

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-1

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2010 Survey Report

**Worth Reservoir**

Prepared by:

Raphael Brock and Thomas Hungerford  
Inland Fisheries Division  
District 2-D, Fort Worth, Texas



Carter A. Smith  
Executive Director

Gary Saul  
Director, Inland Fisheries



July 31, 2011

## TABLE OF CONTENTS

Survey and management summary .....	2
Introduction.....	3
Reservoir description.....	4
Management history.....	4
Methods.....	5
Results and discussion.....	5
Fisheries management plan.....	7
Literature cited.....	9
Figures and tables.....	10-29
Water level (figure 1).....	10
Reservoir characteristics (table 1).....	10
Harvest regulations (table 2) .....	10
Stocking history (table 3).....	11
Habitat survey (table 4) .....	12
Percent directed effort (table 5).....	12
Gizzard shad (figure 2).....	13
Bluegill (figure 3) .....	14
Blue catfish (figures 4-5; table 6) .....	15
Channel catfish (figures 6-7; table 7) .....	17
White bass (figure 8-9; table 8).....	19
Spotted bass (figure 10).....	21
Largemouth bass (figures 11-13; table 9-10).....	22
White crappie (figures 14-15; table 11) .....	26
Proposed sampling schedule (table 12).....	28
Appendix A	
Catch rates for all species from all gear types .....	29
Appendix B	
Map of 2010-2011 sampling locations .....	30
Appendix C	
Historical catch statistics 1990-2011 .....	31

## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Worth Reservoir were surveyed in 2010 using electrofishing and trap netting, and in 2011 using gill netting. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Worth Reservoir is a 3,489-acre impoundment, located on the West Fork Trinity River. The reservoir is located entirely in the city limits of Ft. Worth in Tarrant County and was constructed in 1914 by the City as a municipal water supply. The elongated and serpentine reservoir extends approximately 6 miles upstream from the dam. Shoreline length is approximately 36 miles. Angler and boat access was adequate. However, parts of the reservoir are very shallow and limit boat traffic. Non motorized boat access is available in the north end of the reservoir within the Fort Worth Nature Center. There were two handicap-accessible fishing piers on the reservoir. Fishery habitat was primarily shoreline and sporadic stands of native emergent vegetation in the form of water willow, *Justicia americana*, and bulrushes, *Scirpus species*, and also rocky shoreline. Water levels are not allowed to decrease more than 2 foot below conservation pool because of drinking water quality concerns. The City of Fort Worth is planning to dredge the reservoir to increase water storage capacity, improve water quality, and increase water recreation.
- **Fish consumption advisory history:** Worth Reservoir is currently under a fish-consumption advisory because of elevated levels of polychlorinated biphenyls (PCBs) in fish tissues. The advisory was first implemented by the Department of State Health Services (DSHS) in April 2000 and advised no consumption of any species. The advisory was amended in 2010 to advise no consumption of blue and channel catfish and smallmouth buffalo. During a recent creel survey, 82% of anglers surveyed indicated they were aware of the fish consumption advisory. More information concerning the advisory can be found at <http://www.dshs.state.tx.us/seafood/>.
- **Creel summary:** A 36 day annual creel was conducted from June 2010 through May 2011. Surveys indicated that 58% of anglers were seeking largemouth bass. Largemouth bass were followed by anglers seeking anything (18%), followed by white crappie (9%), and channel catfish (8.0%). A high percentage of legal sized fish that were caught were released. This is probably the result of the fish consumption advisory.
- **Management history:** Important sport fishes include largemouth bass, white crappie, white bass, and blue and channel catfish. All species have been managed with statewide regulations.
- **Fish Community**
  - **Prey species:** Gizzard and threadfin shad were in great abundance in the reservoir. Bluegill and longear sunfish were also very abundant with fish over 6 inches available for anglers.
  - **Catfishes:** The blue catfish catch rate increased from the previous survey. The population is above average in abundance with quality fish available for anglers. The catch rate of channel catfish remained high with quality fish available for anglers. Flathead catfish were present but none were captured this past survey year.
  - **White bass:** White bass catch rate increased from previous survey and an adequate population exists for anglers.

- **Black basses:** The spotted bass population catch rate was similar to previous survey with the size distribution being average. The largemouth bass total catch rate has increased slightly in abundance from the previous survey. Size distribution of the population is average.
- **Crappie:** The white crappie population continued to be high in abundance with quality fish available for anglers. Black crappie were present but in low abundance.
- **Management Strategies:** General monitoring with electrofishing and trap netting will be conducted in 2014 and gill netting surveys will be conducted in 2015. Because of the high directed effort for largemouth bass, available habitat, and low genetic influence, Florida largemouth bass will be stocked in consecutive years and success evaluated with electrofishing in 2014. We also plan to work with the City of Fort Worth to improve non motorized access in the upper end of the reservoir and provide input during planning stages of the dredging project.

## INTRODUCTION

This document is a summary of fisheries data collected from Worth 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*

Worth Reservoir is a 3,489-acre impoundment, located on the West Fork Trinity River. The reservoir is located entirely in the city limits of Ft. Worth in Tarrant County and was constructed in 1914 by the City as a municipal water supply. The elongated and serpentine reservoir extends approximately 6 miles upstream from the dam. Shoreline length is approximately 36 miles. Angler and boat access was adequate. However, areas of the reservoir are very shallow and limit boat traffic. There were two handicap-accessible fishing piers on the reservoir. Fishery habitat was primarily shoreline and sporadic stands of native emergent vegetation in the form of water willow, *Justicia americana*, and bulrushes, *Scirpus species*, and also rocky shoreline. Water levels are not allowed to decrease more than 2 foot below conservation pool because of drinking water quality concerns. Worth Reservoir is currently under a fish-consumption advisory. Worth Reservoir is a eutrophic reservoir (Texas Commission on Environmental Quality 2005). Other descriptive characteristics for Worth Reservoir are in Table 1.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Brock and Hungerford 2007) included:

Continue communication with Department of State Health Services (DSHS), United States Geological Survey (USGS), and the City of Fort Worth's Environmental Service Division regarding future testing of fish tissue and possible removal of contaminated sediments. Continue informing and educating the public regarding the fish consumption advisory and catch and release opportunities

**Actions:** The DSHS collected and tested more fish tissues. The fish consumption advisory was modified to allow harvest of all species with the exception of blue and channel catfish and smallmouth buffalo. Fish advisory signs were placed at public access points around the reservoir. We also attended two meetings regarding the dredging of Worth Reservoir. Although dredging is still planned, no time frame has been established. No current creel data are available for Worth Reservoir. Anecdotal evidence indicates increased tournament and largemouth bass fishing activities.

**Actions:** A 36 day annual creel survey was conducted from June 2010 – May 2011. Results are included in this report.

**Harvest regulation history:** Sport fish populations in Worth Reservoir have been managed with statewide regulations (Table 2).

**Stocking history:** The last stocking of Worth Reservoir occurred in 1999. The stocking consisted of 179,209 Florida largemouth bass. The complete stocking history is in Table 3.

**Vegetation/habitat history:** Worth Reservoir aquatic vegetation is currently composed of shoreline and sporadic stands of native emergent species including water willow and bulrushes. Water levels are not allowed to decrease more than 2 foot below conservation pool because of drinking water quality concerns, thus historically, habitat has remained fairly constant.

**Water transfer:** Worth Reservoir is a main drinking water supply for the City of Fort Worth. Although no

transfer water is pumped directly into the reservoir, water is pumped from Richland Chambers, Cedar Creek, and Benbrook Reservoirs into Eagle Mountain Reservoir which releases water into Worth Reservoir.

**Fish consumption advisory history:** Worth Reservoir is currently under a fish-consumption advisory because of elevated levels of polychlorinated biphenyls (PCBs) in fish tissues. The advisory was first implemented by the Department of State Health Services (DSHS) in April 2000 and advised no consumption of any species. The advisory was amended in 2010 to advise no consumption of blue and channel catfish and smallmouth buffalo. During a recent creel survey, 82% of anglers surveyed indicated they were aware of the fish consumption advisory. More information concerning the advisory can be found at <http://www.dshs.state.tx.us/seafood/>.

## METHODS

Fishes were collected by electrofishing (1.0 hours at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap 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/hr) of actual electrofishing and, for gill and trap 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 2008).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distributions (PSD) as defined by Guy et al. (2007)], and condition indices [relative weight ( $W_r$ )] 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 ( $RSE = 100 \times SE \text{ of the estimate/estimate}$ ) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. A category 1 age and growth analysis was conducted on largemouth bass in fall 2010 (TPWD, Inland Fisheries Division, unpublished manual revised 2008). Ages were determined using otoliths. Source for water level data was the United States Geological Survey website.

