PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

Sheldon Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Sheldon Reservoir were surveyed in 2012 by electrofishing and trap netting and in 2013 by 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:** Sheldon Reservoir is a 1,229-acre reservoir on Culpepper Bayou in Harris County, Texas, lying within Sheldon State Park. The reservoir has a drainage area of 4.0 square miles and a shoreline length of 13.1 miles. The reservoir has a mean depth of 3 feet and a maximum depth of 20 feet.

- **Management History:** Sheldon Reservoir is a very important asset to Texas Parks and Wildlife and to the people of Houston. To make the most of this resource, Inland Fisheries Division has worked closely with Sheldon Reservoir State Park's and Infrastructure's staffs to improve the reservoir in conjunction with the development of the Sheldon Environmental Learning Center. Heavy infestations of hydrilla (*Hydrilla verticillata*), giant salvinia (*Salvinia molesta*), and water hyacinth (*Eichornia crassipes*) have greatly impeded recreational use at Sheldon Reservoir. Herbicide treatments over several years have been unsuccessful in maintaining control of noxious vegetation. However, herbicide treatments in 2011 and 2012 have improved the situation.

- **Fish Community**
  - **Prey species:** Greater control of hydrilla, giant salvinia, and water hyacinth from herbicide treatments in 2011 and 2012 improved electrofishing efficiency in fall of 2012. Although Gizzard Shad (*Dorosoma cepedianum*) were not collected in 2004 or 2008 electrofishing samples, 779.0/h were collected in 2012. Most were small, which indicated a young and expanding population. The catch rate of Bluegill (*Lepomis macrochirus*) in 2012 was 87.0/h, much higher than it was in 2008 (8.0/h) or 2004 (42.0/h). Redear Sunfish (*L. microlophus*) are also available as prey. The catch rate in 2012 was 225.0/h, again much higher than it was in 2008 (22.7/h) or 2004 (84.0/h).

  - **Catfishes:** Historically, catfishes have been poorly represented in gill net surveys of the lake. Both Blue Catfish (*Ictalurus furcatus*) and Channel Catfish (*I. punctatus*) were present in Sheldon Reservoir, but catch rates were low. All catfish caught were over 20 inches in length.

  - **Largemouth bass:** Electrofishing catch rate of Largemouth Bass (*Micropterus salmoides*) dropped from 249.0/h in 2004 to 21.3/h in 2008 but rebounded to 147.0/h in 2012. Changes in catch rates may be more reflective of increased sampling efficiency by reduced vegetation in the reservoir rather than the actual abundance of the Largemouth Bass population. In 2012, the size distribution of Largemouth Bass was quite good (PSD of 70). The number of stock-sized bass in the survey increased slightly. Relative weight for each inch-class of Largemouth Bass suggested fish were in good condition.

  - **Crappie:** Due to overabundant vegetation, trap net surveys were not conducted for the 2004 and 2008 monitoring years; however, a trap net survey was conducted in the fall of 2012. Black Crappie (*Pomoxis nigromaculatus*) were more abundant in the fall 2012 trap net survey than White Crappie (*P.annularis*). Most Crappie were less than harvestable-size and will likely grow to harvestable-size (>10 inches) in the coming years.

- **Management Strategies:** The primary challenge at Sheldon Reservoir is aquatic vegetation management and water level management. An integrated pest management strategy will address the aquatic vegetation problem. Lake Sheldon State Park staff continues to explore ways to supplement water supply to Sheldon Reservoir in low rainfall years. Electrofishing, trap netting, angler access, and gill netting will be conducted every four years. Aquatic vegetation will be surveyed annually.

INTRODUCTION

This document is a summary of fisheries data collected from Sheldon Reservoir from June 2012 through May 2013. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2012-2013 data for comparison.

Reservoir Description

Sheldon Reservoir is a 1,229-acre reservoir on Culpepper Bayou in Harris County, Texas, lying within the Sheldon Wildlife Management Area. The lake has a drainage area of 4.0 square miles, a shoreline length of 13.1 miles, and a Shoreline Development Index of 2.7. The reservoir has a mean depth of 3 feet and a maximum depth of 20 feet. Rainfall in the watershed averages 42.6 inches per year. Sheldon Reservoir is found within the Gulf Coast Plains Land Resource Area with Lake Charles/Benard Association (clay) soil types. Land uses around the reservoir are primarily industrial and residential. Other descriptive characteristics for Sheldon Reservoir are presented in Table 1.

Angler Access

Sheldon Reservoir has one boat ramp (Table 2). The ramp is steep and has inadequate parking. Plans are underway to replace the ramp when funding is available. Public shoreline access is good; however, all of the existing fishing piers are in disrepair, and most have been closed to the public for safety reasons and are being dismantled or rebuilt.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Henson and Webb 2009) included:

1. Access to Sheldon Reservoir is very limited due to heavy infestations of exotic vegetation and infrastructure improvement needs.
   Action: Aquatic vegetation surveys were conducted in summer from 2009 through 2012 to monitor coverage of aquatic vegetation. Vegetation treatments have been conducted in 2011 and 2012 to help control hydrilla, water hyacinth, and giant salvinia. Inland Fisheries and State Parks staffs continue to work together to find solutions to problems with the Sheldon Reservoir boat ramp and fishing piers.
2. Increase public awareness of the Sheldon Reservoir resources.
   Action: Sheldon Reservoir has been featured in news releases and is presented as part of the San Jacinto River Watershed Management Planning process that is underway.
3. As vegetation abundance decreases, fish populations should respond and become more accessible to sampling.
   Action: Electrofishing, trap netting, and gill netting surveys were all conducted during the 2012-2013 sampling period.

