

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

**Houston County Reservoir**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Houston County Reservoir were surveyed in 2012 using electrofishing and trap netting and in 2013 using gill netting. Historical data are presented with the 2012-2013 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Houston County Reservoir is a 1,523-acre impoundment of Little Elkhart Creek within the Trinity River basin and near Crockett, Texas. The reservoir is located within the Piney Woods physiographic region, and the surrounding soil types include Freestone-Kenny and Kaufman-Trinity. Houston County Reservoir was constructed in 1966 for municipal and industrial purposes, and it has been managed by Houston County Water Conservation and Improvement District I.
- **Management History:** Important sport fish include Largemouth Bass and sunfishes. All sport fishes except Largemouth Bass (*Micropterus salmoides*) found in the reservoir are managed under the current statewide regulations. Largemouth Bass harvest is regulated by a 14- to 21-inch slot limit and a 5-fish daily bag limit. Florida Largemouth Bass were introduced in the mid-1970s and have been stocked numerous times; the most recent stocking occurred in 2010. Historically, hydrilla (*Hydrilla verticillata*) has been problematic in the reservoir, and water hyacinth (*Eichornia crassipes*) was recently discovered and is expanding. The hydrilla was treated with fluoridone in 2011.
- **Fish Community**
  - **Prey species:** The 2012 survey indicated Bluegill (*Lepomis macrochirus*) and Threadfin Shad (*Dorosoma pretense*) were the most abundant prey species in Houston County Reservoir. Other prey included Gizzard Shad (*D. cepedianum*), Redear Sunfish (*L. microlophus*), Green Sunfish (*L. cyanellus*), Bullhead Minnows (*Pimephales vigilax*), and Blacktail Shiners (*Cyprinella venusta*). Houston County Reservoir has historically supported a significant sunfish fishery.
  - **Catfishes:** The gill net catch rates of Channel Catfish (*Ictalurus furcatus*) continued to be low in the reservoir. Flathead Catfish remained present.
  - **White Bass:** White Bass (*Morone chrysops*) were present in the reservoir, but gill net catch rates suggest that they are present in low abundance.
  - **Black Basses:** The electrofishing catch rate for Largemouth Bass was higher than that reported in the 2009 survey report. Size structure and body condition of largemouth bass is good. Spotted Bass (*M. punctulatus*) relative abundance was higher than previously reported, but most were small and unlikely to support a significant fishery. Black basses accounted for the majority of the directed effort in the 2006 creel survey and continue to be a popular fishery.
  - **Crappie:** Crappie (*Pomoxis* spp.) were historically not well-represented in the trap net surveys; none were caught in the 2012. However, this species has provided a significant fishery in the past.
- **Management Strategies:** Electrofishing is conducted every two years; whereas, trap netting, gill netting, and angler access surveys occur every four years. Aquatic vegetation is surveyed annually. Requests for Florida Largemouth Bass are submitted on a regular basis according to TPWD stocking criteria.

## INTRODUCTION

This document is a summary of fisheries data collected from Houston County 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*

Houston County Reservoir is a 1,523-acre impoundment of Little Elkhart Creek within the Trinity River basin and near Crockett, Texas. The reservoir is located within the Piney Woods physiographic region, and the surrounding soil types include Freestone-Kenny and Kaufman-Trinity. Houston County Reservoir was constructed in 1966 for municipal and industrial purposes, and it is managed by Houston County Water Conservation and Improvement District I. Houston County Reservoir has a drainage area of approximately 49 square miles and a shoreline length of about 26 miles. The reservoir has a holding capacity of 27,000 acre-feet with a surface area of 1,600 acres at conservation pool elevation (260-ft MSL). The drainage area above the dam is approximately 44 square miles. Normal annual fluctuation is approximately two feet (Figure 1). A severe drought during the 2009-2013 survey period occurred from summer 2011 to spring 2012 when the water level dropped over 4-feet below conservation pool. Other descriptive characteristics for Houston County Reservoir are shown in Table 1.

### *Angler Access*

Houston County Reservoir has one public boat ramp and one commercially operated boat ramp. The Houston County public boat ramp is easily accessible with ample parking for anglers and other recreationists. Crockett Family Resort requires a fee for boat ramp usage and parking. Each location provides adequate access for constituents. Additional boat ramp characteristics are listed in Table 2. Public shoreline access is limited to the public boat ramp, dam, and Crockett Family Resort area.

### *Management History*

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

1. Continue to survey all exotic vegetation annually.  
**Action:** Aquatic vegetation surveys were conducted each summer from 2009 through 2012 to monitor coverage of native plants and non-native hydrilla and water hyacinth. In summer of 2011, hydrilla was controlled by applying herbicide along the shoreline.
2. Work with the controlling authority to develop a pest management plan.  
**Action:** Consultation and recommendations were given to Houston County Water Conservation District I for integrated pest management for hydrilla and water hyacinth. An advisory committee was established in 2011, and public meetings were held that year to discuss treatments of nuisance hydrilla.
3. Continue to survey Largemouth Bass population every two years with fall electrofishing and collect age-0 fish to assess Florida genetics.  
**Action:** In the fall of 2010 and 2012, electrofishing was conducted to monitor the bass population. During these surveys, Largemouth Bass fin clips were collected for genetic analysis.
4. Continue to inform bass clubs and other interested groups of survey results.  
**Action:** Results of these surveys have been presented at public meetings as well as by phone consultation and email.
5. Request a stocking for Florida Largemouth Bass in 2010.  
**Action:** In 2010, 135,370 Florida Largemouth Bass fingerlings were stocked into Houston County Reservoir.

**Harvest regulation history:** All sport fishes except Largemouth Bass are managed under the current statewide regulations. Largemouth Bass harvest is regulated by a 14- to 21-inch slot limit and a 5-fish daily bag limit. Current regulations are found in Table 3.

