Fisheries and Aquatic Resources Adaptive Management System

2019-2023

West River Fisheries Management Area

South Dakota Game, Fish and Parks Wildlife Division

Formally adopted by GFP Commission: March 1, 2019

Department Mission

We provide sustainable outdoor recreational opportunities through responsible management of our state's parks, fisheries, and wildlife by fostering partnerships, cultivating stewardship and safely connecting people with the outdoors

Department Vision

We will conserve our state's outdoor heritage to enhance the quality of life for current and future generations

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"***

Introduction

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. This plan is a dynamic tool addressing the issues, challenges, and opportunities in managing the West 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 fisheries for this management area. 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.

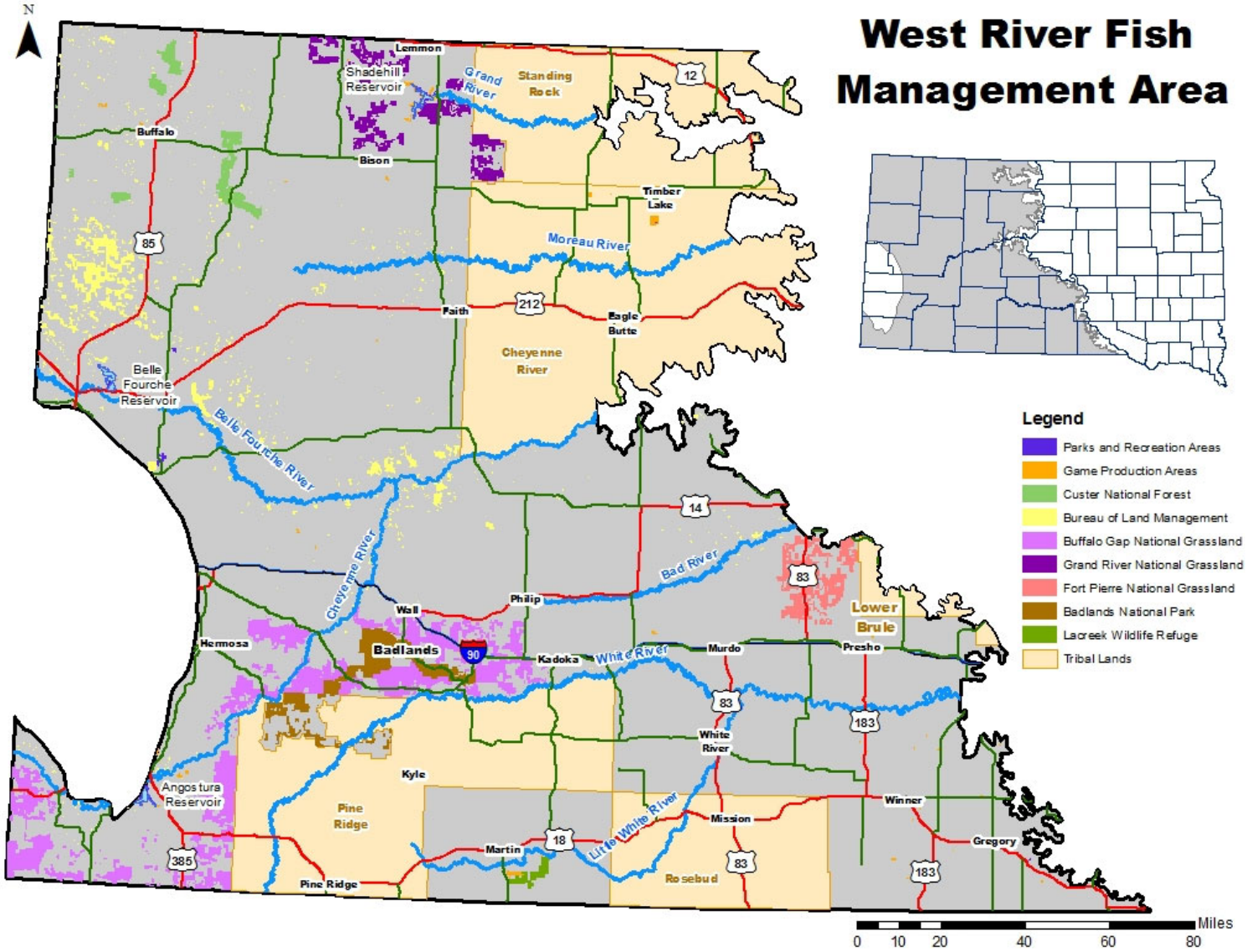

Figure 1. West River Fish Management Area of South Dakota.

Inventory

People

Demographics:

While the West River Fish Management Area (WRFMA) is geographically the largest of the Fish Management Areas (Figure 1), it is sparsely populated with nearly 47% of citizens classified as rural. As a whole, the WRFMA has a Rural Urban Continuum Code average of 7.4 and a mode of 9 (U.S. Census Bureau 2010, U.S. Economic Research Service 2013).

