrant discussion.

## Other Wildlife

Numerous nongame mammals, birds, and reptiles occur within the Resource Area. Mammals

of importance include the furbearers (fox, coyotes, bobcat, beavers, skunk, mink, and badger), the black-tailed prairie dog and others. Also, raptors are of importance with special emphasis on golden eagles and burrowing owls.

## Fisheries

Fisheries within the Resource Area are varied, but primarily confined to the Belle Fourche and Cheyenne rivers, Bear Butte Creek and stock dams.

Fish found in these waters include rainbow and brook trout, bluegill, walleye, sauger, yellow perch, largemouth bass, smallmouth bass, catfish, and numerous nongame species.

## LANDS

There is a total of 280,672 acres of public surface estate and 5,294,122 acres of subsurface mineral estate under BLM administration. Included in the federal subsurface ownership are the Black Hills National Forest, the Buffalo Gap National Grasslands, the Custer National Forest, the Fort Pierre National Grasslands, and the Grand River National Grasslands. The majority of the surface estate, **278,662** acres, are within the study area of the following 13 counties—Brule, Butte, Custer, Fall River, Haakon, Harding, Jackson, Lawrence, Lyman, Meade, Pennington, Perkins, and Stanley. Many of the **278,662** surface acres within the study area are scattered and/or isolated tracts. This land ownership pattern is a result of those remaining less desirable areas being left over from the homesteading days in the late 1800's and early 1900's.

Table 3-10 shows BLM administered surface and BLM as a percent of the county. BLM surface accounts for less than two percent of all counties except Butte, in which about 10 percent of the surface is BLM-administered.

The fragmented ownership pattern of public land presents numerous management problems and often restricts use by the public. Adjustment of the land ownership pattern, preferably by exchange, could increase the management efficiency of federal resources in certain situations and provide legal access to isolated tracts for use by the public for recreation or other purposes.

During the past year, 250 acres have been offered for competitive sale and 1,000 acres of scattered parcels have been considered for exchange.



**TABLE 3-10**  
**COUNTY ACRES IN STUDY AREA<sup>1</sup>**

County	BLM Administered Surface Acres	BLM As A Percent Of County
Brule	521	0.10%
Butte	145,851	9.94%
Custer	3,648	0.37%
Fall River	7,334	0.66%
Haakon	1,400	0.12%
Harding	29,880	1.74%
Jackson	240	0.04%
Lawrence	5,423	1.05%
Lyman	80	0.01% <sup>2</sup>
Meade	41,864	1.89%
Pennington	17,462	0.97%
Perkins	8,135	0.44%
Stanley	16,824	1.73%
<b>GRAND TOTAL</b>	<b>278,662<sup>3</sup></b>	

<sup>1</sup>Approximately 2,000 acres are outside the study area in Bon Home, Charles Mix, Clay, Hughes, Jones, Sully, Union and Yankton Counties.

<sup>2</sup>The percentage figure for Lyman County does not include the Lower Brule Indian Reservation acreage in the calculations.

<sup>3</sup>Approximately 6,400 acres of the total are unleased public lands, agricultural leases and Recreation and Public Purposes (R&PP) leases.

Source: BLM, 1984

Present R&PP leases in the area include the muzzleloader range, and the Veterans of Foreign Wars picnic area and rifle range. Conveyances under the R&PP would be made to qualified applicants (state, county, local governments and nonprofit organizations) on a case-by-case basis. These conveyances usually result in a more beneficial public use such as wildlife reserves, land for schools and colleges, parks, recreation sites, cemeteries, museums, and fairgrounds.

A State of South Dakota-BLM exchange and a Forest Service-BLM exchange are in the proposal stage.

Other sales, exchanges and acquisitions are being considered as a result of management direction and public demand on a case-by-case basis. Public lands within the Resource Area classified for disposal meet all the requirements of Section 203(a) and 206(a) of FLPMA.

The Resource Area processes about 10 rights-of-way cases per year. Most rights-of-way applications are for new construction of rural electric and telephone lines or amendments to existing rights-of-way. Other rights-of-way requests are for roads, transmission lines, and other facilities

authorized by the Mineral Leasing Act. Rights-of-way corridors across public lands have not been a major concern.

## CULTURAL RESOURCES

Few cultural properties have yet been recorded on BLM administered land in South Dakota. A 4,000-year-old prehistoric camp in Meade County, partially on public land, has been recorded. The significance of 23 other known sites on public land is undetermined.

Cultural sites document human occupation in the area from about 10,000 years ago to present. The Early or Paleoindian period dates from about 10,000 to 6,000 years B.C. The Middle or Archaic period is thought to date from 6,000 B.C. to A.D. 400. The Late Prehistoric period began about A.D. 400 with the adoption of the bow and arrow, and continued until the acquisition of the horse and European trade goods, about A.D. 1750.

Prehistoric sites are represented by rock art, bison kills, human burials, tipi rings, and other prehistoric campsites. Forest Service inventories also include rockshelters and rock art panels. The historic period, for which written records exist, is represented by forts, posts, and battlefields from the time of white/Indian conflict, and ghost towns, as well as evidence of



historic mining activities and military occupation at Fort Meade. Numerous sites also exist from the settlement period when large cattle operations flourished, railroads were built, and much of the state was homesteaded. The significance of such properties is determined by the amount and integrity of the information preserved in them, and by the importance of the historic or prehistoric events which occurred there.

