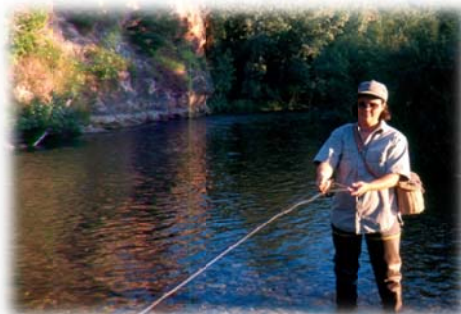


# **Fisheries and Aquatic Resources Adaptive Management System**

**2014-2018**

## **Black Hills Fisheries Management Area Strategic Plan**

### **South Dakota Game, Fish and Parks Wildlife Division**



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**Formally adopted by GFP Commission: April 4, 2014**

## 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

Fisheries management in the Black Hills began in 1886 with the stocking of Brook Trout at Cleghorn Springs (Barnes 2007). The first Brown Trout were stocked in 1890, and by 1910 over 15 million trout and char had been stocked in South Dakota. Fishing regulations began as early as 1887, with a daily limit of 15 trout established in 1912 (Brown 2007). Since that time, stocking, regulations, and other management practices have changed in response to changing angler expectations.

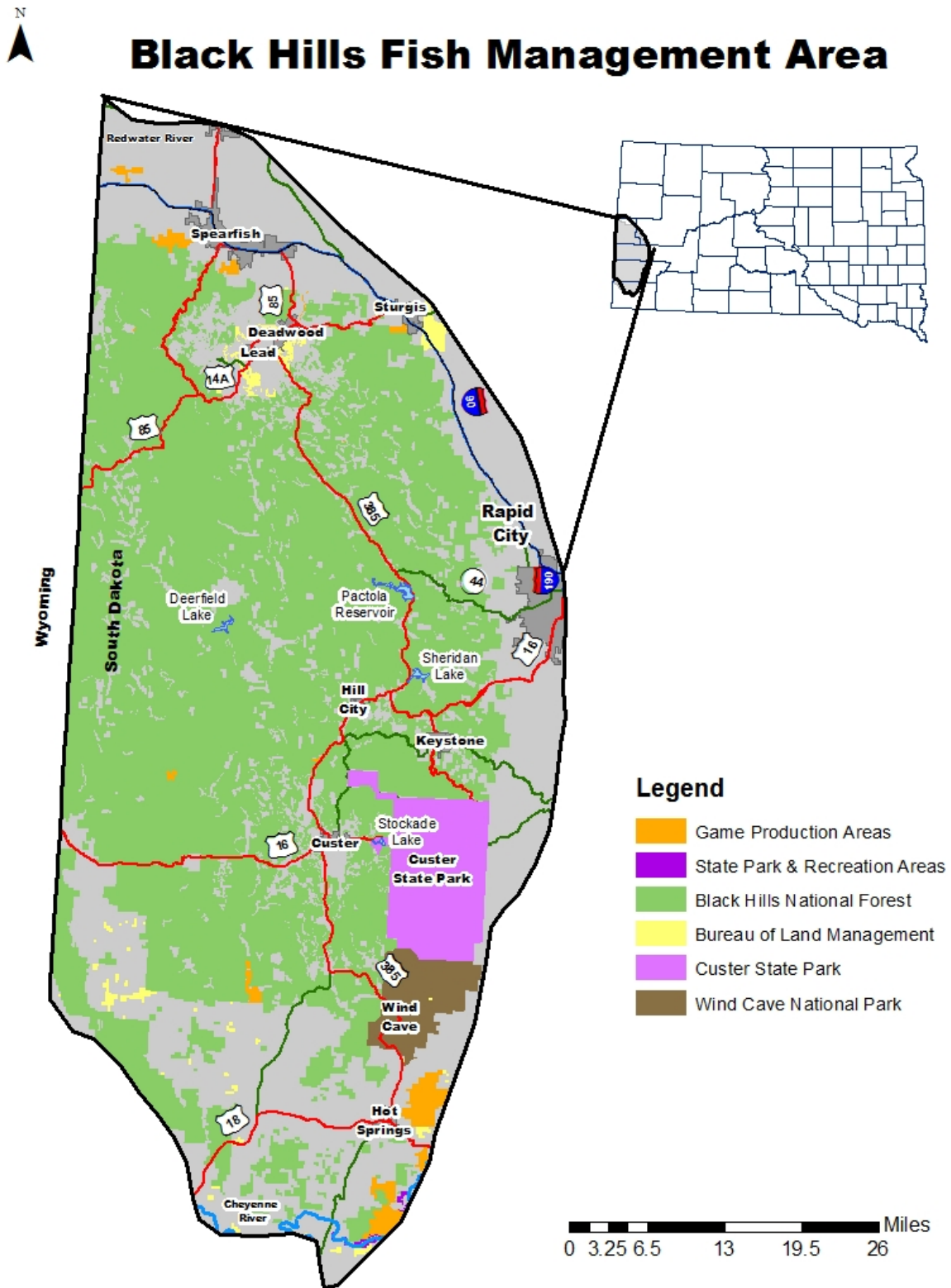
Prior planning efforts include the creation of a trout management plan in 1963, which was last updated in 1984. A Black Hills Stream Management Plan was developed in 1993 (Erickson et al. 1993). This current plan expands the 1993 Stream Management Plan to include all fish species and waters in the Black Hills Fisheries Management Area (BHFMA, Figure 1). Current lake-specific management plans are included in state management plan reports with the most recent plans for Pactola, Sheridan, and Deerfield located in Jost 2006, 2007, and 2008.

In addition to the afore-mentioned plans, development of this current plan is based on published information concerning the inventory and classification of Black Hills waters (Stewart and Thilenius 1964; Ford 1988), Black Hills angler preference and opinion surveys (Erickson and Galinat 2005; Gigliotti 2007), routine fish population surveys, and routine angler use and harvest (creel) surveys. Also included in the background of this plan is the knowledge gained from several studies from state universities. South Dakota State University (SDSU), University of South Dakota (USD) and South Dakota School of Mines and Technology (SDSMT) are three of these institutions where specific studies concerning fisheries in the Black Hills or related water quality and flow studies have been based. Many of these works can be found through university web sites or in institution libraries and are listed in Appendix 1.

This plan is a dynamic tool addressing new issues, challenges, and opportunities in managing the Black Hills fisheries resource. It broadly covers all fisheries resources in the BHFMA, with subsequent **sub plans** to be written specifically addressing Black Hills **streams, small lakes and ponds**, and the three **large reservoirs**. The components of this plan include an **Inventory** Section, which reviews the history and current status of management activities. This section is subdivided into three categories: **People, Fish,** and **Habitat**. Following the Inventory Section is the **Issue** Section, listing the current issues involving Black Hills fisheries. Lastly, measurable and time-bound **Objectives**, along with specific **Strategies**, are listed.