Harvest regulation history: Sport fishes in Sheldon Reservoir are managed under the current statewide regulations except for Channel Catfish and Blue Catfish which are managed with a combined 5-fish daily bag and no size limit. Fishing is by pole-and-line only. Since Sheldon Reservoir falls completely within Sheldon Lake State Park, no fishing license is required. Current regulations are found in Table 3.

Stocking history: The most recent stockings at Sheldon Reservoir include Channel Catfish stocked in 2004 and 2005. The complete stocking history is presented in Table 4.

Vegetation/habitat management history: Sheldon Reservoir has a mixed aquatic plant community of both native and non-native species (Table 6). Hydrilla, giant salvinia, and water hyacinth have all been problematic at times and continue to impede access. Management efforts have had moderate success overall; however, herbicide treatments in 2011 and 2012 have decreased the amount of non-native vegetation substantially, particularly hydrilla. Structural shoreline habitat consists primarily of non-descript shoreline with overhanging brush and native emergent vegetation and has not changed in recent years. During the most recent survey in 2012, only trace hydrilla was found in Sheldon Reservoir.

Water transfer: Sheldon Reservoir serves as wildlife habitat and as a State Park recreational lake. Very rarely is there any discharge from the reservoir. If any discharge occurs during flood events, the water enters the Houston area bayou drainage system leading to the Houston Ship Channel. Currently, no interbasin transfer exists.

METHODS

Fishes were collected by electrofishing (1 hour 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/h) 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 2011). Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified 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). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics. Genetic analysis of largemouth bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2005 through 2012 and by electrophoresis for previous years.

RESULTS AND DISCUSSION

Habitat: Littoral zone structural habitat consisted primarily of native, overhanging and tall vegetation, water hyacinth, and giant salvinia (Table 5). Aquatic vegetation covered nearly 100% of the reservoir's surface area in varying densities, and it consisted of mixed colonies of native and non-native vegetation occupying various areas of the reservoir (Table 6). Non-native giant salvinia was estimated to cover about 66% at the time of the survey, and water hyacinth was estimated to cover approximately 8%. Shallow average depth and extensive photic zone make it more prone to the problematic growth of plants.

Prey species: Greater control of hydrilla, giant salvinia, and water hyacinth from herbicide treatments in 2011 and 2012 improved electrofishing efficiency of prey species in fall of 2012. Gizzard Shad catch was high (779.0/h); whereas, no individuals were caught during the 2008 and 2004 fall electrofishing surveys (Figure 1). Most specimens were small and available as prey (IOV = 99), which suggested that the population was expanding. The catch rate of Bluegill in 2012 was 87.0/h, which was higher than it was in 2008 (8.0/h) and 2004 (42.0/h) (Figure 2). Redear Sunfish were the dominant sunfish species in the fall 2012 survey, and their catch rate (225.0/h) was higher than it was in 2008 (22.7/h) or 2004 (84.0/h) (Figure 3).

Catfishes: Historically, shallow water and excessive aquatic vegetation have limited gill net sampling efficiency, and they have not been effective at capturing catfishes at Lake Sheldon. Although both Blue Catfish and Channel Catfish were present in Sheldon Reservoir, their catch rates continued to be low. In 2013, gill net catch rate for Blue Catfish was 0.6/nn (Figure 4) and for Channel Catfish was 0.4/nn (Figure 5). All individuals caught for both species were over 20 inches in length with no evidence of natural recruitment. It is likely that extensive vegetation cover has repressed natural recruitment of catfishes.

Largemouth Bass: Electrofishing catch rate of Largemouth Bass dropped from 249.0/h in 2004 to 21.3/h in 2008, but partially rebounded to 147.0/h in 2012 (Figure 6). CPUE of stock-sized (≥8 inches) Largemouth Bass also slightly increased from 13.0/h in 2008 to 30.0/h in 2012. However, changes in the catch rates were likely a result of sampling efficiency due decreased vegetation rather than true changes in Largemouth Bass population dynamics. The size structure (PSD=70) suggests a balanced population, and high catch rate of sub-stock (<8 inch) fish suggests adequate recruitment. Relative weights for individual inch classes were high, ranging from 110 to 130, suggesting good prey availability.

Crappie: As a result of overabundant vegetation, trap net surveys were not conducted in 2004 and 2008; however, a trap net survey was conducted in the fall of 2012. White crappie catch rate was 6.0/nn (Figure 7) while Black Crappie had a higher catch rate of 27.4/nn (Figure 8). Both Black and White Crappie ≤4 inches were abundant, suggesting strong year classes and a high potential that harvestable-sized (≥10 inches) will be available in the coming years.

Fisheries management plan for Sheldon Reservoir, Texas

Prepared – July 2013.

ISSUE 1: Access to Sheldon Reservoir is limited due to heavy infestations of exotic vegetation and infrastructure improvement needs. Funding limits implementation of extensive aquatic vegetation control.

MANAGEMENT STRATEGIES

1. Continue to treat hydrilla, giant salvinia, and water hyacinth with appropriate herbicide when funds are available.
2. Continue to work with TPWD State Parks and Infrastructure staffs to develop better access infrastructure, including a new boat ramp, new and repaired fishing piers, and dredging to increase boating access.

ISSUE 2: Sheldon Reservoir is very shallow with a small watershed. During drought conditions in 2010, Sheldon Reservoir nearly went dry. This same problem will exist if rainfall is low in in 2013.

MANAGEMENT STRATEGY

1. Work with the Sheldon Lake State Park staff to find funding to purchase water rights when needed to solve the immediate crises and to work on a dredging plan to increase volumetric capacity in the reservoir.

