

Fisheries and Aquatic Resources Adaptive Management System

2014-2018

East River Fisheries Management Area Strategic Plan

South Dakota Game, Fish and Parks Wildlife Division



**Dave Lucchesi, Co-Chair
Brian Blackwell, Co-Chair
Geno Adams
Katie Bertrand
Jerry Broughton
Steve Chipps**

**Todd Kaufman
Steve LaBay
John Lott
Tyrel Moos
Chelsey Pasbrig
Todd St. Sauver**

**Mark Ermer
Bruce Johnson
Jason Jungwirth
Matt Ward
Dan Jost**

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DIVISION OF WILDLIFE



Agency Mission

The purpose of the Department of Game, Fish and Parks is to perpetuate, conserve, manage, protect, and enhance South Dakota's wildlife resources, parks, and outdoor recreational opportunities for the use, benefit, and enjoyment of the people of this state and its visitors, and to give the highest priority to the welfare of this state's wildlife and parks, and their environment, in planning and decisions.

Division of Wildlife Mission

The Division of Wildlife will manage South Dakota's wildlife and fisheries resources and their associated habitats for their sustained and equitable use, and for the benefit, welfare and enjoyment of the citizens of this state and its visitors.

Our Motto: "Serving People, Managing Wildlife"

I. Introduction

The East River Fisheries Management Area comprises the area of South Dakota east of the Missouri River, and contains more than 210,000 surface acres of lakes and thousands of miles of streams (Figure 1). The variety of aquatic habitats and diverse fisheries provides an estimated 1 million angler days and generates over 50 million dollars in economic benefit each year.

The purpose of this strategic plan is to guide fisheries management based on the missions of the South Dakota Department of Game, Fish and Parks (GFP) and the Division of Wildlife. As part of a fisheries management program that is efficient, effective, friendly, and known for its science-based management recommendations, this plan reflects the values and guiding principles of the Division of Wildlife (SDGFP 2013).

This plan is a dynamic tool addressing the issues, challenges, and opportunities in managing the East River Fisheries Management Area. The components of this plan include an **Inventory** Section, which describes the resources present in this management area, and reviews both historical and current management activities. This section is subdivided into three categories: **People**, **Fish**, and **Habitat**. Following the Inventory Section is the **Issues** Section, listing the current issues involving East River fisheries. Lastly, measurable and time-bound **Objectives**, along with specific **Strategies**, are listed. Progress in meeting these objectives will be evaluated prior to developing subsequent plans.

While this plan will guide staff working on fisheries and aquatic resource issues in the East River Fisheries Management Area, it is also intended to provide the public with information on current fisheries management directions and activities. Members of the public are encouraged to comment on the plan both during development and during implementation.

East River Fish Management Area

Legend

- Game Production Areas
- Parks and Recreation Areas
- USFWS Wildlife Refuge
- Waterfowl Production Area
- Tribal Lands

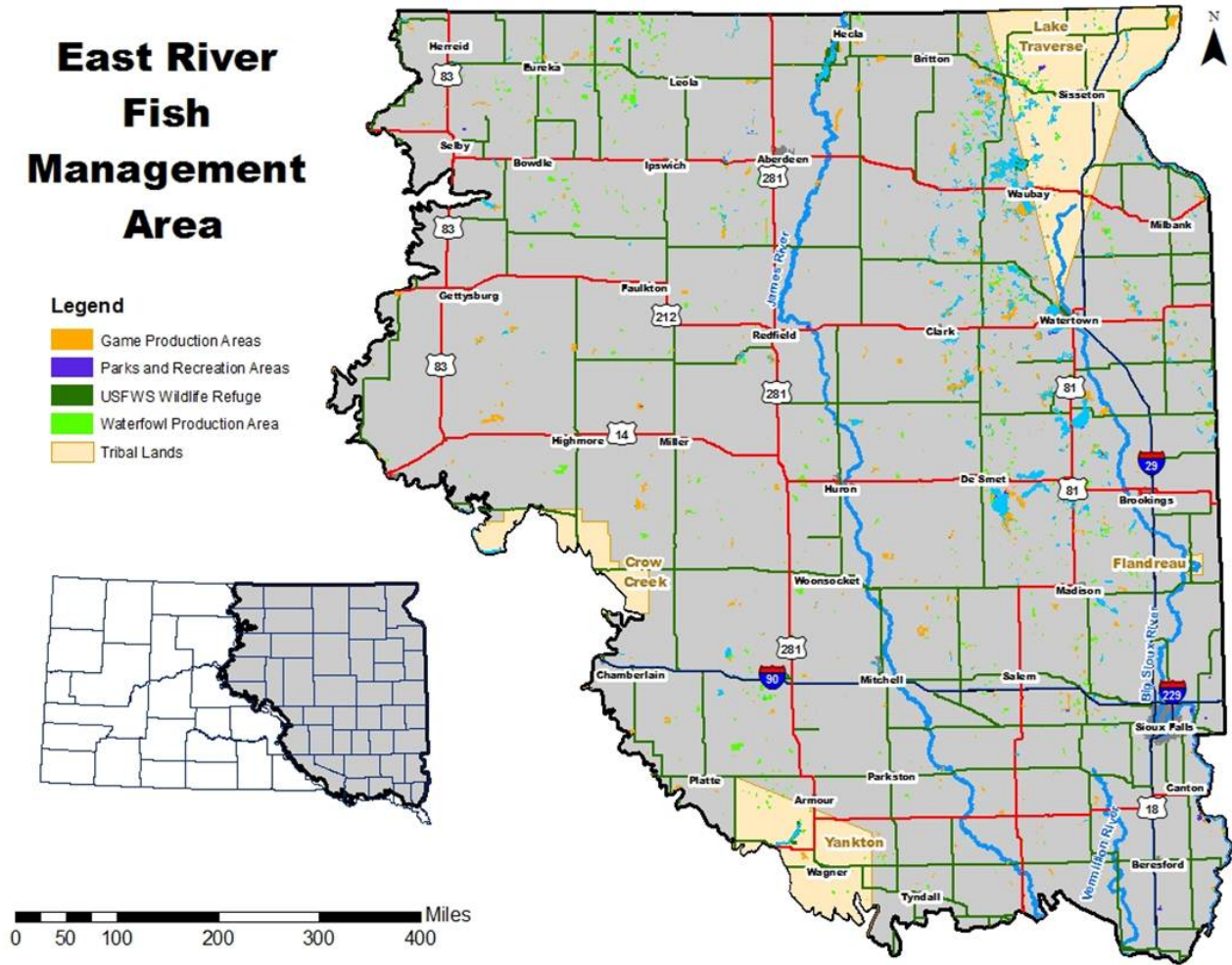


Figure 1. The area encompassed by the East River Fish Management Area (ERFMA) including selected cities, roads, public lands, tribal lands, and waters.

II. Inventory

Habitat

Lakes: The East River Fisheries Management Area has experienced two periods of glaciation, the Illinois Period approximately 400,000 years ago and the Wisconsin Period about 10,000 years ago. The Prairie Coteau is a prominent feature and was formed by materials deposited along a 200-mile stretch east of the James River extending from northern South Dakota to northern Iowa. The Prairie Coteau traverses the eastern half of the East River Fisheries Management Area and is characterized by its many lakes and wetlands.

The lakes of the Prairie Coteau were formed by glacial drift and ice. Some lakes were created over porous deposits giving them a relatively stable water level due to their connection to subsurface aquifers (e.g. Enemy Swim Lake). Other waters, considered closed basins because they lack outlets, are located over impermeable substrates. During periods of above normal precipitation, these basins fill and excess water floods surrounding land creating highly-productive fish habitat (e.g. Bitter Lake). During wet periods, the amount of fish habitat in the East River Fisheries Management Area dramatically increases with the flooding of these closed basins.

The area to the west of the Prairie Coteau contains fewer lakes, but still has abundant wetlands. During periods of above normal precipitation, some of the larger wetlands can support temporary sport fisheries. Manmade impoundments also provide important fisheries habitat.

In 2011, GFP actively managed the fisheries in 257 standing waters in the East River Fisheries Management Area with a combined acreage of 210,631 acres (Table 1). Large (>150 acres) natural lakes account for about 93% of surface area of managed waters, and nearly 70% are located in northeastern South Dakota. This portion of the East River Fisheries Management Area has also experienced the greatest increase in large natural lake acreage during the recent wet period.

Southeastern South Dakota has the greatest number and acres of small natural lakes (<150 acres; Table 1). About 60% of these small, natural lakes are classified as marginal, which means they are shallow and frequently winterkill. Small impoundments (<150 acres) are the most abundant closer to the Missouri River, while urban lakes and ponds are most abundant in the southeast portion of the management area.

Table 1. Number and acres of lakes, by type and classification, actively managed in the East River Fisheries Management Area (small lakes are \leq 150 acres, large lakes are $>$ 150 acres).

Type	Classification	Number	Acres
Small natural lakes	Marginal	17	1,441
	Permanent & Semi-Permanent	11	1,160
	Total	28	2,601
Large natural lakes	Marginal	60	60,370
	Permanent & Semi-Permanent	73	129,681
	Total	133	197,231
Small impoundments	Marginal	15	890
	Permanent & Semi-Permanent	35	1,848
	Total	50	2,738
Large impoundments	Marginal	2	405
	Permanent & Semi-Permanent	13	7,315
	Total	15	7,720
Urban lakes and ponds		31	341
Grand Total		257	210,631

Streams: The East River Fisheries Management Area contains portions of two watersheds. The northeastern tip, which is less than one percent of the entire state, is part of the Hudson Bay watershed and water drains to the north. The remainder of the Area lies in the Gulf of Mexico watershed and the water drains south. Two sub-drainages can be found within the Gulf of Mexico watershed. The Upper Mississippi River drainage in northeast South Dakota includes the Minnesota River drainage that flows through Minnesota to the Mississippi River. The Missouri River sub-drainage covers most of the Area, with the Missouri River marking the edge of the East River Fisheries Management Area. Within the Missouri River sub-drainage, there are three prominent rivers, the Big Sioux, James, and Vermillion. Each river has hundreds of tributaries that contain more fish species and more miles of shoreline than all of the lakes combined (see Appendix 1 for eight digit HUC maps of named tributaries). The James River begins in North Dakota and flows south to the Missouri River east of

Yankton. It is a remnant feature of ancient Lake Dakota which collected water from melting glaciers, and is characterized by its low gradient and tendency for flooding. The Big Sioux River begins in Roberts County and flows south to the Missouri River in northwest Iowa. Falls created by natural granite formations in Sioux Falls are a natural barrier to upstream fish movement. The Vermillion River begins as East and West forks originating in Kingsbury County before combining to form a single river prior to entering the Missouri River near Burbank.

Fish

Lakes: As few as only six fish species may have been present following the last glaciation. After the retreat of the glaciers, fish began migrating into eastern South Dakota through waterways within the two watersheds. Today, the distribution of game fish has been impacted by natural migrations, authorized and unauthorized fish stockings, dams, road crossings, and other fisheries management activities.

