

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

Lake Holbrook

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Holbrook were surveyed in 2012 using electrofishing, and in 2013 using gill netting. Aquatic vegetation and habitat surveys were conducted on Lake Holbrook during August 2012. Additional assessments were conducted annually in July or August from 2009 through 2012 in order to monitor waterwillow colonies, which were initially planted in 2006 and 2007. 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:** Lake Holbrook is a 650-acre impoundment located in Wood County, Texas, on Lankford Creek, a tributary of the Sabine River. The reservoir was constructed by Wood County in 1962 for flood control and recreation. The reservoir contains few aquatic plants, which amount to less than 3% of reservoir surface area. Structural habitat consists primarily of natural shoreline, dead trees, and piers and docks. The majority of the aquatic vegetation found in the reservoir is native emergent species, which are confined to the shoreline and immediately adjacent areas.
- **Management History:** Largemouth Bass and crappie species are the most prominent sport fishes present. Florida Largemouth Bass were most recently stocked in 2008. Work began in 2006 to establish native emergent vegetation in Lake Holbrook to enhance littoral habitat. District personnel collaborated with the Lake Holbrook Association to construct and deploy fish attractors constructed from brush (2007 and 2008) and bamboo (2009 and 2012). District staff created a map for use by anglers, which is available for download from the agency website showing geo-referenced locations of fish attractors.
- **Fish Community**
 - **Prey Species:** The predominant prey species include Bluegill, and other less abundant sunfish species. Gizzard and Threadfin Shad were also present, though they were of low abundance. An extensive fish kill was observed in April 2012 involving the loss of an estimated 2,321 yellow bass.
 - **Catfishes:** Channel Catfish abundance was low but body condition was good. All of the fish collected were of legal size and the absence of sub stock-sized individuals indicates limited recruitment.
 - **Black Basses:** Largemouth Bass were moderately abundant. Almost half of the fish collected in fall electrofishing were of stock size (8 inches), and of these, 17.5% were of legal size. Largemouth Bass tended to be of moderate body condition, indicating adequate prey availability and growth rates were fast. Spotted Bass were collected, though at much lower abundances than Largemouth Bass.
 - **Crappies:** Both White and Black Crappie were documented in gill net catch, but no target population sampling was conducted because trap net catch rates have been historically low.

Management Strategies: Conduct additional vegetation assessments on an annual basis to monitor the introduced native emergent species and redistribute plants within the reservoir as appropriate. Continue working with the local homeowner's association to enhance fish habitat in the lake by supplementing existing fish attractors and constructing new ones as opportunities arise. Continue with standard fisheries monitoring using electrofishing and gill netting surveys in 2016-2017. A roving creel survey will be conducted in spring 2017 to monitor angler effort, catch, and harvest rates.

INTRODUCTION

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

Reservoir Description

Lake Holbrook is a 650-acre impoundment constructed in 1962 on Lankford Creek, a tributary of the Sabine River. The reservoir is located in Wood County approximately 24 miles northwest of Tyler, Texas, and is operated and controlled by Wood County. Primary water uses include flood control and recreation. Natural shoreline, dead trees, and piers and docks dominated habitat at time of sampling. Boat access consists of two public boat ramps. Other descriptive characteristics for Lake Holbrook are in Table 1.

Angler Access

Lake Holbrook has two public boat ramps and no private boat ramps. Bank fishing access is limited to areas near public boat ramps, in the county park, and along short road right-of-ways. Additional boat ramp characteristics are presented in Table 2.

Management History

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

1. Monitor largemouth bass abundance, condition, population size structure, growth rate, and genetic composition.
Action: Lake Holbrook was sampled using electrofishing in fall 2010 and 2012. Genetic analysis of Largemouth Bass was conducted in 2012 and an age and growth assessment was conducted in spring 2013.
2. Work cooperatively with the Lake Holbrook Association to enhance existing fish attractors and create new structures as opportunities arise.
Action: In July 2009 and April 2012, District staff worked with volunteers from the Lake Holbrook Association to construct and deploy bamboo fish attractors. In 2009, bamboo attractors were deployed at six sites. In 2012, a total of 21 structures were used to augment the six existing brush piles and to create two new sites. District staff updated the map showing the location of the brush piles with geographic coordinates that were made available on the agency website. Plans to assess the utilization of fish attractors by sport fishes through visual observations were cancelled because of low ambient visibility observed during a preliminary scuba survey.
3. Expand efforts to establish native aquatic species and to increase the diversity of plant communities.
Action: The initial re-vegetation project initiated in 2006 involved waterwillow and pickerelweed but use of the latter species was discontinued since it performed poorly and tended to grow in shallow water where its contribution to aquatic habitat was limited. District staff transplanted waterwillow from existing colonies in Lake Holbrook to adjacent areas further offshore in water depths of 2-3 feet. These plantings were conducted annually from 2009 through 2011 and colonies established and spread. Annual assessments of waterwillow coverage were also performed in July or August from 2009 through 2012. The expansion of waterwillow colonies in Lake Holbrook was sufficient to

be able to provide plants to support re-vegetation projects in Lake Fork (2012), Lake Winnsboro (2010 through 2012) and Martin Creek Reservoir (2010). Attempts were made in 2009 to establish two native submersed species harvested from reservoir colonies, waterstargrass (July) and American pondweed (September), without protective exclosures. No plants survived. In August 2011, American pondweed, Illinois pondweed, and waterstargrass plants obtained from the Native Aquatic Plant Nursery at the Texas Freshwater Fisheries Center in Athens, Texas, were planted in welded wire exclosures at four sites in Lake Holbrook according to established procedures (Webb et al. 2012). Growth was hampered by drought conditions. In May 2012, additional plants of the same species were planted in enlarged exclosures at three of the sites.

Harvest regulation history: Sport fishes in Lake Holbrook are currently managed with statewide regulations (Table 3).

Stocking history: Florida Largemouth Bass (FLMB) were initially introduced as advanced fingerlings in 1978. Additional stockings have taken place periodically from 1980 through 2008. Blue Catfish were introduced in 1982, but failed to produce a self-sustaining population. Channel Catfish were introduced in 1992, and have developed into a limited fishery. Black Crappie, exhibiting the “black-stripe” trait, were purchased by the Lake Holbrook Association and stocked by TPWD staff in 2003 as part of a research project. The presence of the “black-stripe” variation was later determined to pre-date the stocking and the research project was terminated. Threadfin Shad were also stocked in 2004 to enhance prey fish populations. The complete stocking history is in Table 4.

Vegetation/habitat management history: Historically, Lake Holbrook contained substantial amounts of native submersed aquatic vegetation. Following a drawdown in 1980 to repair and expand the dam, the vegetation declined. Between 2004 and 2012, native aquatic vegetation in Lake Holbrook has increased from 1.0% to 2.7% of reservoir surface area (Table 6). Structural habitat in the reservoir has been limited to areas of standing timber, boat docks, and brush piles introduced by anglers. Recent attempts to establish native aquatic vegetation have been successful and have resulted in localized benefit.

