

South Dakota

Department of Game, Fish and Parks

# Missouri River Strategic Plans

2017-2021



## Fisheries Management Plan for Lake Sharpe

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## **Vision statement for management of Lake Sharpe**

The state of South Dakota manages Lake Sharpe's aquatic resources for the continued use and enjoyment of South Dakota Residents and its visitors.

## **Introduction**

The Missouri River and its reservoirs provide considerable economic and recreational activity for South Dakota. Lake Sharpe and its fisheries are part of a reservoir system which supports 40% of the angler use in South Dakota. Strategic planning is required to focus use of available resources to provide recreational opportunities that meet user expectations at the present time, while protecting resources for future use. Plans for the management of these resources are fundamental to their sustained and equitable use. This plan identifies current issues related to fisheries management of Lake Sharpe and objectives to address these issues. Fisheries management strategies are outlined to accomplish specific objectives.

The Missouri River system represents one of the most economically and recreationally important aquatic resources in the state of South Dakota. Anglers spent over 2.4 million hours fishing the Missouri River system in South Dakota in 2008. In 2010, approximately 37% of all angler days in South Dakota were spent on the Missouri River system, and about 50% of all South Dakota resident licensed anglers fished the Missouri River system. Specifically, Lake Sharpe has supported between 26,321 and 97,339 angler days and contributed between \$1.8 and 6.2 million annually to local and regional economies from 2005-2015. Lake Sharpe is an important resource in South Dakota and its habitat and fish assemblage must be managed to enhance its value to various user groups. The importance of Lake Sharpe to South Dakota fisheries is documented in the issues, objectives and strategies provided herein.

## **Study Area**

Lake Sharpe the 54<sup>th</sup> largest reservoir in the United States and is a flow-through Missouri River reservoir located in central South Dakota and extends from Oahe Dam to Big Bend Dam. Lake Sharpe is 80 mi long and has a surface area of 57,000 ac. Hipple Lake and LaFramboise Bay are large backwaters located on upper Lake Sharpe. These embayments are generally warmer compared to the main lake and recent research has shown their importance to the production of prey and sport fish in Lake Sharpe. Emergent vegetation, including curly leaf pondweed, Eurasian water milfoil, fan-leaved crowfoot, American elodea, and sago pondweed is prevalent in embayments throughout Lake Sharpe. Cattail and round stem bulrush stands are more common in Hipple Lake, but can also be found in LaFramboise Bay.

Lake Sharpe's drainage area spans 5,840 square miles (excluding Missouri River) with 2 major tributaries including the Missouri and Bad Rivers. Lake Sharpe storage capacity is 1.9 million ac-ft. Record pool elevation was 1,422 mean sea level (msl) in 1991; however, record flows out of Big Bend Dam occurred in 2011 when 166,300 cfs was released. Sedimentation is ongoing in Lake Sharpe with the majority of sediment arriving into Lake Sharpe from the Bad River. Since dam construction to 1988, 6.1% of Lake Sharpe's water storage was lost due to sedimentation or about 4.3 ac-ft/yr.

