

2008 Fisheries Surveys on the Pine Ridge Indian Reservation

Prepared by

Greg A. Wanner
U. S. Fish and Wildlife Service
Great Plains Fish and Wildlife Management Assistance Office
Pierre, South Dakota

and

Robert Goodman
Oglala Sioux Parks and Recreation Authority
P. O. Box 570
Kyle, South Dakota 57752

December 2008

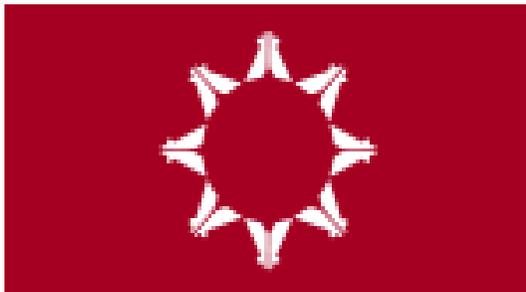


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INTRODUCTION

Pine Ridge Reservation lies in southwest South Dakota. The terrain consists of rolling grassland prairie dissected by streams forming deep canyons. The north half of the reservation consists of Badlands. The area is semi-arid with temperatures that range from 100 °F in the summer to -40 °F in the winter. The growing season averages 130 days and average rainfall is 16 inches.

The Pine Ridge Reservation has three primary drainage systems including the Cheyenne, White, and Little White rivers (Figure 1). The Cheyenne River borders the northwest corner of the reservation and drains badlands. The White River curves diagonally across the reservation from southwest to northeast. It is the largest drainage system on the reservation with numerous dendritic intermittent streams, which also drains highly erodeable badlands. The Little White River originates in the sandhills and flows eastward across the southeast corner of the reservation.

Most streams are low gradient, silt laden, and generally unsuitable for game fish. However, these streams contain numerous cyprinids and catostomids. A few streams originated in the sandhills (e.g. Denby creek) or in pine covered canyon areas (e.g. No Flesh Creek and Corn Creek) and are relatively clear and cool and have held trout populations at times.

Currently, most game fish populations are found in six reservoirs across the reservation including: Oglala, White Clay, Wolf Creek, Denby, Kyle, and Yellow Bear reservoirs. Currently, Oglala and Wolf Creek dam structures are being renovated with limited fishing opportunities.

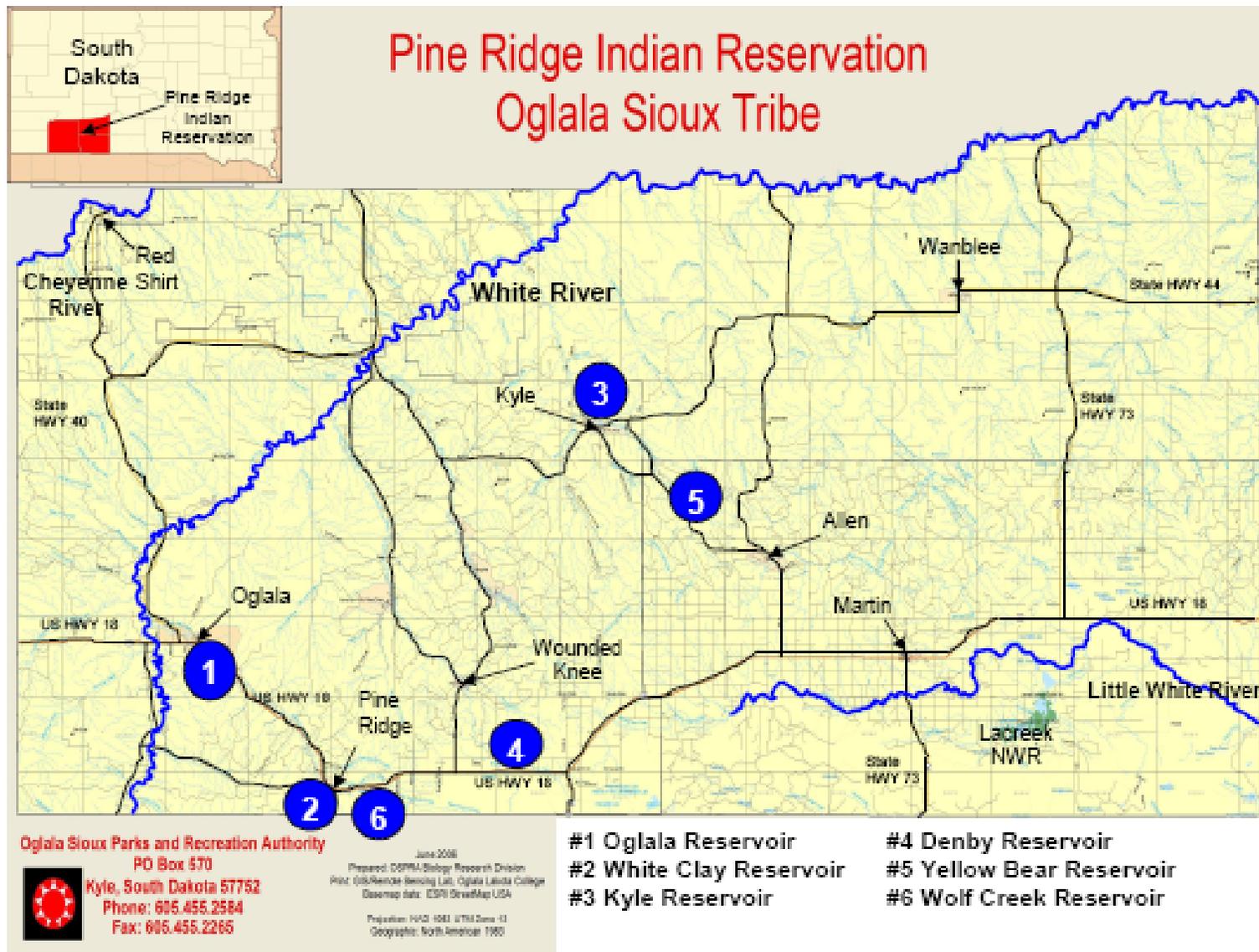


Figure 1. Map of the Pine Ridge Indian Reservation identifying major rivers and reservoirs managed for fishery recreation.

METHODS

Data collection

Night time electrofishing was conducted 1-3 July 2008 with a Smith and Root 5.0 GPP electrofishing system using pulsed DC, 6-7 amps, and a pulse frequency of 30 cycles per second (cps). Electrofishing was conducted in 15 minute transects along the entire reservoir shoreline. Three transects were conducted at White Clay, Denby, and Yellow Bear reservoirs. 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, salinity, alkalinity, and conductivity (Table 1).

Table 1. Pine Ridge Indian Reservation surface water quality parameters.