While this plan will guide staff working on fisheries and aquatic resource issues in the Black Hills 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.

Figure 1. The area encompassed by the Black Hills Fisheries Management Area (BHFMA), including selected cities, landmarks, and major reservoirs.



## II. Inventory

### People

Regulations: Regulations are the primary method for ensuring the equitable use of the fishery resource and protecting fisheries from over-harvest. Black Hills trout fisheries are managed with a variety of regulations. Currently, the BHFMA daily limit for trout is five, with only one trout over 14-inches. Special regulations include a 24-inch minimum length limit on Lake Trout or Splake with a daily limit of one fish in Pactola Reservoir. In addition, Yates Ponds, Pactola Basin, and a section of Rapid Creek are catch and release for all trout species, while a section of Spearfish Creek is catch and release only for Rainbow Trout. The most recent survey of trout anglers indicated that 53% were satisfied with the current regulations, while only 8% were dissatisfied (Gigliotti 2007). The history of regulations within the Black Hills of South Dakota can be found in Appendix 2.

Angler Preferences and Satisfaction: In 1993, a management plan for Black Hills streams was produced (Erickson et al. 1993). In the following years, an extensive angler use and preference survey was conducted throughout the Black Hills. Anglers interviewed during this survey were also sent a follow-up mail questionnaire to collect more detailed information on species preferences, the importance of stream fisheries, angling methods, and preference for special regulation areas (Erickson and Galinat 2005). As a result of this survey several management changes were made, including a reduction in the daily trout limit and an increase in the size of trout stocked.

Results from the Erickson and Galinat (2005) survey indicated that 66% of anglers preferred trout and 17% preferred other species. Nearly 85% of anglers responded that trout were important to their fishing experience. A large number of anglers (70%) wanted opportunities to catch both wild and hatchery trout, while 19% wanted to fish only hatchery-stocked waters, and 16% preferred fish of wild origin.

Several questions regarding preferred fishing locations and methods were also asked. Over 70% of respondents indicated that streams were at least somewhat important to their fishing experience, while 25% said they were not important at all. For stream anglers, both fly fishing and bait fishing were equally preferred, with only 22% preferring spin fishing. With regard to restrictive regulations, 30% of respondents said that they would not fish areas with reduced daily limits, while 39% said that they would prefer to fish in areas with these restrictions. Size restrictions were more popular, being favored by over half of the respondents. However, 22% said that they would not fish in areas with size restrictions. Angler preference for artificial-lure-only areas was fairly evenly split between those opposed to such areas (38%) and those in favor (34%). Anglers indicated a clear preference against catch-and-release regulations, with 42% opposed and only 33% in favor.

A recent development identified through public meetings is the emergence of a group of Black Hills anglers who prefer cool- and warm-water fish species over trout. These

anglers would also like to see trophy management opportunities for non-trout fisheries in the Black Hills.

In addition to the Black Hills Angler Preference Survey (Erickson and Galinat 2005), other methods have been used to obtain angler information. In 2004, 2007, and 2010, a statewide angler survey was conducted with licensed anglers in South Dakota (Gigliotti 2004, 2007 and 2011). As part of these surveys, anglers were classified with respect to their motivations for fishing in the Black Hills and their likelihood for accepting regulation changes. Angler preference and satisfaction information from Black Hills anglers has also been gathered through water-specific creel surveys (Simpson et al. 2007; Simpson 2007a, 2007b, 2007c, 2008, 2009, 2010a, 2010b, 2011a, 2011b, 2012). Angler satisfaction, the focus of these water-specific surveys (Simpson 2007a), exceeded the statewide goal of 66% (Gigliotti 2004) in all instances. In Black Hills streams, satisfaction ranged from a high of 88% to a low of 67% (Simpson 2009). Satisfaction in small lakes and ponds ranged from a high of 86% to a low of 73%, and in large reservoirs overall satisfaction ranged from 86% to 69%. These values are only slightly different from the 1994 mail survey, which noted that 80% of Black Hills anglers were satisfied with their overall experience (Erickson and Galinat 2005).

Angler Access: Public access and fishing opportunities exist in many locations throughout the BHFMA (Appendix 3). Most lands are in public ownership as part of the Black Hills National Forest, Custer State Park, or National Park System. Private land holdings are scattered throughout these large public land blocks. Unless posted, travel is allowed within the Black Hills Fire Protection District. The boundary of the fire protection district generally follows the boundary of the BHFMA.

Even though numerous access opportunities exist on public land, there are locations on pond and stream sections that are entirely surrounded by private land. Access agreements are a tool used to gain reasonable access for anglers in exchange for fish population monitoring or habitat improvements in these areas. Establishing relationships with private landowners along these locations may increase angling opportunities.

Non-Angler Interests: In addition to anglers, other people have an active interest in the Black Hills aquatic resources. Interactions with these individuals are often not documented, and typically occur via phone conversations, personal office visits, or during field work by fisheries personnel. An example of non-angler interest occurred when the diatom *Didymosphenia geminata* was discovered in Rapid Creek. Residents along the creek, many of whom are not anglers, were concerned about the effects of this diatom and wanted to be involved with management actions. Other non-angling parties include governmental units such as the United States Forest Service, Bureau of Reclamation, City of Rapid City, and non-governmental groups such as the Sierra Club, Nature Conservancy, and Humane Society. The new Outdoor Campus West has been a tremendous asset to facilitate discussion with both the angling and non-angling public.

## Fish

Species: Historic fish assemblages in the BHFMA were simple, consisting of suckers, chubs and dace (Bailey and Allum 1962). Trout were first stocked in the late 1800s and are now numerous throughout many stream sections (Barnes 2007). Currently, six species of trout (Brown, Brook, Rainbow, Lake, Tiger and Splake) exist in the streams and reservoirs in the BHFMA. The BHFMA also supports four species listed by the South Dakota Natural Heritage Program (SDNHP) as threatened, endangered or species of greatest conservation need (SGCN) in South Dakota (Table 1). One of the species listed is Mountain Sucker, which are native to the Black Hills. While their numbers remain stable in much of their native range, there has been some decline in the BHFMA (Schultz et al. 2012). Within South Dakota, Mountain Sucker habitat is restricted to the BHFMA, and as a result, it is listed as an S3 species by the SDNHP. S3 species are defined as “either very rare and local throughout its range, or found locally (possibly in abundance at some locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors”. Similarly, Lake Chub are listed as an S1 species by the SDNHP, indicating that they are “critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.” Historically, Lake Chub occurred in streams across the Black Hills, but recent surveys indicate the only remaining population is in Deerfield Reservoir. This localized population has been in decline since 1994 (Isaak et al. 2003). Both Mountain Suckers and Lake Chub are listed as SGCN within South Dakota’s State Wildlife Action Plan (SDGFP 2006).