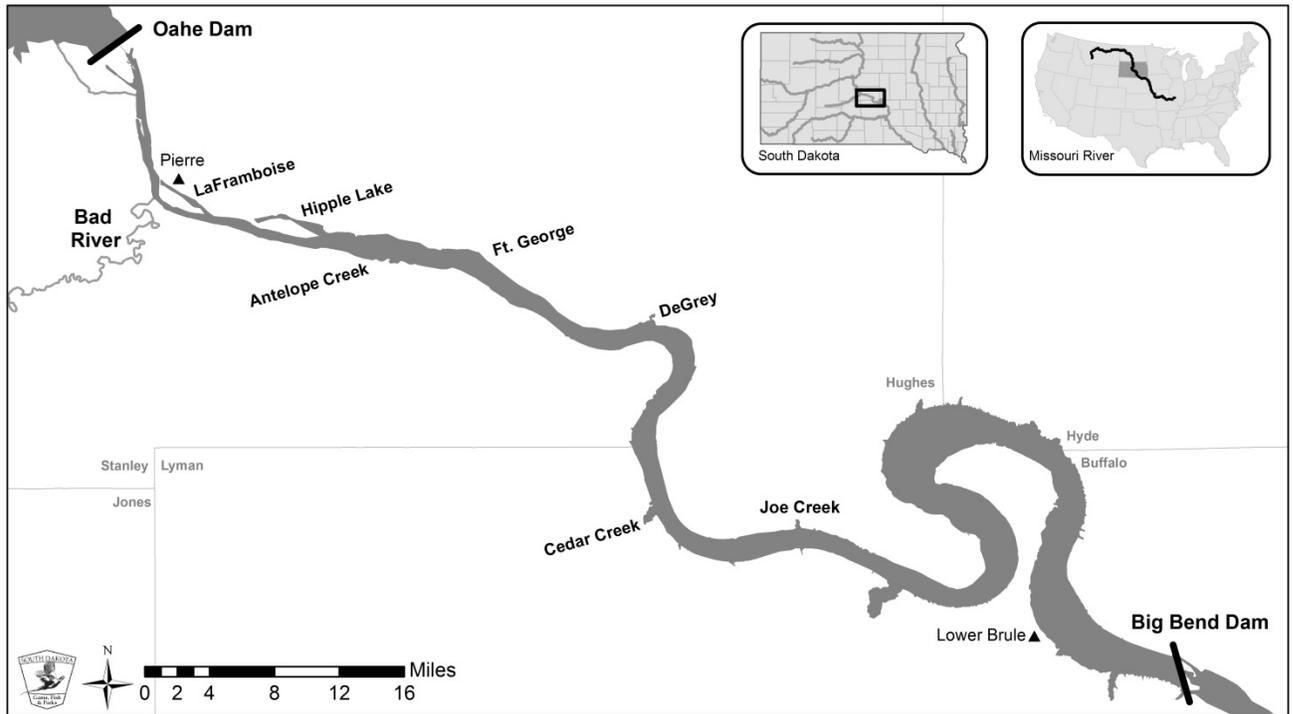


Figure 1. Depiction of Lake Sharpe in central South Dakota. LaFramboise and Hipple Lake are two backwater embayments of Lake Sharpe. Although currently operational, Ft George is an underdeveloped boat ramp. Antelope Creek and Cedar Creek are two boat ramps that can be unusable during certain periods of flow. DeGrey boat ramp is currently unusable. Joe Creek is the first fully operational boat ramp downstream from Ft. George.

## **Management of Lake Sharpe**

### **Stocking**

Lake Sharpe was stocked with approximately 20,000 tiger muskellunge fingerlings during most years in the 1980's and 1990's. Stocking was discontinued after 1997, as few, if any, anglers were targeting muskellunge. Smallmouth bass were stocked between 1980 and 1991. Stocking was discontinued when natural reproduction was adequate to maintain the population. The majority of fish stockings into Lake Sharpe have been of cold-water species, primarily rainbow trout and brown trout. Brown trout stockings were discontinued after 1996 due to low return rates to anglers when compared to rainbow trout. Chinook salmon and cutthroat trout were stocked briefly from 1984-1986 and in 1991. Catchable-size rainbow trout are the only salmonid currently stocked into Lake Sharpe on an annual basis. Recently, efforts to restore a paddlefish population in Lake Sharpe have resulted in stocking of advanced fingerlings in 2015 and advanced fry in 2016. Paddlefish stockings are planned to continue through 2025 or until success of these stockings can be determined.

### **Fisheries Surveys**

Standardized adult fish population surveys (gill-net surveys) started on Lake Sharpe in 1986 and prey fish surveys (seining survey) began in 1982. Since then, fish population surveys have been conducted annually on Lake Sharpe. Over the years these surveys have included:

1. Adult gill-net survey
2. Shoreline prey fish seining survey
3. Larval trawling survey
4. Age-0 walleye fall electrofishing survey
5. Smallmouth bass gill-net survey
6. Panfish trap-net survey

Current fish population surveys include experimental-mesh gill-nets and nylon mesh bag-seines to survey fish populations in Lake Sharpe. Four locations on Lake Sharpe are sampled with six, 91.4-m multifilament gill nets submerged overnight (about 20 h). Three nets are placed  $\leq$  9-m depth and three are placed in  $>$  9-m where possible. Bar mesh dimensions include 13-, 19-, 25-, 32-, 38-, and 51-mm. All fish collected are identified and counted. The first 50 individuals of each species are measured (TL; mm) and weighed (g) at each sampling location. All walleye and sauger are measured, weighed, and otoliths removed for age-estimation (10 per 2.5-cm length group per sampling location). A 6.4-mm nylon mesh bag seine, measuring 30.5-m long by 2.4-m deep with a 1.8-m by 1.8-m bag, is used to collect age-0 and small-bodied littoral fishes. Four seine hauls are made at each sampling station. All fish collected are identified, counted, and classified by age.

