ROSEBUD SIOUX TRIBE
FISHERIES MANAGEMENT PLAN
AUGUST 2016

Prepared by:

Emily Boyd-Valandra
Rosebud Sioux Tribe
Department of Natural Resources, Game, Fish and Parks
PO Box 300, 1165 Circle Drive
Rosebud, SD 57570

and

William L. Stacy and Daniel A. James
U.S. Fish and Wildlife Service
Great Plains Fish and Wildlife Conservation Office
420 S. Garfield Avenue, Suite 400
Pierre, South Dakota 57501
This fisheries management plan was prepared and approved by:

Emily Boyd-Valandra
Rosebud Sioux Tribe Game, Fish, and Parks Department

William Stacy
US Fish and Wildlife Service

Daniel James
US Fish and Wildlife Service
TABLE OF CONTENTS

Introduction........................................................................................................................................ 1
General Goals of the Fisheries Management Plan.............................................................................. 2
General Objectives and Strategies ....................................................................................................... 3
Reservoir Management Plans ............................................................................................................ 5
  Beads Reservoir ................................................................................................................................. 5
    Introduction ..................................................................................................................................... 5
    Fish management history ................................................................................................................. 6
    Fish management goals, objectives, and strategies ........................................................................... 6
  Chases the Woman Reservoir ........................................................................................................... 7
    Introduction ..................................................................................................................................... 7
    Fish management history ................................................................................................................. 8
    Fish management goals, objectives, and strategies ........................................................................... 8
  Eagle Feather Reservoir ..................................................................................................................... 9
    Introduction ..................................................................................................................................... 9
    Fish management history ................................................................................................................. 10
    Fish management goals, objectives, and strategies .......................................................................... 10
  Ghost Hawk Reservoir ...................................................................................................................... 12
    Introduction ..................................................................................................................................... 12
    Fish management history ................................................................................................................. 12
    Fish management goals, objectives, and strategies .......................................................................... 12
  Rosebud (Spotted-tail) Reservoir ....................................................................................................... 13
    Introduction ..................................................................................................................................... 13
    Fish management history ................................................................................................................. 13
    Fish management goals, objectives, and strategies .......................................................................... 14
  Indian Scout Reservoir ...................................................................................................................... 14
    Introduction ..................................................................................................................................... 15
    Fish management history ................................................................................................................. 15
    Fish management goals, objectives, and strategies .......................................................................... 15
  Antelope Creek Reservoir .................................................................................................................. 16
    Introduction ..................................................................................................................................... 16
    Fish management history ................................................................................................................. 17
    Fish management goals, objectives, and strategies .......................................................................... 17
References ................................................................................................................................................ 19
Appendix 1. Fish stocking history in Rosebud Indian Reservation reservoirs........................................ 19
Appendix 2. Recommended maintenance stocking rates for reservoirs on the Rosebud Indian Reservation ......................................................................................................................... 20
Appendix 3. Glossary of fisheries management terms .......................................................................... 21
LIST OF FIGURES

Figure 1. Map of the Rosebud Indian Reservation, South Dakota that depicts locations of recreational fishing reservoirs. ................................................................. 2
Figure 2. Aerial image of Beads Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps) ................................................................. 5
Figure 3. Aerial image of Chases the Woman Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps) ......................................................... 8
Figure 4. Aerial image of Eagle Feather Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps) ................................................................. 10
Figure 5. Aerial image of Ghost Hawk Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps) ................................................................. 12
Figure 6. Aerial image of Rosebud (Spotted-tail) Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps) ......................................................... 13
Figure 7. Aerial image of Indian Scout Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps) ................................................................. 15
Figure 8. Aerial image of Antelope Creek Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps) ................................................................. 17
The Rosebud Indian Reservation is primarily located in Todd County, south central South Dakota, but also contains land in Gregory, Lyman, Mellette, and Tripp counties. In Todd County, the land area comprises about 360,000 ha (0.89 million acres; 1,388 mi²) and had a human population of 10,869 at the time of the 2010 census. The total Tribal land area in all five counties is approximately 510,000 ha (1.26 million acres; 1,970 mi²). The terrain consists of rolling grassland prairie and streams, which have carved deep canyons. Primary land use in the area is for livestock grazing and some farming. The region is semi-arid with temperatures that range from more than 38°C (100°F) in the summer to -34°C (-30°F) during the winter (Bernhard and Yarger 1975). The growing season averages 130 days and average rainfall is 41 cm (16 in).

Two primary watersheds are located on the Rosebud Indian Reservation that include the Little White River (flows south to north) and the Keya Paha River headwaters (flows to the southeast). Most streams are low gradient, silt laden, and generally unsuitable for game fish. However, these streams contain numerous native cyprinid (i.e., minnow) and catostomid (i.e., sucker) species.