**Stocking history:** Florida Largemouth Bass were introduced in the mid-1970s, and they have been stocked numerous times since their introduction. The most recent stocking occurred in 2010 (135,370 fingerlings). The complete stocking history is presented in Table 4.

**Vegetation/habitat management history:** Historically, hydrilla infestations at boat ramps have been controlled with herbicides. District staff treated hydrilla along the developed shoreline with fluridone during summer 2011. Exotic water hyacinth is present in the reservoir and has been problematic in local areas and has not yet been treated.

**Water transfer:** Houston County Reservoir is primarily used for municipal and industrial water supply for the cities of Crockett, Latexo, and Grapeland. Pump stations managed by the Houston County Water Improvement and Conservation District I service water to the neighboring cities; however, interbasin transfers are not known to exist.

## 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.

Water level data was gathered from the United States Geological Survey (USGS) website (Figure 1; USGS 2013).

## RESULTS AND DISCUSSION

**Habitat** Structural shoreline habitat consisted primarily of non-descript mud and sand shoreline with bulkheads and boat docks. Native emergent vegetation grew in front of some of the bulkheads. Standing timber occurred in over half of the reservoir. American lotus (*Nelumbo lutea*) along with water hyacinth occurred in shallow coves (Table 5). Native vegetation covered about 9% of the reservoir's surface area; whereas, non-native vegetation covered less than 1% (Table 6); species present were American lotus, southern naiad (*Najas guadalupensis*), water lily (*Nymphaea* spp.), and coontail (*Ceratophyllum demersum*). During the 2012 habitat survey, hydrilla did not appear to be adversely affecting boat and angler access. Lower levels of non-native vegetation in 2012 can be attributed to a 2011 herbicide application combined with drought.

**Prey species:** Threadfin Shad were captured by electrofishing at a rate of 656.0/h which was lower than the 895.0/h reported in 2008, but is still high. Gizzard Shad electrofishing catch rate was 74.0/h in 2012

which was higher than in 2008 (22.0/h). Index of Vulnerability (IOV) for Gizzard Shad improved from 18 in 2008 to 30 in 2012, but it was still poor, indicating only 30% were of preferable prey size (Figure 2). Bluegill CPUE was highest of all species captured in the 2012 electrofishing survey (915.0/h) (Appendix A) and it was higher than in 2008 (620.0/h) and 2004 (538.0/h). Bluegill size structure continued to be dominated by small individuals (2-4 inches total length [TL]; Figure 3). Redear Sunfish were captured at 95.0/h which was lower than in 2008 (104.0/h) and 2004 (237.0/h). Redear Sunfish size structure was dominated by mid-sized individuals (4-6 inches TL; Figure 4).

**Catfishes:** Historically, Flathead Catfish (*Pylodictis olivaris*) have been present in low abundance, and their gill-net catch rate continued to be low in 2013 (0.4/nn) (Figure 5). Channel Catfish continued to exhibit low relative abundance, as evidenced by a gill-net catch rate of 0.8/nn in 2013, which was slightly lower than it was during 2009 (1.6/nn) (Figure 6). No natural recruitment was evidenced in the 2013 survey; all fish collected were adult size. Directed angler effort for Channel Catfish has historically been low (Henson and Webb 2009).

**White bass:** Historical catch of White Bass in gill net surveys has been low. White Bass gill-net CPUE in 2013 (1.8/nn) indicated continued presence in the reservoir at low relative abundance but higher than in 2009 (0.2/nn) (Figure 7).

**Black basses:** Spotted Bass electrofishing CPUE increased from 16/h in 2004 to 38/h in 2012. Size structure has varied since 2004, and the PSD has decreased since 2008 from 33 to 0, indicating poor size distribution (Figure 8).

Largemouth Bass electrofishing CPUE was 155/h in 2012, higher than in 2010 (15/h) and 2008 (117/h). Size structure improved as PSD increased from 46 in 2008 to 58 in 2012 (Figure 9). Body condition in 2012 was good ( $W_r > 90$ ) for a majority of the size classes and was similar to those reported in 2008 and 2004 (Figure 9). Florida Largemouth Bass genetic influence in 2012 has remained relatively consistent as Florida alleles have ranged from 34% to 46% and Florida genotype has ranged from 3% to 13% (Table 7). Largemouth Bass support the most popular fishery in the reservoir. Creel data from 2006 indicated that anglers allocated 10,535 hours of total effort targeting Largemouth Bass (73% of overall effort; Henson and Webb 2009).

**Crappie:** During past surveys, trap nets have not been effective at capturing crappie at Houston County Reservoir, and no crappie were captured during the fall 2012 survey. However, Houston County Reservoir has historically been a popular destination for crappie anglers (Henson and Webb 2009).

## Fisheries management plan for Houston County Reservoir, Texas

Prepared – July 2013.

**ISSUE 1:** Exotic vegetation continues to be an issue at Houston County Reservoir. Water hyacinth has increased its coverage and distribution on the reservoir; whereas, hydrilla coverage appeared to be low and stable.

### MANAGEMENT STRATEGIES

1. Collaborate with Houston County Water Improvement and Conservation District I and Houston County Reservoir Advisory Committee in implementing control methods for water hyacinth.
2. Provide adequate signage for angler awareness of exotic vegetation on the reservoir.
3. Continue annual summer vegetation surveys to monitor hydrilla and water hyacinth distributions.
4. Consider native aquatic vegetation enhancement to fill empty niche left by hydrilla control.

**ISSUE 2:** Largemouth Bass support the most popular fishery in the reservoir. Historically, Houston County Reservoir has been known for trophy Largemouth Bass, but documented catches of fish over 10 pounds have decreased over time.

