

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-34

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

Nacogdoches Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Nacogdoches Reservoir were surveyed from June 2008 through May 2009 with fall electrofishing, gill netting, and spring electrofishing. Anglers were surveyed from March through May 2009 with a creel survey. Vegetation and access surveys were also conducted in 2008. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Lake Nacogdoches is located on Loco Bayou, a tributary of the Angelina River in the Neches River basin. The City of Nacogdoches is the controlling authority. Primary uses are municipal water supply and recreation. At conservation pool elevation, Lake Nacogdoches is 2,212 surface acres in size, has a shoreline length of 16 miles, and a mean depth of 15 feet. Water level fluctuations average 2 feet annually. Two public boat ramps with loading docks provide excellent boat access. One handicap-accessible fishing pier is also present. Habitat in the lake consists of submerged and emergent aquatic vegetation (mainly hydrilla and American lotus) and standing timber. Most of the land around the reservoir is used for timber production, agriculture, and residential use.
- **Management history:** Important sport fish include largemouth bass and white and black crappie. The 14- to 21-inch slot-length limit for largemouth bass (implemented in 1988) was changed to a 16-inch maximum length limit in 2008. Florida and Sharelunker largemouth bass fingerlings were stocked in 2008 to provide future trophy potential in conjunction with the maximum length limit. Hydrilla is present in the reservoir but is not considered to be problematic.
- **Fish community**
 - **Prey species:** Gizzard shad and threadfin shad were present in the reservoir. However, most gizzard shad were too large to serve as suitable prey. Electrofishing catch of bluegill was high; few fish were over 6 inches in length. Other prey species included longear, redear, and spotted sunfish.
 - **Catfishes:** Numbers of channel catfish are relatively low in the reservoir. High densities of largemouth bass and aquatic vegetation probably limit reproduction and recruitment of channel catfish. Few anglers target catfish at Lake Nacogdoches (<2% of total fishing effort).
 - **Black basses:** Spotted bass were present in low numbers. Largemouth bass were abundant. Size structure remained consistent with past surveys with a high abundance of fish measuring less than the maximum length limit (16 inches). Largemouth bass exhibited fast growth and were in moderate condition. Angler effort and catch was high. The current largemouth bass water body record is 14.02 lbs set in March 1986.
 - **Crappies:** White crappie and black crappie were present in the reservoir. Directed angling effort in spring 2009 was less than in previous years. Angler catch rates were 1.1/h and total harvest was 1,069 fish.
- **Management strategies:** Continue to manage largemouth bass with 16-inch maximum length limit. Continue to monitor trends of hydrilla coverage through annual aquatic vegetation surveys (2009-2012). Conduct spring electrofishing surveys in 2011 and 2013 and a spring quarter (March-May) creel survey in 2013. Conduct standard monitoring with gill nets and fall electrofisher in 2013. Continue voluntary angler survey to monitor catch of largemouth bass \geq five pounds.

INTRODUCTION

This document is a summary of fisheries data collected from Nacogdoches Reservoir from June 2008 through May 2009. 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 2008-2009 data for comparison.

Reservoir Description

Nacogdoches Reservoir is a 2,212-acre impoundment constructed in 1976 on Loco Bayou (Table 1). It is located in Nacogdoches County approximately 10 miles west of Nacogdoches and is operated and controlled by the City of Nacogdoches. Primary water uses included municipal water supply and recreation. Secchi disc readings average 2-4 feet. Water fluctuations average 2 feet annually (Figure 1). Habitat at time of sampling consisted of overhanging brush, rocky shoreline, and aquatic vegetation (primarily hydrilla and American lotus). The majority of the land surrounding the reservoir is used for agriculture, timber production, and residential development.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Smith and Driscoll 2005) included:

1. Monitor success of the largemouth bass 14- to 21-inch slot-length limit.
Action: Largemouth bass growth was examined in 2008 with fish reaching 14 inches by age-3. In 2007 and 2009, spring electrofishing surveys were conducted and a fall electrofishing survey was conducted in 2008. In 2008, the 14- to 21-inch slot-length limit was changed to a 16-inch maximum length limit to increase abundance of trophy largemouth bass. In 2009 a spring-quarter creel survey was conducted to monitor angler harvest, catch rates, and directed effort for largemouth bass. In 2009, a voluntary angler reporting survey was implemented to document the catch of largemouth bass \geq five pounds to document the success of the maximum length limit and to help justify future stocking requests of Florida and Sharelunker largemouth bass.
2. Conduct a spring-quarter creel survey every four years to monitor the crappie fishery.
Action: A spring-quarter creel survey was conducted in 2009. Results indicated crappie fishing effort and harvest declined since 2005.
3. Conduct annual vegetation surveys to monitor hydrilla coverage and if problems were to arise at water intakes, consult with the City of Nacogdoches to develop a management plan for hydrilla control.
Action: Aquatic vegetation surveys were conducted annually from 2005 to 2008. In fall 2008, hydrilla coverage was 22% (historical high = 40% coverage). Currently, no problems concerning hydrilla have been reported by the City of Nacogdoches.

Harvest regulation history: Sport fishes in Nacogdoches Reservoir are currently managed with statewide regulations with the exception of largemouth bass (Table 2). From 1988 to 2008, largemouth bass were managed with a 14- to 21-inch slot length limit. A 16-inch maximum length limit was implemented in 2008 to increase the number of large fish available for catch by anglers.

Stocking history: Channel catfish were stocked in 1976 and 1977 (210,300 total) (Table 3). Florida largemouth bass were stocked in 2000, 2002, 2008, and 2009 at a rate of 50fish/acre. In 2008, 19,991 Sharelunker largemouth bass fingerlings were stocked to provide potential trophy fish for angler catch.

Vegetation/habitat history: Nacogdoches Reservoir aquatic vegetation coverage has increased significantly since 2000. Hydrilla has historically been as high as 40% coverage. An aquatic vegetation survey conducted in 2008 indicated that hydrilla coverage was 22% (Table 4). Native vegetation coverage was 569 acres (American lotus, pondweed, and watershield).

METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations) during October and March (largemouth bass only) and gill netting (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 caught 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 2008).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (W_t)] 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. Average age of 14-inch (13.0 – 15.0 inches) largemouth bass collected in the fall was determined from otoliths.

A roving creel survey (9 days) was conducted from March through May 2009 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Total angler catch of largemouth bass \geq 4, 7, and 10 pounds was also estimated. Anglers were asked if released fish were within weight categories.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of overhanging brush, rocky shoreline, native emergent aquatic vegetation, and hydrilla (Table 4). Aquatic vegetation coverage was approximately 30% of the reservoir surface area.