Lakes and impoundments in eastern South Dakota are typically managed for multiple species, with Walleye, Yellow Perch, Largemouth Bass and Northern Pike the most common (Tables 2 and 3). Natural lakes tend to be managed for Walleye and Yellow Perch, while marginal waters have an increased emphasis on Yellow Perch and Northern Pike. Largemouth Bass and Bluegill are the most commonly-managed species in impoundments (Table 2). Several large natural lakes, as well as large and small impoundments, are also managed for black crappie. Urban and community lakes and ponds are managed for a variety of species and often stocked with adult fish.

Fish stocking is an important management practice in the Management Area. Marginal waters frequently experience fish kills, requiring stocking to maintain a fishery. Fish stockings also occur to introduce new species, enhance existing fish populations, or provide large fish that can be caught immediately. Sources of fish for stocking include state and federal fish hatcheries, natural rearing ponds, and other public waters where adult fish can be netted and transferred to new locations. The size and age of fish stocked depends on management objectives, availability, and the fish community in the receiving water. Adult fish are typically stocked in urban or community lakes where a variety of species are used. Spring and fall stockings of rainbow trout into these waters provide anglers with a species not normally present. Eleven game fish species were stocked into the East River Fisheries Management Area waters between 2008 and 2010, with large natural lakes the primary recipient of walleye and yellow perch stockings (Table 4).

Table 2. The number of lakes managed for a fish species by lake type and classification in the East River Fisheries Management Area (small lakes are ≤ 150 acres, large lakes are > 150 acres).

Type	Classification	Number										
		Black Crappie	Bluegill	Channel Catfish	Largemouth Bass	Musky	Northern Pike	Rainbow Trout	Smallmouth Bass	Walleye	White Bass	Yellow Perch
Small natural lakes	Marginal	0	0	0	0	0	5	0	0	8	0	12
	Permanent & Semi-Permanent	0	0	1	1	0	0	0	0	9	0	11
	Total	0	0	1	1	0	5	0	0	17	0	23
Large natural lakes	Marginal	3	2	0	1	0	32	0	1	40	0	49
	Permanent & Semi-Permanent	16	9	0	5	3	14	0	9	67	0	59
	Total	19	11	0	6	3	46	0	10	107	0	108
Small impoundments	Marginal	2	6	1	10	0	2	0	0	0	0	2
	Permanent & Semi-Permanent	13	22	2	25	0	3	1	0	3	0	9
	Total	25	28	3	35	0	5	1	0	3	0	11
Large impoundments	Marginal	1	0	0	1	0	1	0	1	0	0	1
	Permanent & Semi-Permanent	10	7	2	5	1	2	0	0	9	0	4
	Total:	11	7	2	6	1	3	0	1	9	0	5
Urban lakes and ponds		8	11	2	7	0	17	6	0	0	4	7

Table 3. Acres of water managed for a fish species by lake type and classification in the East River Fisheries Management Area (small lakes are \leq 150 acres, large lakes are $>$ 150 acres).

Type	Classification	Acres										
		Black Crappie	Bluegill	Channel Catfish	Largemouth Bass	Musky	Northern Pike	Rainbow Trout	Smallmouth Bass	Walleye	White Bass	Yellow Perch
Small natural lakes	Marginal	0	0	0	0	0	538	0	0	776	0	1,034
	Permanent & Semi-Permanent	0	0	86	36	0	0	0	0	827	0	903
	Total	0	0	86	36	0	538	0	0	1,603	0	1,937
Large natural lakes	Marginal	1,302	840	0	640	0	46,778	0	640	43,637	0	57,636
	Permanent & Semi-Permanent	15,116	26,316	0	5,575	2,740	10,939	0	36,174	128,016	0	116,431
	Total	16,418	27,156	0	6,215	2,740	57,717	0	36,814	171,653	0	174,067
Small impoundments	Marginal	174	400	27	613	0	137	0	0	0	0	137
	Permanent & Semi-Permanent	944	1,313	130	1,547	0	97	5	0	184	0	508
	Total	1,118	1,713	157	2,160	0	234	5	0	184	0	645
Large impoundments	Marginal	200	0	0	200	0	205	0	200	0	0	205
	Permanent & Semi-Permanent	6,610	3,377	1,003	2,032	235	2,150	0	0	5,927	0	2,341
	Total	6,810	3,377	1,003	2,232	235	2,355	0	200	5,927	0	2,546
Urban lakes and ponds		60	80	43	72	0	167	43	0	0	76	19

Table 4. Fish species stocked in the East River Fisheries Management Area from 2008 to 2010 (small lakes are \leq 150 acres, large lakes are $>$ 150 acres).

Type	Classification	Fish Species
Small natural lakes	Marginal	Largemouth Bass, Northern Pike, Walleye, Yellow Perch
Large natural lakes	Marginal	Black Crappie, Northern Pike, Walleye, Yellow Perch
	Permanent & Semi-Permanent	Black Crappie, Bluegill, Musky, Smallmouth Bass, Walleye, Yellow Perch
Small impoundments	Marginal	Bluegill, Largemouth Bass, Rainbow Trout, White Bass
	Permanent & Semi-Permanent	Bluegill, Largemouth Bass, Walleye, Yellow Perch
Large impoundments	Marginal	Walleye
	Permanent & Semi-Permanent	Black Crappie, Bluegill, Musky, Walleye
Urban lakes and ponds		
		Black Crappie, Bluegill, Channel Catfish, Largemouth Bass, Northern Pike, Rainbow Trout, White Bass, Yellow Perch

Streams: The Big Sioux, Vermillion and James River basins contain the highest species diversity found in the East River Fisheries Management Area. Aside from setting and enforcing regulations, GFP currently does little to manage stream fisheries. Although not actively managed, eastern South Dakota streams contain fishable populations of Channel and Flathead Catfish, Black Bullhead, Northern Pike, Walleye, Freshwater Drum and several species of panfish (Hansen 1981; Braaten 1993; Christianson 1995; Dieterman and Berry 1995; Doorenbos et al. 1996; Arterburn 2001). The movement of walleyes into rivers during high water periods likely helps to supplement stream populations (Blackwell 2001).

From the early 1900s through the 1950s, eastern South Dakota streams were stocked with a variety of species, including Walleye, Yellow Perch, Black Crappie, Largemouth Bass, Channel Catfish, Bullhead, and Rainbow Trout. After 1960, these stockings were mostly limited to Walleye and Smallmouth Bass. No fish have been stocked into the three major rivers since 1988. However, Smallmouth Bass were stocked into Split Rock Creek (Minnehaha County) through 1998 and trout were stocked into Gary Creek (Deuel County) through 2005.

Many of the 23 aquatic species listed as threatened, endangered, rare, or Species of Greatest Conservation Need (SGCN) by South Dakota's State Wildlife Action Plan (WAP) and the South Dakota Natural Heritage Program are found in East River Fisheries Management Area streams (Table 5; SDGFP 2006). Topeka Shiners are found solely in streams and recent sampling efforts have found they are more common in South Dakota than in the rest of their range. Studies done after federal listing have documented their presence in 80% of historically known streams and have also documented them in other streams where they had not been previously reported (Shearer 2003). Topeka Shiners are found in tributaries of the Big Sioux, Vermillion and James Rivers. Blausey (2001) found that Topeka Shiners were associated with areas of low livestock use, overhanging vegetation, low siltation, and run/glide habitats composed of fine gravel and cobble substrates. Topeka Shiners were also collected in backwater areas and from streams with degraded habitats like incised channels, highly-eroded banks and intensively-grazed riparian zones (Shearer 2003). The State of South Dakota has developed a management plan to maintain habitat integrity in Topeka Shiner streams and establish a point-based management goal for the state to contribute towards national recovery efforts (Shearer 2003).

A recent study by the Department of Environment and Natural Resources and South Dakota State University has contributed greatly to knowledge of fish communities in eastern South Dakota streams. Krause (2013) sampled 54 sites on eastern South Dakota streams in the development of a fish Index of Biological Integrity (IBI) which is used to index stream health. Fish community information was collected at all sites, establishing baseline data for long-term monitoring of stream fish communities.

Table 5. South Dakota Natural Heritage Program and Federally listed species in the East River Fisheries Management Area. Status abbreviations: LE= federally endangered; LT=federally threatened; SE = state endangered; ST = state threatened; SGCN = Species of Greatest Conservation Need.

Common Name	Scientific Name	Federal Status	State Status
<i>Fish</i>			
Banded Killfish	<i>Fundulus diaphanus</i>		SE, SGCN
Blacknose Shiner	<i>Notropis heterolepis</i>		SE, SGCN
Blackside Darter	<i>Percina maculata</i>		SGCN
Blue Sucker	<i>Cycleptus elongatus</i>		
Carmine Shiner	<i>Notropis percobromus</i>		SGCN
Central Mudminnow	<i>Umbra limi</i>		SGCN
Hornyhead Chub	<i>Nocomis biguttatus</i>		SGCN
Logperch	<i>Percina caprodes</i>		SGCN
Northern Redbelly Dace	<i>Chrosomus eos</i>		ST, SGCN
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	LE	SE, SGCN
Shovelnose Sturgeon	<i>Scaphirhynchus platyrhynchus</i>	LT	SGCN
Southern Redbelly Dace	<i>Chrosomus erythrogaster</i>		SGCN
Topeka Shiner	<i>Notropis topeka</i>	LE	SGCN
Trout-perch	<i>Percopsis omiscomaycus</i>		SGCN
<i>Turtles</i>			
False Map Turtle	<i>Graptemys pseudogeographica</i>		ST, SGCN
Smooth Softshell	<i>Apalone mutica</i>		SGCN
<i>Mussels</i>			
Creek Heelsplitter	<i>Lasmigona compressa</i>		SGCN
Elktoe	<i>Alasmidonta marginata</i>		SGCN
Hickorynut	<i>Obovaria olivaria</i>		SGCN
Mapleleaf	<i>Quadrula quadrula</i>		SGCN
Pimpleback	<i>Quadrula pustulosa</i>		SGCN
Rock Pocketbook	<i>Arcidens confragosus</i>		SGCN
Yellow Sandshell	<i>Lampsilis teres</i>		SGCN

Bighead and Silver Carp have recently been found in the Big Sioux, Vermillion and James River basins. The rapid expansion of Asian carp throughout these basins was likely expedited by recent flooding. Asian carp inhabit all sections of the James River, but upstream movement in the Big Sioux River has been stopped by the falls in Sioux Falls and by the East Lake Vermillion dam on the Vermillion River. Young-of-the-year Asian carp were collected from several small tributaries, suggesting that these streams may be an important part of the carp lifecycle.

People

About 568,000 people live in the East River Fisheries Management Area, and 40% of these are in the Sioux Falls metropolitan area. Nearly 120,000 people reside in Aberdeen, Brookings, Huron, Mitchell, Pierre, Watertown and Yankton. Compared to population losses from rural areas, recent population growth in these urban areas has occurred and is likely to continue. In addition to increased populations, ethnic diversity in urban areas has also increased, creating new challenges for fisheries management.

