PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-1

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2010 Survey Report

Squaw Creek Reservoir

Prepared by:

John Tibbs, District Management Supervisor
and
Michael S. Baird, Assistant District Management Supervisor

Inland Fisheries Division
District 2B, Waco, Texas

Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

July 31, 2011

TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Squaw Creek Reservoir were surveyed in 2010 using an electrofisher and in 2011 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Squaw Creek Reservoir is a 3,272-acre impoundment located on Squaw Creek in Hood and Somervell counties. The reservoir was built in 1979 by the Texas Utilities Generating Company to serve as a cooling reservoir for the Comanche Peak Nuclear Power Station. The reservoir has a mean and maximum depth of 46 and 135 feet, and is considered mesotrophic. Land use surrounding the reservoir is primarily agriculture.

- **Management history:** Important sport fish at the time of the 1997 management report included largemouth bass and channel catfish. White bass, although present in the reservoir, contributed little to the sport fishery. Palmetto bass were also part of the report for the first time, but not considered important. The management plan from the 1997 report included ending palmetto bass stockings and obtaining a sufficient sample size for largemouth bass to evaluate harvest regulations. The reservoir was closed for security reasons following the 9/11 attacks on the United States, and just re-opened to the public in May 2010. Since angling was denied during this time, no fisheries management work was conducted on the reservoir during its closure.

- **Fish Community**
  - **Prey species:** Forage species were collected by electrofisher in low numbers in 2010.

  - **Catfishes:** Channel catfish catch rates were the highest on record for the district at over 30 fish per net night. Flathead catfish were collected in small numbers, and blue catfish were not observed.

  - **White bass:** White bass were not observed in 2011 gill nets.

  - **Largemouth bass:** Largemouth bass were collected by electrofisher in low numbers in 2010. Low catch rates were thought to be due to inefficient electrofishing from highly conductive water. Body conditions were excellent for all size classes. Additional data were collected on largemouth bass with spring 2011 gill nets.

  - **Crappie:** Crappie were not observed in 2011 gill nets.

- **Management Strategies:** Continue managing Squaw Creek Reservoir with existing regulations. Conduct general monitoring with gill nets in 2014.

INTRODUCTION

This document is a summary of fisheries data collected from Squaw Creek Reservoir in 2010-2011. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2010-2011 data for comparison.

Reservoir Description

Squaw Creek Reservoir is a 3,272-acre impoundment located on Squaw Creek in Hood and Somervell counties. The reservoir was created in 1979 by the Texas Utilities Generating Company (now Luminant Power) to serve as a cooling reservoir for the Comanche Peak Nuclear Power Station. The reservoir was closed for security reasons on September 12, 2001, following the 9/11 attacks on the United States, and just re-opened to the public in May 2010. Conservation pool is 775.0 feet above mean sea level, mean and maximum depths are 46 and 135 feet respectively, and the reservoir is considered mesotrophic (Figure 1). Land use surrounding the reservoir is primarily agriculture. Fish habitat at time of sampling consisted almost exclusively of natural shoreline, including rocky substrate and flooded timber (Table 4). Vegetation was scarce, probably due to the artificially high water temperatures maintained year-round. Angler access to the reservoir is limited from 7:00am to 4:00pm, Thursday through Sunday for bank fishing within the park, and Friday through Sunday for boat fishing; there is a 100-boat limit on the reservoir, but no limit for bank fisherman. Currently, there are no handicap-specific facilities. Further information about Squaw Creek Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Department web page at www.tpwd.state.tx.us and navigating within the fishing link.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (DiCenzo 1997) included: 1) discontinuing palmetto bass stockings, 2) increasing the number of electrofishing sites sampled, 3) supplementing sampling data with catch and size structure data from bass tournaments, and 4) evaluating harvest regulations when an appropriate sample size of largemouth bass was obtained. Actions were never taken on these strategies due to the lake closure in 2001 and inability to gain access to conduct fisheries management work.

Harvest regulation history: Sportfishes in Squaw Creek Reservoir are currently managed with statewide regulations (Table 2).

Stocking history: Florida largemouth bass were last stocked in 1990 and 1991 at 50-fish/acre. Palmetto bass were stocked in 1994 and 1996 at 15-fish/acre. Squaw Creek has not been stocked with sportfish since 1996. The complete stocking history is in Table 3.

Vegetation/habitat history: Aquatic vegetation was scarce, probably due to the artificially high water temperatures maintained year-round. A habitat survey was performed during winter 2010.

Water Transfer: Squaw Creek Reservoir is primarily used as a cooling reservoir for the Comanche Peak Nuclear Power Station. Currently, the only water transfer occurring to or from the reservoir is the pumping of make-up water into the reservoir from nearby Granbury Reservoir to make up for evaporative losses, etc. There are current proposals to add additional nuclear units to the station, and if approved, additional make-up water would need to be pumped into the reservoir.

Golden alga: Squaw Creek Reservoir pumps untreated water directly from Granbury Reservoir to make

up for evaporative losses from the nuclear power station. Granbury has suffered from nearly annual fish kills from the toxic golden alga since 2001, and golden alga cells have been observed in water samples collected from Squaw Creek. Although several fish kills have occurred in the reservoir since its re-opening in May 2010, none have yet been documented to have been caused from golden algae.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations) and gill nets (5 net nights at 5 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). A vegetative habitat survey was conducted by boat during summer 2010 and a structural habitat survey was conducted in winter 2010 using satellite imagery according to the Habitat Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD)] and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Age and growth data were not collected for this report.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted almost exclusively of natural shoreline (Table 4). Standing timber covered an estimated 17% of the reservoir. A habitat survey was conducted during winter 2010 using satellite imagery. No native or exotic vegetation was observed in summer 2010.

Creel: No creels were conducted during this survey period.

Prey species: Threadfin shad were collected by electrofisher at 5/h and gizzard shad, although observed, were not collected in 2010 (Appendix A). Historical averages for these species are low in Squaw Creek (Appendix B). The 1997 Index of vulnerability (IOV) for gizzard shad was poor and only 12% were available to existing predators as forage (Figure 2). Bluegill (2/h) and longear sunfish (2/h) were also collected (Figure 3).