Table 1. South Dakota Natural Heritage Program listed fish species for the Black Hills Fisheries Management Area. Status abbreviations: SE = state endangered; ST = state threatened; SGCN = Species of Greatest Conservation Need.

Common Name	Scientific Name	State Status
Finescale Dace	<i>Chrosomus neogaeus</i>	SE, SGCN
Lake Chub	<i>Couesius plumbeus</i>	SGCN
Longnose Sucker	<i>Catostomus catostomus</i>	ST, SGCN
Mountain Sucker	<i>Catostomus platyrhynchus</i>	SGCN

The BHFMA area also supports multiple warm-water species in both large reservoirs and small impoundments, including Smallmouth and Largemouth Bass (Miller et al. 2010). Additional game-fish species providing angling opportunities include Black Crappie, Yellow Perch, and Northern Pike.

Stocking: From a historical context, all sport fisheries in the Black Hills are a product of stocking. The stocking of hatchery-raised trout is one of the primary tools available for fisheries managers, and catchable trout fisheries comprise a large portion of the recreational fisheries in small lakes and ponds and reservoirs in the Black Hills (Erickson et al. 1993).

The stocking of catchable-sized trout species to create put-and-take fisheries is a standard management practice for lakes in the BHFMA where natural recruitment is low to non-existent (Davis 2012). On average, the three largest reservoirs, Sheridan Lake, Pactola Reservoir and Deerfield Reservoir, receive approximately 25% of the catchable sized Rainbow Trout stocked in the BHFMA (Miller et al. 2010). Stocking numbers in smaller impoundments range from a few hundred to a few thousand depending on size, location, and angling pressure. Additional species have been stocked by SDGFP to increase angler opportunity, such as Smallmouth Bass in Sheridan Lake (Miller et al. 2010).

The stocking of streams within the BHFMA is dependent on individual stream management classifications. Streams are classified into two management categories: wild-trout, or hatchery-supplemented (Erickson et al. 1993). Supplemental stocking is done on stream reaches where environmental variables reduce the opportunity for a self-sustaining trout population. For example, Castle Creek above Deerfield reservoir is managed as a wild Brook Trout fishery, but is supplemented with roughly 150 catchable-sized Rainbow Trout annually because Rainbow Trout have not shown the ability to establish a self-sustaining adult population within the creek (Bucholz and Wilhite 2009). Furthermore, the stocking of hatchery trout can occur in streams where high angling pressure leads to unacceptable angling catch rates or where hatchery stockings are needed to achieve a specific management objective (Erickson et al. 1993). Urban fisheries often receive high angling pressure, which requires the stocking of many catchable Rainbow Trout in order to meet angler expectations.

Fisheries surveys: Fisheries work began in the Black Hills as early as 1890, however the report titled Stream and Lake Inventory and Classification in the Black Hills of South Dakota (Stewart and Thilenius, 1964) was the first comprehensive Black Hills –wide inventory of fish populations. Extensive monitoring followed in the 1970's. Biologists initiated studies to investigate fish population dynamics, regulation effectiveness, and habitat influences.

In the 1980s, an extensive survey of Black Hills stream fish populations was conducted. A follow-up stream survey in the 1990s and in 2010-11 was also completed, using concepts and methodology similar to the 1990s survey. These stream surveys documented the negative impact of drought through increased summer water temperatures, reductions in winter habitat, and low water levels.

Fisheries research: Research within the BHFMA is designed to address management issues such as declines in fish populations or changing conditions within a system. These projects have management-focused objectives and are intended to generate new



management strategies. Recent examples include research projects to evaluate populations of Brown Trout in Rapid Creek (Erickson et al. 2005; James et al. 2007) and examine the movement patterns of a unique population of Rainbow Trout in Spearfish Creek (James 2011).

In cases where the scope of the project requires additional assistance, partnerships with academic institutions, such as South Dakota State University, University of South Dakota and South Dakota School of Mines and Technology, are undertaken. These projects are often financially supported with Sport Fish Restoration Funding. Projects involving the status of native fish (Schultz 2011) and unique trout populations (Davis 2012) have provided managers with essential information.

*Undesirable fish introductions:* Fish species not stocked by Game, Fish and Parks, such as Northern Pike, Yellow Perch and Rock Bass, have established naturally-reproducing populations in many locations throughout the BHFMA (Davis 2012). The introduction of these species complicates management and may lead to costly removal efforts (Miller et al. 2010).

*Fish removals and chemical renovations:* Population manipulation is one of the management tools used by fisheries managers in the BHFMA. Removal of undesired species has been attempted in specific waters to try and improve the overall fishery. After fish population surveys and anecdotal information from anglers indicated that the White Sucker population may have been negatively influencing trout populations in Deerfield Reservoir and its tributaries, removal of suckers occurred in 2006 (Miller et al. 2010).

In cases where removal efforts were likely to have little effect, chemical renovations have been conducted to completely remove all fish from a water body. Deerfield Reservoir has been chemically treated twice in the past in an attempt to restore the trout fishery (Miller et al. 2010). These chemical renovations occurred in conjunction with dam repairs and are unlikely to be an option in the future.

*Aquatic invasive species(AIS):* AIS species are classified as any species not native to an area that threaten the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters (NANPCA 1990). Currently, several AIS species exist within the BHFMA, including *Didymosphenia geminata* and curly leaf pond weed. In 2002, *D. geminata* was discovered in Rapid Creek and has since regularly bloomed from the tailrace below Pactola Reservoir dam downstream to the Rapid City city limits (~39 km). Occasional blooms are observed in Rapid Creek above Pactola Reservoir and in a small, isolated section of Castle Creek. Although these blooms raised concerns with anglers and managers, and were blamed for the decline of the Rapid Creek Brown Trout fishery, research showed that *D. geminata* was not the source of the decline of trout populations (James 2011).

The red-rimmed melania (*Melanoides tuberculata*) is a non-native snail common in the aquarium trade. It is currently present in Cascade Springs (Fall River County) south of Hot Springs, SD and also in Fall River in the town of Hot Springs. Jack Dempsey (*Rocio octofasciata*), a common aquarium fish, has also been sampled in Fall River adjacent to the town of Hot Springs. These two species thrive in the warmer waters of these southern Black Hills streams. Additional AIS species within the BHFMA include European Rudd (*Scardinius erythrophthalmus*) in Sheridan and Pactola Reservoirs (Miller et al. 2009).