One site with BLM involvement, Fort Meade, is presently listed on the National Register of Historic Places. The Gant Site, 39 ME9, is located within Fort Meade and is considered eligible for the Register.

## FORESTRY

There are 9,914 acres of woodland scattered throughout the Resource Area. (See Table 3-11.) Three main types exist: ponderosa pine, juniper and mixed hardwoods. This resource serves primarily as watershed protection and wildlife cover. Harvest rates average one sawlog sale per decade and 700 board feet of incidental juniper post sales annually.

## PALEONTOLOGIC RESOURCES

Legal protection of paleontologic material extends only to those fossils deemed significant (Antiquities Act of 1906, 16 USC 432, 433). Presently, vertebrate fossils are usually the only significant, therefore regulated, fossils. Removal

of significant fossils from public land is authorized by issuing permits to qualified institutions.

The Morrison formation, Lakota sandstone, and Hell Creek formation are noted for the dinosaur fossils they contain. The White River group is an important source of middle Tertiary mammals. A portion of the Pierre shale is known for the *Placenticerus* ammonites and marine reptiles found within. Plant fossils are commonly found in the Lakota sandstone, Fuson shale, and the Fort Union formation (Bjork, personal communication 1983.)

Localities and specimens are recorded as they are found by professional paleontologists or BLM personnel using a locality form and cataloging system. Collection by BLM personnel is limited to those instances where loss of the material is imminent, such as from earthwork activities or erosion. There are presently no active paleontology permits issued by BLM, although various institutions and groups are working in areas where there is public land.

## RECREATION

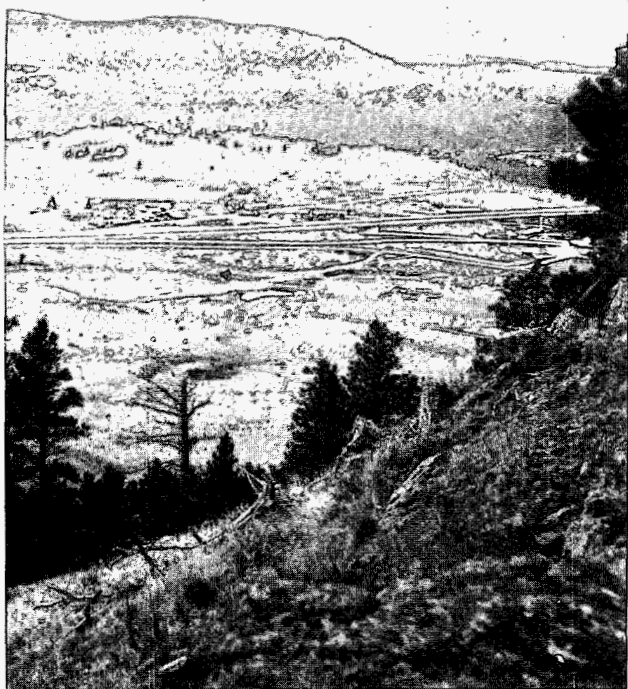
Located within the boundaries of the 13 counties are many areas having recreational values. They include the Black Hills National Forest, Custer National Forest, Nebraska National Forest (consists mainly of national grasslands), Badlands National Monument, Wind Cave National Park, Custer State Park, several ski areas, the historic town of Deadwood, three major rivers, and five reservoirs. These areas

TABLE 3-11  
SUMMARY OF BLM WOODLAND ACRES BY COUNTY  
(Outside of Exemption Area and Fort Meade)

County	Mixed Species (25-75%) <sup>1</sup>	Mixed Species (75+%)	Ponderosa Pine (25-75%)	Ponderosa Pine (75+%)
Harding	8	5	33	0
Pennington	4,827	293	0	0
Meade	2,518	8	0	0
Custer	446	17	144	100
Fall River	107	0	1,109.8	53.0
Perkins	244	0	0	0
TOTALS	8,151	323	1,287	153

<sup>1</sup>Percent crown closure

Source: BLM 1983



offer a variety of dispersed recreational opportunities including fishing, photography, boating, hiking, rock collecting, sightseeing, hunting, and off-road vehicle (ORV) use.

The Bureau has two recreation sites, one near Sturgis and the other near Belle Fourche. The former involves 6,617 acres of the former Fort Meade Military Reservation and provides activities such as camping, picnicking, fishing, hunting, equestrian use, and sightseeing. It also has historical values, including reconstructed stone cavalry jumps, historic trails, and rock carvings. The BLM has completed a plan for recreation management for Fort Meade. (See Appendix G.) The area near Belle Fourche is the Center of the Nation Recreation Area, recognized as a geographic center of the United States, which offers excellent scenic viewing.

Throughout the Resource Area, hunting and fishing are very popular types of recreation. Hunting consists primarily of big game and upland birds with limited waterfowl hunting.

