PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-1

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2010 Survey Report

Bastrop Reservoir

Prepared by:

Marcos J. De Jesus, Assistant District Supervisor
and
Stephan J. Magnelia, District Supervisor

Inland Fisheries Division
District 2-C, San Marcos, Texas

Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

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

- **Reservoir Description:** Bastrop Reservoir is a 906-acre impoundment of Spicer Creek, a tributary of the Colorado River, and is located approximately 3 miles northeast of the City of Bastrop, Bastrop County, Texas. The reservoir was constructed in 1965 to supply water for cooling a natural-gas-fired power plant operated by the Lower Colorado River Authority (LCRA). The reservoir has a shoreline development index of 10.5, and lies within a unique ecological area known as the Lost Pines, a 70 square mile area of the Post Oak Savannah ecological area comprised of loblolly pine forests.

- **Management History:** Important sport fish include largemouth bass and catfishes. The Florida subspecies of largemouth bass was last stocked in Bastrop Reservoir in 1992 to increase Florida bass genetic influence. A 14- to 21-inch slot length limit and a 5 fish daily bag limit (one greater than 21 inches) for largemouth bass was implemented in 1993.

- **Fish Community**
  - **Prey species:** Bluegill, threadfin shad and redear sunfish were the dominant prey species.
  - **Catfishes:** Channel catfish was the dominant species present. Flathead catfish were also present in lower density. Some large flathead catfish were present.
  - **Largemouth Bass:** Largemouth bass were abundant. Growth rate to 14 inches remained good. Individuals above the slot length limit (≥21 inches) remained rare.

- **Management Strategies**
  The reservoir should continue to be managed under current regulations. The harvest of largemouth bass less than 14 inches in length should be promoted through press releases or signage at boat ramps. Aquatic plant coverage should be monitored annually.

INTRODUCTION

This document is a summary of fisheries data collected from Bastrop Reservoir in 2010 and 2011. The purpose of the document is to provide fisheries information and make fisheries 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 species and important prey species. Fisheries management strategies are included to address existing problems or opportunities. Historical data is presented with the 2010 and 2011 data for comparison.

Reservoir Description

Bastrop Reservoir is a stable-level 906-acre impoundment of Spicer Creek, a tributary of the Colorado River, and is located northeast of the City of Bastrop, Bastrop County, Texas. The dam was constructed in 1965 to supply water for cooling a natural-gas-fired power plant operated by the Lower Colorado River Authority (LCRA). The reservoir has a shoreline development index of 10.5, and lies within a unique ecological area known as the Lost Pines, a 70 square mile area of the Post Oak Savannah ecological area comprised of loblolly pine forests. Based on the most recent habitat survey in 1995, the most dominant littoral habitat type was flooded terrestrial vegetation (reservoir was probably slightly high during the survey), followed by native emergent vegetation and brush. Other shoreline habitat types included eroded bank, concrete, riprap, and standing timber/stumps. Submerged aquatic vegetation in 2010 consisted primarily of eel grass and hydrilla. Boat access consisted of 2 public boat ramps in two separate parks. Public bank access included a fishing pier and dock located in each park. Other descriptive characteristics for Bastrop Reservoir are listed in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Magnelia and De Jesus 2007) included:

1. Promote the catfish fishery in Bastrop Reservoir using news releases.

   Action: Several articles were published in outdoor magazines and newspapers promoting catfish fishing opportunities in the Austin area reservoirs and the Colorado River. These articles included Lake Bastrop among other district reservoirs.

2. Investigate the feasibility of introducing a larger forage species with the objective of improving the growth of bass >18 inches.

   Action: A study pre-proposal (Appendix C) was developed in 2008 to evaluate if the introduction of *Erimyzon sucetta* (lake chubsucker) into Bastrop Reservoir would improve largemouth bass growth by providing an intermediate-sized (7-9 inches) forage. This pre-proposal was not approved due to the potential ecological risk associated with this introduction.

Harvest Regulation History: Sport fish in Bastrop Reservoir have been managed with statewide regulations, except for a special slot length limit regulation for largemouth bass (Table 2).

Stocking History: Bastrop Reservoir has not been stocked with any species since 1997, when channel catfish (CCF) were stocked to supplement the CCF population. Florida largemouth bass were introduced starting in 1983 to increase Florida largemouth bass genetic influence. The complete stocking history is in Table 3.

Aquatic Vegetation/Habitat History: Bastrop Reservoir had a diverse and dynamic submersed aquatic vegetation community (Tables 4a-d). Aquatic plants offered excellent fish habitat and consistently met optimal levels for maintaining fish production for phylophitic species (Durocher et al. 1984, Dibble et al. 1996). The exotic species *Hydrilla verticillata* accounted for approximately half of the established vegetation and was found mixed with other native species. Another exotic, *Najas minor* (slender naiad) remained present in the reservoir. Stands of bulrush *Scirpus* sp. mixed with cattails *Typha* sp. surrounded long stretches of the reservoir and abundance remained similar to previous surveys (21% of the shoreline).