These surveys are designed to provide biological information regarding:

1. Species composition

2. Relative abundance
3. Age
4. Growth
5. Condition
6. Recruitment
7. Survival and mortality rates

### **Recent Fish Survey**

In 2015, walleye comprised 38% of the gill-net catch. Other species commonly caught included channel catfish, sauger, common carp, and yellow perch. Walleye CPUE increased from 2014. Multiple walleye year classes were present with a large portion of quality and preferred length walleye. Approximately 30% of walleye in the gill-net sample were  $\geq 381$ -mm and less than 1% were  $\geq 508$ -mm. Proportional size distribution decreased from 51 in 2014 to 41 in 2015, but was in the range of the previous four years.

Historically, walleye condition (relative weight) for Lake Sharpe is generally between 80 and 90. Condition of walleye (stock length and greater) in Lake Sharpe was 79 in 2015, which is similar to the five-year average. Variability in walleye condition in Lake Sharpe likely occurs due to the seasonal availability of gizzard shad and entrainment of rainbow smelt through Oahe Dam. Walleye growth in Lake Sharpe is generally considered good and walleye typically reach the 381-mm minimum length limit during their fourth growing season. However from 2013-2015, walleye surpassed 381-mm at age-3. Age-2 and -3 walleye (i.e., produced in 2013 and 2012) represented 74 percent of the gill net sample. Thirty-four age-1 walleye were captured during the gill net survey which was similar to the five year average.

Eighteen species of small-bodied littoral fishes were collected by shoreline seining. All species had previously been collected in Lake Sharpe. The overall catch rate for all species in combination was 1,182 fish/seine haul which is above the long term mean of 699 fish/seine haul. Age-0 gizzard shad CPUE comprised the majority of the catch. Age-0 walleye CPUE was 5 fish/seine haul which is similar to the long term average.

### **Angler-Use Surveys**

The first angler-use and harvest survey on Lake Sharpe was conducted in 1974. Walleye have been harvested in Lake Sharpe since impoundment and contributed significantly to the sport fish harvest during the first angler-use survey in 1974. Soon after impoundment, paddlefish (a native species) provided a unique fishery below Oahe Dam and were frequently harvested. However, due to low catches and no recorded natural reproduction, paddlefish harvest was banned and the population declined. Sauger were also more prominent in angler harvest immediately after the reservoir was created than they are today. Currently, walleye are the most harvested species followed by smallmouth bass, white bass, and channel catfish.

Prior to 2003, angler-use and harvest survey techniques were designed using a template consisting of two independent parts. First, aerial pressure counts were used to estimate fishing pressure. Second, angler interviews were used to obtain estimates of individual angler harvest, catch, and release rates. Since 2003, a bus route survey has

been used for the angler use and harvest survey to increase the statistical reliability of the pressure estimates generated. A bus route design is a modified access survey typically used for fisheries with numerous access sites spread over a broad geographical region. Current creel surveys are conducted from 1-May through 31-August for the sunrise-to-sunset (daytime) period.

Questions posed in standard interviews gather information on trip length, type of fishing (boat or shore), target species, zip code, number in party, number and species of fish harvested and released, and lengths of walleye harvested by anglers. Angler satisfaction questions are included in each interview. Anglers are also asked specific questions to help guide management practices on Lake Sharpe. For instance, in 2015, anglers were asked what factors would help increase their satisfaction level to “very satisfied” and whether they were aware of new regulations for boat plug removal and live bait transport.

### **Recent Angler-use Survey**

In 2015, estimated fishing pressure for the May-August daylight period (314,064 h) was greater than the long term average for Lake Sharpe (271,571 angler-h). Estimated angler trips spent on Lake Sharpe was the fourth highest observed on Lake Sharpe since 2006. Walleye were the most abundant species (305,774 fish) and walleye harvest (116,826 fish) on Lake Sharpe exceeded the long term average harvest (112,940 fish) but was lower than harvest in 2014. Walleye were also the most frequently released species with an estimated 188,948 walleye caught and released in Lake Sharpe. Smallmouth bass, white bass, and channel catfish were also commonly caught and released.

In 2015, Lake Sharpe anglers contributed about \$5 million to local economies. Non-residents made up 19% of the angler contacts on Lake Sharpe in 2015, similar to estimates from the previous four years. Residents of 34 states were interviewed while fishing Lake Sharpe. About 48% of resident angling parties interviewed on Lake Sharpe during the survey were local anglers from Hughes and Stanley counties. Travel is required for many anglers fishing Lake Sharpe as the reservoir is located a fair distance from large population centers. Many (44%) anglers drove >100 miles to fish on Lake Sharpe. The percent of anglers traveling in excess of 200 miles (one way) to fish Lake Sharpe in 2015 remained similar to 2014. Walleye remain the primary species targeted by roughly two thirds (65%) of the anglers on Lake Sharpe.