*Fish Health:* Fish health is a major concern of fisheries managers. In addition to the possible introduction of salmonid pathogens from outside of South Dakota, several fish health concerns currently exist within the BHFMA. Parasitic yellow grubs are present in Stockade and Bismarck Lakes in Custer State Park and Lakota Lake, north of Custer State Park. These grubs can affect any freshwater fish, but are mostly reported in Yellow Perch within the Black Hills (Miller et al. 2009). Additionally, secondary infections of parasitic water molds (*Saprolegina* spp.) have been observed during the fall in Rapid Creek Brown Trout, likely due to the stressors involved with spawning.

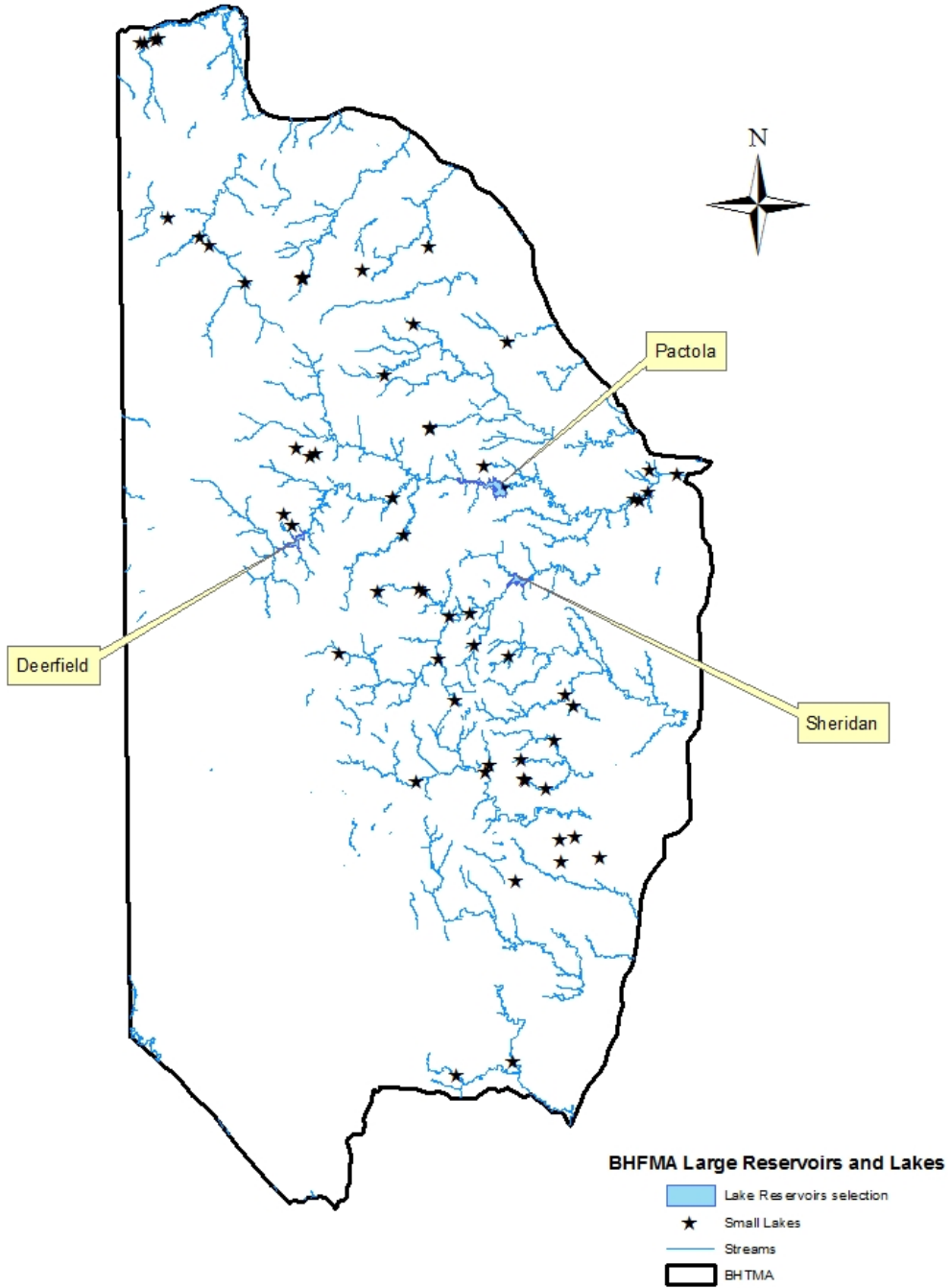
## **Habitat**

Aquatic habitats in this plan are organized by three categories: Large Reservoirs, Small Lakes and Ponds, and Streams. The primary locations of these habitats are indicated in Figure 2.

### **Large Reservoirs**

For management purposes, large reservoirs are classified as greater than 150 acres. Only three bodies of water in the BHFMA meet this classification: Pactola Reservoir, Deerfield Reservoir, and Sheridan Lake. All three reservoirs have a beneficial use classification of Cold Water Permanent Fisheries, which is defined as “surface waters of the state which are capable of supporting aquatic life and are suitable for supporting a permanent population of coldwater fish from natural reproduction or fingerling stocking” (Lorenzen 2005). In addition to various trout species, warm and cool-water fish are also present in each of the reservoirs. The Bureau of Reclamation (BOR) operates Pactola and Deerfield Reservoirs in accordance with downstream water demands, such as irrigation, domestic water supplies, and maintenance of minimum flows in Rapid Creek below Pactola. The U.S. Forest Service holds the water rights to Sheridan Lake and currently operates Sheridan Dam to maintain a stable lake level to maximize benefits to recreation uses on and around the reservoir.

Figure 2. Reservoir, lake and pond, and stream locations within the BHFMA.



## Small Lakes and Ponds

Small ponds and reservoirs are scattered throughout the Black Hills region. These waters range in size from less than an acre to 150 acres. Currently, 47 small lakes and ponds are managed with catchable (11-inch) trout stockings, although other cool and warmwater fish species are present. During warm, dry periods in the summer, elevated surface temperatures in some of these waters precludes trout stocking.