## RESULTS AND DISCUSSION

**Habitat:** Littoral zone habitat consisted mainly of shoreline and sporadic stands of emergent aquatic vegetation in the form of water willow and bulrushes and rocky shoreline (Table 4).

**Creel:** A 36 day annual creel was conducted from June 2010 through May 2011. Surveys indicated that 58% of anglers were seeking largemouth bass (Table 5). Largemouth bass were followed by anglers seeking anything (18%), white crappie (9%), and channel catfish (8%). A high percentage of legal sized fish that were caught were released. This is probably the result of the fish consumption advisory.

**Prey species:** The 2010 fall electrofishing catch rate of threadfin was 163.0/hr which was below the district average of 267.0/hr (Appendix A). The gizzard shad catch rate of 470.0/hr was well above the district average of 278.2/hr and similar to the catch rate observed in 2006 (480.0/hr; Figure 2). Index of vulnerability for gizzard shad was high, indicating that 86% of gizzard shad captured in 2010 were available to existing predators; this was lower than IOV estimate in previous sample. The electrofishing catch rate of bluegill in 2010 of 813.0/hr was more than double the catch rate observed in 2006 and higher than the district average of 195.8/hr (Figure 3). The catch rate of bluegill >6 inches in 2010 (100.0/hr) increased greatly from previous samples. Two percent of anglers, mostly bank anglers, surveyed sought bluegill while fishing (Table 5). The longear sunfish catch rate observed in 2010 (491.0/hr) was also much higher than rates observed in previous samples and much higher than the district average of 93.6/hr (Appendix C).

**Catfishes:** The gill netting catch rate of blue catfish in 2011 of 9.8/nn was the highest catch rate observed

for the species and above the district average of 1.7/nn (Figure 5). Size structure of the blue catfish population was good as indicated by a PSD value of 33 and a PSD-P value of 14. Body conditions of the blue catfish were average with relative weight values near 90 for most size classes. A blue catfish weighing 52.75 pounds was caught during a catfish tournament held on the reservoir which was just below the lake record. Although a good population of blue catfish exists in the reservoir, the percentage of anglers seeking the species was low (2.7%). Catch rate by anglers for blue catfish was 0.2 fish/hr with an estimated harvest of 182 fish (Table 6; Figure 6). The gill net catch rate of channel catfish was 9.6 /nn in 2011 which was similar to previous sample (12.4/nn in 2007; Figure 7). Size structure remained average as indicated by PSD and PSD-P values of 41 and 0, respectively. Channel catfish was the third most sought after species (8%). The catch rate by anglers was low (0.1 fish/hr) with an estimated 883 channel catfish being harvest (Table 7; Figure 8).

**White bass:** The 2010 gill netting catch rate of white bass of 7.6/nn was near the district average of 8.0/nn (Figure 9). This catch rate was above the rate observed in the 2007 (2.8/nn). Size structure of the population was good as indicated by PSD and PSD-P values of 21 and 18, respectively. Only 1.8 % of anglers surveyed targeted white bass while fishing. Angler catch rate of white bass was 0.9/hr with an estimated 383 fish harvested (Table 8; Figure 10).

**Black basses:** The total electrofishing catch rate of spotted bass in 2010 was 45.0/hr which was slightly higher than the catch rate observed in 2006 (38.0/hr) and higher than the district average of 26.9/hr (Figure 11). Size structure of the spotted bass population was good as indicated by a PSD value of 34. The total electrofishing catch rate of largemouth bass continued to show improvement from previous samples with a catch rate of 146.0/hr (Figure 12). The size structure of the population improved from previous samples as indicated by a PSD value of 29. Body conditions in 2010 were at or near optimal for most size classes of fish. Growth of largemouth bass in Worth Reservoir was slow with fish reaching 14 inches after age 3 (Figure 13). Largemouth bass was the most sought after species by anglers (58%). Catch rate by anglers was 0.6/hr with an estimated 235 fish harvested (Table 9; Figure 14). Florida largemouth bass influence was low as Florida alleles were 24.0% in 2010 and Florida genotype was 0 (Table 9).

**White crappie:** The trap netting catch rate of white crappie was 13.8/nn in 2010, which is similar to the previous surveys and district average of 14.4/nn and (Figure 15). The size structure of the population was very good as indicated by a PSD value of 71. White crappie was the third most sought after species by anglers (9%). Catch rate by anglers was 0.5 fish/hr with an estimated 445 fish being harvested (Table 11; Figure 16). Black crappie are present in the reservoir but historical catch rates have been low. However the 2010 trap netting catch rate was 4.6/nn.

## Fisheries management plan for Worth Reservoir, Texas

Prepared – July 2011.

**ISSUE 1:** A fish consumption advisory was implemented on Worth Reservoir in 2000 and amended in 2010 due to elevated levels of PCB's in fish tissues.

### MANAGEMENT STRATEGIES

1. Continue communication with DSHS, USGS, and the City of Fort Worth's Environmental Services Division regarding future testing of fish tissue and possible removal of contaminated sediments.
2. Continue informing and educating the public regarding the fish consumption advisory through news releases and signage maintenance.

**ISSUE 2:** Worth Reservoir receives a high percentage of angler effort towards largemouth bass. The reservoir has better habitat than most district reservoirs because of minimal water level fluctuations. The current reservoir record for largemouth bass is 12.0 lbs. The latest genetic analysis revealed a 24% FLMB alleles with 0% FLMB genotype.

### MANAGEMENT STRATEGY

1. Request FLMB stockings in 2012 and 2013 and conduct genetic analysis in 2014-2015.

**ISSUE 3:** The Fort Worth Nature Center (FWNC) offers non-motorized boat access to the upper end of the reservoir. However the number of users is unknown. Access to the reservoir via the FWNC could be improved.

### MANAGEMENT STRATEGY

1. Work with the City of Fort Worth to get an estimate of the number of non-motorized boaters that use the FWNC access. These data could be used to support efforts to promote fishing in the upper end of the reservoir and make improvements to access areas.

**ISSUE 4:** 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.
4. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.



**ISSUE 5:** Worth reservoir is nearly 100 hundred years old and over time has suffered because of siltation. The siltation has resulted in areas of the reservoir becoming very shallow and difficult to access by boat anglers. The City of Fort Worth is planning to dredge the reservoir to increase water storage capacity, to improve water quality, and increase water recreation.

**MANAGEMENT STRATEGIES**

1. Work with the City of Fort Worth and TPWD watershed management personnel to assist with development of dredging plan.

**SAMPLING SCHEDULE JUSTIFICATION**

General monitoring of sport fish species with electrofishing, trap netting, and gill netting will be conducted every 4 years with the next sampling and report scheduled for 2014-2015.

## 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, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- Brock, R. and T. Hungerford. 2007. Statewide freshwater fisheries monitoring and management program survey report for Worth Reservoir, 2006. Texas Parks and Wildlife Department, Federal Aid Report F-30-R31, Austin.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between Reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16: 888-895.
- Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional Size Distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7):348.
- Texas Commission on Environmental Quality. 2005. Trophic classification of Texas reservoirs.. Austin, TX. 15 pp

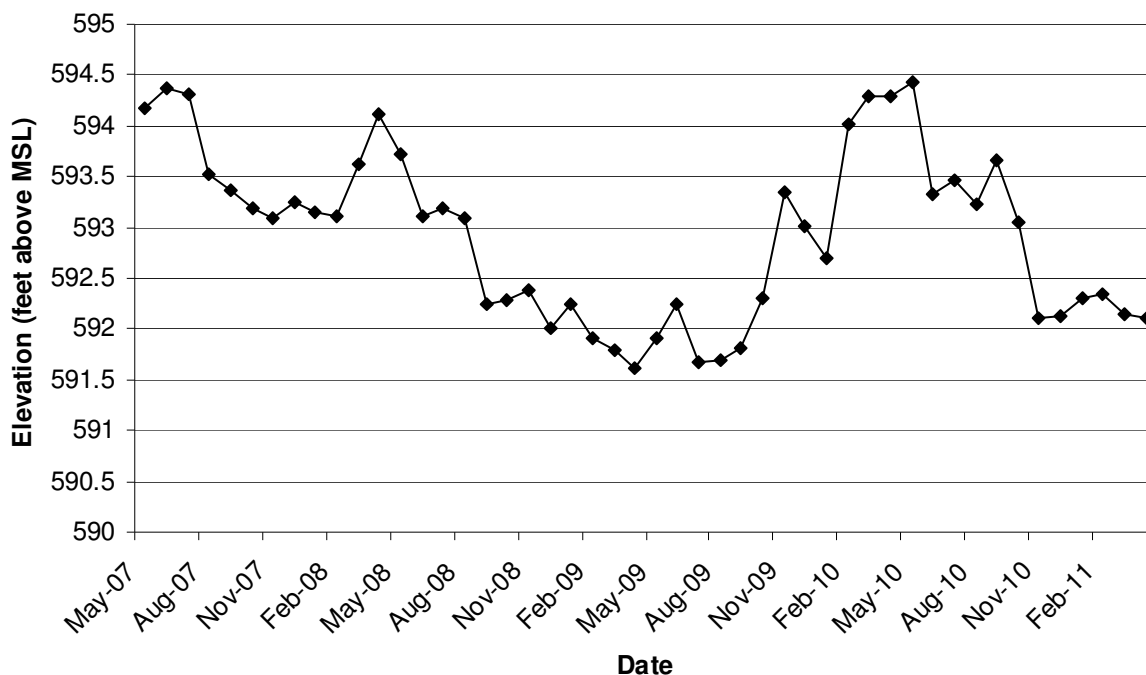


Figure 1. Mean monthly water level elevations in feet above mean sea level (MSL) recorded for Worth Reservoir, Texas from January 2007-April 2011. Conservation pool is 594 feet above MSL.