Regulations:

Distributing fisheries resources and the protection of these resources from over-harvest are primarily done through regulations. West River fisheries are managed by a variety of regulations, which stem from options available in the walleye toolbox (Lucchesi and Blackwell 2009) and the black bass toolbox (Blackwell and Lucchesi 2009). While some of these regulations are statewide in nature (i.e. five largemouth/smallmouth bass combination daily harvest limit), others are specific to waters on a year-round basis. Due to the predatory nature of many popular game fish, they are often used as control measures for prey or smaller game species and regulations are needed for their management. There are a variety of regulations needed to allow for the differences in lake production, current population trends and management objectives which are assigned on a watershed specific basis (Appendix 1).

Angler preferences and satisfaction:

While information on the preferences, expectations and level of satisfaction of anglers fishing in the WRFMA is limited, some information on larger reservoir angler preference does exist (Galinat 2004, 2005; Miller and Galinat 2006). Some additional information has been extracted from statewide angler surveys (Gigliotti 2007) and through collaboration with South Dakota State University (Sundmark in prep.). Survey results indicated that anglers fishing large western irrigation reservoirs tended to be satisfied with their trip (Galinat 2004, 2005). Trip satisfaction with anglers fishing Angostura Reservoir was 60% and 62% in 2001 and 2003-04, respectively. Satisfaction was higher with anglers fishing Belle Fourche with 77% and 82% satisfied in 2003 and 2009-10, respectively. Shadehill Reservoir anglers were the most satisfied at 92% (Gigliotti 2004). Additionally, 95% of anglers targeted walleye as their primary sport fish in Belle Fourche Reservoir (Galinat 2005), while only 43% of anglers at Angostura targeted walleye. Other targeted species included black crappie, smallmouth bass, yellow perch and northern pike. Percent satisfaction was lower on two WRFMA small impoundments

than on larger reservoirs. Angler satisfaction was only 46% at New Wall Lake (42 acres) and 60% at Waggoner Lake (107 acres); however, angler use and satisfaction has not been measured on other small impoundments, with the exception of Curlew Lake and New Underwood Dam (Sundmark in prep.). Additionally, no information on angler satisfaction has been collected for WRFMA river and stream anglers. However, a few statewide surveys have hinted some use on large rivers by anglers (Gigliotti 2004, 2007 and 2011). A more recent survey indicated that over 9,700, 4,900, 3,500 and 6,400 anglers fished the Cheyenne, Belle Fourche, Moreau and Grand Rivers, respectively (Gigliotti 2015).

Angler access:

Public access in western South Dakota varies by water type. For example, large reservoirs have good access through public lands on state parks and recreation areas. Many small reservoirs of varying size are also available to anglers through Lakeside Use Areas, Game Production Areas, or perpetual easements; however, many small impoundments are located on private land and must be accessed through landowner permission. Fisheries Management Agreements, where SDGFP provides fish used in fisheries management at these small waters in return for open public access, expand the number of small waters available to the public. These agreements vary in length based on the species managed with six years for trout and 10 years for bass. Access for anglers along flowing stream or rivers within the WRFMA is governed by South Dakota Codified Law (SDCL). The public has access to waters below the high water mark (SDCL 43-17-1) and in the land below the water (SDCL 43-17-3). These areas may be accessed at public areas, such as road stream crossings. In all cases, landowner approval certainly aids in access to other areas and is normally considered a good approach.

Other management entities:

Multiple other government agencies exist within the WRFMA that manage both terrestrial and aquatic resources. The United State Forest Service (USFS) manages the Buffalo Gap National Grasslands, Grand River National Grasslands and the Ft. Pierre National Grasslands (Region 2 [Rocky Mountain Region]), as well as the Custer-Gallatin National Forest (Region 1 [Northern Region]). Sampling of aquatic resources does occur on portions of these lands by USFS and data transfers generally occur annually. Additionally, SDGFP conducts sampling on many of these waters within both USFS Regions. Bureau of Land Management (BLM) also has land holdings within the WRFMA and does conduct sampling. Again, data transfer generally occurs annually. The United States Fish and Wildlife Service conducts fish population surveys on Ellsworth Air Force Base and has aquatic resources present on the Lacreek National Wildlife Refuge. In some cases, regulations specific to aquatic resources do exist outside of SDGFP regulations and can be found in the Federal Code of Regulations specific to each USFWS holding (e.g. Lacreek National Wildlife Refuge). Bureau of Reclamation (BOR)

manages water levels in the three large reservoirs (Shadehill, Belle Fourche and Angostura), primarily for irrigation. Additionally, four Native American Tribal Reservations (i.e. Standing Rock, Cheyenne River, Pine Ridge and Rosebud) are located within the WRFMA and these tribes manage resources located on tribal trust land. Sampling and management of these areas are coordinated with USFWS.