### MANAGEMENT STRATEGIES

1. Make contact with local angler groups and facilities to document catch of trophy Largemouth Bass if they occur. We plan to document trophy bass catches through a volunteer reporting survey.
2. Request Florida Largemouth Bass biennial stockings at approximately 90 fingerlings/acre justified by production of trophy Largemouth Bass.

**ISSUE 3:** Good relationships were created with local anglers, property owners, and the controlling authority at Houston County when establishing an advisory committee to help guide the development of an integrated pest management plan for hydrilla in 2011. Those relationships need to be maintained.

### MANAGEMENT STRATEGIES

1. Convene the local advisory board made up of area anglers, homeowners, business owners, and the controlling authority as appropriate to communicate on fisheries and aquatic vegetation management issues at least once a year.
2. Utilize local media and the advisory committee to help circulate reservoir management information.

**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. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc., so they can in turn educate their customers.
3. Educate the public about invasive species through the 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.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes electrofishing in 2014 and 2016, angler access survey in 2016, and gill netting in 2017. Aquatic vegetation will be surveyed annually (Table 8). An additional electrofishing survey in 2014 is necessary to monitor Largemouth relative abundance, condition, and size structure on this heavily-used fishery. Gill net surveys are necessary only every four years to ensure presence or absence of channel catfish, flathead catfish, and white bass. Trap net surveys will not be conducted as they perform poorly in this reservoir. Aquatic vegetation surveys are conducted annually to closely monitor invasive aquatic plants and to inspect for new exotics such as giant salvinia.

## LITERATURE CITED

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[http://waterdata.usgs.gov/tx/nwis/uv/?site\\_no=08063010&PARAMeter\\_cd=72020,00054](http://waterdata.usgs.gov/tx/nwis/uv/?site_no=08063010&PARAMeter_cd=72020,00054)

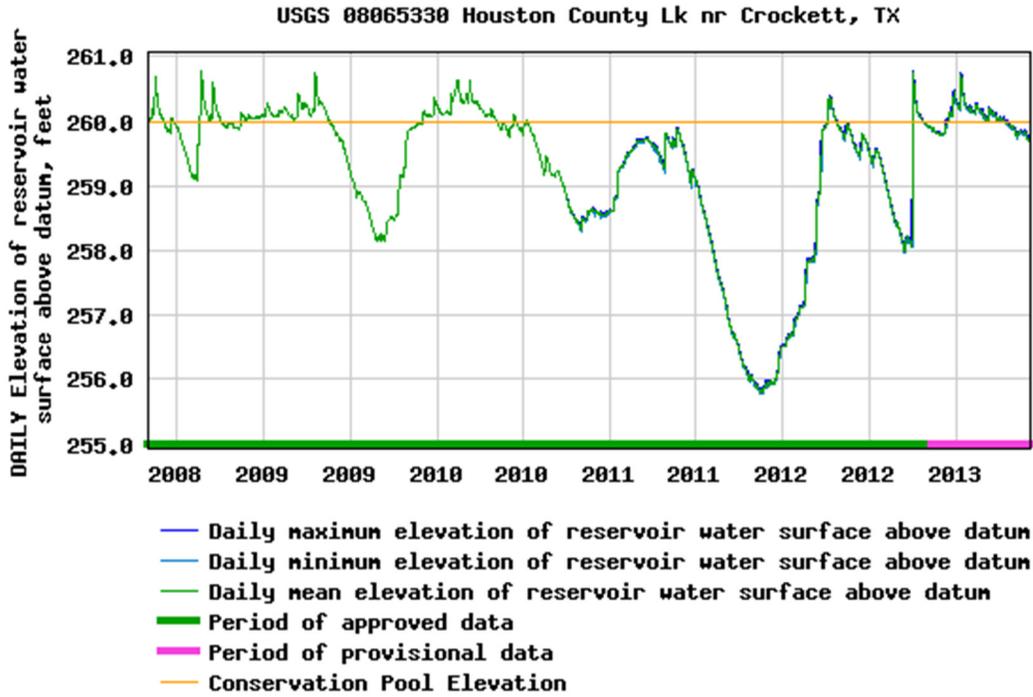


Figure 1. U.S. Geological Survey daily water level elevations in feet above mean sea level recorded for Houston County Reservoir, Texas.

Table 1. Characteristics of Houston County Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	Houston County Water Conservation and Improvement District #1
County	Houston
Reservoir type	Tributary – Little Elkhart Creek
Shoreline Development Index (SDI)	4.6
Conductivity	120 $\mu$ S/cm

Table 2. Boat ramp characteristics for Houston County Reservoir, Texas, August, 2012. Reservoir elevation at time of survey was 1422 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Condition
Houston Co. Public Ramp	31.409927 -95.604351	Y	30	Excellent; no access issues
Crockett Family Resort	31.411680 -95.578512	N	30	Excellent; no access issues

Table 3. Harvest regulations for Houston County Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5 <sup>a</sup> (only 1 > 24 inches)	14- to 21-inch slot
Bass: Spotted	5 <sup>a</sup>	None
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

<sup>a</sup> Daily bag for largemouth bass and spotted bass = 5 fish in any combination.

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

Species	Year	Number	Size
Channel Catfish	1967	5,000	AFGL
	1973	26,221	AFGL
	1986	75,112	AFGL
	Total	106,333	
Crappie, Black	1967	2,000	UNK
	Total	2,000	
Florida Largemouth Bass	1974	56,000	FGL
	1974	18,000	FRY
	1976	75,000	FGL
	1977	75,000	FGL
	2003	131,645	
	2004	136,645	
	2008	134,373	FGL
	2010	135,370	
	Total	762,033	
Green X Redear Sunfish	1967	2,000	FGL
	1986	8,000	FRY
	Total	10,000	
Kemp's Largemouth Bass	1985	34,735	FGL
	1986	62,630	FGL
	Total	97,365	
Northern Pike	1972	200	UNK
	Total	200	
Palmetto Bass	1979	14,500	UNK
	Total	14,500	

Table 5. Survey of structural habitat types, Houston County Reservoir, Texas, 2012. Shoreline habitat type units are in miles and standing timber is acres. Surface area (acres) is listed with percent of total reservoir.

