PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-6

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2015 Fisheries Management Survey Report

Lake Welsh

Prepared by:

Lynn D. Wright, Assistant District Management Supervisor
and
Timothy J. Bister, District Management Supervisor

Inland Fisheries Division
Marshall District
Marshall, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

July 31, 2016

TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Welsh were surveyed in 2015 using electrofishing and in 2016 using hoop netting. Anglers were surveyed from December 2015 through February 2016 with a creel survey. Historical data are presented with the 2015-2016 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 Welsh is a 1,333-acre cooling reservoir for coal-fueled power generation. The reservoir is located in Titus County on Swaunano Creek in the Big Cypress River Basin. . Habitat features consist of standing timber, rocky shoreline, riprap, native aquatic plants, and hydrilla.

- **Management History:** Sport fish include Largemouth Bass and Channel Catfish. Largemouth Bass have been managed under an 18-inch minimum length limit, 5 fish daily bag limit since September 1994. All other sport fishes in Lake Welsh have been managed with statewide regulations. Florida Largemouth Bass stockings in 1975 and 1976 were successful in establishing the Florida Largemouth Bass genetics in the population. In 2011, fish attractors (sunken Christmas trees) were deployed at 6 locations in the reservoir.

- **Fish Community**
  - **Prey species:** Threadfin Shad were present in the reservoir. Gizzard Shad have not been collected since 1993. Electrofishing catch of Bluegill in 2015 was higher than previous years. Few Bluegill were over 5-inches long, which provided excellent prey for Largemouth Bass.

  - **Catfishes:** The Channel Catfish abundance was low and only 4% of the total angling effort targeted Channel Catfish in the winter creel period. Flathead Catfish were present in the reservoir.

  - **Largemouth Bass:** Largemouth Bass were more abundant in 2015 than the previous surveys and exhibited quality size structure and condition. Largemouth Bass growth was fast. The average age of 14-inch Largemouth Bass was 1.5 years. Almost all (96%) of angling effort during the 2015/2016 winter creel survey was directed for Largemouth Bass.

Management Strategies: Conduct electrofishing surveys in 2017 and 2019 and a required aquatic vegetation survey in 2019. Additional vegetation surveys will be conducted from 2016-2018 to monitor changes in hydrilla. Largemouth Bass will continue to be managed under the current 18-inch minimum length limit. All other sport fish will continue to be managed under statewide harvest regulations.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Welsh in 2015-2016. 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 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 Welsh is a 1,333-acre impoundment constructed in 1976 on Swaunano Creek in the Cypress River Basin. It is located in Titus County approximately 10 miles southeast of Mt. Pleasant. The controlling authority is American Electric Power Company. Lake Welsh is a cooling reservoir for coal-fueled power generation. It has a watershed of approximately 34 square miles and a shoreline length of 27 miles. Average annual water level fluctuation was approximately 2 feet from 2009 to 2016, but reservoir level was 4 feet low in 2011 (Figure 1). Habitat features consist of standing timber, rocky shoreline, and aquatic vegetation. Other descriptive characteristics for Lake Welsh are in Table 1.

Angler Access

Lake Welsh has one public boat ramp and no private boat ramps. Shoreline access is limited to the public boat ramp area. Additional boat ramp characteristics are in Table 2.

Management History

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

1. Monitor the Largemouth Bass population and prey species with fall electrofishing and a winter creel survey in 2015. Stock Threadfin Shad if absent during sampling.
   Action: The Largemouth Bass and prey population was surveyed in 2013 and 2015 by electrofishing and angling effort was monitored with a winter creel survey from December 2015 through February 2016. Threadfin Shad were present in the 2015 electrofishing sample and stocking additional shad was not warranted.
2. Conduct annual aquatic vegetation surveys to monitor hydrilla and for other invasive plant species.
   Action: Annual vegetation surveys were conducted to monitor the hydrilla and other invasive species.
3. Inform the public on fisheries management activities and angling opportunities.
   Action: Information regarding fisheries management work at Lake Welsh was disseminated through personal interactions with anglers and through the district Facebook page.
4. Invasive species continue to threaten Texas waters.
   Action: Continued to work with controlling authorities to post signage and to educate the public on invasive species threats through media outlets.