With 70% of South Dakota's population living in the East River Fisheries Management Area, providing ample fishing opportunities is essential. In addition to abundant fish populations, access is needed both to attract anglers and enhance the quality of the fishing experience. Fishing access features commonly provided on lakes include a boat ramp, boat dock, and space for shore fishing adjacent to the launch site. Over 50% of large natural lakes have boat launching facilities, compared to only 21% of the small natural lakes (Table 6).

Most lakes have public shore fishing access, even if it is only a small area next to a boat ramp. Shore fishing sites that are mowed or otherwise improved are rare, but commonly requested by the public, as is vehicle parking close to the water for shore fishing. Small and large impoundments are most likely to provide shoreline access for vehicles.

Fishing piers are popular with anglers, but have only been installed on a few lakes. Large impoundments with a state park are most likely to have a fishing pier. Fish attracting structures have also been added to some lakes. Most lakes do not have handicapped access, and only 40% of waters managed by GFP have a public toilet.

Fisheries within the East River Fisheries Management Area can be subjected to high fishing pressure, especially when they provide fast fishing for walleye, yellow perch or crappie or are located in urban areas. Although urban and community fisheries only comprise a small portion of managed waters, they typically support the greatest amount of fishing pressure per acre of water (Table 7). Fishing pressure is typically much higher during the summer than the winter. As the most abundant type of water in eastern South Dakota, natural lakes support the majority of angling pressure.

Table 6. Percent of lakes by type having various fishing access components in the South Dakota East River Fisheries Management Area (small lakes \leq 150 acres, large lakes $>$ 150 acres).

Access	Natural Lakes		Impoundments		Urban Ponds
	Small	Large	Small	Large	
Number of lakes	133	50	15	31	
Boat launch	21.4	58.6	70.0	93.3	16.1
Shore fishing	75.0	100.0	94.0	100	96.8
Dock	17.9	55.6	50.0	86.7	3.2
Fishing pier	10.7	6.0	2.0	40.0	12.9
Toilet	10.7	36.1	46.0	86.7	54.8
Picnic area	3.6	14.3	22.0	6.0	26.0
Improved fishing site	7.1	6.8	6.0	33.3	12.9
Park present	3.6	15.0	26.0	66.7	61.3
Near-shore vehicle access	14.3	36.8	60.0	86.7	12.9
Fish holding structures	39.3	25.6	12.0	26.7	16.1
Handicapped access	7.1	5.3	6.0	26.7	6.5

The Big Sioux, Vermillion and James Rivers also support considerable fishing pressure, although fishing pressure has never been measured on the Vermillion River. Doorenbos et al. (1996) estimated that anglers spent over 120,000 hours fishing the Big Sioux River from March through October of 1995. Hansen (1981) found that anglers spent about 140,000 hours open-water fishing on the James River in 1976-77. These rivers may account for more than 10% of the total fishing pressure in the East River Fisheries Management Area. Most anglers traveled less than 26 miles and the majority was satisfied with their fishing trips (Doorenbos et al. 1996). At both of these rivers, the hours spent picnicking, exercising, camping, and just relaxing outside far exceeded the hours spent fishing.

The economic value of the East River Fisheries Management Area exceeds \$56 million annually, with fishing at natural lakes responsible for 75% of the expenditures.

Table 7. Average fishing pressure by lake type and season.

	Season	Hours per acre	Total hours	Trip length (hours)	Angler days	Economic value (\$)
	Summer	10.3	2,036,495	3.75	543,065	33,126,992
	Winter	3.4	672,241	4.34	154,894	9,448,551
	Combined		2,708,737		697,960	42,575,543
Small impoundments	Summer	67.4	184,619	3.07	60,137	3,668,334
	Winter	22.5	61,540	3.07	20,046	1,222,778
	Combined		246,159		80,182	4,891,112
Large impoundments	Summer	32.3	249,652	2.79	89,481	5,458,331
	Winter	8.4	64,744	2.73	23,716	1,446,667
	Combined		314,396		113,197	6,904,998
Urban lakes and ponds	Summer	161.3	55,003	1.64	33,539	2,045,854
	Winter	28.9	9,855	1.75	5,631	343,514
	Combined		64,858		39,170	2,389,368
Total			3,334,150		930,509	56,761,021

III. Issues and Opportunities

Since the first strategic plan was developed in 1994, some of the fisheries management concerns have changed. For example, planners in 1994 identified inconsistent recruitment of game fish, inadequate public input, and poor public relations as some of the most important issues (SDGFP 1994). None of those issues were identified as important in the current plan. This is likely because efforts to gather public input through angler surveys, and to interact with the public using open houses and regional advisory panels, have addressed two of these issues. Access to small waters, information and education, and regulation compliance were also identified as high priority issues in 1994. Focused efforts since then have hopefully reduced their importance.

Many issues deemed important in 1994 continue to rank highly however. Concerns about degradation and loss of aquatic habitat are still prevalent. Although efforts have been taken to address these issues, “watershed scale” management practices have not been achieved. Therefore, problems with the loss of shoreline habitat, siltation, degradation of the riparian corridor, and alteration of stream flows (due to agricultural practices and urbanization) persist, and in some cases, have accelerated. Also, a decline in the number of people using the fisheries resource, identified in the prior plan, has continued, and remains a major issue.

Issues identified for the East River Fisheries Management Area were placed into the categories of habitat, fish and people. However, many of the issues could fit into more than one category.

Habitat

1. *Issue:* Loss of shoreline habitat.

A lack of understanding of ecological impacts or a lack of concern for fisheries by modern lakeshore property owners is reflected by current shoreline development practices. Replacing native shoreline plants and trees with fertilized lawns, rip-rapping and seawalls for shoreline stabilization, sand beaches, and the removal of submergent and emergent aquatic vegetation have degraded shoreline habitat. Considerable research in the last 10 years has shown that these practices negatively impact fish populations. Challenges to reversing these impacts include a resistance to change by property owners and a lack of coordination between responsible agencies.

Opportunities:

Water quality is an important issue to most South Dakotans. GFP can promote shoreline projects to lakeshore property owners and lake associations as actions to improve water quality. GFP can provide examples of successful lakeshore

renovations through pilot projects, workshops, and on the GFP website. Shoreline easements could also be pursued to protect shoreline habitat. GFP needs to use the expertise and funds acquired by actively participating in the Glacial Lakes and Great Plains Fish Habitat Partnerships to complete shoreline renovation and protection projects.

2. *Issue: Watershed degradation.*

Intensive agricultural practices, such as ditching, tiling, and plowing of native prairie or Conservation Reserve Program plantings, have resulted in the loss of riparian habitat, leading to increased siltation, increased nutrient loadings, and alteration of stream hydrology. Watershed degradation has increased the frequency of winterkill, reduced the utility and lifespan of small impoundments, and decreased the diversity and distribution of native stream fishes. Inadvertently or illegally introduced exotic nuisance species and diseases also have negative impacts. Challenges to correcting these issues include resistance to change, inadequate information, and a lack of coordination between responsible agencies.

Opportunities:

Watershed-related activities may include developing a procedural manual to guide fisheries staff implementing projects to protect and enhance riparian habitat. Also, a program, like the Conservation Reserve Enhancement Program, to maintain the integrity of riparian areas can be developed, focusing on water quality. Additionally, promoting the development of Environmental Protection Agency 319 projects in impaired watersheds can occur. The impact of sedimentation on impoundments can be mitigated through the construction of sediment dams or water-level management. Organizations such as Walleyes Unlimited, the BASS Federation, the Izaak Walton League and the Nature Conservancy should be involved in these efforts, and the expertise and funds acquired through active participation in the Glacial Lakes and Great Plains Fish Habitat Partnerships needs to be used. Finally, the interaction, communication, and cooperation between natural resource and other agencies needs to be promoted to solve complex habitat issues.

3. *Issue: Deteriorating quality of impoundments.*

Many impoundments are over 70 years old and nearing the end of their useful lifespan. Their infrastructure is deteriorating, with siltation and nutrient-loading degrading habitat and increasing the frequency of fish kills. These waters now provide only limited fishing opportunity.

Opportunities:

Actions are needed to restore some small impoundments. The Iowa DNR has successfully restored small impoundments by improving watershed conditions, reconstructing the lake basin, and eliminating undesirable fishes. However, large-

scale restoration projects can be expensive and require considerable time to complete. Public support for such projects might be obtained by completing a short-term demonstration project to restore fish populations. As the utility of traditional management options (i.e. fish stocking, regulations, etc.) diminishes, long-term and large-scale restoration of small impoundments will require a concerted effort on behalf of resource managers, anglers, and the public.

4. *Issue: Introduction of exotic plants and animals.*

The introduction of common carp well over a century ago has had a large impact on fisheries habitat in Eastern South Dakota. More recently, exotic plants such as brittle naiad and curlyleaf pondweed, and fish species including bighead carp and silver carp, are now found in the East River Fisheries Management Area. The full impact of these exotic invasive species remains to be seen.

Opportunities:

To reduce the chance of exotic plant and animal introductions or their spread, regulations governing the movement and introduction of these exotics need to be continually reviewed and updated. Educational programs to make resource users more aware of these issues should be developed, and the use of the Internet to inform resource users expanded.

Fish

1. *Issue: Problems with accurately assessing the benefits of management actions.*

Natural systems are highly variable, making estimating the benefits of a management action often a complex, time-consuming, and costly task. Examples of current practices that need evaluation include the use of minimum length limits, the use of trap and transfer stocking to supplement existing fish populations, and the effectiveness of current fish management strategies in marginal waters. Past studies to investigate these practices have often provided inconclusive results.

2. *Issue: Standardization of data collection methods and storage.*

Methods to standardize fish survey data collection techniques were implemented in the 1990s. However, further standardization of techniques may be merited and beneficial. Requests for broad-scale fisheries data by students, researchers, and professional organizations are steadily increasing. Assembling this data from various sources and in multiple formats can be time-consuming and costly.

Opportunities:

The current effort to develop a standardized database should be completed. This will simplify data retrieval, facilitate more comprehensive analysis, and streamline reporting.

3. *Issue:* Balancing the need for monitoring with taking beneficial action.

Annual fish population surveys provide useful and needed information for fisheries management. However, they also consume time that might otherwise be used to complete projects that would benefit our customers and the resource.

4. *Issue:* Poor panfish size structure in small impoundments and lakes.

Many small impoundments and some natural lakes do not produce larger panfish preferred by anglers. Slow growth and high adult mortality inhibit the production of larger fish. These fisheries could provide more angling opportunity if larger panfish could be produced. Biomanipulation techniques such as predator stocking, reducing panfish numbers by netting removals, and prey fish stocking have been effective on small impoundments, but only for a limited time.

Opportunities:

Low productivity in small impoundments is often related to poor water quality. Projects with the potential to improve water quality include silt retention dams, low-level outlets, aeration, and circulation. Prey fish stocking also has the potential to increase panfish growth and average size. Evaluation of juvenile largemouth bass stockings to improve predator-prey relationships in these waters can also continue.

