

**South Dakota**

**Department of Game, Fish and Parks**

# **Missouri River Strategic Plans**

2017-2021



## **Fisheries Management Plan for Lake Francis Case**

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Formally adopted by GFP Commission: December 12, 2016

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Vision statement for management of Lake Francis Case

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

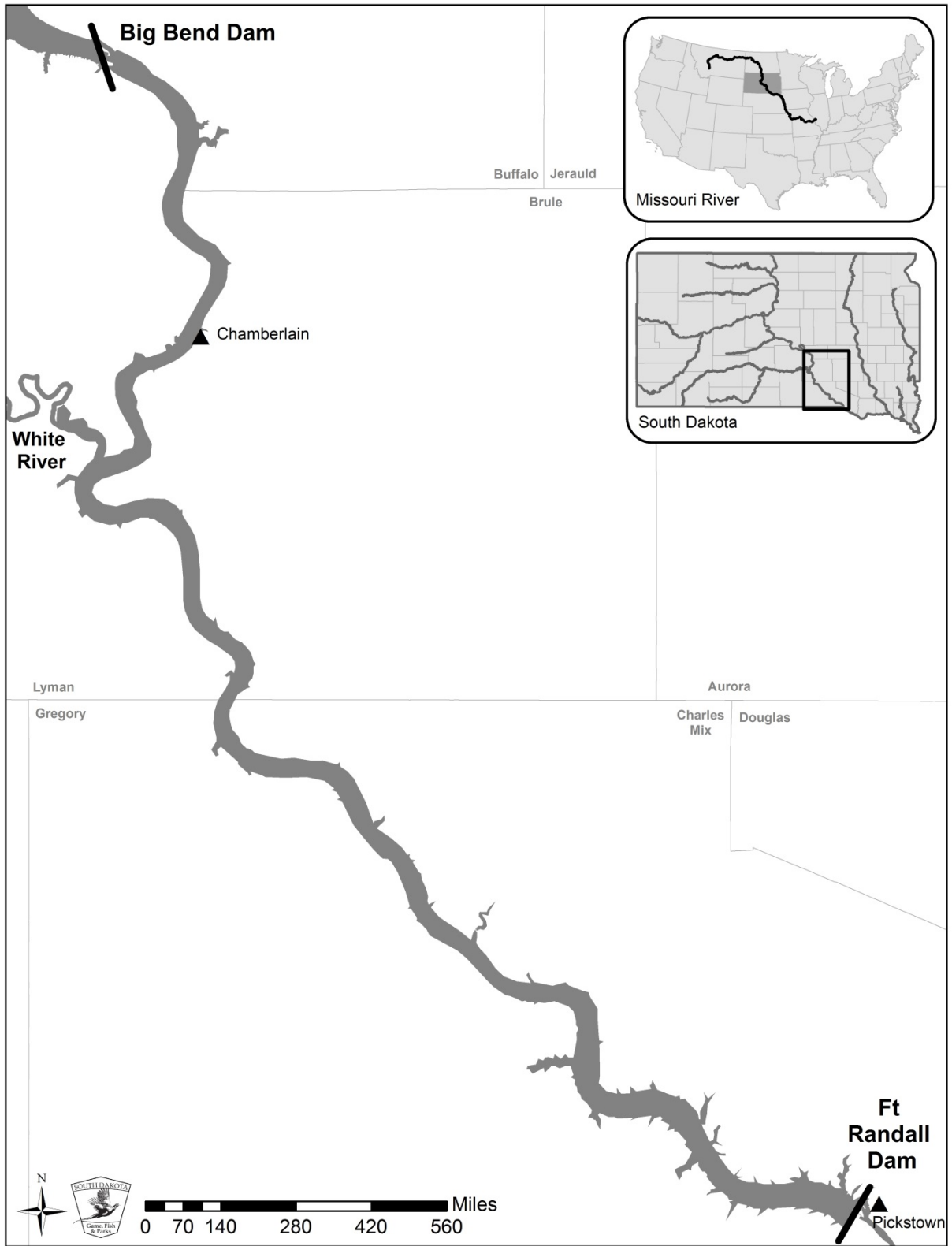
## Introduction

The Missouri River and its reservoirs provide considerable economic and recreational activity for South Dakota. Lake Francis Case 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 limited resources, manage fish populations and provide recreational opportunities that meet user expectations at the present time, while protecting resources for future use. Plans for management of these resources are fundamental to their sustained and equitable use. This plan identifies current issues related to fisheries management of Lake Francis Case and objectives to combat 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. The South Dakota Department of Game, Fish and Parks developed the Missouri River fisheries management area plan to effectively guide management of the resource and direct future research. Development of reservoir specific plans for the Missouri River reservoirs is one of the objectives of that plan.

