

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-6

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2015 Fisheries Management Survey Report

Lake Hawkins

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Hawkins were surveyed in 2013 and 2015 using electrofishing. Aquatic vegetation surveys were conducted annually to monitor hydrilla coverage. An access survey was conducted in August 2015. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Hawkins is a 634-acre impoundment located in Wood County, Texas, on Little Sandy Creek, a tributary of the Sabine River. The reservoir was constructed by Wood County for flood control and recreation. Habitat consists primarily of native submerged and emergent aquatic vegetation. Hydrilla and Eurasian watermilfoil are present in the reservoir. There is a small amount of standing timber in the reservoir and it is generally limited to the northern half of the lake.
- **Management History:** Largemouth Bass and sunfish are the most important fisheries in Lake Hawkins. These populations have been monitored through biennial electrofishing since 2009. Florida Largemouth Bass were initially stocked in 1975, and last stocked in 2010, to improve the trophy potential of the lake. Crappie and catfish are present in the lake; however, sampling has been discontinued for these species due to poor catch rates. Periodic vegetation surveys were conducted to monitor hydrilla in the lake, and the controlling authority stocked the remaining 100 triploid Grass Carp on their permit in 2014 in response to a slight increase in hydrilla coverage.
- **Fish community**
 - **Prey species:** Gizzard and Threadfin Shad were present but historically their abundance has been low due to limited primary productivity. The predominant prey species in the reservoir were sunfishes, the most abundant of which were Bluegill, Redear Sunfish, and Redbreast Sunfish. Bluegill were the most numerous species but larger Redbreast and Redear Sunfish (≥ 7 inches) were present and provide an anecdotally popular fishery.
 - **Catfishes:** Channel Catfish were stocked most recently in 1992, but few fish have been collected in population sampling. Catfish recruitment is likely limited due to predation by Largemouth Bass in this clear water lake.
 - **Largemouth Bass:** Largemouth Bass provide a popular fishery and are positively influenced by the abundant aquatic vegetation and sunfish community. Electrofishing catch rate of Largemouth Bass was higher in 2015, although few individuals of legal-size (≥ 14 inches) were collected.
 - **Crappies:** Black Crappie have historically occurred in low abundance. Optional sampling with trap netting has traditionally collected few fish and has been discontinued.

Management Strategies: Conduct annual vegetation surveys to monitor coverage of hydrilla and Eurasian watermilfoil and make appropriate management recommendations based on survey findings. Continue with standard monitoring using electrofishing and access surveys in 2019-2020 along with Largemouth Bass-only electrofishing in 2017 to collect an age and growth sample. A roving creel survey is planned for March through May 2020.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Hawkins from June 2012 through May 2016. 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 2015 -2016 data for comparison.

Reservoir Description

Lake Hawkins is a 634-acre impoundment constructed in 1962 on Little Sandy Creek, a tributary of the Sabine River. The reservoir is located in Wood County approximately 18 miles north of Tyler, Texas, and is operated and controlled by Wood County. Primary water uses included flood control and recreation. Habitat consisted of natural shoreline with extensive cover provided by submerged and emergent aquatic vegetation. Boat docks and standing timber also provided available habitat for fish. Other descriptive characteristics for Lake Hawkins are in Table 1.

Angler Access

Boat access consists of four public boat ramps. Bank fishing access was present near all public boat ramps, and within the county-operated park and, and along much of the shoreline. Additional boat ramp characteristics are shown in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Storey 2012) included:

1. Monitor for invasive species and educate the public and controlling authority about these species and their management.
Action: Vegetation surveys were conducted annually and a comprehensive vegetation survey was conducted in August 2015. The controlling authority, Wood County, stocked 100 triploid grass carp in 2014, in response to increases in distribution and abundance of hydrilla. The Wood County Precinct 2 commissioner and the Lake Hawkins Association of Property Owners were informed of the status of hydrilla and Eurasian watermilfoil.
2. Monitor the Largemouth Bass population and enhance population genetics through the stocking of FLMB, if justifiable.
Action: Lake Hawkins was sampled using electrofishing in fall 2013 and 2015. Fin clips were taken from a sample of Largemouth Bass collected in fall 2015 for genetics assessment. District staff were unable to conduct a spring quarter roving creel on Lake Hawkins because of manpower constraints.

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

Stocking history: Florida Largemouth Bass (FLMB) were initially introduced in 1975 and stocked again in 1990. In 2010, a private hatchery donated 20,800 FLMB which were stocked by District staff. Blue Catfish were stocked in 1982, but the population did not develop as none have been collected in sampling during the past three decades. Channel Catfish were introduced in 1967 and stocked three times additionally, but are rarely collected. Smallmouth Bass were stocked five times between 1987 and 1991, but a population has not developed. Triploid Grass Carp were stocked by Wood County in 2006, 2011, and 2014 as a part of a management plan to help manage hydrilla. The complete stocking history is in

Table 4.

Vegetation/habitat management history: Lake Hawkins has historically harbored a rich diversity of native aquatic plants (Storey 2012). The invasive aquatic plant species hydrilla and Eurasian watermilfoil have been documented in Lake Hawkins for over 10 years. Hydrilla reached a peak in 2006, covering approximately 76% of the reservoir surface area (Storey and Jubar 2008). To reduce hydrilla coverage, the controlling authority stocked 1,000 Triploid Grass Carp in May 2006 and applied Sonar herbicide in April 2007. Annual vegetation surveys conducted from 2008 through 2015 were used to monitor the distribution of hydrilla in Lake Hawkins by tracking the percentage of sample stations where hydrilla was observed (Appendix C). This method was used to justify additional stockings of 200 Triploid Grass Carp in fall 2011 and a further 100 fish in fall 2014.

Water transfer: Lake Hawkins is primarily used for recreation and flood control. Water withdrawals from the reservoir are limited to homeowner use to irrigate lawns and gardens.

METHODS

Surveys were conducted to attempt to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Hawkins (TPWD unpublished). Primary components of the OBS plan for 2015-2016 are listed in Table 5. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, Sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.33 hour at 16, 5-min stations). Additional sampling for Largemouth Bass was conducted in 2013 (1 hour at 12, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from 10 randomly-selected fish (range 13.0 to 14.9 inches).

Genetics – Genetic analysis of a 30-fish sample of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Micro-satellite DNA analysis was used to determine genetic composition of individual fish.

Statistics – 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 ($RSE = 100 \times SE$ of the estimate/estimate) was calculated for all CPUE statistics.