Fish

Species:

Designation of species as native and nonnative to watersheds and determining historic species assemblages is often difficult. Since European settlement, humans have altered aquatic habitats and introduced nonnative species (Bailey and Allum 1962). In addition, the earliest fish surveys and even current surveys provide limited distributional data, as many surveys are incomplete leading to large gaps in information. Therefore, we refer to “historic” as only native species presumably present within a river drainage when humans of European decent first settled South Dakota in approximately 1850 (Hoagstrom et al. 2007). Historic fish assemblages in the WRFMA consisted of suckers, goldeye, catfish, walleye, and various minnows (Rostlund 1952; Bailey and Allum 1962; Lee et al. 1980; Page and Burr 1991; Hoagstrom et al. 2007). Since European settlement, several other species have been introduced into the WRFMA including: panfish species, bass, yellow perch, northern pike, and gizzard shad (Rostlund 1952; Bailey and Allum 1962; Lee et al. 1980; Page and Burr 1991; Hoagstrom et al. 2007). Additionally, several cold water species, including: brown, brook, rainbow, lake and cutthroat trout, in addition to kokanee salmon, have been introduced into the WRFMA, with the first stocking records from the late 1800s (Barnes 2007; Hoagstrom et al. 2007). The WRFMA also supports eight species listed as threatened, endangered, or species of greatest conservation need (SGCN) in South Dakota (Appendix 2; SDGFP 2006). All of these species are tracked by the South Dakota Natural Heritage Program (SD NHP). In particular, mountain sucker are primarily native to the Black Hills Fish Management Area (BHFMA); however, a small portion of their range is found within the Cheyenne and Belle Fourche River drainages in the WRFMA. While their numbers remain stable in much of their native range, recent decline has been observed in South Dakota (Schultz et al. 2012). Similarly, lake chub were found within both the BHFMA and WRFMA, historically occurring within streams across the Black Hills and within the Little Missouri River drainage; however, recent surveys within the BHFMA indicate the only remaining population is in Deerfield Reservoir (Isaak et al. 2003). The last records for lake chub within the Little Missouri River drainage are from the 1950s and with limited survey data from the northwest portion of the state, knowledge of their current status is unknown. The Sandhills region of south central South Dakota historically provided unique habitats for four other SGCN within the WRFMA, including: finescale dace, northern redbelly dace, northern pearl dace and blacknose shiner. Recent survey work within the Sandhills of South Dakota found isolated populations of northern

pearl dace, northern redbelly dace and only a single blacknose shiner (Felts 2013). Current practices are for native fish to be managed by a natural yield option. This does not mean that there is not concern for native fish, but currently no practical abilities to raise native fish is available. Regulations, removal of non-native species, and trap and transfer to reintroduce native species could all be investigated as native fish management strategies in the future.

Stocking:

The majority of sport fisheries in the WRFMA are the product of stockings. With the exception of walleye, Sauger, Flathead and channel catfish, all other game fish species found within the WRFMA have at one point been introduced (Hoagstrom et al. 2007). Although these species are native to some drainages within the WRFMA, in some instances supplemental and maintenance stockings have been necessary to maintain viable fisheries. The first recorded stocking in the WRFMA was for largemouth bass in Haakon County in 1910 (SDGFP stocking database, Sayler, pers. comm.). Fish stockings are used to create, sustain, and maintain fisheries when natural production is insufficient to maintain a population or in instances where fish kills occur. Adult trap and transfer are most common in the WRFMA (e.g. gizzard shad, smallmouth bass and channel catfish). However, fry and fingerling stockings of hatchery product do occur annually. Shadehill, Belle Fourche, and Angostura Reservoirs are primarily stocked with walleye; however, they have also been stocked with channel catfish, smallmouth bass and panfish. Additionally, gizzard shad have been transferred from Angostura to Shadehill and Belle Fourche Reservoirs to replenish prey populations (SDGFP stocking database, Sayler, pers. comm.). Stocking of WRFMA rivers and streams is not a common practice. Additionally, several put-and-take fisheries exist within the WRFMA, including the Little Moreau #2 trout fishery in SDGFP Region II, and the Lacreek National Wildlife Refuge trout ponds.

Fisheries surveys:

Fisheries monitoring began in the early 1930s; however, more extensive surveying was not done until the 1950s when state fisheries staff were hired to inventory fish populations in the WRFMA (Churchill and Over 1938; Gibbs 1952). Since then, biologists have studied fish population dynamics, regulation effectiveness and influences of habitats on WRFMA fisheries. Standard fisheries surveys are done on a scheduled rotation. In the mid-1990s, inventories of western prairie stream fish were begun in the northern part of the WRFMA (Cunningham et al. 1995). South Dakota State University (SDSU) conducted additional stream surveys as well as surveys of main-stem fish communities in 2003 (Harland 2003; Harland and Berry 2004). Standard sampling data is used to help provide necessary information for fisheries management decisions and is also disseminated to the public on an annual basis (e.g. Miller et al. 2010).