## Streams

There are approximately 800 miles of streams in the Black Hills, which account for nearly all of the coldwater streams in the entire state. Not all of these streams are functional fisheries, but many are still important for nurseries of young and refuge areas for native fishes. Within the Black Hills there are several primary trout streams which include Rapid Creek, Castle Creek, Spearfish Creek, Whitewood Creek, Spring Creek and Crow Creek. These streams provide 240 miles of fishable trout waters during most years and trout populations and distribution may be reduced during prolonged drought periods. These streams are noted as being perennial based on stream classifications stated within the 1993 Black Hills Trout Stream Plan (Erickson et al. 1993). The source of these streams come from underground springs and surface runoff from the central core of the Black Hills and then radiates outwards. Few streams flow westward from the Black Hills, but many flow northerly, eastward, and southeast.

Stream flows are highly influenced by geological conditions. Spring flows originate from fractures of the Madison and Minnelusa aquifers in higher elevations. Multiple loss zones (Table 2) occur within the Black Hills in areas where streams cross outcrops of Madison Limestone and Minnelusa formations (Carter et al. 2002) and are important recharge locations for the Madison and Minnelusa aquifers. Stream sections below these loss zones often become dry stream beds unless inflows exceed the amount of loss (Hortness and Driscoll 1998). Precipitation patterns coupled with the geology of the Black Hills set the baseline conditions for stream water resources and fisheries.

Table 2. Major flow loss zones in the BHFMA.

<b>Stream</b>	<b>Loss (Cubic Feet per Second)</b>
Boxelder Creek	50
Spring Creek	28
Spearfish Creek	23
Grace Coolidge Creek	21
Elk Creek	19
False Bottom Creek	15
Highland Creek	10
Rapid Creek	10

Productive and popular stream tailwater fisheries exist below Sheridan Lake, Deerfield and Pactola Reservoirs. Pactola and Deerfield supply cold-water releases to Rapid Creek and Castle Creek respectively, creating suitable tailrace temperatures for trout throughout the year. Sheridan Lake supplies surface water discharge to Spring Creek over the spillway. Drought conditions and warm temperatures often deplete trout populations during warm summer months, requiring supplemental trout stockings as water temperatures allow.

### **Changes in the Black Hills Fish Management Area**

With the exception of Cox Lake, Mud Lake, and both Mirror lakes, natural lakes and ponds did not exist in the BHFMA prior to human influences (Ron Koth, personal communication). Many of the small lakes present today were constructed by the Work Projects Administration (WPA) during the 1930s. Reservoirs such as Sheridan Lake (originally Lake of the Pines), Horsethief Lake, Stockade Lake, Center Lake, and Bismarck Lake were created by the construction of dams built during this era collaboratively by the WPA and Civilian Conservation Corp (CCC).

### **Water Quality**

The majority of the land within the BHFMA is part of the Black Hills National Forest, which is managed for multiple-uses such as outdoor recreation, cattle grazing, timber harvesting, and wildlife. Pockets of private land are dispersed throughout the management area. The Black Hills region traditionally has some of the best water quality in the state (South Dakota Department of Environment and Natural Resources 2012). Black Hills waters were described as “clear, cool and pure” by US Army Lt. Col. Dodge back in 1876 (Kime 1996). There is little doubt that water quality conditions have declined since these early days exploration.

Urban runoff, grazing practices, water use, fires, mining, and recreational uses have reshaped the Black Hills. Sedimentation as a natural process typically occurs gradually. However with human intervention the speed of sedimentation has greatly increased (Waters 1995). Heavy rainfall events on roads, parking lots, and other impervious surfaces are carried through storm water lines directly to creeks and streams at high velocities, resulting in stream bank erosion. Construction of roads and highways, and unpaved logging and recreational trails, can also increase sedimentation into streams. Overgrazing of stream riparian areas has caused increased fine-sediment deposition, channel widening, decreased water depth, and loss of stream bank stability in western states (Plattes et al 1985). Placer, surface, underground, and sand and gravel, mining have caused sediment loading either through direct intrusion in the stream bed or from erosion of tailings deposited near creeks (Hill 1975). In addition to impacts by sediment increases, stream flow has also been influenced by irrigation demands, domestic use,

dam construction, and non-consumptive uses for mining or electrical power on Rapid Creek, Elk and Spearfish Creeks (Carter et al. 2002). Instream barriers, (i.e culverts and small dams) have potential to reduce stream connectivity and negatively influence fish passage.

### **Habitat Projects**

Increased angling demand and habitat degradation prompted habitat improvement projects beginning in the 1960s. Grazing enclosures, willow plantings along creeks, and other lake and stream improvement projects have been completed, along with habitat-related research (Appendix 4). An intensive habitat study of the Black Hills in 1964 resulted in the publication of the Stream and Lake Inventory and Classification in the Black Hills of South Dakota (Stewart and Thilenius 1964). In 1984 and 1985, a comprehensive stream and riparian habitat inventory was completed for the Black Hills with the goal of developing a system to classify streams based on morphology, trout biomass, and habitat. A total of 220 stations on 65 streams were sampled (Ford 1988). Continued efforts identifying current habitat limiting factors and incorporating past knowledge are required to implement innovative projects to maximize the potential of stream and lake fisheries in the BHFMA.

### **III. Issues**

1. Possible negative impacts of introduced species on recreational fisheries.
2. Current angler demographics are unknown.
3. Conflicting angler preferences require multiple management strategies.
4. Habitat degradation, such as sedimentation, is negatively impacting fisheries.
5. Readily available Black Hills access information for anglers is over 15 years old and needs to be updated.
6. Human dimensions data from the non-angling public in the Black Hills concerning fisheries management activities is lacking.
7. Angler compliance with existing regulations in the Black Hills is unknown.
8. Relationships with private landowners are lacking, preventing the implementation of Best Management Practices along sensitive stream areas.
9. Fish species not stocked by Game, Fish and Parks appear in new Black Hills waters.
10. Anglers may be confused by different bait regulations for different Black Hills waters.
11. Native fish populations in the Black Hills have been negatively impacted by habitat loss.
12. Native fish populations in the Black Hills have been negatively impacted by fish introductions.
13. Stream flows are impacted by human development, which will likely increase in the future.
14. Management to produce maximum angler satisfaction in the Black Hills likely requires complex and possible water-specific regulations.
15. Sunfish and perch in many Black Hills waters may not meet angler expectations.
16. Hatchery rearing influences on post-stocking performance and angler satisfaction are not always considered when making trout stocking decisions.