Harvest regulation history: Largemouth Bass have been managed under an 18-inch minimum length limit, 5 fish daily bag limit since September 1994. All other sport fishes in Lake Welsh have been managed with statewide regulations. Current regulations are found in Table 3.

Stocking history: Adult Threadfin Shad were stocked at a rate of 1.2 fish/acre in 1982. Florida Largemouth Bass were established in the reservoir from stockings in 1975 (55 fish/acre) and 1976 (41 fish/acre). Channel Catfish fingerlings were stocked in 1975 (49 fish/acre) and 1976 (38 fish/acre). Flathead Catfish were stocked in 1978 (68 adults) and 1979 (3.6 fish/acre). Blue Catfish were stocked (1978; 25 fish/acre), but a population did not establish. Black Crappie were stocked from 1988 to 1990 at rates ranging from 26 to 52 fish/acre, but a self-sustaining fishery never developed. The complete stocking history can be seen in Table 4.

Vegetation/habitat management history: Hydrilla, observed in low abundance 2009 and 2010, was monitored annually, when possible, to determine trends in abundance that might necessitate further actions. Water hyacinth was documented at the boat ramp in fall 2007; physical removal was conducted by Texas Parks and Wildlife Department (TPWD) staff.

Water transfer: Lake Welsh receives supplemental water from Lake O' The Pines to help maintain necessary water levels to function as a cooling reservoir for the American Electric Power generation plant. This water transfer is within the Cypress River Basin. No interbasin water transfer is known to exist.

METHODS

Surveys in 2015/2016 were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Welsh (TPWD unpublished). Primary components of the OBS plan 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, and Threadfin Shad were collected by electrofishing (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 13 randomly-selected fish (range 13.0 to 14.9 inches).

Tandem hoop nets – Channel Catfish were collected using 10 tandem hoop-net series at 10 stations. Nets were baited with soap and deployed for 2-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series).

Genetics – Genetic analysis 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). 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.

Creel survey – An access-point creel survey was conducted from December 2015 through February 2016. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Habitat –Vegetation surveys were conducted in 2012 - 2015 to monitor expansion of hydrilla. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Water level – Source for water level data was the American Electric Power Company.

RESULTS AND DISCUSSION

Habitat: Structural habitat surveys were last conducted in 1996 for shoreline habitat (Ryan and Brice 1997) and for standing timber in 2011 (Wright and Bister 2012). The shoreline is 90.4% natural shoreline with some soil cement (6.3%) and rip rap (3.3%) making up the remainder. Additionally, standing timber covered 32.7% of the reservoir surface area. Coontail was the dominant aquatic plant in the reservoir during the 1999, 2003, and 2007 vegetation surveys, but total aquatic vegetation coverage was always less than 5% (Ryan and Brice 2000, 2004; Brice and Bister 2008). Native vegetation covered < 1% of the reservoir's surface area in 2015 and consisted primarily of coontail (Table 6). Hydrilla has increased in coverage from 47 acres in 2012 to 120 acres in 2015. Alligatorweed was present in the reservoir, but at very low abundance.

Creel: Directed fishing effort by anglers was primarily Largemouth Bass (95.6%), followed by anglers fishing for Channel Catfish (4.4%) (Table 7). Results were similar to the 2007/2008 winter creel where directed angling effort for Largemouth Bass was (98.7%). Total fishing effort and direct expenditures at

Lake Welsh were higher in 2015/2016 then the 2007/2008 creel period with double the angling effort (Table 8). Sixty-four percent of anglers traveled more than 50 miles to fish at Lake Welsh during the 2015/2016 winter creel period (Appendix C) and was similar to the 73% during the 2007/2008 winter creel. Both creel surveys showed a high proportion of anglers from the Dallas area.

Prey species: Threadfin Shad were present and collected for the first time since 2009. Electrofishing catch rates of Bluegill were 1,748.0/h in 2015 which was much higher than 2013 (866.0/h) and 2011 (934.0/h) (Figure 2). Redear Sunfish were also present at 41.0/h (Figure 3). Size structure of Bluegill continued to be dominated by small individuals (Figure 2) and provided an abundant forage base for the Largemouth Bass population. Other species present included Warmouth, Green Sunfish, and Longear Sunfish and comprised less than 5% of the sunfish sampled (Appendix A).