5. *Issue:* High natural mortality of yellow perch and crappie in natural lakes.

Yellow perch and crappies seldom live longer than 4 or 5 years in many East River Fisheries Management Area natural lakes. This short lifespan combined with sporadic recruitment often produce inconsistent fishing opportunity.

6. *Issue:* Lack of stream inventories and monitoring, especially for Natural Heritage-listed and federally-threatened or endangered species.

Many tributaries of the three major rivers in the Fisheries Management Area have never been surveyed. The few surveys that have been completed only contain qualitative data (e.g., lists of fish species present). Without density data or population estimates, there is no baseline to measure potential changes in stream fish communities. Federally-endangered Topeka Shiners are more abundant in the East River Fisheries Management Area than anywhere else. Increased planting of

row crops, agricultural drainage and tiling, and urban sprawl could affect their status. This may affect the ability to meet the state management plan goal of maintaining existing stream habitat, with the intent of delisting the species pursuant to the Endangered Species Act (Shearer 2003). Moreover, information on the status of heritage-listed species in these streams can serve as a valuable indicator of stream and watershed health.

7. *Issue:* The lack of current and historical information on river and stream fish populations and sport fisheries.

GFP does not actively manage game fish populations in the Big Sioux, Vermillion and James Rivers. Thus, stream fisheries regulations are the same as those for lakes and impoundments in order to maintain uniformity. Information on stream game fish populations and fisheries is needed before management activities can be considered.

People

1. *Issue:* Cultural changes causing a decline in the use of fisheries resources.

Urbanization, single parent families, video games, organized sports, and low household incomes have all been cited as reasons for declining numbers of young anglers. Fewer young anglers will mean lower revenues and less support for the sport of angling in the future.

Opportunities:

GFP has recently increased efforts to recruit young anglers. Programs like Step Outside have been implemented in cities and towns across the East River Fisheries Management Area. The GFP Outdoor Campus in Sioux Falls teaches about 150 fishing classes to nearly 3,000 children each year. GFP is trying to provide youth fishing opportunities that are easily accessible. Urban and community waters are aggressively stocked with adult fish to provide easy access to fishing for youth. GFP also promotes fishing in urban waters by stocking catchable rainbow trout and other species into lakes within the city limits of Watertown, Brookings, and Sioux Falls. Creel surveys have shown that urban waters are popular with young anglers and may serve as a potential recruitment tool. New programs to direct educational efforts at kids who are not actively participating in the outdoors may be possible through organizations like the Boys and Girls Clubs. These efforts will be evaluated and, if successful, continued or expanded.

Other opportunities exist to simplify and make fishing trips more enjoyable for beginning, novice, or casual anglers. Shore fishing access areas can be made more “user friendly” with the addition of fishing piers (some with canopies), enhanced shoreline access points (large flat rocks or concrete pads), close-to-shore vehicle access, trails from parking areas to fishing sites, and fish

attracting habitat. Likewise, snow removal from access points can increase the use of winter fisheries. Steps must also be taken to improve the fishing experience for the growing number of anglers from diverse ethnic backgrounds. A potential first step could be to develop fishing regulation booklets in various languages.

Recruitment programs should be monitored to evaluate their success in achieving objectives. Effective evaluation methodologies should be developed to identify successful programs and eliminate unsuccessful ones. Creel surveys and statewide angler surveys can help provide this type of information.

Methods to more effectively communicate with our customers should be investigated. Social media can be used to inform, teach, and advertise. The Internet can be used to convey resource locations and management reports. The GFP website can provide permits and application forms, and give instructions for completing them. Information on regulation changes or Aquatic Nuisance Species can also be communicated using the website.

2. *Issue: Access issues where waters on private property adjoin public property under high water conditions.*

Waters over private property accessible from adjoining public land with active fisheries have become sources of conflict between anglers and landowners. The less-than-clear legality of the public's right to use these waters adds to the controversy.

IV. Goal, Objectives and Strategies

Goal: Manage fisheries and aquatic resources in the East River Fish Management Area of South Dakota for long-term sustainable use and enjoyment.

Objective 1: Identify and participate in watershed maintenance and restoration efforts by 2018.

Strategy 1.1 Assemble a team to work on watershed issues.

Strategy 1.2 Determine the potential roles GFP can play in watershed management.

Strategy 1.3 Develop new partnerships with groups already working in the watersheds.

Strategy 1.4 Continue to utilize the expertise and funding of organizations like the Glacial Lakes Fish Habitat Partnership, other state agencies, and watershed development districts to implement watershed projects.

Strategy 1.5 Build relationships with lake associations by attending their meetings and functions.

Strategy 1.6 Participate in two watershed management/enhancement projects in the East River Fisheries Management Area.

Objective 2: Develop and standardize surveys to inventory and monitor stream and riverine fishes by 2018.

Strategy 2.1 Develop and prioritize a list of fish species to focus on (e.g. SGCN and riverine game species).

Strategy 2.2 Design a standardized survey and sampling protocol.

Strategy 2.3 Incorporate existing Index of Biotic Integrity data into the analysis.

Strategy 2.4 Identify and collaborate with partners to develop and conduct surveys.

Strategy 2.5 Conduct multiple surveys over time so changes in the watershed, aquatic habitats and fish community can be evaluated.

Objective 3: Utilize fish community and angler survey information to direct watershed and aquatic habitat work by 2018.

Strategy 3.1 Share survey information with potentially affected individuals.

Strategy 3.2 Prioritize efforts based on survey results.

Objective 4: Conduct projects to assess the condition of stream and riverine communities by 2018.

Strategy 4.1 Conduct a statewide mussel survey.

Strategy 4.2 Continue to monitor Topeka shiners under an improved protocol.

Strategy 4.3 Revisit Index of Biological Integrity study sites by 2018 to search for changes in site scores.

Strategy 4.4 Conduct 1-2 projects designed to assess population dynamics of Species of Greatest Conservation Need by 2018.

Strategy 4.5 Conduct studies to assess changing fish communities, especially in areas recently invaded by exotic species.

Objective 5: Identify critical shoreline habitat around heavily-developed lakes to direct shoreline enhancement and protection efforts by 2018.

Strategy 5.1 Use remote sensing to evaluate changes in shoreline habitat.

Strategy 5.2 Develop a protocol to accurately assess changes to the shoreline.

Strategy 5.3 Identify critical shoreline areas and the thresholds needed to support quality game fish and panfish populations.

Strategy 5.4 Prioritize potential shoreline enhancement and protection projects.

Strategy 5.5 Implement projects to protect and enhance the most critical shoreline habitats.

Objective 6: Increase angler use on small impoundments by 2018.

Strategy 6.1 Evaluate current angler use on small impoundments.

Strategy 6.2 Abandon bass and panfish management on some small impoundments with limited aquatic habitat and implement a perch and walleye stocking strategy.

Strategy 6.3 Evaluate the stocking of prey fish species, such as fathead minnows or gizzard shad, into small impoundments where game fish growth is below average.

Strategy 6.4 Reduce panfish abundance to increase the population size structure in small impoundments where growth is density-dependent.

Strategy 6.5 Evaluate the effects of aeration or circulation technology to prevent summer stratification on one small impoundment.

Strategy 6.6 Evaluate the use of aeration or circulation technology to prevent winterkill on small impoundments.

Strategy 6.7 Conduct a demonstration project (e.g. drawdown or settling pond) aimed at restoring small impoundment fish populations.

Strategy 6.8 Conduct projects to improve shoreline fishing access on small impoundments affected by excessive aquatic vegetation during the summer.

Strategy 6.9 Conduct projects to improve vehicle and boat access.

Strategy 6.10 Evaluate angler use after implementation of management strategies to determine if any increases can be detected.

Strategy 6.11 Rehabilitate aging small impoundments in areas that lack fishing opportunity.

Strategy 6.12 Use social marketing techniques to increase angler awareness about the harm caused by unauthorized fish introductions into small impoundments and other waters.

Objective 7: Investigate the cause of high natural mortality in panfish populations and identify potential mediation methods by 2018.

Strategy 7.1 Identify populations having high natural mortality.

Strategy 7.2 Examine current and historic data to determine if high mortality is cyclical.

Strategy 7.3 Develop research projects (e.g., yellow perch genetics) to identify potential causes of observed mortality schedules.

Objective 8: Evaluate the effectiveness of stocking adult fish into existing fish populations by 2018.

Strategy 8.1 Compare stocking records with lake survey results and the return rates of stocked fish to anglers.

Strategy 8.2 Use new technologies (e.g. otolith microchemistry, marking, etc.) to evaluate the contribution of adult fish stocking into existing populations.

Objective 9: Evaluate the effectiveness of hatchery-produced yellow perch stocking by 2018.

Strategy 9.1 Develop effective sampling techniques for age-0 yellow perch.

Strategy 9.2 Determine the contribution of stocked eggs, fry or fingerling perch to existing populations.

Strategy 9.3 Evaluate the stocking of yellow perch eyed eggs into waters without yellow perch.

Strategy 9.4 Evaluate, in relation to the highest probability of increasing population abundance, the stocking of yellow perch eyed eggs, fry, and fingerlings at various rates.

Objective 10: Evaluate the feasibility and cost benefit of improving game fish populations in one to three small lakes dominated by nuisance fish species by 2018.

Strategy 10.1 Identify one to three small lakes with a history of overabundant nuisance fish species.

Strategy 10.2 Implement various nuisance fish control methods (e.g. netting, increased predator abundance, fish barriers, etc.) and evaluate.

Objective 11: Improve game fish populations and fishing opportunity on one to three marginal waters by 2018.

Strategy 11.1 Research current aeration and circulation technologies and evaluate their potential to reduce fish kills.

Strategy 11.2 Implement and evaluate various aggressive stocking strategies (e.g. annual stocking, increased stocking rates, etc.).

Strategy 11.3 Review current research and techniques on marginal lake restoration and management, and evaluate their potential for implementation in South Dakota.

Objective 12: Improve angler access on natural lakes.

Strategy 12.1 Work with counties and townships to create access sites along public road right-of-ways.

Strategy 12.2 Work with willing landowners to buy or lease property for access.

Strategy 12.3 Determine ways to increase funding for access development and maintenance.

Strategy 12.4 Develop shore fishing opportunities at one to five locations each year.

Strategy 12.5 Create shore fishing opportunities by clearing terrestrial and aquatic vegetation from shoreline areas.

Strategy 12.6 Continue to clear snow from access sites at selected lakes using GFP personnel and private contractors.

Objective 13: Improve information transfer about urban and community fisheries to fishery users by 2018.

Strategy 13.1 Use a survey to gather urban and community angler input on preferred methods for receiving information (e.g. signage, QR codes, news media, social media, etc.).

Strategy 13.2 Based on survey results, implement the communication methods preferred by most urban and community anglers.

Objective 14: Create five additional urban and community fishing opportunities by 2018.

Strategy 14.1 Inventory existing urban and community fisheries, and identify additional locations where fishing opportunity is needed.