Date	Time (military)	Depth (m)	Water temp. (°C)	D.O. (mg/L)	Secchi depth (cm)	pH	Salinity (ppt)	Pheno. alkalinity (mg/L)	Total alkalinity (mg/L)	Cond. (µS/cm)	Specific cond. (µS/cm)
Denby Reservoir											
1 Jul 2008	0220	0.3	22.5	12.2			0.1	34	137	220	229
Kyle Reservoir											
19 Jun 2007	0020	0.3	24.1	6.2	201	6.7	0.3	0	274	550	559
White Clay Reservoir											
1 Jul 2008	0100	0.3	23.7	7.6			0.2	0	188	408	422
Yellow Bear Reservoir											
3 Jul 2008	0115	0.3	22.8	9.4							
3 Jul 2008	0115	1.7	22.9	8.7							
3 Jul 2008	0115	3.3	20.1	0.2							
3 Jul 2008	0115	5.0	13.3	0.1							
2 Jul 2008	2145	0.3	23.5	10.3			0.2	0	205	380	392
2 Jul 2008	2145	1.7	23.2	9.0							
2 Jul 2008	2145	3.3	19.1	0.1							
2 Jul 2008	2145	5.0	13.3	0.1							
19 Jun 2007	0020	0.3	24.1	6.2	201	6.7	0.3	0	274	550	559

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 black crappie. 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.

Denby Reservoir

Lake Description

Denby reservoir is located 32 km east of Pine Ridge and approximately 1.6 km north of U. S. Highway 18. A 33 m earthen dam across Denby Creek maintains water levels in the impoundment. Denby Creek is the primary water supply, but one small intermittent unnamed creek on the southwest corner contributes during the rainy season. The earthen structure has one box-type fixed crest spillway with a screw gate that allows for complete draw downs. Access to the dam is limited to one dirt road on the northwest side of the lake. The lake is used primarily for recreation. The surrounding water shed is used for livestock grazing, a small housing development lies on the southwest corner.

The reservoir is about 8 ha (20 acres) at full pool with a maximum depth of 5 m and an average depth of 3 m. Conductivity is 300 $\mu\text{S}/\text{cm}$ at 21 °C and alkalinity averages 870 mg/L. Secchi disk averages 3 m with and average pH of 8.

The bottom of Denby Reservoir is primarily fine silt and organic matter with an area of gravel on the southeast corner. Emergent vegetation is primarily cattail *Typha sp.* and softstem bulrush *Scirpus validus* on the southeast corner, submergent vegetation is abundant throughout the reservoir and consists primarily of coontail *Ceratophyllum demersum*. Inundated trees are abundant on the west side. The lake is surrounded by dense vegetation and trees and shows little sign of trampling by livestock.

Denby Reservoir fishery management history

The reservoir was chemically renovated and restocked in 1955, 1958, 1964, and 1971 in an attempt to control green sunfish *L. cyanellus* and white sucker. Previous attempts to stock catchable size trout have failed because of competition, predation, and lethal summer water temperatures. Previous to 2008, the last fishery survey was conducted during June 1996 (USFWS 1997). That survey consisted of three, 15-min night electrofishing transects, five trap nets, and two gill nets set overnight. Catch data for all fish species collect in 1996 are presented in Table 1.

Table 1. Denby Reservoir mean catch per unit effort (CPUE) for fish \geq stock length, mean relative weights (W_r), proportional and relative stock density (PSD and RSD) data from June 1996 fishery assessment. Mean CPUE calculated as fish/hr for electrofishing and fish/net night for trap and gill nets.

Species	N	Electrofishing mean CPUE	Trap net mean CPUE	Gill net mean CPUE	Mean W_r	PSD	RSD
Largemouth bass	13	17.3/hr			113	91	46
Bluegill	179	174.6/hr	12/net		103	75	18
Northern pike	8						
Yellow perch	22		1.4/net	10.5/net	104	41	6

Results and Discussion

Black bullhead

In 2008, a 220 mm bullhead was collected during electrofishing.

Bluegill

In 2008, the relative abundance of bluegill in Denby Reservoir was high at 75 stock length fish/hr (SE = 28.9), which is above the Fish Management Plans objective of 50 bluegills/hr of electrofishing (Wanner and Ecoffey 2007). However, the population is dominated with sub-stock length and stock to quality length bluegills (Figure 2). The bluegill mean Wr was normal for Denby Reservoir (Table 2), which may indicate adequate prey availability.

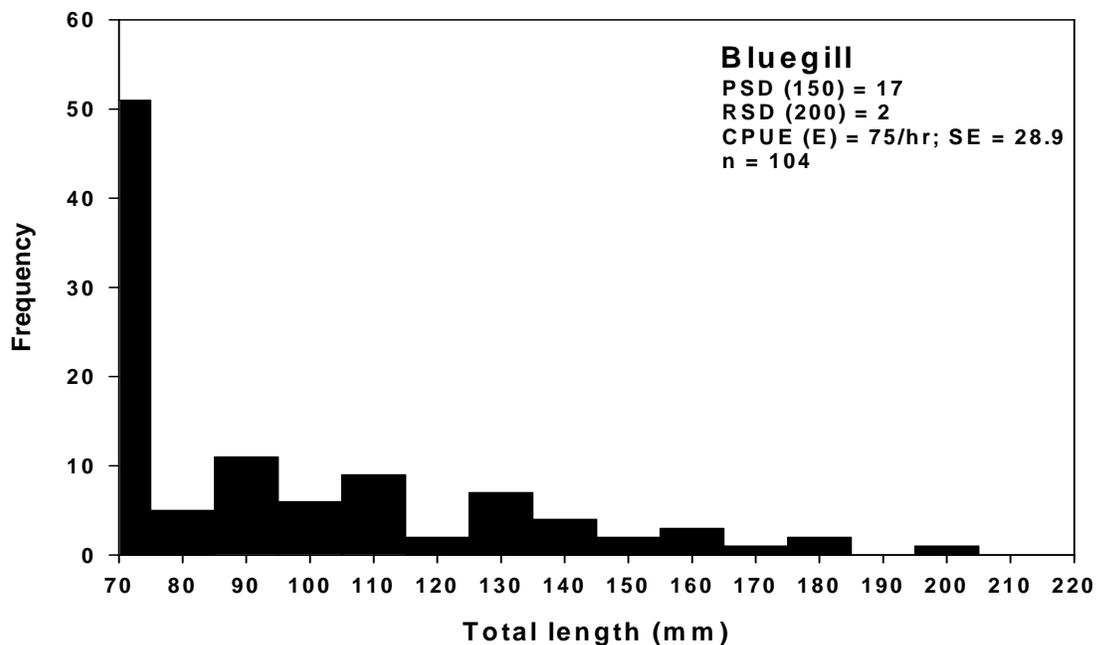


Figure 2. Length frequency distribution (10-mm length groups) for bluegill collected by electrofishing in Denby Reservoir in July 2008. Mean catch per uit effort (CPUE) calculated for bluegill \geq stock length (80 mm) only.

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

Length category	n	Mean Wr
Stock – quality (80 – 149 mm)	31	116 (1.2)
Quality – preferred (150 – 199 mm)	8	112 (4.0)
Preferred – memorable (200 – 249 mm)	1	109
Memorable – trophy (250 – 299 mm)		
Trophy (\geq 300 mm)		
Total	40	115 (1.2)

Golden shiner

A total of 17 golden shiner were captured during sampling with a mean CPUE = 23/hr; SE = 12.7.

Largemouth bass

The relative abundance is low (15 fish/hr; SE 2.7) compared to the Fish Management Plan goal of 40 fish/hr. PSD and RSD values (Figure 3) are near Plan goals of PSD range from 40 to 70 and RSD greater than 10. Spawning success is evident with some recruitment to the population. The Mean W_r for largemouth bass was highest in Denby Reservoir (Table 3) compared to the other reservoirs sampled in 2008 such as White Clay Reservoir (Mean W_r = 109; SE = 1.3) and Yellow Bear Reservoir (Mean W_r = 119; SE = 2.3). The 2008 survey was similar to the 1996 survey for all indices (Table 1).