**Portions of 11 South Dakota rivers are identified in the Nationwide Rivers Inventory. There are public lands adjacent to the inventoried portions of these two rivers; the Belle Fourche and Cheyenne rivers.**

Most of the public land administered by the BLM is in a scattered pattern, thus, this land has a supplemental role in the overall recreational activities.

## MINERALS

The public mineral estate in South Dakota totals 5,294,122 acres with BLM surface estate of 280,672 acres. **The remaining mineral estate is overlain by fee surface or other federally administered lands.** BLM has varied responsibilities on these lands according to who controls the surface over these minerals, the specific mineral type, and the public laws governing Public Domain and Acquired Lands. Categories of minerals of potential value include fuels (coal and oil and gas), metallics, industrials and nonmetallics, structural materials, and geothermal resources.

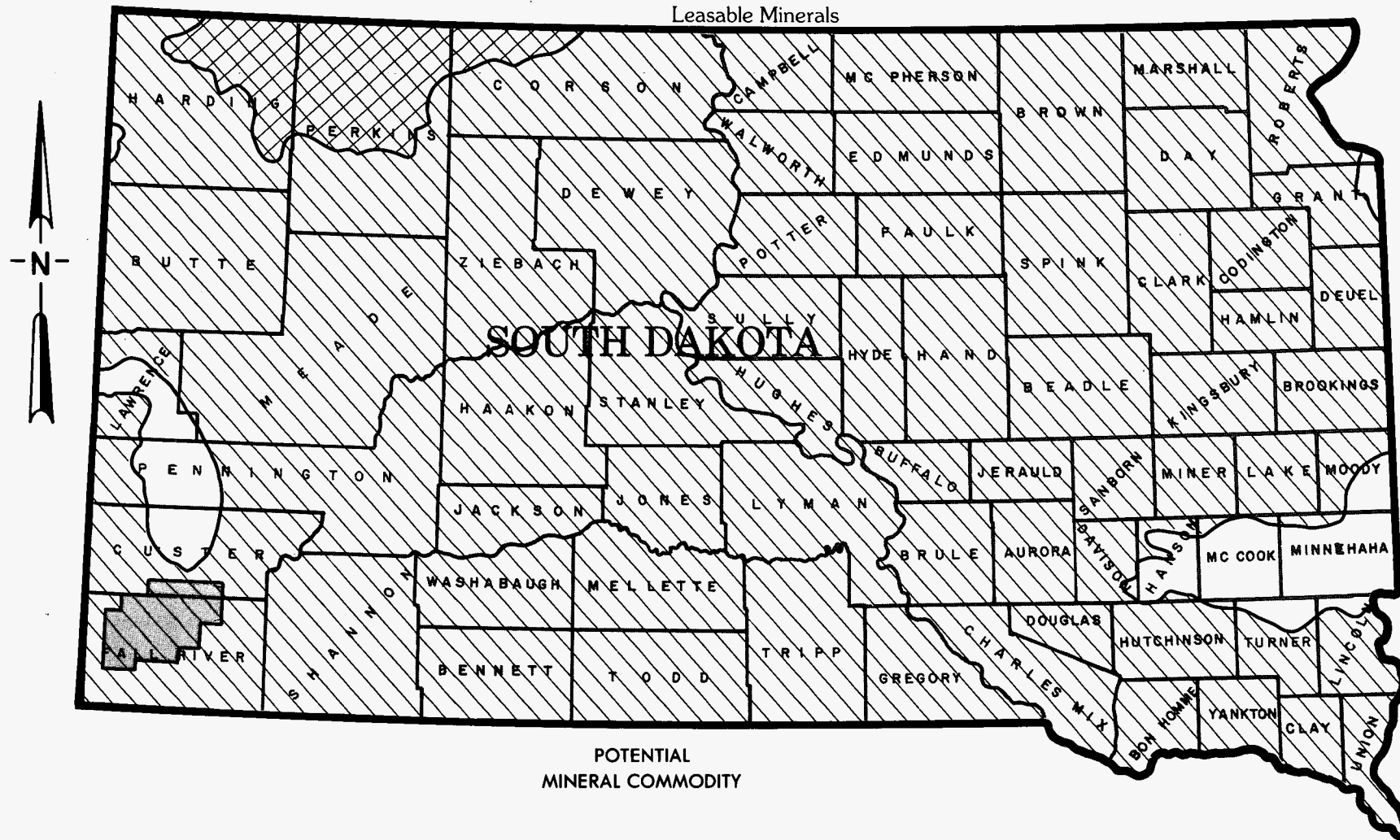
As of 1984, there were 86 producing federal oil wells and 26 producing federal gas wells in South Dakota. Cumulative state oil production as of 1984 was 12,000,301 barrels. Ninety-six percent of this production was in Harding and Butte Counties, with the remainder in Custer, Fall River, and Dewey Counties (Map 3-4a). Cumulative gas production was 9,505,554 million cubic feet (MCF). Ninety-one percent of this production was in Harding County, with the remainder in Fall River County. The lignite coal-bearing area of South Dakota is in the northwest and includes parts of Harding, Perkins, Meade, Ziebach, Dewey, and Corson Counties. Currently, there is no active mining in the state, although there has been recent exploration activity. Estimates of potentially recoverable coal show a total of 640 million tons, 65 percent of which is in Harding County.