Habitat type	Estimate	% of total
Bulkhead/boat docks	11.0 miles	41.3
Natural / Non-descript	14.4 miles	54.1
Rip-rap	1.2 miles	4.5
Timber	816.0 acres	53.6

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 <sup>a</sup>	94.1 (6.2)	72.4 (4.75)
Native floating-leaved <sup>b</sup>	<1.0 (0.01)	63.8 (4.19)
Native emergent <sup>c</sup>	830.7 (54.5)	1.2 (0.08)
Non-native		
Hydrilla	410.3 (26.9)	0.5 (0.03)
Water hyacinth	<1.0 (0.01)	0.8 (0.05)

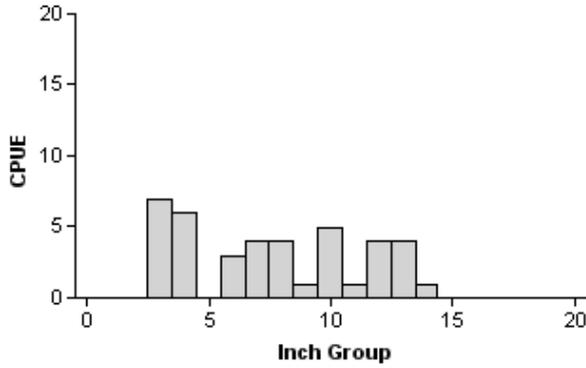
<sup>a</sup> Native submersed species primarily consisted of coontail, Illinois pondweed, and bushy pondweed.

<sup>b</sup> Native floating-leaved vegetation consisted of American lotus and white water-lily.

<sup>c</sup> Native emergent vegetation consisted primarily of cattail, giant bulrush, soft rush, sedges, and water primrose.

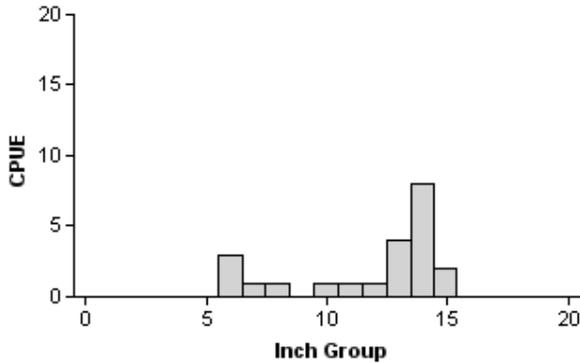
# Gizzard Shad

2004



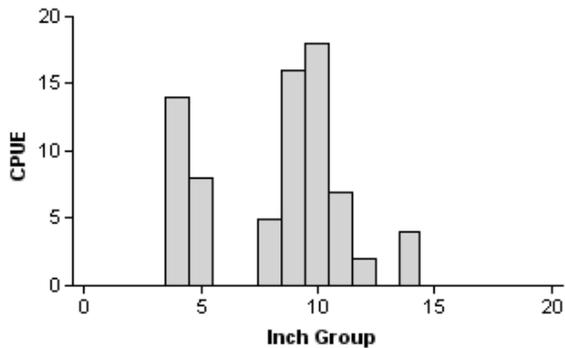
Effort = 1.0  
 Total CPUE = 40.0 (25; 40)  
 IOV = 48 (13)

2008



Effort = 1.0  
 Total CPUE = 22.0 (36; 22)  
 IOV = 18 (12)

2012

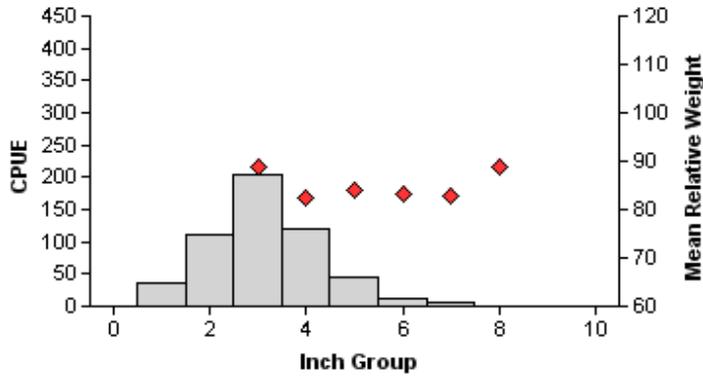


Effort = 1.0  
 Total CPUE = 74.0 (27; 74)  
 IOV = 30 (9.2)

Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Houston County Reservoir, Texas, 2004, 2008, and 2012.

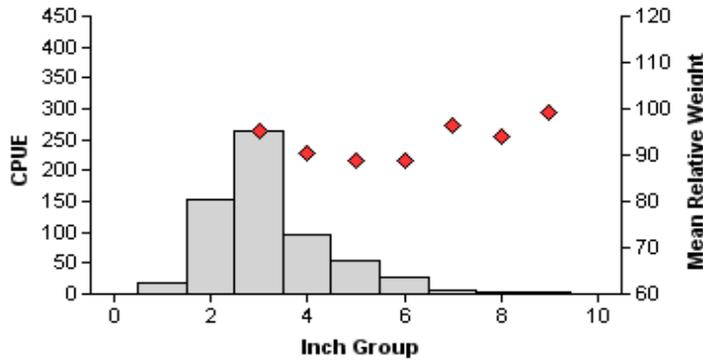
# Bluegill

2004



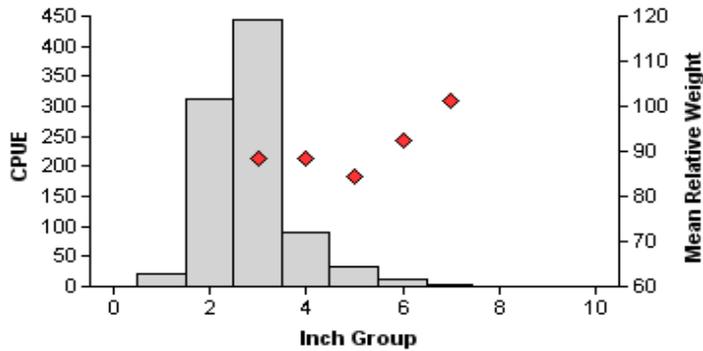
Effort = 1.0  
 Total CPUE = 538.0 (22; 538)  
 PSD = 5 (0.8)