Habitat - Aquatic vegetation surveys were conducted between 2008 and 2015 to monitor the frequency of occurrence of hydrilla and Eurasian watermilfoil in shoreline samples using the random point method. A shoreline habitat survey was also conducted in August 2015. The 2015 aquatic vegetation and habitat survey was conducted using a random point method employing 100 sites (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

Water level – There is no gauging station on Lake Hawkins to monitor lake elevation so no data is available.

RESULTS AND DISCUSSION

Habitat: A point intercept vegetation survey conducted in August 2015 showed a diverse aquatic plant community. The most abundant native plants were the submersed species coontail (80%) and the emergent species white waterlily (66%), pondweed (60%) and maidencane (57%) (Table 6). Eurasian watermilfoil (25%) and hydrilla (14%) were the most abundant non-native species. Vegetation surveys conducted annually between 2008 and 2015 were used to monitor the percentage occurrence of hydrilla in shoreline samples and this method was used to determine when it was appropriate to stock supplemental Triploid Grass Carp (Appendix C). In fall 2014, 100 Triploid Grass Carp were stocked by the controlling authority at the recommendation of the management office to counteract an increase in frequency of occurrence of hydrilla. Occurrence of Eurasian watermilfoil has increased between 2009 and 2015 reaching 30% of shoreline samples in 2015. (Appendix D). A habitat survey conducted in 2015 revealed a shoreline dominated by natural shoreline (70%) bordered by native aquatic species. Boat docks were observed on 15% of the shoreline and bulkhead occurred on approximately 10% of the shoreline (Table 7).

Prey species: The abundance of aquatic vegetation and high water clarity in Lake Hawkins provides ideal conditions for a prey base dominated by sunfish. Gizzard Shad catches have historically been low and comprised of larger individuals. In 2015, CPUE was 17.3/h, and in the past three surveys fish were too large to make any meaningful contribution to the prey base (IOV=0) (Figure 1). Threadfin Shad, however, were collected in higher numbers (95.3/h) (Appendix A). Total CPUE of Bluegill in 2015 (198.0/h) was consistent with catches in 2011 (247.0/h) and 2007 (159.0/h). The majority of fish collected were less than 5 inches in length, making them suitable prey for most predators (Figure 2). Objectives of an RSE-T ≤ 25 for Redear (33) or Redbreast Sunfish (26) were not met. Redear Sunfish CPUE (45.0/h) was also consistent with previous surveys in 2011 (53.0/h) and in 2007 (60.0/h) (Figure 3). The catch rate of Redbreast Sunfish was slightly higher in 2015 (134.3/h) than in 2011 (104.0/h) and much higher than in 2007 (24.0/h) (Figure 4). Lake Hawkins' sunfish populations contain large individuals which provide additional angling opportunities.

Channel Catfish: No Channel Catfish have been collected in gill netting since 2003, and this sampling method was discontinued in 2012. Although Channel Catfish were stocked on multiple occasions, recruitment did not occur, likely due to high water clarity and subsequent predation by Largemouth Bass.

Largemouth bass: The electrofishing catch rate of Largemouth Bass was 52.5/h in 2015, similar to 2013 (49.0/h) although lower than the level observed in 2011, 88.0/h (Figure 5). The Largemouth Bass population continues to be dominated by smaller fish. Over 71% of the fish collected in 2015 were at or above stock size (8 inches), and only 20% of these fish were of legal size. Body condition for size classes up to 14 inches in fall 2015 was good (W_r ranged from 90 to 100) but the few fish 15 inches and larger exhibited poorer body conditions (W_r ranged from 65 to 80). Growth of Largemouth Bass in Lake Hawkins was slower than the previous assessment with fish growing to an average of 14 inches (13.5 to 14.7 inches) in 3.4 years ($N = 10$; range = 2 – 5 years) as compared with the previous estimate of 2.3 years (Storey 2012). Despite sampling additional electrofishing stations, only 10 of the targeted 13 Largemouth Bass for aging prescribed in the OBS plan were collected. Genetic assessment of a 30-fish largemouth bass sample collected during fall 2015 indicated a FLMB allele frequency of 41.0% which was lower than the two previous analyses (Table 8).

Crappies: Trap net sampling was discontinued in 2003 as a result of historically low catches of Crappie. This was an indication of a low-density population, an inefficient sampling method hampered by abundant aquatic vegetation and high water clarity or a combination of factors.

Fisheries management plan for Lake Hawkins, Texas

Prepared – July 2016

ISSUE 1: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels 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.

Hydrilla coverage in Lake Hawkins has decreased from a peak of 479 acres in December 2006 but evidence of increases in coverage prompted stockings of additional triploid grass carp in fall 2011 (200) and 2014 (100). Eurasian watermilfoil has shown evidence of an increased frequency of occurrence. Hydrilla and Eurasian watermilfoil continue to pose a threat to the reservoir.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc. so that they can in turn educate their customers.
3. Educate the public about invasive species via 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.
6. Conduct comprehensive vegetation and habitat surveys every 4 years.
7. Conduct annual random point method vegetation surveys to monitor the frequency of occurrence of hydrilla and Eurasian watermilfoil in shoreline samples.
8. Make management recommendations to Wood County in the event that coverage of hydrilla or Eurasian watermilfoil increases to levels requiring control. Options could include purchase and stocking of additional Triploid Grass Carp or herbicide applications.
9. Provide progress reports on the status of hydrilla to the Wood County Commissioner and the Association of Lake Hawkins Property Owners as appropriate.

ISSUE 2 The Largemouth Bass population in Lake Hawkins is dominated by fish smaller than the minimum length limit. The lake received its last stocking of FLMB by TPWD in 1990 and in 2015 the population contained an FLMB allele frequency of 41%. Stocking of FLMB has the potential to improve the quality of the fishery but in order to justify stockings information is needed on the lake's ability to produce Largemouth Bass over 7 or 8 pounds.

MANAGEMENT STRATEGIES

1. Attempt to collect bass tournament data to provide supplementary information on the quality of the Largemouth Bass population.
2. Conduct a roving creel survey in spring 2020 (March to May) to document angler catch and harvest rates and angling effort and to estimate release of different size ranges of Largemouth Bass.

Objective-Based Sampling Plan and Schedule for 2016-2020

Sport fish, forage fish, and other important fishes

Sport fishes in Lake Hawkins include Largemouth Bass, sunfish, Channel Catfish, and crappie. Sunfish are the primary prey species for sport fishes.