Table 1. Characteristics of Worth Reservoir, Texas.

Characteristic	Description
Year Constructed	1914
Controlling authority	City of Fort Worth
Counties	Tarrant
Reservoir type	Mainstream Trinity River
Conductivity	375 umhos/cm

Table 2. Harvest regulations for Worth Reservoir Texas.

Species	Bag limit	Length limit (inches)
Catfish: channel, blue, their hybrids and subspecies	25	12 minimum
Catfish: flathead	5	18 minimum
Bass, white	25	10 minimum
Bass: spotted	5	none
Bass: largemouth	In any combination	14 minimum
Crappie: white and black, their hybrid and subspecies	25	10 minimum

Table 3. Stocking history of Worth Reservoir, 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)
Blue catfish	1990	36,465	FGL	2.0
	Total	36,465		
Channel catfish	1972	35,000	AFGL	7.9
	Total	35,000		
Florida largemouth bass	1975	150,012	FRY	1.0
	1991	178,173	FGL	1.2
	1994	178,606	FGL	1.3
	1999	179,209	FGL	1.3
	Total	686,000		
Green sunfish x redear sunfish	1972	15,000		UNK
	Total	15,000		
Largemouth bass	1967	200,000	UNK	UNK
	1969	200,000	UNK	UNK
	1971	50,000	UNK	UNK
	1980	85	UNK	UNK
	Total	450,085		
Palmetto bass (striped X white bass hybrid)	1978	12,666	UNK	UNK
	1979	1,093,000	FRY	0.4
	1981	948,550	FRY	0.4
	Total	2,054,216		
Threadfin shad	1984	1,000	AFGL	3.0
	Total	1,000		

Table 4. Survey of littoral zone and physical habitat types, Worth Reservoir, Texas, 2010. 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.

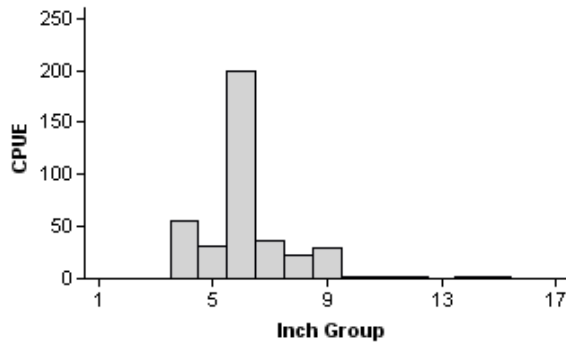
Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Bulk head	0.7	1.4		
Bulk head and piers and docks	0.4	0.8		
Native emergent	19.5	38.2	72.1	2.0
Native emergent + natural	12.1	23.7		
Native emergent + natural + boat dock	2.8	5.5		
Native emergent + boat dock	3.4	6.7		
Native emergent + rocky shoreline	5.1	10.0		
Native emergent + rocky shoreline + boat dock	1.8	3.5		
Natural	0.3	0.6		
Natural + boat dock	0.8	1.6		
Natural + rocky shoreline	0.9	1.8		
Rock bluff	1.4	2.7		
Rocky shoreline	1.2	2.4		
Rocky shoreline + boat dock	0.6	1.2		

Table 5. Percent directed angler effort by species, for Worth Reservoir, Texas, from June 2010 through May 2011.

Species	Percent Directed Effort
Blue catfish	3
Channel Catfish	8
White bass	2
Bluegill	2
Largemouth bass	58
Anything	18

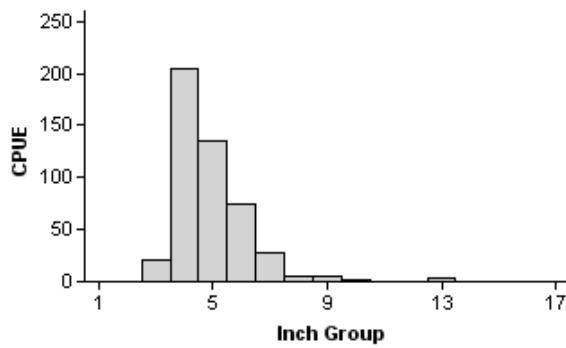
## Gizzard Shad

2002



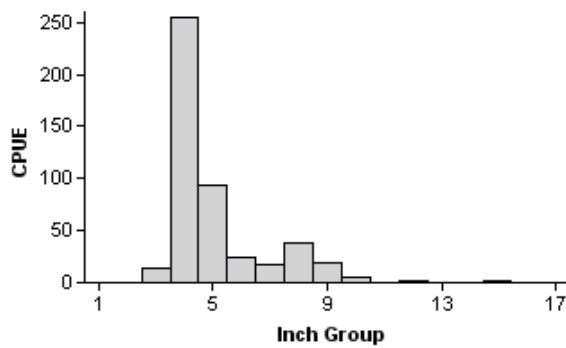
Effort = 1.0  
 Total CPUE = 380.0 (17; 380)  
 Stock CPUE = 94.0 (28; 94)  
 IOV = 85 (4.1)

2006



Effort = 1.0  
 Total CPUE = 480.0 (55; 480)  
 Stock CPUE = 45.0 (19; 45)  
 IOV = 96 (1.9)

2010

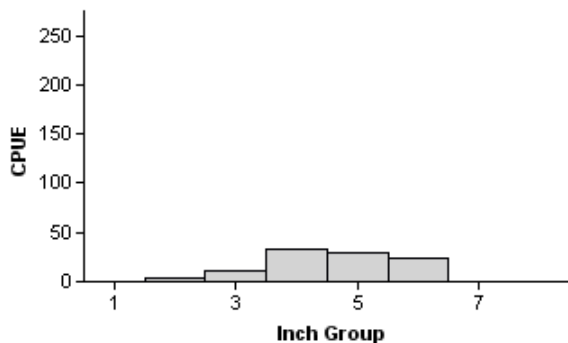


Effort = 1.0  
 Total CPUE = 470.0 (25; 470)  
 Stock CPUE = 83.0 (24; 83)  
 IOV = 86 (4)

Figure 2. Number of gizzard shad caught per hour (CPUE; bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Worth Reservoir, Texas, 2002, 2006, and 2010.

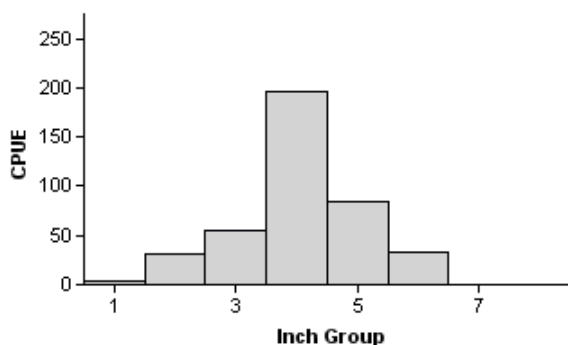
## Bluegill

2002



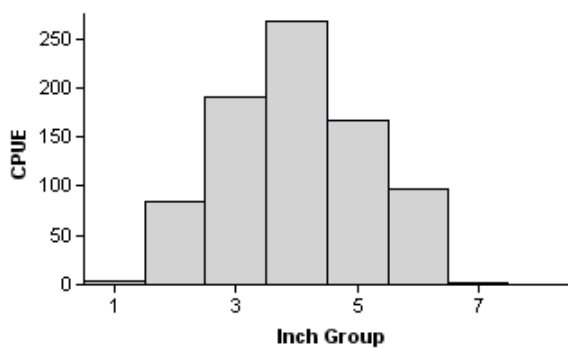
Effort = 1.0  
 Total CPUE = 100.0 (28; 100)  
 Stock CPUE = 97.0 (29; 97)  
 CPUE-6 = 23.0 (37; 23)  
 PSD = 24 (5.6)