2008



Effort = 1.0  
 Total CPUE = 620.0 (18; 620)  
 PSD = 9 (1.8)

2012



Effort = 1.0  
 Total CPUE = 915.0 (17; 915)  
 PSD = 3 (0.7)

Figure 3. 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, Houston County Reservoir, Texas, 2004, 2008, and 2012.

# Redear Sunfish

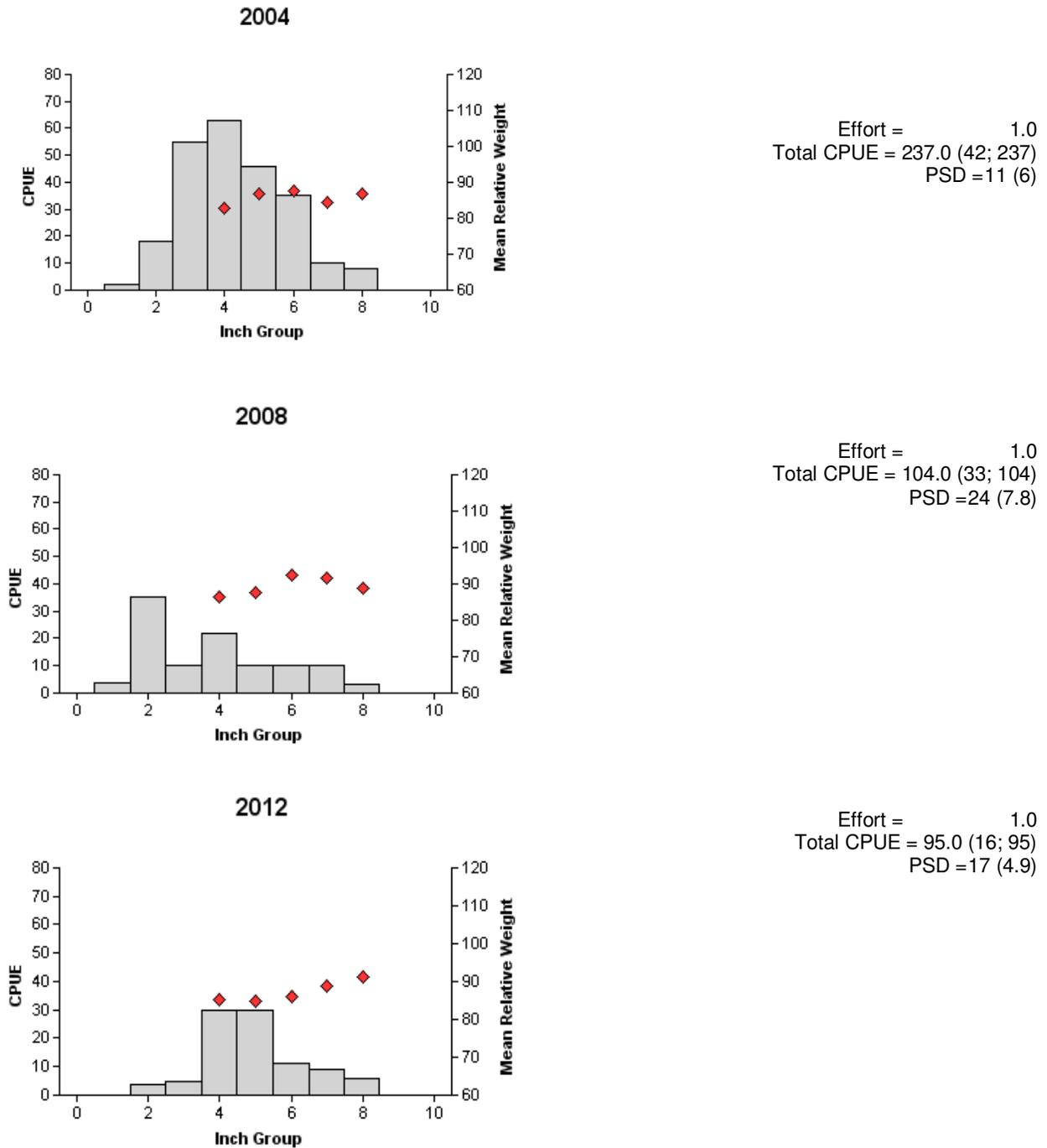
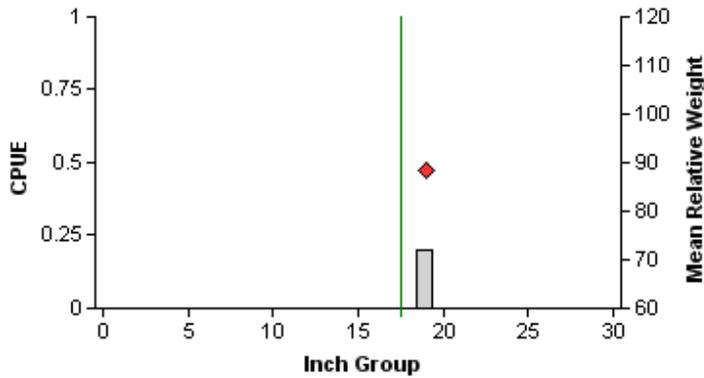


Figure 4. Number of Redear Sunfish caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Houston County Reservoir, Texas, 2004, 2008, and 2012.