Water transfer: Lake Holbrook was constructed by Wood County for recreation and flood control. There are no pump stations on the reservoir and no inter-basin transfers exist.

METHODS

Fishes were collected by electrofishing in fall 2010 and 2012 (1 hour at 12, 5-min stations), and gill netting in spring 2013 (5 net nights at 5 stations). Electrofishing in 2010 targeted Largemouth Bass only. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (Texas Parks and Wildlife Department (TPWD), Inland Fisheries Division, unpublished manual revised 2011). Aquatic vegetation and littoral habitat surveys were performed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Shoreline distances and areas of vegetation were estimated using ArcView GIS software.

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 ($RSE = 100 \times SE \text{ of the estimate/estimate}$) was calculated for all CPUEs. Ages were determined from otoliths of 13 Largemouth Bass (13.1 to 14.9 inches) collected by electrofishing in April 2013, and from 24 Black Crappie (9.2 to 13.0 inches) collected by gill netting in February 2013.

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 30 individual fish from fall 2012.

There is no gauging station on Lake Holbrook. Elevation data presented are based on estimates measured at the lake outflow at the time of surveys.

Annual assessments of waterwillow coverage were conducted in summer (July or August) from 2009 through 2012. Colonies in the vicinity of the initial waterwillow plantings were geo-referenced and measured using a measuring tape. Individual colony areas were calculated and summed to yield total area.

District staff received data from Thursday night individual, 3-fish-bag tournaments held on Lake Holbrook from March through September in years 2009 to 2012 by the Grand Saline Bass Club. Tournaments were held from 6pm to 9pm. Participation averaged 19 (range = 4 to 36) anglers per tournament and the total number of largemouth bass weighed-in averaged 20 (range = 3 to 46). These data provided supplementary information on the quality of the Largemouth Bass fishery on Lake Holbrook.

An investigation of a yellow bass fish kill was conducted on April 13, 2012 by staff of the TPWD Kills and Spills Team (KAST) and necropsies were performed on four specimens by staff at the TPWD Inland Fisheries Division Analytical Services Laboratory in San Marcos, Texas.

RESULTS AND DISCUSSION

Vegetation/habitat: Structural habitat consisted primarily of natural shoreline (89%), dead trees (40%), and piers and docks (34%) (Table 5). Bulkhead and rock shore each accounted for over 5% of total shoreline distance. Aquatic vegetation in Lake Holbrook is limited (18.1 acres, 2.8% of reservoir surface area) and native emergent species are predominant (14.8 acres). Native submersed species (bushy pondweed and muskgrass) are limited in distribution, accounting for 2.5 acres. The invasive aquatic species alligatorweed was present but did not pose any immediate management problems requiring control. Waterwillow established by District staff in 2006 and 2007, as part of a native aquatic vegetation enhancement project, increased in coverage by an estimated factor of 26 (2600%) through 2012 (Appendix D). Attempts to introduce native submersed species (American pondweed, Illinois pondweed, and waterstargrass) planted in welded-wire exclosures began in 2012 and continued in 2013.

Prey species: The prey base in Lake Holbrook is dominated by sunfishes, with Bluegill being the most abundant species (Appendix A). Total CPUE of Gizzard Shad was low (55.0 fish/h) with an estimated 22% of the sample being of appropriate size for predators (Figure 1). Threadfin Shad were collected at a slightly higher rate (Appendix A). Electrofishing CPUE of Bluegill, Longear Sunfish, and Redear Sunfish were 306.0 fish/h, 44.0 fish/h, and 44.0 fish/h, respectively (Appendix A). Total CPUE of Bluegill in 2012 (306.0 fish/h) was lower than in 2008 (389.0 fish/h) but higher than in 2004 (95.0 fish/h) (Figure 2). The modal length class of the Bluegill population was 4 inches, a suitable prey size for game fish such as Largemouth Bass. Redear Sunfish provide an additional prey species, but they also offer recreational opportunities (Figure 3), since the majority of the fish collected ranged from 5 to 9 inches in length.

An extensive fish kill was observed on Lake Holbrook in April 2012 involving the loss of an estimated 2,321 yellow bass. The causative agents were identified as heavy gill infestations of the ciliated protozoan parasite *Chilodonella* spp. and monogenetic trematodes.

Channel catfish: The gill netting catch rate of Channel Catfish in 2013 (1.8/nn) was the same as in 2009, but lower than in 2005 (3.2/nn) (Figure 4). All of the fish collected in the last two surveys were of legal size and the absence of sub-stock-sized individuals suggests limited recruitment, likely resulting from Largemouth Bass predation.

Black Basses: Largemouth Bass were moderately abundant (Figure 5). The electrofishing CPUE of Largemouth Bass in 2012 (83.0 fish/h) was similar to 2008 (84.0 fish/h), but lower than in 2010 (122.0 fish/h). Although relative abundance varied, the relative contribution of stock-sized (≥ 8 inches) and legal-sized (≥ 14 inches) Largemouth Bass was consistent among surveys (2008, 2010, and 2012), ranging between 48-53% and 15-18%, respectively. Largemouth Bass tended to have moderate relative weights, with most size groups ranging from 85 to 100, indicating adequate prey availability. A 2012 Largemouth Bass sample subjected to genetic analysis had an FLMB allele frequency of 27.0% and none were pure FLMB (Table 6). Second or higher generation hybrids (Fx) between FLMB and Northern Largemouth Bass (NLMB) accounted for 90% of the sample. Growth of Largemouth Bass in Lake Holbrook was fast. Average age at 14.0 inches (13.1 to 14.9 inches) was 1.8 years in spring (N=13; range=1–3 years) (Appendix C).

Data from the Grand Saline Bass Club's Thursday-night tournaments, held each year from March to September (Appendix E), exhibited decreasing participation from 2009 through 2012. Numbers and total weights of bass weighed-in trended upward, but average fish weight remained consistent. Yearly average weight of tournament "big fish" ranged from 4.6 to 5.0 pounds, and each year the heaviest fish ranged from 6.8 to 8.1 pounds. These data indicate the quality of the Largemouth Bass fishery in Lake Holbrook.

Spotted Bass were collected in Lake Holbrook but were much less abundant than Largemouth Bass. In 2012, fall electrofishing total CPUE was 6.0/h (Appendix A) and no fish were collected in previous samples (Jubar and Storey 2009).

Crappies: Both White and Black Crappies were present in the reservoir but no population sampling was conducted because trap net catches have been historically low. It is likely that the gear is inefficient in this reservoir because crappie fishing is reportedly good on Lake Holbrook. A sample of Black Crappie collected in spring gill netting indicated fast growth, with fish ages averaging 2.4 years at 10.0 inches (9.2 to 10.9 inches) (Figure 7).

Fisheries management plan for Lake Holbrook, Texas

Prepared – July 2013

ISSUE 1: The most recent stockings of FLMB occurred in 2007 and 2008. Subsequently, FLMB genetic influence has declined. In fall 2012, no pure FLMB were identified in the genetics sample and 90% of the fish were intergrades between FLMB and NLMB. Largemouth Bass fishery quality is demonstrated by the Grand Saline Bass Club's tournament results from 2009 through 2012. Improvements in the reservoir's aquatic habitat should improve survival of young Largemouth Bass.