Strategy 14.2 Investigate identified locations for urban and community fishery potential (e.g. existing ponds, pond construction potential, local government cooperation, etc.).

Strategy 14.3 Plan and establish new urban and community fisheries.

Objective 15: Improve angler access to four existing urban and community fisheries by 2018.

Strategy 15.1 Evaluate angler accessibility at existing urban and community fisheries and identify potential improvements (e.g. handicapped accessibility, fishing piers, shoreline access, trails, etc.).

Strategy 15.2 Prioritize potential improvement projects.

Strategy 15.3 Plan and implement the four highest priority access improvement projects.

Objective 16: Determine the most effective fish stocking strategies for urban and community fisheries by 2018.

Strategy 16.1 Conduct surveys to gather urban and community angler preference for species, size of fish caught, catch rates, and other pertinent information.

Strategy 16.2 Use survey results to develop a fish stocking plan for each fishery.

Strategy 16.3 Determine the most cost-effective stocking strategy for providing fish that produce the highest angler satisfaction.

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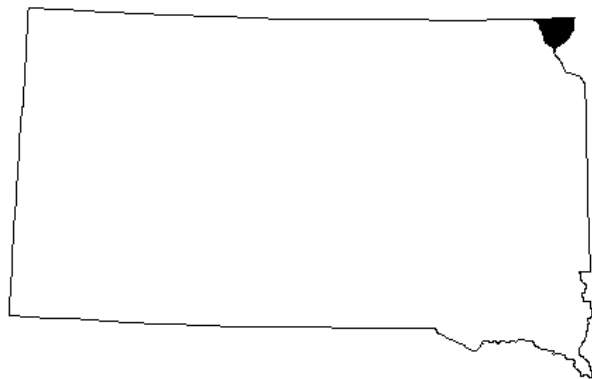
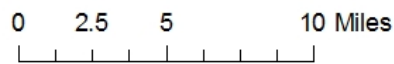
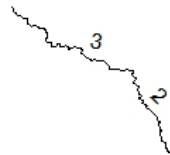
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Appendix 1. Eight digit HUC maps of named streams in eastern South Dakota

9020101

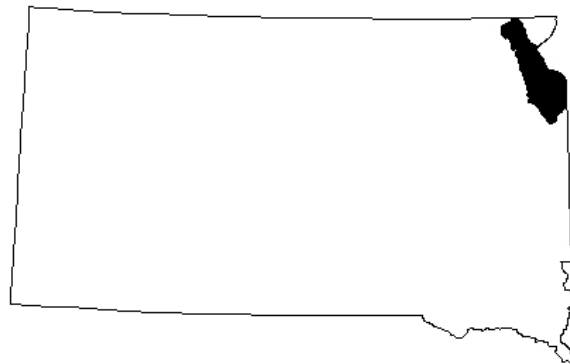
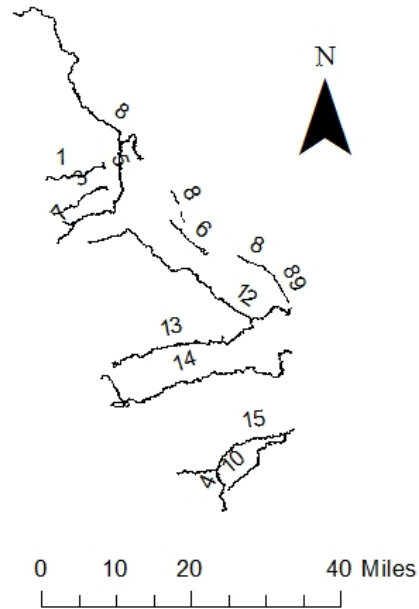
- 1 Bois De Sioux
- 2 Cottonwood Slough
- 3 Jim Creek



Appendix 1. Continued

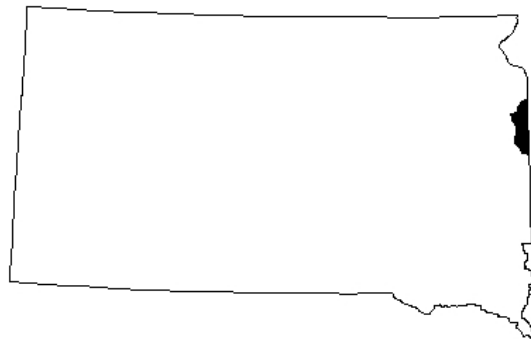
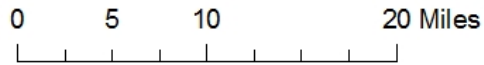
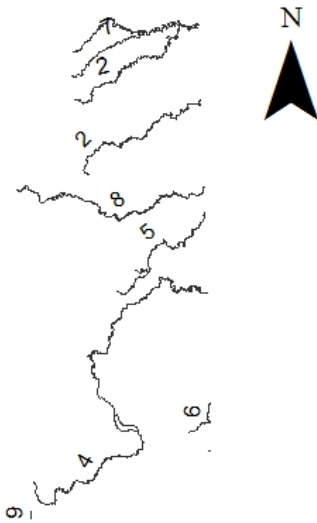
7020001

- 1 Agency Creek
- 2 Big Coulee Creek
- 3 Big Spring Creek
- 4 Caine Creek
- 5 Goodwill Creek
- 6 Hartford Beach Creek
- 7 Jorgenson River
- 8 Little Minnesota River
- 9 Minnesota River
- 10 Mud Creek
- 11 Whetstone River
- 12 Whetstone River, North Fork
- 13 Whetstone River, South Fork
- 14 Yellow Bank River, South Fork
- 15 Yellow Bank River, North Fork



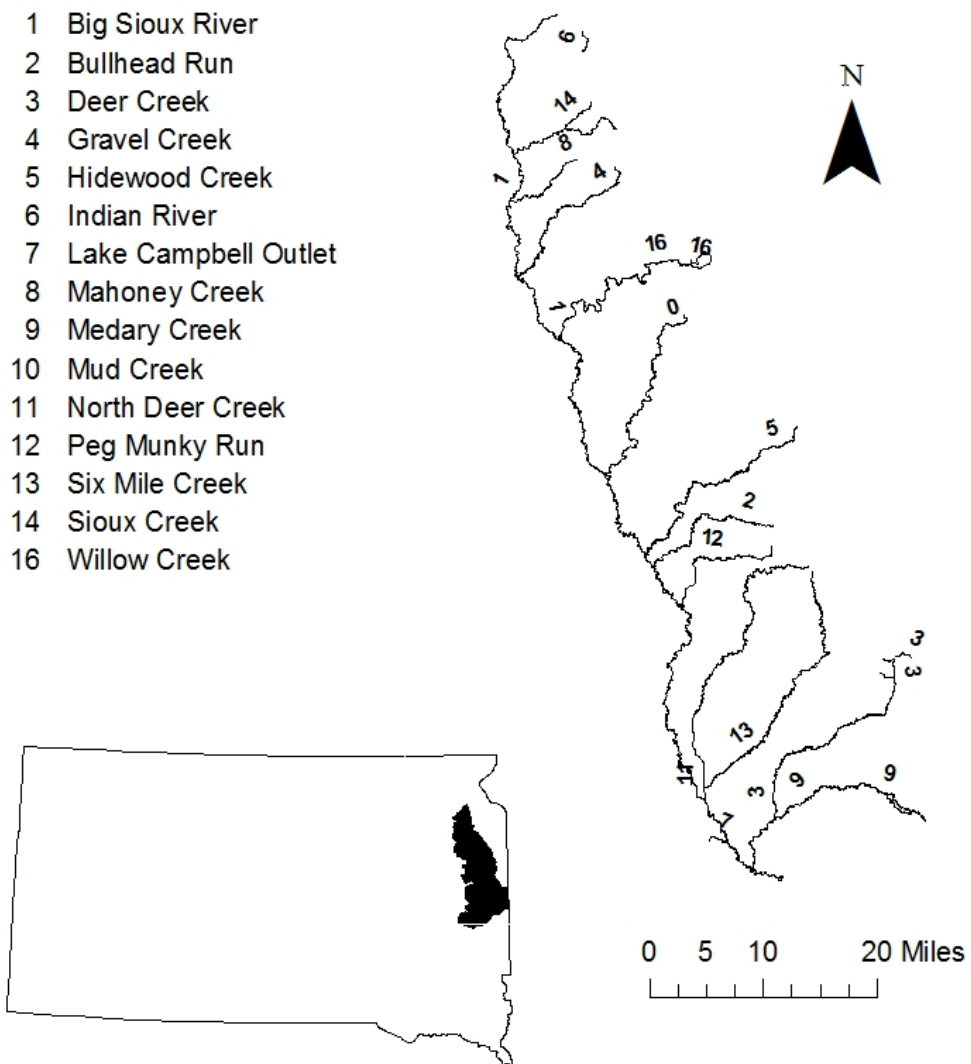
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- 1 Canby Creek
- 2 Crow Timber Creek
- 3 Deer Creek
- 4 Florida Creek
- 5 Lac Qui Parle River, West Branch
- 6 Lazarus Creek
- 7 Lost Creek
- 8 Monighan Creek
- 9 North Deer Creek



Appendix 1. Continued

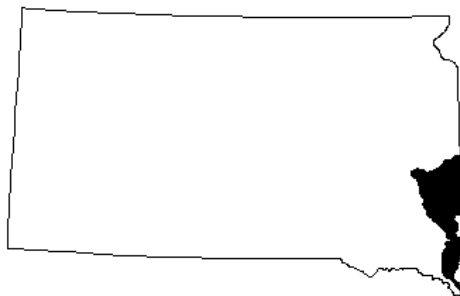
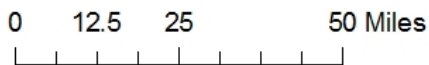
10170202



Appendix 1. Continued

10170203

- 1 Bachelor Creek
- 2 Beaver Creek
- 3 Beaver Creek, South Fork
- 4 Big Sioux River
- 5 Brookfield Creek
- 6 Brule Creek
- 7 Buffalo Creek
- 8 Brule Creek, East
- 9 East Union Creek
- 10 Finnie Creek
- 11 Green Creek
- 12 Little Beaver Creek
- 13 Mud Creek
- 14 Buffalo Creek, North
- 15 Negro Creek
- 16 Nine Mile Creek
- 17 Pattee Creek
- 18 Pipestone Creek
- 19 Richland Creek
- 20 Saddle Creek
- 21 Sargeant Creek
- 22 Sayles Creek
- 23 Scott Creek
- 24 Silver Creek
- 25 Skunk Creek
- 26 Skunk Creek, West Branch
- 27 Snake Creek
- 28 Green Creek, South
- 29 Split Rock Creek
- 30 Spring Creek
- 31 Squaw Creek
- 32 Brule Creek, West Branch
- 33 Pipestone Creek, West
- 34 Union Creek, West Branch
- 35 Willow Creek