Fisheries research:

Research has often reflected the needs of fisheries managers, biologists, or hatchery personnel. Project ideas were also generated from objectives and strategies outlined in our first fisheries strategic plan (SDGFP 1994). The scope of some projects requires additional support so partnerships with academic institutions and the USGS cooperative units are undertaken. Aside from fish community survey work and habitat relationships on the Cheyenne, Belle Fourche, Keya Paha, White, and Moreau Rivers (Mayden 1987; Hampton and Berry 1997; Loomis et al. 1999; Doorenbos 1998; Fryda 2001; Duehr 2004; Harland and Berry 2004), recent examples of fisheries research within the WRFMA include projects to evaluate predator prey relations with walleye on WRFMA reservoirs (Ward 2005), evaluating the age, growth, and recruitment of channel catfish on WRFMA large reservoirs (Stevens 2013) and determining the genetic structure of yellow perch (VanDeHey et al. 2013). Projects involving the status of native fishes and SGCN are often financially supported by State Wildlife Grants and can provide managers with essential information related to rare species distribution, status, and habitat associations. Additionally, recent native species research was conducted in the Sandhills area on four SGCN within the WRFMA (Felts 2013).

Unauthorized fish introductions:

The unauthorized introduction of fish, such as northern pike, yellow perch, largemouth bass and smallmouth bass, have established naturally-reproducing populations in many small lakes and impoundments throughout the WRFMA (Hoagstrom et al. 2007). The introduction of these species complicates management efforts and may lead to native species loss and costly removal efforts (Miller et al. 2010).

Fish removals and chemical renovations:

Population manipulation is one of the management tools utilized by fisheries managers to improve and restore fisheries in the WRFMA. Removals of undesirable fish or of over–abundant fish have been done in an attempt to improve fisheries. Routine black bullhead removals on waters during lake surveys, and periodically, more intensive fish removals are done within WRFMA waters. In cases where fish removal efforts are unlikely to succeed, chemical renovations have been done to remove all fish from a water body. For example, chemical renovations have been conducted on ponds within the Lacreek National Wildlife Refuge to improve fisheries (Lee, pers. comm.).

Aquatic Invasive Species (AIS):

AIS 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, aquaculture, or recreational activities dependent on such

waters (NANPCA 1990). Currently, several AIS exist within the WRFMA, including European rudd, common carp, and curlyleaf pondweed. Common carp can be found throughout the WRFMA. European rudd are found within Newell Reservoir and curlyleaf pondweed currently has an established population in Angostura Reservoir (SDGFP AIS database, Smith, pers. comm.). The full impact that AIS have on native species and aquatic habitats is not fully understood.

Habitat

Lakes and Large Reservoirs:

Bear Butte Lake and the LaCreek lakes are the only natural lakes know to exist in the WRFMA. All other standing water resources in this region are manmade impoundments. Belle Fourche, Angostura and Shadehill are the three largest reservoirs and are operated by the BOR in accordance with downstream water needs, such as irrigation. They have a beneficial use classification as Warmwater Permanent Fisheries, which is defined as “surface waters of the state which are capable of supporting aquatic life and are suitable for the permanent propagation or maintenance, or both, of warmwater fish” (Lorenzen 2005). Walleye are the primary sport fish in all three reservoirs (Galinat 2004, 2005), but other species present include black crappie, channel catfish, smallmouth bass, largemouth bass and yellow perch.

Small Impoundments:

Small ponds are an important aspect of angling within the WRFMA. Typically, these aquatic systems range in size from less than one acre to 150 acres. Small impoundments are often located on intermittent streams in order to have a more consistent water source for livestock or irrigation. They provide a significant portion of the fishing opportunities in the WRFMA. Rapid City aquaticsI staff manages 31 priority ponds, 24 secondary and currently has 26 privately owned ponds signed up in access agreements. Similarly, Ft. Pierre and Chamberlain aquatics staff combined manage 32 small impoundments, along with 49 privately owned ponds signed up in access agreements. In addition, Ft. Pierre staff work cooperatively with the USFS to manage 18 priority ponds, 18 secondary ponds, and 24 other waters identified as fisheries within the Fort Pierre National Grassland. Small prairie ponds are typically managed for largemouth bass but also can include panfish, forage fish and a variety of other species. Small impoundments often experience large fluctuations in water level, especially during dry cycles when periodic fish kills often occur.

Streams and rivers:

There are approximately 5,300 miles of rivers and streams within the WRFMA, not including an additional estimated 52,000 miles of intermittent streams which often

flow from west to east (SDGFP 2006). Six major tributaries of the Missouri River can be found in the WRFMA: Little Missouri, Grand, Moreau, Cheyenne, Bad and White Rivers. Due to large gaps in information on these major tributaries, comprehensive research on the fish and habitat has been conducted on the White (Fryda 2001), Cheyenne (Hampton 1998), Bad (Milewski 2001) and Moreau (Loomis 1997) Rivers. Combined, these tributaries drain an estimated 55,718 square miles (SDGFP 1994). Additionally, Doorenbos (1998) evaluated the fishes and habitat of the Belle Fourche River, a major tributary of the Cheyenne River, which drains an additional 3,290 square miles. Kaiser (2017) also sampled most tributaries in an effort to develop an Index of Biotic Integrity for the Northwestern Great Plains.