MANAGEMENT STRATEGIES

1. Recommend stocking of FLMB at 100 fish/acre in 2014 and 2015.
2. Monitor Largemouth Bass relative abundance, condition, and population size structure by conducting electrofishing surveys every other year beginning in 2014.
3. Continue to monitor FLMB genetic influence by collecting fin samples from Largemouth Bass every four years.
4. Continue to work with the Grand Saline Bass Club to collect data from the club's Thursday night tournaments.
5. Initiate roving creel survey in the spring quarter (March-May) in 2017.

ISSUE 2 Structural habitat in Lake Holbrook is limited. District 3B staff and volunteers from the Lake Holbrook Association have assembled and deployed fish attractors consisting of brush in 2007 and 2008 to provide habitat for bass, crappie and sunfishes. In 2009 and 2012, fish attractors were constructed employing bamboo because it was lighter to work with, provided increased vertical structure, and the material is reportedly more resistant to decay than traditionally-used materials.

MANAGEMENT STRATEGIES

1. Continue to work cooperatively on enhancement projects with the Lake Holbrook Association as opportunities present themselves.
2. Supplement eight existing brush reefs and consider expansion of project as appropriate.
3. Continue to update map showing the locations of brush reefs as changes are made

ISSUE 3 Aquatic vegetation in Lake Holbrook is limited (<3% reservoir surface area) and dominated by native emergent types. District staff have been successful in establishing and re-distributing waterwillow colonies in Lake Holbrook. Increasing the diversity of the reservoir's aquatic vegetation by introduction of submersed aquatic species would be beneficial.

MANAGEMENT STRATEGIES

1. Continue to experiment with three native submersed species (American pondweed, Illinois pondweed and waterstargrass) planted inside welded wire herbivore enclosures at three sites in Lake Holbrook. Monitor plant survival and spread within and outside the enclosures annually. Supplement any failed colonies with additional plants through summer 2015. If no significant colonization is observed by fall 2015, enclosures will be removed and the project will be discontinued.
2. Continue to conduct annual assessments of the coverage of waterwillow to track the progress of its establishment.

ISSUE 4: Although anecdotal information provided by anglers indicates the existence of a popular crappie fishery at Lake Holbrook, previous population assessments (2004, 2005, 2008) utilizing trap nets have yielded low catch rates. Catch rates of less than 3.0/nn for white crappie and less than 1.0/nn for black crappie for the last three surveys were observed. It is difficult to make accurate assessments of the population at such low sample sizes.

MANAGEMENT STRATEGY

1. Conduct roving creel survey from March through May 2017 to monitor angler effort, catch, and harvest rates.

ISSUE 5: Catches of channel catfish in gill netting surveys are traditionally low, and recruitment appears to be limited as evidenced by low numbers of juvenile fish collected.

MANAGEMENT STRATEGY

1. Request advanced-fingerling (9-in) channel catfish to supplement the fishery in the event that surplus fish become available.

ISSUE 6: 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.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes electrofishing in 2014 and 2016, a roving creel survey from March through May 2017, angler access survey in 2016, gill netting in 2017, and annual aquatic vegetation surveys (Table 7). Gill net surveys will monitor Channel Catfish recruitment, condition, and relative abundance. Annual vegetation assessments will monitor the survival and distribution of introduced native aquatic vegetation, as well as inspect for invasive non-native aquatic vegetation.

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, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- 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. Neuman, 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.
- Jubar, A., and K. Storey. 2009. Statewide freshwater fisheries monitoring and management program survey report for Lake Holbrook, 2008. Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Performance Report, Project F-30-R-34, 23 pages.
- Webb, M. A., R.A. Ott, Jr., C.C. Bonds, R.M. Smart, G.O. Dick, and L. Dodd. 2012. Propagation and establishment of native aquatic plants in reservoirs. Management Data Series, No. 273. Texas Parks and Wildlife Department, Inland Fisheries Division, Austin, Texas

Table 1. Characteristics of Lake Holbrook, Texas.

Characteristic	Description
Year constructed	1962
Controlling authority	Wood County
Surface area	650 acres
Counties	Wood
Reservoir type	Tributary
Mean depth	8.0 ft.
Maximum depth	30.0 ft.
Shoreline Development Index (SDI)	4.96
Conductivity	155 μ mho / cm
Secchi disc range	4 – 6 ft.

Table 2. Boat ramp characteristics for Lake Holbrook, Texas, August, 2012. Reservoir elevation at time of survey was estimated at 1.5 feet below conservation pool elevation.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Condition
CR 2260	32.690179 -95.544251	Y	2	Excellent, no access issues
CR 2298	32.699644 -95.55613	Y	20	Excellent, no access issues

Table 3. Harvest regulations for Lake Holbrook.

Species	Bag limit	Length limit (inches)
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish: Flathead	5	18-inch minimum
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 Lake Holbrook, Texas. Size categories are: FGL = fingerling; AFGL = advanced fingerling, and ADL = adults.

<u>Year</u>	<u>Number</u>	<u>Size</u>
	<u>Threadfin Shad</u>	
<u>2004</u>	<u>5,500</u>	ADL
Species total	5,500	
	<u>Blue Catfish</u>	
<u>1982</u>	<u>54,154</u>	FGL
Species total	54,154	
	<u>Channel Catfish</u>	
<u>1992</u>	<u>10,526</u>	AFGL
Species total	10,526	
	<u>Florida Largemouth Bass</u>	
1978	1,085	AFGL
1980	39,845	FGL
1983	52,902	FGL
1999	106,197	FGL
2000	105,080	FGL
2005	211	ADL
2007	67,769	FGL
<u>2008</u>	<u>65,058</u>	FGL
Species total	438,147	
	<u>Black Crappie</u>	
<u>2003</u>	<u>10,800</u>	FGL
Species total	10,800	

Table 5. Survey of structural habitat types Lake Holbrook, Texas, August 2012. Shoreline habitat type units are in miles. Reservoir water level was estimated to be 1.5 feet below conservation pool elevation at time of survey.

Habitat type	Estimate	% of total
Natural shoreline	10.9 miles	89.3
Dead trees	4.9 miles	40.2
Piers and docks	4.2 miles	34.3
Rock shore	0.7 miles	5.5
Bulkhead	0.6 miles	5.3

Table 6. Survey of aquatic vegetation, Lake Holbrook, Texas, 2004, 2008, and 2012. Surface area (acres) is listed with percent of total reservoir surface area in parentheses. Reservoir water level was estimated to be 1.5 feet below conservation pool elevation at time of survey in August 2012. Individual native species observed during surveys are listed in footnotes.