Water Transfer: There are no inter-basin water diversion structures at Bastrop Reservoir.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations) 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 netting as the number of fish caught in one net set overnight (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual, revised 2009). Aquatic vegetation coverage was estimated by the use of Trimble® GPS unit in conjunction with sonar depth finder. Species identification was confirmed on samples collected with a modified aquatic rake. Littoral habitat was observed and documented along the entire shoreline from a survey boat.

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Size Distribution (PSD); as defined by Guy et al. (2007)], and condition indices [relative weights (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). The Index of Vulnerability (IOV) was used to determine the percentage of gizzard shad vulnerable to predation (DiCenzo et al. 1996). Relative standard error (RSE = 100 x SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Ages were determined for largemouth bass in fall 2010 using otoliths from 129 individuals 150 mm in length (category 3 age analysis; TPWD Procedures Manual, revised 2009).

RESULTS AND DISCUSSION

Habitat: Littoral shoreline zone habitat consisted primarily of flooded terrestrial vegetation, emergent native aquatic vegetation, and brush (Table 5).

Prey species: Gizzard shad, threadfin shad, bluegill, and redear sunfish electrofishing catch rates were 2.0/h, 210.0/h, 302.0/h and 58.0/h, respectively. Index of Vulnerability (IOV) for gizzard shad indicated none of the gizzard shad were vulnerable to existing predators, similar to the IOV estimate in 2006 (Figure 1). Gizzard shad electrofishing CPUE has consistently been low in recent surveys, with the forage base dominated by threadfin shad and small sunfish. Total CPUE (302.0/h) of bluegill in 2010 almost doubled since 2006, and size structure continued to be dominated by small individuals, < 5 inches (Figure 2). Other sunfish species were available as well.

Catfishes: The 2011 gill net total catch rate for channel catfish was 4.4/nn (Figure 3), lower than the 2007 survey (7.6/nn), and fell below the average total catch rate of 6.5/nn since 1998 (Appendix D). The moderate population still offers quality fish, with most individuals sampled measuring within the 14- to 22-inch range (Figure 3). Channel catfish condition (Wr) was good, as average relative weights for all length groups exceed 90, with most exceeding optimal levels (≥100) (Figure 3). Flathead catfish were present in low density (0.8/nn), with large individuals (≥22 inches) dominating the gill net catch.

Largemouth bass: The electrofishing catch rate of stock-length largemouth bass was 185/h and 142/h in 2008 and 2010, respectively (Figure 4). These catch rates were higher since the last reported survey in 2006 (127/h). Size structure has remained similar since 2006, with PSD's in the 60's. The catch rate of largemouth bass greater than 14 inches (CPUE14) was 45/h in 2010, similar to previous surveys (Figure 4). Once again, electrofishing surveys in 2008 and 2010 have failed to collect a single bass ≥21 inches in length, confirming low abundance of these individuals. Slow growth within the slot length limit makes it rare to see individuals live long enough to surpass the upper slot length of 21 inches. Individuals between 18 and 20 inches (CPUE-18 = 8.0/h and 5.0/h in 2008 and 2010, respectively) are available and provide some opportunity for larger bass. A creel survey in 2005 revealed that legal sub-slot harvest did occur at rates slightly higher than in other Central Texas power cooling reservoirs (Magnelia and De Jesus 2006 and Magnelia and De Jesus 2007). This indicates some interest in largemouth bass harvest of these smaller individuals. Large scale harvest might improve the population structure, although growth appears to be slowest after individuals enter the protected slot (Figure 5). Harvest of sub-slot fish can help reduce intra-specific competition for available forage. As previously reported (De Jesus and Magnelia 2007), the forage base in Bastrop Reservoir is almost exclusively composed of small individuals (2 - 4 inches). Predators of all sizes are limited to this smaller forage and larger predators must expend more energy to fulfill their energetic needs. This may lead to slowing growth as individuals get larger. Overall slow growth of largemouth bass in Bastrop Reservoir has persisted since 2002. In 2010, largemouth bass reached an average length of 14 inches between 2 and 3 years (N = 129; range = 1 – 7 years) (Figure 5). This growth was average for the ecological region (Prentice 1987). Body condition (Wr) in 2010 and 2008 were good (relative weights above 90) for nearly all size classes of fish, but not as good as the 2006 survey when condition was optimal (≥ 100) in almost every length group (Figure 4).

Fisheries management plan for Bastrop Reservoir, Texas

Prepared - July 2010.