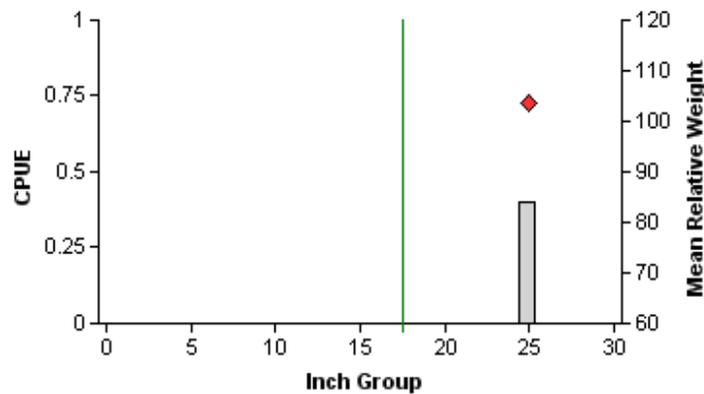
## Flathead Catfish

2009



Effort = 5.0  
 Total CPUE = 0.2 (100; 1)  
 PSD = 0 (111.8)

2013

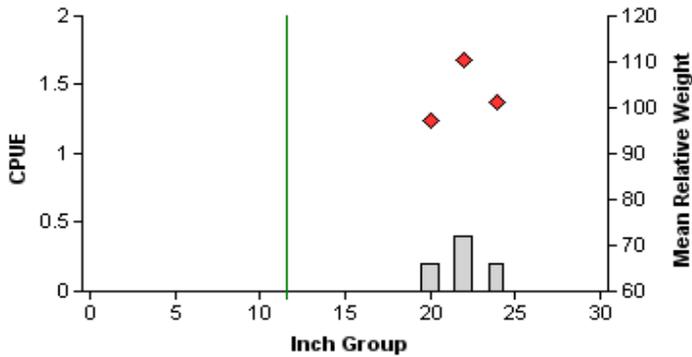


Effort = 5.0  
 Total CPUE = 0.4 (61; 2)  
 PSD = 100 (0)

Figure 5. Number of Flathead 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, Houston County Reservoir, Texas, 2009 and 2013. No Flathead Catfish were collected in 2005. Vertical line represents length limit at time of survey.

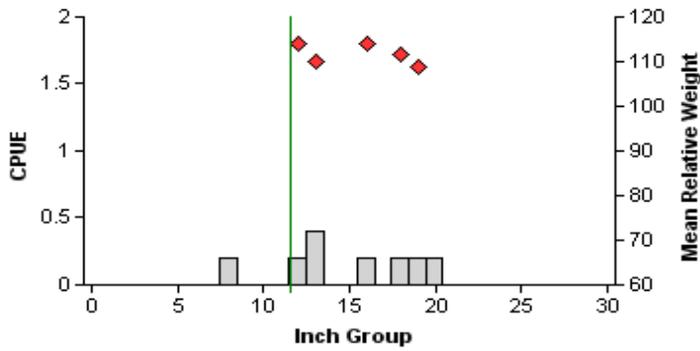
# Channel Catfish

2005



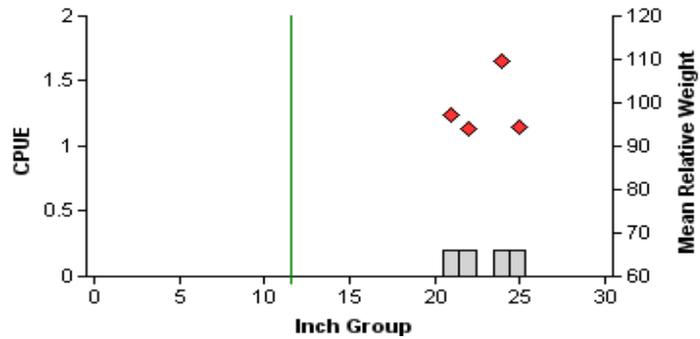
Effort = 5.0  
 Total CPUE = 0.8 (47; 4)  
 PSD = 100 (0)

2009



Effort = 5.0  
 Total CPUE = 1.6 (25; 8)  
 PSD = 57 (28.1)