Habitat projects:

Increased angler demands, changing landscapes and aging outlet structures in many small impoundments have prompted many habitat projects within the WRFMA. These projects are often joint efforts between SDGFP, Federal Agencies and non-governmental organizations (NGOs). Habitat projects have included the placement of trees in Belle Fourche Reservoir by the High Plains Anglers and GFP. Additionally, trees have been placed in Curlew and Angostura Reservoirs by GFP staff to improve spawning habitat for fish. Federal assistance through the Clean Water Act, Section 319 is also available to support a variety of activities to help improve water quality. These activities often include providing private landowners with technical and financial assistance, demonstration projects and monitoring to help identify best management practices. This funding was used by the South Dakota Grasslands Coalition to implement a project that reduced sediment and nutrient inputs and improved overall water quality on South Dakota grasslands by improving range condition on grassland management systems (Jessop 2010).

Management Issues

1. Many of the impoundments in the WRFMA are over 80 years old and are not capable of supporting quality fisheries on a consistent basis.

2. Habitat degradation, such as degraded shorelines, bank destabilization, and sedimentation, is negatively impacting fisheries and species assemblages.

3. Current angler demographics, management preferences, and use patterns within much of the area are unknown, limiting the ability to develop management strategies for specific waters.

4. Water level fluctuations on large Bureau of Reclamation reservoirs complicate fisheries management by impacting system productivity, available fish habitat, and other factors.

5. Changing land-use practices in western SD may be impacting fisheries resources in the area.

6. Public awareness of all fishing opportunities (e.g. fish management agreements) in the area is low.

7. Lack of use data and remoteness often result in low prioritization for small dams on a statewide level, reducing the likelihood of project selection.

8. Communication and coordination on issues between government entities may be hindering management of some fisheries.

9. Population dynamics of prey fish important for sport fish are unknown or not taken into consideration when making management decisions.

10. Limited access to many portions of large western Missouri River tributaries restricts fishing opportunity.

Goals, Objectives, Strategies

Goal:

Manage fisheries and aquatic resources in the West River Fisheries Management Area of South Dakota for long-term sustainable use and enjoyment.

Objectives and Strategies

Not all objectives will be met due to brushfires, unforeseen obstacles, and changes in needs or priorities as a part of the adaptive management process.

1. Objective:

Improve angling access on 10 small impoundments by 2023.

Strategies:

a) Identify, prioritize, and select fisheries in need of access improvements.

b) Select appropriate management action(s) for selected fisheries (e.g. vegetation removal, boat ramp construction, fishing piers).

c) Communicate area fishing access needs to habitat staff and fisheries administrators.

d) Secure funding and necessary approvals to complete selected projects.

e) Evaluate angler use of selected access areas following completion of projects.

2. ***Objective:***

Complete a comprehensive renovation of one small impoundment by 2023.

Strategies:

a) Review status of small impoundments.

b) Coordinate with all interested department staff, (Law Enforcement, Habitat, Aquatics, Terrestrial, etc.) to prioritize small impoundments for renovation.

c) Select impoundment for renovation after consultation with fiscal and administrative staff.

d) Submit project for Capital Development funding.

e) Work with necessary stakeholders to secure project approval and obtain required permits.

f) Coordinate, as needed, with GFP engineering to develop designs and issue contracts.

g) Oversee project completion.

h) Coordinate with Communication staff to highlight completion of high-profile renovation project.

3. ***Objective:***

Maintain a minimum angler satisfaction rate of 70% on the three large irrigation reservoirs by 2023.

Strategies:

a) Maintain interagency information communication on water level management.

b) Work with human dimensions and other pertinent staff to develop appropriate survey methods to obtain necessary information such as angler satisfaction, harvest, etc.

c) Conduct fish population surveys, stocking, and other fisheries management activities on each reservoir on an annual basis.

d) Conduct one angler use and harvest survey on each of the three large irrigation reservoirs within the plan cycle.

4. Objective:

Complete two research projects focused on sport or prey-fish population dynamics in impoundments by 2023.

Strategies:

a) Identify a list of area fisheries where sport or prey-fish populations have declined or population dynamics information is lacking.

b) Select the two highest priority lakes for study.

c) Generate hypotheses on potential factors limiting fish abundance or interfering with preferred size structure in identified fisheries.

d) Develop appropriate study designs in consultation with other department staff and academic researchers.

e) In consultation with administrative staff, determine if research can be conducted by Department staff or if it should be a graduate student project.

f) Write proposals and obtain the required funding.

g) Initiate and complete research studies

h) Disseminate information from research projects internally and externally.

i) Implement management strategies to improve sport fisheries.