Anglers’ perception of their fishing experience is important to the success of a fishery. In 2015, anglers were asked to consider all factors when evaluating their level of satisfaction with their fishing trip. The median trip rating for the May-August 2015 period was “moderately satisfied”. About 79% of angling parties interviewed in 2015 indicated some degree of satisfaction. Anglers that harvested three or more walleye on average were “very satisfied” In general, as mean walleye catch rate increased, the level of satisfaction increased, similar to previous years. To better understand factors influencing satisfaction, anglers were asked the supplemental question: “What would help increase your satisfaction level to ‘very satisfied’?” Forty-four percent of anglers interviewed gave a “very satisfied” response and were not asked this question. The majority (63%) of anglers interviewed responded with “catch more fish”. When looking at the high levels of satisfaction on Lake Sharpe combined with the high catch and high

release rates, it appears that current management regulations and practices are serving the public well.

### **Fisheries Research**

Lake Sharpe has gone through phases of high/low research attention. In the 1960's and 1970's Lake Sharpe research focused on northern pike reproduction, recruitment and atresia (June 1970; Hassler 1970), channel catfish population characteristics (Elrod 1974), *Percid* population dynamics (Nelson and Walburg 1977), and impacts of water discharge on age-0 fishes (Martin et al. 1981). A suite of sturgeon research was performed during the 1980's and 1990's (Kallemeyn 1983; Keenlyne et al. 1994). In the mid 1990's, research focused on the influences of environmental variables on white bass recruitment, growth, and mortality (Beck et al. 1997) and entrainment of fishes through Big Bend Dam (Smith and Brown 2002).

More recently, the Lake Sharpe fishery has returned as a research priority for South Dakota. Researchers evaluated potential competition between Lake Sharpe walleye and smallmouth bass (Wuellner et al. 2010), revealed the impacts of drought on zooplankton communities and production (Beaver et al. 2013), examined gizzard shad population characteristics as they relate to other systems in South Dakota and throughout the US (Wuellner et al. 2008), and described hybridization of walleye and sauger (Graeb et al. 2010). Since 2010, the smallmouth bass regulation was evaluated and eventually removed (Fincel et al. 2015), diet overlap for walleye and sauger was studied (Fincel et al. 2016a) as was the importance of specific habitats to walleye production in Lake Sharpe (Carlson et al. 2016a) and the potential to use non-lethal tissues for isotope analysis (Fincel et al. 2011).

The flood of 2011 brought forth many research projects documenting the impacts of high discharge on the Missouri River system. Fincel et al. (2016b) examined the entrainment of rainbow smelt during the summer of 2011 through Oahe Dam into Lake Sharpe and made recommendations for future releases. Additionally, walleye entrainment during the 2011 Missouri River Flood was assessed (Carlson et al. 2016b) as was the impacts of cold water releases on age-0 gizzard shad abundance, growth, and hatch timing (Greiner et al. 2016).

There are many current and ongoing research studies on Lake Sharpe. These include evaluating acoustic telemetry use with gizzard shad and using this technology to reveal the importance of Hipple Lake and other side channel habitat types to gizzard shad reproduction and survival. Corroborating the telemetry research on gizzard shad using otolith microchemistry and using otolith microchemistry to describe where sport and prey fishes on Lake Sharpe originated. Other ongoing research projects include explaining current and ongoing trends of Lake Sharpe's white bass population, using acoustic telemetry to evaluate current management practices for stocking rainbow trout in Oahe Marina, describing the dynamic rate functions, exploitation and movement of Lake Sharpe walleye, and evaluating population parameters and movement patterns of shovelnose sturgeon in Lake Sharpe. SDGF&P is also working with the USF&WS to identify stocking protocols and document habitat use of stocked paddlefish in Lake Sharpe. Additionally, current research is evaluating economic expenditures and the financial impact of Lake Sharpe angling to local communities.