- 17.** The long-term impacts of invasive or introduced species in Black Hills waters are not well understood.
- 18.** Hatchery production of trout is limited, with hatcheries currently operating at capacity.
- 19.** The extended time frame for requesting changes in coldwater hatchery production requires long-term planning by fisheries managers.
- 20.** Sampling protocols and management strategies for non-game and native fish populations are lacking.
- 21.** Sampling protocols for aquatic invertebrates and amphibians are not established.
- 22.** Trout stocking criteria and prioritization are not well-defined.
- 23.** Shore fishing opportunities are limited due to siltation and vegetation.
- 24.** Long-term planning is required to implement habitat and access projects on federal lands.
- 25.** Water quality data, such as dissolved oxygen, nutrient levels, and temperature, have not been recently collected from most Black Hills waters.
- 26.** Population genetics information, including genetic health, source strains, and contribution to the fishery, is unknown for nearly all naturally-reproducing trout populations.
- 27.** Data pertinent to Black Hills fisheries management collected and stored by other state and federal resource agencies is not readily available.
- 28.** Factors affecting trout reproduction and recruitment are unknown for many streams.
- 29.** Current information on riparian zones is lacking.
- 30.** Many Black Hills small ponds and lakes are aging and filling with sediment, with some dams experiencing structural deterioration.
- 31.** Habitat restoration and access projects are often not evaluated upon completion, and cost-benefit analysis is not conducted.
- 32.** Sedimentation from forestry practices, grazing, road construction, and mining may be negatively impacting habitat quality and fish populations.



- 33.** Overhead cover along streams may be impacted by grazing practices.
- 34.** Instream flows are often insufficient to maintain game fish populations in many Black Hills streams.
- 35.** Elevated summer water temperatures limit coldwater habitat in some waters.
- 36.** Existing habitat may be limiting over-winter survival in selected creeks.
- 37.** Sampling protocols to measure instream habitat have not been established.

#### **IV. Goal, Objectives, Strategies**

**Goal:** Manage fisheries and aquatic resources in the Black Hills of South Dakota for long-term sustainable use and enjoyment.

*(The objectives listed below are in no particular order of preference or ranked order of how work will proceed)*

**Objective 1:** Develop an operational plan to manage the presence of undesirable introduced fish species in Black Hills waters by 2016.

**Strategy 1.1** Conduct research to understand impacts of undesirable introduced fish species on managed fish populations.

**Strategy 1.2** Survey angler use and preferences concerning undesirable introduced fish species.

**Strategy 1.3** Develop management strategies based on info collected in 1.1 and 1.2.

**Objective 2:** Prevent unplanned and undesirable fish introductions by increasing angler awareness and influencing angler behavior by 2018.

**Strategy 2.1** Highlight the issues of illegal fish introductions through social marketing campaigns.

**Strategy 2.2** Utilize law enforcement to increase awareness/compliance.

**Strategy 2.3** Explore new regulations to prevent further introductions.

**Objective 3:** Determine current angler demographics and preferences for Black Hills lakes and streams by June 2015.

**Strategy 3.1** Conduct a comprehensive demographics and preference survey of Black Hills anglers.

**Strategy 3.2** Continue angler outreach through appropriate techniques to gather input and share information.

**Strategy 3.3** Develop effective questions with creel surveys to collect angler demographic and preference data.

**Objective 4:** Develop a database that contains pertinent habitat information from Black Hills watersheds to identify and prioritize degraded waters by 2018.

**Strategy 4.1** Determine sources of existing data.

**Strategy 4.2** Acquire existing data from other agencies.

**Strategy 4.3** Complete Multiple Indicator Monitoring System (MIMS) training to develop standardized sampling procedures.

**Strategy 4.4** Publish a list of Black Hills habitat projects for inclusion in the database.

**Strategy 4.5** Identify up to five locations annually to conduct long and short-term habitat (MIMS) monitoring.

**Strategy 4.6** Identify habitat variables to be included in the database.

**Strategy 4.7** Identify and involve agency staff needed to construct a database.

**Objective 5:** Develop a procedural manual to direct the selection of habitat improvement projects and evaluation procedures by 2018.

**Strategy 5.1** Review the existing dam matrix.

**Strategy 5.2** Identify key components to include in both stream and dam matrices.

**Strategy 5.3** Work with other Department staff, other state agencies, federal agencies, and non-governmental organizations (NGOs) in development of the manual.

**Strategy 5.4** Review existing scientific literature.

**Strategy 5.5** Assign staff to a work group to complete a procedural manual.

**Objective 6:** Complete existing and currently identified habitat improvement projects.

**Strategy 6.1** Complete Rapid Creek habitat project from Pactola Basin to the Placerville Camp by June 2014.

**Strategy 6.2** Complete the Norbeck Scenic Byway Lakes enhancement Project by 2015.

**Strategy 6.3** Complete Grace Coolidge dredging project by 2014.

**Strategy 6.4** Complete Gimlet stream crossing repairs by 2014.

**Objective 7:** Refine existing trout stocking criteria and evaluation criteria for implementation by 2018.

**Strategy 7.1** Review and incorporate angler preference information into stocking criteria.

**Strategy 7.2** Review historic regulation information.

**Strategy 7.3** Review pertinent scientific literature.

**Strategy 7.4** Incorporate information from current and ongoing research studies and management surveys.

**Strategy 7.5** Work with hatchery staff to identify hatchery capabilities and imitations.

**Strategy 7.6** Determine research needs to fill information gaps, particularly as it relates to predators, hatchery rearing influences, and other areas.

**Strategy 7.7** Establish standard to determine if stocking meets management objectives.

**Objective 8:** Determine factors that may be limiting the quality of Black Hills fisheries by 2017.

**Strategy 8.1** Conduct research concerning recruitment, growth and mortality, and interspecies competition.

**Strategy 8.2** Refine fish population surveys to incorporate the collection of additional and pertinent data.

**Strategy 8.3** Work with South Dakota State University and other university researchers.

**Strategy 8.4** Use information from Angler Use and Preference surveys to determine quality.

**Strategy 8.5** Involve NGOs, other department staff, and potentially affected individuals.

**Objective 9:** Generate sub-plans for the BHFMA plan by June 2015 using information from the Angler Use and Preference survey and fish population and habitat surveys.

**Strategy 9.1** Update the Black Hills Stream management plan as a sub-plan of the BHFMA plan.

**Strategy 9.2** Generate a small lakes and ponds management plan as a sub-plan to the BHFMA plan.

**Strategy 9.3** Update water-specific management plans for the three large reservoirs in the BHFMA as scheduled, to serve as sub-plans for the BHFMA plan.

**Objective 10:** Investigate and identify streams and refuge areas which can be managed for non-game and native fish populations by 2018.

**Strategy 10.1** Develop and prioritize a list of fish species (e.g. Species of Greatest Conservation Need) on which to focus management efforts.

**Strategy 10.2** Review current research on negative impacts of introduced species on native fish communities and techniques to reduce impacts on native fish for potential implementation in South Dakota.