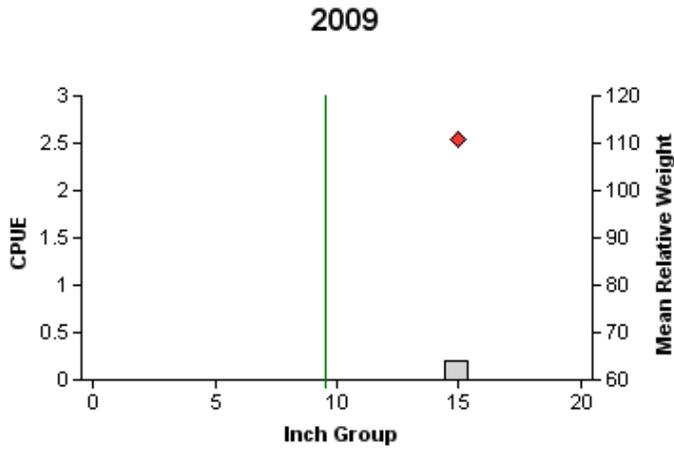
2013



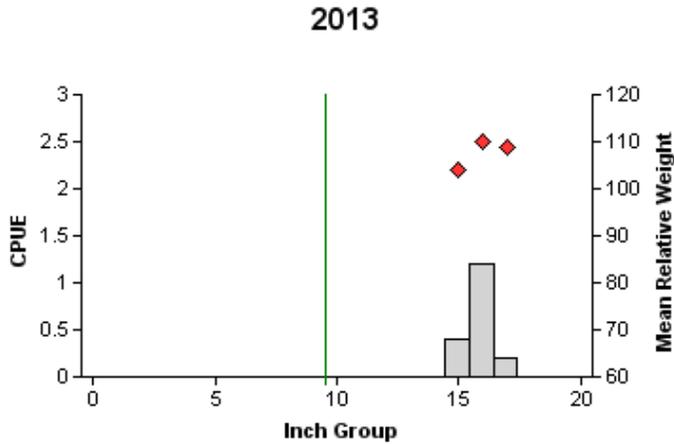
Effort = 5.0  
 Total CPUE = 0.8 (25; 4)  
 PSD = 100 (0)

Figure 6. Number of Channel Catfish caught per net night (CPUE), mean relative (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Houston County Reservoir, Texas, 2005, 2009, and 2013. Vertical line represents length limit at time of survey.

# White Bass



Effort = 5.0  
 Total CPUE = 0.2 (100; 1)

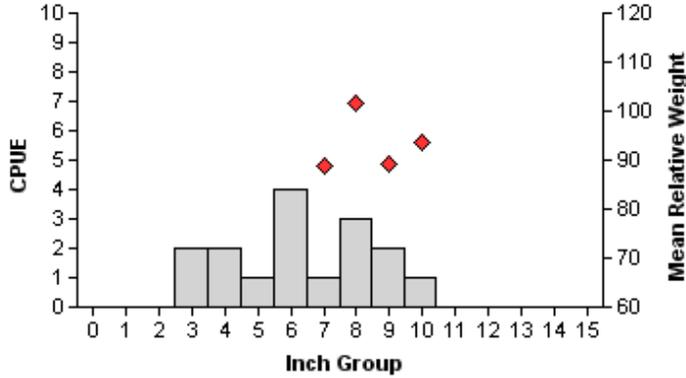


Effort = 5.0  
 Total CPUE = 1.8 (87; 9)

Figure 7. Number of White Bass caught per net night (CPUE), relative weight (diamonds), and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall trap net surveys, Houston County Reservoir, Texas, 2009 and 2013. No White Bass were collected in 2005. Vertical line represents length limit at time of survey.

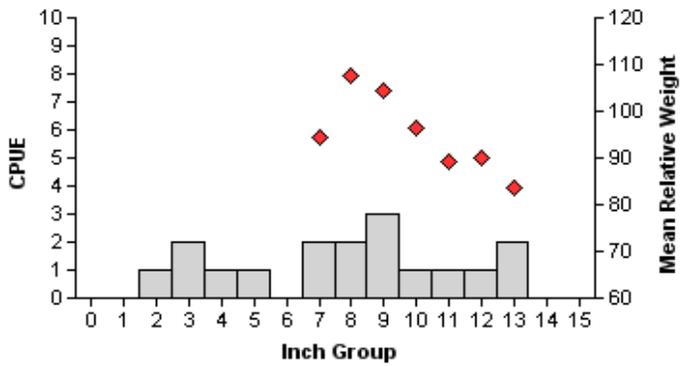
# Spotted Bass

2004



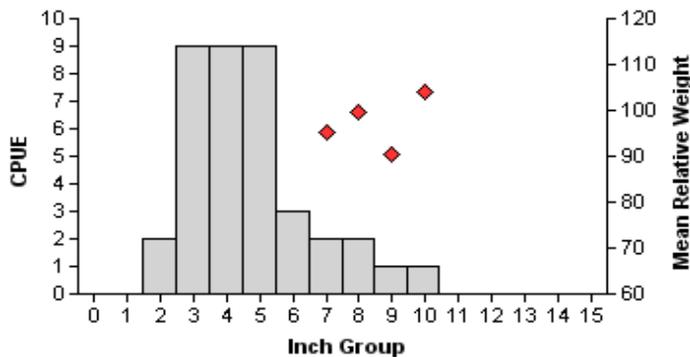
Effort = 1.0  
 Total CPUE = 16.0 (49; 16)  
 PSD = 0 (131.8)

2008



Effort = 1.0  
 Total CPUE = 17.0 (24; 17)  
 PSD = 33 (15.4)

2012

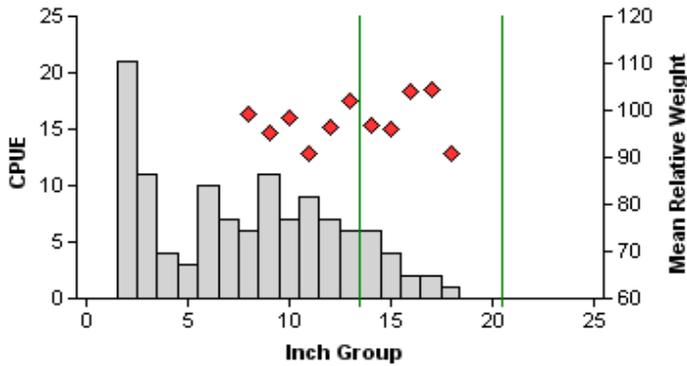


Effort = 1.0  
 Total CPUE = 38.0 (31; 38)  
 PSD = 0 (274.1)

Figure 8. Number of Spotted Bass 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, Houston County Reservoir, Texas, 2004, 2008, and 2012.