ISSUE 3: Sheldon Reservoir would benefit from the support of local anglers and other users.

MANAGEMENT STRATEGIES

1. Work with Sheldon Lake State Park staff to develop a Friends of Reservoirs Chapter in support of Sheldon Reservoir.
2. Meet with the local bass club to provide information about Sheldon Reservoir and its fisheries to local constituents.

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 (*Dreissenia 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 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 state park to post appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the 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.

SAMPLING SCHEDULE JUSTIFICATION: The proposed sampling schedule includes monitoring by electrofishing, trap netting, gill netting, and an access survey in 2015/2016 (Table 8). Exotic vegetation surveys will be conducted at least once annually. Sheldon Reservoir's four-year sampling rotation was shifted earlier by one year to more evenly distribute the management district's sampling workload. Following 2015-2016 sampling year, surveys will be conducted every four years.

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Henson, J., and M. Webb. 2005. Statewide freshwater fisheries monitoring and management program survey report for Houston County Reservoir, 2004. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Henson, J. and M. Webb. 2009. Statewide freshwater fisheries monitoring and management program survey report for Houston County Reservoir, 2008. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Table 1. Characteristics of Sheldon Reservoir, Texas.

Characteristic	Description
Year constructed	1958
Controlling authority	Texas Parks and Wildlife Commission
County	Harris
Reservoir type	State Park Reservoir
Shoreline Development Index (SDI)	2.7
Conductivity	80 µmhos/cm

Table 2. Boat ramp characteristics for Sheldon Reservoir, Texas, August 2012. Reservoir elevation at time of survey was 50 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Pineland Road	29.868455 -95.168196	Y	10	Unknown	Steep, inadequate parking

Table 3. Harvest regulations for Sheldon Reservoir, Texas. Fishing is by pole-and-line only. Reservoir is contained entirely within the state park boundary. No fishing license is required.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	5 (in any combination)	none
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Sheldon Reservoir, Texas. FRY = Fry; FGL = fingerling; AFGL = advanced fingerling; UNK = Unknown.

Species	Year	Number	Size
Blue Catfish	1972	4,800	UNK
	1978	46,360	UNK
	1983	89	UNK
	Total	51,249	
Channel Catfish	1972	12,500	AFGL
	1976	34,640	AFGL
	1978	90,654	AFGL
	1984	78,432	FGL
	1990	12,261	FGL
	2004	1,968	AFGL
	2005	17,908	AFGL
	Total	248,363	
Flathead Catfish	1972	1,015	UNK
	1983	25	UNK
	Total	1,040	
Black Crappie	1972	51,000	UNK
	Total	51,000	
Warmouth	1972	41,600	UNK
	Total	41,600	
Green X Redear Sunfish	1972	80,000	UNK
	1976	24,365	UNK
	1988	70,300	UNK
	Total	174,665	
Redear Sunfish	1983	107,800	UNK
	Total	107,800	
Florida Largemouth Bass	1978	120,000	FRY
	1983	52,344	FRY
	Total	172,344	
Largemouth Bass	1972	73,000	UNK
	1983	15,569	UNK
	Total	88,569	
Red Drum	1976	246	UNK
	Total	246	

Table 5. Survey of structural habitat types, Sheldon Reservoir, Texas, 2012. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Overhanging Brush	5.3 miles	40
Non-descript/mixed vegetation	7.8 miles	60

Table 6. Survey of aquatic vegetation, Houston County Reservoir, Texas, 2012. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2009	2012
Native submersed[a]	280.7 (22.8)	86.6 (7.0)
Native floating-leaved[b]	223.4 (18.2)	827.2 (67.3)
Native emergent[c]	479.1 (40.0)	511.0 (41.6)
Non-native		
Giant salvinia	586.5 (47.7)	810.0 (65.9)
Water hyacinth	554.9 (45.1)	8.0 (0.7)
Hydrilla	772.0 (62.8)	<1.0 (0.1)

[a] Native submersed vegetation was primarily coontail (*Ceratophyllum demersum*), Illinois pondweed (*Potamogeton illinoensis*), and brushy pondweed (*Potamogeton pectinatus*).
[b] Native floating-leaved vegetation was primarily American lotus (*Nelumbo lutea*) and water lilies (*Nymphea* spp.).
[c] Native emergent vegetation consisted primarily of giant bulrush (*Scirpus californicus*), cattail (*Typha* spp.), sedges (*Carex* spp.), and soft rush (*Juncus effusus*).