2006



Effort = 1.0  
 Total CPUE = 404.0 (18; 404)  
 Stock CPUE = 369.0 (18; 369)  
 CPUE-6 = 33.0 (19; 33)  
 PSD = 9 (1.4)

2010

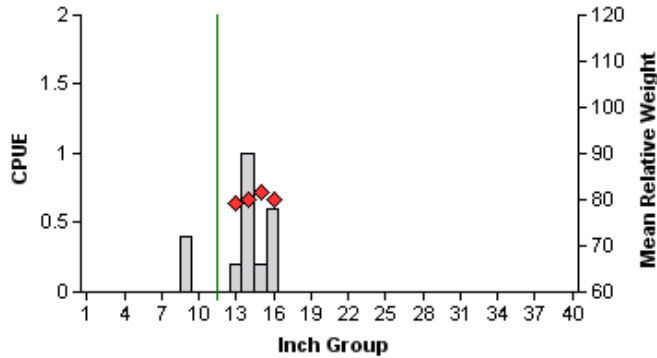


Effort = 1.0  
 Total CPUE = 813.0 (16; 813)  
 Stock CPUE = 725.0 (16; 725)  
 CPUE-6 = 100.0 (23; 100)  
 PSD = 14 (2)

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, Worth Reservoir, Texas, 2002, 2006, and 2010.

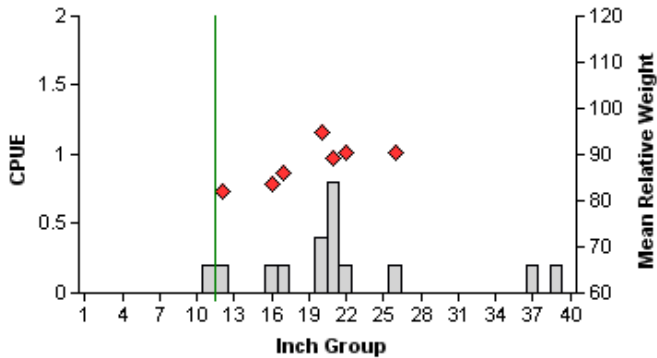
## Blue Catfish

2003



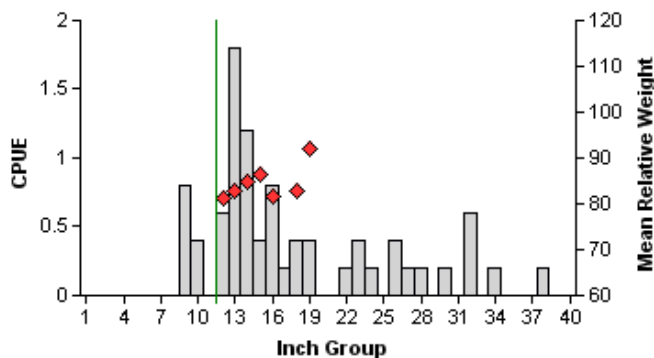
Effort = 5.0  
 Total CPUE = 2.4 (36; 12)  
 Stock CPUE = 2.0 (32; 10)  
 CPUE-12 = 2.0 (32; 10)  
 PSD = 0 (74.2)  
 PSD-P = 0 (0)

2007



Effort = 5.0  
 Total CPUE = 2.8 (43; 14)  
 Stock CPUE = 2.6 (45; 13)  
 CPUE-12 = 2.6 (45; 13)  
 PSD = 77 (4.3)  
 PSD-P = 15 (9.7)

2011



Effort = 5.0  
 Total CPUE = 9.8 (8; 49)  
 Stock CPUE = 8.6 (9; 43)  
 CPUE-12 = 8.6 (9; 43)  
 PSD = 33 (9.2)  
 PSD-P = 14 (5.6)

Figure 4. Number of blue catfish caught per net night (CPUE; bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Worth Reservoir, Texas, 2003, 2007, and 2011. Vertical line represents length limit at time of sampling.



Table 6. Creel survey statistics for blue catfish at Worth Reservoir from June 2010 through May 2011, where total catch per hour is for anglers targeting blue catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2010/2011
Percent directed effort	3.0
Directed effort (h)	1082.9 (44.7)
Directed effort/acre	0.31
Total catch per hour	0.2 (241.3)
Total harvest	182 (5.3)
Harvest/acre	0.05
Percent legal released	68.2

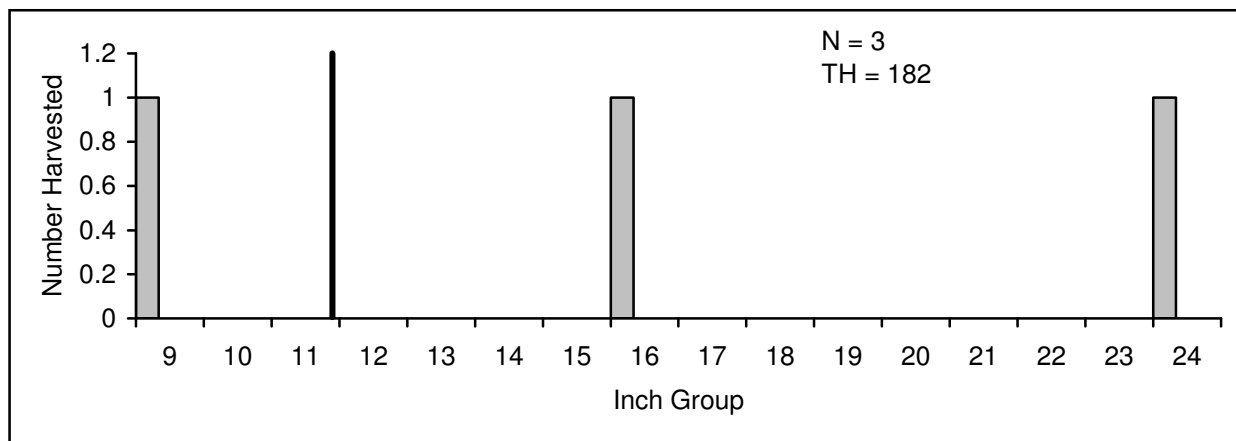


Figure 5. Length frequency of harvested blue catfish observed during creel surveys at Worth Reservoir from June 2010 through May 2011 all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents minimum length limit at time of sampling.