Catfishes: Channel catfish catch rates were the highest on record at over 30/nn, and equated to 151 collected individuals. The PSD for channel catfish is defined as the percentage of 11-inch and longer individuals which are also 16-inches and longer. Proportional size distribution values have remained somewhat stable (43 in 1997 and 29 in 2011) indicating acceptable recruitment, growth, and mortality rates during the years the reservoir was closed. Ninety-nine percent of sampled individuals were of legal size, and individuals in the preferred (24 inch) and memorable (28 inch) size classes were collected. Body conditions were good to excellent – and improved with size (Figure 4; Appendices A and B). Limited age and growth work was performed on channel catfish in 1997; channels approached quality size (16 inches) in three years (DiCenzo, 1997). No creel data exists for channel catfishes in Squaw Creek Reservoir.

Flathead catfish were collected in low numbers, and no blue catfish were collected (Appendices A and B).

White bass: White bass were not collected from gill nets in 2011, and only a single individual was collected in 1994 (Appendix B).

Largemouth bass: Largemouth bass were collected by electrofisher at 5/h in 2010; this catch rate

equates to 5 individuals, and is the lowest on record for the district (Figure 5; Appendices A and B). Additional catch data (4.20-fish/nn) were collected on largemouth bass with spring 2011 gill nets (Figure 6). Despite low catch rates with the electrofisher, anecdotal information from anglers suggests a good bass fishery exists. This discrepancy is due entirely to high conductivity within the reservoir, and the inability to efficiently shock fish with the electrofisher. The Proportional size distribution (PSD) for largemouth bass is defined as the proportion of 8-inch and longer individuals which are also 12-inches and longer within the population. Proportional size distributions from electrofisher and gill nets were disproportionately high (80 and 90 respectively), possibly indicating uneven recruitment, growth, or mortality. The proportion of individuals 14-inches and larger was similar to the 1997 survey, suggesting few proportional changes in the larger size classes of the population. Body condition was excellent, and Wrs averaged over 100. Age and growth work on largemouth bass in 1997 indicated bass typically reached the preferred size (15 inches) by age two. No creel data exists for largemouth bass in Squaw Creek Reservoir, and electrofisher sample sizes prevented genetic analysis for this report.

White crappie: Trap netting became an optional gear in 2009, and since past crappie surveys had failed to collect useful sample sizes, trap nets were not conducted during this survey period (Appendix B).

Fisheries management plan for Squaw Creek Reservoir, Texas

Prepared – July 2011

ISSUE 1: Squaw Creek's channel catfish population is among the best in central Texas, with many individuals in the preferred and memorable size classes. Anglers targeting channel catfish specifically need to be informed about this opportunity.

MANAGEMENT STRATEGY

1. Prepare at least one news release highlighting channel catfish angling opportunities at Squaw Creek, and release it through the statewide VOCUS system.

ISSUE 2: Electrofishing catch rates of all species have traditionally been low in Squaw Creek, and the fall 2010 survey is among the worst on record despite use of the upgraded electrofishing system (i.e., Smith Root 7.5 GPP). Low catch rates were initially thought to be an artifact of high salinities (i.e., conductivity) within Squaw Creek Reservoir and the Upper Brazos River system in general. However, conductivity, measured in micro Siemens (µS) has increased dramatically over the last four surveys: 1,300 in 1994, 1,750 in 1990, 3,000 in 1997, and 4,950 in 2011, indicating power-plant operations are contributing to the high conductivities observed. The controlling authority, Luminant Power, is in the process of adding additional reactors to the plant, which will further increase conductivities in the reservoir, making electrofishing even less efficient in the future.

MANAGEMENT STRATEGIES

1. Discontinue electrofishing surveys.
2. Gill net in mid winter to avoid the higher water temperatures and fish mortality.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant Salvinia (*Salvinia molesta*) and other invasive vegetation species can

form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes winter gill netting in 2014 (Table 5).

LITERATURE CITED

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

DiCenzo, Victor. 1997. Statewide freshwater fisheries monitoring and management program survey report for Squaw Creek Reservoir, 1997. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

DiCenzo, V. J., M. J. Maceina, and M. R. Stimert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