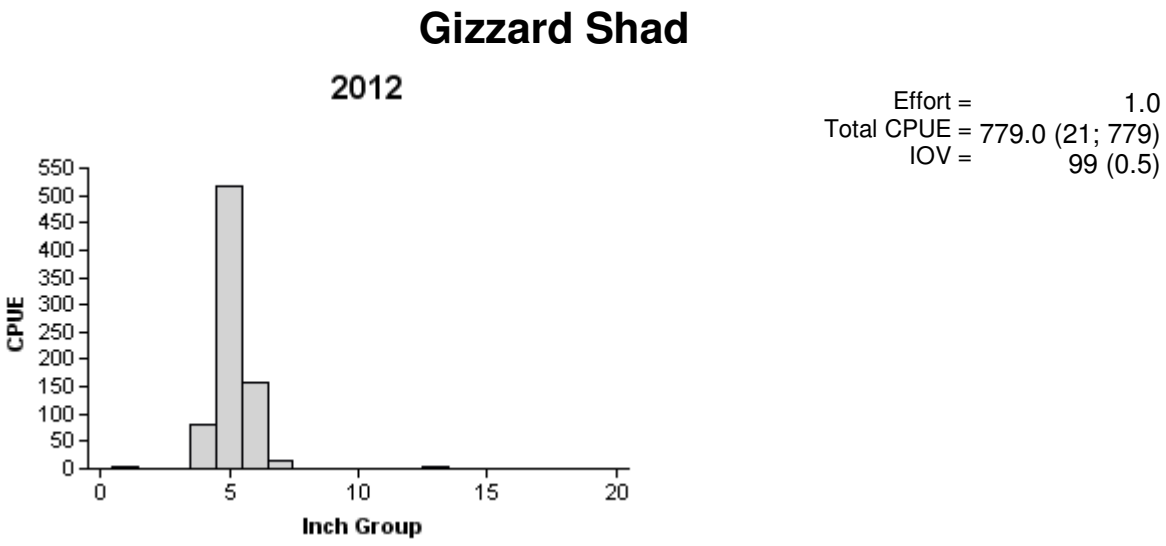


Figure 1. Number of Gizzard Shad caught per hour (CPUE), and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Sheldon Reservoir, Texas, 2012. No Gizzard Shad were collected in 2004 or 2008.

Bluegill

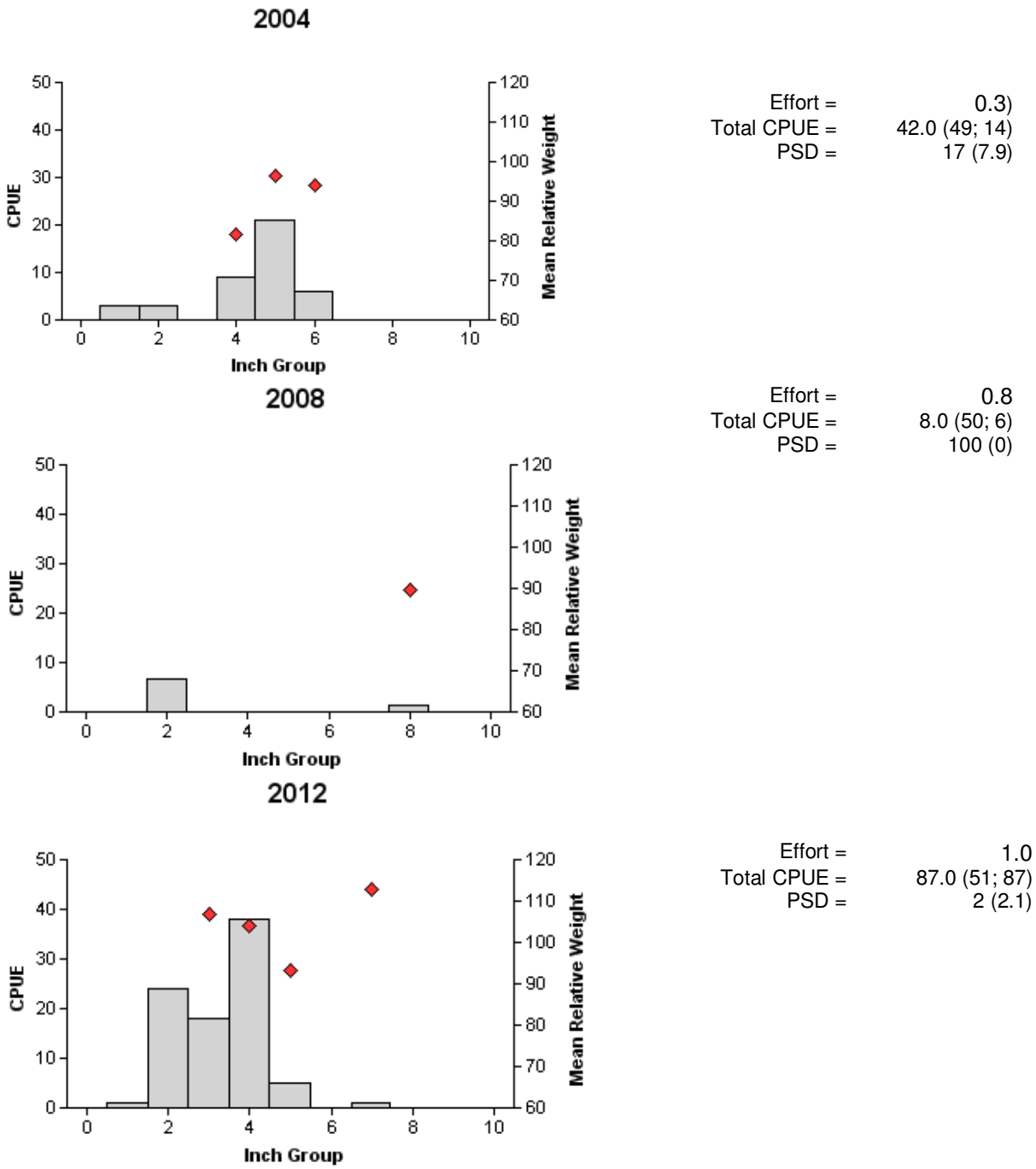
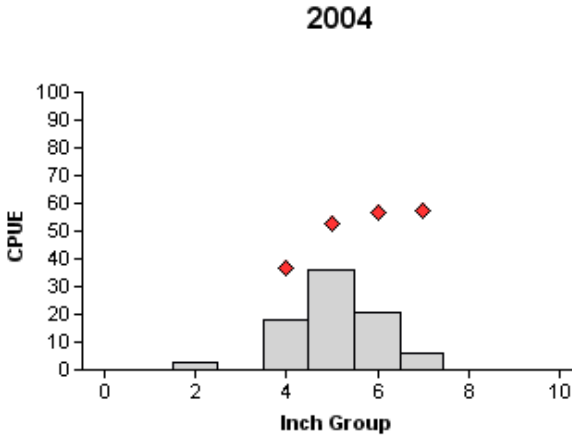
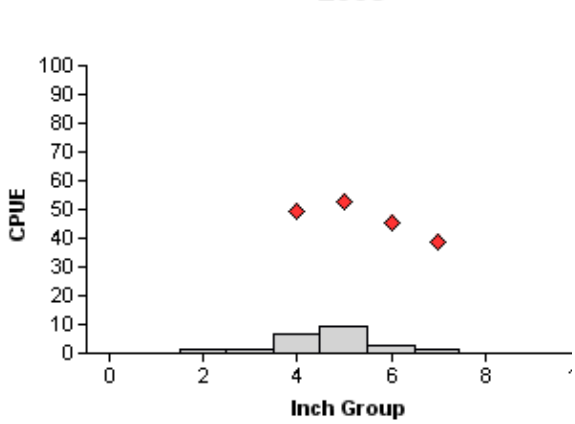