Vegetation	2004	2008	2012
Native emergent	6.4 (1.0) ¹	10.6 (1.6) ³	14.8 (2.3) ⁵
Native submersed	0.4 (0.1) ²	2.0 (0.3) ⁴	2.5 (0.4) ⁶
Sub-total Native sp.	6.8 (1.0)	12.6 (1.9)	17.3 (2.7)
Invasive			
<i>Alligatorweed</i>		<0.1 (<0.1)	0.8 (0.1)
Total	6.8 (1.0)	12.7 (2.0)	18.1 (2.8)

¹ *Cattail, maidencane, spikerush*

² *Muskgrass, stonewort*

³ *Cattail, giant cutgrass, maidencane, pickerelweed, waterwillow*

⁴ *Muskgrass*

⁵ *American lotus, cattail, giant cutgrass, maidencane, pickerelweed, spikerush, waterprimrose, waterwillow*

⁶ *Bushy pondweed, muskgrass*

Gizzard Shad

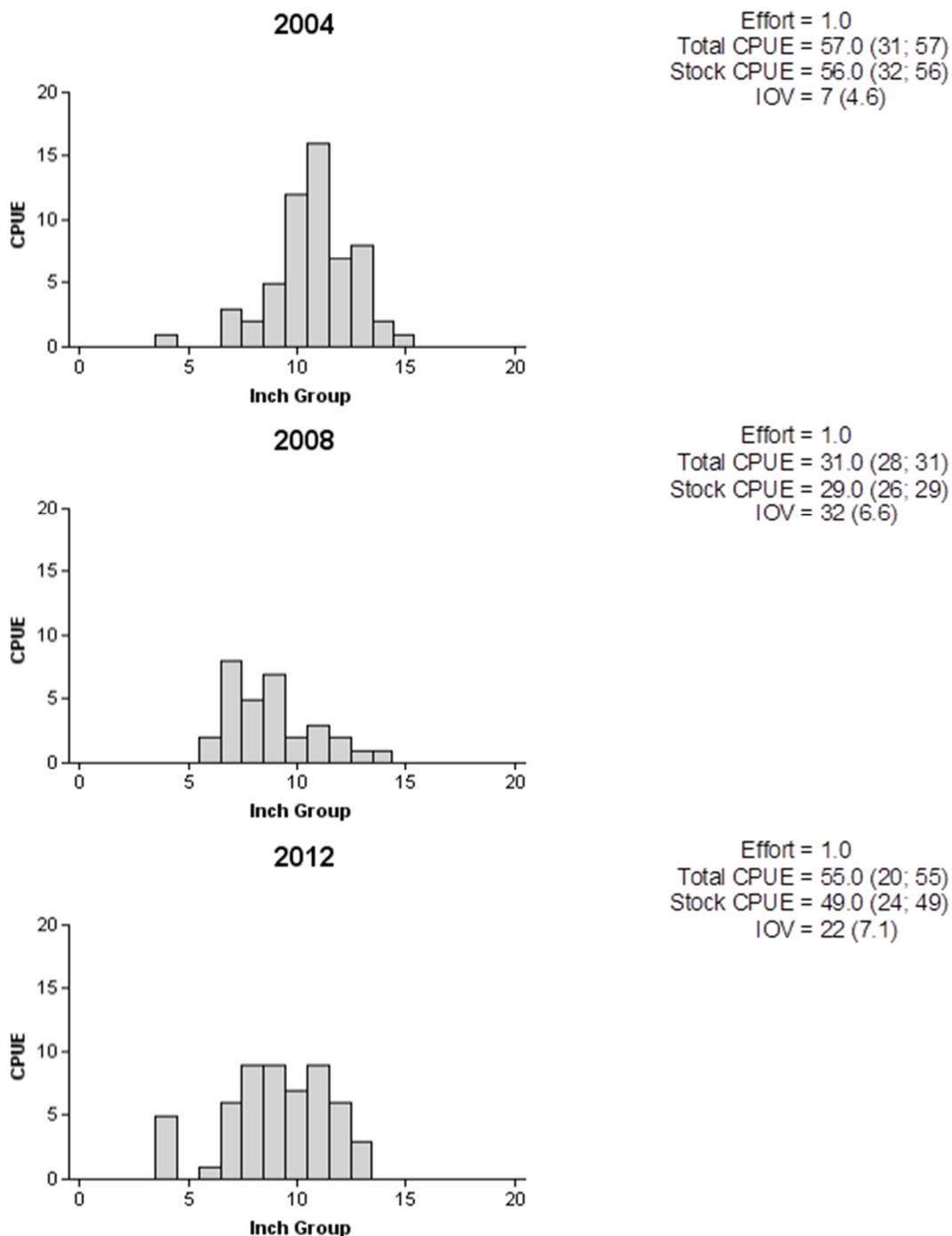


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Holbrook, Texas, 2004, 2008 and 2012.

Bluegill

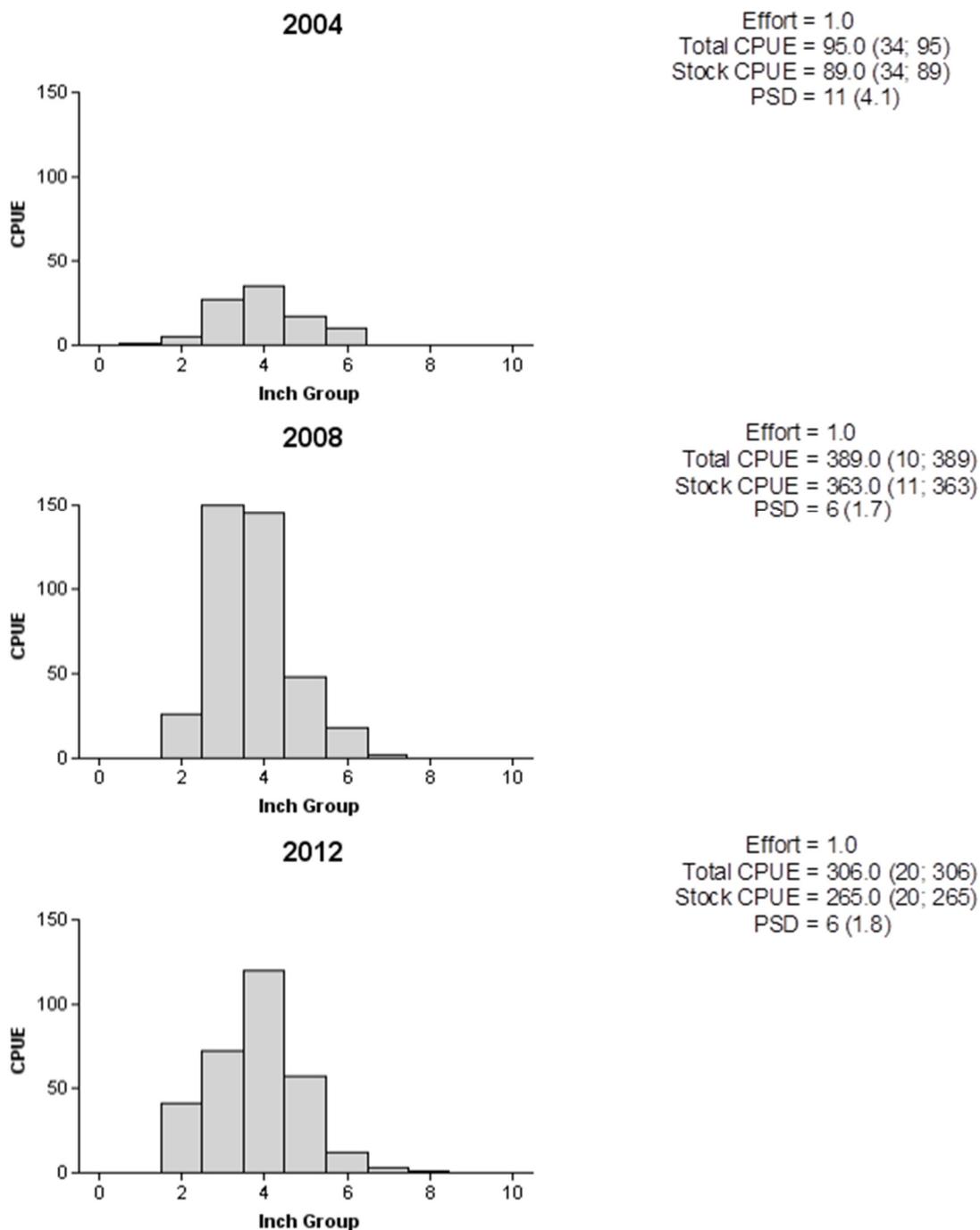
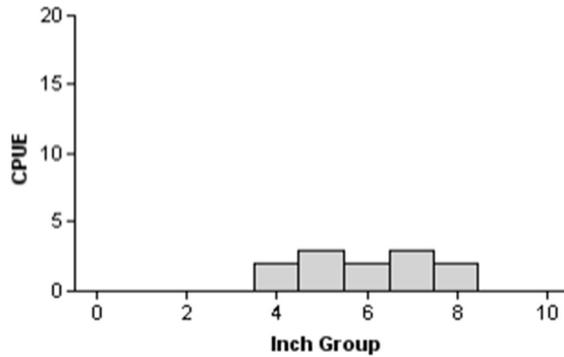