Lake Francis Case is a 107-mile long, 102,000-acre mainstem Missouri River reservoir, located in south-central South Dakota extending from Big Bend Dam to Fort Randall Dam (Figure 1). The White River, which enters Lake Francis Case from the west at about 11 river miles south of Chamberlain, is the only sizable tributary on the reservoir. Due to its large sediment load, the White River has caused a large delta area to form in the reservoir. Other water inputs include localized runoff from the many small creeks and groundwater from numerous artesian wells located throughout the reservoir.

From 2005-2015, Lake Francis Case supported between 84,575 and 150,650 angler days annually and generated between \$8.6 and 13.2 million in direct economic input to the local and regional economies (based on a value of \$77 per angler trip). Lake Francis Case is an important resource in South Dakota and its habitat and fish community must be managed to enhance its value to various user groups. The importance of Lake Francis Case to South Dakota fisheries is documented in the issues, objectives and strategies provided herein.



**Figure 1. Lake Francis Case, SD.**

## Management of Lake Francis Case

### Stocking

In an effort to diversify prey species in Lake Francis Case, adult spottail shiners were stocked in 1979. This one-time stocking proved successful as spottail shiners have been common in the reservoir since. Black crappies were stocked in the mid-1980s and largemouth bass were stocked from 1984 to 1990. Northern pike were stocked sporadically from 1982 through 1993 while tiger muskellunge were stocked in the mid-1980s. Few anglers targeted these species and stocking efforts were discontinued. Smallmouth bass were stocked annually from 1985-1990 in an attempt to diversify the sport fishery. These stockings were discontinued when natural reproduction was adequate to maintain the population. In an attempt to utilize the coldwater habitat available in the reservoir, chinook salmon were stocked annually from 1983-1986. Brown, cutthroat, and rainbow trout were also stocked sporadically from the mid-1980s until 2000. These stocking were discontinued after several years of poor return to the angler creel, and currently, no salmonid species are being stocked. Walleye fingerlings were stocked annually into Lake Francis Case from 1988-1992 and again in 2002, but were discontinued after it was determined that natural production was sufficient to maintain the population. Paddlefish have been stocked into Lake Francis Case since the late 1970s. Fry were stocked sporadically up to 1990, and fingerlings (8-10 inch) have been stocked annually since then. Initial paddlefish stockings were aimed at maintaining a brood source for paddlefish, while current stockings are made to support a put-grow-and-take snag fishery.

### Fisheries Surveys

Standardized adult fish population surveys using gill nets were initiated on Lake Francis Case in 1982 and prey fish surveys using seines began in 1981. Since then, fish population surveys have been conducted annually on Lake Francis Case. Over the years these surveys have included:

1. Adult gill-net survey
2. Shoreline seining survey
3. Larval trawling survey
4. Age-0 walleye fall electrofishing survey
5. Spring adult walleye electrofishing survey
6. Smallmouth bass electrofishing survey

Current fish population surveys employ experimental-mesh gill-nets and nylon mesh bag-seines. Three locations on Lake Francis Case are sampled with 91.4-m multifilament gill nets submerged overnight (about 20 h). Nets are placed in both embayment and reservoir habitat with reservoir nets set at different depth ranges, when available. Three nets are placed  $\leq$  12-m depth and three are placed in 12-m to 24-m and 24-m to 37-m depth, where possible. Bar mesh dimensions include 13-, 19-, 25-, 32-, 38-, and 51-mm. All fish collected are identified, enumerated, measured (TL; mm) and weighed (g). In addition, otoliths are collected from all walleye and sauger each year and pectoral spines are removed from channel catfish every fifth year for age estimation. A 6.4-mm nylon mesh bag seine, measuring 30.5-m long by 1.8-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
8. Population size structure

### **Fish Surveys**

A fishery developed in Lake Francis Case shortly after impoundment. Black bullhead, largemouth bass, bluegill, and yellow perch were most abundant in the angler catch during the first couple of years after impoundment (Gasaway 1970). Ten to 15 years after impoundment, those fish populations declined while populations of emerald shiner, white bass, walleye, and channel catfish increased (Gasaway 1970). Over time, Lake Francis Case transitioned from a fishery dominated by northern pike, largemouth bass, and panfish into one dominated by walleye.