Figure 2. Number of Bluegill caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Sheldon Reservoir, Texas, 2004, 2008, and 2012.

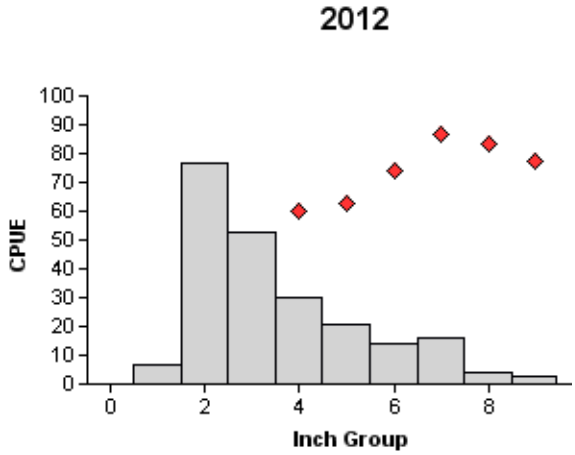
Redear Sunfish



Effort = 0.3
Total CPUE = 84.0 (48; 28)
PSD = 7 (3.9)



Effort = 0.8
Total CPUE = 22.7 (50; 17)
PSD = 7 (7.2)

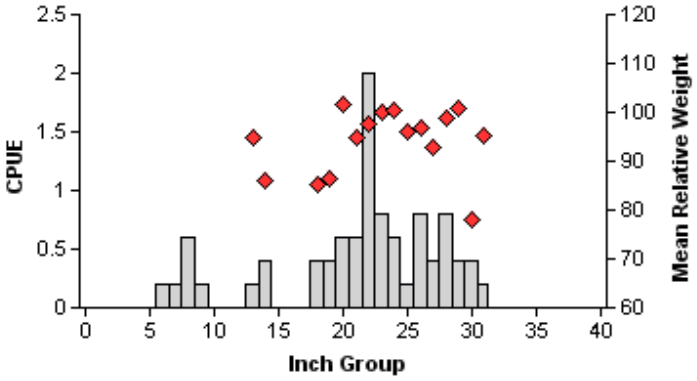


Effort = 1.0
Total CPUE = 225.0 (19; 225)
PSD = 26 (5.1)

Figure 3. Number of Redear Sunfish 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 fall electrofishing surveys, Sheldon Reservoir, Texas, 2004, 2008, and 2012.

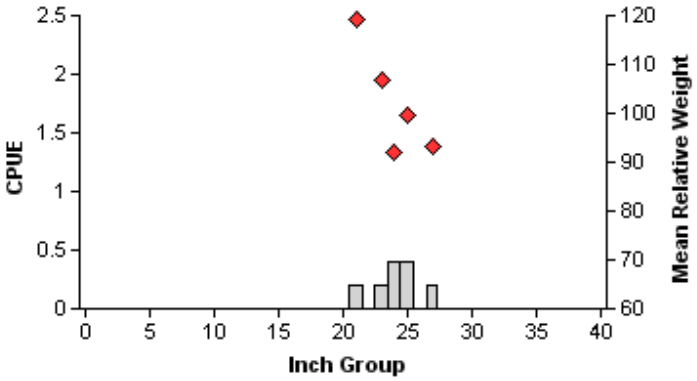
Blue Catfish

2001



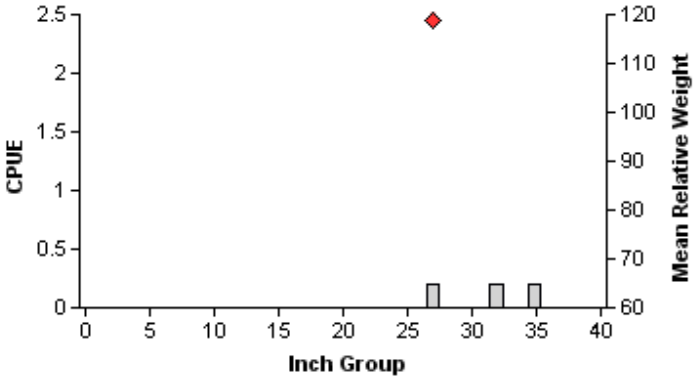
Effort = 5.0
Total CPUE = 10.4 (23; 52)
PSD = 85 (9.3)

2005



Effort = 5.0
Total CPUE = 1.4 (53; 7)
PSD = 100 (0)