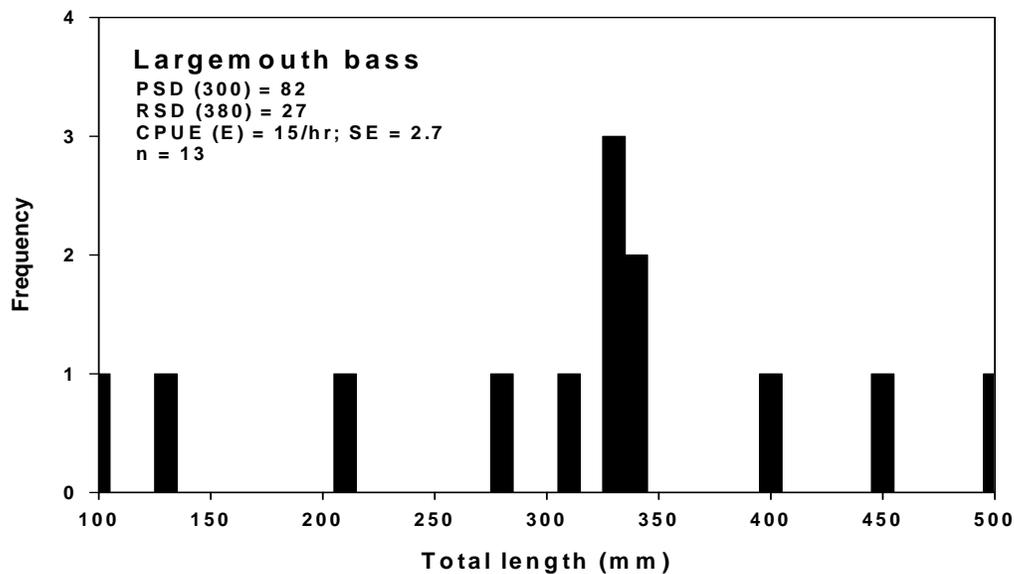


Figure 3. Length frequency distribution for largemouth bass collected by electrofishing in Denby Reservoir in July 2008.

Table 3. Mean relative weight (W_r) with standard error (SE) in parenthesis, and number (n) weighed by length category for largemouth bass captured by electrofishing in Denby Reservoir, July 2008.

Length category	n	Mean W_r
Sub-stock (< 200 mm)	2	116 (14.6)
Stock – quality (200 – 299 mm)	2	102 (12.3)
Quality – preferred (300 – 379 mm)	6	125 (4.7)
Preferred – memorable (380 – 509 mm)	3	133 (4.9)
Memorable – trophy (510 – 629 mm)		
Trophy (\geq 630 mm)		
Total	13	122 (4.3)

Northern pike

Northern pike were observed during all three electrofishing transects. Because of the difficulty of sampling for northern pike with electrofishing gear, only a few were measured during sampling with a range in length from 74 to 500 mm indicating multiple year classes and evidence of successful recruitment.

Yellow perch

Thousands of YOY yellow perch < 40 mm were observed during electrofishing indicating successful spawning in 2008. The perch population in Denby Reservoir is dominated by sub-stock and stock to quality length perch (Figure 4). Mean W_r is normal (Table 4) indicating prey is available.

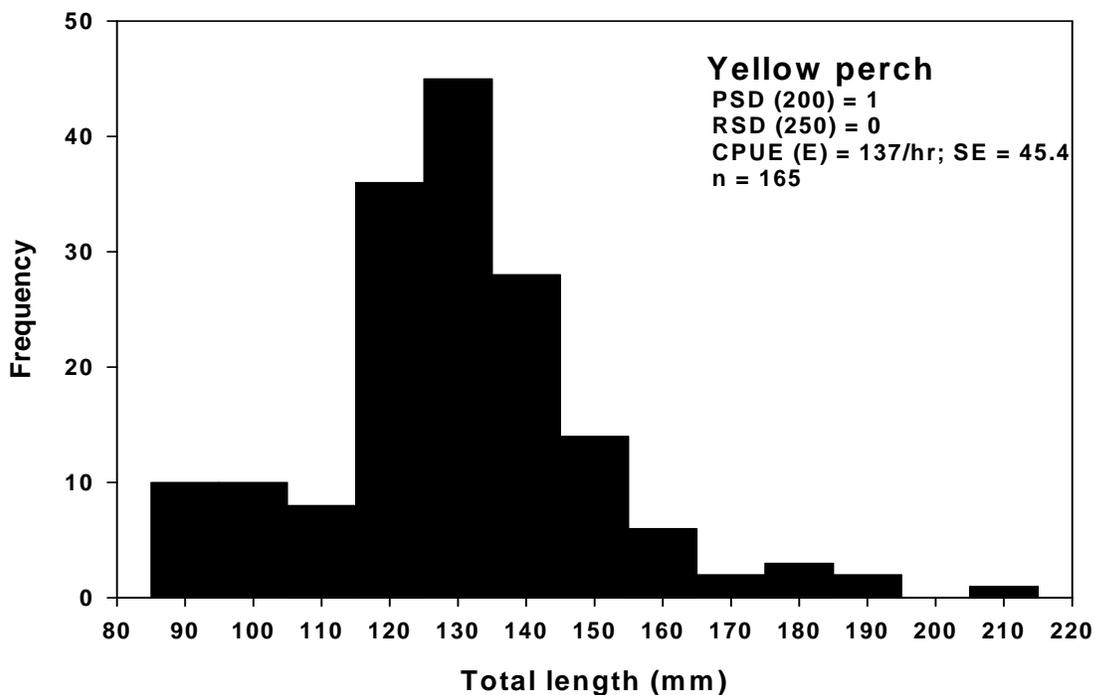


Figure 4. Length frequency distribution for yellow perch collected by electrofishing in Denby Reservoir in July 2008.

Table 4. Mean relative weight (W_r) with standard error (SE) in parenthesis, and number (n) weighed by length category for yellow perch captured by electrofishing in Denby Reservoir, July 2008.

Length category	n	Mean W_r
Sub-stock (< 130 mm)	20	101 (1.3)
Stock – quality (130 – 199 mm)	27	99 (1.1)
Quality – preferred (200 – 249 mm)	1	86
Preferred – memorable (250 – 299 mm)		
Memorable – trophy (300 – 379 mm)		
Trophy (\geq 380 mm)		
Total	48	(0.9)

White Clay Reservoir

Lake Description

White Clay Reservoir is located in a ponderosa pine *Pinus ponderosa* area south of Pine Ridge, South Dakota and north of White Clay, Nebraska. White Clay Creek is the primary water supply, but an unnamed creek on the south west corner of the impoundment provides intermittent run-off during spring snow runoff and heavy summer rains. The dam and emergency spill way are earthen with one screw-gate for drawdown capabilities. The watershed is steep and rocky with scattered grasslands and ponderosa pine draws. The surrounding area is used primarily for livestock grazing and is severely overgrazed in many parts of the watershed. Access is limited to one road in South Dakota from the east and one from the south in Nebraska. The impoundment is relatively close to the cities of Pine Ridge and White Clay and receives the greatest fishing pressure of any of the reservation impoundments.