Creel: Similar to previous survey years, fishing effort at Nacogdoches Reservoir was primarily directed at black basses (85.6%), crappies (6.5%), and anything (4.7%) (Table 5). Total fishing effort for all species was 20,664 h and similar to previous years (Table 6). Total directed expenditures (\$97,189) were an increase from previous years.

Prey species: Electrofishing catch rates of threadfin shad were 22.0/h in 2008 (Appendix A), although this was probably not a true reflection of population status given the variability in catch rates (historical mean=67.0; SD=125.7). The majority of gizzard shad sampled in 2008 were not available as prey (IOV=1.15) (Figure 2). Bluegill was the predominant prey species. The electrofishing catch rate was 322.0/h in 2008 (Figure 3). Few anglers targeted sunfish (1.3% of the total angler effort) (Table 5).

Channel catfish: Historically, channel catfish abundance has been low. The gill net catch rate in the spring of 2009 (1.2/nn) was similar to catch rates observed in 2005 (0.8/nn) and 2001 (0.8/nn) (Figure 4). Channel catfish recruitment is likely limited by largemouth bass predation and a reduction in preferred food items (i.e., benthic invertebrates). Relatively high vegetative cover likely limits nutrients available for invertebrates. A similar relationship between largemouth bass abundance, hydrilla coverage, and channel catfish abundance has been observed at Martin Creek Reservoir (Ashe and Driscoll 2006). Relative weights exceed 90 and were similar to the past two survey years. Few anglers targeted catfish (1.9% of directed fishing effort) during spring 2009 (Table 5) and harvest was limited to 214 fish (Table 8 and

Figure 5).

Black basses: Electrofishing catch rates of spotted bass have been historically low, averaging 2.7/h in the past three fall electrofishing surveys. No spotted bass were collected during the fall 2005 and 2008 electrofishing surveys. Spotted bass catch was 2.0/h during the 2009 spring electrofishing survey (Appendix A). There was no angler harvest or catch of spotted bass observed during the 2009 spring creel survey.

Fall electrofishing largemouth bass catch rates from 2002-2008 (range=68-147/h) (Figure 6) were hindered by excessive hydrilla around the shoreline at the time of sampling. Population size structure was similar and favorable across years (PSD range = 53 - 74; RSD-16 range = 20 - 31). Relative weights exceeded 80 indicating largemouth bass were in moderate condition. Growth of largemouth bass was fast; average age at 14 inches (13.5 - 14.5 inches) was 2.4 years (N = 8; range = 2 - 3 years). Spring electrofishing catch rates were not hindered by hydrilla and reflected better catch rates than observed during fall surveys. Catch rates observed in 2009 (226/h) were higher than what was observed in 2007 (180/h) (Figure 7). Florida largemouth bass influence has remained relatively constant as Florida largemouth bass alleles have ranged from 52.6 to 73.0% (Table 10).

The black bass fishery accounted for the majority of annual fishing effort (85.6%; Table 5). Creel surveys indicated directed effort was similar in 2001 and 2009, however there was less directed effort toward black bass in 2005 (Table 5). Total angler catch rates were high during the last three survey periods (range=0.64-0.95/h). Total harvested numbers of largemouth bass decreased by 16% in 2009 from what was observed in 2005 (Table 9), with the majority of harvested fish ranging from 13–14 inches in length (Figure 8). Catch of largemouth bass ≥ 4 pounds was high during the spring-quarter creel and exceeded 2,500 fish (Table 9). Estimated catch of fish ≥ 7 pounds and ≥ 10 pounds was 664 and 37, respectively.

A voluntary angler reporting program was implemented in February 2009 to increase information on fish ≥ 21 inches or 5 pounds caught to provide greater insight regarding large fish abundance. Since the implementation of the reporting program through May 2009 a total of 193 largemouth bass ≥ 21 inches/5 pounds were voluntarily reported. The creel survey from March through May 2009 indicated a reporting rate of 20% with 121 anglers interviewed having caught 271 eligible fish and having reported 55 fish. From this, an estimated total of 951 largemouth bass ≥ 21 inches/5 pounds have been caught by anglers from February – May 2009.

Crappies: Historically, trap net catch rates of crappies (both white and black) have been low (≤ 1.0 /nn). Trap net surveys were discontinued in 2004.

White and black crappie were present in the reservoir (Figure 9; Appendix A). A decrease in directed fishing effort was observed during the spring 2009 creel survey (6.5% of total fishing effort) from the 2005 survey (25.4% of fishing effort) (Table 5). Although directed fishing effort substantially decreased from 2005, harvest in 2009 was higher with 1,069 crappie harvested versus only 357 crappie harvested in 2005 (Table 11). The decrease in crappie fishing effort was offset by an increase in angler effort toward black basses.

Fisheries management plan for Nacogdoches Reservoir, Texas

Prepared – July 2008

ISSUE 1: Historically, hydrilla coverage in Nacogdoches Reservoir has exceeded 40%. In 2008 hydrilla coverage was 22% of the reservoir surface area.

MANAGEMENT STRATEGY

1. Continue to monitor aquatic vegetation annually (2009-2013). If hydrilla coverage expands beyond a coverage area that prompts public complaint within the next 4 years, meet with city officials and angling public to develop an integrated aquatic vegetation management plan.

ISSUE 2: During the creel survey conducted in the spring of 2005, approximately 52% of all anglers expressed that they would potentially retain a largemouth bass ≥ 21 inches. In 2008 a 16-inch maximum length limit was implemented prohibiting the retention of largemouth bass ≥ 16 inches unless the fish is greater than 24 inches and 13 pounds. Under this scenario, the fish must be donated to the Sharelunker program. All other fish greater than 16 inches must be immediately released back into the reservoir. The purpose of the 16-inch maximum length limit is to allow largemouth bass to achieve their growth potential and to promote a trophy bass fishery.