ISSUE 1 Largemouth bass growth after age 3 was poor, with few fish in older age classes exceeding 18 inches in length. No bass collected during electrofishing surveys since 1998 exceeded 21 inches in length. A proposed management strategy to increase growth of larger individuals was not approved. Age-and-growth, angler catch and electrofishing data since the slot length limit regulation change indicated there was little potential for trophy (>21 inches) bass in this reservoir. Slow growth may be explained by possible intraspecific competition among all size groups and/or lack of larger forage items. Decreasing intraspecific competition may improve growth.

MANAGEMENT STRATEGY

1. Fish cleaning tables are available at both boat ramps. In collaboration with the Lower Colorado River Authority promote the harvest of sub-slot bass on Bastrop Reservoir using signage at the boat ramps. Measure the effect of this signage in increasing harvest over a two year period conducting a pre and post spring creel survey.
2. Conduct an intensive age-and-growth analysis to measure changes in growth.

ISSUE 2: 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. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc., so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

ISSUE 3: Bastrop Reservoir supported a diverse aquatic plant community typified by between-year variability in total and individual plant coverage. Mechanical harvesters and herbicide treatments have historically been utilized by the LCRA to control plants, especially hydrilla. However, these plants offered excellent habitat for littoral fishes (e.g., largemouth bass and sunfishes) and major changes in plant coverage had the potential to impact fish populations. Monitoring information on aquatic vegetation coverage was valuable when interpreting fisheries data.

MANAGEMENT STRATEGY

1. Continue annual aquatic vegetation monitoring.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule (Table 6) will constitute mandatory sampling in 2014/2015, with additional bass-only electrofishing survey during spring 2012 and/or 2013 to further evaluate growth in relation to diets. Due to poor historic sampling returns for crappie, and cost efficiency, trap netting will be removed from the sampling schedule at Bastrop Reservoir.

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Table 1. Characteristics of Bastrop Reservoir, Texas

Characteristic	Description
Year constructed	1965
Controlling authority	LCRA
Counties	Bastrop
Reservoir type	Power plant cooling reservoir
Shoreline development index (SDI)	10.5
Conductivity	1,273 umhos/cm

Table 2. Harvest regulations for Bastrop Reservoir.

Species	Bag limit	Length limit (inches)
Bass: largemouth	5*	14- to 21-inch slot
Catfish: channel and blue catfish	25	12 minimum
Flathead catfish	5	18 minimum

*Only one may be over 21 inches.

Table 3. Stocking history of Bastrop, 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)
Black crappie x White crappie	1993	90,400	FRY	0.9
	1994	110,753	FRY	0.9
	1995	103,738	FRY	0.9
	Total	304,891		
Blue catfish	1969	4,425	UNK	UNK
	1970	4,615	UNK	UNK
	1971	4,644	UNK	UNK
	Total	13,684		
Channel catfish	1969	5,517	AFGL	7.9
	1970	4,683	AFGL	7.9
	1971	4,610	AFGL	7.9
	1982	500	UNK	UNK
	1990	6,208	ADL	11.2
	1997	8,300	AFGL	7.0
	Total	29,818		
Florida Largemouth bass	1983	41,713	FGL	2.0
	1984	17,056	FGL	3.0
	1990	90,551	FRY	0.8
	1991	771	ADL	9.0
	1991	90,872	FGL	1.3
	1992	59,509	FGL	1.1
	1992	31,101	FRY	0.9
	Total	331,573		
Green sunfish x redear sunfish	1972	1,980		UNK
	Total	1,980		
Kemp's Largemouth bass	1985	46,314		1.0
	1986	45,400		1.0
	Total	91,714		
Palmetto Bass (striped X white bass hybrid)	1972	1,800	FGL	1.5
	1973	9,760	FGL	1.5
	1974	10,400	UNK	UNK
	1975	9,086	UNK	UNK
	Total	31,046		
Peacock bass	1978	519		UNK
	1979	3,234		UNK
	Total	3,753		
White crappie	1992	94,577	FRY	0.6
	Total	94,577		

Table 4a. Aquatic plants observed during aquatic vegetation surveys, Bastrop Reservoir, Texas, September 2007. Surface area (acres) and percent reservoir coverage were determined for each plant species.

Common Name	Scientific name	Acres	% coverage
Muskgrass	*Chara* sp.	12	1
Coontail	*Ceratophyllum demersum*	1	<1
Eel grass	*Vallisneria americana*	106	12
Hydrilla	*Hydrilla verticillata*	20	2
Marine naiad	*Najas marina*	67	8
Slender naiad	*Najas minor*	16	2
Southern naiad	*Najas guadalupensis*.	45	5
Spike rush	*Eleocharis* sp.	<1	<1
	Total	267	30

Table 4b. Aquatic plants observed during aquatic vegetation surveys in Bastrop Reservoir, Texas, September 2008. Surface area (acres) and percent reservoir coverage were determined for each plant species.