White Clay Reservoir is about 36 ha (90 acres) with a maximum depth of 7 m and an average depth of 3 m. The banks and shoreline are moderately sloped, which produces a large littoral area. The substrate is sand and clay with scattered outcrops of rock. Submergent vegetation is abundant and includes coontail, milfoil *Myriophyllum sp.*, and pondweeds. During summer, submergent vegetation on the south east area and the two small bays on the west become too dense to navigate a boat through. Emergent vegetation includes cattail, sedges, and bulrush which form a narrow band around most of the impoundment.

White Clay Reservoir fishery management history

The dam has been periodically managed for catchable trout, but competition and warm temperatures make it a poor site. The impoundment was drained and held in a drawn down state for four years to facilitate repairs on the dam during the late 1980's and early 1990's. Surveys, conducted during the first year after being refilled, indicated that bluegill, yellow perch, northern pike, largemouth bass, and white sucker had either survived or colonized the impoundment. During spring 1993, 60 adult largemouth bass were transplanted from Yellow Bear Reservoir to White Clay Reservoir and fingerling largemouth bass were stocked during summer of 1994. The last fishery survey was conducted during June 1996 (USFWS 1997). The survey consisted of four, 15-min night electrofishing transects, eight trap nets, and three gill nets set overnight. Catch data for all fish species is presented in Table 5.

Table 5. White Clay Reservoir 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 June 1996 fishery assessment with 80% confidence intervals in parenthesis. Mean CPUE calculated as fish/hr for electrofishing and fish/net night for trap and gill nets.

Species	N	Electrofishing mean CPUE	Trap net mean CPUE	Gill net mean CPUE	Mean Wr	PSD	RSD
Largemouth bass	7	7/hr (5.6)			105	86	0
Bluegill	11	7/hr	0.6/net		138	73	55
Northern pike	23		0.3/net (0.1)	6/net (3.3)	96	52	13
Yellow perch	49		5.3/net (2.3)	11.3/net (12.4)	99	50	18

Results and Discussion

Black bullhead

Black bullhead – CPUE = 8/hr; SE = 2.3; n = 6

Bluegill

The relative abundance of stock length bluegill was very high at 220 fish/hr (SE = 23.1), which is well above management goals and is a large increase from the 1996 survey where only 7 fish/hr were captured. The bluegill population is dominated with stock to quality and quality to preferred length fish (Figure 5). Bluegill mean Wr is substantially lower in 2008 (mean Wr = 105; SE = 1.9; Table 6) compared to the survey conducted in 1996 (mean Wr = 138; Table 5). Lower mean Wr may be due to the increase in relative abundance of bluegills.

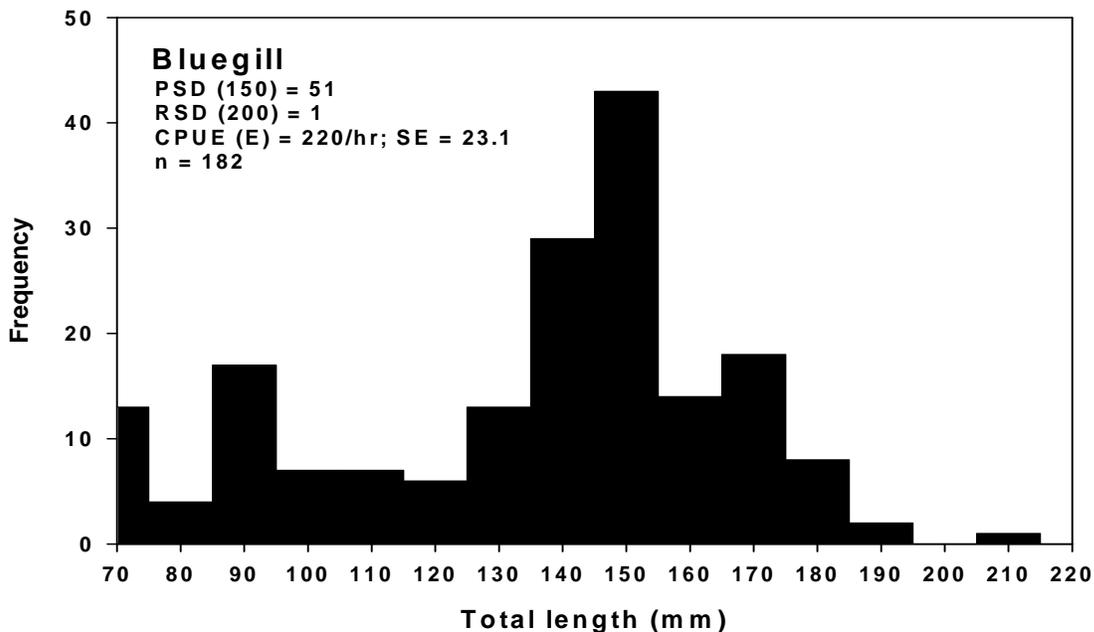


Figure 5. Length frequency distribution for bluegill collected by electrofishing in White Clay Reservoir in July 2008.

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

Length category	n	Mean Wr
Stock – quality (80 – 149 mm)	34	112 (2.1)
Quality – preferred (150 – 199 mm)	22	95 (2.0)
Preferred – memorable (200 – 249 mm)	1	93
Memorable – trophy (250 – 299 mm)		
Trophy (≥ 300 mm)		
Total	57	105 (1.9)

Golden shiner

Golden shiner mean CPUE = 24/hr; SE = 4.6; n = 18

Largemouth bass

The relative abundance of stock length largemouth bass was very high at 121 fish/hr (SE = 2.7), which is well above management goals of 40 fish/hr and is a large increase from the 1996 survey where only 7 fish/hr (SE = 5.6) were captured. PSD and RSD values are also within management goals with multiple length groups (Figure 6). Largemouth mean Wr in 2008 (mean Wr = 109; SE = 1.3; Table 7) is similar compared to the survey conducted in 1996 (mean Wr = 105; Table 5).