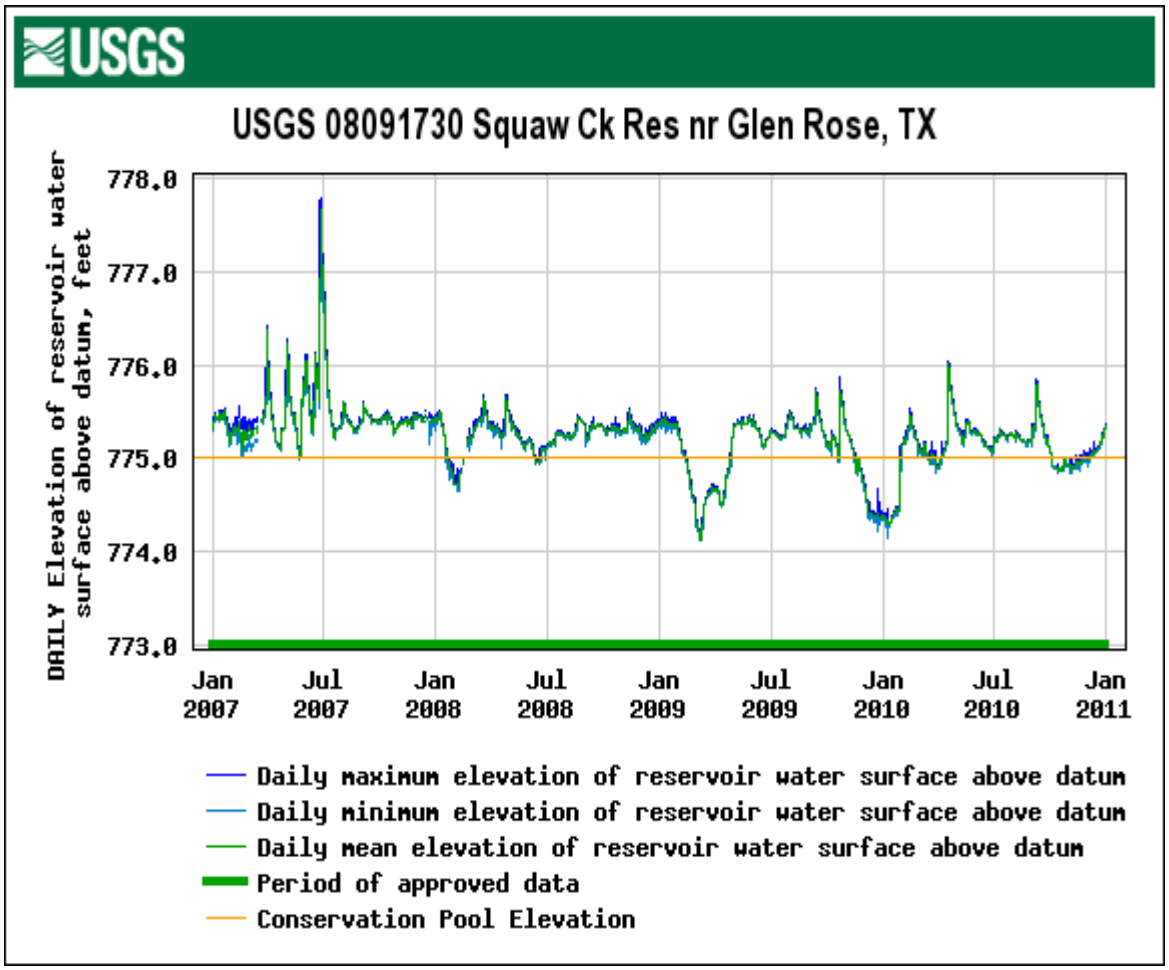


Figure 1. Daily mean water levels for Squaw Creek Reservoir from January 1, 2007 through January 1, 2011. Conservation pool level is 775.0 feet above mean sea level. Figure from the USGS website.

Table 1. Characteristics of Squaw Creek Reservoir, Texas.

Characteristic	Description
Year Constructed	1979
Controlling authority	Luminant Power
County	Hood, Somervell
Reservoir type	Tributary of the Brazos River
Shoreline Development Index (SDI)	7.0
Conductivity	4,950 µS

Table 2. Harvest regulations for Squaw Creek Reservoir.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No Limit
Catfish, flathead	5	18 - No Limit
Bass, white	25	10 - No Limit
Bass: largemouth and smallmouth	5	14 – No Limit
Crappie: white	25 (in any combination)	10 - No Limit

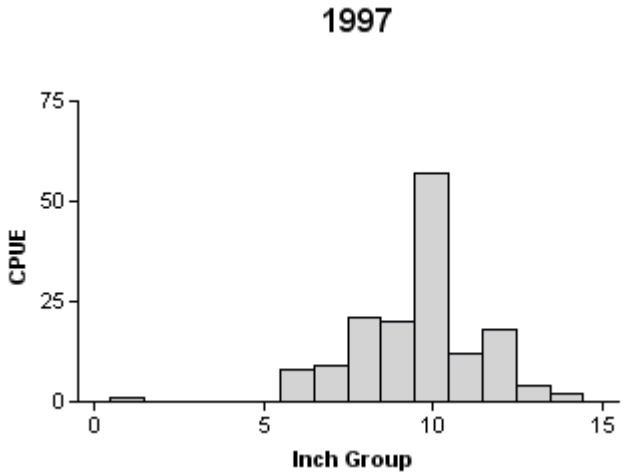
Table 3. Stocking history of Squaw Creek, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Channel catfish	1986	17,501	AFGL	4.0
	Total	17,501		
Florida Largemouth bass	1990	164,654	FRY	0.7
	1991	163,600	FGL	1.2
	Total	328,254		
Palmetto Bass (striped X white bass hybrid)	1979	99,900	UNK	UNK
	1981	100,000	UNK	UNK
	1983	99,000	UNK	UNK
	1994	50,844	FGL	1.6
	1996	51,538	FGL	1.5
	Total	401,282		
Smallmouth bass	1979	100,000	UNK	UNK
	1980	49,955	UNK	UNK
	1982	59,875	UNK	UNK
	Total	209,830		
Threadfin shad	1982	12,000	AFGL	2.9
	1984	3,900	AFGL	3.0
	Total	15,900		
Walleye	1979	4,860,000	FRY	0.2
	Total	4,860,000		

Table 4. Survey of littoral zone and physical habitat types, Squaw Creek Reservoir, Texas, 2011. Linear shoreline distance (miles) and percent of linear shoreline distance was recorded for each habitat type greater than one percent; otherwise noted as trace. Percent of total shoreline distance is blank for boat docks/piers because they were dually coded with adjacent habitat; counts are given instead. Survey was conducted using 2010 NAIP, 1-meter resolution satellite imagery.

	Shoreline Distance	
Shoreline habitat type	Miles	Percent of total
Natural shoreline	34.36	95.90
Bulkhead		trace
Rocky shoreline (rocks > 4”)	1.39	3.90
Piers and Boat Docks		N=1

Gizzard Shad



Effort = 1.0
Total CPUE = 152.0 (14; 152)
Stock CPUE = 143.0 (15; 143)
IOV = 12 (8.2)

Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Squaw Creek Reservoir, Texas, 1997. No gizzard shad were collected with the electrofisher in 2010.