The Lake Francis Case walleye population is characterized by consistent recruitment and steady growth. One of the major factors affecting walleye recruitment in Lake Francis Case is run-off or more specifically nutrient in-flow into the reservoir. Lake Francis Case has the potential to produce huge year-classes of walleye when conditions are favorable, and during periods of high water, the reservoir can support more walleyes. Relative abundance of walleyes has varied annually from 6 walleyes/nets to nearly 30 walleye/net. Fluctuations in walleye abundance are strongly correlated with the yearly amount of water flowing through (yield) the Missouri River basin.

Historically, walleye have accounted for 30-35% of gill-net catches in Lake Francis Case. Recent surveys indicate this has not changed. Over the past 30 years, walleye gill-net Catch Per Unit Effort (CPUE) averaged nearly 16 walleye/net. However, during the past five years, walleye gill-net CPUE has averaged just under 10 walleye/net. Walleye abundance showed increases from 2009 to 2011 before declining to all-time lows in recent years. Abundance of walleye less than 15 inches in length in gill-net samples has been lower in recent surveys. Approximately 36% of walleye in the gill-net sample were  $\geq 15$  inches and larger in the 2016 survey, compared to 32% and 60% of fish for 2014 and 2015, respectively. Approximately 6% of the walleye in the 2016 survey were  $\geq 20$  inches.

Historically, walleye condition for Lake Francis Case is generally between 75 and 85, on a scale where a value of 90 to 100 is optimal. Condition of walleye 10 inches and longer in Lake Francis Case was 82 in 2015, which is similar to the five-year average. Variability in walleye condition in Lake Francis Case likely occurs due to the seasonal availability of gizzard shad. Walleye growth in Lake Francis Case is generally considered good and walleye typically reach the 381-mm minimum length limit at age-3. Age-3 and age-4 walleye represented 28% of the 2015 gill-net sample.

While age-0 gizzard shad typically provide a bulk of the forage for Lake Francis Case, many other species are available in the reservoir as prey. Age-0 yellow perch, white bass, freshwater drum, and crappie species provide alternative forage, as do many species of shiners, minnows, and darters. Catch per effort for shoreline seining on Lake Francis Case has historically averaged 550 fish/seine haul. Below average CPUE has been experienced in recent surveys. Eighteen species of small-bodied littoral fishes were collected by shoreline seining in 2015. All species had previously been collected in Lake Francis Case. The overall catch rate for all species in combination was 411 fish/seine haul. Age-0 gizzard shad comprised 54 percent of

the catch. Emerald shiners and age-0 white bass comprised 22 and 12 percent of the catch respectively.

### **Angler-Use Surveys**

The first angler-use and harvest survey on Lake Francis Case was conducted in 1954. This survey showed some harvest of walleye within a year after impoundment. Currently, walleye are the most harvested species followed by white bass, smallmouth bass, channel catfish, and sauger. Sauger were more prominent in angler harvest immediately after the reservoir was created than today.

Paddlefish (a native species) initially provided a unique fishery below Big Bend Dam and were frequently harvested. However, due to angler and commercial harvest coupled with low natural reproduction, paddlefish numbers declined and harvest was banned from 1988 through 2011. Paddlefish snagging reopened in 2012 with a limited-entry snag fishery that now occurs annually during the month of May.

Prior to 2000, 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 2000, a bus route survey has been used for the angler use and harvest survey to improve precision and accuracy of pressure estimates. A bus route design is commonly used to survey fisheries with numerous access sites spread over a broad geographical region. Current creel surveys are conducted from 1-April through 31-July for the sunrise-to-sunset (daytime) period.

Questions asked in standard interviews are designed to collect information on trip length, type of fishing (boat or shore), target species, zip code, number in party, number and species harvested and released, and size distribution of harvested walleyes. Questions to determine angler satisfaction and preferences as well as guide management activities are also included in the interview.

Information on angler use and harvest is also collected for the paddlefish season by including a postage-paid postcard with each permit issued. This card was designed to be easily completed by anglers and serves to collect information needed to manage the fishery. To increase response, anglers that do not return their card are sent a reminder shortly after the season ends. The card includes questions on harvest, catch and release numbers, size harvested, hours snagged, area and days fished as well as general comments from anglers.