MANAGEMENT STRATEGY

1. In February 2009, a voluntary angler reporting program was implemented to monitor largemouth bass catch ≥ 21 inches/5 pounds. Through May 2009 an estimated 951 largemouth bass ≥ 21 inches/5 pounds were caught. The voluntary angler reporting program will be maintained through 2012 to monitor the success of the 16-inch maximum length regulation and to justify future stockings of both Florida and Sharelunker largemouth bass fingerlings.
2. A spring-quarter (March – May) creel survey will be conducted in 2013 to monitor catch, harvest, and directed effort of largemouth bass and to further evaluate the success and angler satisfaction of the 16-inch maximum length limit. Supplementary questions will be incorporated to monitor catch of fish ≥ 4 , 7, and 10 pounds.
3. Continue to monitor largemouth bass population size structure and growth to assess the success of the implemented maximum length limit by spring electrofishing (2010 and 2012) and fall electrofishing (2012).
4. Continue annual stockings of Florida largemouth bass at a rate of 50 fish/acre to maximize trophy fish abundance.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional aquatic vegetation surveys (2009-2012), spring electrofishing surveys (2010 and 2012), and a spring (March-May) creel in 2013. Standard monitoring with gill nets and fall electrofishing will be conducted in 2012-2013 (Table 12). Additional aquatic vegetation surveys are required to monitor hydrilla coverage. Additional spring electrofishing and creel surveys are conducted to evaluate the 16-inch maximum length limit regulation.

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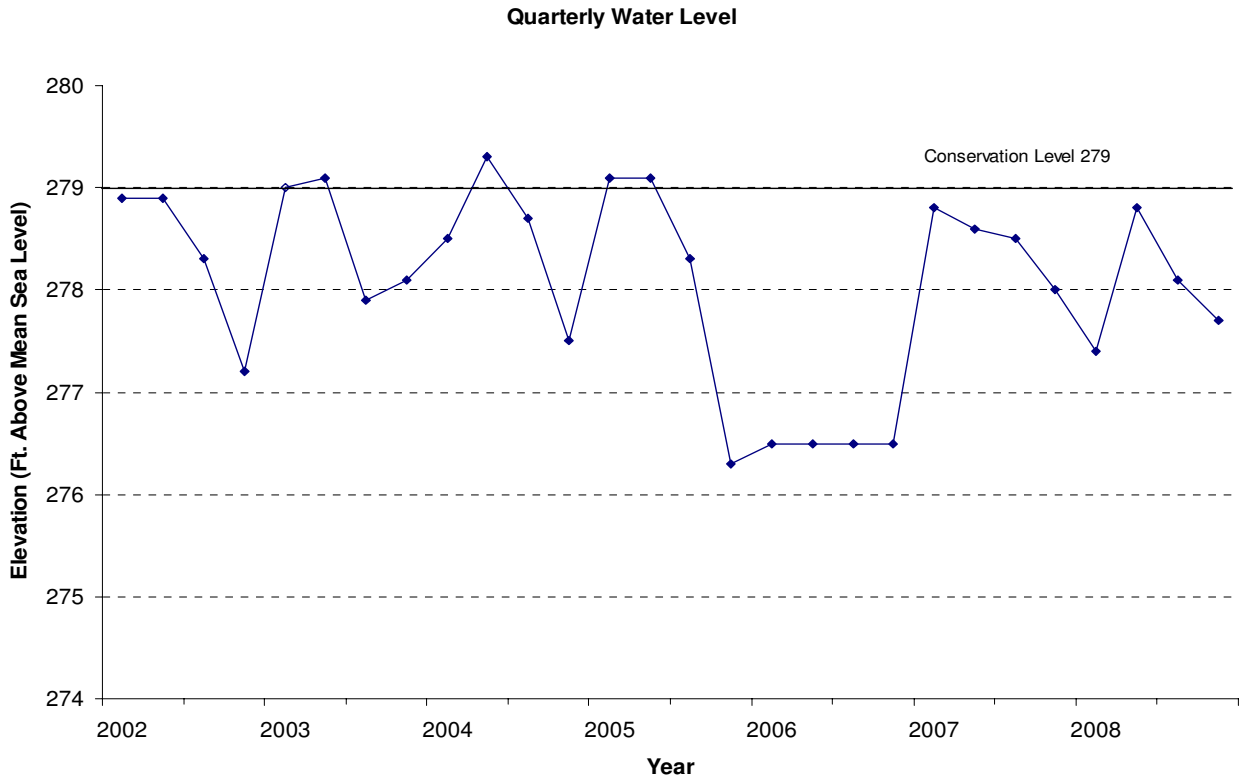


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Nacogdoches Reservoir, Texas.

Table 1. Characteristics of Nacogdoches Reservoir, Texas.

Characteristic	Description
Year constructed	1976
Controlling authority	City of Nacogdoches
Counties	Nacogdoches
Reservoir type	Secondary Stream
Shoreline Development Index (SDI)	2.3
Conductivity	120 umhos/cm

Table 2. Harvest regulations for Nacogdoches Reservoir, Texas.

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: largemouth ^{a,b}	5	No limit – 16
Bass: spotted ^a	5	No Limit - No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

^aBag limit for largemouth and spotted bass is 5 in the aggregate.

^bMaximum length limit of 16 inches for largemouth bass. Largemouth bass 24 inches or greater in length may be temporarily retained in a live well or other aerated holding device and immediately weighed using personal scales. Fish weighing over 13 pounds or more may be donated to the Sharelunker program; otherwise, the fish must be immediately released in Lake Nacogdoches.

Table 3. Stocking history of Nacogdoches, 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	1976	110,000	AFGL	7.9
	1977	100,300	AFGL	7.9
	Total	210,300		
Florida Largemouth bass	1977	221,400	FRY	1.0
	1999	500	FGL	2.9
	2000	110,743	FGL	1.4
	2002	110,152	FGL	1.6
	2008	110,762	FGL	1.6
	2009	110,661	FGL	1.7
	Total	664,218		
ShareLunker Largemouth Bass	2008	19,991	AFGL	6.4
	Total	19,991		

Table 4. Survey of littoral zone and physical habitat types, Nacogdoches Reservoir, Texas, 2008. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Riprap	0.2	0.5		
Rocky shoreline	7.6	27.9		
Eroded bank	0.9	3.3		
Indescript	1.7	6.2		
Overhanging brush	16.0	58.6		
Hydrilla			488	22.1
Pondweed (Floating leafed)			2	<1.0
Watershield (Floating leafed)			51	2.3
American lotus (Floating leafed)			516	23.3

Table 5. Percent directed angler effort by species for Nacogdoches Reservoir, Texas, March – May 2001, 2005, and 2009.