**Strategy 10.3** Design standardized survey and sampling protocols to collect information necessary for management.

**Strategy 10.4** Identify and collaborate with partners to exchange data, conduct surveys, and implement necessary conservation actions.

**Strategy 10.5** Investigate trap and transfer stocking techniques as a potential management tool for supplementation and management of non-game fish populations.

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## **VI. Appendices**

### Appendix 1. Associated literature conducted in relation to Black Hills Fisheries

*(This list is not a complete or comprehensive bibliographic review of all literature from selected universities and governmental institutions)*

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## Appendix 2. Historical Synopsis of Special Management Regulations within the Black Hills Trout Management Area

### 1981 Creation of Hanna Creek Special Management Area

- Catch and Release.
- Barbless, artificial lure only.
- Possession of trout or natural (organic) baits with 100 feet of stream is prohibited.

### Creation of Rapid Creek I Special Management Area (from Kelly Gulch to Castle Creek)

- Daily limit of one trout 15 inches or longer.
- Barbless, Artificial lures only.
- Possession of trout smaller than 15 inches or natural (organic baits) with 100 feet of stream is prohibited.

### Creation of Rapid Creek II Special Management Area (from Lake Pactola to the confluence of the north and south forks of Rapid Creek except the waters described in Rapid Creek I above)

- Daily trout limit is 8, only one which may be a brown trout longer than 15 inches.
- October 1 through December 31.

### 1985 Removal of barbless hooks requirement for artificial lures

Regulations on Rapid Creek II were made year round

### Creation of Maurice Special Management Area on Spearfish Creek

- Catch and Release
- artificial lures only
- Possession of trout or natural (organic) baits with 100 feet of stream is prohibited

### 1988 Rapid Creek Special Management unit I Eliminated

### 1991 Creation of Pactola Basin Area from bridge below Pactola Dam to Foot Bridge at Placerville Camp

- Catch and release.
- Artificial lures only.

## Eliminated Rapid Creek Special Management Unit I

Creation of Silver City Special management area on Rapid Creek from USFS turnaround at Silver City to Confluence with Castle Creek

Silver City, Hanna, and Maurice areas were changed to the following restrictions

- Daily limit is 4 brown trout 11 inches or less.
- Brown trout over 11 inches and all rainbow, brook and cutthroat trout must be released.
- Artificial lures only.
- Possession of organic bait within 100 feet of stream is prohibited.

Modified text for size limits to include: Where and when size limits applied, all species of fish in possession must be whole and only gills, entrails and scales could be removed.

1993 Only 1 brown or rainbow trout over 14 inches could be included in the daily limit.

Only 1 brook trout over 12 inches could be included in daily limit.

Anglers could take an additional limit of 8 brook trout under 8 inches in length.

1994 Pactola Basin Area expanded to include section of stream from outlet of stilling basin to the footbridge at Placerville.

1997 Artificial Lures definition modified to:  
“Artificial lures include flies, jigs, spoons, spinners and plugs made of metal, plastic, wood, hair, feathers and other nonedible materials. Artificial lures do not include fish eggs, moldable scented baits, naturally occurring foods or man-made food.”

Created and Defined Black Hills Trout Management Area

Daily limit reduced to 5 trout with only 1 over 14 inches allowed

Eliminated Silver City Special Management Area on Rapid Creek

Eliminated Hanna Creek Special Management Area

Created of Yates Ponds Special Management Area

- Catch and release.
- Artificial lures only.

Created Crow Creek Special Management area from GFP property to Redwater and Meadow Brook Golf Course Special Management Area on Rapid Creek

- Trout over 10 inches must be released.
- Artificial lures only.

Modified Maurice Special Management Area to allow taking of all trout EXCEPT rainbow trout

Expanded Pactola Basin Special Management Area to include the Stilling Basin

2003 Lake trout/splake special length restriction at Pactola, daily limit of 1 and must be 24 inches or longer

2004 Stockade Lake 15 inch minimum length limit includes smallmouth bass

Highgrading of trout within the BHTMA is not permitted

2005 Lake Haven Crossing Pond

- Catch and release
- Artificial lures only

2006 Removed Lake Haven regulations

Sheridan Lake 15 inch minimum for largemouth

2008 Spearing of any non-trout game species is allowed in Pactola Reservoir

2010 Sheridan Lake, smallmouth bass included in the 15 inch minimum

Changed wording of “The use or possession of baitfish...” to “The use or possession of live baitfish...” to allow anglers to use preserved/dead baitfish in the BHTMA.

Creek chubs may be taken by hook and line (by licensed anglers) for use in waters where live minnows or baitfish are allowed



Appendix 3. Public access locations within the Black Hills Fish Management Area (B Beach, BR Boat Ramp, CG Campground, D Docks, FC Fish Cleaning Facility, H ADA Access, PC Primitive Camping, PT Picnic Tables, SF Shore Fishing, SP State Park license required, T Public Toilets, WI Walk-in Fishing, br Boating Restriction).

Water	Species	Facilities
Battle Creek	Brown & Brook Trout	SF
Beaver Creek	Brown & Brook Trout	SF, CG
Bismark Lake	Brown & Rainbow Trout, Perch, Black Crappie	SF, BR, CG, PT, T, br, H
Box Elder Creek	Brown & Brook Trout	SF
Box Elder Creek- Steamboat Spring Box	Brown & Brook Trout	SF, ST, PT, T
Canyon Lake	Brown & Rainbow Trout	SF, BR, br
Canyon Lake Park Ponds	Brown & Rainbow Trout	SF
Cascade Creek	Brown Trout	Limited access
Castle Creek above Deerfield Reservoir	Brown, Brook, & Rainbow Trout	SF, WI
Castle Creek Walk-In Fishery below Deerfield Reservoir	Brown, Brook, & Rainbow Trout	SF, WI
Center Lake	Rainbow & Tiger Trout	SP, CG, SF, BR
Cold Brook Reservoir	Rainbow Trout, Largemouth Bass	PT, BR, T, br
Cold Spring Creek	Brown & Brook Trout	SF
Cottonwood Springs	Brown & Rainbow Trout, Largemouth Bass, Black Crappie	SF, BR, br
Crow Creek	Brown Trout	SF