### **The 2015 Angler-use Survey**

The estimated fishing pressure for the April-July daylight period in 2015 (663,200 angler-h) was greater than the long term average for Lake Francis Case (576,172 angler-h). Estimated angler trips spent on Lake Francis Case was the fifth highest on record since 1995. Walleye were the most caught species (447,649 fish), however, walleye harvest (149,943 fish) on Lake Francis Case was below the long-term average (163,235 fish). This may have been due to lower abundances of legal-sized walleye in the population. Walleye were also the most frequently released species with an estimated 297,706 fish released. Smallmouth bass, freshwater drum, white bass, and channel catfish were also commonly caught and released.

Lake Francis Case anglers contributed about \$11.6 million to local economies in 2015,. Non-residents from 20 different states made up 34% of the angler contacts which was similar to the percentage of non-residents for the past 4 years. Many (65%) anglers drove over 100 miles to fish the reservoir and most (93%) were primarily targeting walleye.

Angler perception of their fishing experience is important in evaluating satisfaction with a fishery and success of management practices. In 2015, anglers were asked to consider all factors when evaluating their level of satisfaction with their fishing trip. The median trip satisfaction rating for the April-July period was "slightly satisfied" with about 69% of angling



parties interviewed indicating some degree of satisfaction. Over the previous five years, anglers had an average satisfaction rating of 75%. The level of satisfaction tends to increase as walleye catch rate increases..

From 2012-2016, an average of over 1,800 residents have applied annually for 350 Lake Francis Case paddlefish snagging tags/permits. Paddlefish anglers have spent an average of 3,064 hours annually during this time pursuing paddlefish. Harvest has averaged 167 paddlefish and ranged from 123 fish in 2016 to 195 fish in 2014. An estimated 722 paddlefish are released annually by paddlefish anglers on Lake Francis Case and catch rates have averaged 0.3 paddlefish/hour of snagging.

### **Fisheries Research**

Early fisheries research focused on changes in fish populations after impoundment (Gasaway 1970, Walburg 1977). Some studies evaluated the effects of discharge, water levels, and peaking on fish populations and productivity (Benson 1973, Martin and Novotny 1977). Martin et al. (1981) evaluated impacts of water discharge on age-0 fishes while Nelson and Walburg (1977) studied population dynamics of *percids* in Missouri River reservoirs.

As sport fisheries matured and the reservoir transformed into a walleye fishery, research focused on game fish and factors affecting them (Michaletz 1984, 1986). Fielder (1989) assessed the success of stocking of coldwater fish in Lake Francis Case. Beck et al. (1997) researched the influences of environmental variables on white bass recruitment, growth and mortality. As angler use increased and sport-fish harvest became more of a concern, Game, Fish, and Parks research focused on survey methods and techniques (Miller, 1984, Stone and Lott 2002, Soupir et al. 2006). Wuellner et al. (2008) examined gizzard shad population characteristics as they relate to other systems in South Dakota and throughout the United States, and Graeb et al. (2010) described hybridization of walleye and sauger in Missouri River reservoirs.

Schreck (2010) examined seasonal use of Missouri River deltas by fishes. Walleye entrainment during the flood of 2011 was assessed by Carlson et al. (2016). Game, Fish, and Parks has worked with the USFWS to stock paddlefish into Lake Francis Case for more than 30 years. Pierce, et al. (2011) evaluated stocking success of paddlefish and investigated the potential for a sport fishery on Lake Francis Case. Their findings lead to the opening of the paddlefish snag fishery in 2012. Pierce, et al. (2015) also evaluated the effects of exploitation on mortality rates of paddlefish. Current research is evaluating economic expenditures and the financial impact of Lake Francis Case angling to local communities.

### **Aquatic Invasive Species**

Lake Francis Case does not contain any known AIS, however curly leaf pond weed and Eurasian water milfoil are both likely present at undetectable levels. Both invasive plant species are present in Lake Sharpe directly upstream of Lake Francis Case and fragments of both species have been observed in the drift below Big Bend Dam. The fall drawdown likely inhibits heavy colonization of the two invasive plant species. Additionally, zebra mussels are present in Lewis and Clark Lake directly downstream from Lake Francis Case. The close proximity and shared recreational and fishing use between the reservoirs puts Lake Francis Case at a high risk of zebra mussel introduction. The fall drawdown would likely keep zebra mussels at lower densities due to dewatering of shallow areas and freezing during winter months. If zebra mussels do become established, Lake Francis Case would become a potential source for additional infestations around the state even if the drawdown keeps the population at low abundance.