Low-density fisheries

Channel Catfish: Population abundance of Channel Catfish in Lake Hawkins is extremely low because water clarity is high and predation from Largemouth Bass on juvenile catfish is likely high. Gill net surveys from 1989-2012 showed CPUE of Channel Catfish ranged from 0.0 to 0.2/nn. Gill net sampling of this population was discontinued in 2012. Information collected through a creel survey would be desirable to estimate fishing effort, catch and harvest rates of catfish.

Crappie: Both White and Black Crappie are present in Lake Hawkins; however, single-cod, shoreline trap netting CPUE-T ranged from 0 to 0.8/nn from 1996 to 2003. This sampling method was discontinued in 2003 because catches were insufficient to assess the fishery. Documenting fishing effort for crappie at Lake Hawkins through a spring quarter, roving creel survey would provide useful information about the importance of crappie fishing in the reservoir.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Lake Hawkins supports a popular Largemouth Bass fishery dominated by smaller individuals in a clear water lake with a diverse aquatic vegetation community. Trend data on CPUE, size structure, body condition, growth, and FLMB influence is desired for monitoring this fishery. These data will allow for determination of any large-scale changes in the Largemouth Bass population that may initiate further investigation. Results from the last four electrofishing surveys predict a sample of 50 stock-sized Largemouth Bass can be obtained at the 80th percentile by sampling between 12 and 21 stations, yielding an RSE ≤ 25 at the 80th percentile. A minimum effort of 12 randomly-selected nighttime electrofishing stations will be conducted and an additional six random stations will also be generated in the event additional sampling is required to meet OBS plan objectives for Largemouth Bass in fall 2019. A Category 3 age and growth sample of Largemouth Bass subsampled at 5 fish per 10 mm strata to calculate mean length-at-age (MLA) estimates of age classes will be collected in fall 2017 using electrofishing. The Largemouth Bass fishery needs to be characterized through the use of a spring quarter roving creel survey to be conducted from March to May 2020.

Sunfish and other prey species: Lake Hawkins maintains a diverse population of sunfish dominated by Bluegill, Redear, and Redbreast Sunfish, the larger members of which support an anecdotally popular fishery. Long term monitoring trend data is desired for these sunfish populations to evaluate CPUE and size structure (PSD) of the population. Condition of the Largemouth Bass population and size structure of the sunfish community will enable the characterization of prey fish availability for sport fishes. In the past four comprehensive electrofishing surveys, a minimum of 150 Bluegill were collected during each survey so it is unnecessary to predict sampling effort required to collect a 50-fish sample. It is also desirable to determine CPUE and size structure of Redear and Redbreast Sunfish populations in Lake Hawkins but no additional sampling effort beyond that needed to obtain sampling objectives for Largemouth Bass will be expended. Sampling for Clupeids will be to document their presence/ absence since few shad are typically collected in sampling and these are generally too large to be utilized by sport fishes.

Objective-based sampling plan components for Lake Hawkins, Texas for 2016 – 2020.

Gear/ target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing – Fall 2017</i>			
Largemouth Bass	<i>Verify potential slow growth</i>	Category 3	N = 200
<i>Electrofishing – Fall 2019 (Effort = 12 – 18 stations)</i>			
Largemouth Bass	<i>Monitor trend in:</i>		
	Abundance	CPUE – stock	RSE-Stock \leq 25
	Size structure	PSD, length frequency	N \geq 50 stock
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	N = 30, any age
Bluegill ^a	Abundance	CPUE – Total	RSE \leq 25
	Size structure	PSD, length frequency	N \geq 50 total
Redear Sunfish ^a	Abundance	CPUE – Total	RSE \leq 25
	Size structure	PSD, length frequency	N \geq 50 total
Redbreast Sunfish ^a	Abundance	CPUE – Total	RSE \leq 25
	Size structure	PSD, length frequency	N \geq 50 total
Gizzard Shad ^a	<i>Presence / absence</i>		
<i>Creel survey (March – May 2020)</i>			
Largemouth Bass	<i>Characterize fishery and document trophy potential</i>	Directed effort, angler CPUE, harvest, and release of fish by weight categories	
Catfish & Crappies	<i>Characterize fishery</i>	Directed effort, angler CPUE, harvest	

^a No additional effort will be expended to achieve an RSE \leq 25 for CPUE of Bluegill, Redear Sunfish or Redbreast Sunfish if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

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Table 1. Characteristics of Lake Hawkins, Texas.

Characteristic	Description
Year constructed	1962
Controlling authority	Wood County
Surface area	634 acres
Counties	Wood
Reservoir type	Tributary
Mean depth	15.0 ft.
Maximum depth	30.0 ft.
Shoreline development index (SDI)	5.8
Conductivity	130 μ mho / cm
Secchi disc range	8 – 12 ft.

Table 2. Boat ramp characteristics for Lake Hawkins, Texas, August 2015. Reservoir elevation at time of survey was at or near conservation elevation (373.75 feet above mean sea level).

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Park at Dam	32.61388 -95.25509	Y	100	370	Excellent, no access issues
Fish Hawke Point	32.62180 -95.25306	Y	50	369	Excellent, no access issues
North Ramp	32.63659 -95.26307	Y	5	369	Excellent, no access issues
CR 3497	32.62273 -95.24274	Y	15	369	Excellent, no access issues

Table 3. Harvest regulations for Lake Hawkins.

Species	Bag limit	Minimum-Maximum length (inches)
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12 - No limit
Catfish: Flathead	5	18 - No limit
Bass: Largemouth	5	14 - No limit
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10 - No limit

Table 4. Stocking history of Lake Hawkins, Texas. Size categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Species	Year	Number	Size
Threadfin Shad	1991	500	ADL
	Total	500	
Triploid Grass Carp	2006	1,000	ADL
	2011	200	ADL
	2014	100	ADL
	Total	1,200	
Blue Catfish	1982	56,154	FGL
	Total	56,154	
Channel Catfish	1967	4,000	AFGL
	1981	54,500	FGL
	1982	55,000	FGL
	1992	8,028	AFGL
	Total	121,531	
Smallmouth Bass	1987	21,500	FGL
	1988	157,300	FRY
	1989	1,550	FGL
	1989	38,476	FGL
	1991	3,740	FGL
	Total	222,566	
Florida Largemouth Bass	1975	55,000	FGL
	1990	80,546	FGL
	2010	20,800	FGL
	Total	156,346	

Table 5. Objective-based sampling plan components for Lake Hawkins, Texas 2015 – 2016.