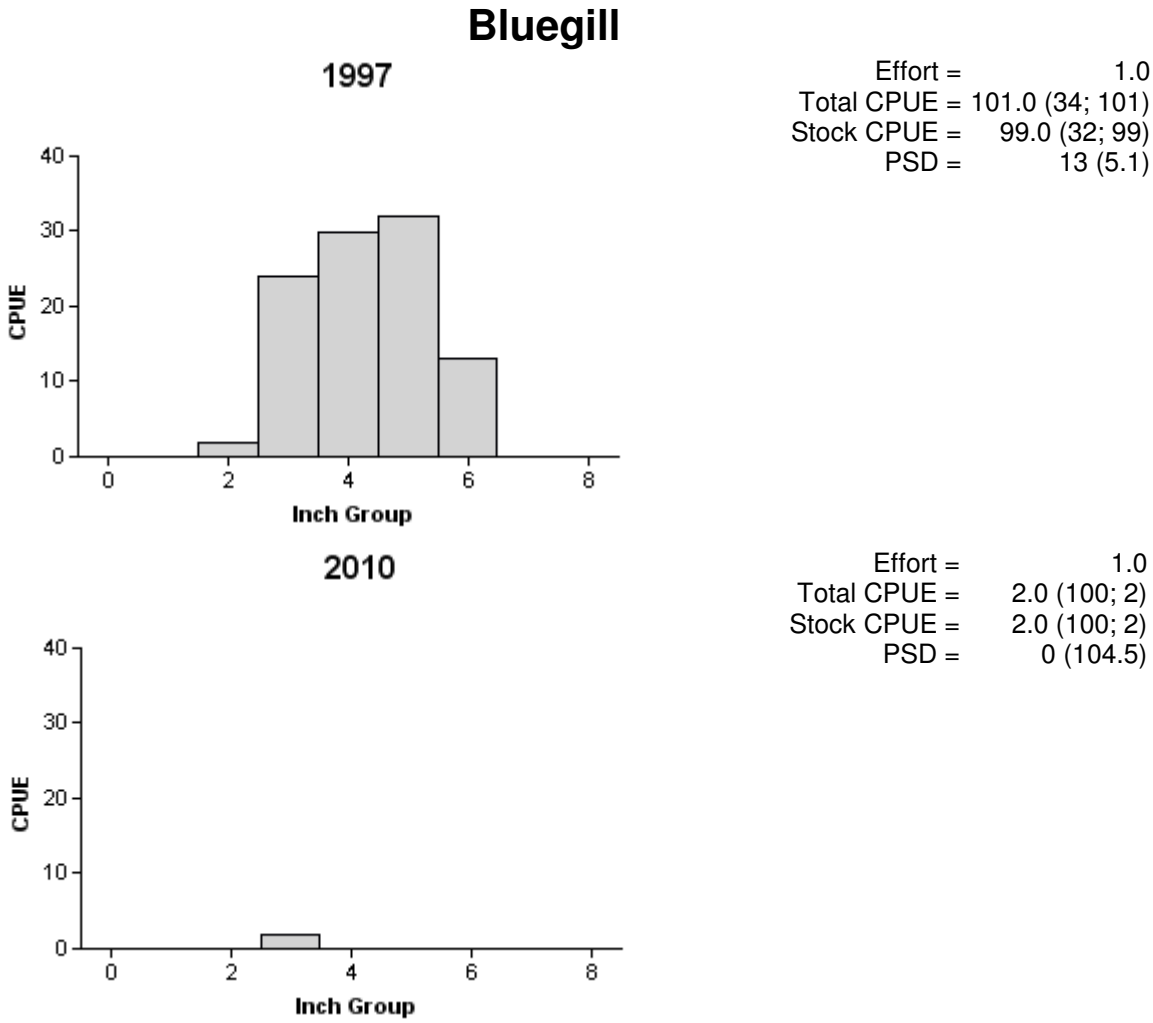
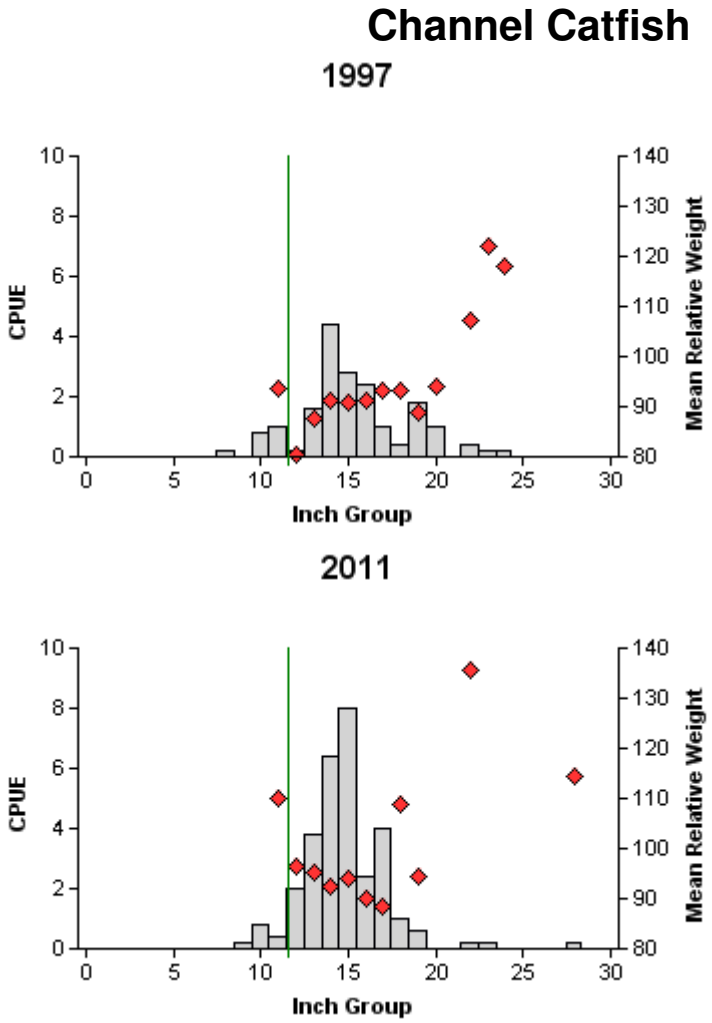


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Squaw Creek Reservoir, Texas, 1997 and 2010.



1997

Effort = 5.0
Total CPUE = 18.4 (11; 92)
Stock CPUE = 17.4 (13; 87)
PSD = 43 (4.2)
PSD-12 = 94 (3.8)

2011

Effort = 5.0
Total CPUE = 30.2 (8; 151)
Stock CPUE = 29.2 (9; 146)
PSD = 29 (7.7)
PSD-12 = 99 (0.9)

Figure 4. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Squaw Creek Reservoir, Texas, 1997 and 2011.