### **Regulations**

Lake Francis Case, Lake Sharpe and Lake Kampeska were the first South Dakota waters to have a length restriction placed on the walleye fishery. In 1990, an April-June, 356-mm minimum length limit was implemented on both Missouri River reservoirs. In 1999, the minimum length limit was increased to 381-mm during all months except July and August with a stipulation that, at most, one fish in the daily limit could be 457-mm or longer. These changes were made to reduce harvest during a period of high angler use and walleye vulnerability with a gizzard shad forage and to attempt to equitably distribute the harvest of walleye longer than 457-mm. The daily limit was reduced to three fish in 2004 and 2005 as an additional measure to reduce harvest during a period of low 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. Beginning in 1990, the “dredge-hole” area near Chamberlain has been closed to fishing from December-March to reduce catch and release mortality during the cold water period when walleye commonly inhabit this deep-water area. In 2003 the closed period was lengthened to December-April. A regulation implemented in 2001, and currently still in effect, requires ice anglers fishing the reservoir from the northern Gregory-Charles Mix county line downstream to Ft. Randall Dam to keep the first four walleye they catch regardless of size. The purpose of this regulation is to reduce release mortality during the cold water period when anglers are commonly fishing for walleye in deep water.

### Reservoir Access and Habitat

Lake Francis Case provides many boat launching facilities, however, shore fishing access is generally limited. Boats can be launched at six recreation areas and 10 lakeside use areas operated by Game, Fish, and Parks, and one recreation area and three lakeside use areas operated by the United States Army Corps of Engineers (hereafter Corps of Engineers). These areas provide camping and recreation opportunities in addition to angling access and account for a majority of recreational access. Within these public access areas there are 24 Game, Fish and Parks boat ramps four Corps of Engineers boat ramps. Abundant shore fishing access exists within the recreations and lakeside use areas, but shore fishing access is limited to a few “pull-off” areas outside of these areas, most of which are located in the upper 1/3<sup>rd</sup> of the reservoir. Shoreline access is available within a few state Game Production Areas. Within the city of Chamberlain, there is a fishing pier at American Creek campground and 1 Americans with Disabilities Act (ADA) approved fishing pier in the American Creek marina. Standard operating elevation for Lake Francis Case is 1355 ft. above mean sea level (msl). Access to the reservoir is severely impacted by the annual drawdown during which water elevation drops nearly 20 feet, reaching approximately 1335-1339 ft. msl affecting many boat ramps see Table 1

Table 1 Lake Francis Case Boat Ramp Elevations

Boat Ramp	Ramp top elevation	Ramp bottom elevation	Boat ramp ownership	River mile
St Francis Bay	1359	1333	SD GFP	880
North Bay	1361	1326	SD GFP	881
South Shore	1362	1348	SD GFP	881
White Swan	1362	1348	SD GFP	885
Joe Day Bay	1360	1348	SD GFP	887
South Scalp Creek	1365	1356	SD GFP	890
Pease Creek	1355	1340	SD GFP	892
Pease Creek High Water			SD GFP	892
South Wheeler	1357	1336	SD GFP	895
North Wheeler	1362	1343	SD GFP	896

Whetstone	1358	1337	SD GFP	900
Platte Creek	1365	1340	SD GFP	912
Snake Creek	1360	1334	SD GFP	921
Snake Creek High Water			SD GFP	920
West Bridge	1365	1345	SD GFP	921
Buryanek	1359	1348	SD GFP	923
Elm Creek	1362	1351	SD GFP	939
Dude Ranch	1362	1348	SD GFP	962
American Creek Marina	1366	1337	SD GFP	968
Cedar Shore	1365	1340	SD GFP	968
Cedar Shore High Water			SD GFP	968
American Creek Campground	1362	1345	SD GFP	968
Big Bend Spillway	1370	1340	US COE	987
Big Bend Left Tailrace	1369	1341	US COE	987
Big Bend Right Tailrace	1367	1341	US COE	987
Old Fort Thompson Ramp	1363	1345	US COE	987
Boyer	Ramp Unusable		SD GFP	947
Prairie Dog Bay			SD GFP	880

The upper portion of Lake Francis Case consists of shallow, cottonwood-stump covered mudflats surrounding a deeper channel area. Below Chamberlain, the White River has created a shallow delta area in the mid-to-upper portion of the reservoir. This area typically warms faster in the spring and a large percentage of this area is exposed during the winter drawdown months. It is thought that the drawdown of the reservoir may hinder establishment of aquatic invasive plant species such as curly leaf pondweed and Eurasian watermilfoil. Unfortunately, the same action probably hinders survival of aquatic invertebrates. The mid and lower portions of the reservoir are relatively deep with a small percentage of shoreline habitat available to fish on the main lake. However, these sections of the reservoir do have large embayments which provide shallow water habitat for fish.

