

2008 Fisheries Surveys on the Lower Brule Indian Reservation

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INTRODUCTION

Lower Brule Indian Reservation encompasses over 40,000 acres in Lyman and Stanley Counties, South Dakota (Figure 1). The eastern and northern boundaries are formed by Lake Sharpe (Missouri River). The landscape consists of rolling hills of short-grass prairie and steep drainages near the Missouri River.

The climate consists of warm, dry temperatures during the summer months typically exceeding 100 °F during July and August. Average annual precipitation is 18 inches, which mainly comes in the form of rain from April to June. Winter months are harsh with occasional blizzards and temperatures reaching -30 °F.

The prairie on the Lower Brule Indian Reservation provides excellent habitat for both migratory and resident birds, elk *Cervus canadensis*, buffalo *Bison bison*, pronghorn *Antilocapra americana*, whitetail *Odocoileus virginianus* and mule deer *O. hemionus*, coyote *Canis latrans*, badger *Taxidea taxus*, and prairie dogs *Cynomys ludovicianus*. Low dams have been constructed across the Lower Brule Indian Reservation to collect precious water for livestock including buffalo. These small reservoirs provide additional habitat for birds and mammals while providing recreational fishing opportunities.

Lower Brule has been assisted by the U. S. Fish and Wildlife Service in managing their fishery resources (with varying degrees of assistance) since 1958. During this time, several different management approaches have been tried including netting and electrofishing surveys, stocking fish, and attempting to establish and maintain a cold water trout fishery.

Today, emphasis has been focused on managing reservoirs as sport fisheries for cool and warm water fish including northern pike *Esox lucius*, largemouth bass *Micropterus salmoides*, bluegill *Lepomis macrochirus*, yellow perch *Perca flavescens*, and black crappie *Pomoxis nigromaculatus*. This involves surveys with frame (trap) and gill nets, and electrofishing. The collected data is then used to help Tribal personnel with the establishment of regulations and fish stocking strategies that will allow them to meet their management goals.

METHODS

Data collection

Night time electrofishing was conducted on 17 September 2008 with a Smith and Root 5.0 GPP electrofishing system with a maximum output power of 5,000 watts, using pulsed DC, 6-7 amps, and a pulse frequency of 60 pulses per second. Electrofishing was conducted along the entire shoreline in each surveyed reservoir. All fish captured were measured to total length (TL; mm) and five fish per centimeter length group were weighed (g) at each reservoir.

A list of common names, scientific names, and abbreviations for fish mentioned in this report is presented in Appendix A.

Water quality parameters collected at each reservoir were water temperature, dissolved oxygen, pH, alkalinity, and conductivity (Table 1).

Table 1. Lower Brule Indian Reservation surface water quality parameters collected in September 2008.

Date	Time (military)	Water temperature (°C)	D.O. (mg/L)	Secchi depth (cm)	pH	Phenolphthalein alkalinity (mg/L)	Total alkalinity (mg/L)	Conductivity (µS/cm)
Badhorse Reservoir								
17 Sep 2008	0245	18.2	7.9		9.1	0	171	406
Carlin Reservoir								
17 Sep 2008	2246	18.6	10.9		9.0	17	137	287
Reuer Reservoir								
17 Sep 2008	0100	18.2	9.5		8.6	0	103	761
Right Tailrace Reservoir								
17 Sep 2008	2100	19.0	9.7		10.3	34	68	1,586

Data analysis

Relative abundance of fish species were expressed as mean catch per unit effort (CPUE) as fish/hr for electrofishing. Proportional stock density (PSD; Anderson 1976) and relative stock density (RSD; Gabelhouse 1984) were calculated for largemouth bass, bluegill, and yellow perch. Length categories used to calculate PSD and RSD for each fish species is presented in Appendix B. Relative weights (W_r ; Wege and Anderson 1978) were calculated using a standard weight (W_s) equation for each fish species and summarized in Appendix C. A glossary of fishery terms and data analysis is summarized in Appendix D. Fish stockings across the Lower Brule Indian Reservation are presented in Appendix E.

Badhorse Reservoir

Lake Description

Badhorse Reservoir lies on the western edge of Lower Brule. Land use in the drainage is primarily livestock grazing.

Badhorse Reservoir fishery management history

Sporadic fish stocking of largemouth bass, bluegill, and yellow perch have occurred at unknown dates.

Results and Discussion

Yellow perch

In 2008, Badhorse Reservoir fish population consisted of a high density of yellow perch (342 perch/hr) in the stock-quality and quality-preferred length groups (Figure 2). Relative weights are normal indicating adequate prey availability (Table 2).

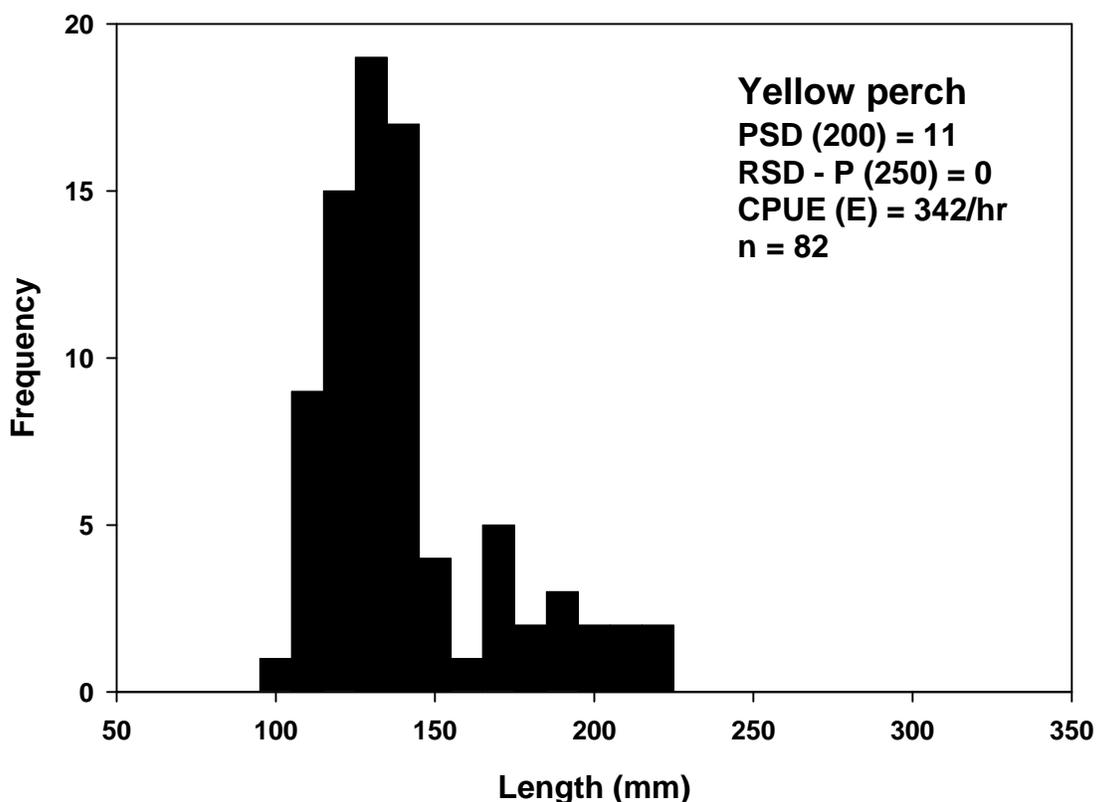


Figure 2. Yellow perch length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for perch \geq stock length (130 mm) captured by electrofishing in Badhorse Reservoir in September 2008.