Figure 2. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Holbrook, Texas, 2004, 2008, and 2012.

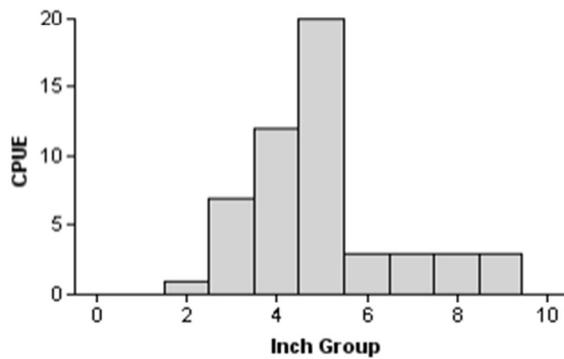
Redear Sunfish

2004



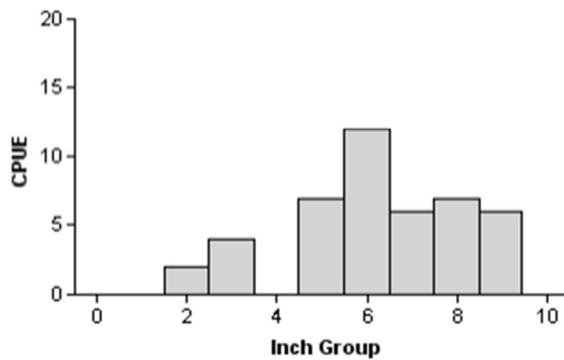
Effort = 1.0
 Total CPUE = 12.0 (43; 12)
 Stock CPUE = 12.0 (43; 12)
 PSD = 42 (12.6)

2008



Effort = 1.0
 Total CPUE = 52.0 (21; 52)
 Stock CPUE = 44.0 (22; 44)
 PSD = 20 (5.9)

2012



Effort = 1.0
 Total CPUE = 44.0 (20; 44)
 Stock CPUE = 38.0 (21; 38)
 PSD = 50 (8.3)

Figure 3. Number of Redear Sunfish 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, Lake Holbrook, Texas, 2004, 2008, and 2012.