Since 1951, the fish management program has been a cooperative effort involving the U.S. Fish and Wildlife Service, The Rosebud Sioux Tribe, and the Bureau of Indian Affairs (Haines 1981). Currently, most game fish populations are found in reservoirs throughout the reservation (Figure 1). Fish management on the Rosebud Indian Reservation was intensive from the 1950s until the early 1990s when management consisted primarily of stocking, conducting fisheries population surveys, collecting baseline data for developing a fisheries management plan, and conducting workshops in fish management techniques (Haines 1981). The most recent surveys began again in 2010.

The spread of aquatic invasive species (AIS) throughout North America has prompted concern for fish and aquatic conservation managers. In 2009, the discovery of Asian clam shells in rearing ponds at Gavins Point National Fish Hatchery (GPNFH), South Dakota, highlighted the importance of AIS concerns for the Great Plains region. Reservation waters in South Dakota, including Beads Dam, Eagle Feather Reservoir, and Ghost Hawk Reservoir on the Rosebud Reservation were sampled for the presence of Asian clams in 2010 because of the possibility they had been transferred in fish stocking vehicles from GPNFH. Fortunately, Asian clams were not found in reservation waters (USFWS 2010). Nevertheless, the threat of invasion by other AIS, such as zebra mussel (Dreissena polymorpha) or Eurasian watermilfoil (Myriophyllum spicatum), persists, especially on waters with boating access.

This Fisheries Management Plan describes the recreational fishing reservoirs and outlines the goals, objectives, and strategies for each on the Rosebud Indian Reservation. This effort is the result of a cooperative partnership between the Rosebud Sioux Tribe and the U.S. Fish and Wildlife Service (USFWS). This plan recognizes that, (1) management of fisheries and aquatic resources on the Rosebud Indian Reservation will increase recreational value for Tribal members, (2) the Rosebud Sioux Tribe has the inherent right and responsibility to make decisions concerning management of fisheries and aquatic resources on their lands, (3) Native American culture and customs are compatible with management of these resources, (4) primary
responsibility for execution of fisheries and aquatic resource management lies with the Tribe and the Bureau of Indian Affairs, and (5) the USFWS’s role is to assist the Rosebud Sioux Tribe by providing technical advice, assistance, and support.

Figure 1. Map of the Rosebud Indian Reservation, South Dakota that depicts locations of recreational fishing reservoirs.

**General Goals of the Fisheries Management Plan**

1. Address the cultural, recreational, and economic needs related to fisheries and aquatic resource management for Tribal members of the Rosebud Sioux Tribe.
2. Manage recreational fisheries for enjoyment and sustainable harvest through monitoring, management activities, and stocking as necessary.
3. As a result of effective fisheries management, generate funding from fishing license sales.
4. Conserve and enhance fish and aquatic resources on the Rosebud Indian Reservation.
General Objectives and Strategies

1. Maintain sustainable fisheries populations in each reservoir that benefit Tribal members.
   - Establish and enforce effective fishing regulations that achieve management goals.
     - Maintain effective and appropriate harvest limits.
     - Manage fisheries using established techniques (Murphy and Willis 1996; Kohler and Hubert 1999). Goal options generally include:
       - **Big bass option**:
         - The big bass option manages for a small number of trophy largemouth bass, but usually results in an overpopulated, stunted panfish population. Typically, catch rates on trophy largemouth bass will be low. Regulations for this option usually require that all largemouth bass longer than 15 inches be released; however, largemouth bass under that length may be harvested.
           - Objectives for fish species:
             - Largemouth bass: PSD=50-80, PSD-P=30-60
             - Panfish: PSD=10-50, PSD-P=0-10
       - **Panfish option**:
         - The panfish option manages for larger-sized panfish, but usually results in a larger number of smaller largemouth bass. Regulations for this option usually require a minimum size limit for largemouth bass of 15 inches (i.e., anglers cannot harvest a bass unless it is 15 inches long).
           - Objectives for fish species:
             - Largemouth bass: PSD=20-40, PSD-P=0-10
             - Panfish: PSD=50-80, PSD-P=10-30
       - **Balanced option**:
         - The balanced, or all-purpose option, allows for the harvest of largemouth bass and panfish of a variety of sizes. Regulations for this option usually require a protected slot limit of 12-15 inches for largemouth bass. With this regulation, anglers may keep bass smaller than 12 inches, must release bass that are between 12-15 inches, but may harvest bass longer than 15 inches long.
           - Objectives for fish species:
             - Largemouth bass: PSD=40-70, PSD-P=10-40
             - Panfish: PSD=20-60, PSD-P=5-20
       - **Trout option**
         - Reservoirs with appropriate habitat and high angler use can be stocked with put-and-take, hatchery-reared trout (as available from hatchery) in the spring and fall of the year.
           - Implement supplemental fish stocking as necessary to meet management goals.
             - Stocking requests are made through the USFWS (i.e., Great Plains FWCO, D.C. Booth National Hatchery, and Gavins Point National Fish Hatchery).
             - As available, trap and transfer fish from over populated waters to less populated waters.
2. Protect reservoir habitat.
   - Exclude livestock from access to reservoirs to protect shoreline habitat and stream riparian areas above reservoirs.
   - Encourage agricultural practices that eliminate or limit sediment and pesticide runoff within reservoir watersheds.
   - Maintain reservoir aesthetics through litter control and facility maintenance.
   - Maintain access to reservoirs and rivers.
     - Maintain roads leading to reservoirs and rivers.
     - Construct and maintain boat ramps.
     - Provide access for disabled or handicapped anglers.