## Channel Catfish

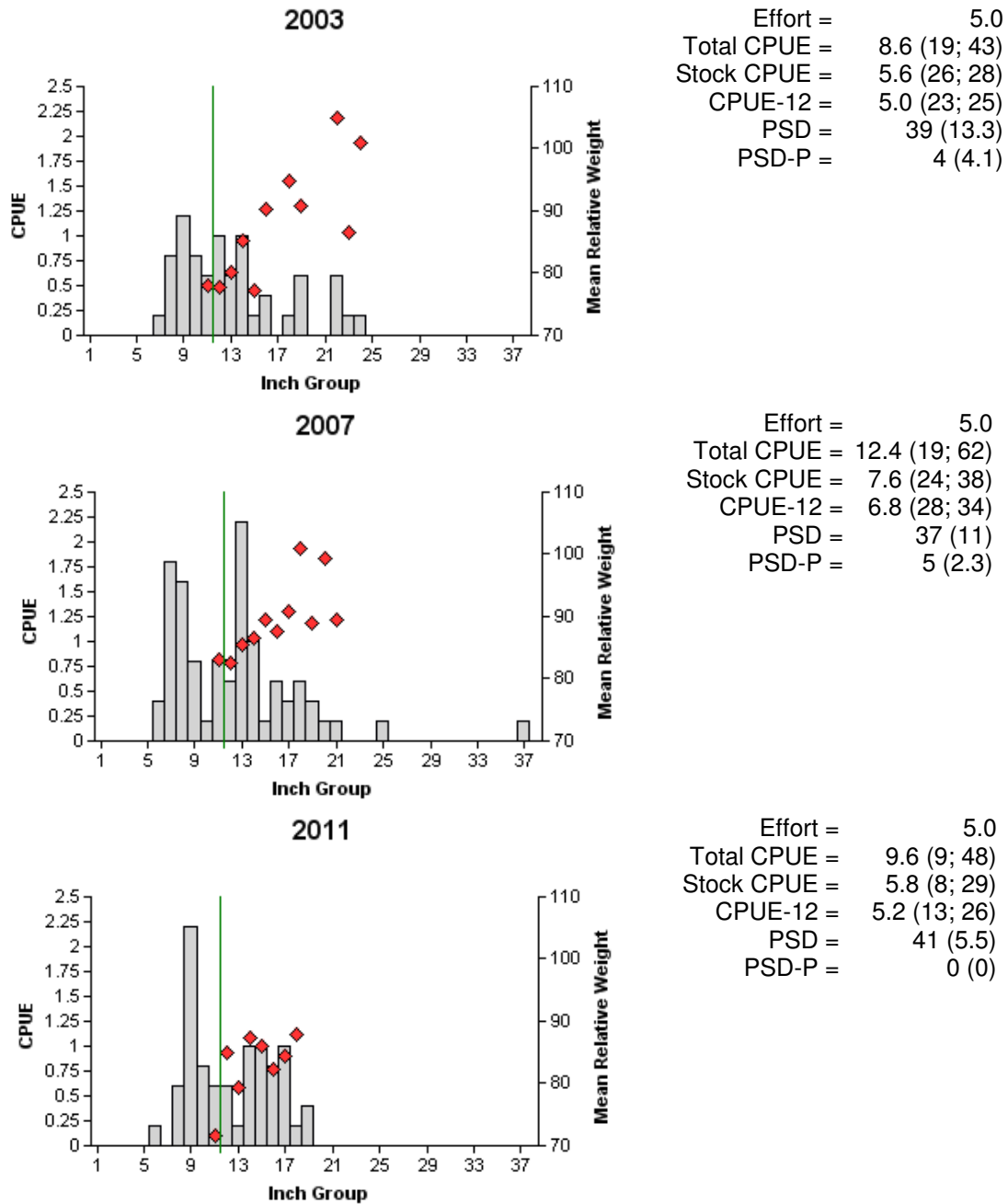


Figure 6. Number of channel catfish caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Worth Reservoir, Texas, 2003, 2007, and 2011. Vertical line represents length limit at time of sampling.

Table 7. Creel survey statistics for channel catfish at Worth Reservoir from June 2010 through May 2011, where total catch per hour is for anglers targeting channel catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2010/2011
Percent directed effort	8.0
Directed effort (h)	3186.7 (25.6)
Directed effort/acre	0.9
Total catch per hour	0.34 (43.3)
Total harvest	883 (71.6)
Harvest/acre	0.25
Percent legal released	60.6

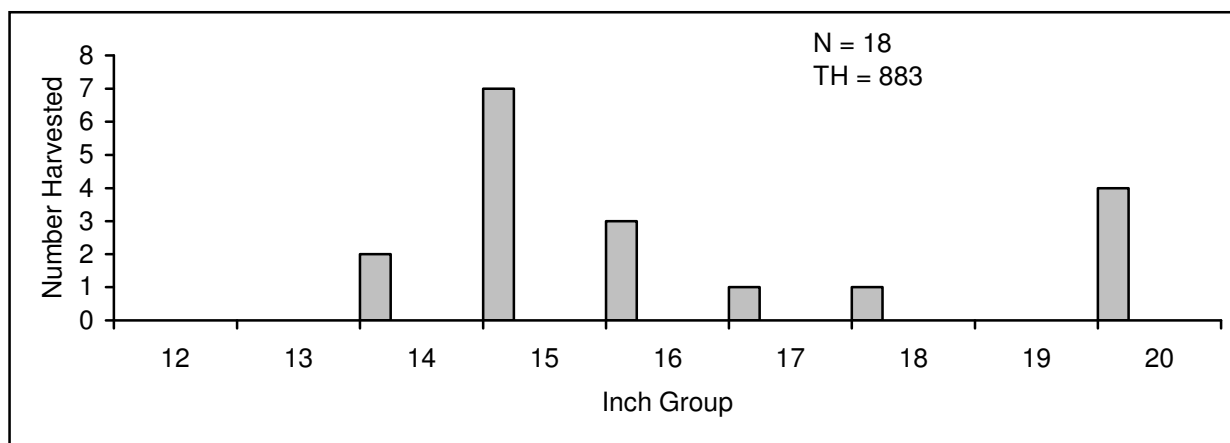


Figure 7. Length frequency of harvested channel catfish observed during creel surveys at Worth Reservoir from June 2010 through May 2011 all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

## White Bass

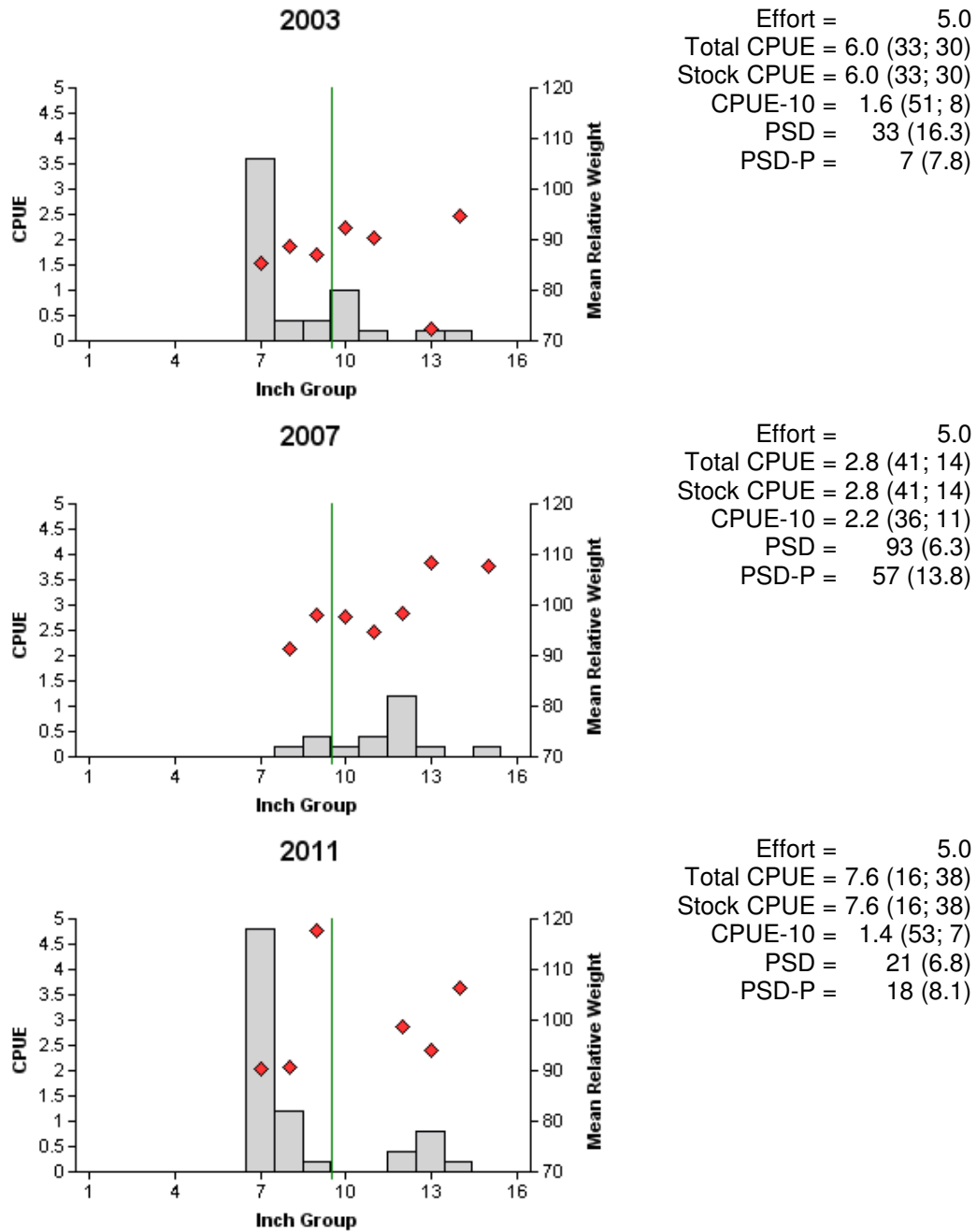


Figure 8. Number of white bass caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Worth Reservoir, Texas, 2003, 2007, and 2010. Vertical line represents length limit at time of sampling.