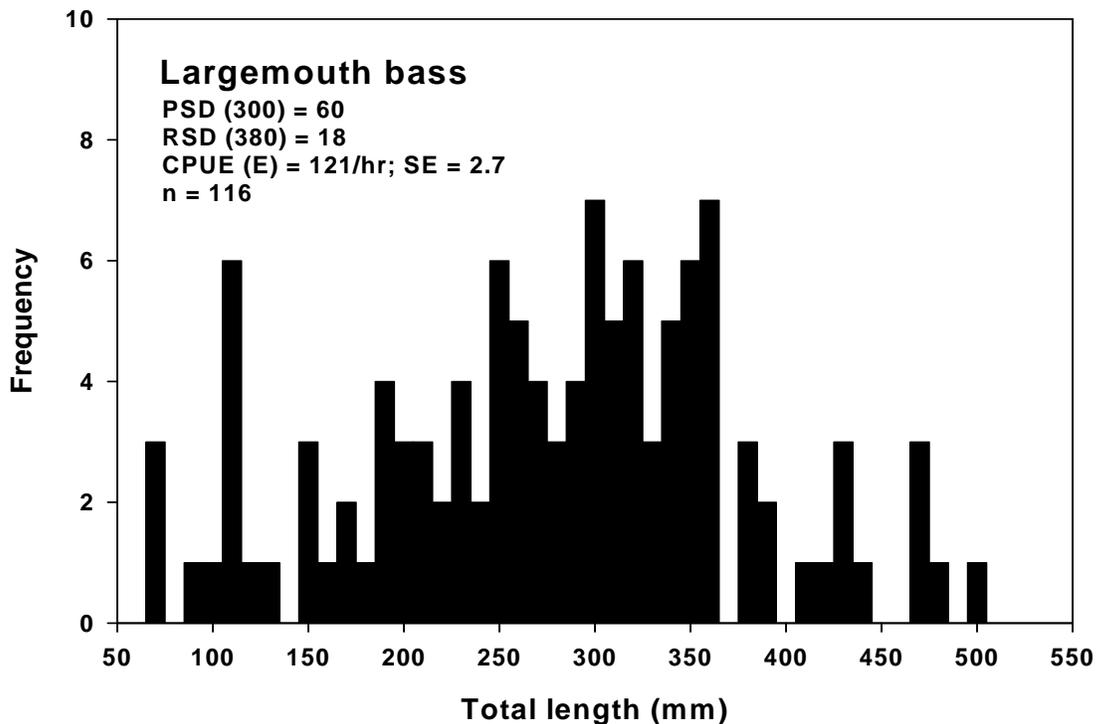


Figure 6. Length frequency distribution for largemouth bass collected by electrofishing in White Clay Reservoir in July 2008.

Table 7. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for largemouth bass captured by electrofishing in White Clay Reservoir, July 2008.

Length category	n	Mean Wr
Sub-stock (< 200 mm)	21	119 (4.4)
Stock – quality (200 – 299 mm)	35	107 (1.6)
Quality – preferred (300 – 379 mm)	33	104 (1.3)
Preferred – memorable (380 – 509 mm)	16	109 (2.7)
Memorable – trophy (510 – 629 mm)		
Trophy (\geq 630 mm)		
Total	105	109 (1.3)

Yellow perch

The yellow perch population was dominated by sub-stock length fish (Figure 7), which is similar to the 2008 survey in Denby Reservoir. Largemouth bass and northern pike may be depredating yellow perch as they attain greater lengths or fisherman may be removing the perch as they approach 150 mm (6 in.). Yellow perch mean W_r is similar to other reservoirs across Pine Ridge Indian Reservation (Table 8).

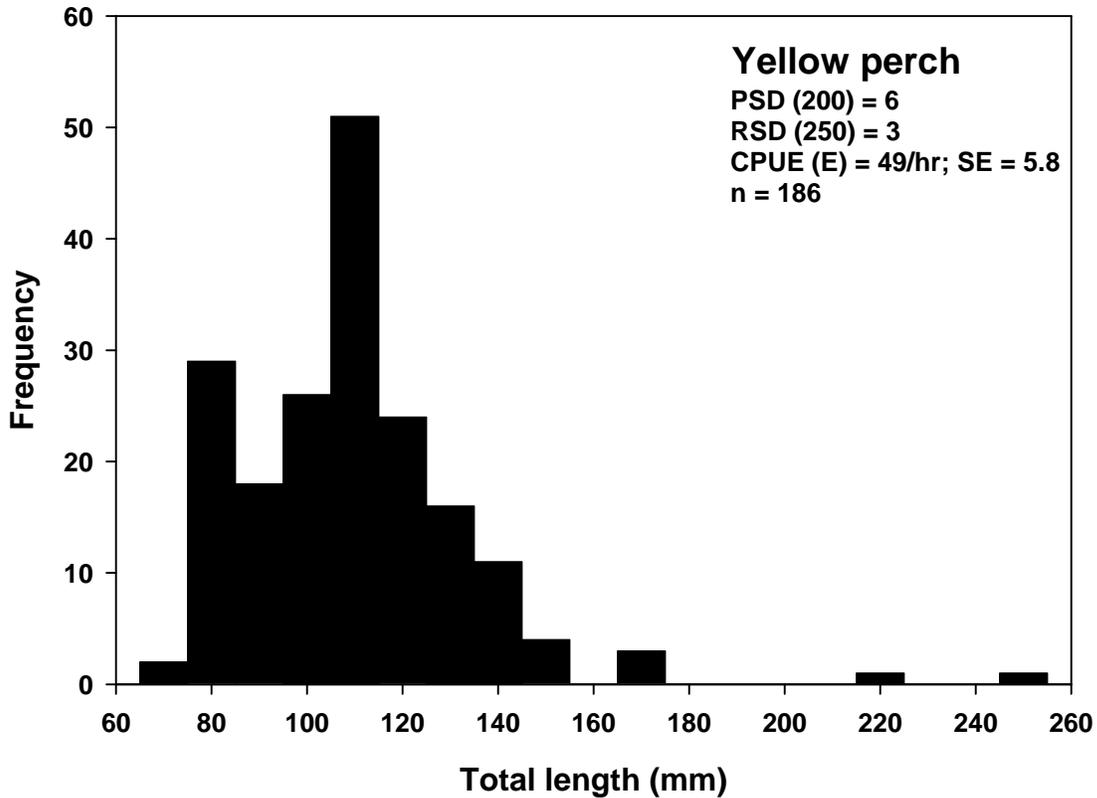


Figure 7. Length frequency distribution for yellow perch collected by electrofishing in White Clay Reservoir in July 2008.

Table 8. Mean relative weight (W_r) with standard error (SE) in parenthesis, and number (n) weighed by length category for yellow perch captured by electrofishing in Denby Reservoir, July 2008.

Length category	n	Mean W_r
Sub-stock (< 130 mm)	25	96 (1.7)
Stock – quality (130 – 199 mm)	17	93 (4.0)
Quality – preferred (200 – 249 mm)	1	96
Preferred – memorable (250 – 299 mm)	1	86
Memorable – trophy (300 – 379 mm)		
Trophy (\geq 380 mm)		
Total	44	95 (1.8)

Yellow Bear Reservoir

Lake Description

Yellow Bear Reservoir is located in a ponderosa pine forested area between the communities of Kyle and Allen. Historically, this reservoir was managed as a put-and-take trout fishery, but the water temperature was likely too warm and is best suited for a warm water fishery. The reservoir has a surface area of 6 ha (15 acres) with a maximum depth of 5 m, alkalinity averages 200 mg/L (Haines and Sherman 1984). The dam structure was renovated in 2006.

Yellow Bear Reservoir fishery management history

Information regarding the management in Yellow Bear Reservoir is limited. An electrofishing survey was conducted during June 2007 (USFWS 2007). The survey consisted of three, 15-min night electrofishing transects. Catch data for all fish species is presented in Table 9.

Table 9. Yellow Bear 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 June 2007 fishery assessment. Standard error in parenthesis. Mean CPUE calculated as fish/hr for electrofishing and fish/net night for trap and gill nets.

Species	N	Electrofishing mean CPUE	Trap net mean CPUE	Gill net mean CPUE	Mean Wr	PSD	RSD
Largemouth bass	86	1.3/hr (1.3)				100	100
Bluegill X green sunfish	94	45/hr (9.3)				9	0
Black bullhead	1	1.3/hr (1.3)				100	100
Yellow perch	1	1.3/hr (1.3)				0	0

Results and Discussion

Black bullhead

In 2008, 14 bullhead were captured ranging from 127 to 181 mm (Figure 8). In 2007, one black bullhead (345 mm) was captured while electrofishing in Yellow Bear Reservoir.