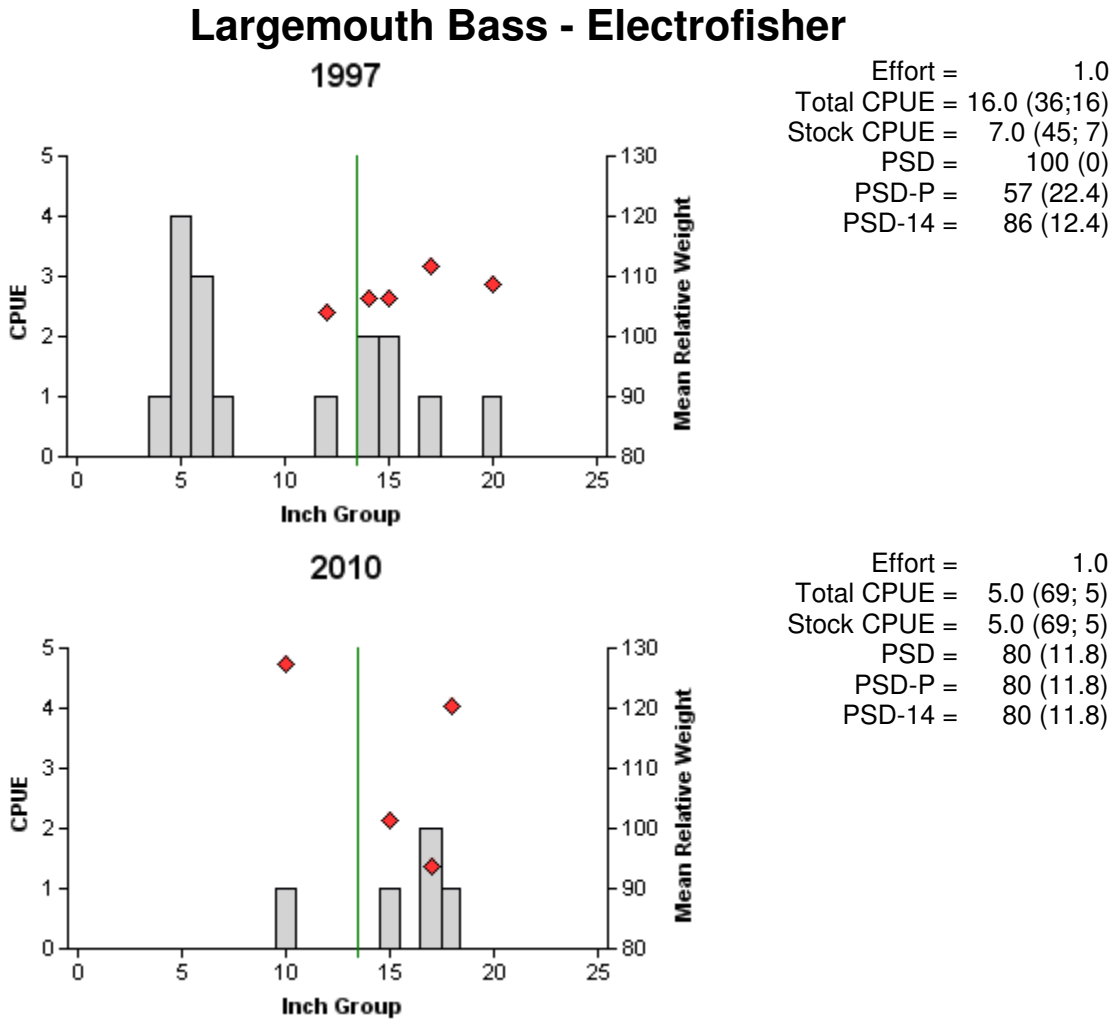


Figure 5. Number of largemouth bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Squaw Creek Reservoir, Texas, 1997 and 2010.

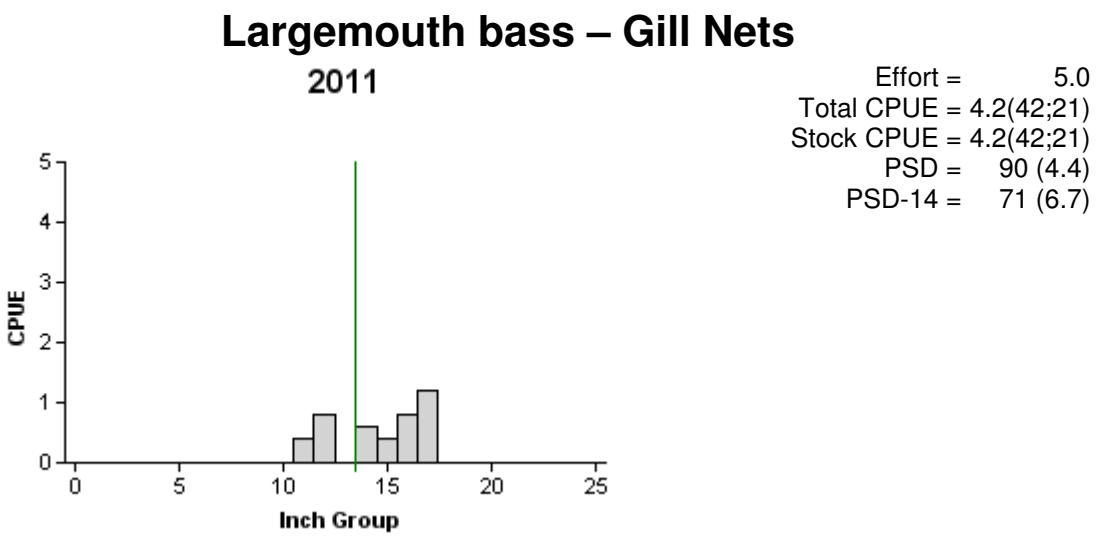


Figure 6. Number of largemouth bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Squaw Creek Reservoir, Texas, 2011.

Table 5. Proposed sampling schedule for Squaw Creek Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard surveys are denoted by S and additional surveys denoted by A.

Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Vegetation Survey	Access Survey	Report
Fall 2011-Spring 2012							
Fall 2012-Spring 2013							
Fall 2013-Spring 2014							
Fall 2014-Spring 2015			S		S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Squaw Creek Reservoir, Texas, 2010-2011. Asterisk denotes collection by a non-standard gear.