2019 to 2023 Work Priorities

At the beginning of the 2019-2023 plan period, the highest priorities for completion of objectives or strategies include:

- Increasing angler access to small impoundments
- Improving communication with other government entities on water management
- Collecting fish population and angler use and harvest information
- Increasing understanding of sport- and prey-fish populations

Due to brushfires, unforeseen obstacles, and development of new management issues, plan priorities may change during the implementation period.

Literature Cited

Bailey, R.M. and M.O. Allum. 1962. Fishes of South Dakota. Miscellaneous Publications, Museum of Zoology, University of Michigan, No. 119, Ann Arbor.

Barnes, M.E. 2007. Fish hatcheries and stocking practices: past and present. Pages 267-294 *in* C. Berry, K. Higgins, D. Willis, and S. Chipps, editors. History of fisheries and fishing in South Dakota. South Dakota Department of Game, Fish and Parks, Pierre.

Blackwell, B.G., and D.O. Lucchesi. 2009. South Dakota Black Bass Toolbox. South Dakota Department of Game, Fish and Parks, Wildlife Division Completion Report 09-03, Pierre.

Churchill, E.P. and W.H. Over. 1938. Fishes of South Dakota. South Dakota Department of Game and Fish, Pierre, SD. 87 pp.

Cunningham, G.R., R.D. Olson, and S.M. Hickey. 1995. Fish surveys of the streams and rivers in south-central South Dakota west of the Missouri River. Proceedings of the South Dakota Academy of Science 74: 55-64.

Doorenbos, R. D. 1998. Fishes and Habitat of the Belle Fourche River, South Dakota. Electronic Theses and Dissertations. 333. https://openprairie.sdstate.edu/etd/333

Duehr, J. P. 2004. Fish and Habitat Relations at Multiple Spatial Scales in Cheyenne River Basin, South Dakota. Electronic Theses and Dissertations. 336. https://openprairie.sdstate.edu/etd/336

Felts, E. 2013. Ecology of Glacial Relict Fishes in South Dakota's Sandhills Region. Electronic Theses and Dissertations. 350. https://openprairie.sdstate.edu/etd/350

Fryda, D. D. 2001. A Survey of the Fishes and Habitat of the White River, South Dakota. Electronic Theses and Dissertations. 364. https://openprairie.sdstate.edu/etd/364

Galinat, G. 2004. Angler Use and Fish Harvest Surveys on Angostura Reservoir, South Dakota, 2001. South Dakota Department of Game, Fish and Parks. Report No. 04-17.

Galinat, G. 2005. Angler Use and Fish Harvest Survey on Belle Fourche Reservoir, South Dakota, 2002. South Dakota Department of Game, Fish and Parks. Report No. 05-04.

Gibbs, R.C. 1952. Statewide Fisheries Investigations-Quarterly Progress Report No. 1. South Dakota Department of Game, Fish and Parks. Report No. 52-1.

Gigliotti, L.M. 2004. Fishing in South Dakota-2003. Fishing activity, harvest, and angler opinion survey. South Dakota Department of Game, Fish and Parks Special Report HD-6-04.AMS.

Gigliotti, L.M. 2007. Fishing in South Dakota 2006. South Dakota Department of Game, Fish and Parks, Fisheries Division Report HD-9-07, Pierre.

Gigliotti, L.M. 2011. Fishing in South Dakota – 2010: Resident fishing activity, harvest and angler opinion survey. South Dakota Game, Fish, and Parks Report ID#: HD-7-11.AMS, Pierre.

Gigliotti, L.M. 2015. Fishing in South Dakota – 2015: Information from the 2015 Internet Angler Survey. South Dakota Game, Fish, and Parks Report, Pierre.

Hampton, D.R. and C.R. Berry, Jr. 1997. Fishes of the mainstream Cheyenne River in South Dakota. Proceedings of the South Dakota Academy of Science 76:11-25.

Hampton, D. R. 1998. A Survey of the Fishes and Habitat of the Cheyenne River in South Dakota. Electronic Theses and Dissertations. 453. https://openprairie.sdstate.edu/etd/453

Harland, B. C. 2003. Survey of the Fishes and Habitat of Western South Dakota Streams. Electronic Theses and Dissertations. 458. https://openprairie.sdstate.edu/etd/458

Harland, B.C. and C.R. Berry Jr. 2004. Fishes and habitat characteristics of the Keya Paha River, South Dakota-Nebraska. Journal of Freshwater Ecology 19:169-77.

Hoagstrom, C.W., S.S. Wall, J.G. Kral, B.G. Blackwell, and C.R. Berry, Jr. 2007. Zoogeographic patterns and faunal change of South Dakota fishes. Western North American Naturalist 67: 161-184.