Aluminum, iron, magnesium, and manganese occur in significant quantities in the western counties of the state (Map 3-4b). The largest deposit of manganese in the nation is in the lower part of the Missouri Valley in South Dakota. The last activity in this area was during World War II. Gold and silver have been perennially the chief income producers in South Dakota's mining industry. These minerals occur in vein, replacement, and placer deposits of the Black Hills area. Tungsten, tin, beryllium, and primary uranium have been mined and are still present in pegmatite deposits of the Black Hills.

Limestone has ranked only behind gold in value of annual production. All limestone mining activity has been in the Black Hills and is used



# South Dakota Minerals Assessment Map Leasable Minerals



POTENTIAL  
MINERAL COMMODITY

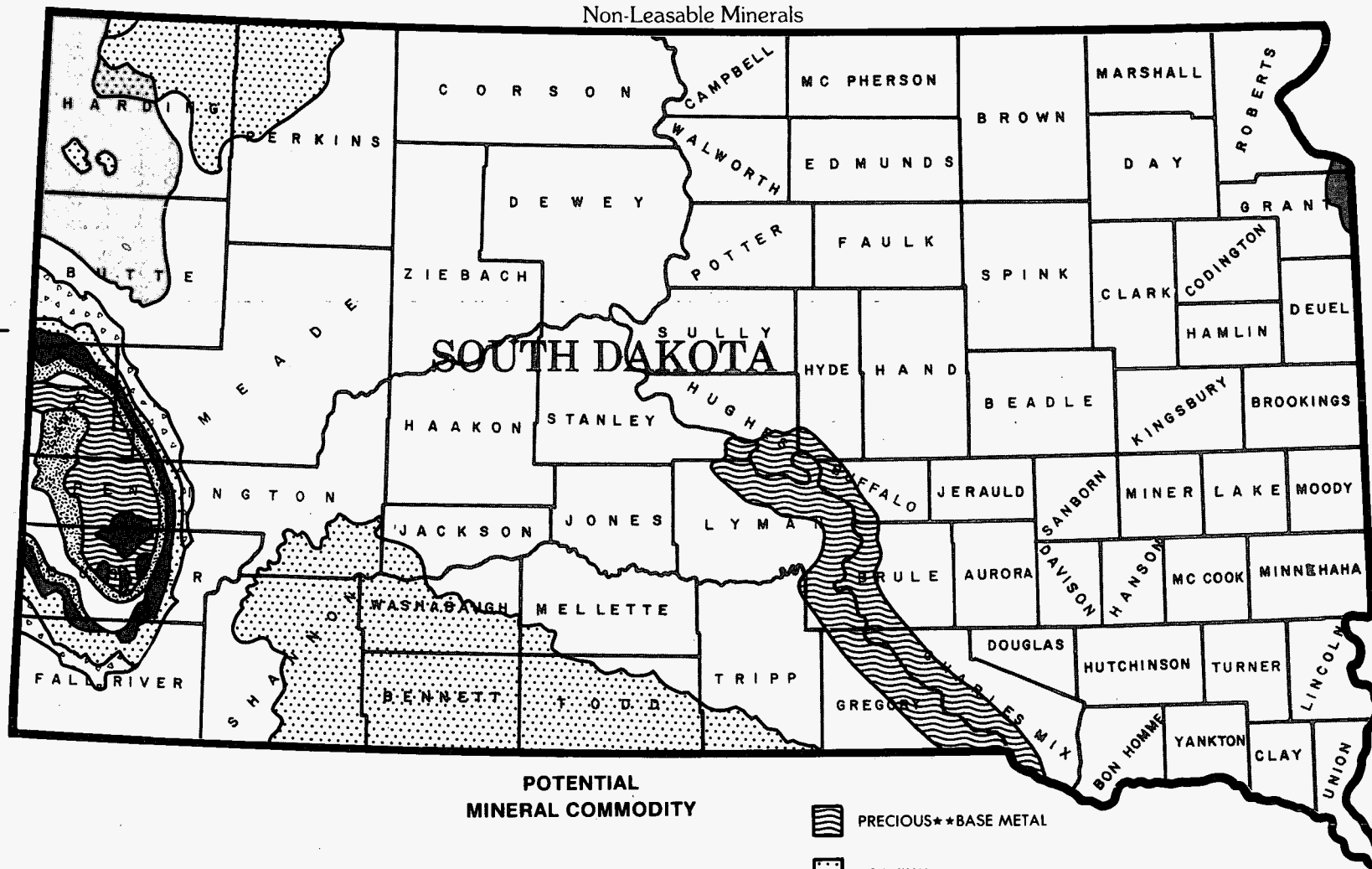
-  COAL
-  OIL\*GAS

 GEOTHERMAL

10 0 10 20 30 40 50  
MILES SCALE




# South Dakota Minerals Assessment Map

Non-Leasable Minerals

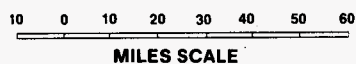


## POTENTIAL MINERAL COMMODITY

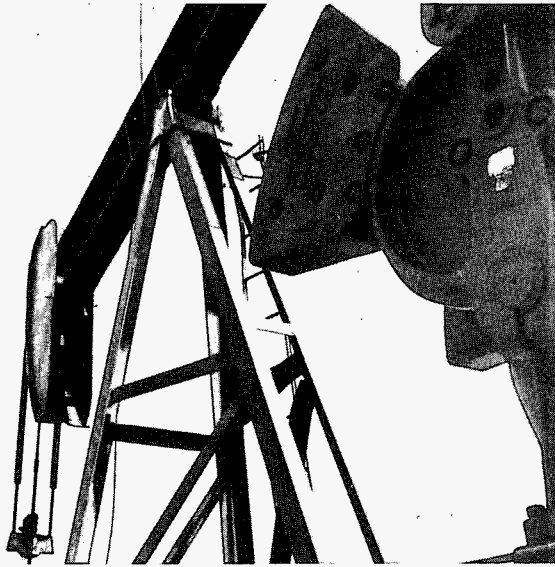
-  SALINES
-  LIMESTONE
-  BENTONITE

-  PRECIOUS\*\*BASE METAL
-  URANIUM
-  OTHER

anhydrite/gypsum  
rare earths  
pegmatite minerals  
building stone







primarily in the manufacture of Portland cement. Bentonite is common in Upper Cretaceous rocks and occurs over wide areas in the state (Map 3-4b). It is being mined in the Mowry Shale northwest of Belle Fourche. Extensive deposits of high-grade gypsum/anhydrite occur in Lawrence, Meade, Pennington, Custer, and Fall River Counties. Production is steady and geared for a small regional market. Salt beds of economic quantities are located in Harding and Butte Counties. To date, there is no development activity in South Dakota.

Granite in the Black Hills has historically been quarried on a small scale for building and riprap material. Sandstone and quartzite use exist in most of the western counties. Sand and gravel is used as a construction material is available in almost all areas of the state and continues to be a steady source of income.

There is no known interest in geothermal resources, although an area in Custer and Fall River Counties has been classified "prospectively valuable" by BLM (Map 3-4a).

## ECONOMICS

### Overview

The 13-county study area, as represented by distribution of employment, is similar to the state as a whole. (See Table 3-12.) The exceptions are forestry and mining employment which, for the state, are concentrated within the 13-county area, accounting for 77 and 88 percent respectively of the total employment in these industries.

For the 13-county area, the rank of the basic industries (by employment) is agriculture, manufacturing, mining, and forestry. Basic industries are those for which most revenues are derived from outside the region. These industries are the major determinants of overall employment within a region. Recreation and tourism is considered a base industry. However, its direct effects contribute to the service and retail trade industries.