## Lake Francis Case Issues and Opportunities

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

Lake access for much of Lake Francis Case is limited. Boat ramps are provided along much of the lake, but still there are vast areas lacking adequate access. Minimum- or no-maintenance roads into some access areas limit use by anglers. Similarly, ice fishing access is limited because most of the shoreline is inaccessible to motor vehicles. Changing water elevations during the refilling period of December-April severely impacts access for ice anglers. During periods of low water, lake access becomes even more limited as water elevation affects boat ramp operation. Also, designated roads do not extend to low water elevations to allow shoreline angling access and any roads constructed cannot extend beyond the Corps take line, meaning foot travel would still be necessary at most locations. Perceived crowding at boat ramps, as well as on the main lake, has also been brought forth as an issue by Lake Francis Case users.

### ***Opportunities***

Many opportunities exist to increase boat and shore access on Lake Francis Case. Some of these can be done at a relatively low cost to the state. For example, developing low maintenance gravel roads (with driving restrictions) over state land can increase shoreline access and the potential exists to develop this access along much of the shoreline. An example of this type of project would be the Shrake Road south of Chamberlain. Agreements with private land holders could also be pursued for these access projects. The Wildlife and Parks Division of GFP could work together to identify and prioritize possible parking lot expansion projects at high use access sites. At a higher expense, the construction of additional boat launching facilities could add ramps at critical, high use locations thus improving access and reducing crowding. These ramps could also be coupled with habitat initiatives outlined in the *Issue 2*. Coordination with the Corps of Engineers could provide opportunities to increase access to the reservoir.

### 2) **Issue – Habitat quantity and quality negatively impact fish populations and fishing opportunity.**

Siltation on Lake Francis Case has had pronounced effects and evidence of reservoir ageing is readily apparent. Embayment siltation has rendered some boat ramps and popular angling locations difficult to access with examples including the Crow Creek confluence and Boyer Access Area. Embayments in the upper portion of the reservoir have been lost due to siltation. Delta formation in the upper third of the reservoir negatively impacts navigation at low water elevations. Siltation caused by wind and water erosion has negatively impacted spawning substrate with examples being the White River and Elm Creek areas of the reservoir. Fall/winter water drawdown restricts aquatic vegetation growth and affects food web dynamics. Species such as northern pike, yellow perch and most centrachids could benefit from vegetated areas within the

reservoir. Fall/winter drawdown displaces sport and prey fish as habitat in the littoral zone dewatered. Little evidence of paddlefish reproduction exists. Paddlefish spawning substrate in the White River displays evidence of siltation caused by the heavy sediment load the river carries. Recent pallid sturgeon research has shown that anoxic areas in river-to-reservoir transition areas have impacted sturgeon survival. This phenomenon could be negatively impacting paddlefish recruitment near the White River delta as heavy sediment loading may cause low dissolved oxygen levels.

### ***Opportunities***

Many avenues exist to improve present and construct new habitat on Lake Francis Case. Some projects will come at a substantial monetary cost. However, small scale renovations could be completed over long periods of time to defray large one-time expenses. Larger scale habitat additions such as tree reef or other artificial habitat additions could contribute to sport and prey fish reproduction, recruitment, and retention; ultimately benefitting anglers. Additionally, small-scale habitat modifications could include focusing habitat efforts in small, back water bays or marinas accessible to shore anglers. The fall drawdown presents a rare opportunity to visually inspect, modify repair or add habitat components while the shoreline areas are above the water level, although moving ice sheets may have damaging effects on artificial habitats as the water level rises throughout the winter months. Habitat efforts could not only increase fish production, but attract fish to accessible shore fishing locations. 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 Francis Case.**

Recruitment, growth, mortality, and movement patterns are unknown for many species in Lake Francis Case, making management recommendations difficult. Specifically factors affecting walleye recruitment are relatively unknown. Local runoff is thought to drive productivity, prey production and ultimately walleye recruitment; however this relationship has not been thoroughly investigated and documented. Additionally, specific habitat use by individual species is unknown but greatly warranted for prioritization of habitat initiatives or for identifying ideal water management scenarios. Little information exists on Lake Francis Case non-sport fish. Although some unique large-river species are found in Lake Francis Case, there has been little concerted effort to document population characteristics or trends of these native species. SDGFP currently allows commercial harvest of channel catfish and buffalo species, however little is known about the buffalo species status in Francis Case.