Common Name	Scientific name	Acres	% coverage
Eel grass	*Vallisneria americana*	100	12
Hydrilla	*Hydrilla verticillata*	115	13
Musk grass	*Chara* sp.	40	5
Coontail	*Ceratophyllum demersum*	<1	<1
Southern naiad	*Najas guadalupensis*	<1	<1
Mix [1]	*Hydrilla/Vallisneria/Najas*	10	1
	Total	265	31

Table 4c. Aquatic plants observed during aquatic vegetation surveys in Bastrop Reservoir, Texas, September 2009. Surface area (acres) and percent reservoir coverage were determined for each plant species.

Common Name	Scientific name	Acres	% coverage
Eel grass	*Vallisneria americana*	76	1
Hydrilla	*Hydrilla verticillata*	71	8
Musk grass	*Chara sp.*	11	9
Spike rush	*Eleocharis* sp.	2	<1
Slender naiad	*Najas minor*	2	<1
Southern naiad	*Najas guadalupensis*	<1	<1
Mix [1]	*N. marina/C. demersum*	31	4
Mix [2]	*N. minor/N. guadalupensis*	2	<1
Mix [3]	*Vallisneria/Hydrilla/Ceratophyllum/Chara*	33	4
	Total	228	26

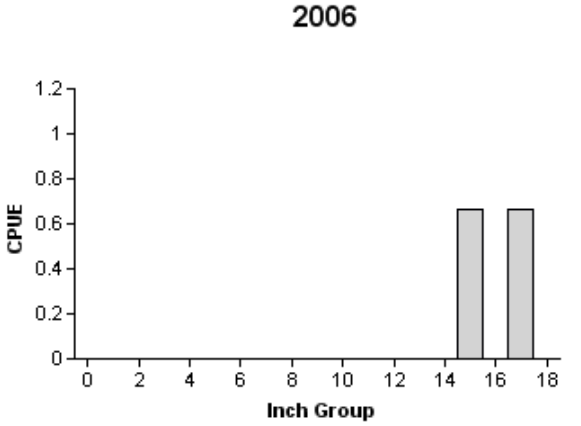
Table 4d. Aquatic plants observed during aquatic vegetation surveys in Bastrop Reservoir, Texas, September 2010. Surface area (acres) and percent reservoir coverage were determined for each plant species.

Common Name	Scientific name	Acres	% coverage
Eel grass	*Vallisneria americana*	70	8
Hydrilla	*Hydrilla verticillata*	95	11
Coontail	*Ceratophyllum demersum*	3	<1
Musk grass	*Chara sp.*	6	<1
Slender naiad	*Najas minor*	5	<1
Spike rush	*Eleocharis* sp.	12	1
Mix [1]	*Hydrilla/Ceratophyllum/Najas*	13	1
Mix [2]	*Hydrilla/Vallisneria*	10	1
	Total	214	25

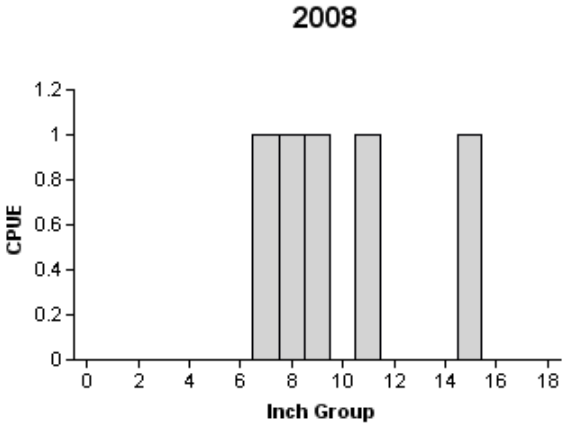
Table 5. Survey of structural habitat types, Bastrop Reservoir, Texas, 1995. A linear shoreline distance (miles) was recorded for each habitat type found.