Table 2. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for yellow perch captured by electrofishing in Badhorse Reservoir, July 2008.

Length category	n	Mean Wr
Sub-stock (< 130 mm)	11	115 (4.3)
Stock – quality (130 – 199 mm)	25	105 (1.9)
Quality – preferred (200 – 249 mm)	6	89 (2.1)
Preferred – memorable (250 – 299 mm)		
Memorable – trophy (300 – 379 mm)		
Trophy (\geq 380 mm)		
Total	42	105 (2.0)

Fathead minnow

Thousands of 40 – 70 mm fathead minnows *Pimephales promelas* were captured while electrofishing in September 2008. Evidence of multiple year classes suggested successful spawning and recruitment even with the high densities of yellow perch. Fathead minnows are likely foraged on by adult yellow perch. High diet overlap is likely between fathead minnows and larval and juvenile perch.

Carlin Reservoir

Lake Description

Land use in the drainage is livestock grazing and dry land farming (mainly winter wheat).

Carlin Reservoir fishery management history

Sporadic fish stocking of largemouth bass, bluegill, and yellow perch has occurred at unknown dates.

Results and Discussion

Bluegill

Only one 68 mm bluegill was captured in Carlin Reservoir in 2008.

Largemouth bass

Only sub-stock length largemouth bass were captured during electrofishing surveys in 2008 indicating that to date, that stocking was successful (Figure 3).

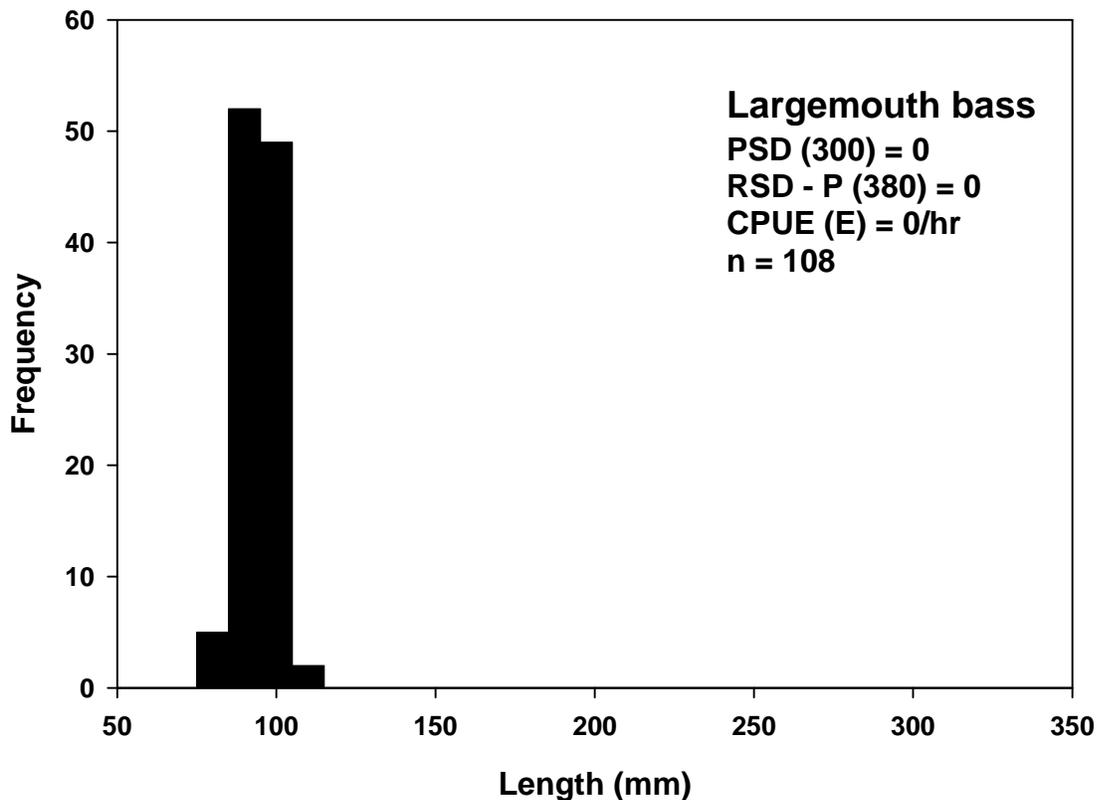


Figure 3. Largemouth bass length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for bass \geq stock length (200 mm) captured by electrofishing in Carlin Reservoir in September 2008.

Yellow perch

A high density of yellow perch was observed in Carlin Reservoir with a Mean CPUE of 243 fish/hr. Multiple length groups (Figure 4) of fish indicated that either earlier stockings were successful or there is successful spawning and recruitment. The yellow perch population is dominated by stock to quality length fish with a few preferred length fish available to anglers. Mean relative weights were normal indicating an abundance of prey (Table 3).