3. Establish and maintain fisheries monitoring program.
   - Conduct fisheries surveys every 2-3 years that successfully evaluates fish population characteristics using established gears (e.g., electrofishing, gill nets, trap nets).
     - At a minimum, collect data for measures of relative abundance (C/f), body condition (Wr), stock density indices (PSD, PSD-P).
     - Optionally, collect data for survival, growth, and recruitment.
   - Monitor general water quality for fish habitat (i.e., temperature, dissolved oxygen, pH, conductivity, and water clarity [Secchi disk, turbidity]).

4. Prevent, reduce, and control aquatic invasive/nuisance species.
   - Inform and educate Tribal members about preventing the spread and introduction of aquatic nuisance species.
   - Establish a “Clean, Drain, and Dry” campaign to encourage recreational users to disinfect boats, trailers, and angling equipment to prevent the spread of AIS.

5. Generate funding for fish and aquatic resource management.
   - Maintain appropriate fishing license fees.
   - Maintain a variety of vendors (e.g., stores, online) to sell fishing licenses.
Reservoir Management Plans

Each reservoir on the Rosebud Indian Reservation is unique in regards to characteristics associated with the type and size of watersheds, size of the reservoir, nutrient inputs, available habitats, and fish community. Because inter- and intraspecific interactions among fish species are usually complicated, management of fish and aquatic resources for each reservoir may be different and may change as time progresses. Therefore, this Fisheries Management Plan should be considered flexible and subject to adaptive management.

Significant flooding occurred on the Rosebud Indian Reservation in 2013. Due to recent burning, local soils were in a highly erodible state which led to high sediment loads in heavy flood waters which combined to have drastic impacts on several of the Reservation’s stock dams. This likely led to significant changes to the water bodies discussed below, affecting things like maximum depth, the present fish community, substrate type, and aquatic and riparian vegetation. Future surveys will require assessing the remaining fish population and re-measuring depth to understand the flood-induced changes to these reservoirs.

Beads Reservoir

Introduction

Beads Reservoir (Figure 1; coordinate location: 43.19612, -101.00677) is located within a steep-walled canyon approximately 2 miles west of the Little White River, adjacent to BIA Highway 5 between the cities of Rosebud and St. Francis. At full pool, the lake has a surface area of 17 ha (42 ac) and a maximum depth of 10.1 m (33 ft).

Figure 2. Aerial image of Beads Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps)
Fish management history

Fisheries management at Beads Reservoir has a history dating to the 1950s. The original survey in 1951 (unknown gear used) reported black bullhead, black crappie, bluegill, green sunfish, largemouth bass, and pumpkinseed sunfish. One fingerling largemouth bass stocking occurred in 1951. Throughout the 1960s and 1970s, Beads Reservoir was the primary fishing location on the Reservation for black crappie, largemouth bass, and pumpkinseed sunfish (Haines 1981). In 1979, the dam structure washed out during a severe storm; the next fisheries survey was not conducted until 1982. Channel catfish were stocked from 1987–1989, brook trout were stocked in 1988, and largemouth bass were stocked in 1989. The most recent fisheries surveys conducted on Beads Reservoir were in 2010 and 2012.

The most recent fish survey was conducted in 2012, which revealed that largemouth bass, bluegill, and pumpkinseed sunfish were the most abundant game species in the lake (James and Boyd 2013). Black crappie, yellow perch, and walleye have been previously stocked in substantial numbers, but only a few individuals are observed during surveys, which suggest that stockings have not been largely successful in providing a fishery for those species.

Fish management goals, objectives, and strategies

Goal: Panfish Option (bluegill and pumpkinseed sunfish).
Rationale: Currently, fishery metrics are close to the appropriate stock indices for bass and bluegill, while pumpkinseed sunfish objectives are being met for the panfish option.
Recommendation: Consider increasing the minimum-size length-restriction from 12 inches to 15 inches to reach all management goals.

- **Largemouth bass:**

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>2012</td>
<td>18</td>
<td>3</td>
</tr>
</tbody>
</table>

Objective 1. Maintain a PSD of 20-40 and a PSD-P of 0-10.