Channel Catfish

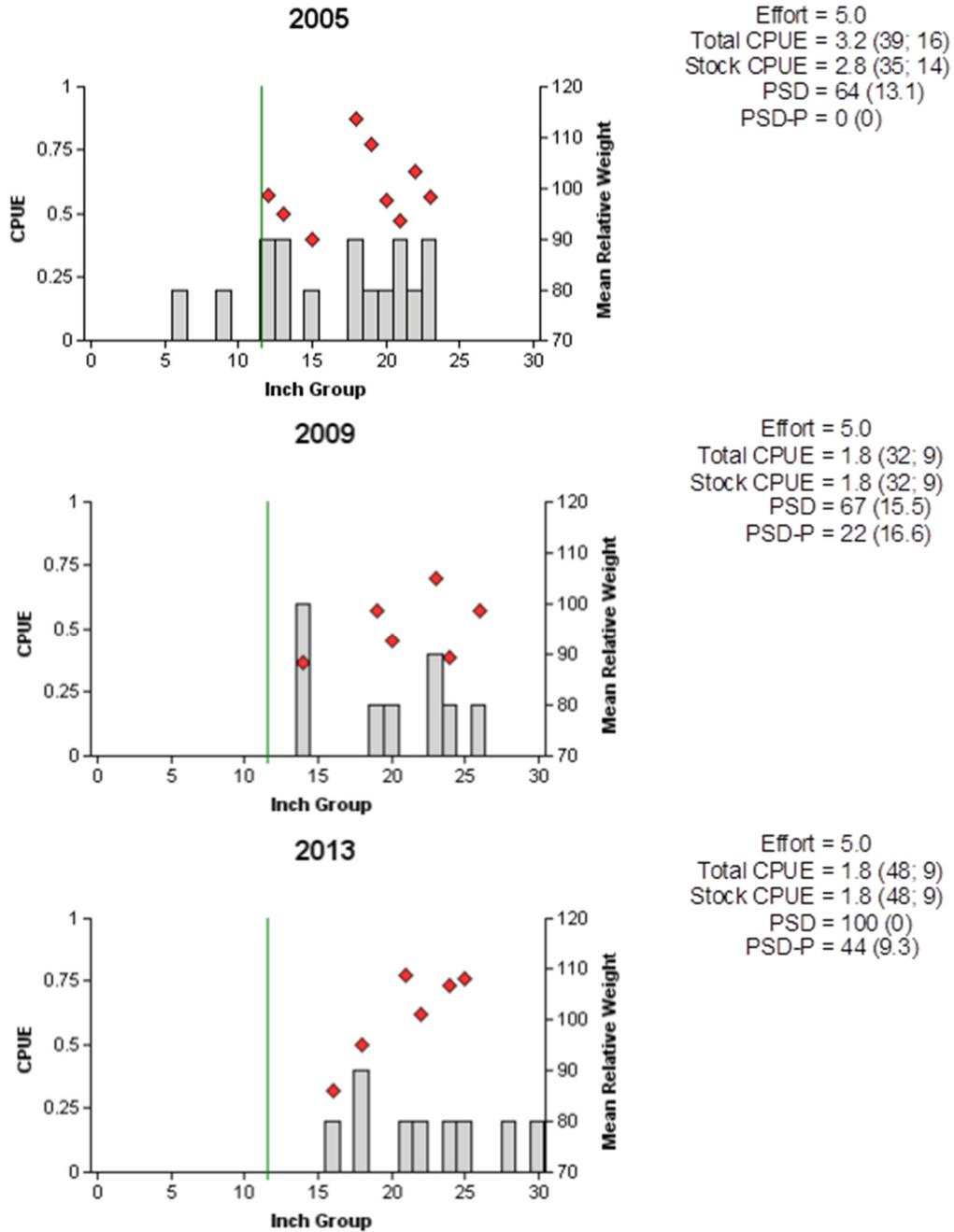


Figure 4. Number of Channel Catfish caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Holbrook, Texas, 2005, 2009 and 2013. Vertical lines indicate minimum length limit at time of survey.

Largemouth Bass

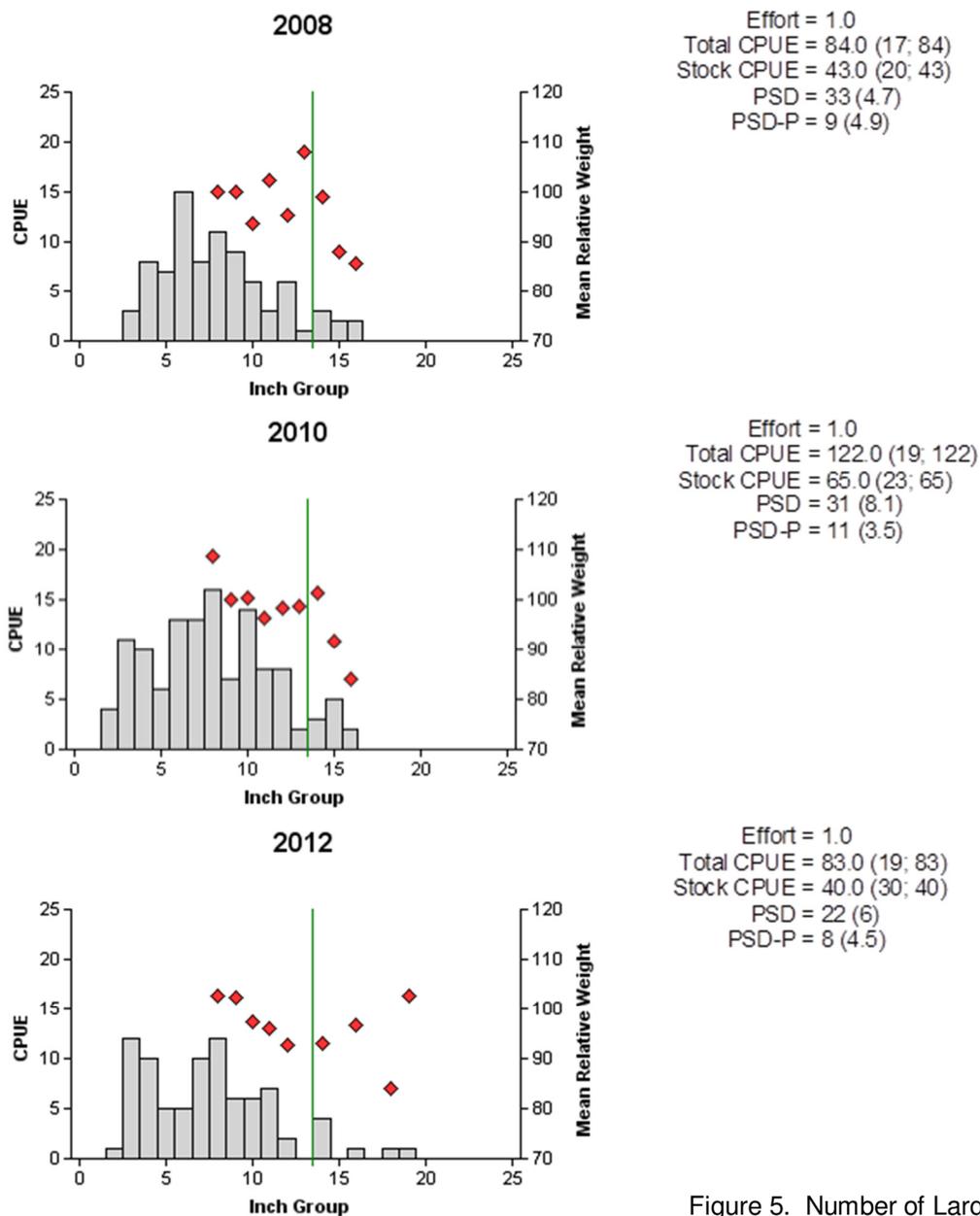


Figure 5. Number of Largemouth Bass

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, Lake Holbrook, Texas, 2008, 2010, and 2012. The 2010 survey was for Largemouth Bass-only. Vertical lines indicate minimum length limit at time of survey.

Largemouth Bass

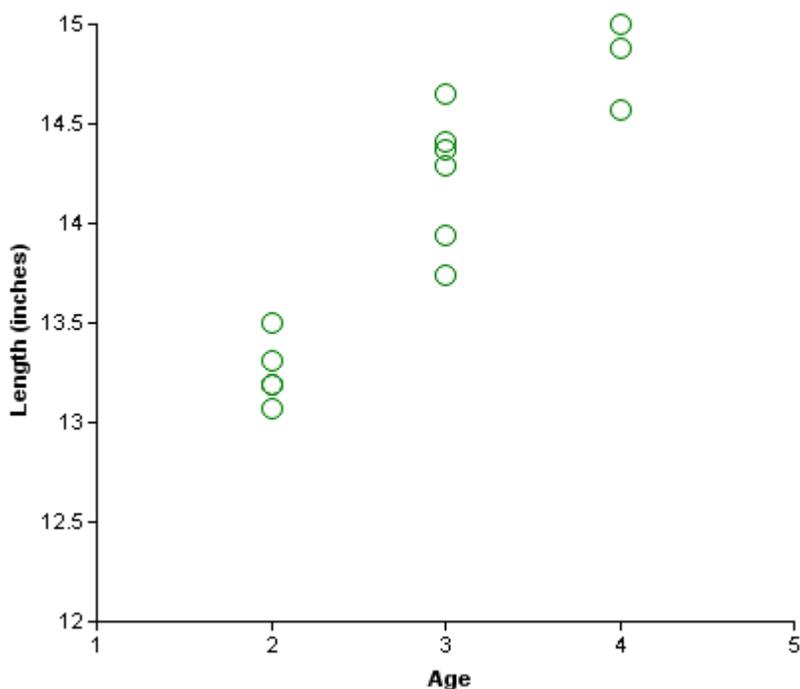


Figure 6. Length-at-age for Largemouth Bass collected from electrofishing at Lake Holbrook, Texas, April 2013.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Holbrook, Texas, 2000, 2002, 2004 and 2012. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation 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	Genotype				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
2000	17	2	3	5	7	27.9	11.8
2002	28	1	8	13	6	40.4	3.6
2004	16	2	3	9	2	51.6	12.5
2012	30	0	1	27	2	27.0	0.0