Gear/ target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 14 inches	$N = 13$, 13.0 – 14.9 inches
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	$N = 30$, any age
Bluegill ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Redear Sunfish ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Redbreast Sunfish ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$

^a No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill, Redear Sunfish or Redbreast Sunfish if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Survey of aquatic vegetation, Lake Hawkins, Texas, 2015. Percent occurrence of aquatic vegetation species and associated upper and lower confidence limits (CL) estimated using the Random Point Method.

Vegetation type	Species	% occurrence	Lower CL	Upper CL
Native submersed	Coontail	80	72.9	87.1
	Fanwort	3	-0.3	6.3
	Muskgrass	37	27.5	46.5
Native emergent	American lotus	11	4.9	17.1
	Arrowhead	5	0.7	9.3
	Buttonbush	5	0.7	9.3
	Cattail	34	24.7	43.4
	Maidencane	57	47.3	66.7
	Pickerelweed	24	15.6	32.4
	Pondweed	60	50.4	69.6
	Smartweed	3	-0.3	6.3
	Spatardock	8	2.7	13.3
	Waterprimrose	2	-0.7	4.7
	Watershield	1	-1.0	3.0
	Waterwillow	15	8.0	22.0
	White waterlily	66	56.7	75.3
Non-native	Alligatorweed (Tier III)*	8	2.7	13.3
	Elephant Ear (Tier III)*	5	0.7	9.3
	Eurasian watermilfoil (Tier III)*	25	16.5	25.0
	Giant reed (Tier III)*	1	-1.0	3.0
	Hydrilla (Tier III)*	14	7.2	20.8

* Tier III is Watch Status

Table 7. Percent occurrence with lower and upper 95% confidence limits (CL) of shoreline structural habitat at 100 random sites in Lake Hawkins, Texas, August 2015.

Structural habitat type	Percent occurrence	Lower CL	Upper CL
Natural	70	61	79
Rip Rap	1	0	2
Bulkhead	10	4	16
Docks	15	8	22
Standing timber	3	0	6
Eroded bank	1	0	2

Gizzard Shad

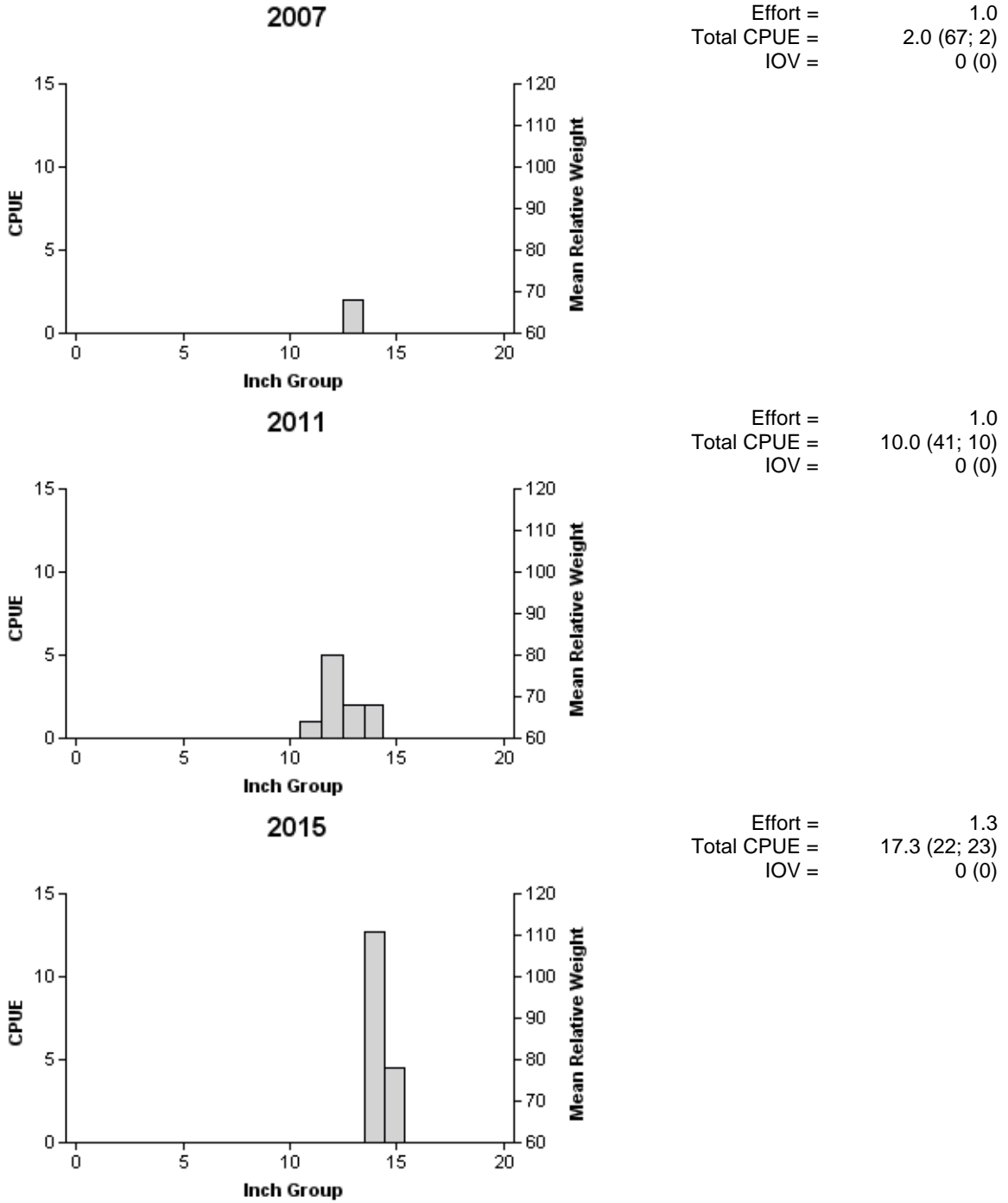


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2007, 2011, and 2015.