Strategy 1. Evaluate largemouth bass size structure with electrofishing.
Strategy 2. To achieve goal size-structure, two options could be implanted.

2a: Discourage harvest of largemouth bass 15 inches (<381 mm) in length through voluntary compliance.

2b: Enact regulation to limit harvest of largemouth bass 15 inches (<381 mm) in length.

- **Bluegill**

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>47</td>
<td>1</td>
</tr>
</tbody>
</table>
Objective 1. Maintain a PSD of 50-80 and a PSD-P of 10-30.
   Strategy 1. Evaluate bluegill size structure with electrofishing.
   Strategy 2. Increase density of smaller (12-15 inch) largemouth bass, which will
   eat smaller panfish to reduce competition for food.
   Strategy 3. Encourage harvest of small bluegill (< 6 inches).

• Pumpkinseed sunfish

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>96</td>
<td>1</td>
</tr>
<tr>
<td>2012</td>
<td>61</td>
<td>22</td>
</tr>
</tbody>
</table>

Objective 1. Maintain a PSD of 50-80 and a PSD-P of 10-30.
   Strategy 1. Evaluate pumpkinseed sunfish size structure with electrofishing.
   Strategy 2. Increase density of smaller (12-15 inch) largemouth bass, which will
   eat smaller panfish to reduce competition for food.
   Strategy 3. Encourage harvest of small bluegill (< 6 inches).

**Chases the Woman Reservoir**

**Introduction**

Chases the Woman Reservoir (Figure 3; coordinate location: 43.18746, -100.94590) is located
approximately one mile east of the Little White River off BIA Highway 5 between the cities of
Rosebud and St. Francis. At full pool, the reservoir has a surface area of 3.2 ha (8 ac) and a
maximum depth of 5.8 m (19 ft.). The dam structure was constructed in 1964.
Figure 3. Aerial image of Chases the Woman Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps)

Fish management history

Fisheries management in Chases the Woman Reservoir began shortly after construction of its dam when 2,000 rainbow trout and 1,000 brown trout were stocked in 1965. Rainbow trout were stocked almost annually until 1990. In 1979, the dam structure washed out during a severe storm. The dam was repaired and management resumed in 1983. Fish species observed after 1983 included black bullhead, golden shiner, rainbow trout, white sucker, and yellow perch. Cutthroat trout were stocked in 1986.

The Chases the Woman Reservoir fishery is currently dominated by large numbers of small largemouth bass. Black crappie were present in very small numbers, while yellow perch were absent despite being stocked in recent years. The rainbow trout stocking program has been successful in the reservoir.

Fish management goals, objectives, and strategies

Goal: Panfish Option (black crappie or bluegill). Trout option.
Rationale: Small largemouth bass dominate the fishery, while only a few black crappie individuals were present.
Recommendation: The number of smaller largemouth bass should be reduced. Bass should be removed by electrofishing and transferred to another reservoir that needs an increased number of bass. Because bluegills exist in numerous other reservoirs, black crappie could be stocked into the reservoir. The large number of small bass may have high predation rates on stocked fry or fingerlings, therefore it is recommended that stocked black crappie should be
at least 4 inches long, which would necessitate a trap and transfer from another reservoir. Hatcheries are unlikely to be able to produce black crappie of that size. Continue to stock rainbow trout.

- **Largemouth bass:**

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

  Objective 1. Achieve a PSD of 20-40 and a PSD-P of 0-10.
  Strategy 1. Evaluate largemouth bass size structure with electrofishing.
  Strategy 2. Decrease density of small largemouth bass to reduce competition for food and increase growth.
  2a: Encourage harvest of small largemouth bass.

- **Black crappie:**

  Objective 1. Maintain a PSD of 30-60 and a PSD-P of >10.
  Strategy 1. Evaluate black crappie size structure with electrofishing.
  Strategy 2. Decrease density of small largemouth bass to reduce predation pressure on young black crappie.

- **Rainbow trout:**

  Objective 1. Stock rainbow trout in the spring and(or) fall at a rate of 50-100/acre.

**Eagle Feather Reservoir**

**Introduction**

Eagle Feather Reservoir (Figure 4; coordinate location: 43.32277, -101.03858) is located 0.5 mile west of the town of Parmelee. At full pool, the reservoir has a surface area of 18 ha (44.5 ac) and a maximum depth of 7.3 m (24 ft.). Eagle Feather Reservoir is within the Cutmeat Creek watershed, which drains >10,000 ha (40 mi²; ~25,000 ac) of pasture. Cutmeat Creek flows through the communities of Upper Cutmeat, He Dog, and Parmelee. The stream’s flow is regulated by White Horse and He Dog dams upstream of Eagle Feather Reservoir. The creek and reservoirs are used extensively to water livestock.
Fish management history

In 1953, the reservoir was completely drained. Information regarding fish stocking during the 1950s is limited; however, results from a fisheries survey in 1968 reported that black bullhead, bluegill, green sunfish, largemouth bass, northern pike, and white suckers were present. Subsequent surveys from the 1970s to 1992 reported the presence of black bullhead, bluegill, green sunfish, golden shiners, largemouth bass, northern pike, pumpkinseed sunfish, walleye, white suckers, and yellow perch. Eagle Feather Reservoir is a popular recreational fishery for the Rosebud Sioux Tribe.