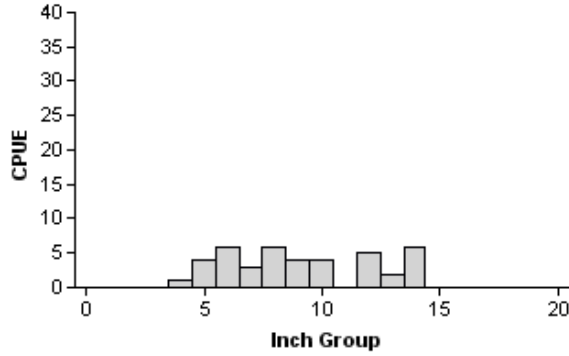
Species	Year		
	2001	2005	2009
Catfishes	1.3	0.1	1.9
Sunfishes	4.6	2.8	1.3
Black basses	80.7	62.6	85.6
Crappies	13.4	25.4	6.5
Anything	0.0	9.1	4.7

Table 6. Total fishing effort (h) for all species and total directed expenditures at Nacogdoches Reservoir, Texas, March – May 2001, 2005, and 2009.

Creel Statistic	Year		
	2001	2005	2009
Total fishing effort	22,655	19,473	20,664
Total directed expenditures	\$68,991	\$78,751	\$97,189

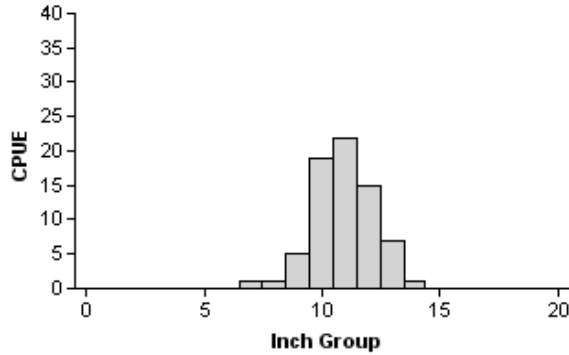
Gizzard Shad

2002



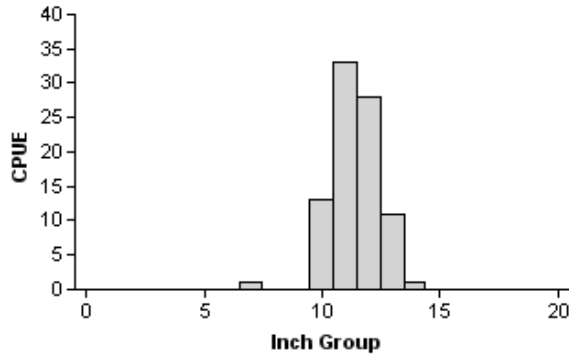
Effort = 1.0
 Total CPUE = 41.0 (36; 41)
 Stock CPUE = 30.0 (43; 30)
 PSD = 43 (13)
 IOV = 34.2 (19.5)

2004



Effort = 1.0
 Total CPUE = 71.0 (28; 71)
 Stock CPUE = 71.0 (28; 71)
 PSD = 63 (8.9)
 IOV = 1.4 (1.2)

2008



Effort = 1.0
 Total CPUE = 87.0 (23; 87)
 Stock CPUE = 87.0 (23; 87)
 PSD = 84 (2.9)
 IOV = 1.2 (1.2)

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, Nacogdoches Reservoir, Texas, 2002, 2004, and 2008.

Bluegill

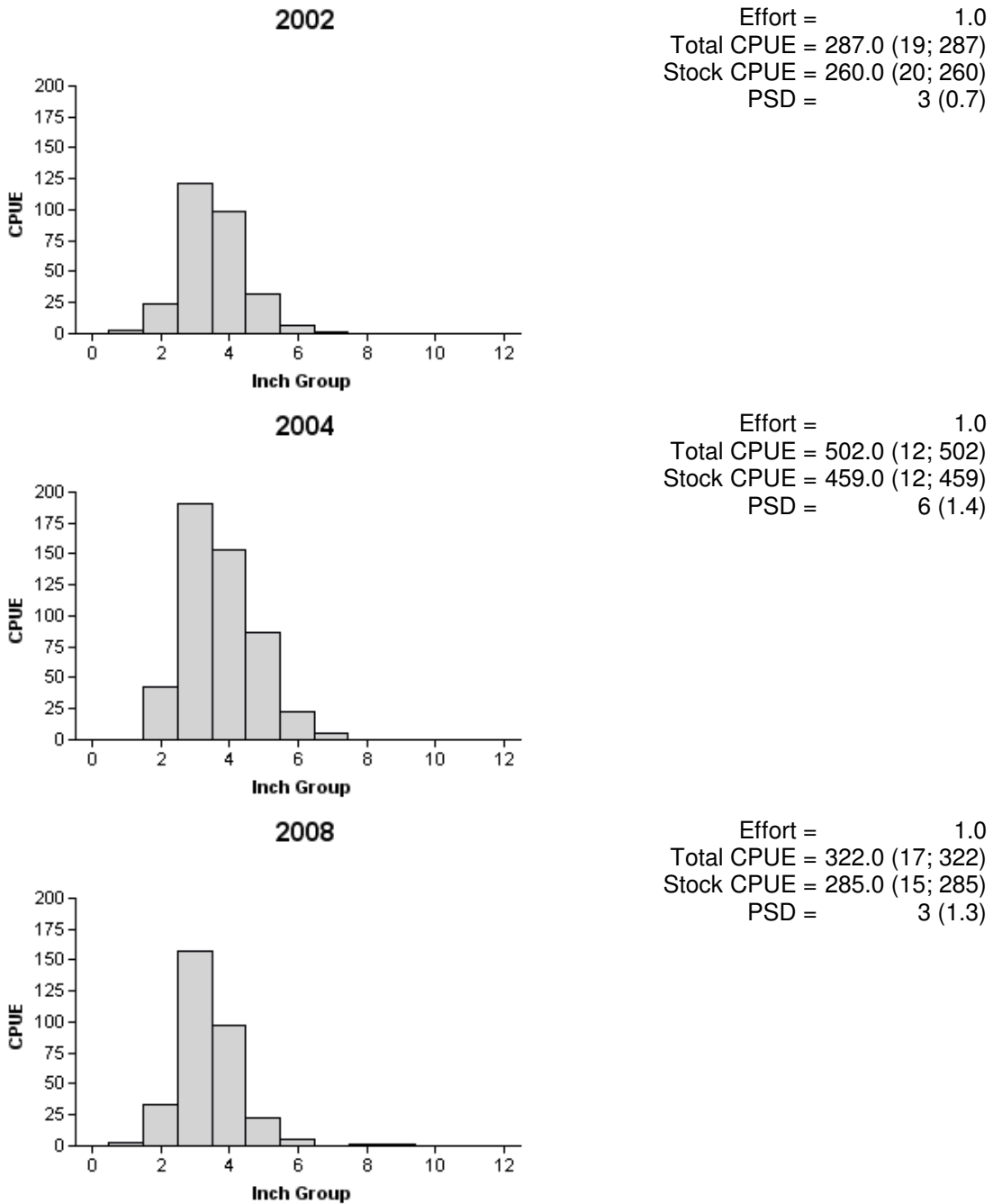


Figure 3. Number of bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Nacogdoches Reservoir, Texas, 2002, 2004, and 2008.