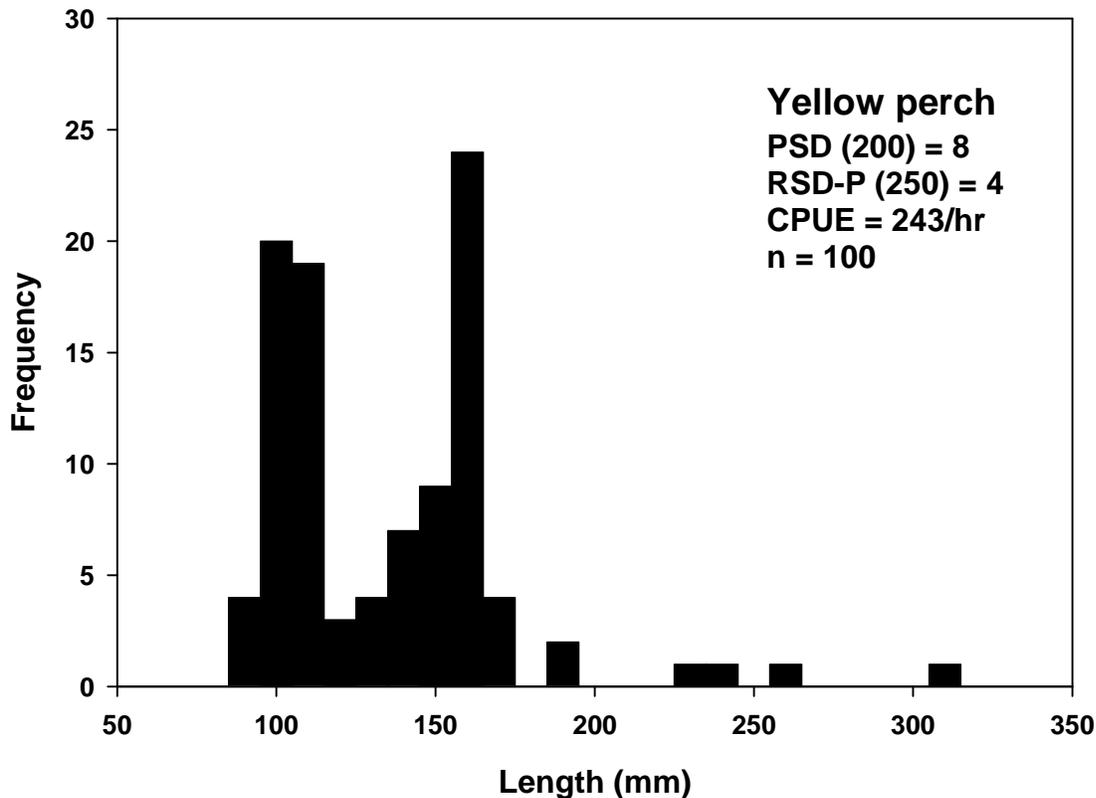


Figure 4. Yellow perch length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for perch \geq stock length (130 mm) captured by electrofishing in Carlin Tailrace Reservoir in September 2008.

Table 3. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for yellow perch captured by electrofishing in Carlin Reservoir, September 2008.

Length category	n	Mean Wr
Sub-stock (< 130 mm)	17	112 (2.6)
Stock – quality (130 – 199 mm)	25	106 (1.9)
Quality – preferred (200 – 249 mm)	2	87 (6.6)
Preferred – memorable (250 – 299 mm)	1	112
Memorable – trophy (300 – 379 mm)	1	85
Trophy (\geq 380 mm)		
Total	46	107 (1.7)

Reuer Reservoir

Lake Description

Reuer Reservoir is a 3 ha impoundment with a maximum depth of 3.4 m (during 1995) at full pool (Figure 1). The dam is located at T107N, R74W, S24 and 25. Emergent vegetation covered 50% of the shoreline and was composed mainly of cattails *Typha sp.*

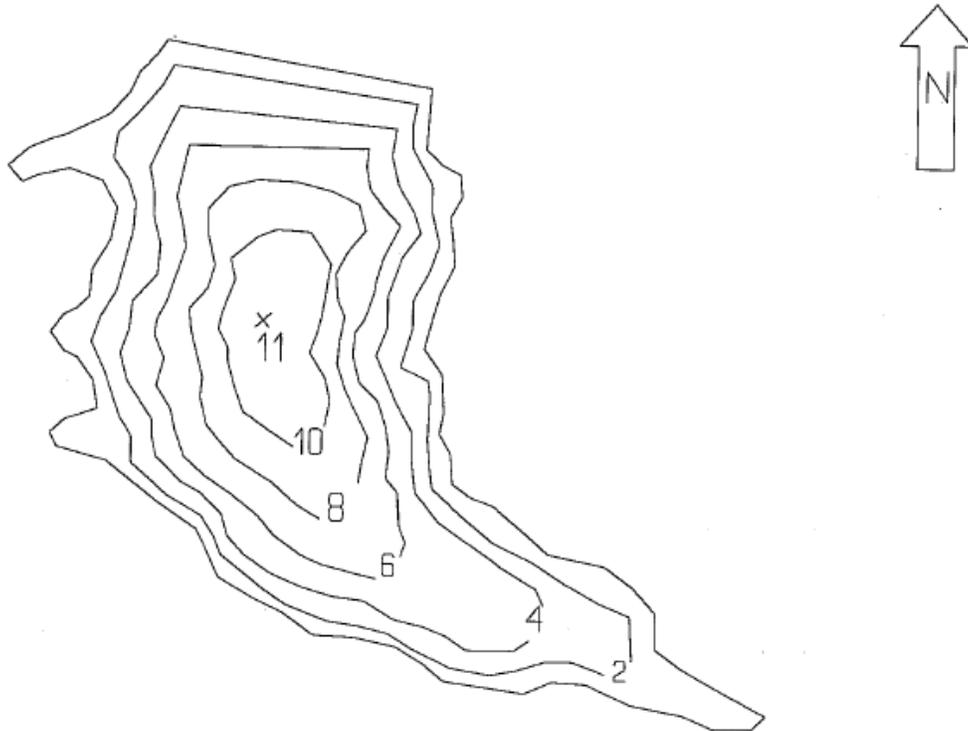


Figure 5. Bottom profile of Reuer Reservoir. Depth measured in feet.

Reuer Reservoir fishery management history

Information regarding the fishery management in Reuer Reservoir is limited. A survey was conducted during 22 May 1995 (USFWS 1995) that included electrofishing the entire shoreline at night and four overnight trap nets. At the time of the survey, water temperature was 16°C, secchi depth = 0.7 m, pH = 9, conductivity = 641 $\mu\text{S}/\text{cm}$, phenolphthalein alkalinity = 0, and total alkalinity = 137 mg/L. Catch data for all fish species is presented in Table 4.

Table 4. Reuer Reservoir total number (N) of fish, mean catch per unit effort (CPUE) for fish \geq stock length, mean relative weights (Wr), proportional and relative stock density (PSD and RSD) data from May 1995 fishery assessment. Mean CPUE calculated as fish/hr for electrofishing and fish/net night for trap nets.

Species	N	Electrofishing	Trap net	Mean Wr	PSD	RSD
		mean CPUE	mean CPUE			
Largemouth bass	21	42		99	25	20
Black crappie	23	26	2.3	100	95	5
Bluegill	71	38	12.5	103	92	14

Results and Discussion

Bluegill

Only five bluegill were captured 21.7 min of electrofishing for a mean CPUE of 13.8 fish/hr (Figure 6). Mean Wr was high for the bluegill captured (Table 5).