## **Aquatic Invasive Species**

Concern, knowledge and awareness of Aquatic Invasive Species (AIS) were largely non-existent until relatively recently on Lake Sharpe. From impoundment through the mid 2000's there were no AIS specific surveys performed on the lake, and very little data on species now considered AIS in South Dakota exist prior to this time. Monitoring surveys were instituted on Lake Sharpe in 2008 and are currently incorporated into standard fish management surveys. Dreissenid mussel veliger sampling is performed annually as an early detection method for Zebra and Quagga mussels. Surveys have identified few AIS populations in Lake Sharpe. Invasive plant species present in the reservoir include Curly pondweed, and Eurasian water milfoil and Purple loosestrife. Common carp and European rudd are the two AIS fish populations in Lake Sharpe.

## **Regulation History**

Walleye harvest regulations for Lake Sharpe have differed from standard statewide regulations since 1990 when an April through June 356-mm minimum length limit was implemented. In 1999, the minimum length limit was increased to 381-mm during all months except July and August and a stipulation that, at most, one fish in the daily limit could be 457-mm or longer was added. These changes were made to reduce harvest during a period of high angler use and increase the abundance of walleye longer than 457-mm in the population. The daily limit was reduced to three fish for 2004 and 2005 to reduce harvest during a period of low walleye abundance. In 2006, the daily limit was returned to the statewide limit of four and the one walleye over 457-mm length regulation was increased to 508-mm. This regulation has been in place since 2006.

Experimental regulations for smallmouth bass were implemented in 2003 and evaluated through 2011 for their effectiveness at increasing the size structure of the population in Lake Sharpe. Special regulations for smallmouth bass from 2003 through 2007 included a 306- to 457-mm protected slot length limit with, at most, one fish 457-mm or longer in the daily limit. In 2008, the smallmouth bass regulations on Lake Sharpe were altered to include a 355- to 457-mm protected slot length limit with, at most, one fish 457-mm or longer in the daily limit. The regulation change was implemented with a goal to decrease abundance and increase size structure through increased harvest of smaller smallmouth bass. The slot limit regulation for smallmouth bass was evaluated beginning in 2011 and deemed unsuccessful, thus, this regulation was removed at the end of calendar year 2011.

Table 1. History of special harvest regulations for walleye and smallmouth bass on Lake Sharpe, South Dakota, 1968-2015.

<b>Species</b>	<b>Period</b>	<b>Daily limit</b>	<b>Possession limit</b>	<b>Length restrictions</b>
Walleye/Sauger in combination	1968-1983	8	16	None
	1984-1989	6	12	None
	1990-1998	4	8	<ul style="list-style-type: none"> <li>• April-June 356-mm minimum length</li> </ul>
	1999-2003	4	8	<ul style="list-style-type: none"> <li>• Sept.-June 381-mm minimum length</li> <li>• At most one equal to or longer than 457-mm</li> </ul>
	2004-2005	3	8	<ul style="list-style-type: none"> <li>• Sept.-June 381-mm minimum length</li> <li>• At most one equal to or longer than 457-mm</li> </ul>
	2006-present	4	8	<ul style="list-style-type: none"> <li>• Sept.-June 381-mm minimum length</li> <li>• At most one equal to or longer than 508-mm</li> </ul>
Smallmouth bass	2003-2007	5	10	<ul style="list-style-type: none"> <li>• Only fish shorter than 306-mm or 457-mm and longer may be kept and at most one fish in the daily limit may be 457-mm or longer.</li> </ul>
	2008-2011	5	10	<ul style="list-style-type: none"> <li>• Only fish shorter than 306-mm or 457-mm and longer may be kept and at most one fish in the daily limit may be 457-mm or longer.</li> </ul>
	2012-present	5	10	None

## **Reservoir Access and Habitat**

Lake Sharpe has abundant shore fishing access on the upper 1/3<sup>rd</sup> of the reservoir. Shore access within the cities of Ft. Pierre and Pierre provide ample shore fishing opportunities. Just downstream from Pierre is Hipple Lake and the Farm Island Recreation area. These locations also provide many shore fishing opportunities. Approximately 20 km downstream a number of “pull-offs” exist where anglers can access Lake Sharpe. However, past this location, shoreline access is limited to a few boat ramp access points and a few Game Production Areas. There are several fishing piers on Lake Sharpe and 2 ADA approved accesses on Lake Sharpe. Following the flood of 2011, the fishing pier along LaFramboise causeway has become silted in and sits in less than ½ m of water. Although historically a popular angling location, this pier is rarely used for angling since the flood.