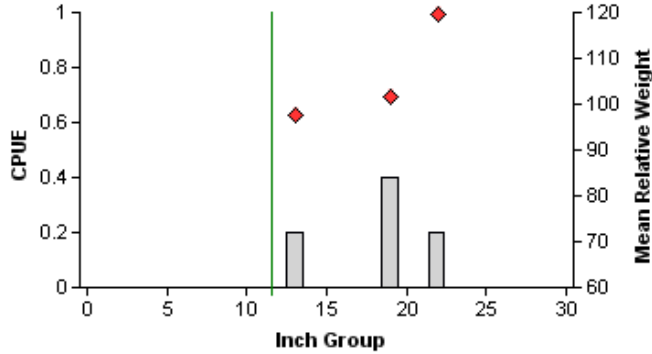
Sunfishes

Table 7. Creel survey statistics for sunfishes at Nacogdoches Reservoir from March through May 2001, 2005, and 2009, where total catch per hour is for anglers targeting sunfishes and total harvest is the estimated number of sunfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2001	2005	2009
Directed effort (h)	1,045.11 (49)	542.09 (58)	262.46 (84)
Directed effort/acre	0.47 (49)	0.25 (58)	0.12 (84)
Total catch per hour	2.37 (18)	1.51 (80)	8.25 (NA)
Total harvest	1,702.80 (58)	36.1 (755)	0.0 (0)
Harvest/acre	0.77 (58)	0.02 (755)	0.0 (0)
Percent legal released	61	96	100

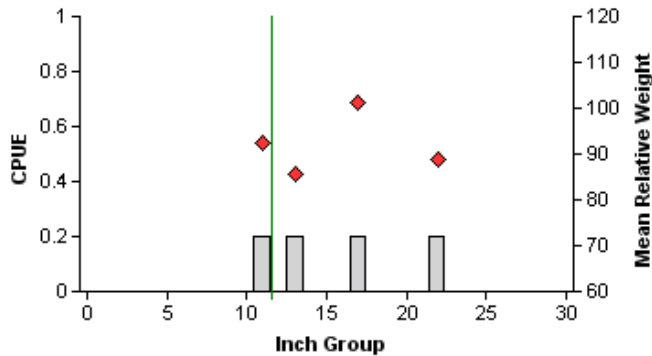
Channel Catfish

2001



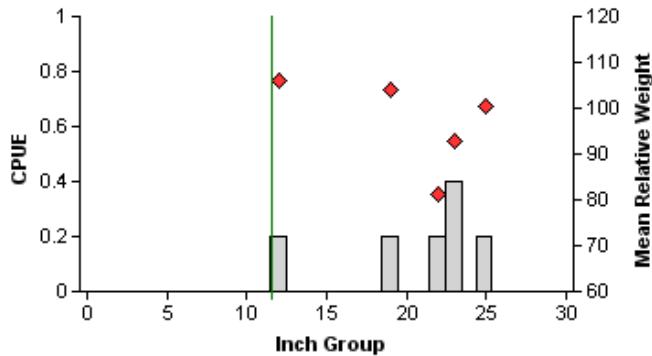
Effort = 5.0
 Total CPUE = 0.8 (61; 4)
 Stock CPUE = 0.8 (61; 4)
 PSD = 75 (19.8)
 RSD-12 = 100 (0)

2005



Effort = 5.0
 Total CPUE = 0.8 (47; 4)
 Stock CPUE = 0.8 (47; 4)
 PSD = 50 (34.2)
 RSD-12 = 75 (17.1)

2009



Effort = 5.0
 Total CPUE = 1.2 (49; 6)
 Stock CPUE = 1.2 (49; 6)
 PSD = 83 (15.9)
 RSD-12 = 100 (0)

Figure 4. Number of channel catfish caught per net night (CPUE, bars) mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Nacogdoches Reservoir, Texas, 2001, 2005, and 2009. Vertical lines indicate minimum length limit.

Catfishes

Table 8. Creel survey statistics for catfishes at Nacogdoches Reservoir from March through May 2001, 2005, and 2009, where total catch per hour is for anglers targeting catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2001	2005	2009
Directed effort (h)	297.73 (115)	14.68 (233)	393.68 (71)
Directed effort/acre	0.13 (115)	0.01 (233)	0.18 (71)
Total catch per hour	1.6 (89.6)	0.00 (0)	0.28 (20)
Total harvest	324.34 (110)	93.21 (276)	213.77 (102)
Harvest/acre	0.15 (110)	0.04 (276)	0.10 (102)
Percent legal released	15.6	13.8	0.1

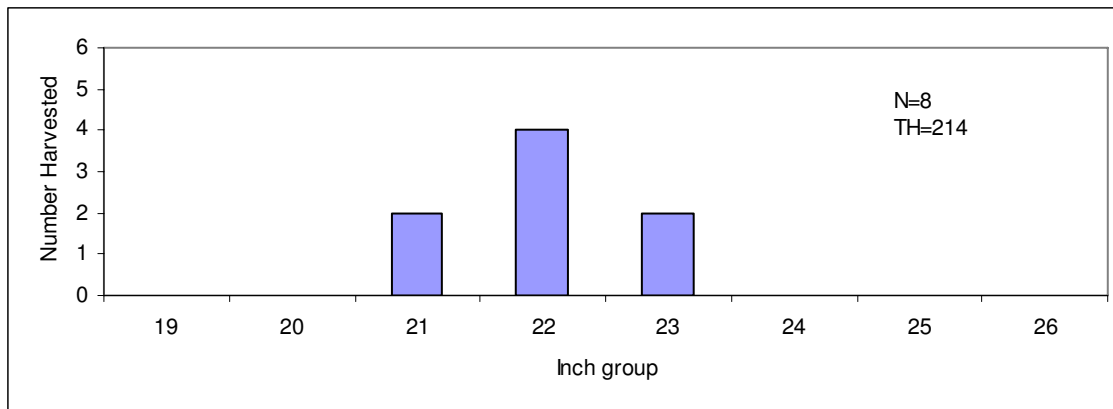


Figure 5. Length frequency of harvested channel catfish observed during creel surveys at Nacogdoches Reservoir, Texas, March through May 2009, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