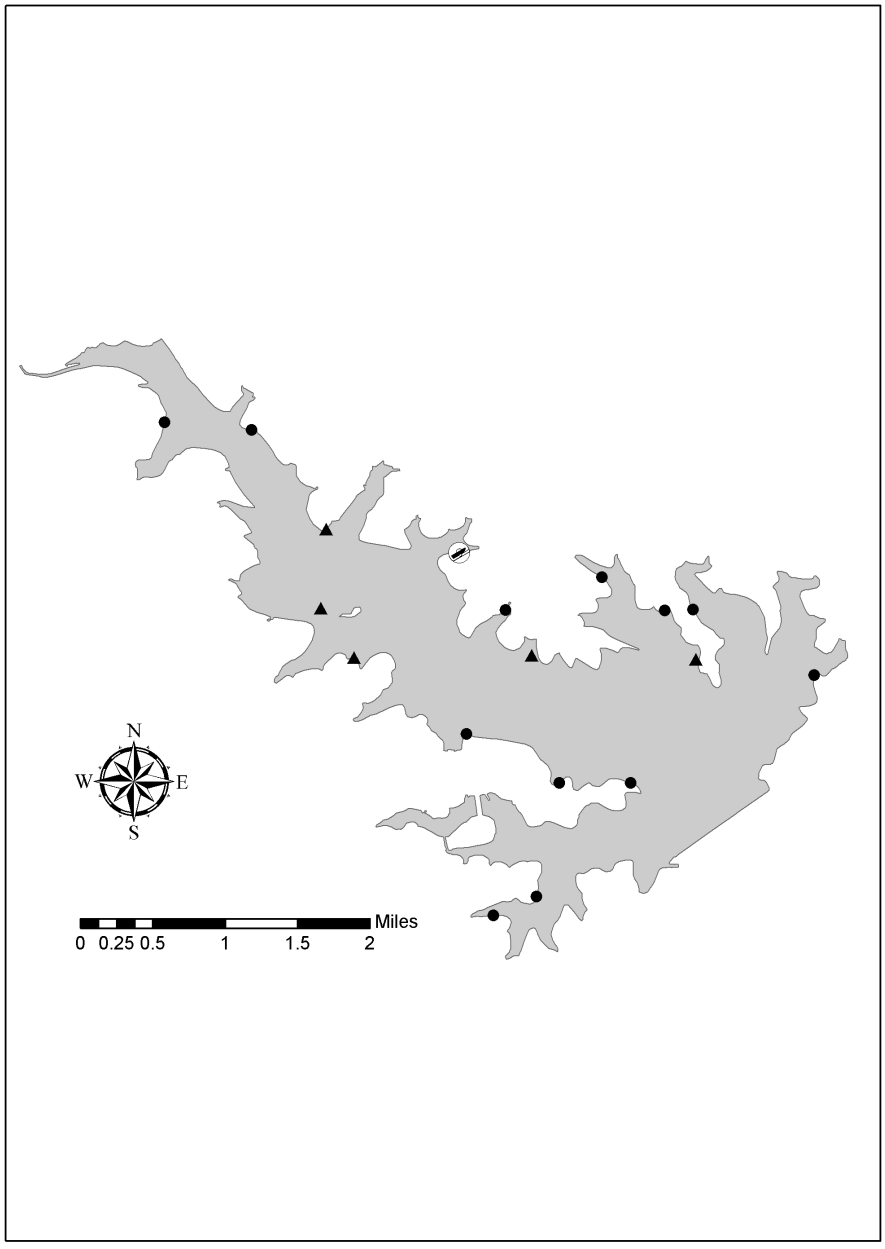
Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Threadfin shad			5	5.0
Channel catfish	151	30.20		
Flathead catfish	2	0.40		
Blue tilapia	1	0.20		
Bluegill			2	2.0
Longear sunfish			2	2.0
Largemouth bass	21	4.20	5	5.0

APPENDIX B

Catch rates (CPUE) of targeted species by gear type for standard surveys on Squaw Creek Reservoir, Texas, 1994 to present. All stations were randomly selected. Electrofishing stations were shocked with a 5.0 Smith-Root GPP (Gas Powered Pulsator) until 2010, when a 7.5 Smith-Root GPP began being used. Species averages are in bold. Asterisk denotes collection by a non-standard gear.

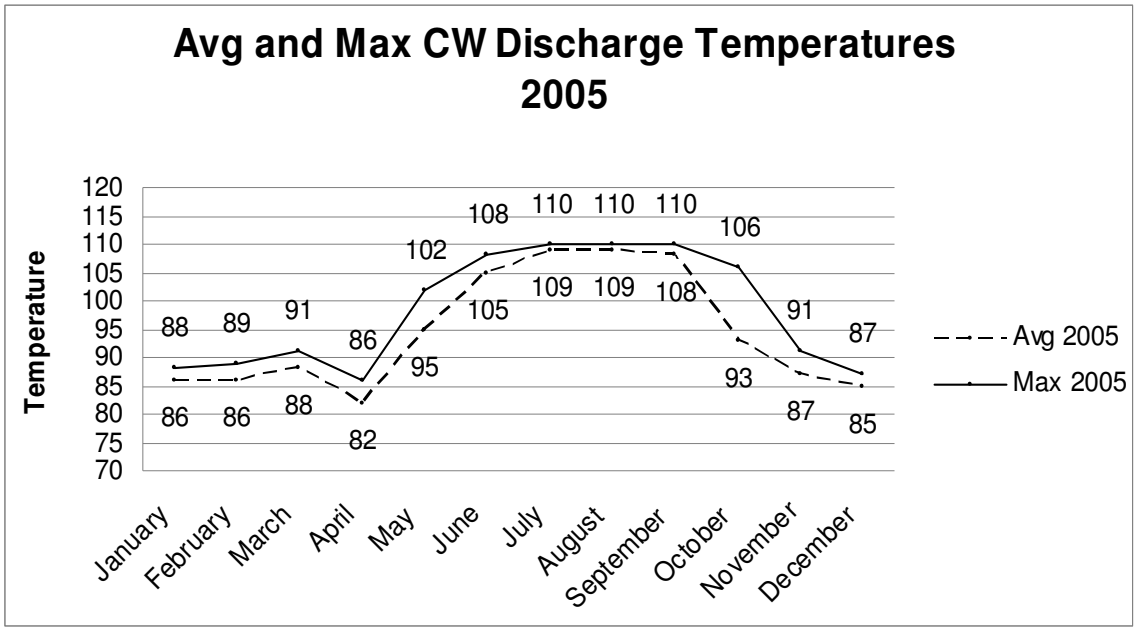
Gear	Species	1994	1997	2010	2011	Avg.
Electrofisher						
	Largemouth bass	12.7	16	5		11.2
	Smallmouth bass	1.3	0			0.4
	Gizzard shad	7.3	152			53.1
	Threadfin shad	6.0		5		3.7
	Bluegill sunfish	45.3	101	2		49.4
	Longear sunfish		19	2		7
	Warmouth		10			3.3
Gill nets						
	Channel catfish	15	18.4		30.2	21.2
	Flathead catfish	0.4			0.4	0.3
	Hybrid Striped bass		4.8			
	White bass	0.8				0.3
	Largemouth bass				*4.2	
	Nile/Blue talapia				0.2	
Trap nets						
	White crappie	0	0			0
	Black crappie	0	1			0.5