Agriculture is a significant base industry for each of the 13 counties within the study area. It is dominant in Brule, Fall River, Haakon, Harding, Jackson, Lyman, Perkins, and Stanley counties. The mining industry is significant in Butte and Lawrence counties. There is some forestry employment throughout the western counties, but it provides a major source of employment only in Custer County. Tourism and recreation are significant in Custer, Fall River, Lawrence, and Pennington counties. This is due to the tourism attraction of the Black Hills area.

Pennington County generates approximately half (45%) of the employment in the 13-county area. Rapid City, the largest city in the area, serves as the major trade center for the western portion of the region.

The major use of surface public lands is grazing. Due to the small percentage of public land in each county, Bureau actions generally do not have significant impacts on the economic structure of the counties (See Table 3-10.)

### Agriculture

In the 13-county area, there are approximately 16.5 million acres of land. (See Table 3-13.) In 1982, approximately 5,200 farms/ranches utilized 83.5% of these lands. Cropland for production of corn, wheat and hay accounted for approximately 20% of the agricultural lands. Grazing land, which includes public grazing land, totalled approximately 77% of the agricultural lands. BLM-administered lands total approximately 279.5 thousand acres and support approximately 73,778 AUMs. The total market value from all agricultural production was approximately 302.6 million dollars in 1982 in the 13-county area (Department of Commerce, Bureau of Census).

In 1982, the 13-county area had a cattle and calf inventory of approximately 800,000. This was 20.3% of the total state inventory. Sales of cattle and calves totalled approximately 469 thousand head and this was approximately 19.4% of the state's total sales.

**TABLE 3-12**  
**EMPLOYMENT BY INDUSTRY**

County— Industry	Brule		Butte		Custer		Fall River		Haakon		Harding		Jackson	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Employment	2,490	100	3,528	100	2,575	100	3,356	100	1,205	100	748	100	1,117	100
Agriculture	670	27	772	22	237	9	367	11	406	34	401	54	344	31
Forestry & Fish	18	1	0	—	149	6	16	—	—	—	12	2	—	—
Mining	1	—	359	10	121	5	140	4	13	1	11	1	—	—
Construction	114	5	240	7	192	7	161	5	49	4	35	5	73	6
Manufacturing	53	2	64	2	277	11	114	3	115	10	7	1	40	3
Transportation	109	4	236	7	187	7	497	15	45	4	31	4	45	4
Wholesale Trade	129	5	94	3	48	2	46	1	77	6	11	1	10	1
Retail Trade	538	22	671	19	314	12	526	16	168	14	72	10	127	11
Finance, Insurance, Real Estate	94	4	153	4	76	3	141	4	57	5	21	3	22	2
Services	672	27	781	22	805	31	1,180	35	227	19	102	14	353	32
Public Administration	92	4	158	4	169	7	168	5	48	4	45	6	103	9