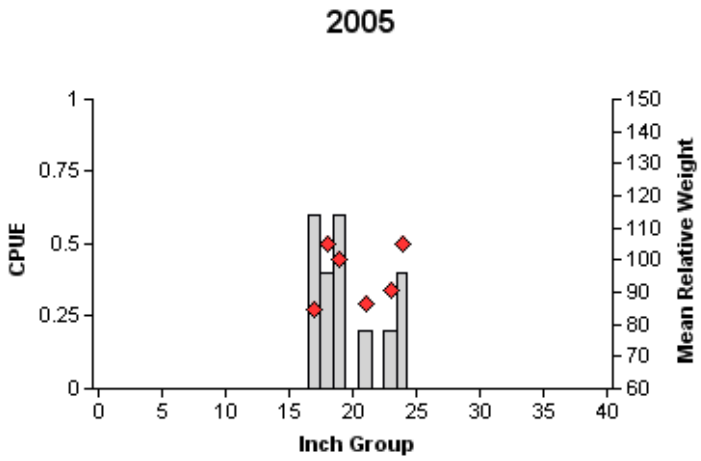
2013



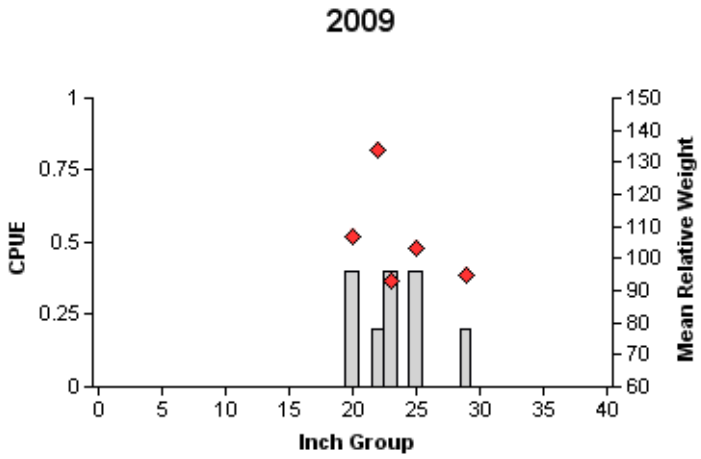
Effort = 5.0
Total CPUE = 0.6 (100; 3)
PSD = 100 (0)

Figure 4. Number of Blue Catfish caught per net night (CPUE), 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, Sheldon Reservoir, Texas, 2001, 2005, and 2013.

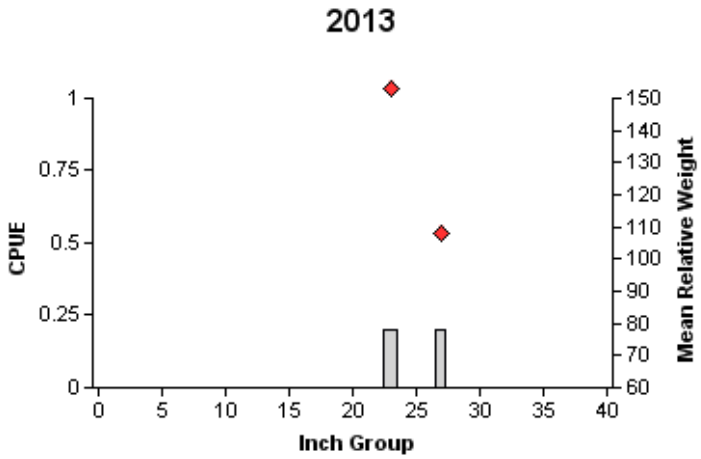
Channel Catfish



Effort = 5.0
Total CPUE = 2.4 (43; 12)
PSD = 100 (0)



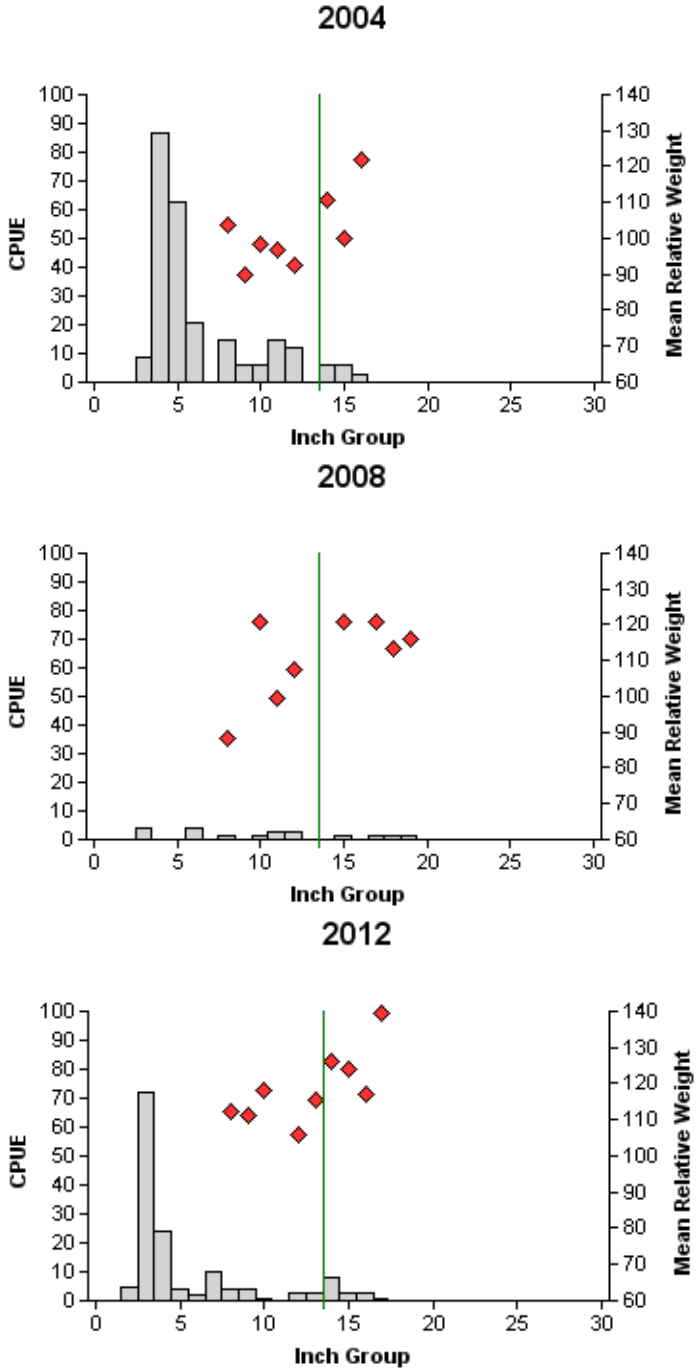
Effort = 5.0
Total CPUE = 1.6 (70; 8)
PSD = 100 (0)