Bluegill

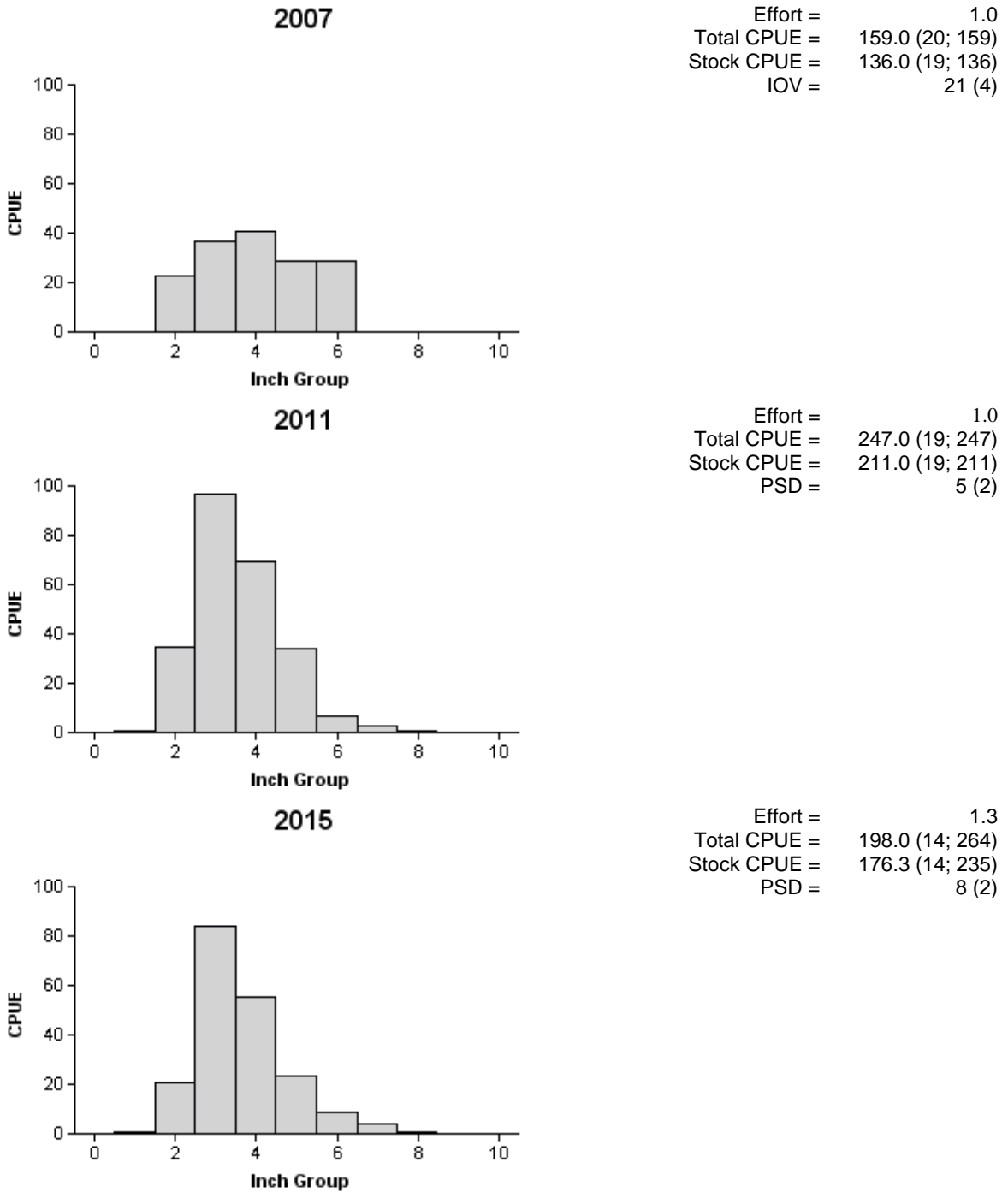


Figure 2. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2007, 2011, and 2015.