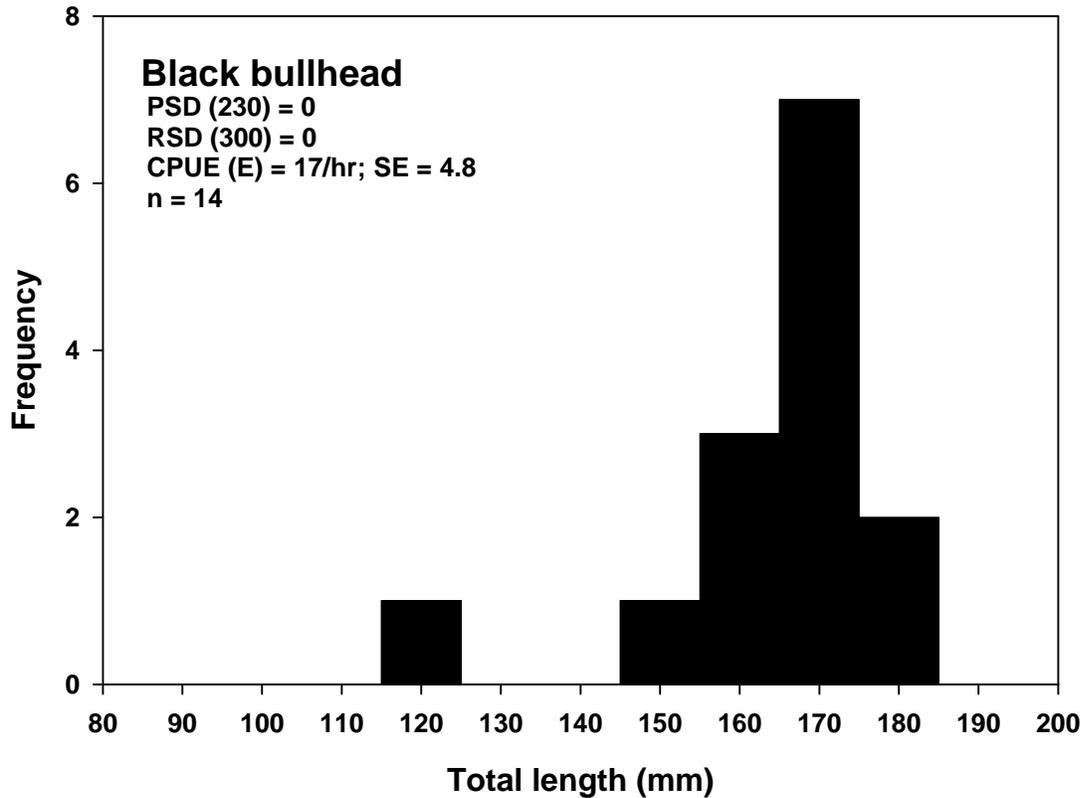


Figure 8. Length frequency distribution for black bullhead collected by electrofishing in Yellow Bear Reservoir in July 2008.

Black crappie

Twenty-one black crappie were collected during electrofishing in 2008 with a population dominated by stock to quality length (130 to 200 mm) fish (Figure 9). The crappie mean W_r was relatively high (Table 10).

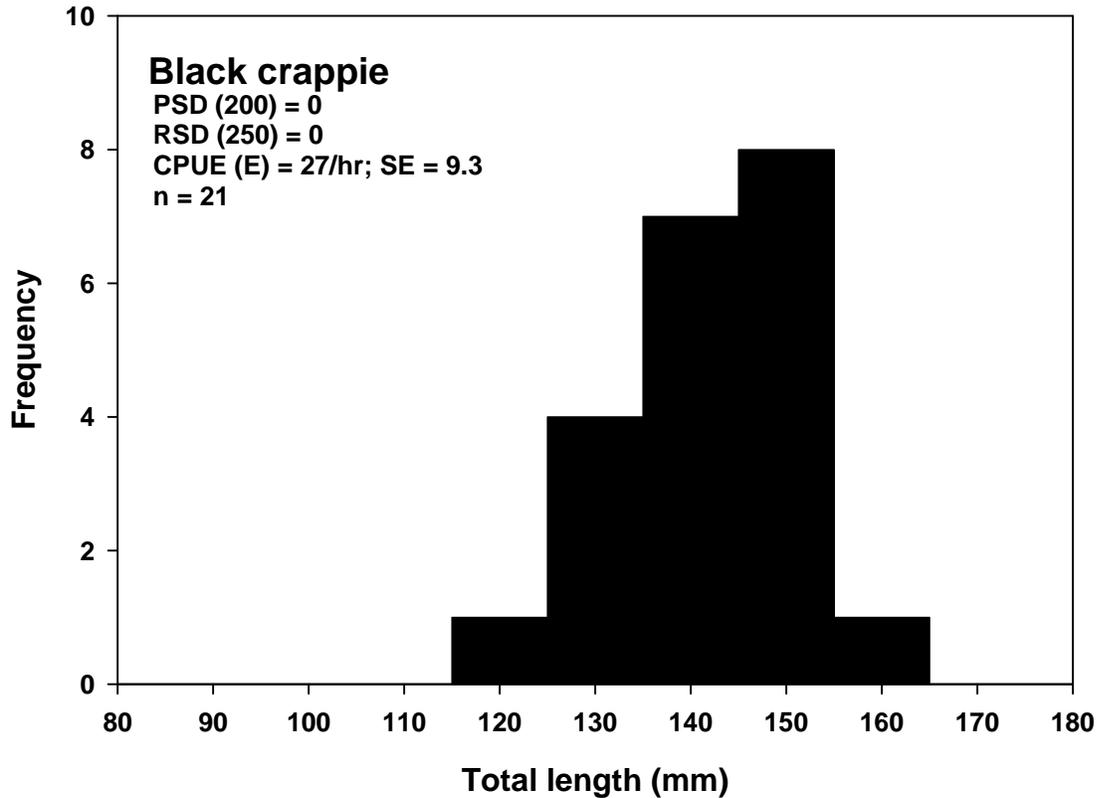


Figure 9. Length frequency distribution for black crappie collected by electrofishing in Yellow Bear Reservoir in July 2008.

Table 10. Mean relative weight (W_r) with standard error (SE) in parenthesis, and number (n) weighed by length category for black crappie captured by electrofishing in Yellow Bear Reservoir, July 2008.

Length category	n	Mean W_r
Sub-stock (< 130 mm)	1	126
Stock – quality (130 – 199 mm)	15	122 (2.8)
Quality – preferred (200 – 249 mm)		
Preferred – memorable (250 – 299 mm)		
Memorable – trophy (300 – 3799 mm)		
Trophy (\geq 380 mm)		
Total	16	122 (2.6)

Bluegill, green sunfish, and bluegill X green sunfish hybrids

During sampling in 2007, all bluegills and green sunfish were combined during sampling. During 2008, we successfully sorted bluegills from green sunfish. During 2007, the fishery was dominated by sub-stock length green sunfish with some larger bluegills and hybrids (Figure 10). The sub-stock length green sunfish in 2007 did recruit to stock length in 2008 with an extremely high relative abundance (375 fish/hr; SE = 67.3). Mean Wr was high indicating abundant availability of prey for both bluegill (Table 11) and green sunfish (Table 12).