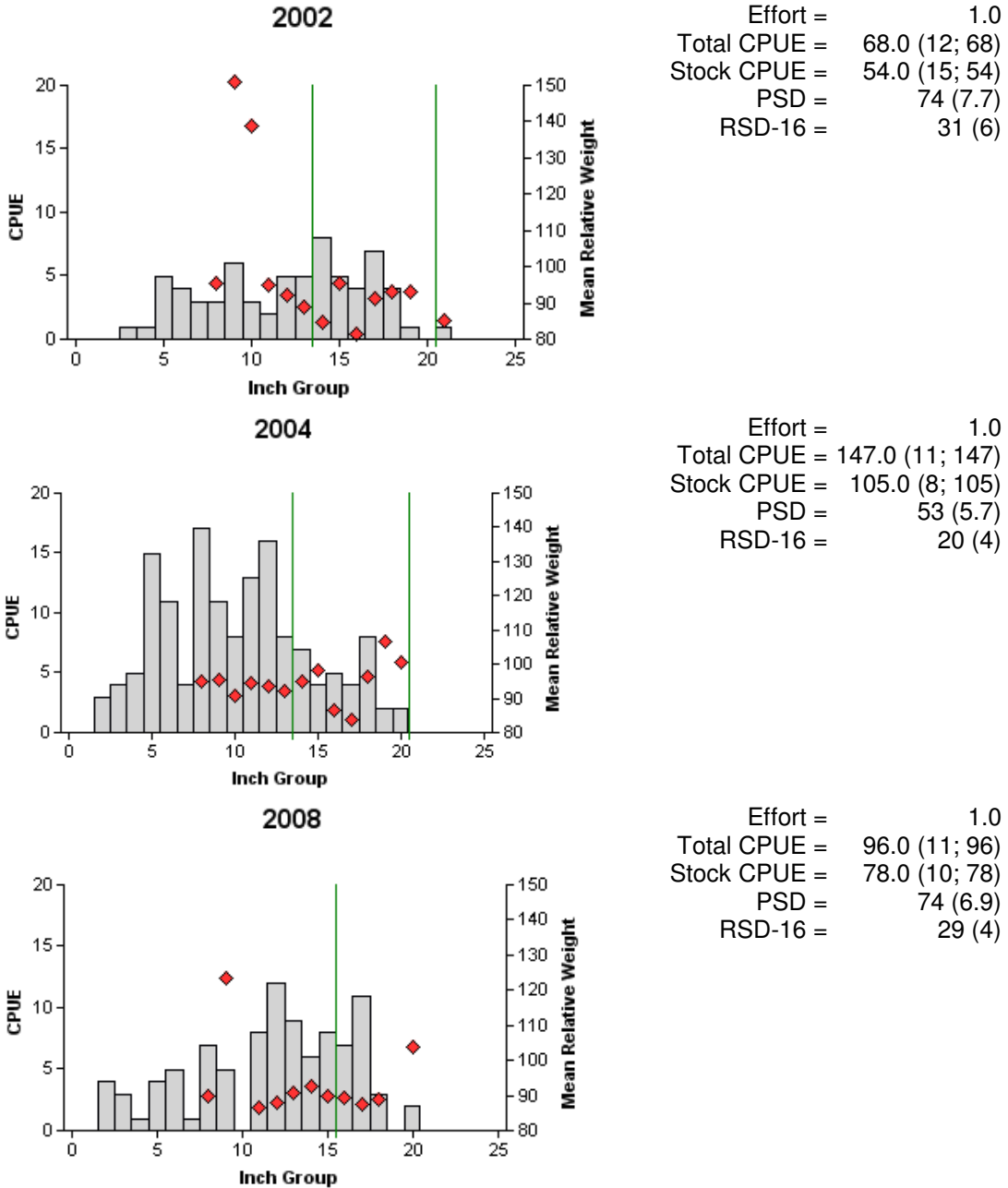


Figure 6. Number of largemouth bass caught per hour (CPUE, bars) mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Nacogdoches Reservoir, Texas, 2002, 2004, and 2008. Vertical lines indicate maximum and minimum length limit for 2002 and 2004, vertical line indicates maximum length limit for 2008.