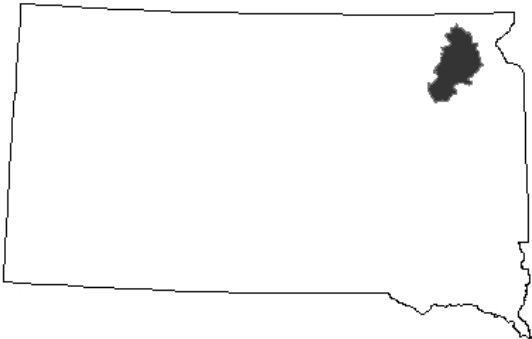


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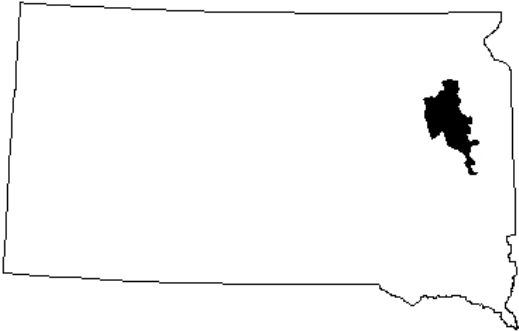
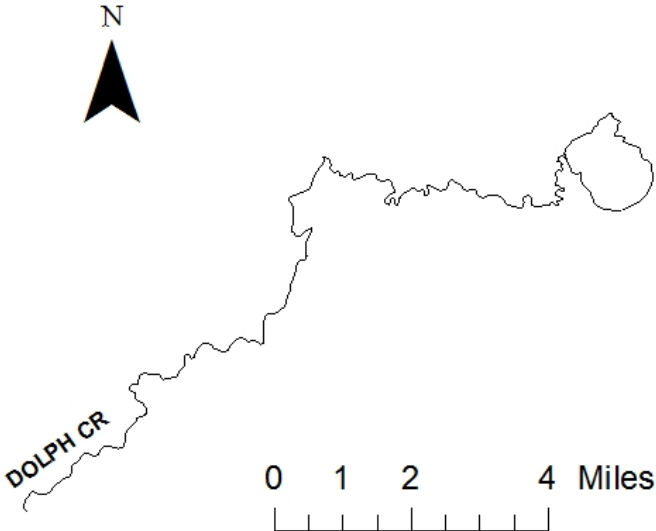
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- 1 Antelope Creek
- 2 Chekapa Creek

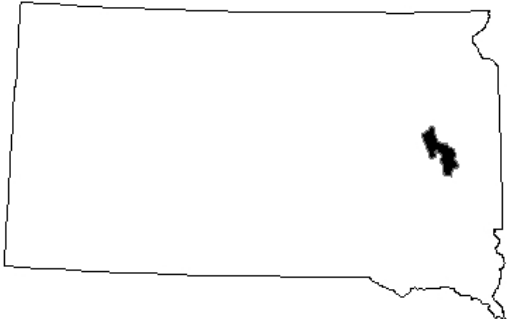
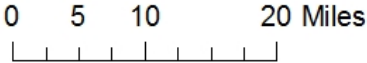
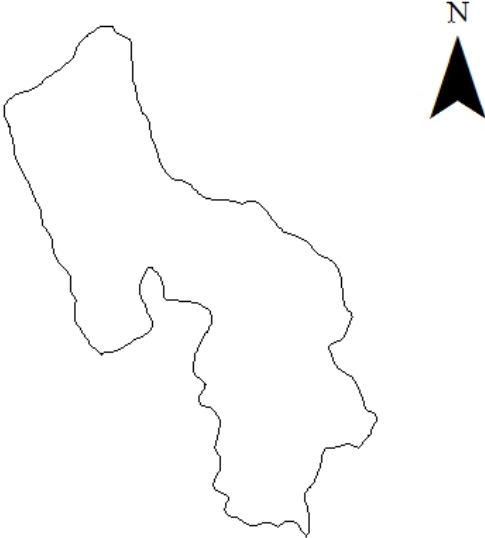
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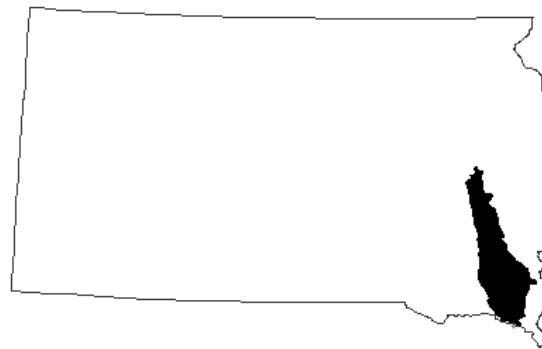
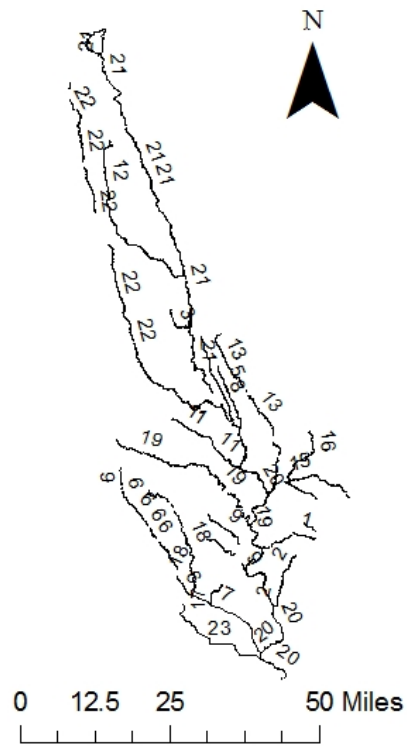
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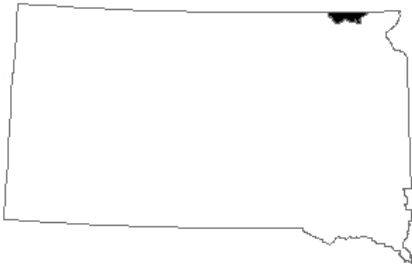
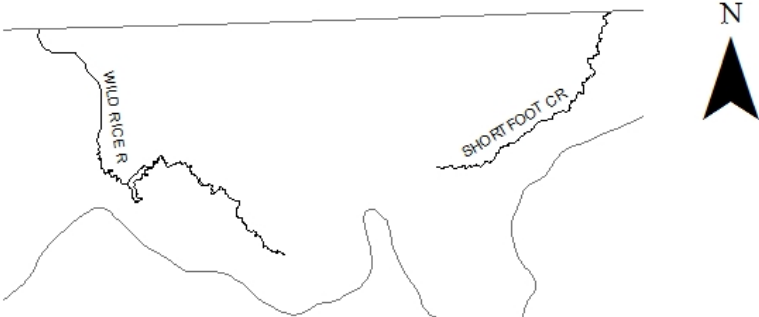
Appendix 1. Continued

10170102

- 1 Ash Creek
- 2 Baptist Creek
- 3 Battle Creek
- 4 Blind Creek
- 5 Camp Creek
- 6 Clay Creek
- 7 Clay Creek Ditch
- 8 Elce Creek
- 9 Frog Creek
- 10 Haram Creek
- 11 Hurley Creek
- 12 Little Vermillion River
- 13 Long Creek
- 14 Missouri River
- 15 Saddle Creek
- 16 Snake Creek
- 17 Spring Creek
- 18 Turkey Creek
- 19 Turkey Ridge Creek
- 20 Vermillion River
- 21 Vermillion River, East Fork
- 22 Vermillion River, West Fork
- 23 Yankton Clay Creek Ditch



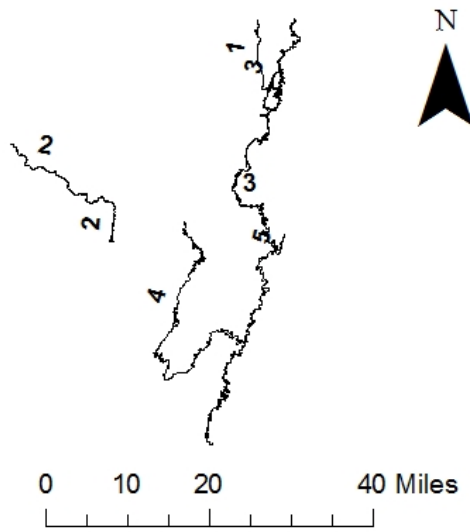
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Appendix 1. Continued

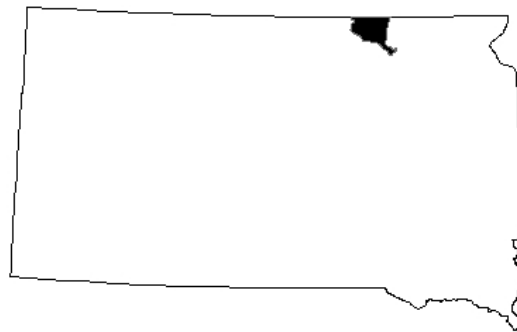
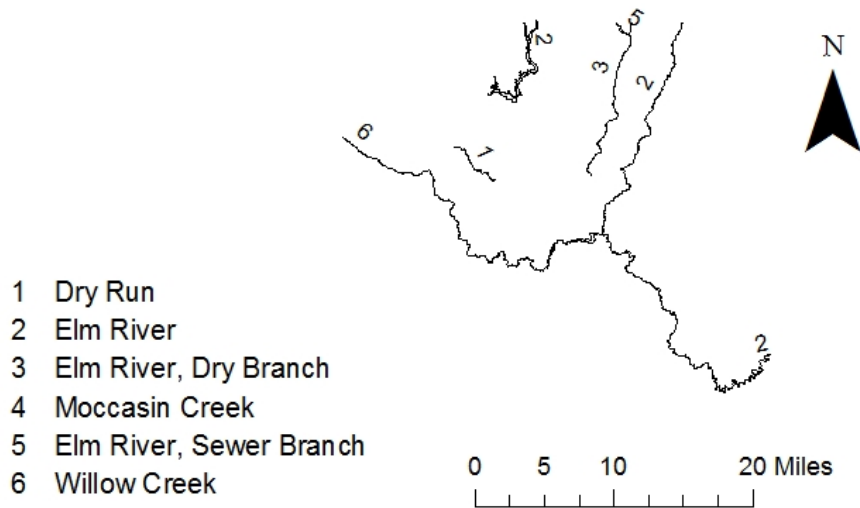
10160003