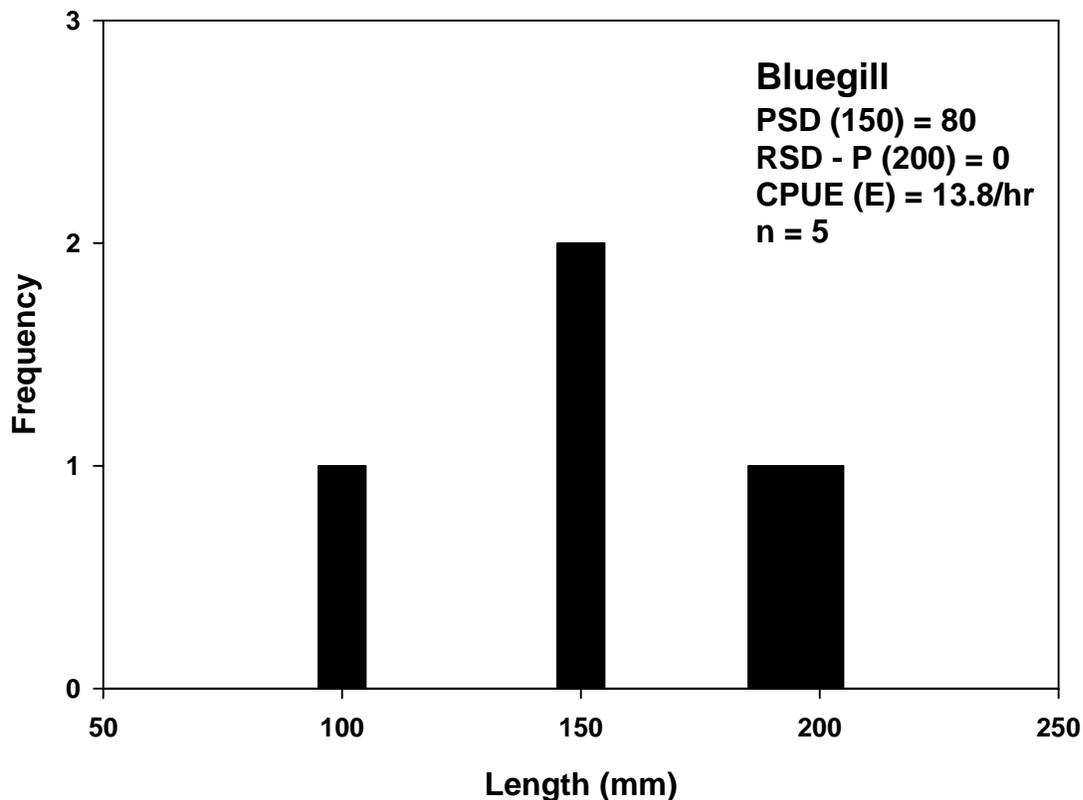


Figure 6. Bluegill length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE) calculated for bluegill \geq stock length (80 mm)/hr captured by electrofishing in Reuer Reservoir in September 2008.

Table 5. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for bluegill captured by electrofishing in Reuer Reservoir, September 2008.

Length category	n	Mean Wr
Stock – quality (80 – 149 mm)	1	110
Quality – preferred (150 – 199 mm)	4	114 (3.5)
Preferred – memorable (200 – 249 mm)		
Memorable – trophy (250 – 299 mm)		
Trophy (≥ 300 mm)		
Total	5	114 (2.9)

Largemouth Bass

Only sub-stock and preferred length largemouth bass were captured in Reuer Reservoir (Figure 7) indicating successful spawning or stocking, but with low recruitment to larger length groups. Mean Wr was high for largemouth bass (Table 6).

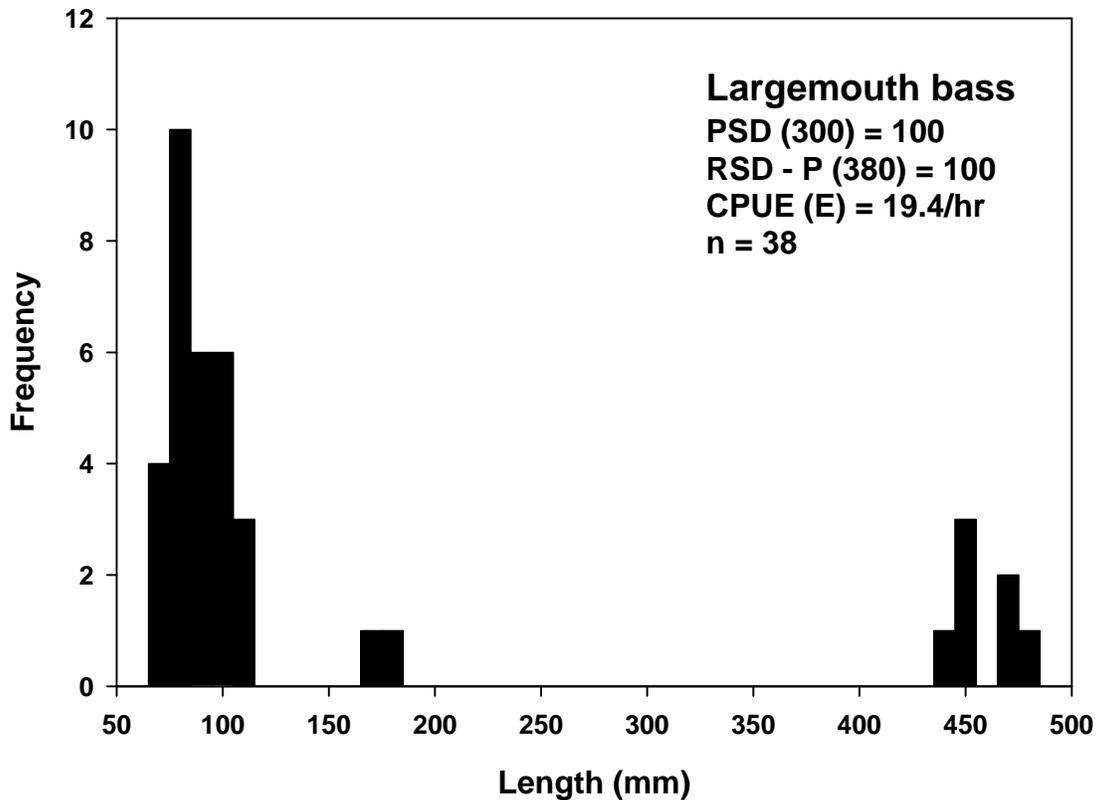


Figure 7. Largemouth bass length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for bass \geq stock length (200 mm) captured by electrofishing in Reuer Reservoir in September 2008.

Table 6. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for largemouth bass captured by electrofishing in Yellow Bear Reservoir, July 2008.

Length category	n	Mean Wr
Sub-stock (< 200 mm)	22	136 (3.6)
Stock – quality (200 – 299 mm)		
Quality – preferred (300 – 379 mm)		
Preferred – memorable (380 – 509 mm)	7	103 (1.7)
Memorable – trophy (510 – 629 mm)		
Trophy (\geq 630 mm)		
Total	29	128 (3.8)

Northern pike

Two large (\approx 900 mm) were observed while electrofishing. Both escaped being captured.

Yellow Perch

Only six yellow perch were captured during the electrofishing surveys. All were sub-stock to quality length (Figure 8). Relative weights were normal (Table 7) indicating adequate levels of prey.