	Shoreline distance	
Structural habitat type	Miles	Percent of total
Brush	2.6	18.6
Eroded bank	1.5	11.7
Flooded terrestrial vegetation	4.8	34.3
Riprap	0.5	3.6
Concrete	1.2	8.6
Standing timber/stumps	0.4	2.9
Native emergent vegetation (Bulrush)	2.9	20.7
Total	13.9	100

Gizzard Shad



Effort =	1.5
Total CPUE =	1.3 (69; 2)
IOV =	0 (0)



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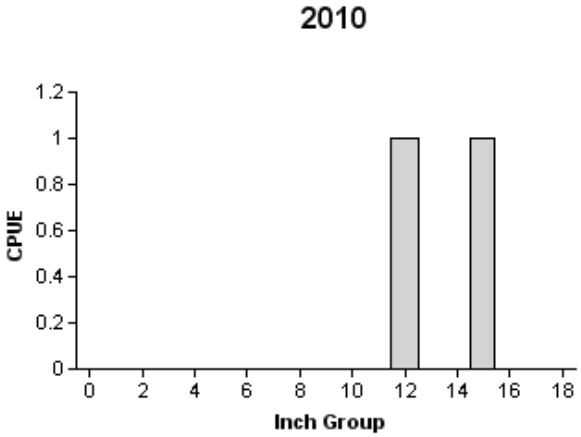
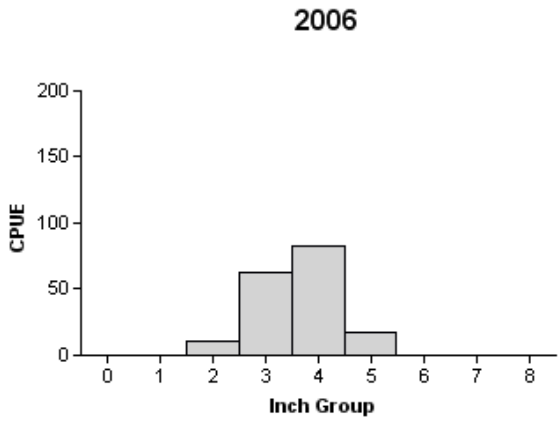
Total CPUE =	5.0 (55; 5)
IOV =	20 (15.6)



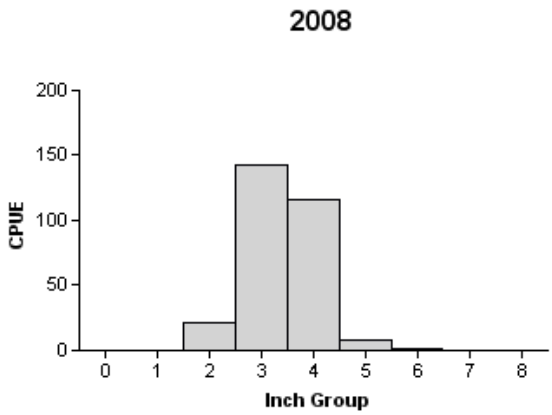
Effort =	1.0
Total CPUE =	2.0 (67; 2)
IOV =	0 (0)

Figure 1. 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, Bastrop Reservoir, Texas, 2006, 2008 and 2010.

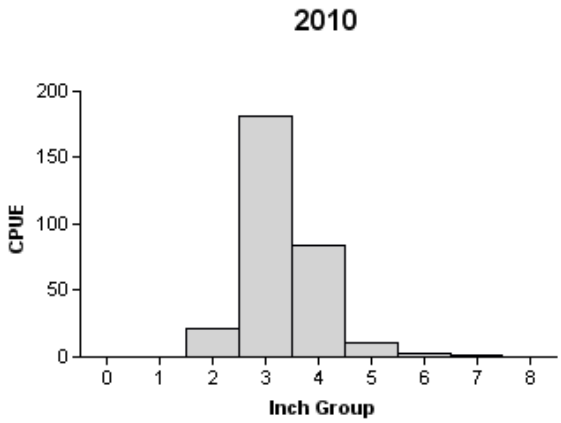
Bluegill



Effort = 1.5
Total CPUE = 174.7 (22; 262)
PSD = 0 (35.3)



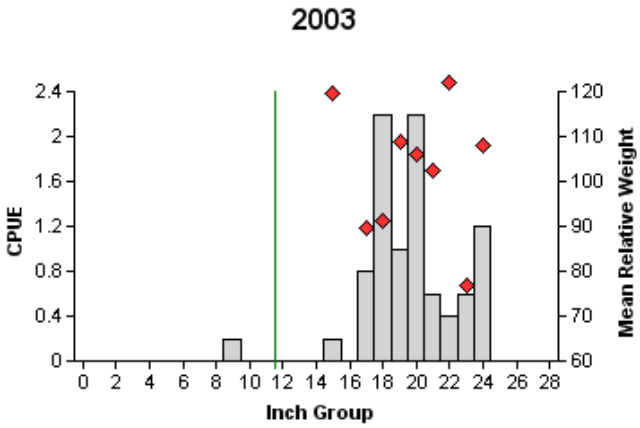
Effort = 1.0
Total CPUE = 290.0 (20; 290)
PSD = 0 (0.4)