The most recent fisheries surveys were completed in 2010 and 2012, which revealed a good fishery of largemouth bass, bluegill, pumpkinseed sunfish, and yellow perch (James and Boyd 2013). Walleye and black crappie have both recently been stocked in large numbers, but have not been observed in significant numbers during recent surveys, indicating that the stockings have not been successful.

Fish management goals, objectives, and strategies

Goal: Balanced, or All-Purpose Option (bluegill, pumpkinseed sunfish, and yellow perch).

Rationale: The reservoir supports a variety of game-fish species and currently has a fairly balanced population of all species. Increasing the number of 12-15 inch largemouth bass should result in a few larger bass while also decreasing the number of smaller panfish.

Recommendation: The suggested regulation for a balanced fish population is a protected slot limit for largemouth bass. If bluegills are needed for another reservoir, Eagle Feather would be a good source to trap them and transfer to other reservoirs.

- Largemouth bass:
Past survey results

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>69</td>
<td>38</td>
</tr>
<tr>
<td>2012</td>
<td>63</td>
<td>38</td>
</tr>
</tbody>
</table>

Objective 1. Maintain a PSD of 40-70 and a PSD-P of 10-40.

Strategy 1. Evaluate largemouth bass size structure with electrofishing.

Strategy 2. Increase density of 12-15 inch largemouth bass to increase predation on panfish and increase the number of larger bass.

2a: Discourage harvest of 12-15 inch largemouth bass through voluntary compliance.

2b: Enact a regulation of a protected slot limit for 12-15 inch largemouth bass (i.e., 12-15 inch bass must be released, all other sized bass may be harvested).

- **Bluegill:**

Past survey results

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>

Objective 1. Achieve and maintain a PSD of 20-60 and a PSD-P of 5-20.

Strategy 1. Evaluate bluegill size structure with electrofishing.

Strategy 2. Increase density of larger bluegill by increasing density of 12-15 inch largemouth bass, which will eat smaller panfish and reduce competition for food and increase growth of bluegill.

Strategy 3. Encourage harvest of small bluegill (< 6 inches).

- **Pumpkinseed sunfish:**

Past survey results

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>59</td>
<td>2</td>
</tr>
</tbody>
</table>

Objective 1. Maintain a PSD of 20-60 and a PSD-P of 5-20.

Strategy 1. Evaluate pumpkinseed sunfish size structure with electrofishing.

Strategy 2. Increase density of 12-15 inch largemouth bass, which will eat smaller panfish and reduce competition for food.

- **Yellow perch:**

Past survey results

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>
Objective 1. Achieve and maintain a PSD of 30-60.
Strategy 1. Evaluate yellow perch size structure with electrofishing.
Strategy 2. Increase abundance of yellow perch by stocking fingerlings.

**Ghost Hawk Reservoir**

**Introduction**

Ghost Hawk Reservoir (Figure 5; coordinate location: 43.256875, -100.907602) is located west of the city of Rosebud along BIA Highway 5. The surface area and depth information is currently unknown.

![Figure 5. Aerial image of Ghost Hawk Reservoir on the Rosebud Indian Reservation.](image_credit: www.bing.com/maps)

**Fish management history**

Little is known about the fishery in Ghost Hawk Reservoir because boat access is difficult and surveys have not been conducted in recent history. The trout stocking program has been successful.

**Fish management goals, objectives, and strategies**

Goal: Trout option. Other options pending full fisheries survey.
Rationale: Trout fishing is successful and highly utilized after stocking. Fisheries survey information is unavailable because surveys have not been completed.
Recommendation: Create boat access and complete fisheries survey. Continue to stock trout.

- **Rainbow trout:**
  Objective 1. Stock rainbow trout in the spring and(or) fall at a rate of 50-100/acre.
Rosebud (Spotted-tail) Reservoir

Introduction

Rosebud Reservoir (Figure 6; coordinate location: 43.22910, -100.85087) is located within the city of Rosebud. At full pool, the reservoir has a surface area of 3.2 ha (8 ac) and a maximum depth of 4.0 m (13.0 ft.). The Rosebud watershed drains about 14,500 ha (56 mile²; 36,000 ac). Siltation and extensive vegetation in the reservoir has been common.