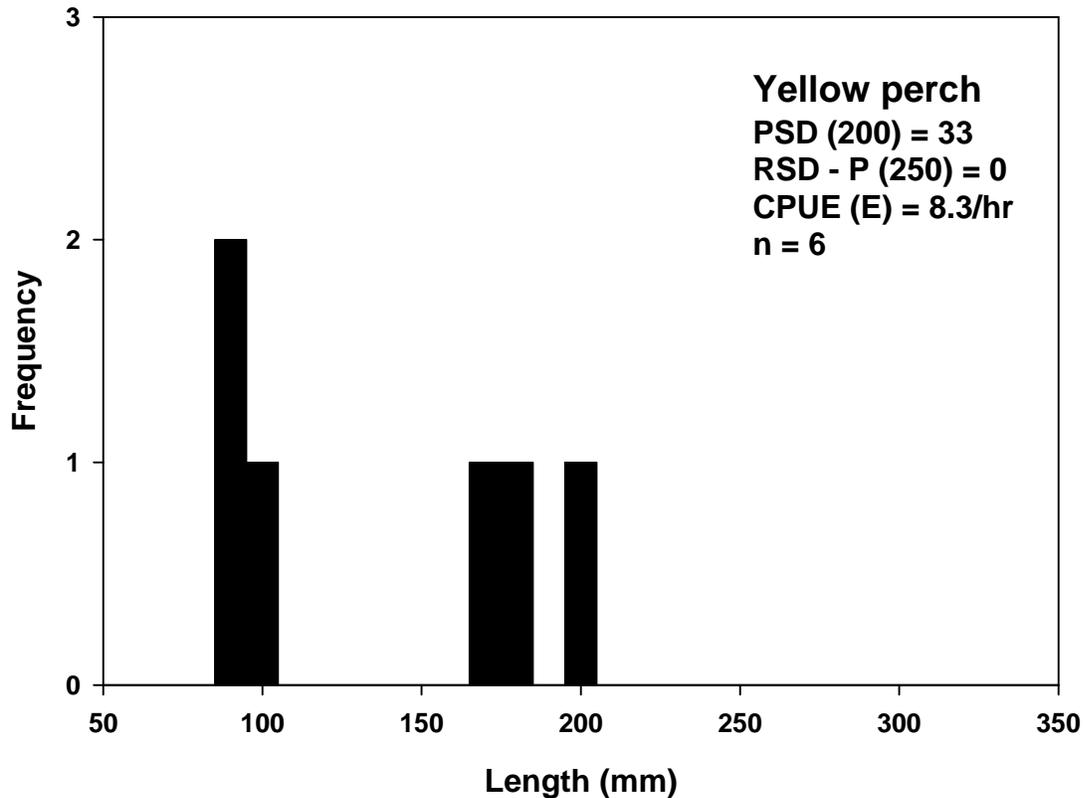


Figure 8. Yellow perch length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for perch \geq stock length (130 mm) captured by electrofishing in Reuer Reservoir in September 2008.

Table 7. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for yellow perch captured by electrofishing in Reuer Reservoir, September 2008.

Length category	n	Mean Wr
Sub-stock (< 130 mm)	3	108 (4.4)
Stock – quality (130 – 199 mm)	2	101 (7.1)
Quality – preferred (200 – 249 mm)	1	83
Preferred – memorable (250 – 299 mm)		
Memorable – trophy (300 – 379 mm)		
Trophy (\geq 380 mm)		
Total	6	101 (4.8)

Emerald and golden shiners

Many 60 – 70 mm emerald shiners and 70 – 90 mm golden shiners were captured while electrofishing Reuer Reservoir in September 2008.

Right Tailrace Reservoir

Lake Description

The reservoir is located in a steep drainage along the Missouri River breaks just downstream of the tailrace on Big Bend. Primary land use in the drainage is livestock grazing. The reservoir is nearly completely silted in with a maximum depth of 1 m.

Right Tailrace Reservoir fishery management history

Sporadic fish stocking of largemouth bass, bluegill, black crappie, and yellow perch has occurred at unknown dates.

Results and Discussion

Bluegill

There is a high density (mean CPUE = 242 fish/hr) of sub-stock and stock to quality length bluegills in Right Tailrace Reservoir (Figure 9). Mean W_r was normal indicating adequate levels of prey (Table 8).

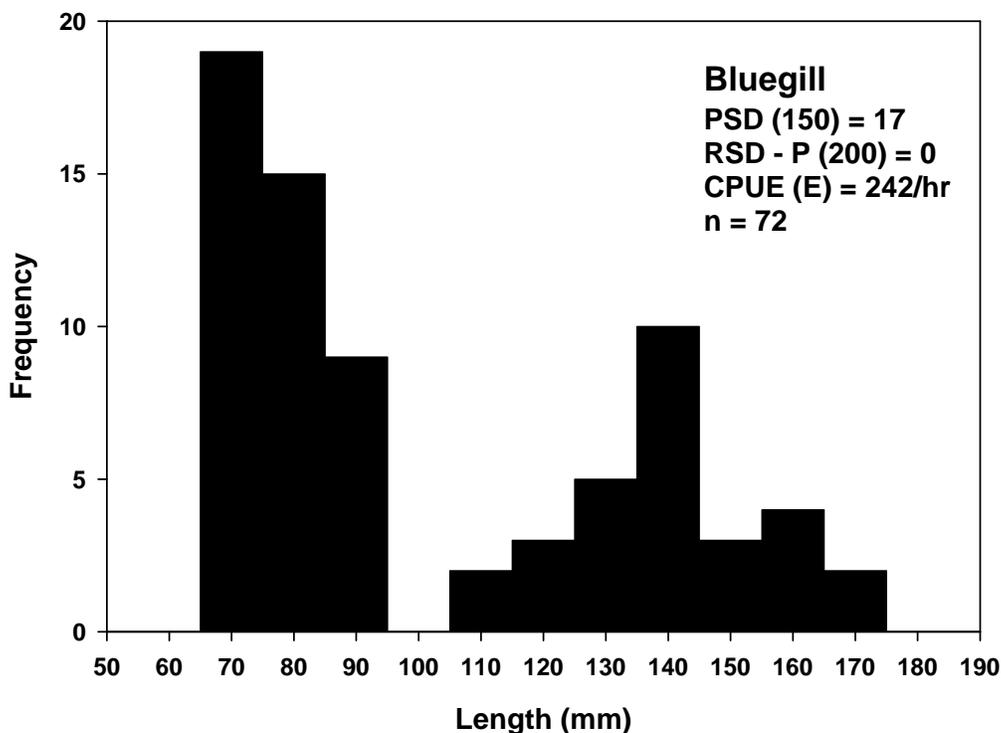


Figure 9. Bluegill length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for bluegill \geq stock length (80 mm) captured by electrofishing in Right Tailrace Reservoir in September 2008.

Table 8. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for bluegill captured by electrofishing in Right Tailrace Reservoir, September 2008.

Length category	n	Mean Wr
Stock – quality (80 – 149 mm)	25	112 (2.4)
Quality – preferred (150 – 199 mm)	9	105 (3.3)
Preferred – memorable (200 – 249 mm)		
Memorable – trophy (250 – 299 mm)		
Trophy (≥ 300 mm)		
Total	34	110 (2.0)

Largemouth bass

Only 8 largemouth bass were captured in 790 sec of electrofishing. No preferred length bass were captured (Figure 10). Mean Wr was normal indicating adequate levels of prey (Table 9).