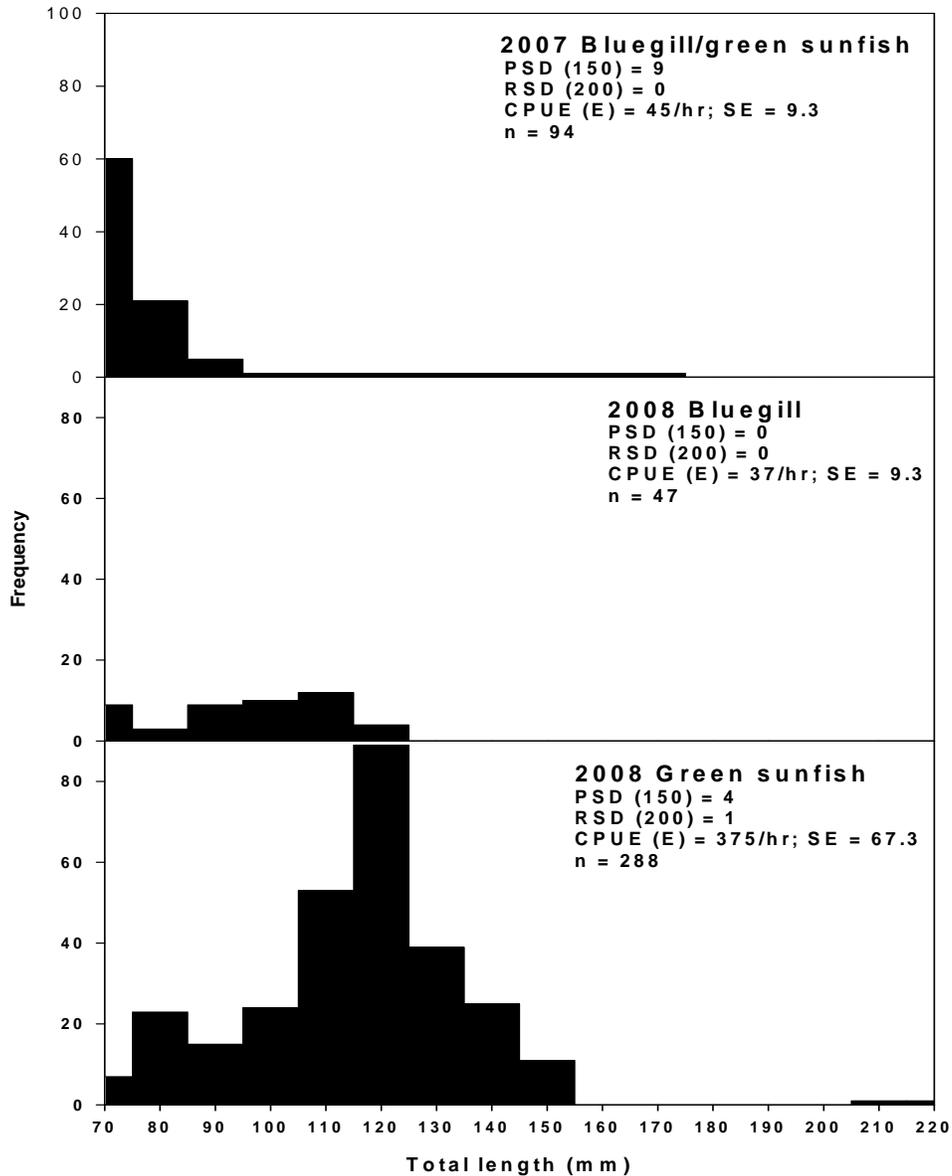


Figure 10. Length frequency distribution (10-mm length groups) for bluegill, green sunfish, and bluegill x green sunfish hybrids collected by electrofishing in Yellow Bear Reservoir, June 2007 and July 2008. Mean catch per unit effort (CPUE) for bluegill/green sunfish \geq stock length (80 mm).

Table 11. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for bluegill captured by electrofishing in Yellow Bear Reservoir, July 2008.

Length category	n	Mean Wr
Stock – quality (80 – 149 mm)	22	130 (1.7)
Quality – preferred (150 – 199 mm)		
Preferred – memorable (200 – 249 mm)		
Memorable – trophy (250 – 299 mm)		
Trophy (\geq 300 mm)		
Total	22	130 (1.7)

Table 12. Mean relative weight (Wr) with standard error (SE) in parenthesis, and number (n) weighed by length category for green sunfish captured by electrofishing in Yellow Bear Reservoir, July 2008.

Length category	n	Mean Wr
Stock – quality (80 – 149 mm)	36	117 (3.2)
Quality – preferred (150 – 199 mm)	4	109 (4.4)
Preferred – memorable (200 – 249 mm)	2	122 (3.2)
Memorable – trophy (250 – 299 mm)		
Trophy (\geq 300 mm)		
Total	42	116 (2.9)

Largemouth Bass

The relative abundance of stock length largemouth bass continues to be low. However, a strong year class of sub-stock length fish (Figure 11) were captured in 2008 indicating evidence of natural spawning and recruitment. A high abundance of small (<300 mm) largemouth bass is needed to control the overabundant green sunfish population in this reservoir. However, a put-and-take fishery of rainbow trout will be affected by an abundant largemouth bass population. Relative weights were normal for largemouth bass in Yellow Bear Reservoir (Table 13).