Isaak, D.J., W.A. Hubert, C.R. Berry Jr. 2003. Conservation assessment for lake chub, mountain sucker, and finescale dace in the Black Hills National Forest, South Dakota and Wyoming. US Department of Agriculture, Forest Service, Custer, South Dakota.

Jessop, J. 2010. Grasslands Management and Planning Project-Segment 2 Final Report.

Kaiser, C. 2017. Biotic Integrity in the Northwestern Great Plains and Mechanisms Regulating Stream Condition in South Dakota. Electronic Theses and Dissertations. 1207. https://openprairie.sdstate.edu/etd/1207

Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer, Jr. 1980. Atlas of North American freshwater fishes. North Carolina State Museum of Natural History, Raleigh.

Loomis, T. M. 1997. Survey of the Fishes and Habitat in the Upper Moreau River, Perkins County, South Dakota. Electronic Theses and Dissertations. 526. https://openprairie.sdstate.edu/etd/526

Loomis, T.M., C.R. Berry, Jr., and J. Erickson. 1999. The fishes of the upper Moreau River basin. The Prairie Naturalist 31:193-214.

Lorenzen, P. B. 2005. Targeting Impaired Lakes in South Dakota. South Dakota Department of Environment and Natural Resources.

Lucchesi, D.O., and B.G. Blackwell, 2009 South Dakota Walleye Toolbox South Dakota Department of Game, Fish and Parks, Wildlife Division Completion Report 09-04, Pierre.

Mayden, R.L. 1987. Faunal exchange between Niobrara and White River systems of the North American Great Plains. Prairie Naturalist 19:173-176.

Milewski, C. L. 2001. Local and Systemic Controls on Fish and Fish Habitat in South Dakota Rivers and Streams: Implications for Management. Electronic Theses and Dissertations. 542. https://openprairie.sdstate.edu/etd/542

Miller, B. and G. Galinat. 2006. Angler Use and Fish Harvest Surveys at New Wall and Waggoner Lakes and Shadehill Reservoir in Western South Dakota, 2003. South Dakota Department of Game, Fish and Parks. Report No. 06-08, Pierre.

Miller, B., M. Bucholz, and G. Galinat. Statewide Fisheries Survey, 2010. South Dakota Game, Fish and Parks. Report No. 13-03.

NANPCA (Nonindigenous Aquatic Nuisance Prevention and Control Act). 1990. PL 101-646, Washington.

Page, L.M. and B.M. Burr. 1991. A field guide to freshwater fishes, North American North of Mexico. Houghton Mifflin Company, Boston, MA.

Rostlund, E. 1952. Freshwater fish and fishing in native North America. University of California Publication in Geography 9:1-314.

Schultz, T.D., S.J. Lewis, and K.N. Bertrand. 2012. Fish assemblage structure in Black Hills, South Dakota streams. Prairie Naturalist 44:98-104.

SDGFP (South Dakota Game, Fish and Parks). 1994. Systematic approach to management. Wildlife Division, Pierre.

SDGFP (South Dakota Game, Fish and Parks). 2006. Comprehensive Wildlife Conservation Plan. SDGFP, Wildlife Division Report 2006-08, Pierre.

Stevens, T. M. 2013. Feeding Ecology and Factors Influencing Growth and Recruitment of Channel Catfish in South Dakota Reservoirs. Electronic Theses and Dissertations. 425. https://openprairie.sdstate.edu/etd/425

Sundmark, A. in prep. Economic Impact of Fishing in Selected Small Lakes and Impoundments in South Dakota. PhD Dissertation, South Dakota State University, Brookings.

U.S. Census Bureau. 2010. State & county Quickfacts: South Dakota data by county. Retrieved July 03, 2013, from http://factfinder2.census.gov/faces/nav/jsf/pages/guided_search.xhtm

U.S. Economic Research Service. 2013. Atlas of Rural and Small-Town America. Retrieved July 29, 2013 from http://www.ers.usda.gov/topics/rural-economy-population/rural-classifications.aspx

VanDeHey, J.A., B.L. Sloss, B.G. Blackwell, and D.W. Willis. 2013. Genetic structure of yellow perch in South Dakota. Presented at the Dakota Chapter American Fisheries Society meeting, Bismarck, North Dakota.

Ward, M. J. 2005. Gizzard Shad Reproductive Biology and Predator-Prey Relations with Walleyes in Western South Dakota Reservoirs. Electronic Theses and Dissertations. 595. https://openprairie.sdstate.edu/etd/595

Appendices

Appendix 1. West River Fish Management Area exceptions to statewide harvest regulations.