Channel Catfish: The hoop net catch rate of Channel Catfish was 0.7/series in 2016 (Figure 4). The Channel Catfish population continued to have low relative abundance consistent with previous gill net surveys (Wright and Bister 2012). Directed fishing effort and total harvest for Channel Catfish was low (Table 9). Only 4.4% of anglers targeted Channel Catfish during the winter creel period. Sampling objectives for abundance and size structure analysis were not met due to poor catch rates.

Largemouth Bass: The electrofishing catch rate of stock-length Largemouth Bass has increased over the past three surveys with 147.0/h in 2015, 121.0/h in 2013, and 65.0/h in 2011 (Figure 5). Improved catch rates of Largemouth Bass is likely attributed to increased recruitment due to expanding hydrilla coverage over the same time period. Size structure has been excellent as PSD was 52 in 2015 (Figure 5). Growth of Largemouth Bass in Lake Welsh was fast; average age at 14 inches (13.0 to 14.9 inches) was 1.5 years (N = 13; range = 1 – 4 years) in 2015 and 1.1 years (N = 13; range = 1 – 2 years) in 2013. Body condition in 2015 was adequate (Wr > 90) for nearly all size classes of fish and was similar to body condition in previous surveys (Figure 5). Angling catch was 0.8 fish/h in from December 2015 through February 2016 and was identical to the previous survey in 2007/2008. Total directed effort was double the previous survey with over 25,000 hours of effort during the creel period. Few bass were harvested and percent legal released was 99 percent (Table 10). Florida Largemouth Bass influence has remained relatively constant as Florida alleles have ranged from 89.0 to 93.5% and Florida genotype has ranged from 17.0 to 65.0% (Table 11).

Fisheries management plan for Lake Welsh, Texas

Prepared – July 2016.

ISSUE 1: An 18-inch minimum length limit (5 fish daily bag limit) was implemented in September 1994 to improve fishing quality. Largemouth Bass have fast initial growth rates, above average condition, and improved recruitment that has coincided with the recent increase in hydrilla. Creel data indicates that it is a popular winter bass fishing location and draws significant numbers of anglers from outside the local area. Continued sampling of the Largemouth Bass population is necessary to monitor this important fishery.

MANAGEMENT STRATEGY

1. Continue to regulate Largemouth Bass harvest with a 18-inch minimum length limit
2. Monitor the Largemouth Bass and prey species with electrofishing in 2017 and 2019 to ensure the population benefits from the special harvest regulation.

ISSUE 2: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

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

Objective-Based Sampling Plan and Schedule

Sport fish, forage fish, and other important fishes

Sport fishes in Lake Welsh include Channel Catfish, Black Crappie, and Largemouth Bass. Important forage species include Bluegill and Threadfin Shad.

Low-density fisheries

Black Crappie: Black Crappie are present in Lake Welsh, but population abundance is extremely low. Trap net surveys from 1989-2003 showed CPUE of Black Crappie ranged from 0.0 to 0.2 fish/nn. Trap netting has since been discontinued. A winter creel survey in 2007/2008 and 2015/2016 indicated that no directed effort or catch of Black Crappie occurred. Sampling this population is unnecessary in FYs 2017-2020.