Largemouth Bass

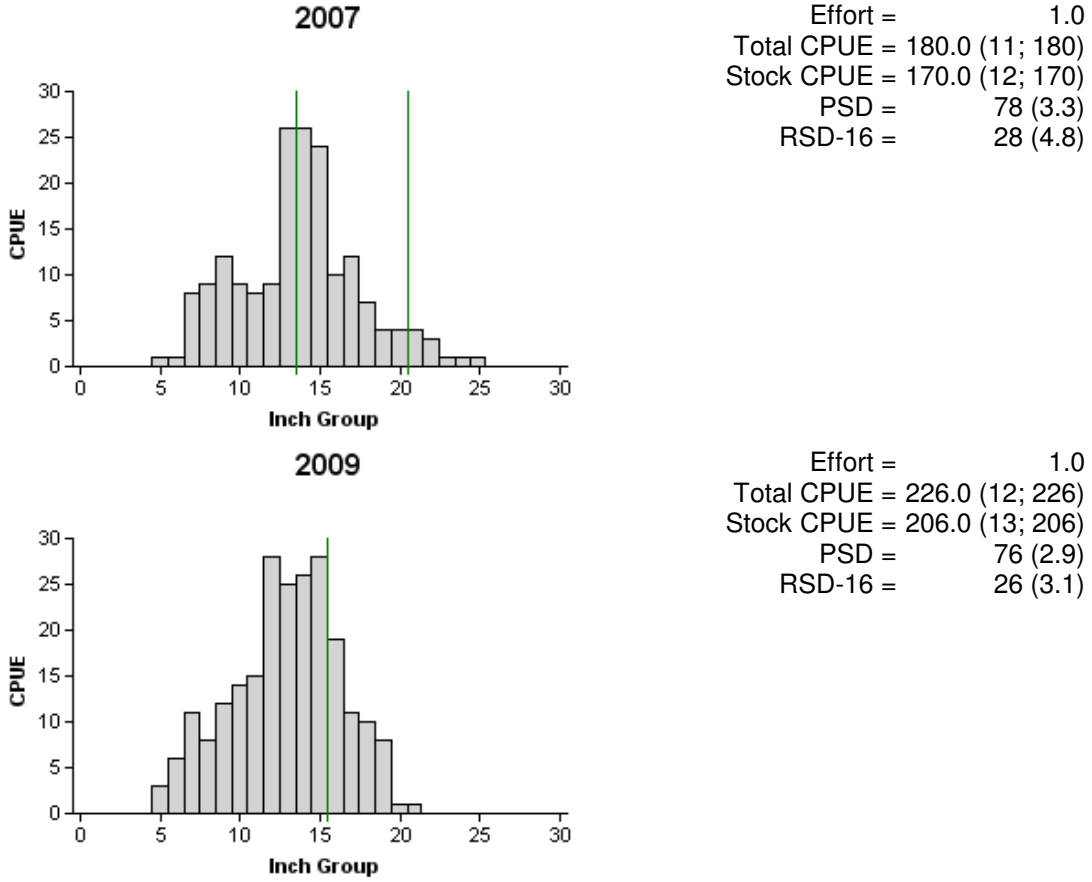


Figure 7. Number of largemouth bass caught per hour (CPUE, bars) mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Nacogdoches Reservoir, Texas, 2007 and 2009. Vertical lines indicate maximum and minimum length limit for 2007, vertical line indicates maximum length limit for 2009.

Largemouth Bass

Table 9. Creel survey statistics for largemouth bass at Nacogdoches Reservoir - Texas from March through May 2001, 2005, and 2009, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses. For estimated catch of ≥ 4 , ≥ 7 , and ≥ 10 pound fish, the percentages of total catch are provided (estimates are not available for 2001 and 2005).

Creel Survey Statistic	Year		
	2001	2005	2009
Directed effort (h)	18,286.61 (28)	12,191.39 (29)	17,684.22 (34)
Directed effort/acre	8.27 (28)	5.51 (29)	7.99 (34)
Total catch per hour	0.64 (14)	0.95 (10)	0.77 (11)
Total catch	12,199 (38)	11,729 (29)	13,918 (40)
$\geq 4 - 6.9$ pound fish			2,510 - 18.0%
$\geq 7 - 9.9$ pound fish			664 - 4.8%
≥ 10 pound fish			37 - 1.5%
Total harvest	783.83 (54)	926.61 (50)	774.90 (38)
Harvest/acre	0.35 (54)	0.42 (50)	0.35 (38)
Percent legal released	84	87	93

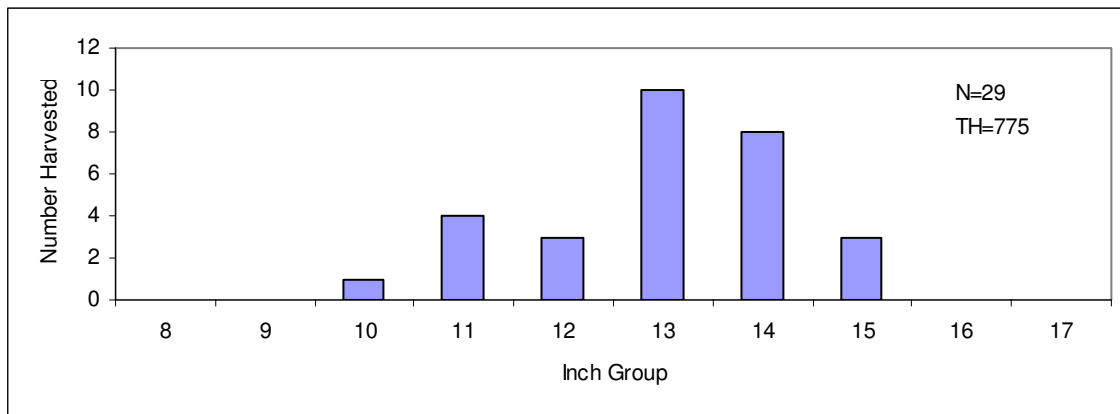


Figure 8. Length frequency of harvested largemouth bass observed during creel surveys at Nacogdoches Reservoir, Texas, March - May 2009, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 10. Results of genetic analysis of largemouth bass collected by fall electrofishing, Nacogdoches Reservoir, Texas, 2000 - 2008. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Fx = first or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype			% FLMB alleles	% pure FLMB
		FLMB	Fx	NLMB		
2000	44	10	34	0	71.0	22.7
2001	45	7	36	2	54.7	15.5
2004	38	3	34	1	52.6	7.9
2008	30	1	30	0	73.0	3.0

Crappies

Table 11. Creel survey statistics for crappies at Nacogdoches Reservoir from March through May 2001, 2005, and 2009, where total catch per hour is for anglers targeting crappies and total harvest is the estimated number of crappies harvested by all anglers. Relative standard errors (RSE) are in parentheses

Creel Survey Statistic	Year		
	2001	2005	2009
Directed effort (h)	3,025.96 (36)	4,948.86 (32)	1,356.51 (45)
Directed effort/acre	1.37 (36)	2.24 (32)	0.61 (45)
Total catch per hour	0.51 (61)	1.73 (15)	1.11 (67)
Total harvest	891.94 (12)	356.96 (100)	1,068.82 (84)
Harvest/acre	0.40 (12)	0.16 (100)	0.48 (84)
Percent legal released	22	0	7

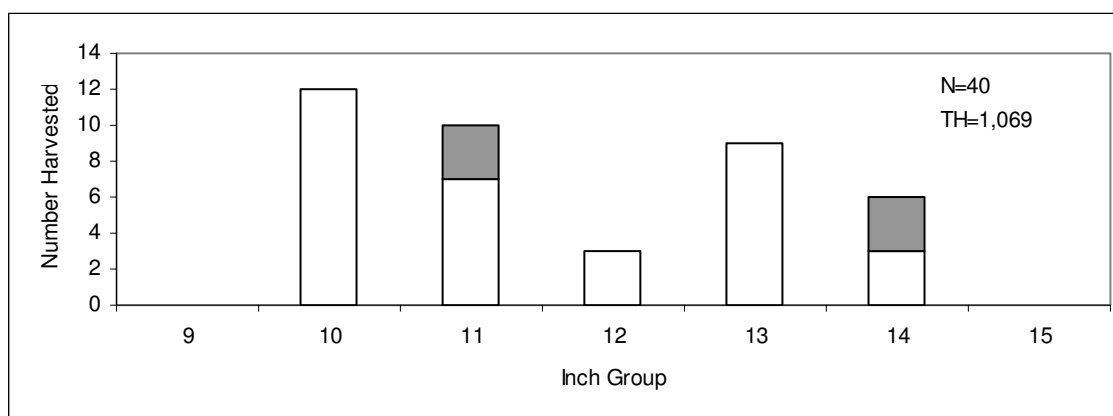


Figure 9. Length frequency of harvested crappies (white = white crappie; grey = black crappie) observed during creel surveys at Nacogdoches Reservoir, Texas, March 2009 through May 2009, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 12. Proposed sampling schedule for Nacogdoches Reservoir, Texas. Gill netting surveys are conducted in the winter, while electrofishing surveys are conducted in the fall and spring. Standard survey denoted by S and additional survey denoted by A.