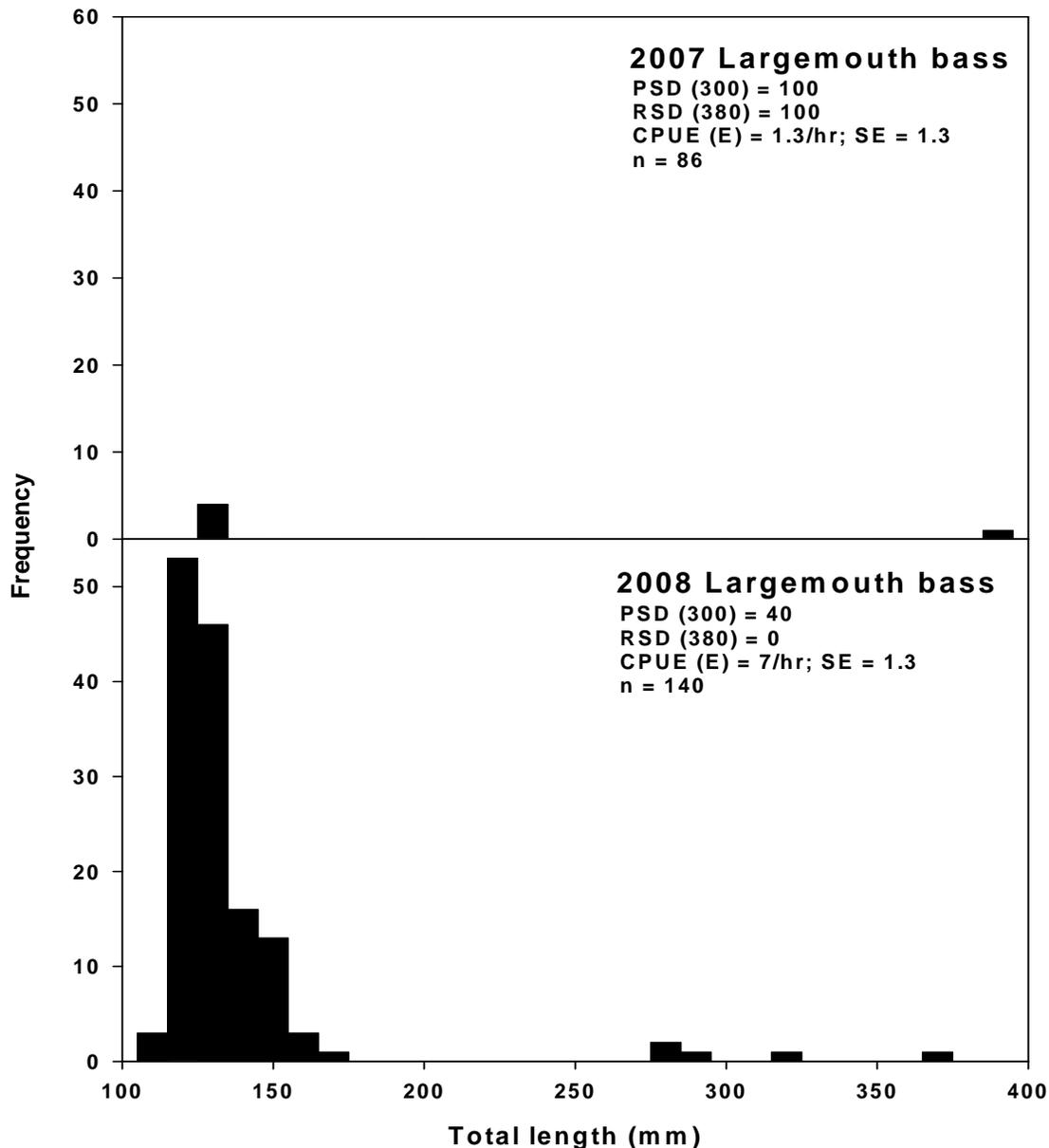


Figure 11. Length frequency distribution (10-mm length groups) for largemouth bass collected by electrofishing in Yellow Bear Reservoir, June 2007. Mean catch per unit effort (CPUE) for largemouth bass \geq stock length (200 mm).

Table 13. 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)	27	120 (2.1)
Stock – quality (200 – 299 mm)	3	104 (7.8)
Quality – preferred (300 – 379 mm)	2	130 (21.9)
Preferred – memorable (380 – 509 mm)		
Memorable – trophy (510 – 629 mm)		
Trophy (\geq 630 mm)		
Total	32	119 (2.3)

Rainbow trout

Two trout were collected during electrofishing in July 2008 and were likely from the group of fish stocked in April 2008. They were 256 mm/170 g and 299 mm/230 g.

Walleye

Two walleye were collected during electrofishing. They were 184 mm/53 g and 185mm/43 g. These walleye were likely accidentally stocked during a transplant of yellow perch or “bait-bucket” transfer by anglers. An additional predator such walleye, in addition to largemouth bass, will likely decrease the effectiveness of a put-and-take rainbow trout fishery.

Yellow Perch

One young of the year yellow perch was captured while electrofishing in Yellow Bear Reservoir in 2008 (CPUE = 1.3/hr; SE = 1.3) and in 2007.

MANAGEMENT RECOMMENDATIONS

Overall Pine Ridge 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.
 - Oglala and Kyle reservoirs in 2009.
 - Denby, White Clay, and Yellow Bear reservoirs in 2010.
3. Continue supplemental stockings of predator (walleye) and panfish (perch) species in Oglala Reservoir when dam structure is completed and as the reservoir fills. The newly flooded vegetation will provide adequate prey for fish and allow for fast growth rates. Investigate stocking smallmouth bass once walleye and panfish populations are established.
4. Create a bass/bluegill fishery as soon as Wolf Creek Reservoir dam structure is completed. A put-and-take trout fishery will be short-lived and will require continuous stocking.
5. Investigate length limits (e.g., walleye – only one in a daily limit may be 20 inches or longer; largemouth bass – minimum length of 15 inches).
6. Daily limit of 3 northern pike across Pine Ridge Indian Reservation.
7. Investigate darkhouse spearfishing for northern pike and non-game fish from December 1 to February 28 of each year.
8. Limit Northern Pike populations on all reservation waters except Denby Reservoir and White Clay Reservoir
9. Acquire funding to purchase fish haul tank/truck.
10. Acquire equipment or implement assistance from OST EPA office to track changes in water quality throughout year to better understand seasonal changes.

Denby Reservoir Management Recommendations

1. Work with landowners upstream to remove nutrients entering the reservoir. Grass buffers that are fenced off from livestock along Denby Creek will improve incoming water quality.
2. Continue stocking largemouth bass at 100 fish/acre.
3. Repair fishing docks.

4. Clean up trash along shoreline and below spillway structure to improve outdoor opportunities for the public.

White Clay Reservoir Management Recommendations

1. Do not stock bass or bluegill in White Clay Reservoir. Natural recruitment appears to be successful even with the high harvest rates observed during sampling.
2. Construct fishing docks for handicap/disabled access.
3. Clean up trash along shoreline and below spillway structure.

Yellow Bear Reservoir Management Recommendations

1. Continue the successful program of put-and-take trout fishery.
2. Encourage catch and release of all largemouth bass < 12 inches to increase the abundance of small predators on the green sunfish population.
3. Construct fishing docks for handicap/disabled access.

ACKNOWLEDGMENTS

We thank Jesse Stover 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>Pomoxi 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>
Yellow perch	YEP	<i>Perca flavescens</i>

Appendix B. Minimum total lengths (TL; mm) of length categories for fish species found on Pine Ridge 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 Pine Ridge 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 Pine Ridge 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			Northern pike			Yellow perch			Rainbow trout			Channel catfish			Walleye		
		Month	N	Size	Month	N	Size	Month	N	Size	Month	N	Size	Month	N	Size	Month	N	Size	Month	N	Size
Denby	2008	7	2000	FY																		
	1991													4	1,500	AD						
	1988				9	2,500	FY															
Kyle	2008	7	6500	FY																		
	1991																9	5,000	FG			
	1990																9	5,000	FG			
	1989																9	5,000	FG			
	1988	7	5,000	FG																		
Oglala	2008										6	190,000	FY							6	35,000	FY
	1996	7	80,000	FG				4	60,000	FG												
	1995	7	70,000	FG				4	70,000	FG	?	9 quarts	eggs									
White Clay	2008	7	9000	FY																6	35,000	FY
	1994	unk.	60	AD																		
	1992	9	30,000	FG																		
	1989	9	5,000	FG													7	5,000	FG			
Wolf Creek	1992													4	1,000	AD						
	1991													4	1,500	AD						
	1990																					
	1989													4	1,000	AD						
	1988													4	1,000	AD						
Yellow Bear	2008	7	1500	FY							6	1800	FY	5	1,500	AD						
	1992													4	1,000	AD						
	1991													4	1,000	AD						
	1990																					
	1989													4	1,000	AD						
	1988				9	2,500	FY															