Channel Catfish: Channel Catfish are present in Lake Welsh, but abundance was very low in the most recent survey. From 1989-2012 CPUE-S in gill nets ranged from 2.6 to 25.4 fish/nn and of the last 9 gill net surveys, only 2 of those surveys collected more than 50 stock size fish. Winter creel data shows very few anglers targeting Channel Catfish at Lake Welsh. Sampling this population is unnecessary in FYs 2017-2020.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are the most popular sport fish in Lake Welsh. Previous winter-quarter creel surveys from 2007/2008 and 2015/2016 indicate Largemouth Bass angling comprised 98.7% and 95.6% of total angling effort. The popularity and reputation for quality Largemouth Bass fishing at this reservoir warrants sampling time and effort. Largemouth Bass have been managed with an 18-in MLL regulation since 1994. Trend data on CPUE, size structure, and body condition have been collected biennially since 1999 with fall nighttime electrofishing. Continuation of biennial trend data in this reservoir with night electrofishing in the fall will allow for determination of any large-scale changes in the Largemouth Bass population that may spur further investigation. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in fall 2017 and 2019 (Table 12), but sampling will continue at random sites until 100 stock-size fish are collected and the RSE of CPUE-S is $\leq$ 25 (the anticipated effort to meet both sampling objectives is 12 stations with 80% confidence). Twelve random stations will be determined. Exclusive of the original 12 random stations, 3 additional random stations will be pre-determined in the event some extra sampling is necessary. A maximum of 15 stations will be sampled. Otoliths from 13 fish between 13.0 and 14.9 inches will be collected to determine mean age at 14 inches. Due to consistent Florida Largemouth Bass genetic influence in the population, and no anticipated stocking plans, genetic analysis will only be conducted once every 8 years beginning in 2023.

Bluegill: Bluegill are the primary forage at Lake Welsh. Like Largemouth Bass, trend data on CPUE and size structure of Bluegill have been collected biennially since 1999. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in Bluegill relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers of Bluegill for size structure estimation (PSD; 50 fish minimum at 12 stations with 80% confidence) and relative abundance estimates (RSE $\leq$ 25 of CPUE-Total; anticipated effort is 12 stations). No additional effort will be expended to achieve an RSE25 for CPUE-T of Bluegill. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density. Relative weight of Largemouth Bass $\geq$ 8" TL will be determined from their length/weight data (maximum of 10 fish weighed and measured per inch class).

Threadfin Shad: Threadfin Shad are a secondary source of forage in Lake Welsh. Summer fish kills that primarily affect shad have occurred periodically at Lake Welsh and have caused the absence of Threadfin Shad during some surveys, however, they were present in the 2015 fall electrofishing survey. We will document presence/absence of shad species during fall electrofishing.

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.

Brice, M. W., and T. J. Bister. 2008. Statewide freshwater fisheries monitoring and management program survey report for Lake Welsh, 2007. Texas Parks & Wildlife Department, Federal Aid Project F-30-R-33, Austin.

Guy, C. S., R. M. Neumann, 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.

Ryan, M. J., and M. W. Brice. 1997. Statewide freshwater fisheries monitoring and management program survey report for Lake Welsh, 1996. Texas Parks & Wildlife Department, Federal Aid Project F-30-R-21, Austin.

Ryan, M. J., and M. W. Brice. 2000. Statewide freshwater fisheries monitoring and management program survey report for Lake Welsh, 1999. Texas Parks & Wildlife Department, Federal Aid Project F-30-R-24, Austin.

Ryan, M. J., and M. W. Brice. 2004. Statewide freshwater fisheries monitoring and management program survey report for Lake Welsh, 2003. Texas Parks & Wildlife Department, Federal Aid Project F-30-R-29, Austin.

Wright, L. D., and T. J. Bister. 2012. Statewide freshwater fisheries monitoring and management program survey report for Lake Welsh, 2011. Texas Parks & Wildlife Department, Federal Aid Project F-221-M-2, Austin.