Information needs regarding stocking success, fish population sampling and the impact of regulations on the walleye fishery exist. Factors contributing to the success of paddlefish stocking are not well understood, and therefore, information to guide future stockings is lacking. Discrepancies between fish population survey results and the

levels of catch and harvest rates have generated some skepticism around the reliability of current survey methods at assessing the population. Finally, the effectiveness of current regulations for improving the walleye fishery has not recently been quantified.

### ***Opportunities***

Although knowledge gaps regarding fish population dynamics in Lake Francis Case exist, studies can be designed to address some of these questions. With recent advances in fish telemetry systems, understanding fish movements is becoming more inexpensive while concurrently producing more comprehensive results. Additionally, previous research projects examined growth, recruitment, and mortality on walleye, sauger, smallmouth bass, and paddlefish in Lake Francis Case. Future studies could parallel these in an attempt to better quantify dynamic rate functions such as recruitment, growth and mortality rates of Lake Francis Case fishes.

There is little or no evidence of paddlefish spawning and recruitment on Lake Francis Case. This is likely due to habitat changes resulting from dam construction. Therefore the paddlefish population is maintained through annual stocking. Work could be conducted to optimize stocking strategies for paddlefish on Lake Francis Case. Standard surveys are currently under scrutiny with many projects examining the assumptions inherent in any survey methodology. Survey results can be compared with creel results to better explain variability or survey or inconsistent survey results. Similar to efforts to improve stocking, these labors could be expanded to better refine, or increase, current survey methodology. With the stocking and survey initiatives, evaluating or modeling population response to current and potential regulations could be performed for multiple focal species such as walleye, sauger and paddlefish..

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

Many user group conflicts exist on Lake Francis Case. These include, but are not limited to perceived high use by non-resident anglers in the spring (desire for a closed season by residents), conflict between tournament and non-tournament anglers (crowding at boat ramps and popular fishing spots), conflict between conventional and spear anglers (competition for popular areas), conflict between anglers targeting different species (anglers believe smallmouth bass and walleye compete for habitat and food resources) and conflict between anglers and rec boaters (primarily near state recreation areas where use is heavier).

### ***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 Francis Case information dissemination and user feedback. Additionally, more opportunity exists for biologists to physically meet with anglers from across the state. Moreover, competent staff is located throughout the state making Lake Francis

Case information dissemination feasible for staff other than those intimately working on Lake Francis Case and the Missouri River.

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

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. Historically, Lake Francis Case has had fewer AIS infestations than the other Missouri River reservoirs which may be due, in part, to the annual fall/winter drawdown; however, many 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 Francis Case is high since it attracts many anglers and recreational boaters from across the state and country and also due to its close proximity to the Zebra Mussel infestation in Lewis and Clark Lake. The establishment of Dreissenid mussels in Lake Francis Case would likely impact the operation of Fort Randall Dam, could further complicate water management issues on the reservoir, and would serve as a source population for other water bodies.

***Opportunities***

Many opportunities exist to slow the spread of AIS to and from Lake Francis Case, 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 – Challenges of public and government interactions**

Lake Francis Case 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 Francis Case also has multiple government jurisdictions including federal entities and tribes. Communication between all of these entities can be challenging though warranted.

***Opportunities***

The opportunity exists to increase communication between the state, federal entities, and tribes. Recently, a state tribal liaison was hired demonstrating the commitment the State has to increasing interaction with South Dakota tribes. Collaboration with various federal entities could benefit the research and management of fishes in Lake Francis Case, through cost shared habitat and access projects or altered water management.

**Goal: Manage fisheries and aquatic resources of Lake Francis Case for long-term sustainable use and enjoyment.**

Objectives and strategies presented here to address general Lake Francis Case management issues not already addressed in objectives contained in the Missouri River strategic plan.