- 1 Dry Run
- 2 Foot Creek
- 3 James River
- 4 Moccasin Creek
- 5 Putney Slough



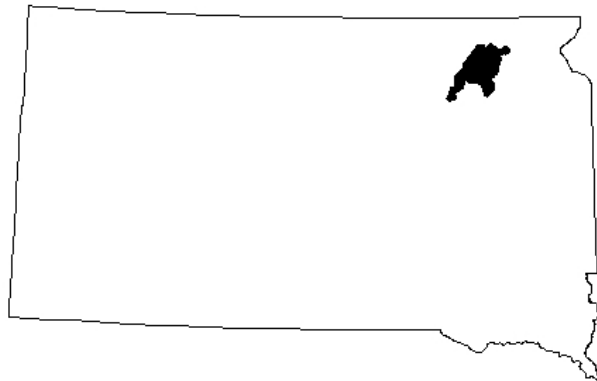
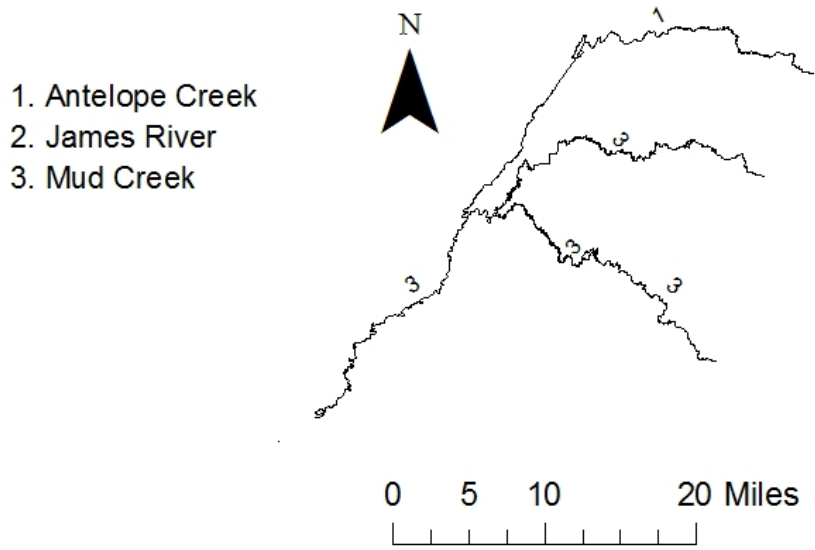
Appendix 1. Continued

10160004



Appendix 1. Continued

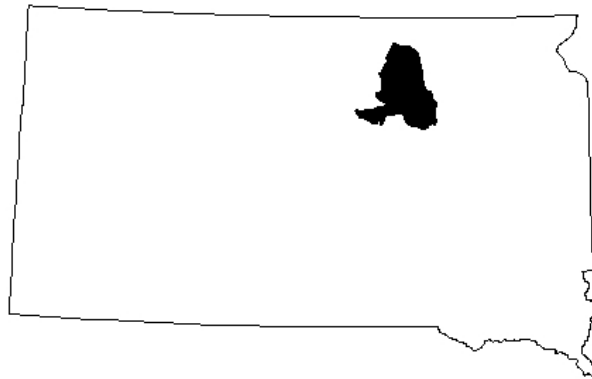
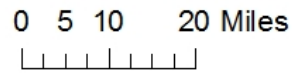
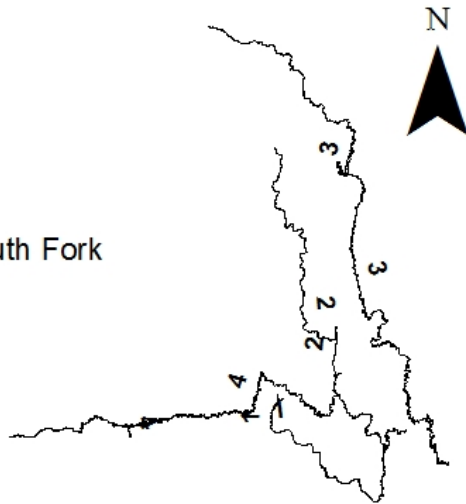
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10160008

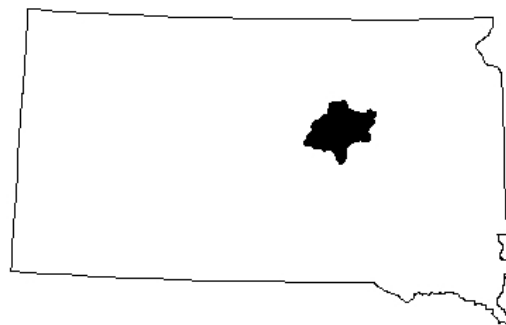
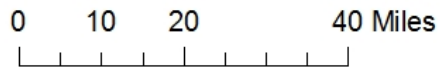
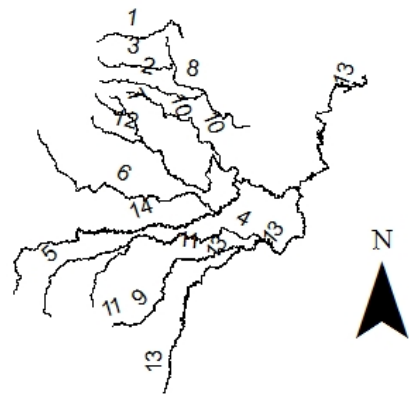
1. Dove Creek
2. Preacher's Run
3. Snake Creek
4. Snake Creek, South Fork



Appendix 1. Continued

10160009

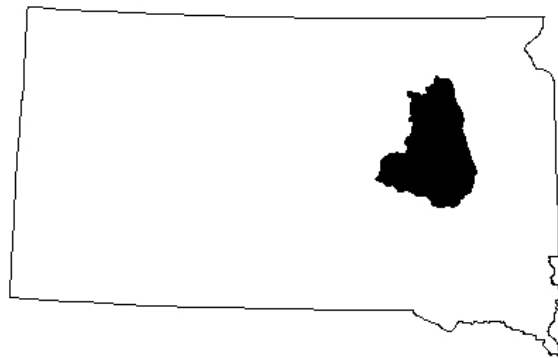
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- 2 Campbell Creek
- 3 Gooder Creek
- 4 Little Turtle Creek
- 5 Little Wolf Creek
- 6 Lost Creek
- 7 Matter Creek
- 8 Medicine Creek
- 9 Mud Creek
- 10 North Wolf Creek
- 11 Ree Creek
- 12 Shaefer Creek
- 13 Turtle Creek
- 14 Wolf Creek



Appendix 1. Continued

10160006

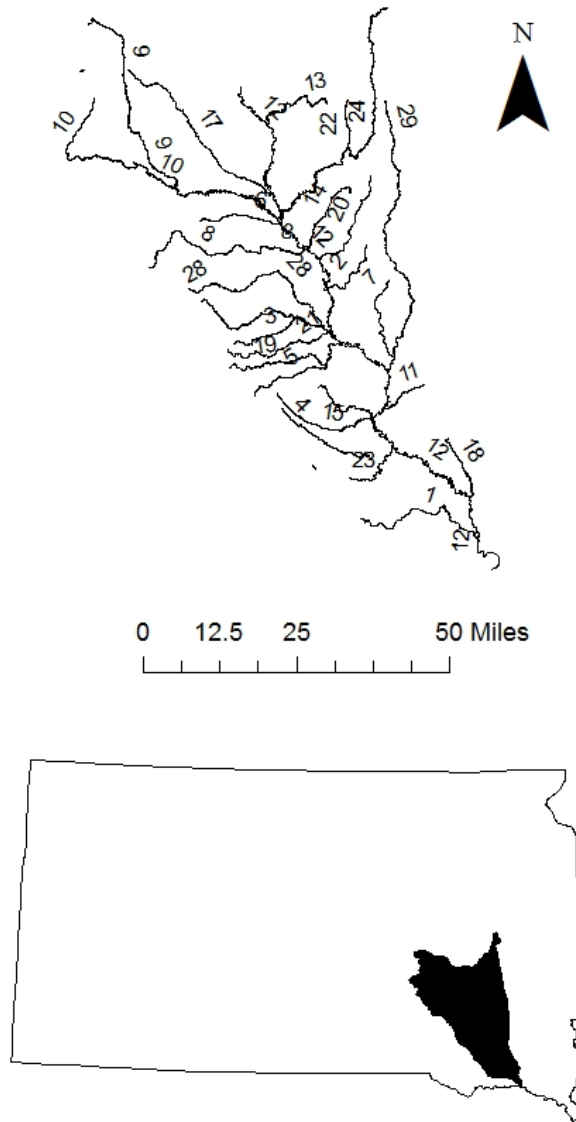
- 1 Cain Creek
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- 3 Fordham Creek
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- 11 Snake Creek
- 12 Timber Creek



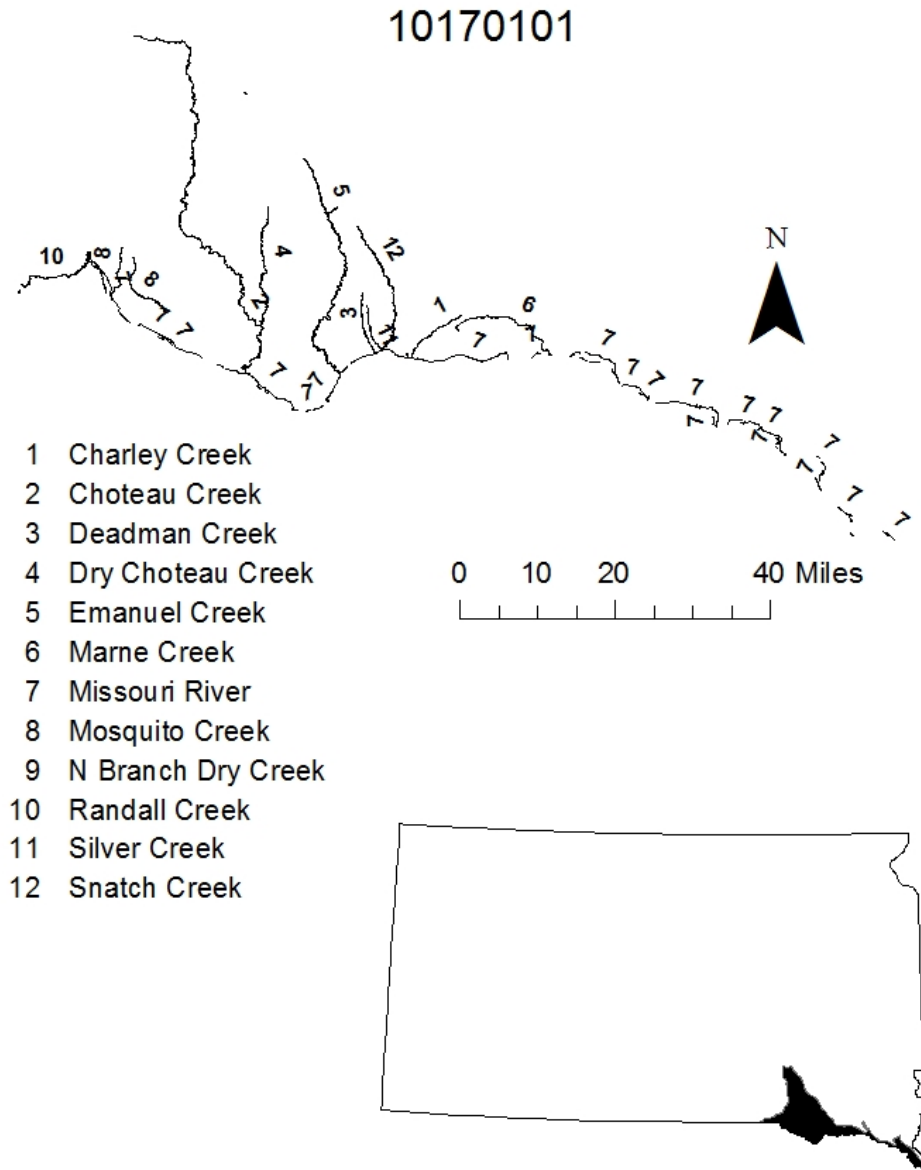
Appendix 1. Continued

10160011

- 1 Beaver Creek
- 2 Bloom Creek
- 3 Coffee Creek
- 4 Dawson Creek
- 5 Dry Creek, North Branch
- 6 Dry Run
- 7 Elm Creek
- 8 Enemy Creek
- 9 Firesteel Creek
- 10 Firesteel Creek, West
- 11 Furlong Creek
- 12 James River
- 13 Jim Creek
- 14 Johnson Creek
- 15 Lonetree Creek, South
- 16 Missouri River
- 17 Morris Creek
- 18 Mud Creek
- 19 North Branch Dry Creek
- 20 Pierre Creek
- 21 Pony Creek
- 22 Pooley Creek
- 23 Prairie Creek
- 24 Rock Creek
- 25 Sand Creek
- 26 Smith Creek, East Fork
- 27 Snatch Creek
- 28 Twelvemile Creek
- 29 Wolf Creek