County— Industry	Lawrence		Lyman		Meade		Pennington		Perkins		Stanley		South Dakota	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Employment	7,757	100	1,426	100	7,152	100	29,048	100	2,291	100	1,221	100	296,679	100
Agriculture	283	4	480	34	904	13	832	3	913	40	244	20	47,762	16
Forestry & Fish	85	1	—	—	—	—	67	—	7	—	2	—	465	—
Mining	1,352	17	3	—	216	3	192	1	56	2	—	—	2,791	1
Construction	514	7	109	8	605	8	2,371	8	130	6	142	12	17,464	6
Manufacturing	518	7	10	—	685	10	3,003	10	83	4	22	2	28,555	10
Transportation	370	5	79	6	352	5	2,228	8	155	7	79	6	18,005	6
Wholesale Trade	181	2	44	3	264	4	1,283	4	93	4	28	2	13,842	5
Retail Trade	1,503	19	191	13	1,263	18	6,229	21	343	15	209	17	51,384	17
Finance, Insurance, Real Estate	303	4	43	3	232	3	1,810	6	69	3	40	34	13,856	5
Services	2,339	30	283	20	2,291	32	9,105	31	381	17	296	24	85,476	28
Public Administration	309	4	184	13	340	5	1,928	7	61	3	159	13	17,049	6

Source: U.S. Department of Commerce PC 80—C43 Tables 69 and 178, 1983

Assuming BLM-administered lands are used on the average of 8 months a year, the 73,778 AUMs produce 9,222 animal units, which is 2.1% of the cattle and calf sales for the 13-county area. Assuming \$400 of gross revenue per animal unit, production on public lands contributes \$3,688,800 of gross revenue annually to the livestock industry. Approximately \$10/AUM of ranch income, a net term, is associated with the BLM AUMs. That is, approximately three quarter million dollars of ranch income is associated with BLM AUMs.

Public land is an economic factor to the 444 ranches that have allotments on BLM-administered lands and enables many of them to remain in business.

The average ranch is 9.9% dependent upon public land to support the ranch operations. (See Table 3-14.) Generally, the smaller ranches are

more dependent on BLM lands than are the larger ones.

### Permit Value

The BLM does not recognize a public land grazing preference as real property; however, these preferred AUMs do have value in the context of a total ranch operation. The value of the preference varies considerably. If the preference is for small, isolated, landlocked tracts of public lands, the value is minor. Where public lands provide a large block of grazing, the preference value can be substantial. Preference value is difficult to estimate because it usually is not separated from the total value of the ranch. Ranches are usually valued and sold on a cost-unit basis. It is estimated that an average value for the BLM grazing preference is approximately \$100 per AUM or \$1,200 per animal unit.

**TABLE 3-13**  
**AGRICULTURAL ACREAGES AND MARKET VALUE OF PRODUCTION (1982)**

Counties	Land Area	Farm Acres	No. of Farms	Market Value of Production
Brule	523,520	447,940	441	\$23,264,000
Butte	1,440,000	1,120,970	494	26,691,000
Custer	996,480	418,046	302	7,885,000
Fall River	1,115,520	1,001,854	336	40,354,000
Haakon	1,162,240	1,208,121	322	25,364,000
Harding	1,716,480	1,584,596	274	16,235,000
Jackson	1,259,726	1,249,726	282	16,637,000
Lawrence	512,000	196,321	245	10,643,000
Lyman	1,077,120	907,934	422	28,690,000
Meade	2,217,600	2,056,225	773	33,761,000
Pennington	1,778,560	1,076,059	577	22,725,000
Perkins	1,830,400	1,670,908	595	27,858,000
Stanley	904,960	860,755	169	17,074,000
<b>TOTALS</b>	<b>16,534,606</b>	<b>13,799,455</b>	<b>5,232</b>	<b>\$296,445,000</b>

Source: U.S. Department of Commerce, Bureau of Census, 1982 Census of Agriculture, February 1984.

**TABLE 3-14**  
**ESTIMATED RANCH DEPENDENCY ON BLM LAND**

Ranch Size Category	Ranches in Category	Number of Ranches in Each Category of Dependency				Average Percent Dependency
		0-15	16-30	31-45	45-100	
Small 0-3,500 acres	183	118(64%)	25(14%)	5(3%)	35(19%)	11.6%
Medium 3,501-9,000 acres	169	146(86%)	19(86%)	3(2%)	1(1%)	8.7%
Large 9,001-14,000 acres	47	39(83%)	5(11%)	2(4%)	1(2%)	9.0%
Very Large 14,001 and up	45	33(73%)	9(20%)	0(0%)	3(7%)	10.2%
	444	336(76%)	58(13%)	10(2%)	40(9%)	9.9%

Source: BLM 1984

## SOCIAL CONDITIONS

### Population Trends

Since 1870 South Dakota has had sizeable population increases every decade until the drought and depression years of the 1930's. The most rapid growth occurred during the 1870 to 1880 settlement years of Dakota Territory. (See Table 3-15.) Drought in the 1880's discouraged settlement and encouraged many to move after 1890. There was a new surge of growth after 1900. This growth was generated by the opening of western South Dakota to homesteaders, the coming of railroads, and the establishment of trade centers. These factors combined gave South Dakota its largest population ever in 1930, 692,849 persons.