Table 8. Creel survey statistics for white bass at Worth Reservoir from June 2010 through May 2011 , where total catch per hour is for anglers targeting white bass and total harvest is the estimated number of white bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2010/2011
Percent directed effort	2.0
Directed effort (h)	712.0 (51.6)
Directed effort/acre	0.2
Total catch per hour	0.9 (35.2)
Total harvest	384 (55.1)
Harvest/acre	0.1
Percent legal released	80.0

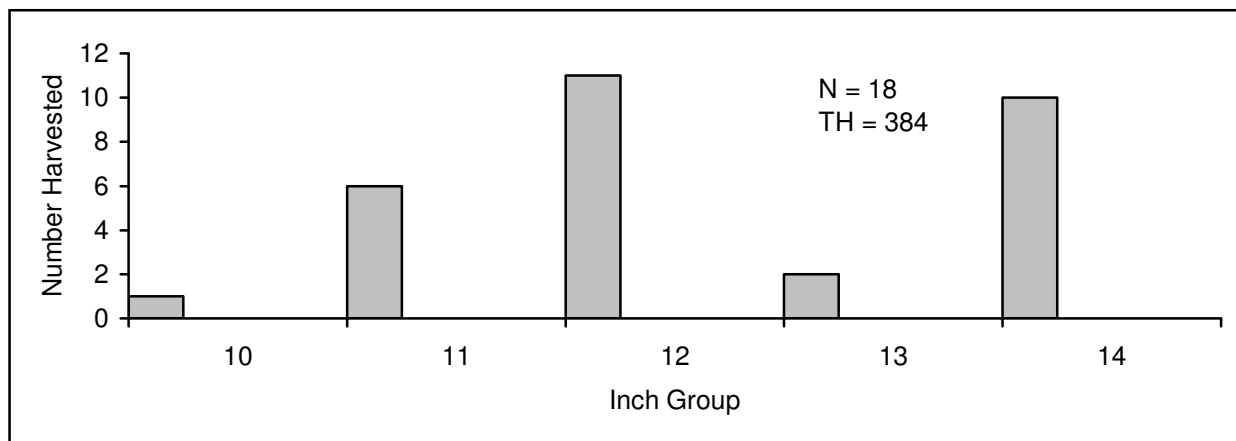
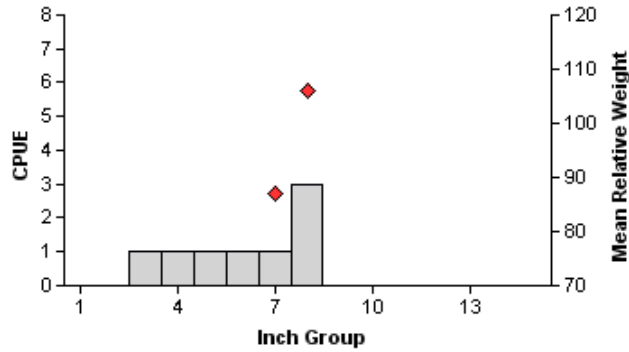


Figure 9. Length frequency of harvested white bass observed during creel surveys at Worth Reservoir from June 2010 through May 2011, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

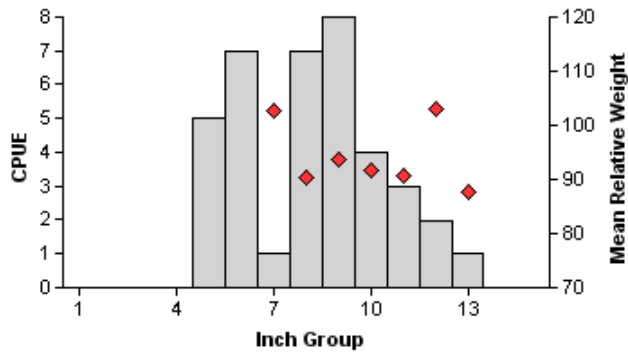
## Spotted Bass

2002



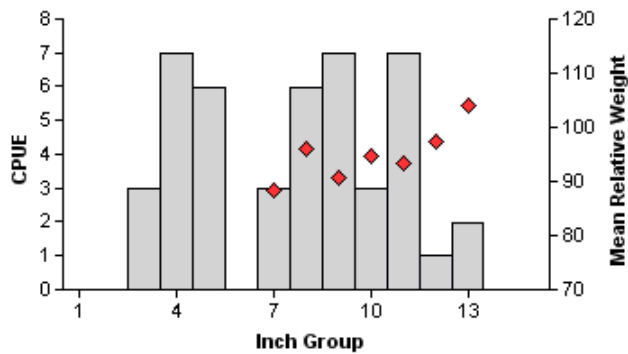
Effort = 1.0  
 Total CPUE = 8.0 (46; 8)  
 Stock CPUE = 4.0 (56; 4)  
 CPUE-12 = 0.0 (0; 0)  
 PSD = 0 (110.8)

2006



Effort = 1.0  
 Total CPUE = 38.0 (27; 38)  
 Stock CPUE = 26.0 (28; 26)  
 CPUE-12 = 3.0 (52; 3)  
 PSD = 23 (8.4)

2010



Effort = 1.0  
 Total CPUE = 45.0 (31; 45)  
 Stock CPUE = 29.0 (41; 29)  
 CPUE-12 = 3.0 (72; 3)  
 PSD = 34 (8.7)

Figure 10. Number of spotted 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, Worth Reservoir, Texas, 2002, 2006, and 2010.

## Largemouth Bass

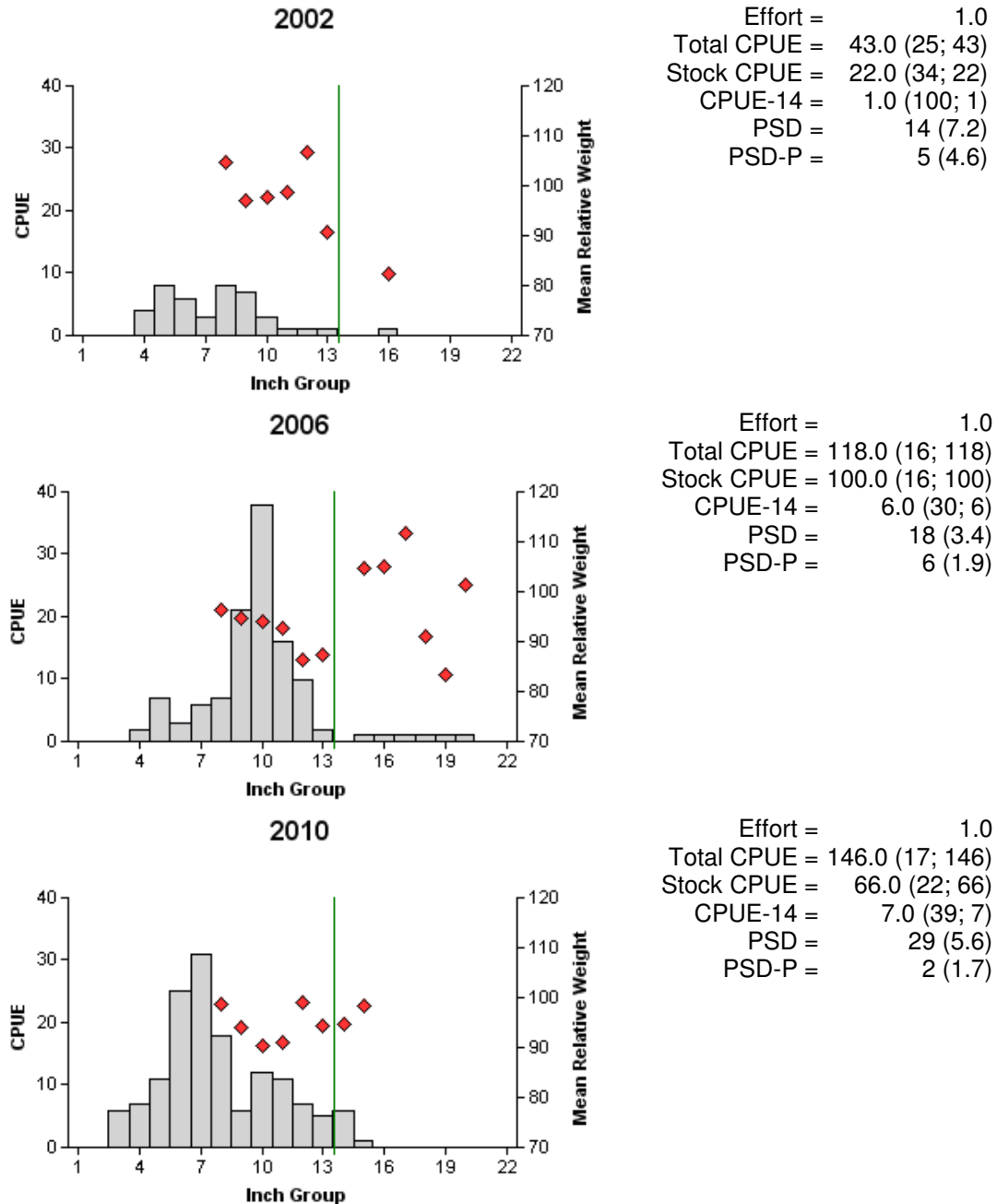


Figure 11. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Worth Reservoir, Texas, 2002, 2006, and 2010. Vertical lines represent length limit at time of sampling.