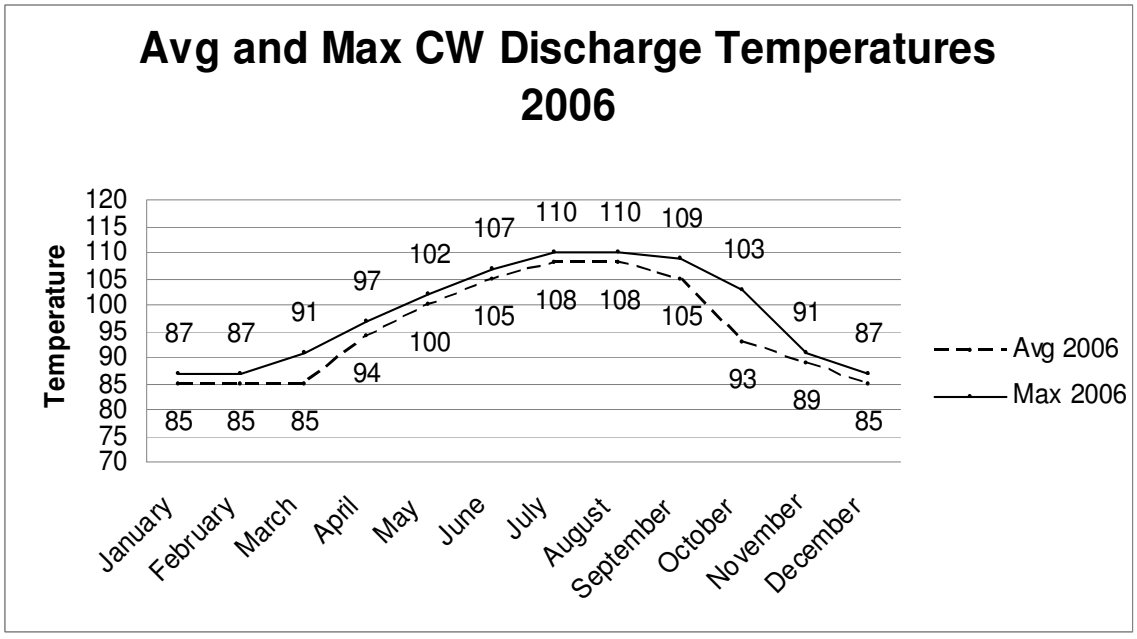
APPENDIX C



Location of sampling sites, Squaw Creek Reservoir, Texas, 2010-2011. Standard electrofishing and gill netting stations are indicated by circles and triangles respectively. Water level was near full pool at time of sampling.

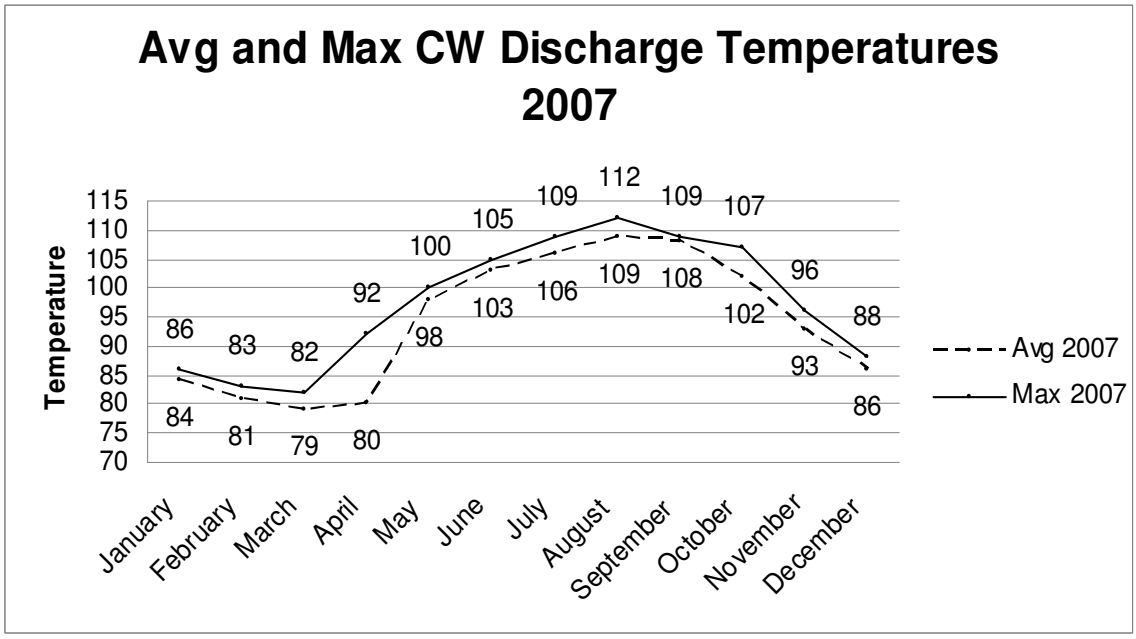
APPENDIX D

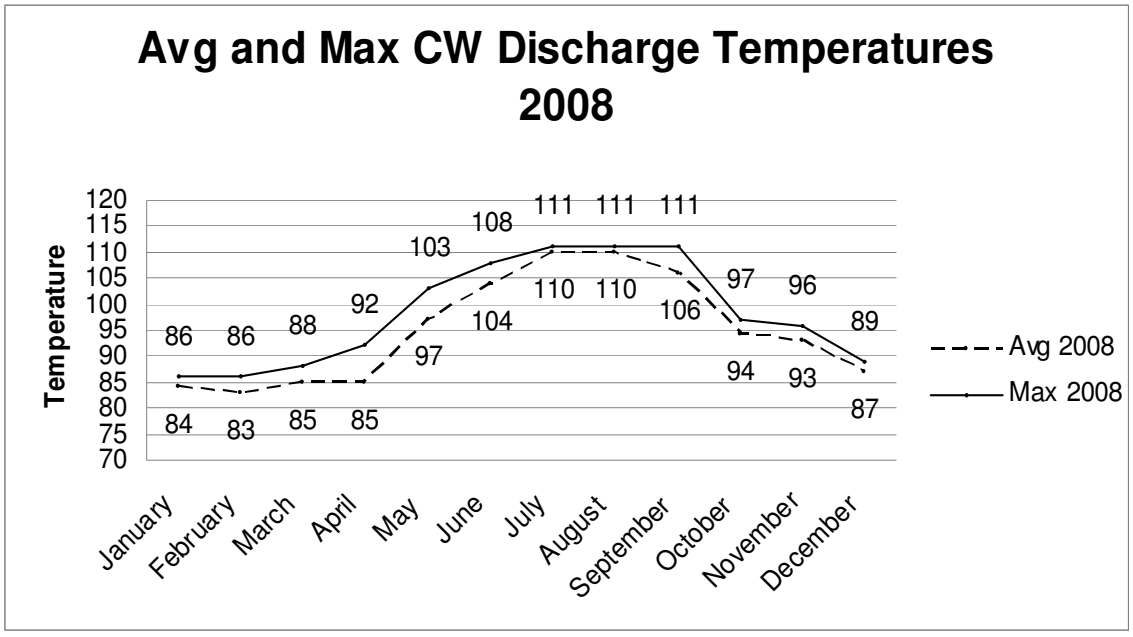




Average and maximum discharge temperatures into Squaw Creek Reservoir from power plant, 2005 and 2006. Figures courtesy of Luminant Power.