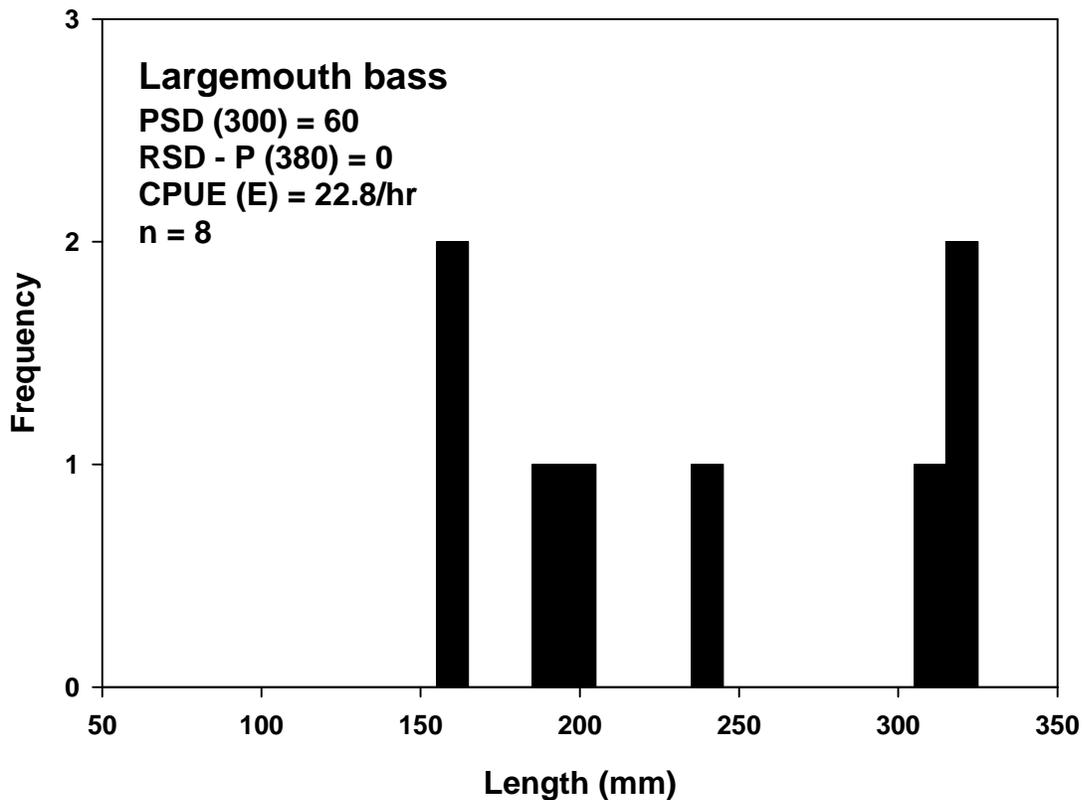


Figure 10. Largemouth bass length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for bass \geq stock length (200 mm) captured by electrofishing in Right Tailrace Reservoir in September 2008.

Table 9. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for largemouth bass captured by electrofishing in Yellow Bear Reservoir, July 2008.

Length category	n	Mean Wr
Sub-stock (< 200 mm)	3	111 (5.8)
Stock – quality (200 – 299 mm)	2	104 (0.2)
Quality – preferred (300 – 379 mm)	3	94 (7.5)
Preferred – memorable (380 – 509 mm)		
Memorable – trophy (510 – 629 mm)		
Trophy (\geq 630 mm)		
Total	8	103 (4.1)

White crappie

No preferred length crappies were captured during electrofishing (Figure 11). Mean Wr was normal indicating adequate levels of prey (Table 10).

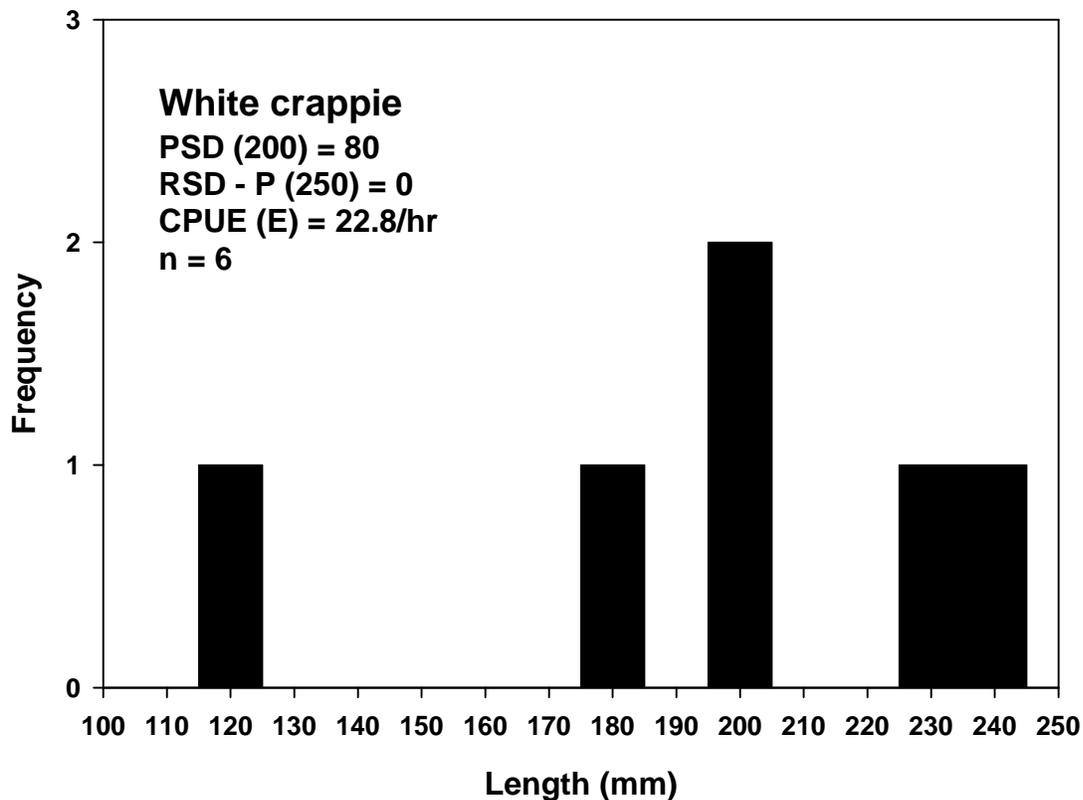


Figure 11. White crappie length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for crappie \geq stock length (130 mm) captured by electrofishing in Right Tailrace Reservoir in September 2008.

Table 10. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for white crappie captured by electrofishing in Right Tailrace Reservoir, September 2008.

Length category	n	Mean Wr
Sub-stock (< 130 mm)	1	127
Stock – quality (130 – 199 mm)	1	120
Quality – preferred (200 – 249 mm)	4	104 (3.0)
Preferred – memorable (250 – 299 mm)		
Memorable – trophy (300 – 3799 mm)		
Trophy (\geq 380 mm)		
Total	6	110 (4.7)

Yellow perch

Only 5 yellow perch were captured when the reservoir was sampled (Figure 12). Mean Wr was normal indicating adequate levels of prey (Table 11).