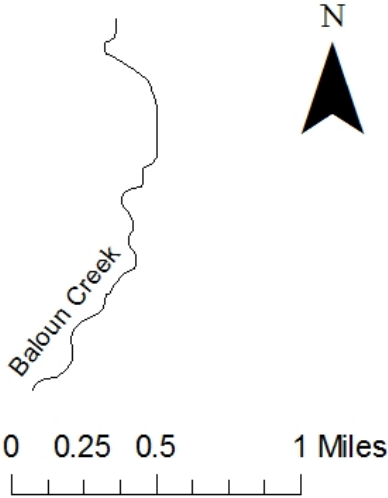


Appendix 1. Continued



Appendix 1. Continued

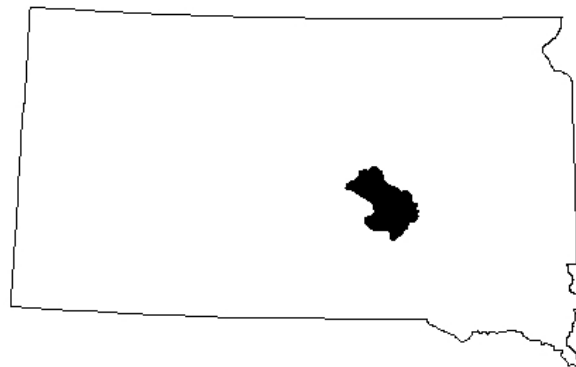
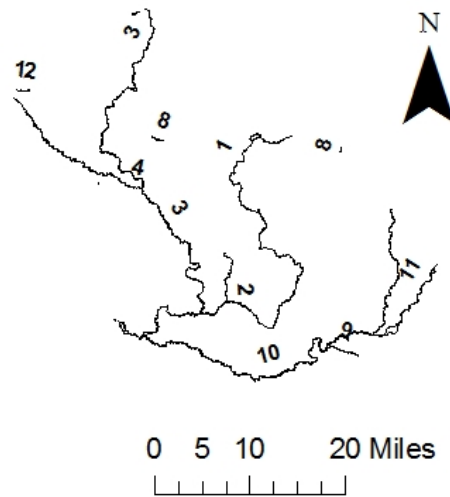
10160007



Appendix 1. Continued

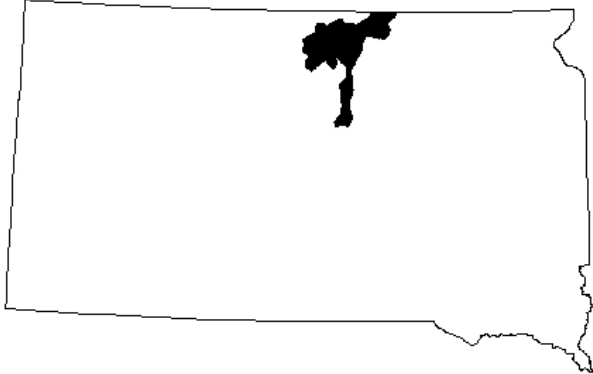
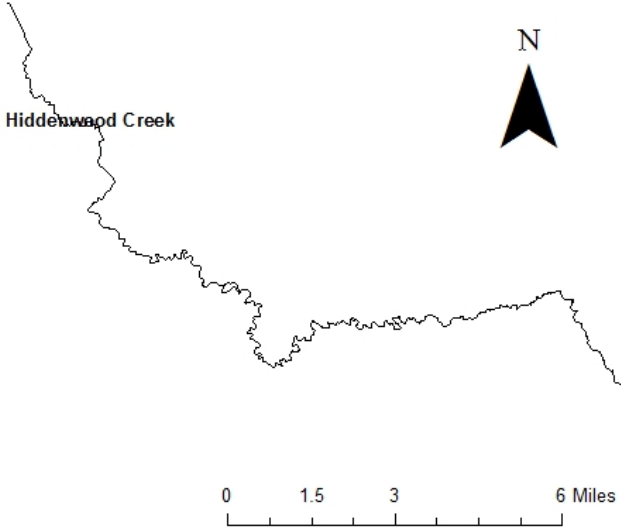
10140105

- 1 Crow Creek
- 2 Dry Run
- 3 Elm Creek
- 4 Elm Creek, West Fork
- 5 Little Elm Creek
- 6 Missouri River
- 7 South Medicine Creek
- 8 Sand Creek
- 9 Sayles Creek
- 10 Smith Creek
- 11 Smith Creek, East Fork
- 12 Elm Creek, West Fork



Appendix 1. Continued

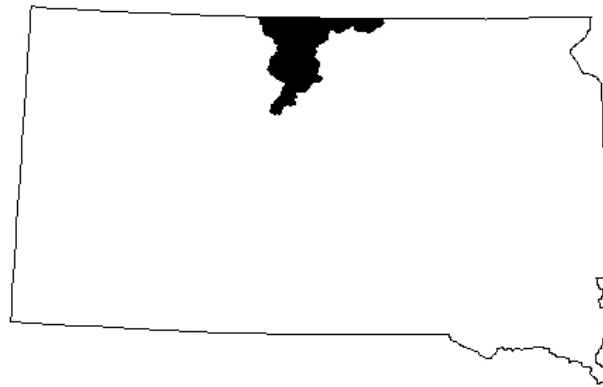
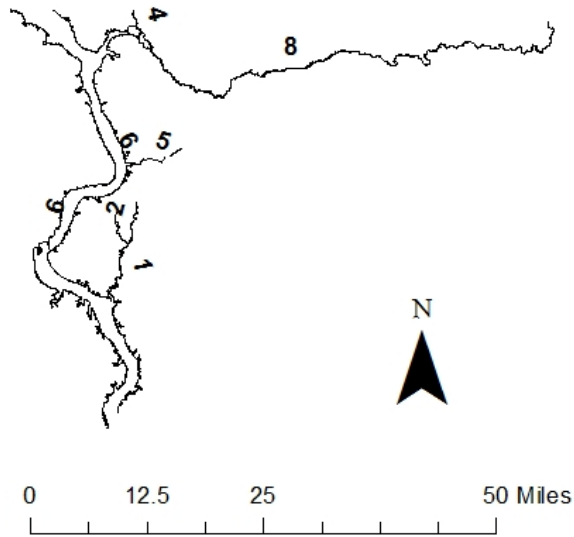
10130106



Appendix 1. Continued

10130102

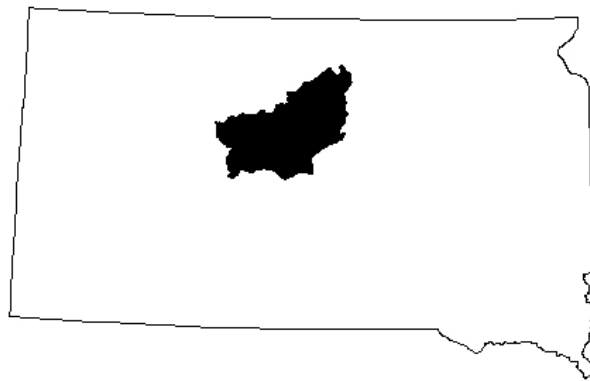
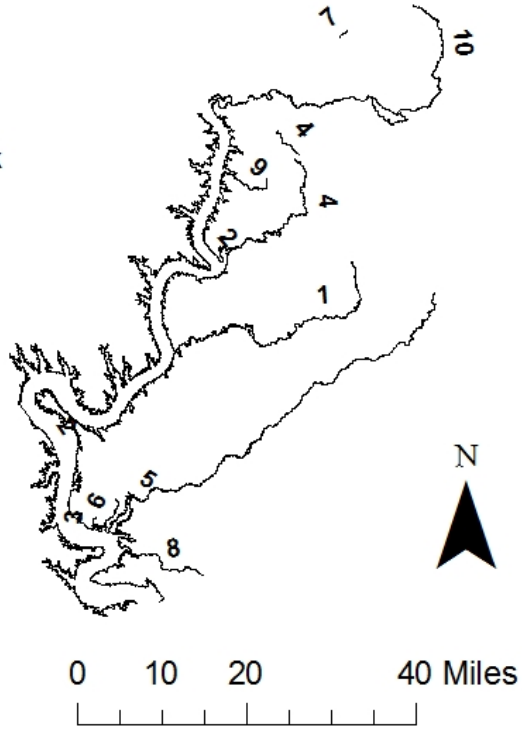
- 1 Blue Blanket Creek
- 2 Cane Creek
- 3 Cottonwood Creek
- 4 Decker Creek
- 5 Locke Creek
- 6 Missouri River
- 7 Olson Creek
- 8 Spring Creek



Appendix 1. Continued

101230105

- 1 Artichoke Creek
- 2 Lake Oahe
- 3 Dry Creek
- 4 Little Cheyenne Creek
- 5 Okobojo Creek
- 6 Plum Creek
- 7 Rieger Creek
- 8 Spring Creek
- 9 Steamboat Creek
- 10 Swan Creek



Appendix 1. Continued

10140101

- 1 American Creek
- 2 Andes Creek
- 3 Bad Hand Creek
- 4 Campbell Creek
- 5 Castalia Creek
- 6 Chameyrush Creek
- 7 Chapelle Creek
- 8 Cherry Creek
- 9 Choteau Creek
- 10 Dry Run
- 11 Elm Creek
- 12 Garden Creek
- 13 Little Elm Creek
- 14 Missouri River
- 16 Pease Creek
- 17 Platte Creek
- 18 Reynolds Creek
- 19 S. Chapelle Creek
- 20 Sluiter Drain
- 21 Smith Creek
- 22 Snake Creek
- 23 Soldier Creek
- 24 White Swan Creek