Figure 6. Aerial image of Rosebud (Spotted-tail) Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps)

Fish management history

The first record of fisheries management for Rosebud Reservoir was from 1951, when the reservoir was chemically treated (rotenone) to remove fish and subsequently stocked with brown trout. From the 1950s to the 1970s, Rosebud was managed as a put-and-take trout fishery. However, the water depth decreased due to siltation and mean water temperatures increased to a level that did not support trout survival, although rainbow trout have been occasionally stocked. Northern pike and channel catfish were stocked in the 1960s and 1970s. Since the 1950s, black bullhead, bluegill, brown trout, creek chubs, fathead minnows, green sunfish, largemouth bass, northern pike, pumpkinseed sunfish, rainbow trout, and white suckers have been caught during fisheries surveys. The reservoir is currently managed for warm water species (e.g., largemouth bass and bluegill). Rosebud Reservoir is an important fishery due to its location within the community.

The most recent fisheries surveys were completed in 2010 and 2012. The fishery is largely composed of largemouth bass and bluegill (James and Boyd 2013). Black crappie and yellow perch have been stocked in the past, but are not observed in surveys, which could indicate
stockings were not successful. The rainbow trout stocking program in Rosebud Reservoir is very successful due to its location within the community and easy access for anglers.

**Fish management goals, objectives, and strategies**

Goal: Panfish Option (bluegill). Trout option.
Rationale: Currently, fishery metrics are close to the appropriate stock indices for bass and bluegill.
Recommendation: Consider increasing the minimum-size length-restriction from 12 inches to 15 inches to reach improve management goals. Continue to stock trout.

- **Largemouth bass**:  
  
  *Past survey results*  
<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>2012</td>
<td>23</td>
<td>0</td>
</tr>
</tbody>
</table>

  Objective 1. Achieve and maintain a PSD of 20-40 and a PSD-P of 0-10.  
  Strategy 1. Evaluate largemouth bass size structure with electrofishing.  
  Strategy 2. Increase density of largemouth bass <15 inches in length to increase predation on smaller panfish and increase the number of larger bass.  
  2a: Discourage harvest of largemouth bass <15 inches in length through voluntary compliance.  
  2b: Enact a regulation of a minimum size limit of 15 inches for largemouth bass (i.e., bass less than 15 inches must be released, all other sized bass may be harvested).

- **Bluegill**:  
  
  *Past survey results*  
<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>98</td>
<td>4</td>
</tr>
<tr>
<td>2012</td>
<td>89</td>
<td>5</td>
</tr>
</tbody>
</table>

  Objective 1. Achieve and maintain a PSD of 50-80 and a PSD-P of 10-30.  
  Strategy 1. Evaluate bluegill size structure with electrofishing.  
  Strategy 2. Increase density of larger bluegill by increasing density of largemouth bass < 15 inches, which will eat smaller panfish and reduce competition for food and increase growth of bluegill.  
  Strategy 3. Encourage harvest of small bluegill (< 6 inches).

- **Rainbow trout**:  
  Objective 1. Stock rainbow trout in the spring and(or) fall at a rate of 50-100/acre.

**Indian Scout Reservoir**
Introduction

Indian Scout Reservoir (Figure 7; coordinate location: 43.23500, -100.83990) is located just outside of the town of Rosebud. At full pool, the reservoir has a surface area of 1 ha (2.5 ac) and a maximum depth of 6.7 m (22.0 ft).

Figure 7. Aerial image of Indian Scout Reservoir on the Rosebud Indian Reservation. (Image credit: www.bing.com/maps)

Fish management history

The dam and outlet structure at the reservoir was renovated in 2011. The most fisheries survey was conducted in 2012 and represents the first survey since the renovation. Largemouth bass was the only species caught, but relative abundance was fairly high compared to other reservoirs on the reservation (James and Boyd 2013). Natural reproduction was apparent and condition was good. Rainbow trout have been stocked since the most recent survey, but success of the stocking has not been evaluated.

Fish management goals, objectives, and strategies

Goal: Panfish Option (pumpkinseed sunfish, black crappie, or bluegill). Trout option.
Rationale: Largemouth bass dominate the fishery. The bass will need prey fish to be successful.
Recommendation: The number of smaller largemouth bass should be reduced before introducing a prey fish. Bass should be removed by electrofishing and transferred to another reservoir that needs an increased number of bass. Because bluegills exist in numerous other reservoirs, black crappie or pumpkinseed sunfish could be stocked into the reservoir, although bluegill are a good option as well. The large number of bass may have high predation rates on stocked fry
or fingerlings, therefore it is recommended that stocked panfish be at least 4 inches long, which would necessitate a trap and transfer from another reservoir. Hatcherries are unlikely to be able to produce black crappie of that size. Continue to stock trout.