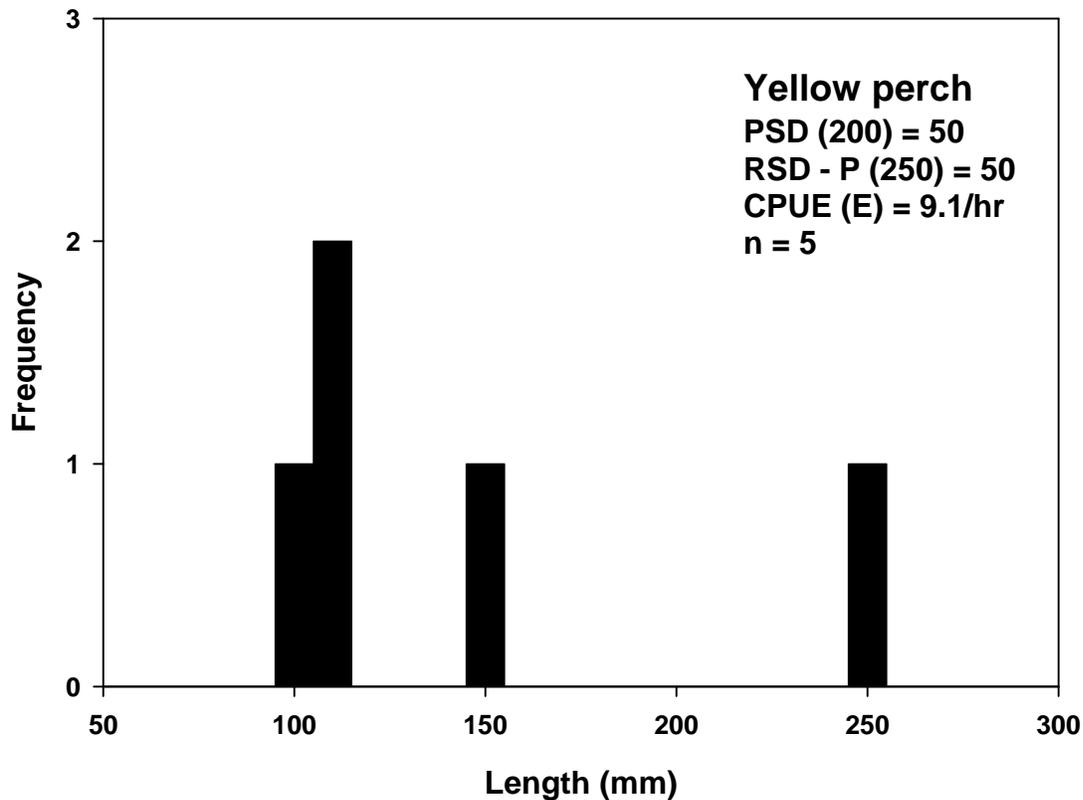


Figure 12. Yellow perch length frequency distribution, proportional stock density (PSD), relative stock density (RSD-P), and mean catch per unit effort (CPUE; fish/hr) calculated for perch \geq stock length (130 mm) captured by electrofishing in Right Tailrace Reservoir in September 2008.

Table 11. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for yellow perch captured by electrofishing in Right Tailrace Reservoir, September 2008.

Length category	n	Mean Wr
Sub-stock (< 130 mm)	3	94 (6.9)
Stock – quality (130 – 199 mm)	1	98
Quality – preferred (200 – 249 mm)		
Preferred – memorable (250 – 299 mm)	1	87
Memorable – trophy (300 – 379 mm)		
Trophy (\geq 380 mm)		
Total	5	94 (4.2)

MANAGEMENT RECOMMENDATIONS

Overall Lower Brule Indian Reservation Fisheries Management Recommendations

1. Work with landowners above reservoirs to control silt and nutrients entering the reservoirs.
2. Survey reservoirs every two years with electrofishing.
 - Cattail, Deadman, Donnie, Rubble reservoirs in 2009.
 - Badhorse, Carlin, and Reuer reservoirs in 2010.
 - Other reservoirs in 2009? (Big Game Unit North, Durkin's, Skinner, Wally, and Madsen reservoirs.
3. Continue supplemental stockings of predator (largemouth) and panfish (perch or bluegill) species in reservoirs when needed when there is evidence of lack of successful spawning and recruitment or over-harvest.
4. Acquire funding to purchase fish haul tank/truck.
5. Construct fishing docks for handicap/disabled access along Lake Sharpe and small reservoirs near Lower Brule.
6. Investigate managing small reservoirs with a bass/bluegill, bass/perch, or bass/bluegill and perch combination.
7. Inform tribal members on fish stockings, fishery surveys, and fishing access.
8. Inform non-tribal members on fishing opportunities across the Lower Brule Indian Reservation to increase revenue through license sales.
9. Fence off livestock from reservoirs that are managed as a recreational fishery. This will increase water clarity, which will in turn increase macroinvertebrate production (fish food). Increase submergent and emergent vegetation will provide adequate spawning and rearing habitat. Additionally, excluding livestock will eliminate sloughing of the shoreline and reduce siltation to increase the lifespan of the fishery.

Badhorse Reservoir Management Recommendations

1. Continue stocking largemouth bass at 100 fish/acre to control fathead minnow population and improve the size structure of yellow perch.
2. Do not stock bluegill to improve the bass/perch fishery.

Carlin Reservoir Management Recommendations

1. Continue stocking largemouth bass at 100 fish/acre to improve the size structure of yellow perch.
2. Do not stock bluegill to improve the bass/perch fishery.

Reuer Reservoir Management Recommendations

1. Continue stocking largemouth bass at 100 fish/acre to improve the size structure of yellow perch and bluegill.
2. Continue stocking bluegill and yellow perch at 500 fish/acre.
3. Construct fishing docks for handicap/disabled access.
4. Remove northern pike to improve bass/panfish fishery.
5. Reuer Reservoir is one of the largest reservoirs on Lower Brule. This is likely one of the better reservoirs to maintain a northern pike fishery. Stock northern pike at 50 fish/acre to increase pike density.

Right Tailrace Reservoir Management Recommendations

1. Manage Right Tailrace Reservoir as a put-and-take fishery. Maximum depths of only 3 feet make the reservoir susceptible to winterkills.
2. Move adult fish from other reservoirs to maintain a put-and-take fishery.
3. Improve access road. Road is nearly washing out 100 m downstream of reservoir.

ACKNOWLEDGMENTS

I thank Ben Janis and Josh Kiesow for assisting with the electrofishing surveys.