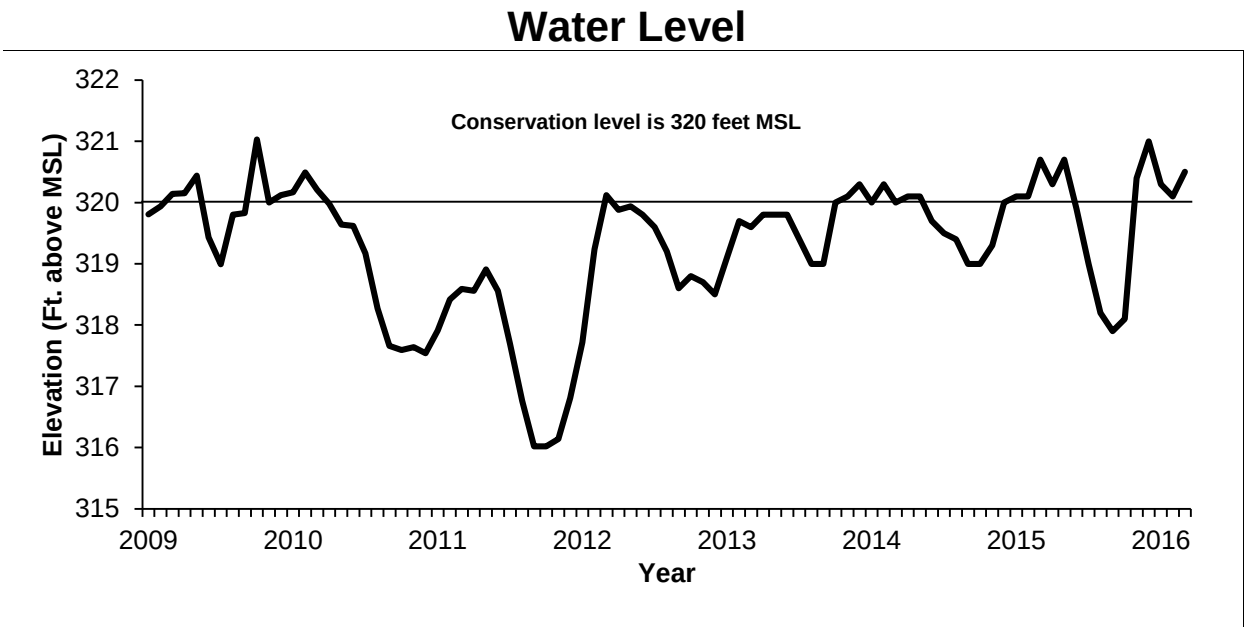


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Welsh, Texas.

Table 1. Characteristics of Lake Welsh, Texas.

Characteristic	Description
Year constructed	1976
Controlling authority	American Electric Power Company
County	Titus
Reservoir type	Tributary, cooling
Shoreline Development Index (SDI)	5.3
Conductivity	480 µS/cm

Table 2. Boat ramp characteristics for Lake Welsh, Texas, May 2016. Reservoir elevation at time of survey was 320 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
County Rd 4855	33.07473 -94.84585	Y	40	312	Adequate, no access issues

Table 3. Harvest regulations for Lake Welsh, 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, Largemouth	5	18-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Lake Welsh, Texas. AFGL = advanced fingerling; ADL = adults.

Species	Year	Number	Size
Black Crappie	1988	34,125	AFGL
	1989	36,769	AFGL
	1990	69,176	AFGL
	Total	140,070	
Blue Catfish	1978	33,230	AFGL
Channel Catfish	1975	64,115	AFGL
	1976	50,000	AFGL
	Total	114,115	
Flathead Catfish	1978	68	ADL
	1979	4,800	AFGL
	Total	4,868	
Florida Largemouth Bass	1975	73,350	AFGL
	1976	55,000	AFGL
	Total	1,320,163	
Threadfin Shad	1982	1,600	ADL

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

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 100 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 ≥ 50
Threadfin Shad [a]			Presence/Absence
Tandem hoop netting			
Channel Catfish	Abundance	CPUE– stock	RSE-Stock ≤ 25
	Size structure		N ≥ 100 stock

[a] No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill and Threadfin Shad 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 Welsh, Texas, 2012 – 2015. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2012	2013	2014	2015
Native submersed				5.0 (0.4)
Native floating-leaved				0
Native emergent				< 1.0 (0.1)
Non-native				
Hydrilla (Tier III)*	47.0 (3.5)	52.0 (3.9)	94.0 (7.1)	120.0 (9.0)
Alligatorweed (Tier III)				< 1.0 (0.1)

*Tier III is Watch Status

Table 7. Percent directed angler effort by species for Lake Welsh, Texas, 2007/2008 and 2015/2016. Survey periods were from December through February.

Species	2007/2008	2015/2016
Channel Catfish	1.3	4.4
Largemouth Bass	98.7	95.6

Table 8. Total fishing effort (h) for all species and total directed expenditures at Lake Welsh, Texas, 2007/2008 and 2015/2016. Survey periods were from December through February. Relative standard error is in parentheses.