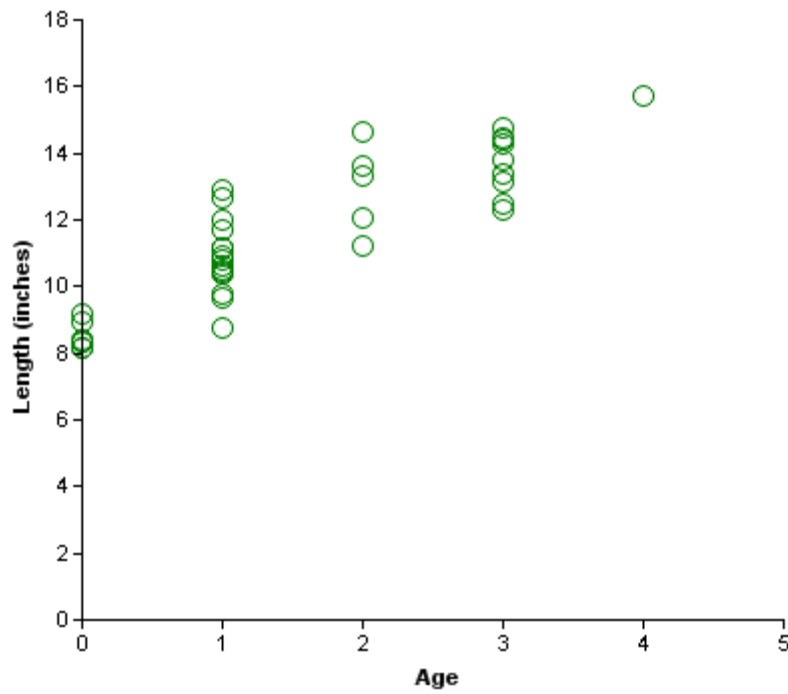


Figure 12. Length at age for largemouth bass (sexes combined) collected from electrofishing at Worth Reservoir, Texas, for fall 2010 (N=37).



Table 9. Creel survey statistics for largemouth bass at Worth Reservoir from June 2010 through May 2011, 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.

Creel Survey Statistic	Year
	2010/2011
Percent directed effort	58.0
Directed effort (h)	23,132.4 (0.0)
Directed effort/acre	6.6
Total catch per hour	0.6 (18.8)
Total harvest	235 (6.9)
Harvest/acre	0.07
Percent legal released	97.4

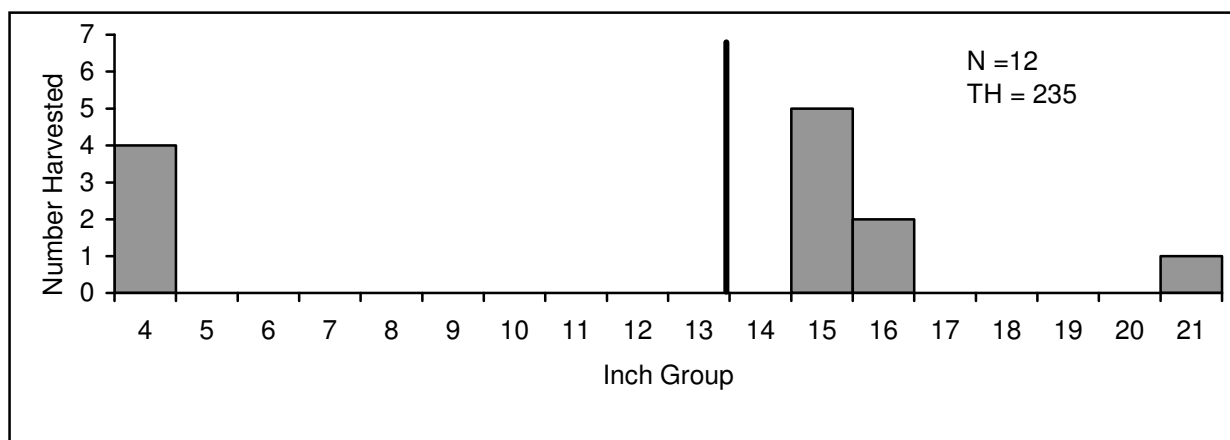


Figure 13. Length frequency of harvested largemouth bass observed during creel surveys Worth Reservoir from June 2010 through May 2011, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents minimum length limit at time of sampling.

Table 10. Results of genetic analysis of largemouth bass collected by fall electrofishing, Worth Reservoir, Texas, 2010. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB.

Year	Sample size	% FLMB alleles	%NLMB alleles	F genotypes	N genotypes	F1
2010	30	24	76	0	13	0

## White Crappie

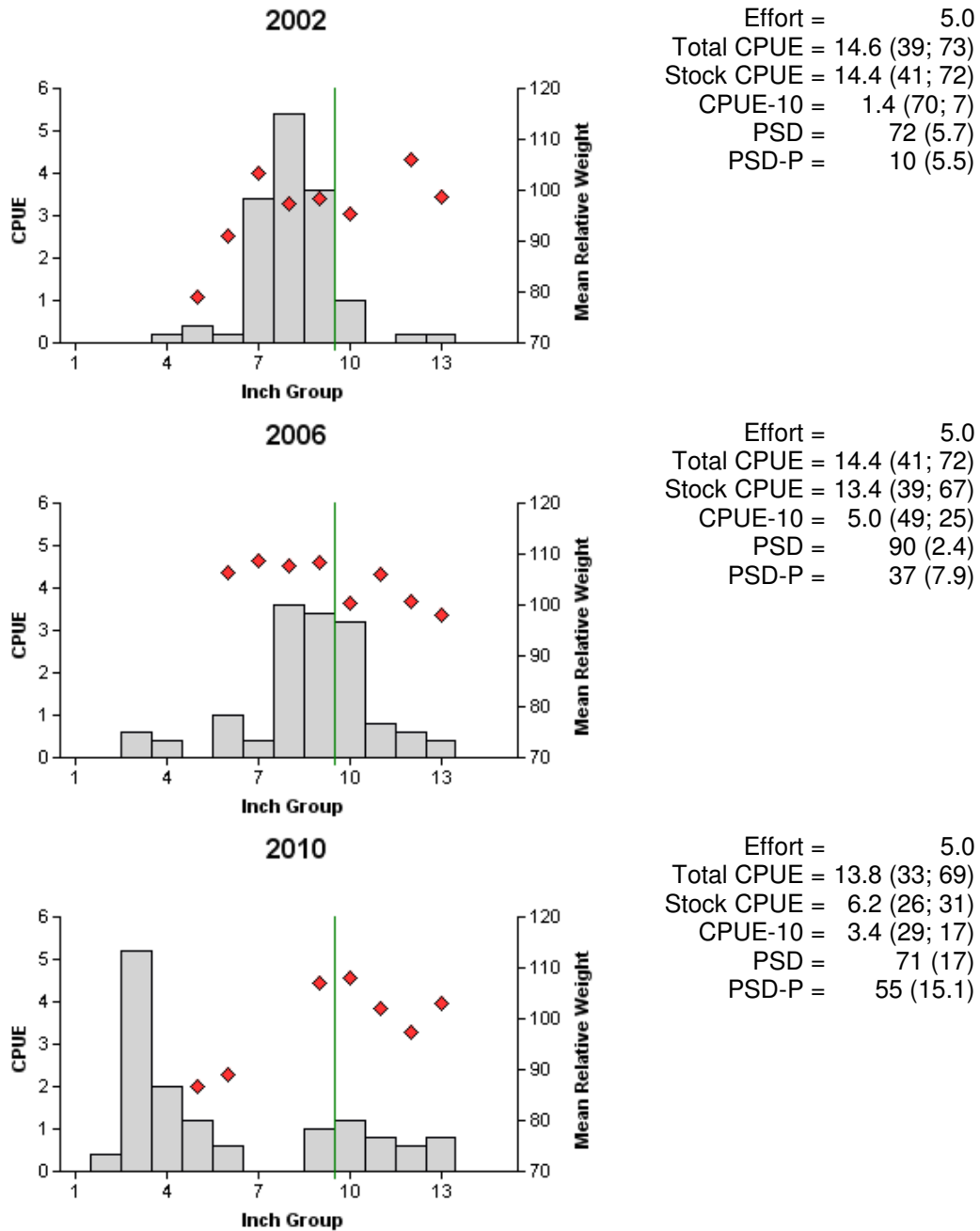


Figure 14. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Worth Reservoir, Texas, 2002, 2006, and 2010. Vertical line represents length limit at time of sampling.