Black Crappie

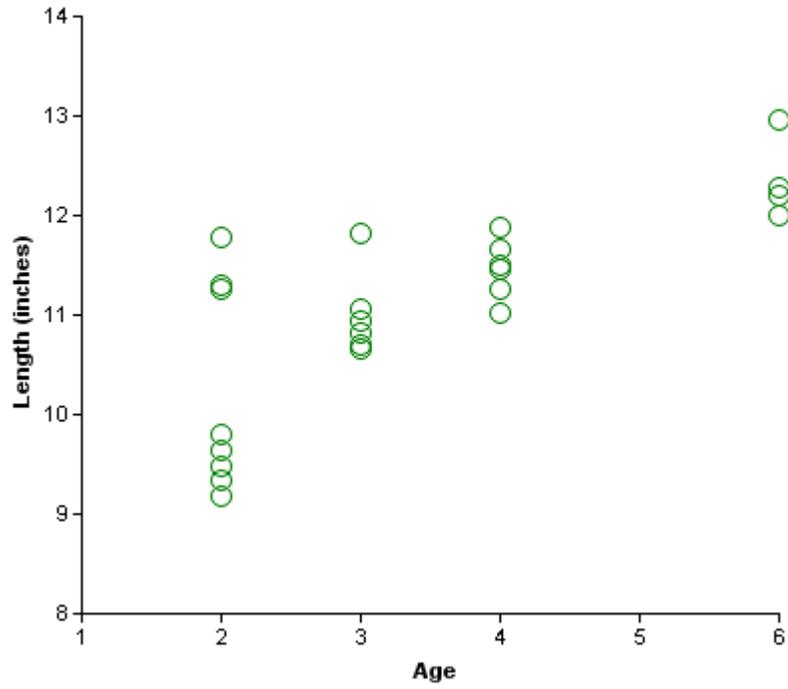


Figure 7. Length-at-age for Black Crappie collected from gill netting at Lake Holbrook, Texas, February 2013.

Table 8. Proposed sampling schedule for Lake Holbrook, Texas. Gill netting surveys are conducted in the spring, while electrofishing is conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

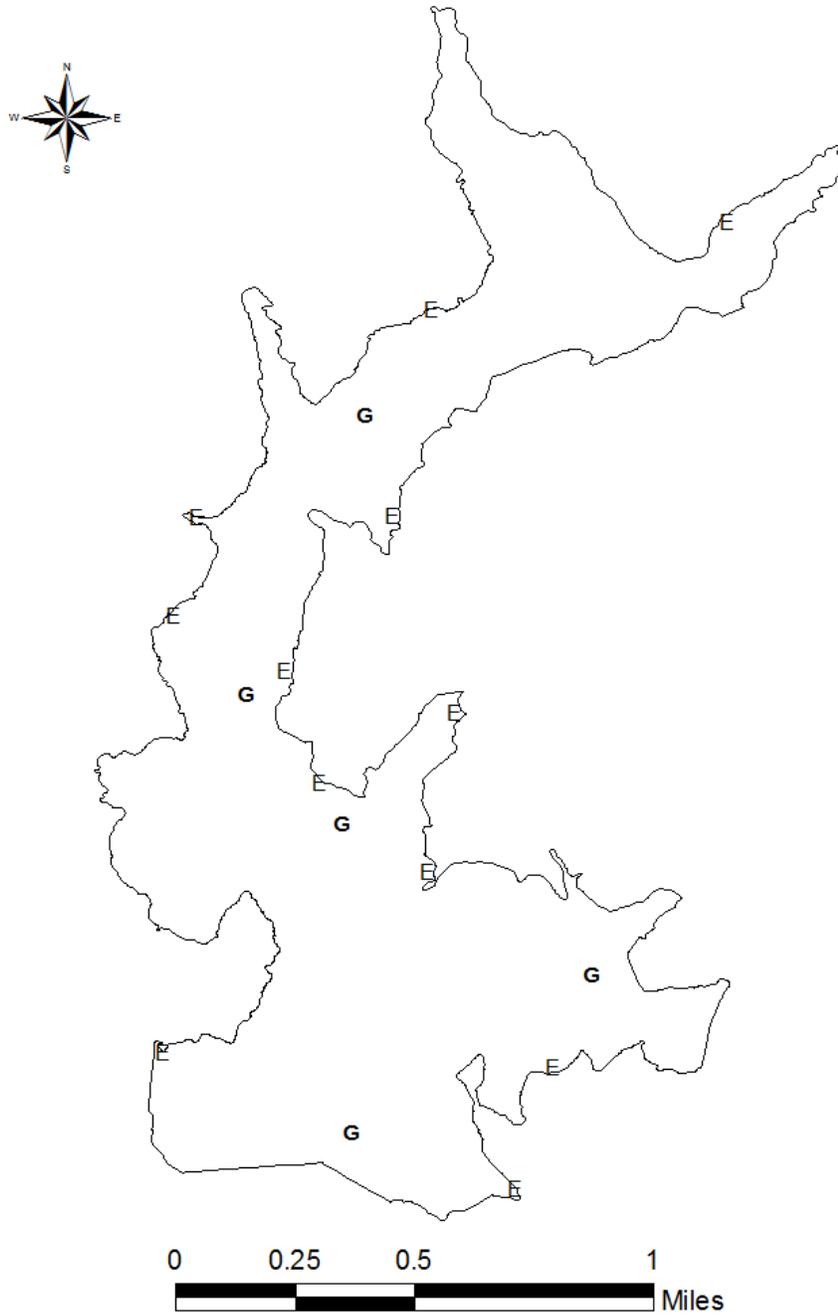
Survey year	Electrofishing Fall	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2013-2014					A			
2014-2015	A				A			
2015-2016					A			
2016-2017	S		S		S	S	A	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected by fall electrofishing, and spring gill netting from Lake Holbrook, Texas, 2012-2013.