Creel statistic	2007/2008	2015/2016
Total fishing effort	13,437 (52)	26,947 (41)
Total directed expenditures	$108,733 (59)	$161,680 (47)

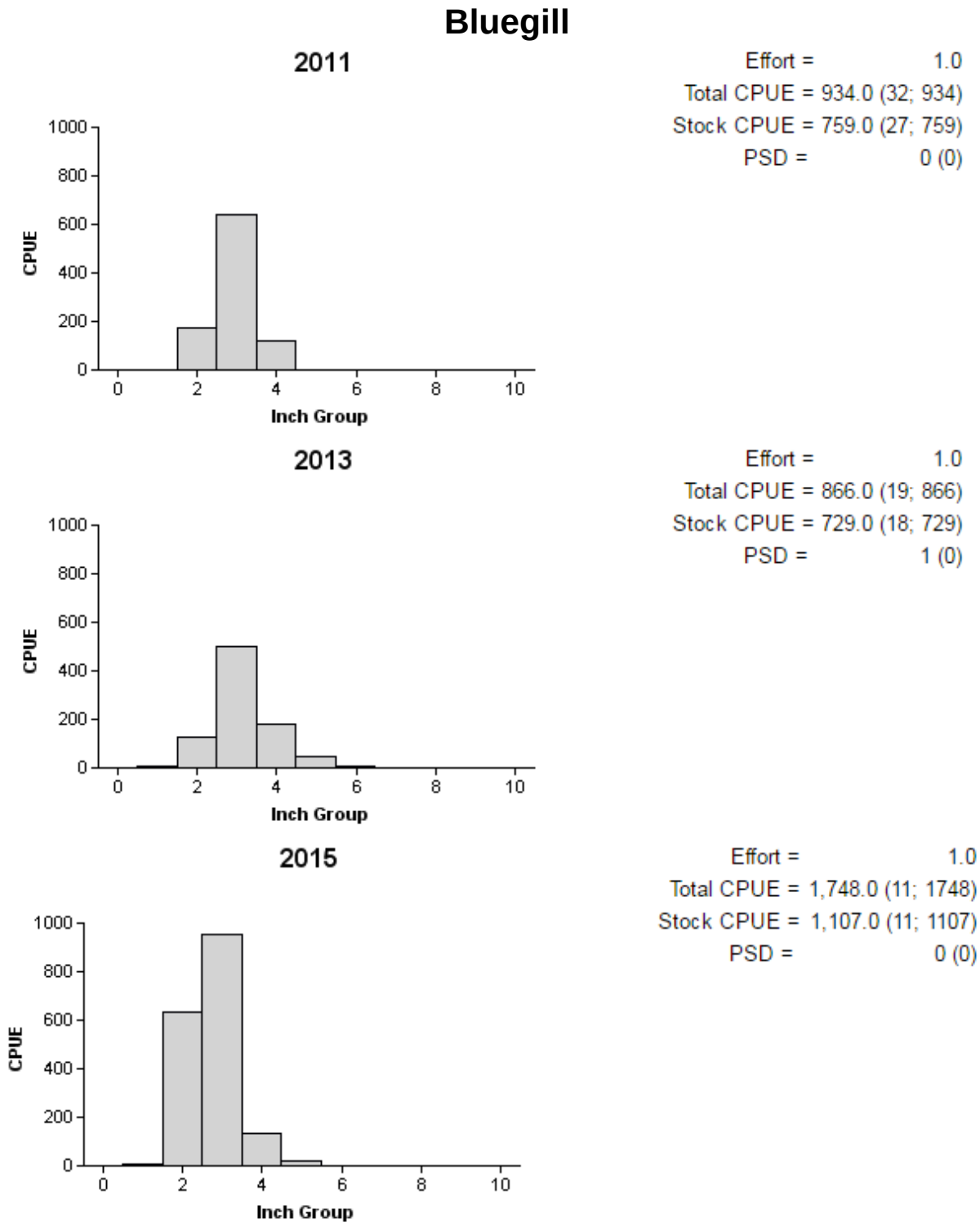


Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Welsh, Texas, 2011, 2013, and 2015.