**Lake Francis Case**

**Objective 1. Identify major factors that influence walleye recruitment in Lake Francis Case by July 2021.**

- Strategy 1.1 Assemble available data on fish population characteristics and environmental variables which may influence walleye reproduction and recruitment of walleye to age-1, as determined through a literature review.
- Strategy 1.2 Conduct a study to determine factors affecting walleye recruitment.
- Strategy 1.3 Investigate the effects of water temperature on the Lake Francis Case food web.
- Strategy 1.4 Compile and analyze data to understand the influence of gizzard shad recruitment and survival on walleye recruitment.
- Strategy 1.5 Investigate impacts of winter water elevation draw-downs on reproduction and recruitment of Lake Francis Case prey and sport fish, with a focus on walleye and gizzard shad.

**Objective 2: Evaluate paddlefish sport fishery on Lake Francis Case and develop management recommendations by July 2021.**

- Strategy 2.1 Review and compile coded wire tag data to evaluate stocking success and determine conditions favorable to survival of fingerlings post-release.
- Strategy 2.2 Evaluate the paddlefish stocking program on Lake Francis Case to determine optimal use of hatchery products.



Strategy 2.3 Continue annual creel survey to collect data on harvested paddlefish.

Strategy 2.4 Summarize information in a report and implement any identified changes in management.

**Objective 3. Maintain and enhance shore fishing and boat access along Lake Francis Case at three locations by July 1, 2021.**

Strategy 3.1 Work with GFP land managers, the Parks Division, and the Corps of Engineers to increase shoreline access at priority locations throughout Lake Francis Case.

Strategy 3.2 Evaluate the potential to add fishing nodes to accessible shorelines where anglers can access deeper water.

Strategy 3.3 Develop ADA fishing access at priority sites along Lake Francis Case.

Strategy 3.4 Improve or build new boat ramps along stretches of Lake Francis Case currently lacking boat access.

Strategy 3.5 Work with GFP land managers, the Parks Division, and the Corps of Engineers to develop recommendations that mitigate congestion at popular access sites on Lake Francis Case during periods of high use.

**Objective 4: Investigate user conflict on Lake Francis Case and develop recommendations for mediation by July 1, 2021.**

Strategy 4.1 Identify user conflicts on Lake Francis Case through angler survey preference questions and public interaction including public meetings and concerns brought forward via email and phone calls from the public.

Strategy 4.2 Identify the groups or angler types affected by the issues identified in strategy 4.1.

Strategy 4.3 Work with cooperating agencies to develop strategies to inform and mediate conflicts.

Strategy 4.4 Develop a plan to address conflicts.

Strategy 4.5 Share plan with GFP staff, other participating or affected agencies, stakeholders, and other interested/affected groups.

Strategy 4.6 Implement plan or identify next steps for plan implementation.

**Objective 5: Determine potential threat of AIS species to Lake Francis Case by July 1, 2021.**

Strategy 5.1 Complete a preliminary risk assessment to predict likelihood of AIS infestation in Lake Francis Case.

Strategy 5.2 Identify potential threats to current Lake Francis Case fisheries from AIS invasion.

Strategy 5.3 Work with state AIS biologists to create and implement AIS outreach program that specifically address needs for Lake Francis Case.

Strategy 5.4 Evaluate the effects of fall/winter water draw-down on AIS establishment.

**Objective 6. Evaluate efficacy of fisheries surveys conducted on Lake Francis Case by July 2021.**

Strategy 6.1 Develop a random sampling design for implementation of American Fisheries Society standard gillnet survey methodologies by July 2017.

Strategy 6.2 Evaluate hydroacoustic methods for indexing prey fish abundance and compare these with existing indices from other survey methods.

Strategy 6.3 Continue evaluation of fall age-0 electrofishing with age-0 gill net catches to determine which provides the best indicator of walleye recruitment.

Strategy 6.4 Evaluate and update creel survey design based on recent angler use trends at Lake Francis Case access sites.

**Objective 7. Increase public and government interaction by July 2021.**

- Strategy 7.1 Continue to provide hard copy and online reports to the public.
- Strategy 7.2 Continue to conduct informational meetings, open houses, and guide/resort owner meetings as requested discuss Lake Francis Case issues.
- Strategy 7.3 Implement an additional annual public open house schedule that rotates between Chamberlain, Lake Andes and Mitchel, SD.
- Strategy 7.4 Design and experiment with new report formats suitable for new media to improve dissemination of information to the public.
- Strategy 7.5 Attend Ft. Randall Dam interagency meetings held by the Corps of Engineers and provide input for the Annual Operating Plan.
- Strategy 7.6 Attend Lower Brule Sioux Tribe interagency meeting and exchange information and identify potential issues.

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