During the period of 1930 to 1940, South Dakota's population decreased by almost 50,000 persons. Drought and unemployment forced many to seek employment elsewhere. From 1940 to 1950, South Dakota experienced small increases in population.

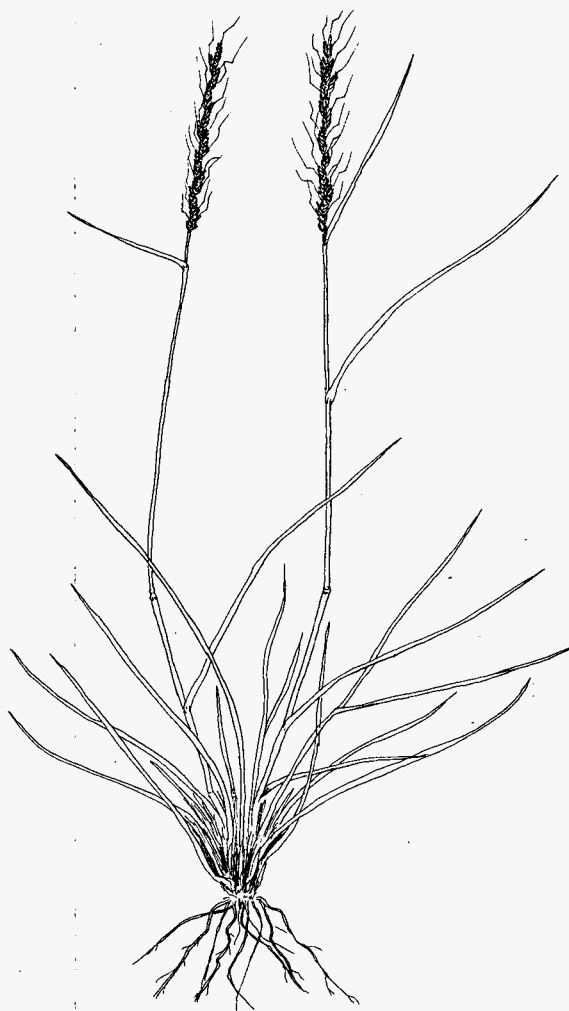
Recent trends (1970 to 1980) show eight out of 13 counties increasing in population. Population decreases are shown in five entirely rural counties, Brule, Haakon, Harding, Lyman and Perkins (Tables 3-16 and 3-17). Distributed age classes within the 13 counties are not significantly different from the statewide percentages. Over half of the population is in the working age group, 18 to 64 years. Less than one third of the population is under 17 years and around one sixth is 65 years and older.

**TABLE 3-15**  
**TOTAL POPULATION OF SOUTH DAKOTA,**  
**URBAN AND RURAL BY DECADE,**  
**1880 — 1980**

	Population of South Dakota		
	The State	Urban	Rural
1880	98,268	7,208	91,060
1890	348,600	28,555	320,045
1900	401,570	40,936	360,634
1910	583,888	76,469	507,419
1920	636,547	101,872	534,675
1930	692,849	130,907	561,942
1940	642,961	158,087	484,874
1950	652,740	216,710	436,030
1960	680,514	267,180	413,334
1970	666,257	296,628	369,629
1980	690,768	320,777	369,991

Source: U.S. Department of Commerce, Bureau of Census, 1980 Census of Population, Number of Inhabitants, South Dakota

Historically, the industrial base of the Resource Area has been dominated by agriculture, which has largely determined the shape of both the economic and social structure of the area. The prevailing lifestyle is strongly tied to the land and to the sense of independence, self-reliance and stability which is characteristic of rural areas. In 1930, the state's largest population was rural, accounting for 81 percent of the total. (See Table 3-18.) This figure continued to decline with the rural percentage being 53.6 percent statewide in 1980. Some counties show the entire population as being rural, outside communities of 2,500 in population. Pennington County shows the smallest percentage being rural at 23.2 percent. Pennington County includes Rapid City, the major population center in the Resource Area.