Lake Sharpe currently has 25 boat ramps, four of which are maintained by the Lower Brule Sioux Tribe. Oahe Downstream, Farm Island Recreational Area, and West Bend are popular access points that offer many camping and recreating opportunities to compliment angling access. However, Lake Sharpe boat access has declined over recent years. Boat ramps such as DeGrey, Ft. George, North Bend, Cedar Creek, and Antelope Creek are currently unusable or close to becoming unusable due to sedimentation. Additionally, Hipple Lake boat access sites no longer serve to access the main lake. Thus, much of the middle zone of Lake Sharpe is hard to access for boat anglers.

Lake Sharpe contains some unique habitat types. Backwater areas unique to Lake Sharpe include Hipple Lake, LaFramboise side channel, and Ft. Pierre city developments provide complex habitats. However; no evaluation on the use of these areas by fish has been conducted. Since the late 2000's, Christmas trees have been placed in Hipple Lake as a way to boost lake productivity and to concentrate fish to areas easily accessible by shore anglers. These habitat modifications have been very popular and in 2016, Mossback® permanent habitat structures were placed in Hipple Lake. These habitat structures last far longer than the pine trees used previously (>20 years compared to 2-3 years); however, no evaluations have been conducted in South Dakota to compare fish assemblages/sizes between the two habitat types.

## Issues and Opportunities

### 1) **Issue – Shoreline and boat access on Lake Sharpe can be limited due to a variety of factors.**

Lake access is limiting for much of middle and lower Lake Sharpe. Boat ramps and lakeshore angling access points are interspersed throughout the lake, but there are vast areas void of adequate access. For instance, only 1 boat ramp (Ft. George), provides access from the Polo Fields (on the lake side of Hipple Lake) down to Joe Creek on the east side of the river. Additionally, reservoir and embayment siltation has rendered some boat ramps and popular shore angling locations unusable. For instance, De Grey is currently unusable and Antelope Creek and Cedar Creek can be unusable dependent on water elevation. Moreover, siltation has rendered the Hipple Lake access channel (a previously popular boat access location) unusable to boat traffic. Also, water elevation in the Pierre area can change greatly depending on water releases impeding some shore fishing access locations. Moreover, much of upper Lake Sharpe shorelines are overlaid with rip-rap and while protecting specific shorelines from erosion, these rocky stretches make it difficult to fish from. Currently, there are 2 ADA facilities located on Lake Sharpe. Crowding at boat ramps, as well as on the main lake, has also been brought forth as an issue by Lake Sharpe users.

### ***Opportunities***

Many opportunities exist to increase boat and shore access on Lake Sharpe. Some of these can be done at relatively low costs to the state. For instance, developing low maintenance gravel roads (with driving restrictions) over state land can increase shoreline access and potentially be developed along much of Lake Sharpe shoreline (or bike/walking trails). Specifically, shoreline access trails could be developed from Farm Island down to DeGrey and beyond. This could be coupled with fishing pods or wing dykes (and coupled with placing fish habitat structures as outlined in *issue 2*) to boost shore angling experiences. At a higher expense, additional boat ramp construction could add ramps (or refurbish existing ramps) at high use locations or locations currently lacking boat ramp access. Additionally, the Ft. George or Degrey boat access areas could be renovated providing ample boat access to this stretch of Lake Sharpe. Moreover, dredging could be implemented to remove sediments recently deposited from the 2011 Missouri River Flood at the mouth of Hipple Lake to improve boat access. These projects could also be coupled with habitat initiatives and shore fishing nodes/piers outlined in the following *Issue 2*. There are also locations that could be suitable for ADA fish access locations throughout the lake.

### 2) **Issue – Fish habitat quantity and quality may negatively impact anglers and fish populations on Lake Sharpe.**

Embayment siltation, and overall indications of reservoir ageing, have filled in embayments and rendered some boat ramps and popular angling locations unusable. Moreover, siltation from the Bad River has made stretches downstream from this

tributary relatively shallow impeding shore fishing opportunities and creating impassible and/or dangerous boat navigation situations. Wave action has had noticeable impacts on shoreline habitat, most of which has not been formally documented. Areas such as Hipple Lake have lost much of their connection to the main lake. Additionally, information regarding specific habitat requirements for sport fish (and prey fish) reproduction and recruitment is lacking (discussed in *Issue 3*). Middle Lake Sharpe appears devoid of complex habitat and gets little attention from anglers. Additionally, sport fish surveys suggest low abundance throughout this portion of the lake.

In general, shoreline habitat targeted by shore anglers is reduced or non-existing for most of middle and lower Lake Sharpe. In these areas, locations available for shore fishing are in areas of sand, shale and silt and are not habitat types that hold many sport fish (other than catfish). Although plentiful sportfish populations exist, little shoreline habitat is available to concentrate fish to what few areas shore anglers can access in the middle and lower zone of Lake Sharpe.