- **Largemouth bass:**

<table>
<thead>
<tr>
<th>Year</th>
<th>PSD</th>
<th>PSD-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

  Objective 1. Achieve a PSD of 20-40 and a PSD-P of 0-10.
  Strategy 1. Evaluate largemouth bass size structure with electrofishing.
  Strategy 2. Decrease density of small largemouth bass to reduce competition for food and increase growth.
  2a: Encourage harvest of small largemouth bass.

- **Alternative 1) Black crappie:**

  Objective 1. Maintain a PSD of 30-60 and a PSD-P of >10.
  Strategy 1. Evaluate black crappie size structure with electrofishing.
  Strategy 2. Decrease density of small largemouth bass to reduce predation pressure on young black crappie.

- **Alternative 2) Bluegill or pumpkinseed sunfish**

  Objective 1. Maintain a PSD of 50-80 and a PSD-P of 10-30.
  Strategy 1. Evaluate size structure with electrofishing.
  Strategy 2. Decrease density of small largemouth bass to reduce predation pressure on young panfish.

- **Rainbow trout:**

  Objective 1. Stock rainbow trout in the spring and(or) fall at a rate of 50-100/acre.

---

**Antelope Creek Reservoir**

**Introduction**

Antelope Creek Reservoir (Figure 8; coordinate location: 43.295973, -100.617887) is filled by Antelope Creek, which is the headwaters of the Keya Paha River. The reservoir is located near the city of Mission, SD. In 1951, the reservoir had a surface area of 151 acres and had a maximum depth of 27 ft (Mack 1989), but was described as having a surface area of 136 acres with a maximum depth of 25 ft in 1982 (Goudreault 1982). Siltation has likely substantially decreased the depth of the reservoir since then. The major water quality concern for Antelope Creek Reservoir is nutrient enrichment from seepage and overflow from nearby sewage lagoons. The area has sandy soils and a shallow water table, which allows for rapid seepage. Nutrients from sewage and runoff have created a highly eutrophic lake increasing vegetation and algae growth (Goudreault 1982).
Fish management history

Antelope Creek Reservoir has a long history of fisheries management beginning in 1951. The first surveys found black bullhead, black crappie, common carp, creek chubs, golden shiners, green sunfish, and largemouth bass. Throughout the 1950s, fingerling largemouth bass were the only species stocked. In 1959, the lake was renovated twice because common carp and channel catfish were detected after the first renovation failed. From 1960 to 1990 the reservoir was stocked with channel catfish, largemouth bass, northern pike, and walleye. Additionally, 6,000 muskellunge were stocked in 1987. Occasionally, white suckers were collected (Mack 1989). Walleye were rarely captured during surveys, suggesting that survival was low.

The most recent fisheries survey was completed in 2010. Panfish (black crappie, bluegill, and yellow perch) populations were mostly composed of smaller fish. Largemouth bass were present, but in very low numbers. One northern pike was caught during surveys. Common carp were also present in moderate abundance, representing numerous age classes.

Fish management goals, objectives, and strategies

Goal: Pending full fisheries survey.
Rationale: Past survey data is outdated, but has suggested that numerous species are present, including a large number of common carp.
Recommendation: Due to its larger size, Antelope Creek Reservoir should receive a full fisheries survey using electrofishing, trap nets, and gill nets to evaluate the status of the fishery. Pending the results of such a survey, a recommendation for management actions can be made at that time.
References


Schmucker, Paul, Nohr, and Associates Consulting Engineers, Mitchell, South Dakota


## Appendix 1. Fish stocking history in Rosebud Indian Reservation reservoirs.

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Black crappie</th>
<th>Largemouth bass</th>
<th>Rainbow trout</th>
<th>Walleye</th>
<th>Yellow perch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>year</td>
<td>#</td>
<td>size</td>
<td>year</td>
<td>#</td>
</tr>
<tr>
<td>Antelope Creek</td>
<td></td>
<td>2010</td>
<td>13,600</td>
<td>FG</td>
<td></td>
</tr>
<tr>
<td>Beads</td>
<td>2009</td>
<td>15,000</td>
<td>FG</td>
<td>2009</td>
<td>3,500</td>
</tr>
<tr>
<td>Chases the Woman</td>
<td>2009</td>
<td>1,500</td>
<td>FG</td>
<td>2009</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eagle Feather</td>
<td>2009</td>
<td>20,000</td>
<td>FG</td>
<td>2009</td>
<td>4,000</td>
</tr>
<tr>
<td>Ghost Hawk</td>
<td>2009</td>
<td>1,200</td>
<td>FG</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indian Scout</td>
<td>2009</td>
<td>4,000</td>
<td>FG</td>
<td>2009</td>
<td>800</td>
</tr>
<tr>
<td>Rosebud</td>
<td></td>
<td>2010</td>
<td>4,000</td>
<td>FG</td>
<td></td>
</tr>
</tbody>
</table>

*Stocking-size abbreviations are for fry (FY; hatch to 1.49 in), fingerling (FG; 1.5 to 5.49 in), sub-adult (SA; ≥ 5.5 in, not sexually mature), adult (AD; sexually mature, regardless of size), and mixed (MX; transplanted from natural sources).
Appendix 2. Recommended maintenance stocking rates for reservoirs on the Rosebud Indian Reservation. Stocking rates are based on those suggested by Willis and et. al (1990) and Blaser and Eades (2006).