Effort = 5.0
Total CPUE = 0.4 (0; 2)
PSD = 100 (0)

Figure 5. Number of Channel Catfish caught per net night (CPUE), 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, Sheldon Reservoir, Texas, 2005, 2009, and 2013.

Largemouth Bass



Effort =	0.3
Total CPUE =	249.0 (15; 83)
Stock CPUE =	69.0 (50; 23)
PSD =	39 (9.6)

Effort =	0.8
Total CPUE =	21.3 (26; 16)
Stock CPUE =	13.3 (28; 10)
PSD =	60 (16.7)

Effort =	1.0
Total CPUE =	147.0 (17; 147)
Stock CPUE =	30.0 (23; 30)
PSD =	70 (9.7)

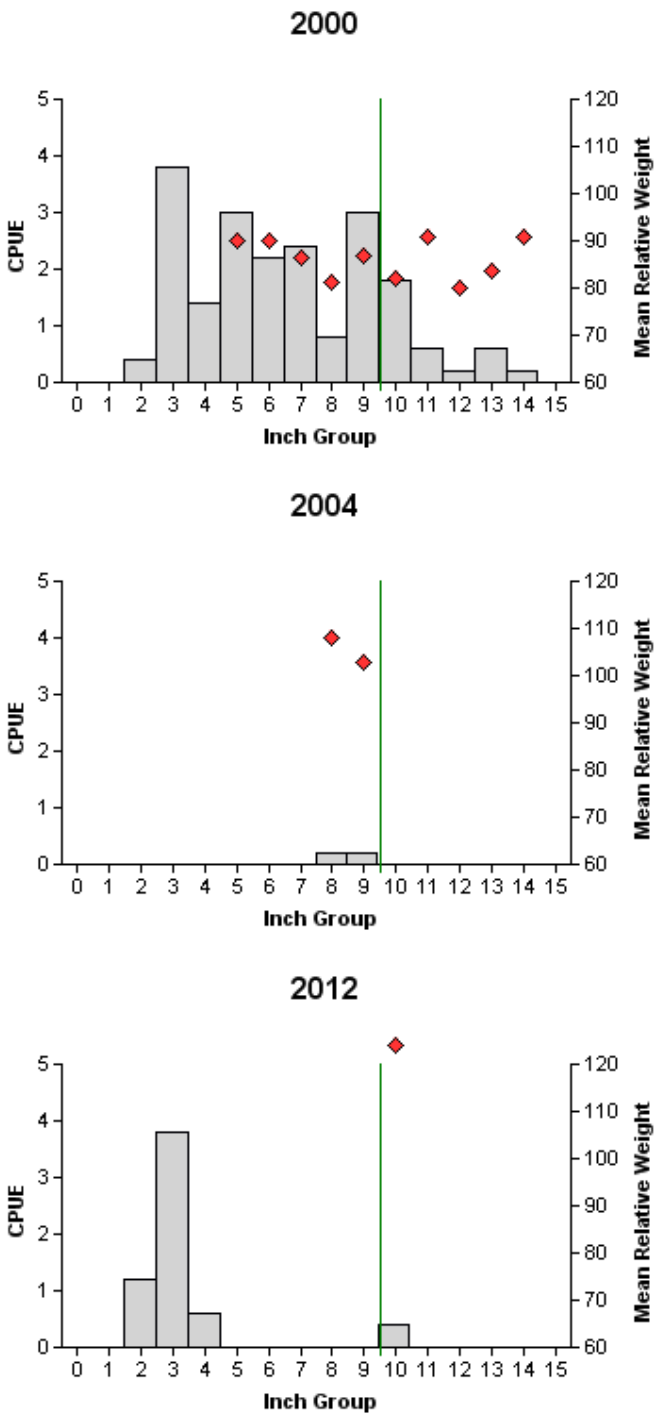
Figure 6. Number of Largemouth Bass caught per hour of electrofishing (total CPUE), mean relative weight (diamonds), and population indices (RSE and N for total CPUE and stock CPUE and SE for size structure are in parentheses) for fall surveys, Sheldon Reservoir, Texas, 2004, 2008, and 2012. Vertical line indicates minimum length limit.

Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Sheldon Reservoir, Texas, 2004 and 2012. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2004	50	8	42	0	65.0	16.0
2012	30	1	29	0	60.0	0.3

White Crappie



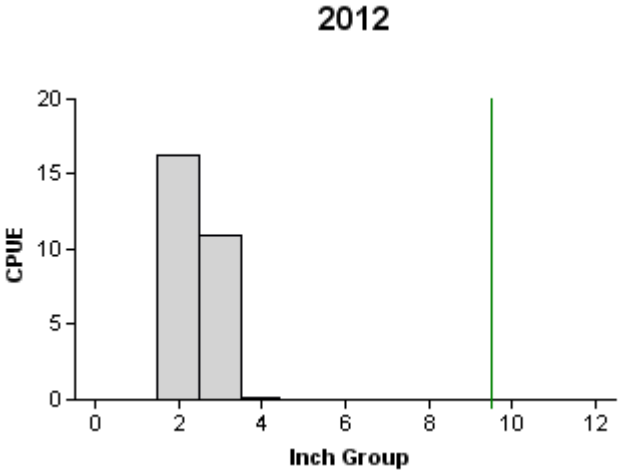
Effort =	5.0
Total CPUE =	20.4 (23; 102)
PSD =	49 (6)

Effort =	5.0
Total CPUE =	0.4 (61; 2)
PSD =	100 (0)

Effort =	5.0
Total CPUE =	6.0 (44; 30)
PSD =	100 (0)

Figure 7. Number of White Crappie caught per net night (CPUE), 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, Sheldon Reservoir, Texas, 2000, 2004, and 2012. Vertical line indicates minimum length limit.

Black Crappie



Effort =	5.0
Total CPUE =	27.4 (51; 137)
PSD =	0 (0)

Figure 8. Number of Black Crappie caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Sheldon Reservoir, Texas, 2012. Vertical line indicates minimum length limit. Black Crappie were not collected in 2004 and 2008.

Table 8. Proposed sampling schedule for Sheldon Reservoir, Texas. Survey period is June 2013 through May 2017. Gill netting surveys are conducted in the spring while electrofishing and trap netting surveys are conducted in the fall. A standard survey denoted by S and an additional survey denoted by A. Sheldon Reservoir's four-year sampling rotation was shifted up one year to more evenly distribute District sampling workload. Following 2015-2016 sampling year, surveys will be conducted every four years.

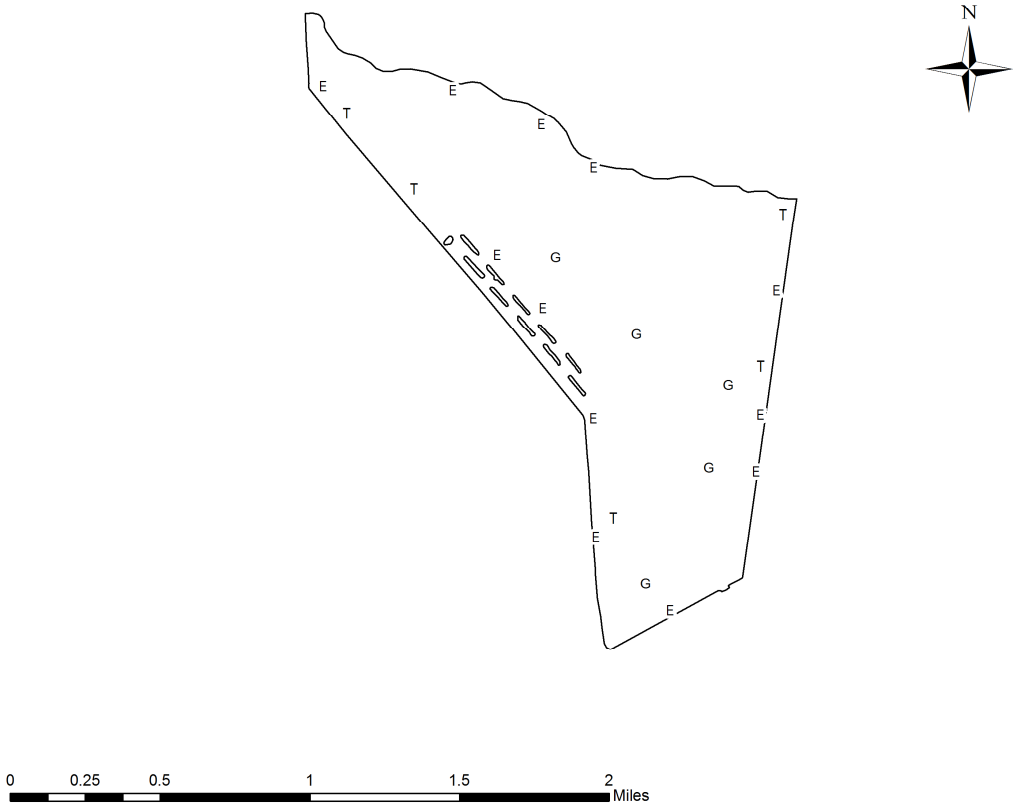
Survey year	Electrofish Fall	Trap net	Gill net	Habitat		Access	Report
				Structural	Vegetation		
2013-2014					A		
2014-2015					A		
2015-2016	S	A	S	S	S	S	S
2016-2017					A		

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Sheldon Reservoir, Texas, 2012-2013. Sampling effort was five net nights for gill netting, five net nights for trap netting, and one hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					779	779.0
Blue Catfish	3	0.6				
Channel Catfish	2	0.4				
Bluegill					87	87.0
Redear Sunfish					225	225.0
Largemouth Bass					147	147.0
White Crappie			30	6.0		
Black Crappie			137	27.4		

APPENDIX B



Location of sampling sites, Sheldon Reservoir, Texas, 2012-2013. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.