Redear Sunfish

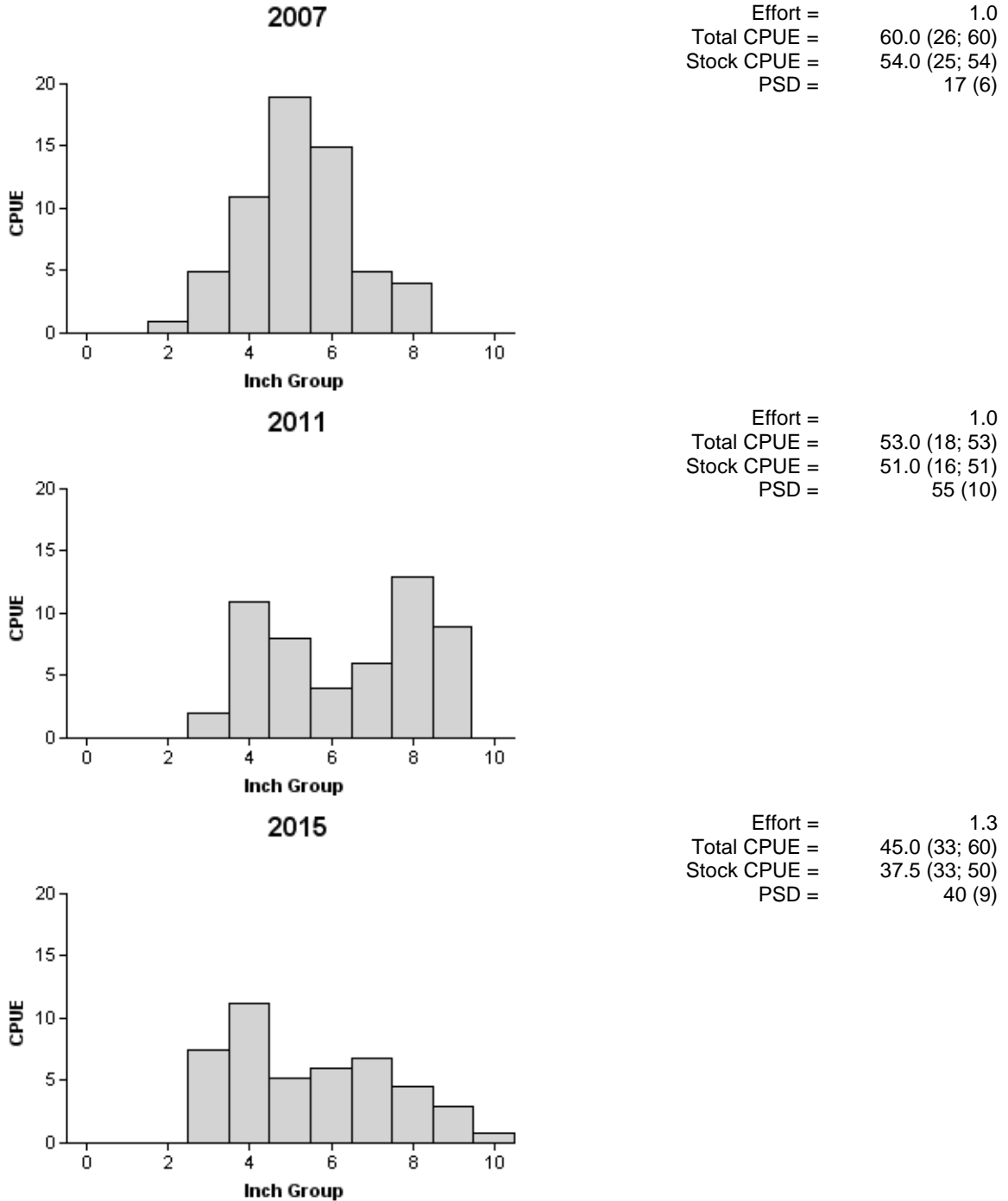


Figure 3. Number of Redear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2007, 2011 and 2015.

Redbreast Sunfish

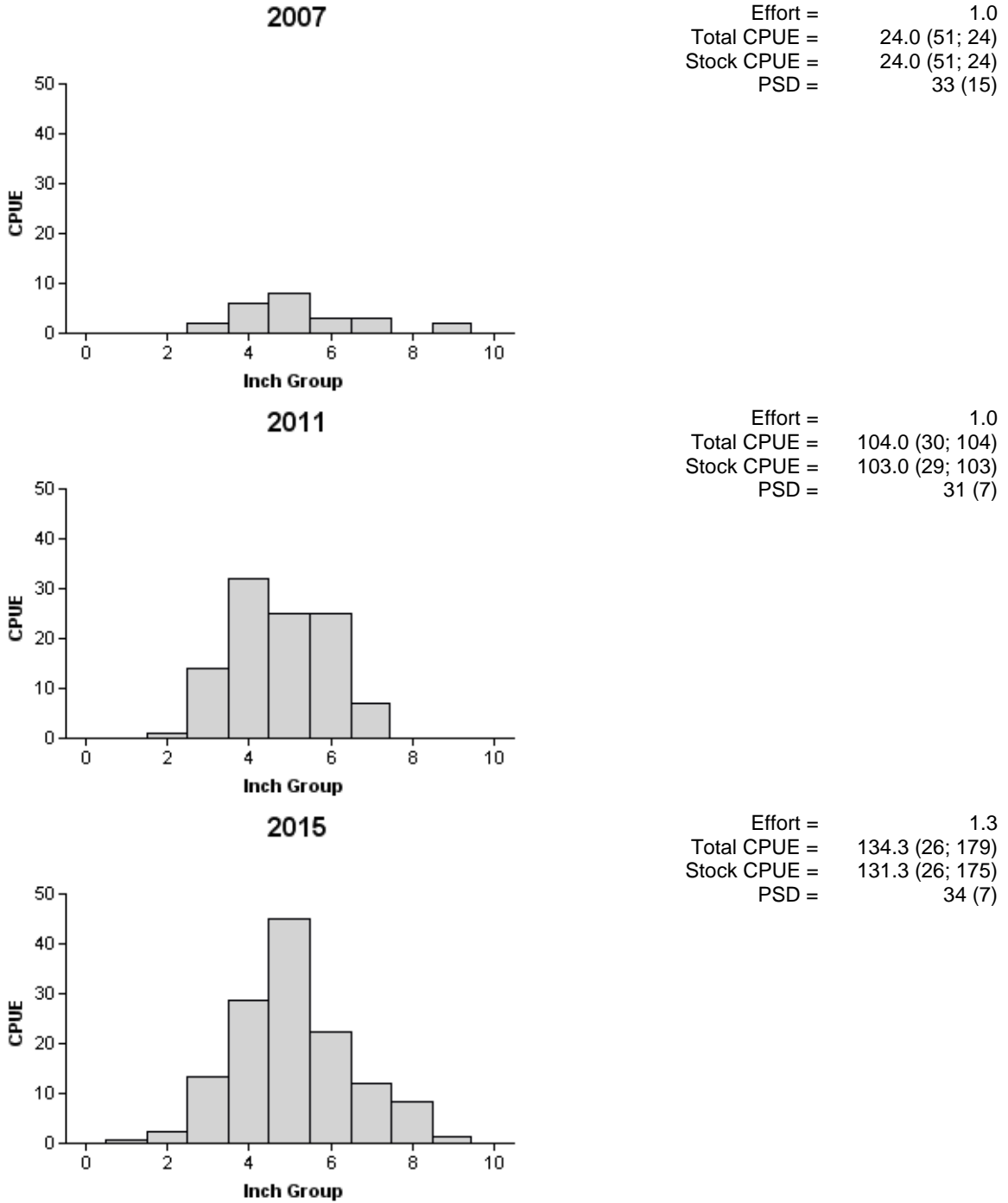


Figure 4. Number of Redbreast Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2007, 2011 and 2015.