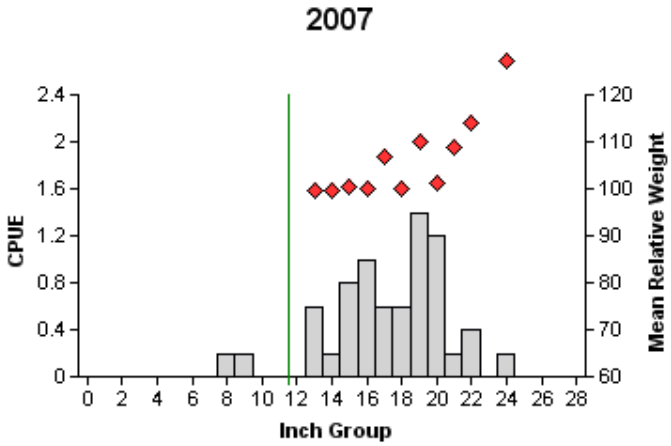
Effort = 1.0
Total CPUE = 302.0 (24; 302)
PSD = 1 (0.8)

Figure 2. 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, Bastrop Reservoir, Texas, 2006, 2008 and 2010.

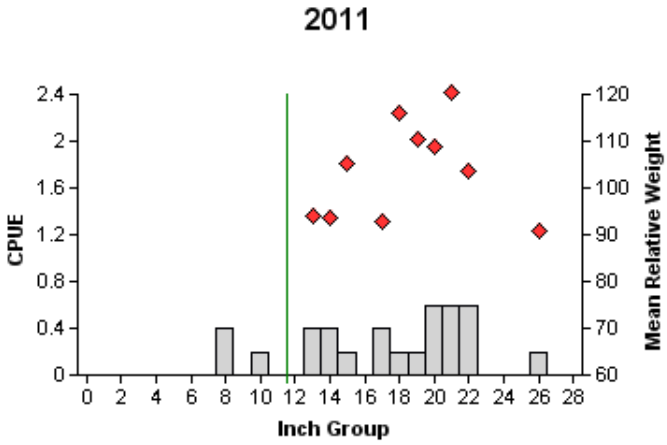
Channel Catfish



Effort =	5.0
Total CPUE =	9.4 (11; 47)
CPUE-12 =	9.2 (11; 46)
PSD =	98 (2.1)
PSD-12 =	100 (0)



Effort =	5.0
Total CPUE =	7.6 (14; 38)
CPUE-12 =	7.2 (13; 36)
PSD =	78 (8.5)
PSD-12 =	100 (0)

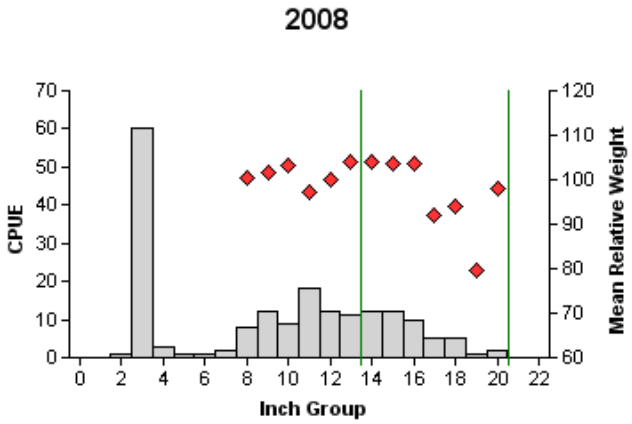


Effort =	5.0
Total CPUE =	4.4 (17; 22)
CPUE-12 =	3.8 (19; 19)
PSD =	74 (10.6)
PSD-12 =	100 (0)

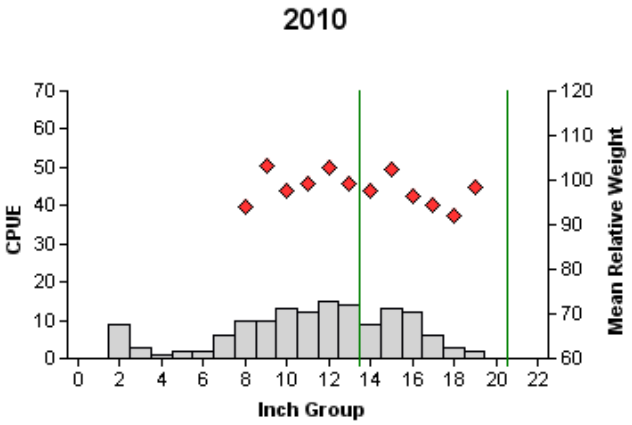
Figure 3. Number of channel catfish caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Bastrop Reservoir, Texas, 2003, 2007 and 2011. Minimum length limit is indicated by vertical line.