Coxes Lake	Rainbow Trout	SF, D,T
Custer Municipal Pond	Rainbow Trout, Bass	SF
Dalton Lake	Rainbow Trout	SF, PT, CG, H
Deerfield Lake	Rainbow & Brook Trout, Splake, Perch	CG, SF, BR, PT, T, br
Ditch Creek	Brook & Rainbow Trout	CG, SF
Elk Creek	Brown & Brook Trout	SF
Englewood Creek	Brown & Brook Trout	SF
Fall River	Brown & Rainbow Trout	Limited Access
French Creek	Brown & Rainbow Trout	WI, PC
Grace Coolidge Dams	Rainbow & Tiger Trout	WI
Grizzly Creek	Brown & Brook Trout	SF
Hanna Creek	Brown & Brook Trout	SF
Hanna Creek Pond	Brown & Brook Trout	SF
Horsethief Lake	Rainbow Trout, Perch	CG, SF, PT, T, H
Iron Creek (N)	Brown Trout	SF
Iron Creek (S)	Brown & Brook Trout	SF
Iron Creek Lake	Rainbow Trout, Perch, Largemouth Bass	SF, CG, BR, T, D
Jackson Blvd Pond	Rainbow Trout	SF
Lakota (Biltmore) Lake	Rainbow & Brook Trout, Perch, Northern Pike	SF
Legion Lake	Rainbow Trout	SP, CG, D

Little Spearfish Creek	Brown & Brook Trout	SF, PT, SF, CG, WI
Little Spearfish Creek-Rod & Gun Campground	Brown & Brook Trout	PT, SF, CO
Little Spearfish Creek-Roughlock Falls Area	Brown & Brook Trout	SF
Little Spearfish Creek-Timon Gampground	Brown & Brook Trout	SF, PT, CO
Major Lake	Rainbow Trout	SF
Memorial Pond	Rainbow Trout	SF
Mirror Lakes 1 & 2	Rainbow Trout	SF, T, D
Mitchell Lake	Rainbow Trout	SF
Newton Fork Creek	Rainbow Trout	SF
Newton Fork Dam	Rainbow Trout	SF, PT, T
North Fork Rapid Creek	Brown & Brook Trout	
Pactola Reservoir	Brown, Rainbow, & Lake Trout, Largemouth Bass, Pike, Perch	BR, PT, CG, T, SF, H
Rapid Creek	Brown & Brook Trout	SF
Rapid Creek – Pactola Basin	Brown & Brook Trout	SF, WI
Rapid Creek – Placerville Camp	Brown & Brook Trout	SF, WI
Rapid Creek – Rapid City	Brown & Brook Trout	SF
Rapid Creek – Silver City	Brown & Brook Trout	SF, WI
Reausaw Lake	Brown Trout	SF, T
Rhodes Fork	Brown & Brook Trout	SF

Roosevelt Pond	Rainbow Trout	SF
Roubaix Lake	Rainbow Trout	CG, PT, SF
Savoy Weir #1 & #2	Brown & Brook Trout	SF
Sheridan Lake	Brown & Rainbow Trout, Perch, Black Crappie, Largemouth Bass, Smallmouth Bass Pike	BR, PT, T, CG, H
Slate Creek	Brown Trout	SF, WI (Below Dam)
Slate Creek Dam	Rainbow Trout	SF
South Fork Rapid Creek	Brown & Brook Trout	CG, PT, SF
Spearfish Creek	Brown, Rainbow & Brook, Trout	SF, H
Spring Creek	Brown, Rainbow, & Brook Trout	SF, WI (Below Dam)
Stockade Beaver Creek	Brook Trout	SF
Stockade Lake	Brown & Rainbow Trout, Perch, Bullhead, Black Crappie, Largemouth Bass, Smallmouth Bass	SP, BR, PT
Strawberry Hill Pond	Rainbow Trout	SF, CG, BR, T, D, H
Sunday Gulch Pond	Brown & Brook Trout	SF, D, H
Sylvan Lake	Rainbow Trout	SP, CG, PT, H
Yates Pond	Brown & Rainbow Trout	SF

Appendix 4. Habitat projects or habitat research conducted in the Black Hills Fisheries Management Area since 1990.

Dates		Location	Description
1990	2003	Rapid Creek	Winter flow regime
1991	1991	Castle Creek	Instream cover
1992	1992	Rapid Creek, Griffith	Instream habitat
1993	1993	French Creek	Instream cover, holding areas
1994	1994	Castle Creek	Instream cover, stream meanders
1994	1994	Castle Creek, Barte	Instream habitat
1995	1996	Deerfield, Castle Creek	Valve replacement
1995	1995	Rapid Creek, McKie	Instream habitat
1996	1996	French Creek	Instream habitat
1996	1996	Galena Creek	Stream channel relocation
1996	2002	Rapid Creek	Folding cover, fish passage
1996	1996	Spearfish Creek, Painter	Instream habitat
1996	1996	Rapid Creek, O'Brien	Instream habitat
1997	2003	Castle, Rapid Creeks	Willow plantings
1997	1997	Pactola Basin	Holding cover
1997	1997	Spearfish Creek	Bank work, instream structure
1997	1998	Stockade Lake	Aeration system
1999	1999	Pactola Basin	Fish passage
1999	1999	Spearfish Creek, Maurice	Instream habitat repair
1999	1999	Spring Creek, Hill City Park	Instream habitat, riparian zone
1999	1999	WASP Mine	Riparian zone renovation
1999	1999	Yates Pond	Outlet structure, dam embankment
1999	1999	Yates Pond	Nutrient research
2000	2002	Reausaw Lake	Rehabilitation
2000	2002	Spearfish Creek	Geochemistry research
2001	2001	Castle Creek	Riparian zone protection
2001	2002	Grace Coolidge Creek	Structure repair and removal
2001	2001	Hearst Diversion	Fish passage, water right
2001	2001	Spearfish Creek	Flow research
2002	2003	Black Hills	Bog iron research
2002	2002	Cleghorn Springs	Flow modeling research
2002	2003	Hanna Pond	Sediment removal, replace outlet
2002	2004	Black Hills	Riparian zone, water flow research
2002	2003	Spearfish Creek	Flow Modeling research
2002	2003	Sheridan Lake Watershed	TMDL research
2003	2003	Grace Coolidge Creek	Sediment removal
2003	2003	Spearfish Creek, Savoy	Culvert, water right
2004	2005	Little Spearfish Creek	Rehab old weir
2004	2005	Sunday Gulch pond	Pond Construction
2005	2006	Pactola	Geomorph study MEI

2005	2006	Yates pond	Sediment removal, sheetpile wall
2006	2006	Pactola	New low water ramp
2006	2007	Savoy weir	Rehabilitation
2006	2006	Whitewood Creek	Re-deck three bridges
2007	2008	Roubaix Lake	Sediment removal and structure
2007	2008	Sheridan Lake	USGS water budget
2008	Current	Canyon Lake bypass	US14A grade work
2008	Current	Yates Pond	Pond bank stability
2011	2012	Dalton Lake	Sediment removal, structural repair