LITERATURE CITED

- Anderson, R. O. 1976. Management of small warm water impoundments. *Fisheries* 1:5-7, 26-28.
- Gabelhouse, D. W., Jr. 1984. A length-categorization system to assess fish stocks. *North American Journal of Fisheries Management* 4:273-285.
- Guy, C. S., and D. W. Willis. 1990. Structural relationships of largemouth bass and bluegill populations in South Dakota ponds. *North American Journal of Fisheries Management* 10:338-343.
- Haines, B., and R. Sherman. 1984. Pine Ridge Indian Reservation Fishery Management Plan. Kyle, South Dakota.
- Henson, J. C. 1991. Quantitative description and development of a species-specific growth from for largemouth bass, with application to the relative weight index. Master's thesis. University of Missouri, Columbia.
- Hillman, W. P. 1982. Structure and dynamics of unique bluegill populations. Master's thesis. University of Missouri, Columbia.
- Neumann, R. M. and B. R. Murphy. 1991. Evaluation of the relative weight (W_r) index for assessment of white crappie and black crappie populations. *North American Journal of Fisheries Management* 11:243-251.
- Wege G. J., and R. O. Anderson. 1978. Relative weight (W_r): a new index of condition for largemouth bass. Pages 79-91 in G. D. Novinger and J. G. Dillard, editors. *New approaches to the management of small impoundments*. North Central Division, American Fisheries Society, Special Publication 5, Bethesda, Maryland.
- Willis, D. W. 1989. Proposed standard length-weight equation for northern pike. *North American Journal of Fisheries Management* 9:203-208.
- Willis, D. W., C. S. Guy, and B. R. Murphy. 1991. Development and evaluation of a standard weight (W_s) equation for yellow perch. *North American Journal of Fisheries Management* 11:374-380.

APPENDICES

Appendix A. Common and scientific names of fishes mentioned in this report.

Common name	Abbreviations	Scientific name
Black bullhead	BLB	<i>Ameiurus melas</i>
Black crappie	BLC	<i>Pomoxis nigromaculatus</i>
Bluegill	BLG	<i>Lepomis macrochirus</i>
Green sunfish	GSF	<i>Lepomis cyanellus</i>
Largemouth bass	LMB	<i>Micropterus salmoides</i>
Northern pike	NOP	<i>Esox lucius</i>
White crappie	WTC	<i>Pomoxis annularis</i>
Yellow perch	YEP	<i>Perca flavescens</i>

Appendix B. Minimum total lengths (TL; mm) of length categories for fish species found on Lower Brule Indian Reservation.

Species	Stock	Quality	Preferred	Memorable	Trophy	Reference
Black bullhead	150	230	300	380	450	Gabelhouse 1984
Black crappie	130	200	250	300	380	Gabelhouse 1984
Bluegill	80	150	200	250	300	Gabelhouse 1984
Green sunfish	80	150	200	250	300	Gabelhouse 1984
Largemouth bass	200	300	380	510	630	Gabelhouse 1984
Northern pike	350	530	710	860	1120	Gabelhouse 1984
Yellow perch	130	200	250	300	380	Gabelhouse 1984

Appendix C. Intercept (a) and slope (b) parameters for standard weight (Ws) equations and the minimum total lengths (TL; mm) recommended used to calculate relative weight (Wr). Metric equations are in millimeters and grams. Summary for fish species found on Lower Brule Indian Reservation.

Species	Intercept (a)	Slope (b)	Minimum total length	Reference
Black crappie	-5.618	3.345	100	Neumann and Murphy 1991
Bluegill	-5.374	3.316	80	Hillman 1982
Largemouth bass	-5.528	3.273	150	Henson 1991
Northern pike	-5.437	3.059	100	Willis 1989
Yellow perch	-5.386	3.230	100	Willis et al. 1991

Appendix D. Glossary of fishery terms and data analysis.

Alkalinity: Alkalinity is a measure of a waters ability to resist a change in pH expressed in mg/l or ppm. Because alkalinity is dependent on minerals such as calcium (Ca), and this relates to aquatic vegetation production, alkalinity is a good indicator of a water bodies potential to produce fish. Less than 40 mg/l is considered soft water; greater than 40 mg/l is hard water.

Catch per Unit Effort (CPUE): CPUE is the catch per unit of sampling effort that is used as an index of abundance to document population changes over time. The formula is:

$$\text{CPUE} = \frac{\text{number of fish in a length class, length category, or sample}}{\text{net night or hour of electrofishing}}$$

Conductivity: Conductivity is a measure of a water bodies ability to conduct electricity, which is dependent on the amount of ions in the water. Total dissolved solids (TDS) is equal to 0.5 X Conductivity. Conductivity is a good measure of a water bodies productivity because of the relation between minerals and productivity.

Effort: The effort is the total amount of time expended in collecting a sample. The time may be in hours, minutes, or net days. The effort is used to calculate CPUE.

Memorable length: The memorable length is a standard category unique for each species. The memorable length is the length that most anglers remember catching and is 59 to 64% of the world record length.

Net days: A unit of time used to describe the effort required to collect a sample using Gill nets or Trap nets. For example, if 5 Gill nets were left for a 24 hour period, then 5 Gill nets days worth of effort were expended.

pH: a measure of how basic or acidic a body of water is. This information is important as many species of game fish have narrow pH tolerances.

Preferred length: The preferred length is a standard category unique for each species. The preferred length is the length that most anglers prefer to catch and is usually within a range of 45 to 55% of the world record length.

Proportional Stock Density (PSD): PSD is the number of fish greater than or equal to a minimum quality length in a sample divided by the number of fish greater than or equal to a minimum stock length. The formula is: $\text{PSD} = (\text{number of fish} \geq \text{"quality" length} / \text{number of fish} \geq \text{"stock" length}) \times 100$.

Quality length: The quality length is a standard length category unique for each species of fish. The Quality length is usually within a range of 36 to 41% of the world record length and generally the minimum size that most anglers will keep.

Relative Stock Density (RSD): The RSD is the number of fish greater than a minimum preferred length in a stock divided by the number of fish greater than or equal to a minimum stock size. The formula is: $RSD = (\text{number of fish} \geq \text{"preferred" length} / \text{number of fish} \geq \text{"stock" length}) \times 100$.

Relative weight (W_r): The relative weight of a fish or group of fish is referred to as a " W_r " value. The relative weight is a comparison of the condition of the fish in a sample and the condition of a theoretical optimum sample. The formula is: $W_r = (W/W_s) \times 100$; where " W " is the weight of an individual and " W_s " is a length specific standard weight.

Stock length: The stock length is the smallest of the standard length category unique for each species of fish. The stock length is usually within a range of 20 to 26% of the world record length and at or near which a species reaches sexual maturity.

Trophy length: Trophy length is a standard length category unique for each species of fish. The Trophy length is size worthy of acknowledgment and is greater than 74% of the world record length.

Appendix E. Fish stocking history for Lower Brule Indian Reservation reservoirs. Stocking size: Fry (FY; Hatch to 1.49 in); Fingerlings (FG; 1.5 to 5.49 in); Sub-adult (SA; ≥ 5.5 in, not sexually mature); Adult (AD; sexually mature, regardless of size); Mixed (MX; transplanted from natural sources).													
Reservoir	Year	Largemouth bass			Bluegill			Black crappie			Yellow perch		
		Month	N	Size	Month	N	Size	Month	N	Size	Month	N	Size
Badhorse													
Big Game Unit North													
Carlin													
Deadman	1995		300	FG									
Durkin's													
Jandreau	1995		200	FG									
Kid's Dam 1	1995					130	MX						
Kid's Dam 2	1995					114	MX						
Reuer													
Right Tailrace	2008		250	FG		2,000	FG					250	FG
	2007											600	FG
	2005		300	FG								600	FG
	2004		800	FG		2,000	FG		2,000	FG			
Skinner													
Wally													