Table 11. Creel survey statistics for white crappie at Worth Reservoir from June 2010 through May 2011, where total catch per hour is for anglers targeting white crappie and total harvest is the estimated number of white crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2010/2011
Percent directed effort	9.0
Directed effort (h)	3,368 (32.2)
Directed effort/acre	0.97
Total catch per hour	0.5 (54.8)
Total harvest	445(48.0)
Harvest/acre	0.13
Percent legal released	67.6

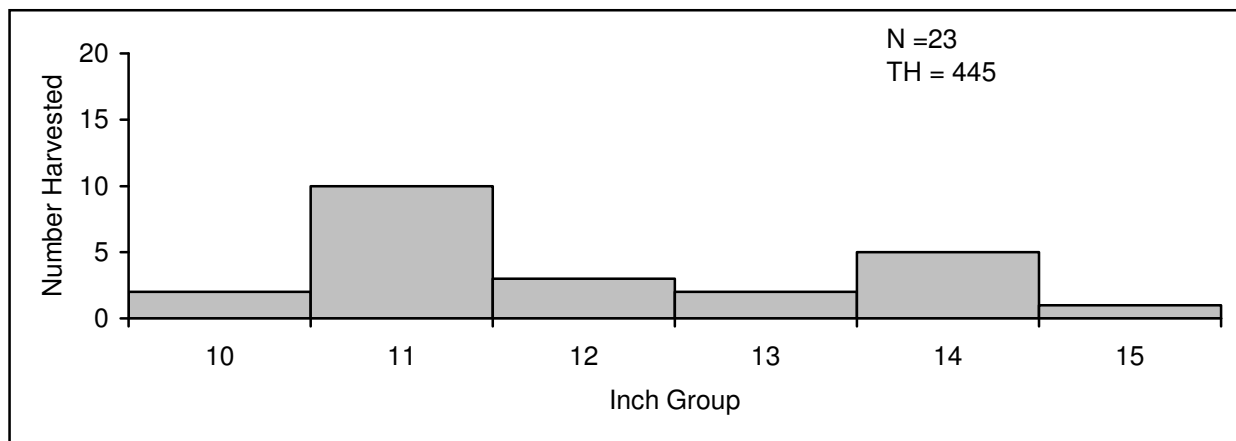


Figure 15. Length frequency of harvested white crappie observed during creel surveys at Worth Reservoir from June 2010 through May 2011, all anglers combined. N is the number of harvested white crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 5. Proposed sampling schedule for Worth 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.

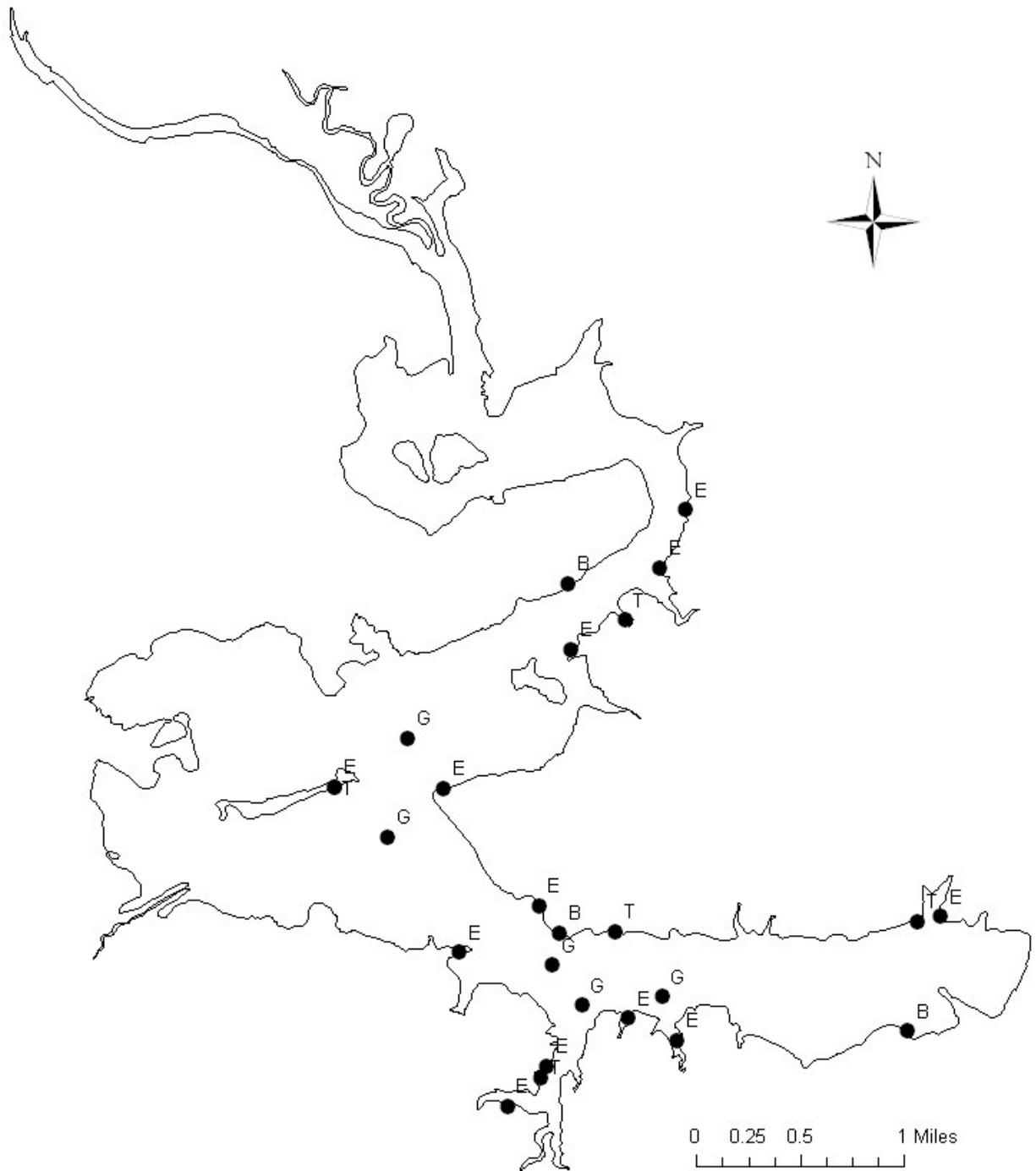
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Vegetation Survey	Access Survey	Report
Fall 2011-Spring 2012							
Fall 2012-Spring 2013							
Fall 2013-Spring 2014							
Fall 2014-Spring 2015	S	S	S		S	S	S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all species collected from all gear types from Worth Reservoir, Texas, 2010-2011.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	169	33.8			470	470.0
Threadfin shad					163	163.0
Common carp	2	0.4				
River carp sucker	1	0.2				
Smallmouth buffalo	19	3.8				
Blue catfish	49	9.8				
Channel catfish	48	9.6				
White bass	38	7.6				
Bluegill	2	0.4			813	813.0
Longear sunfish	1	0.2			491	491.0
Redear sunfish					27	27.0
Spotted bass					45	45.0
Largemouth bass					146	146.0
White crappie	10	2.0	69	13.8		
Black crappie			23	4.6		
Freshwater drum	1	0.2				

## APPENDIX B



Location of sampling sites, Worth Reservoir, Texas, 2010-2011. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Boat ramps are indicated with a B. Water level was approximately 2.5 ft below conservation pool at time of sampling.

Historical catch rates of targeted species by gear type for Worth Reservoir, Texas, 1990, 1992, 1995, 1998, 2002, 2003, 2006, 2007, 2010, and 2011.

Gear	Species	Year									
		1990 <sub>a</sub>	1992	1995	1998	2002	2003	2006	2007	2010	2011
Gill Netting (fish/net night)	Blue catfish			3.0	0.6		2.4		2.8		9.8
	Channel catfish	7.0	7.0	6.4	6.6		8.6		12.4		9.6
	White bass	3.2	4.2	3.8	4.2		6.0		2.8		7.6
Electrofishing (fish/hour)	Gizzard shad										
	Threadfin shad	224.0	394.0	250.7	300.0	380.0		480.0		470.0	
	Bluegill	347.3	188.0	302.0	109.0	100.0		404.0		813.0	
	Longear sunfish			245.3	108.0	66.0		334.0		334.0	
	Redear sunfish		26.0	21.3	8.0	3.0		18.0		27.0	
	Spotted bass		85.3	88.7	45.0	8.0		38.0		45.0	
	Largemouth bass	80.7	189.3	185.3	152.0	43.0		118.0		146.0	
Trap Netting (fish/net night)	White crappie	27.0	31.6	19.2	14.4	14.6		14.4		13.8	
	Black crappie	0.2	0.0	1.6	1.4	0.0		0.0		4.6	