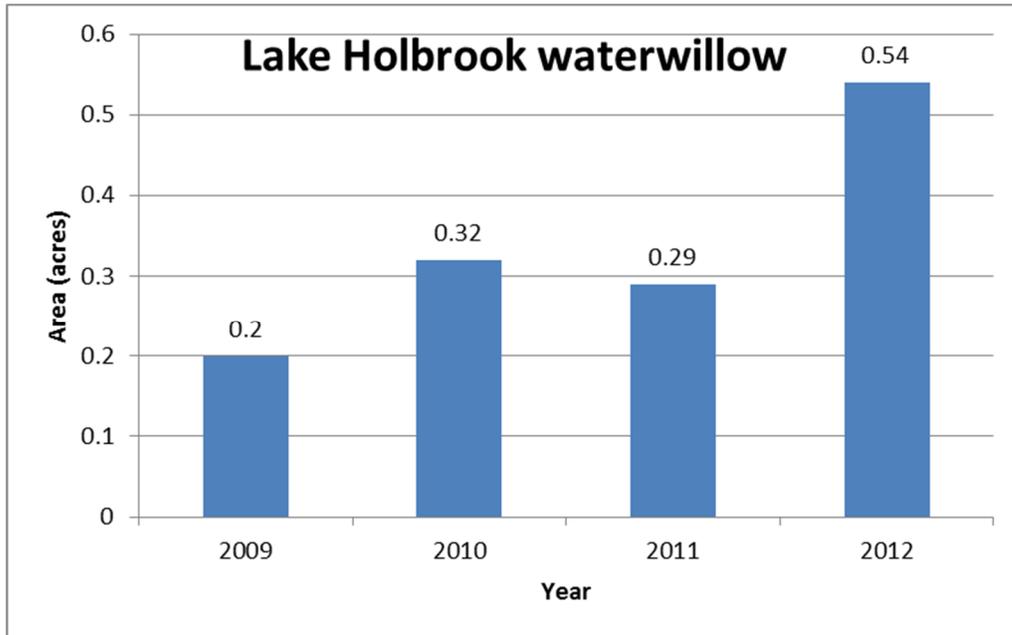
Species	Electrofishing		Gill netting	
	N	CPUE	N	CPUE
Gizzard Shad	55	55.0		
Threadfin Shad	66	66.0		
Channel Catfish			9	1.8
Warmouth	3	3.0		
Bluegill	306	306.0		
Longear Sunfish	44	44.0		
Redear Sunfish	44	44.0		
Spotted Bass	6	6.0		
Largemouth Bass	83	83.0		

APPENDIX B



Location of electrofishing (E) and gill netting (G) sites, Lake Holbrook, Texas, 2012-2013.

APPENDIX C



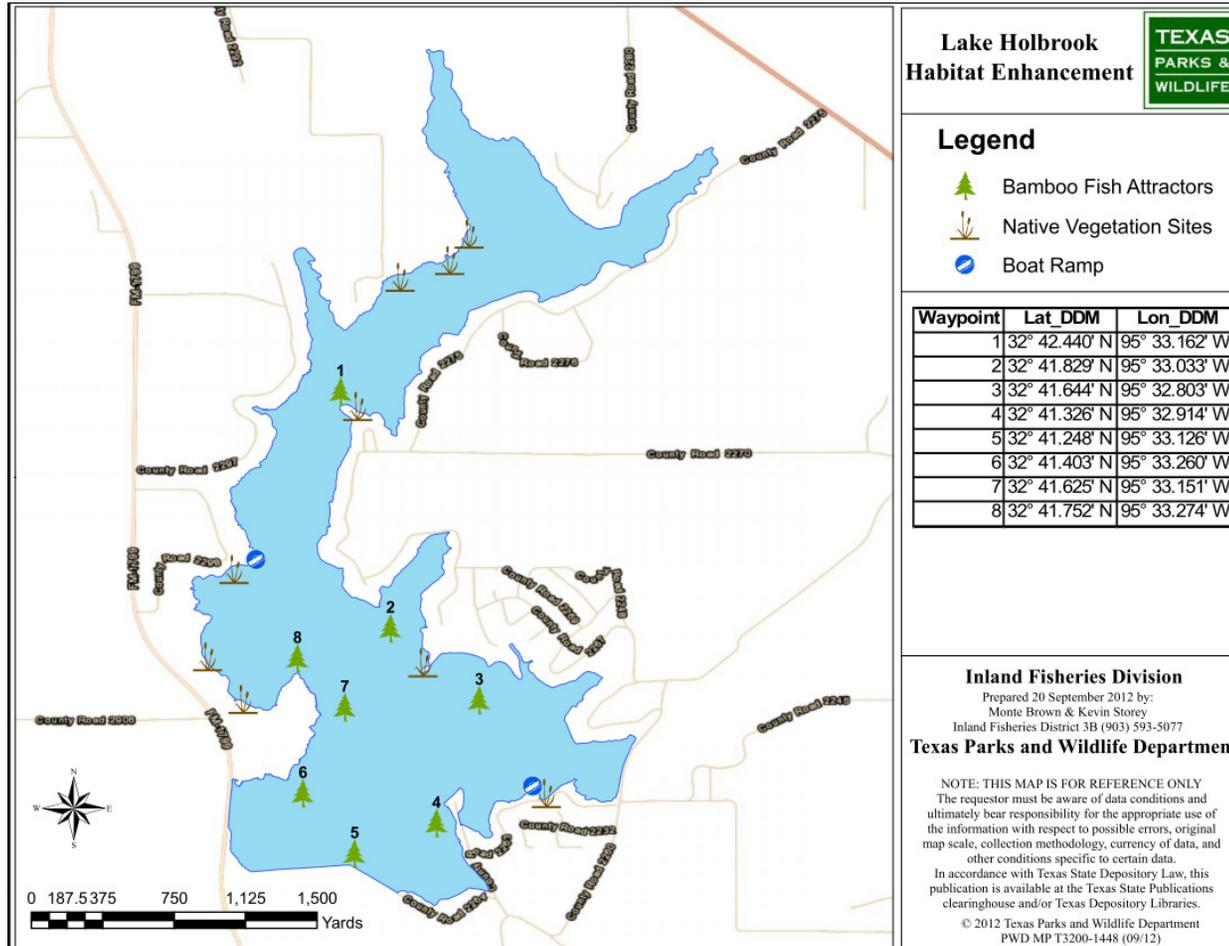
Area estimates of waterwillow colonies established on Lake Holbrook in native vegetation enhancement project, summer 2009 through 2012. Initial plantings in 2006 and 2007 occupied a combined estimated area of 0.02 acres at introduction.

APPENDIX D

Grand Saline Bass Club Thursday night tournament data, March to September 2009-2012

Tournament Statistics	2009	2010	2011	2012
Number of participating anglers	561	549	487	486
Total effort (hr)	1,683	1,647	1,461	1,434
Number of bass weighed	547	560	565	603
Total weight of weighed fish (lbs)	1,277	1,328	1,363	1,390
Average weight of weighed fish (lbs)	2.33	2.37	2.41	2.30
Average "Big Fish" weight (lbs)	4.85	4.96	4.61	4.59
Largest "Big Fish" weight (lbs)	6.79	8.12	7.04	7.31

APPENDIX E



Location of brush piles placed by TPWD staff and the Lake Holbrook Association in 2012 and native vegetation enhancement sites. This map is available to anglers for viewing and downloading: <http://www.tpwd.state.tx.us/fishboat/fish/recreational/lakes/holbrook/>