Largemouth Bass

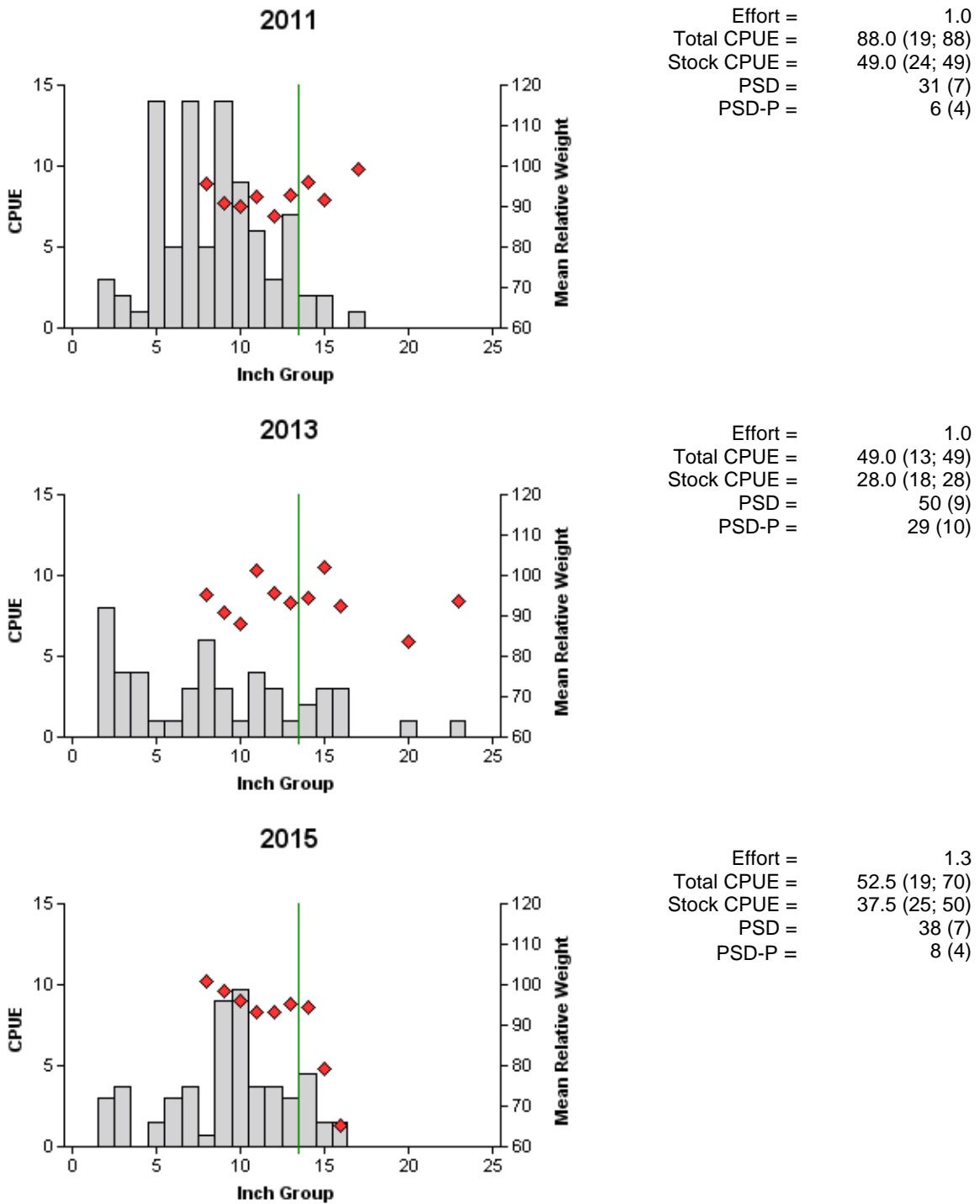


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2011, 2013, and 2015. Vertical lines indicate minimum length limit at time of survey.

Table 8. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Hawkins, Texas, 2007, 2011 and 2015. 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 with micro-satellite DNA analysis.

Year	Sample size	Genotype					% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	Combined hybrids	NLMB		
2007	30	0	a	a	30	0	63.4	0.0
2011	27	3	0	24	24	0	54.0	11.0
2015	30	0	0	30	30	0	41.0	0.0

^aAnalysis did not separate F1 from Fx hybrids

Table 9. Proposed sampling schedule for Lake Hawkins, Texas. Electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

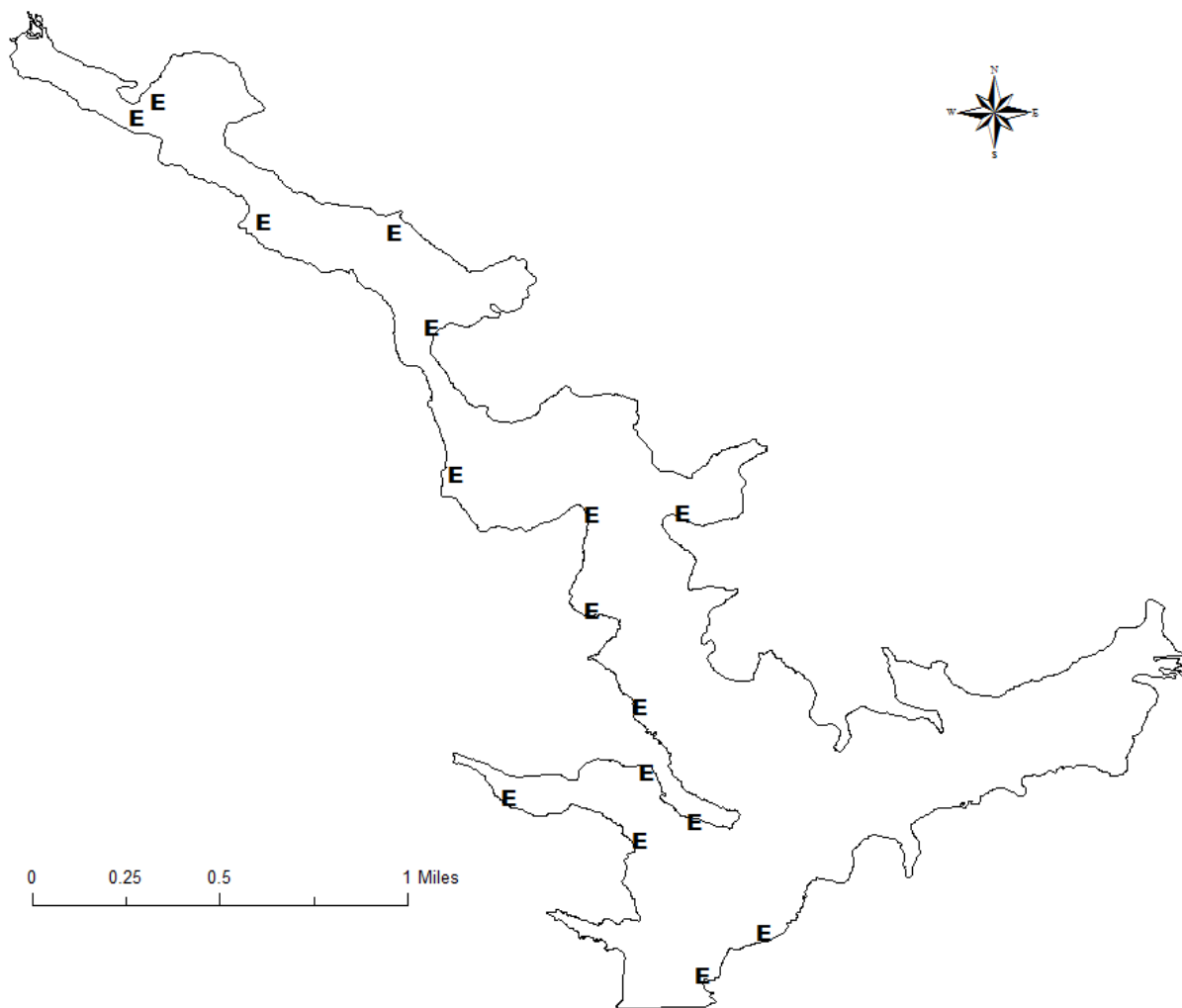
Survey Year	Vegetation	Access	Electrofishing	Creel	Report
2016-2017	A				
2017-2018	A		A		
2018-2019	A				
2019-2020	S	S	S	A	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected by fall electrofishing from Lake Hawkins, Texas, 2015.