<table>
<thead>
<tr>
<th>Species</th>
<th>Size</th>
<th>Number to stock/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catfish</td>
<td>Fingerling</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>25</td>
</tr>
<tr>
<td>Largemouth bass</td>
<td>Fingerling</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>30-50</td>
</tr>
<tr>
<td>Sunfish (bluegill, crappie,</td>
<td>Fingerling</td>
<td>500</td>
</tr>
<tr>
<td>pumpkinseed, yellow perch)</td>
<td>Adult</td>
<td>50</td>
</tr>
<tr>
<td>Trout</td>
<td>Adult</td>
<td>50-100</td>
</tr>
<tr>
<td>Walleye</td>
<td>Fry</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Fingerling</td>
<td>50-100</td>
</tr>
</tbody>
</table>

**Catch per unit effort (C/ƒ):** an index of abundance used to document relative changes over time (also known as relative abundance), calculated as,

\[
C/ƒ = \frac{\text{number of fish (per length group, category, or sample)}}{\text{effort in unit of time (e.g., hour or net night)}}
\]

**Conductivity:** a measure of water’s ability to conduct electrical current, which is dependent on the amount of ions in the water. Total dissolved solids (TDS) are equal to ~0.5*conductivity. Conductivity is an approximate measure of a water body’s productivity due to a relationship between minerals and productivity.

**Effort:** the amount of time expended in collecting a sample (e.g., hours, minutes, or net nights). Effort is used to calculate C/ƒ.

**Memorable length:** the length of a fish (unique to each species) considered as the length that most anglers remember catching, quantified as 59-64% of the world record length for that species.

**Net-night:** a unit of time (i.e., overnight, <24 hr.) describing the effort expended for a sampling gear, such as a gill net or trap net. For example, if five gill nets were left in the water overnight, five gill net nights of effort were expended.

**pH:** a measure of how basic or acidic water is. Pure water is considered neutral with a pH of 7. Because pH is on a log10 scale, a change of 1 pH unit equates to a 10-fold increase in H⁺ (hydrogen ions). Values for pH less than 7 indicate acidic water, while pH values greater than 7 indicate basic water.

**Preferred length:** the length of a fish (unique to each species) that is considered the preferred length that most anglers want to catch, quantified as 45-55% of the world record length for that species.

**Proportional size distribution (PSD):** the percentage of a sample of stock length fish that are also greater than the number of fish ≥ a fish’s length category (i.e., quality, preferred, memorable, trophy), calculated as,

\[
\text{PSD} = \frac{\text{number of fish} \geq \text{quality length}}{\text{number of fish} \geq \text{stock length}} \times 100
\]

\[
\text{PSD - P} = \frac{\text{number of fish} \geq \text{preferred length}}{\text{number of fish} \geq \text{stock length}} \times 100
\]

\[
\text{PSD - M} = \frac{\text{number of fish} \geq \text{memorable length}}{\text{number of fish} \geq \text{stock length}} \times 100
\]

\[
\text{PSD - T} = \frac{\text{number of fish} \geq \text{trophy length}}{\text{number of fish} \geq \text{stock length}} \times 100
\]
Relative weight \((W_r)\): an index of the condition, or general well-being, of a fish, calculated as,

\[
W_r = \frac{\text{weight (W)}}{\text{standard weight (W_s)}} \times 100
\]

where \(W\) is the weight (g) of an individual fish and \(W_s\) is a length specific standard weight developed for each species.

**Quality length:** the length of a fish (unique to each species) that is considered the minimum length most anglers would keep, quantified as 36-41% of the world record length for that species.

**Standard error** (SE): the standard deviation of the sampling distribution of a statistic, calculated as,

\[
\frac{\text{standard deviation}}{\sqrt{n}}
\]

or,

\[
\sqrt{\frac{\text{variance}}{n}}
\]

where \(n\) is the sample number.

**Standard weight:** weight of a fish standardized by regression of weight on length for a particular species, often determined by the 75th percentile weight rather than average weight in a length-class.

**Stock length:** the length of a fish (unique for each species) considered as the length that a fish reaches sexual maturity, quantified as 20-26% of the world record length for that species.

**Trophy length:** the length of a fish (unique to each species) considered to be a length worthy of acknowledgement, quantified as 74-80% of the world record length for that species.

**Variance:** a measure of the dispersion around the average of the sample, calculated as,

\[
\sum (\text{observed value} - \text{sample mean})^2
\]