### ***Opportunities***

Many avenues exist to improve existing and construct new habitat on Lake Sharpe. Small scale renovations could be completed over long periods of time to defray large one-time expenses. Small-scale habitat modifications could include focusing habitat efforts in locations accessible to shore anglers. Additionally, increased access through fishing pods or small scale dykes (in the Ft. George area for instance) could be paired with fish habitat renovations (on downstream side of shore access construction). These efforts could not only increase fish production, but attract fish to newly accessible shore fishing locations. Moreover, reconnecting Hipple Lake to the main channel could provide passage to the complex habitat types in Hipple Lake to sport fish in Lake Sharpe. All of these habitat modifications could be evaluated continuously so that further manipulations could be continued, modified, or discontinued dependent on specific outcome criteria.

### **3) Issue – Many knowledge gaps exist for fish population dynamics in Lake Sharpe.**

Many knowledge gaps exist for Lake Sharpe sport- and prey-fish. Recruitment, growth, mortality, and movement patterns are unknown for many species, making management recommendations ill informed. Additionally, information on habitat use by specific species is unknown but greatly warranted; especially if habitat manipulations are approved. Little information exists on Lake Sharpe non-sport fish. Although some unique large-river species are found in Lake Sharpe, no concerted effort to document population characteristics or trends of these native fish have been carried out.

Information regarding stocking dynamics on Lake Sharpe is lacking. There is little information to guide any ongoing or future stocking strategies. There is also skepticism with standard surveys as to how representative they are of the population on which they

are monitoring. Moreover, there is little information documenting the impacts of current or potential regulations on the sport fish populations of Lake Sharpe.

### ***Opportunities***

Although knowledge gaps regarding fish population dynamics in Lake Sharpe are common, many avenues could be taken to answer many of these questions. For instance, with recent advances in fish telemetry systems, understanding fish movements is becoming more inexpensive while concurrently producing more comprehensive results. Additionally, research projects examining growth, recruitment and mortality on important sport and prey fish of Lake Sharpe could be initiated. Future studies could parallel those on other reservoirs in an attempt to better quantify the dynamic rate functions of Lake Sharpe fishes.

Standard surveys are currently under scrutiny with many projects examining the assumptions inherent in any survey methodology. Like the stocking/spawning effort, these labors could be expanded to better refine, eliminate, or increase current survey methodology. With the stocking, spawning, and survey initiatives, evaluating population response to current and potential regulations could be examined for multiple focal species.

#### **4) Issue – User group conflicts.**

Many user group conflicts exist on Lake Sharpe. These include, but are not limited to, conflicts between anglers targeting different species, non-tournament and tournament anglers, conventional anglers and spear fishers, boat and shore anglers, residents and non-residents, different angler types, recreational boaters and anglers, etc.

### ***Opportunities***

With an increase in social media, the ability to interact with users from a wide geographic range is possible. Recorded videos, webinars, podcasts, etc. could be used to aid in Lake Sharpe information dissemination and user feedback. Additionally, more opportunity exists for biologists to physically meet with anglers from across the state. Competent staff is located throughout the state making Lake Sharpe information dissemination feasible for staff other than those directly working on Lake Sharpe and the Missouri River.

#### **5) Issue – New and established aquatic invasive species could potentially impact the fishery and recreation on Lake Sharpe.**

Aquatic Invasive Species (AIS) are non-native species of fish, invertebrates and plants that negatively impact the ecosystem or the human use of the ecosystem. Several species such as Curly Pondweed and Common Carp are already

present in Lake Sharpe, and many more potentially harmful species are present in the Missouri River Basin in South Dakota.

The primary vector for the movement of AIS invertebrates and plants is the overland transport of boats. The risk of AIS introductions into Lake Sharpe is high since it attracts many anglers from across the state and country. The establishment of Dreissenid mussels in Lake Sharpe would likely impact the operation of Big Bend Dam, could further complicate water management issues on the reservoir, and would serve as a source population for downstream reservoirs and other water bodies.

### ***Opportunities***

Many opportunities exist to slow the spread of AIS to and from Lake Sharpe, including education, control and regulation. Prevention through education and compliance with regulations are likely the most effective and feasible means to slow the spread of AIS. This requires a cooperative effort from tribal, state, federal, nongovernment agencies and the various user groups. Control and eradication opportunities may exist in some instances, but are largely infeasible at this time.