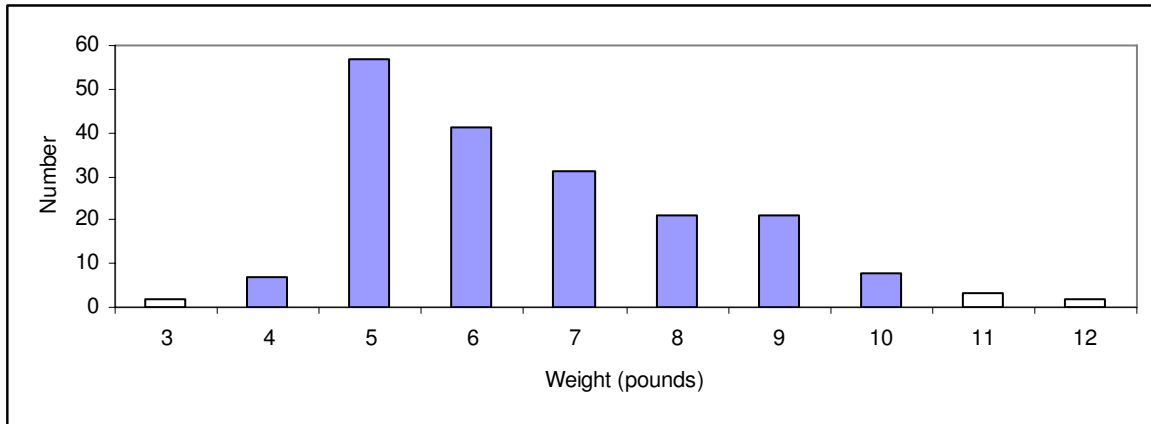
Survey Year	Fall Electrofisher	Spring Electrofisher	Gill Net	Creel Survey	Vegetation	Report
2009-2010					A	
2010-2011		A			A	
2011-2012					A	
2012-2013	S	A	S	A	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Nacogdoches Reservoir, Texas, 2008-2009.

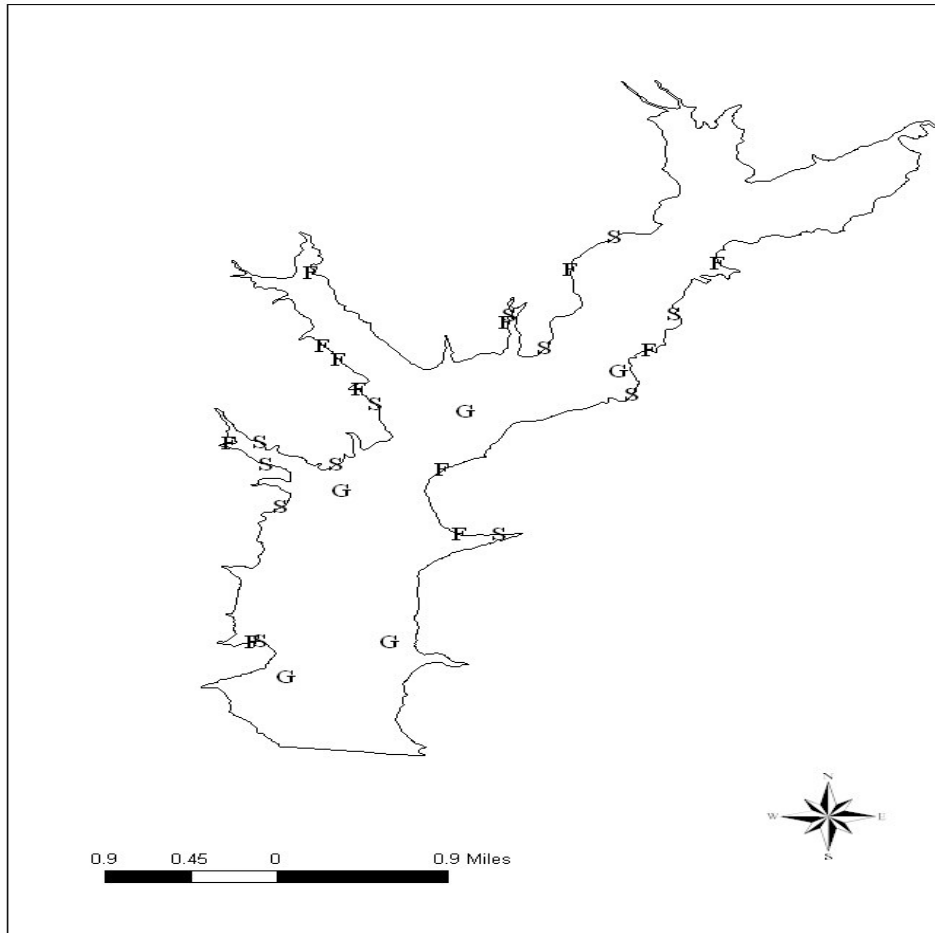
Species	Gill Netting		Fall Electrofishing		Spring Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	11	2.2	87	87.0		
Threadfin shad			22	22.0		
Spotted sucker	42	8.4				
Yellow bullhead	13	2.6				
Channel catfish	6	1.2				
Warmouth			1	1.0		
Bluegill			322	322.0		
Longear sunfish			2	2.0		
Redear sunfish			9	9.0		
Spotted sunfish			2	2.0		
Spotted bass	2	0.4			2	2.0
Largemouth bass	29	5.8	96	96.0	226	226.0
White crappie	5	1.0				
Black crappie	5	1.0				

APPENDIX B



Weight-frequency of largemouth bass \geq 3 pounds voluntarily reported by anglers from February 1 through May 31, 2009. N=193.

APPENDIX C



Location of sampling sites, Nacogdoches Reservoir, Texas, 2008-2009. Gill net, fall electrofishing, and spring electrofishing stations are indicated by G, F, and S respectively.