Largemouth bass

Effort =	1.5
Total CPUE =	127.3 (10; 191)
Stock CPUE =	70.0 (13; 105)
CPUE-14 =	35.3 (22; 53)
CPUE-18 =	4.7 (37; 7)
CPUE-21 =	0.0 (0; 0)
PSD =	68 (5.7)
PSD-14 =	50 (7.5)
PSD-21 =	0 (0)



Effort =	1.0
Total CPUE =	185.0 (12; 185)
Stock CPUE =	117.0 (19; 117)
CPUE-14 =	47.0 (25; 47)
CPUE-18 =	8.0 (38; 8)
CPUE-21 =	0.0 (0; 0)
PSD =	60 (6.7)
PSD-14 =	40 (4.9)
PSD-21 =	0 (0)



Effort =	1.0
Total CPUE =	142.0 (21; 142)
Stock CPUE =	119.0 (26; 119)
CPUE-14 =	45.0 (32; 45)
CPUE-18 =	5.0 (62; 5)
CPUE-21 =	0.0 (0; 0)
PSD =	62 (8.3)
PSD-14 =	38 (5.4)
PSD-21 =	0 (0)

Figure 4. 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, Bastrop Reservoir, Texas, 2006, 2008 and 2010. Slot length limit indicated by vertical lines.

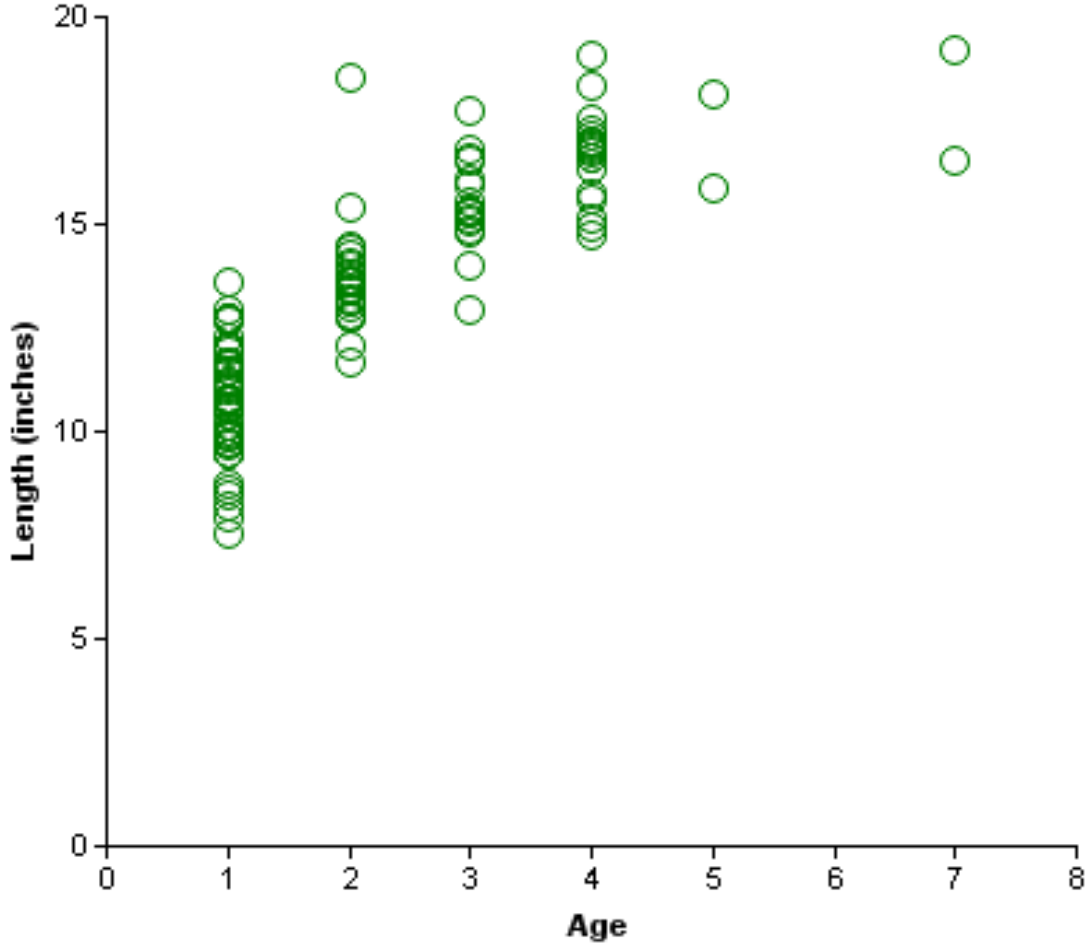


Figure 5. Length at age for largemouth bass collected by electrofishing at Bastrop Reservoir, Texas, October 2010 (N=129).

Table 6. Proposed sampling schedule for Bastrop Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S, and additional survey denoted by A.