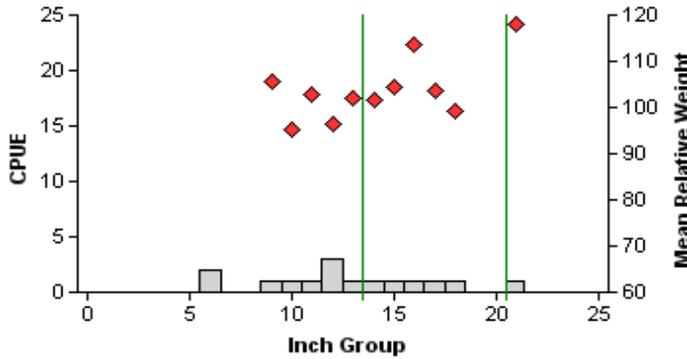
# Largemouth Bass

2008



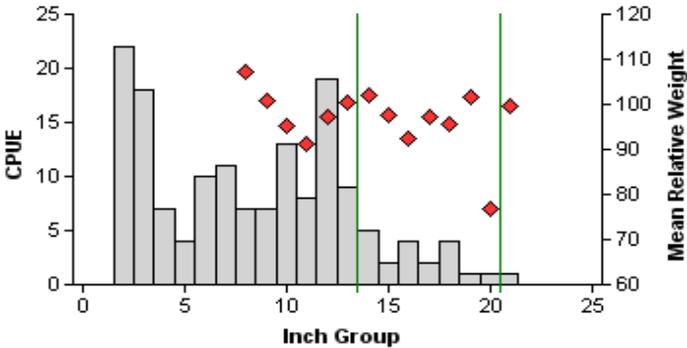
Effort = 1.0  
 Total CPUE = 117.0 (14; 117)  
 Stock CPUE = 61.0 (19; 61)  
 PSD = 46 (5.5)

2010



Effort = 1.0  
 Total CPUE = 15.0 (34; 15)  
 Stock CPUE = 13.0 (40; 13)  
 PSD = 77 (15.8)

2012



Effort = 1.0  
 Total CPUE = 155.0 (11; 155)  
 Stock CPUE = 83.0 (17; 83)  
 PSD = 58 (3.5)

Figure 9. Number of Largemouth Bass caught per hour (total CPUE, bars), 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 electrofishing surveys, Houston County Reservoir, Texas, 2008, 2010, and 2012. Vertical lines indicate upper and lower ends of the protected size class at the time of survey.

## Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Houston County Reservoir, Texas, 2004, 2008, 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.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2004	30	2	26	2	40.2	6.7
2008	30	1	22	7	34.4	3.3
2012	30	4	24	2	46.1	13.3

Table 8. Proposed sampling schedule for Houston County 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. Standard surveys denoted by S and additional surveys denoted by A.

Survey year	Habitat						Report
	Electrofishing Fall	Gill net	Structural	Vegetation	Access	Creel survey	
2013-2014				A		A*	
2014-2015	A			A			
2015-2016				A			
2016-2017	S	S	S	S	S		S

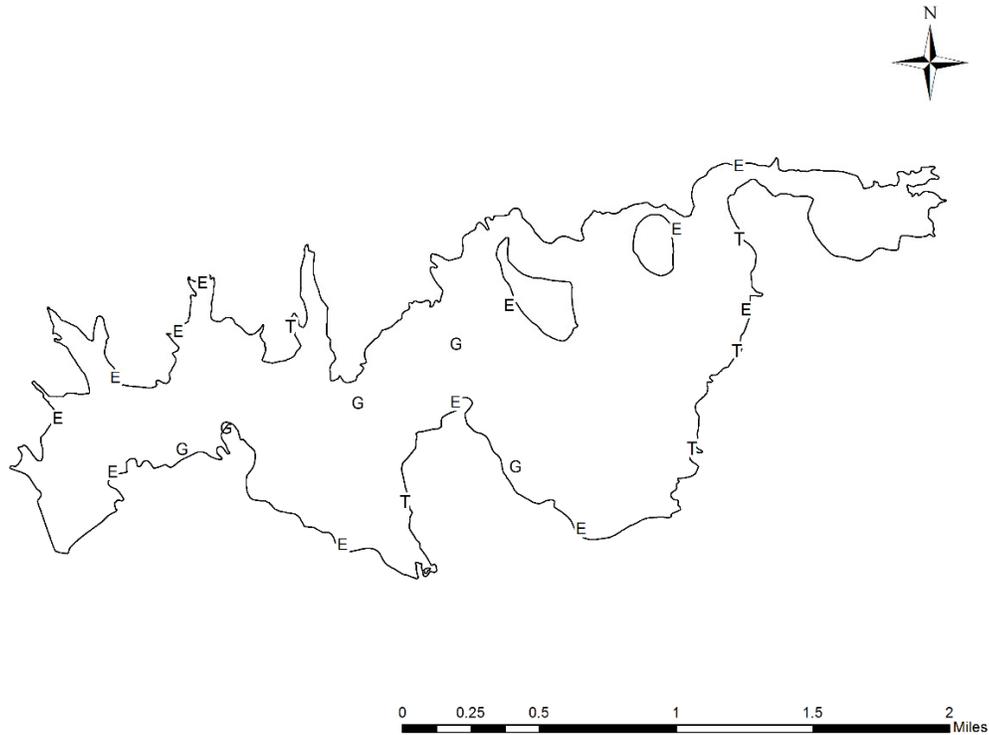
\*Spring-quarter (2014)

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Houston County Reservoir, Texas, 2012-2013. Sampling effort was 5 net nights for gill netting, 5 net nights for trap netting, and 1 hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					74	74.0
Threadfin Shad					650	650.0
Channel Catfish	4	0.8				
Flathead Catfish	2	0.4				
White Bass	9	1.8				
Bluegill					915	915.0
Redear Sunfish					95	95.0
Largemouth Bass					155	155.0
Spotted Bass					38	38.0
Crappies			0	0.0		

## APPENDIX B



Location of sampling sites, Houston County Reservoir, Texas, 2012-2013. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was 1-2 ft below conservation pool at time of sampling.