### **6) *Issue – Lack of public and government interactions***

Lake Sharpe is frequented by anglers from across South Dakota and the United States. As such, information dissemination and feedback from anglers across a wide geographic area is difficult. Lake Sharpe also has multiple federal and tribal entities involved in management. Communication between all of these entities can be challenging, though warranted.

### ***Opportunities***

The opportunity exists to increase communication between the state, federal entities, and the tribes. Recently, a state tribal liaison was hired and this shows the commitment the state has to increasing interaction with South Dakota's tribes. Moreover, collaboration with federal entities could benefit research efforts and management of Lake Sharpe.

## Objectives and Strategies

Objectives and strategies are presented here to address Lake Sharpe management issues not already addressed in objectives contained in the MRFMA Strategic Plan. Objectives, for issues similar to MRFMA issues, are included in the MRFMA plan.

### **Objective 1. Increase shore fishing opportunities at two locations along Lake Sharpe by December 31, 2021.**

- Strategy 1.1 Work with the Parks Division, the USACE, local municipalities, and anglers to identify priority areas, with specific consideration for locations downstream of Ft. George, for access development and improvement based on potential use and feasibility.*
- Strategy 1.2 Develop designs for shore fishing access improvements that are ADA compliant with access to deep water and fish habitat.*
- Strategy 1.3 Create specific structural habitat designs to concentrate fish in developed shore fishing areas.*
- Strategy 1.4 Develop plans for sediment removal and habitat improvements, of the areas immediately downstream of the LaFramboise causeway shore fishing access sites.*
- Strategy 1.5 Construct shore fishing access improvements in coordination with Parks, the USACE, and local partners.*

### **Objective 2. Improve boat access at two locations along Lake Sharpe by December 31, 2021.**

- Strategy 2.1 Work with the Parks Division, the USACE, local municipalities, and anglers to identify priority areas, with specific consideration for the stretch of Lake Sharpe extending from the Polo Field ramp to Joe Creek, for access development and improvement. .*
- Strategy 2.2 Develop designs to rebuild or renovate boat access sites at Ft. George, DeGrey, Antelope Creek and/or Cedar Creek.*
- Strategy 2.3 Develop shoreline fishing opportunities in association with renovated boat access.*
- Strategy 2.4 Construct boat access improvements in coordination with Parks, the USACE, and local partners.*

### **Objective 3. Improve connectivity of Hipple Lake with the main channel of Lake Sharpe to benefit fish populations and improve boat access by December 31, 2021.**

- Strategy 3.1 Work with engineers to determine the feasibility, including cost estimates, of options to improve connectivity and boat access from Hipple Lake to the main channel of Lake Sharpe.*
- Strategy 3.2 Pursue partnerships with other entities to obtain funding for the most feasible option identified by engineering.*
- Strategy 3.3 Implement project when needed funds are secured.*

**Objective 4. Conduct six research studies on critical sport- and prey-fish on Lake Sharpe by December 31, 2021.**

- Strategy 4.1 Determine appropriate sampling effort and methods for Lake Sharpe sport- and prey-fish based on Lake Sharpe's reservoir characteristics, management needs and fishery potential.*
- Strategy 4.2 Determine growth, recruitment, mortality, exploitation and movement patterns of walleye in Lake Sharpe.*
- Strategy 4.3 Investigate the potential use of underwater observations to index sport-fish in Lake Oahe tailrace.*
- Strategy 4.4 Determine habitat preferences, overwinter survival, and reproduction needs of gizzard shad on Lake Sharpe.*
- Strategy 4.5 Review stocking histories of cold-water fish and subsequent angler use to determine optimal stocking strategies.*
- Strategy 4.6 Investigate why white bass populations have not rebounded following the large fish kill in the mid 2000's.*
- Strategy 4.7 Evaluate current and future habitat enhancement projects on their impacts to fish and anglers.*

**Objective 5. Increase knowledge of status of native species in Lake Sharpe, its tributaries, and intermittent streams by December 31, 2021.**

- Strategy 5.1 Work with USF&WS to conduct native species surveys and determine native species presence and status in Lake Sharpe.*
- Strategy 5.2 Examine dynamic rate functions, abundance, movements and habitat use of shovelnose sturgeon on Lake Sharpe.*
- Strategy 5.3 Conduct surveys of portions of tributaries and intermittent streams not included in other prairie stream sampling efforts to determine species presence and status.*
- Strategy 5.4 Establish native species sampling protocols and survey frequency to begin collecting trend data on species status.*

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