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

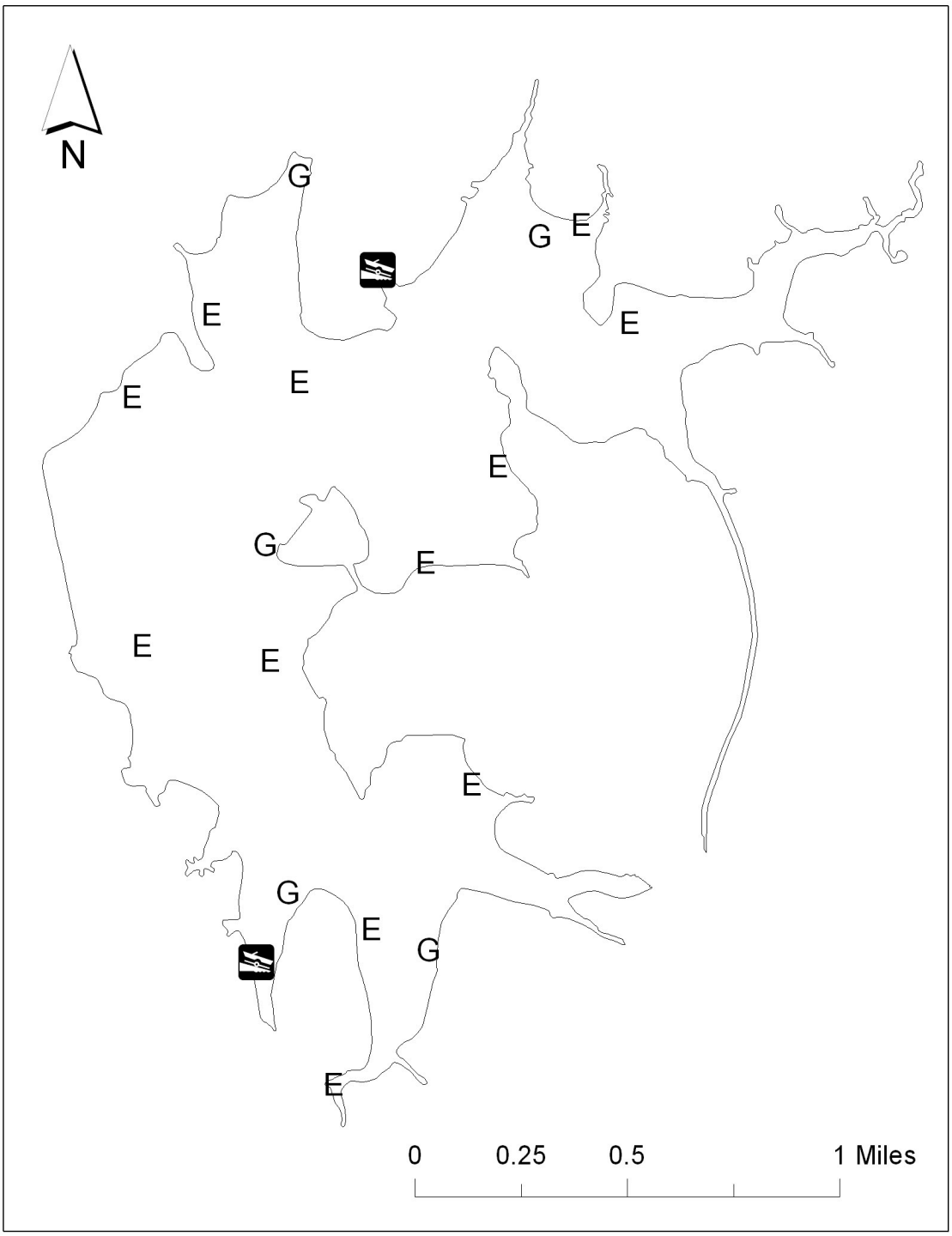
Appendix A

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

	Electrofishing		Gill Netting	
Species	CPUE	N	CPUE	N
Gizzard shad	2.00	2		
Threadfin shad	210.00	210		
Inland silverside	1.00	1		
Channel catfish			4.40	22
Flathead catfish			0.80	4
Redbreast sunfish	28.00	28		
Green sunfish	8.00	8		
Warmouth	4.00	4		
Bluegill	302.00	302		
Redear sunfish	58.00	58		
Redspotted sunfish	38.00	38		
Largemouth bass	142.00	142		
Rio Grande cichlid	5.00	5		

Appendix B

Location of sampling sites, Bastrop Reservoir, Texas, 2010-2011. Gill netting and electrofishing stations indicated by G and E, respectively.



Appendix C

Total catch rates (CPUE-tot) of channel catfish collected in gillnets from 1998 to 2011 at Bastrop Reservoir, TX. Mean total catch rate (6.5/nn) indicated by horizontal line.