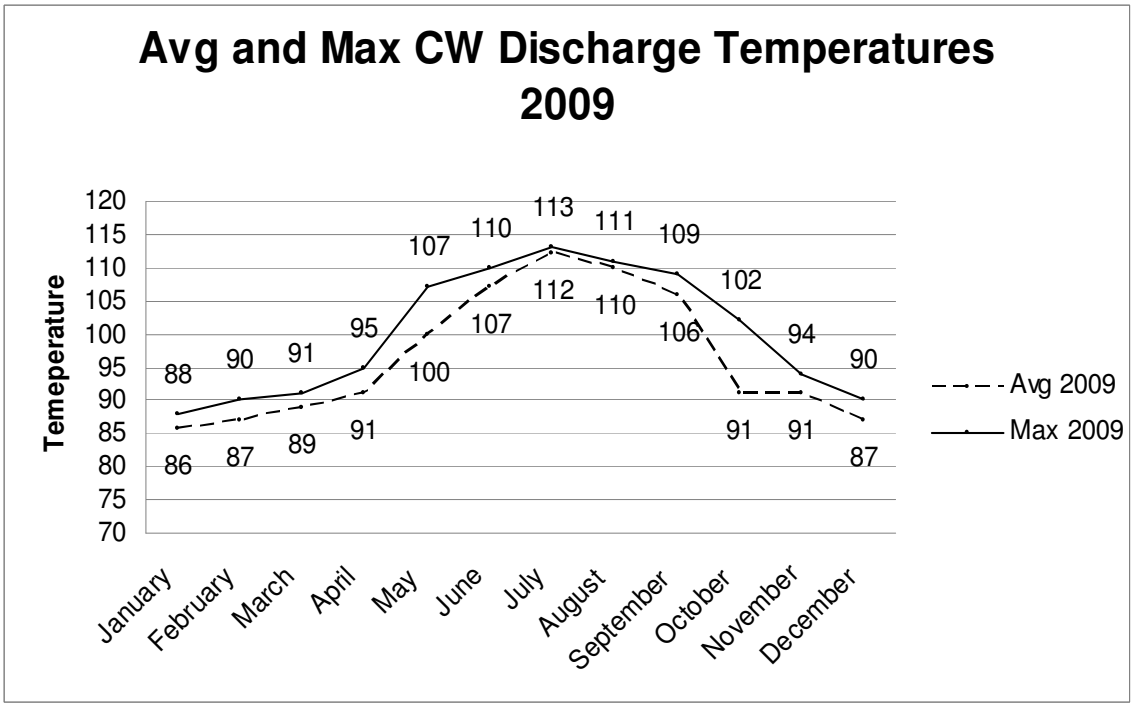
APPENDIX D CONTINUED

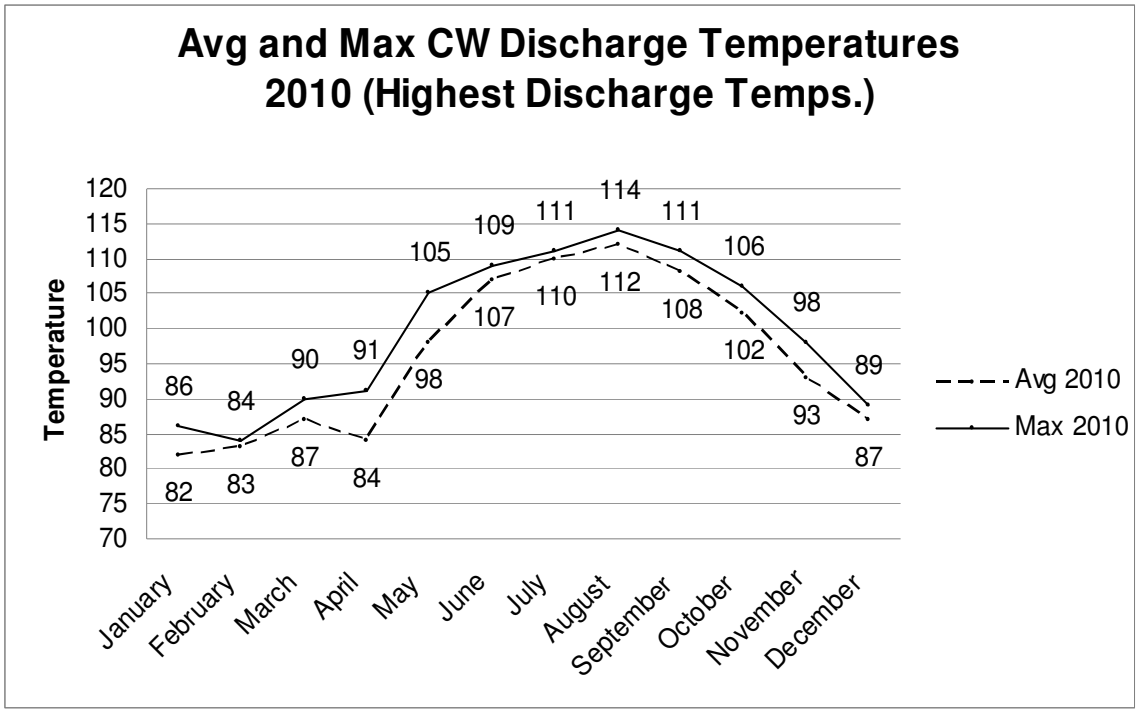




Average and maximum discharge temperatures into Squaw Creek Reservoir from power plant, 2007 and 2008. Figures courtesy of Luminant Power.

APPENDIX D CONTINUED





Average and maximum discharge temperatures into Squaw Creek Reservoir from power plant, 2009 and 2010. Figures courtesy of Luminant Power.