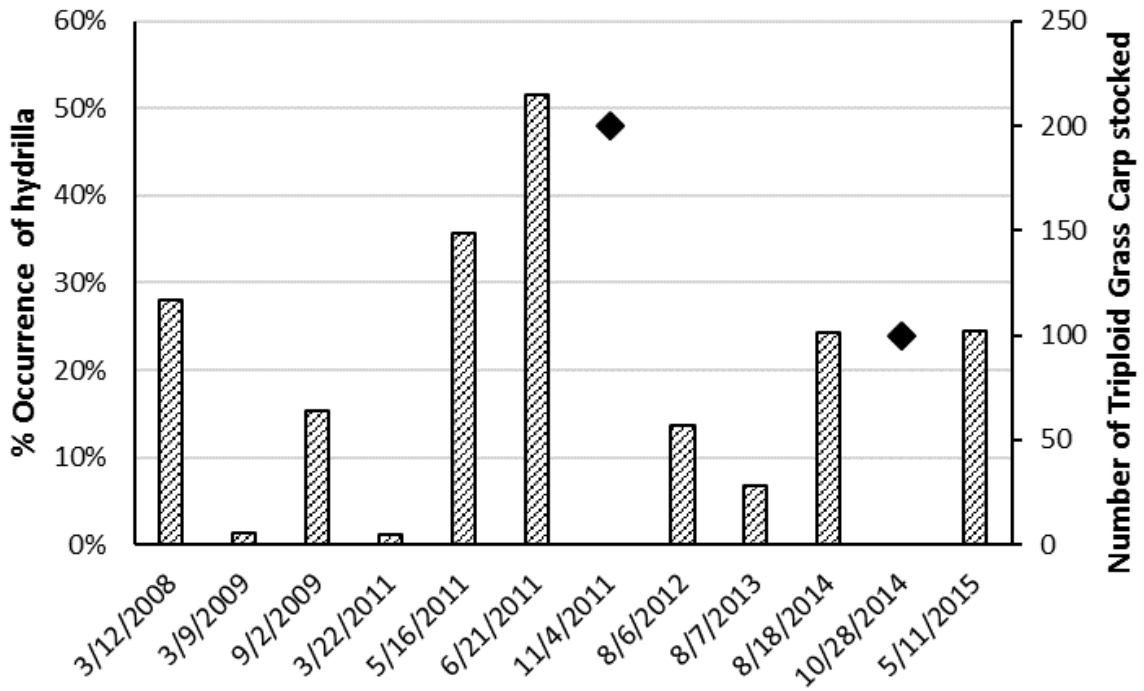
Species	Electrofishing	
	N	CPUE
Gizzard Shad	23	17.3
Threadfin Shad	127	95.5
Redbreast Sunfish	179	134.6
Warmouth	23	17.3
Bluegill	264	198.5
Longear Sunfish	12	9.0
Redear Sunfish	60	45.1
Largemouth Bass	70	52.6

APPENDIX B



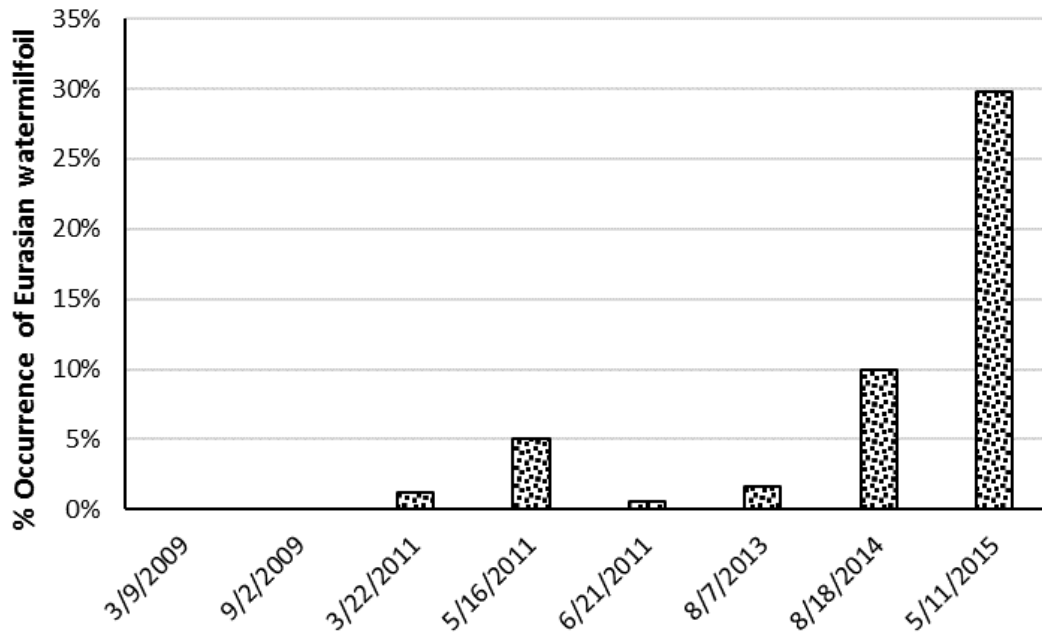
Location of electrofishing (E) sites, Lake Hawkins, Texas, 2015. Lake elevation was at conservation pool elevation during sampling.

APPENDIX C



Percent occurrence of hydrilla in shoreline samples observed during vegetation surveys at Lake Hawkins, 2008 – 2015. Black diamonds represent stockings of Triploid Grass Carp.

APPENDIX D



Percent occurrence of Eurasian watermilfoil in shoreline samples observed during vegetation surveys at Lake Hawkins, 2009 – 2015.