*Green Needlegrass*

**TABLE 3-16**  
**POPULATION CHARACTERISTICS AND SOCIAL WELL-BEING BY COUNTY**

		Brule	Butte	Custer	Fall River	Haakon	Harding	Jackson	Lawrence	Lyman	Meade	Pennington	Perkins	Stanley	South Dakota
Population 1970	1)	5,870	7,825	4,698	7,505	2,802	1,855	2,920 A	17,453	4,060	17,020	59,349	4,769	2,457	666,257
Population 1980	2)	5,245	8,372	6,000	8,439	2,794	1,700	3,437	18,339	3,864	20,717	70,361	4,700	2,533	690,768
Percent change (1970—1980)	2)	-10.6%	7.0%	27.7%	12.4%	-0.3%	-8.4%	+17.7%	5.1%	-4.8%	21.7%	18.6%	-1.4%	3.1%	3.7%
Density 1980 (per square mile)	1)	6.4	3.7	3.8	4.9	1.5	0.6	1.8	22.9	2.3	6.0	25.3	1.6	1.8	9.1
Percent population by age (1980)	2)														
— 17 yrs or less	1)	31.4%	30.3%	29.7%	27.5%	34.3%	30.5%	39.2%	27.3%	35.4%	33.3%	30.0%	28.2%	34.1%	29.8%
— 18 to 64 yrs		54.0%	55.5%	58.5%	55.3%	52.8%	56.4%	50.2%	59.6%	52.5%	58.5%	61.6%	56.7%	56.1%	57.1%
— 65 yrs or more		14.5%	14.2%	11.8%	17.2%	12.8%	13.1%	10.6%	13.1%	12.1%	8.2%	8.4%	15.1%	9.9%	13.2%
Percent nonwhite population (1980)	3)	2.4%	2.5%	3.3%	6.2%	1.5%	1.3%	43.7%	2.5%	23.4%	5.5%	7.9%	1.2%	3.9%	7.4%
Unemployment rate (July 1984)	4)	3.8	3.1	2.2	2.9	1.4	1.5	2.7	3.8	4.9	3.0	3.6	2.0	3.5	3.8
Median Income of families (1979)	5)	13,037	15,345	16,798	14,274	14,131	14,301	13,783	16,597	12,863	16,624	17,364	15,049	16,996	13,830
Percent families below poverty level (1979)	5)	21.4	12.7	10.2	12.5	18.4	19.1	27.4	10.3	24.8	8.0	9.5	15.9	11.2	13.1

A. The population figures for Jackson County in 1970 did not include Washabaugh County. However, the 1980 census reflects the combined population of both counties because they consolidated. To obtain a realistic percentage of change the 1970 population of Jackson County has the 1970 population of Washabaugh County added to it.

1) U.S. Department of Commerce, Bureau of Census, 1980 Census of the Population, A Number of Inhabitants, South Dakota.

2) U.S. Department of Commerce, Bureau of Census, 1982, 1980 Census of the Population, General Population Characteristics, South Dakota.

3) U.S. Department of Commerce, Bureau of Census, 1982, 1980 Census of Housing, General Housing Characteristics, South Dakota.

4) South Dakota, Department of Labor, 1984, South Dakota Labor Bulletin, July.

5) South Dakota, Department of Health, 1982, South Dakota Vital Statistics and Health Statistics.

6) U.S. Department of Commerce, Bureau of Census, 1982, 1980 Census of the Population, General Social and Economic Characteristics, South Dakota.



**TABLE 3-17**  
**CHARACTERISTICS OF RURAL AND FARM POPULATION**

	Brule	Butte	Custer	Fall River	Haakon	Harding	Jackson	Lawrence	Lyman	Meade	Pennington	Perkins	Stanley	South Dakota
Percent Rural (population below 2,500) (1980) 1)	100%	44.0%	100%	43.5%	100%	100%	100%	47.8%	100%	52.0%	23.2%	100%	100%	50.6%
Percent Farm (based on total population) (1980) 2)	26.4%	13.2%	10.6%	5.6%	31.6%	51.0%	26.6%	2.6%	25.6%	8.4%	1.7%	35.6%	20.8%	16.9%
Percent Change in Total Acreages for Farms and Ranches (1974-1978) 3)	-9.7%	-10.7%	10.2%	-7.6%	5.8%	4.4%	-3.6%	3.0%	-3.3%	7.2%	-16.9%	-6.6%	-9.0%	-3.1%
Percent Change in Number of Farms and Ranches (1974-1978) 3)	-5.6%	-0.4%	2.2%	-5.0%	2.3%	-11.5%	-9.4%	3.2%	11.2%	-9.9%	-5.2%	-9.7%	-5.3%	-7.4%
Percent Change in Aver- age Size of Farms and Ranches (1974-1978) 3)	-4.3%	-10.3%	7.8%	-2.8%	3.5%	17.9%	6.4%	-0.2%	8.9%	3.0%	-12.4%	3.4%	-3.8%	4.6%

- 1) U.S. Department of Commerce, Bureau of Census, 1980 Census of Population, Number of Inhabitants, South Dakota  
 2) U.S. Department of Commerce, Bureau of Census, 1980 Census of Population and Housing, Summary Tape File 3A, South Dakota.  
 3) U.S. Department of Commerce, Bureau of Census, 1978 Census of Agriculture, State and County Data, South Dakota.

**TABLE 3-18**  
**SOUTH DAKOTA'S URBAN AND RURAL POPULATION AS A PERCENT  
OF STATE POPULATION, 1880 - 1980**

	Year											
	1800	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	
Rural	92.7	91.8	89.8	86.9	84.0	81.1	75.4	66.8	60.9	55.5	53.6	
Urban	7.3	8.2	10.2	13.1	16.0	18.9	24.6	33.2	39.1	44.5	46.4	

Source: U.S. Department of Commerce, Bureau of Census, 1980 Census of Population, Number of Inhabitants, South Dakota.