Water Body Name	Species	Regulation
Angostura Reservoir	Walleye	15” minimum
Shadehill Reservoir	Walleye	15” minimum
Belle Fourche Reservoir	Walleye	≤15”, or ≥18” can be taken; of those only 1 may be ≥18”
Curlew Lake	Walleye	15” minimum; Daily limit 2.
Newell Lake	Walleye	15” minimum; Daily limit 2.
Burke	Largemouth/Smallmouth Bass	15” minimum
New Wall Lake	Largemouth/Smallmouth Bass	≤14”, or ≥18” can be taken; of those only 1 may be ≥18”
Missouri River tributaries	Channel Catfish	No limits

Appendix 2. West River Fish Management Area (WRFMA) rare species list. Status abbreviations: LE= federally endangered; LT-federally threatened; SE=state endangered; ST=state threatened; SGCN=Species of Greatest Conservation Need. FMA abbreviations: BH= Black Hills; WR= West River; ER= East River; MR= Missouri River.

Common Name	Scientific Name	State Status	Fish Management Area
Blacknose Shiner	*Notropis heterolepis*	SE, SGCN	WR, ER
Finescale Dace	*Chrosomus neogaeus*	SE, SGCN	BH, WR
Lake Chub	*Couesius plumbeus*	SGCN	BH, WR
Longnose Sucker	*Catostomus catostomus*	ST, SGCN	BH, WR
Mountain Sucker	*Catostomus platyrhynchus*	SGCN	BH, WR
Northern Pearl Dace	*Margariscus nachtriebi*	ST, SGCN	WR
Northern Redbelly Dace	*Chrosomus eos*	ST, SGCN	WR
Sturgeon Chub	*Macrhybopsis gelida*	ST, SGCN	WR

Appendix 3. Management issues included in the 2014-2018 West River Fisheries Management Area Plan.

1. Little is known of species present in prairie rivers and streams.
2. Impacts of drought and flooding on fish populations in small lakes and ponds and intermittent streams are largely unknown.
3. Management strategies have not been developed for nongame species, particularly for those listed by the South Dakota Natural Heritage Program.
4. Management generally focuses on in-water habitat and typically excludes riparian areas.
5. Information gaps exist in the WRFMA due to the large number of waters in this management area.
6. The impacts of unauthorized introductions and Aquatic Invasive Species on native and game species are poorly understood.
7. Fish species not stocked by Game, Fish and Parks appear in new locations.
8. There is a lack of a unified approach to addressing unauthorized introductions.
9. The impacts on fisheries of the structural deterioration of small dams are unmeasured.
10. Habitat degradation (e.g. degraded shorelines, bank destabilization, and sedimentation) is negatively impacting fisheries and species assemblages.
11. Habitat and access projects are not tracked or evaluated upon completion, and cost-benefit analysis is not conducted.
12. The lack of user information on many remote public waters in the WRFMA makes the prioritization of access projects difficult to determine.
13. Access and use of private waters covered by access agreements is limited.
14. Information on fish health (i.e., disease, viruses, pathogens, and parasites) is limited.
15. Pertinent data collected and stored by tribal and other governmental entities, as well as non-governmental organizations, is not readily available.
16. Current angler demographics and use patterns within majority of the West River Fisheries Management Area are unknown.
17. Shoreline angling opportunities on small waters are limited during the summer due to abundant aquatic vegetation.
18. An inability to control water levels on large reservoirs negatively impacts fisheries.

Appendix 4. Objectives and completion status for the 2014-2018 West River Fisheries Management Area Plan.

1. ***Objective:***

   Utilize the statewide comprehensive habitat plan, once developed, for monitoring and rehabilitating small impoundments within the WRFMA by December 31, 2018.

   Status: Not complete. Statewide comprehensive habitat plan not created.

2. ***Objective:***

   Participate in at least one watershed improvement project to reduce sedimentation and improve water quality by December 31, 2018.

   Status:

   Not completed. No project identified.

3. ***Objective:***

   Determine demographics and preferences of anglers fishing rivers and streams and small lakes and ponds by December 31, 2018

   Status:

   Completed. Participated in SDSU joint research project looking at economic impacts of small impoundments in which four were located in the WRFMA. Angler demographics and use information was collected during this study. Additionally, utilized Statewide Angler survey to gather use information on WRFMA rivers and streams

4. ***Objective:***

   Establish and implement standardized sampling protocols and monitoring programs for streams, rivers, and small lakes and ponds by December 31, 2018.

   Status:

   Completed. Document created.

5. ***Objective:***

   Develop and implement management strategies to mitigate unauthorized fish introductions by December 31, 2018.

Status:

Completed. Document created.

6. Objective:

Improve access on five small waters by December 31, 2018.

Status:

Completed. Access has been improved on the following waters: New Underwood Dam (new boat ramp and fishing pier), New Wall Dam (fishing pier), Old Wall Dam (boat ramp), Waggoner Lake (gravel on boat ramp), Newell City Pond (fishing pier).

7. Objective:

Develop and standardize surveys to inventory and monitor non-game fish species by December 31, 2018.

Status:

Completed. Utilized existing sampling protocols for sampling lotic and lentic systems that had been previously applied within the WRFMA.