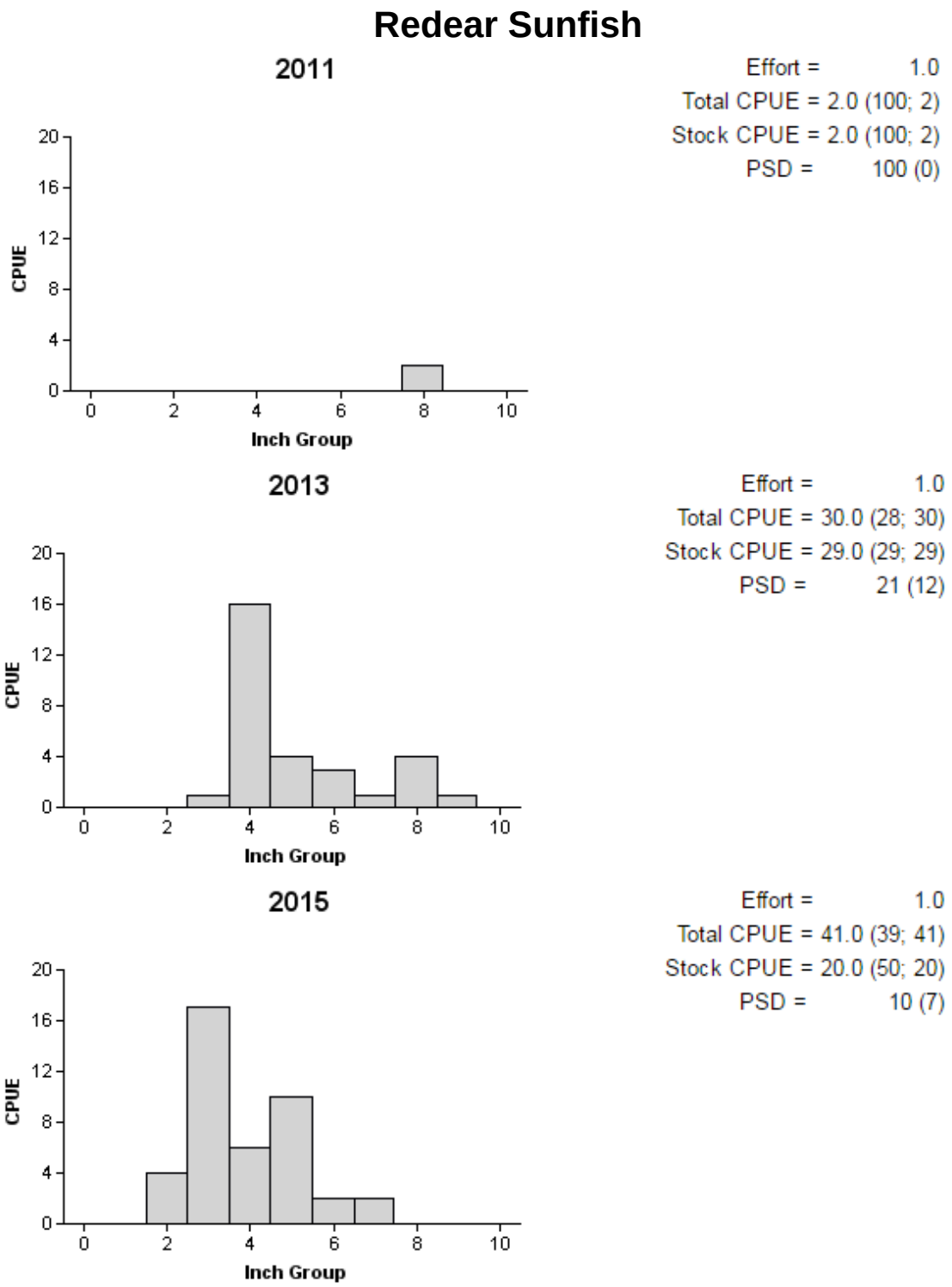


Figure 3. Number of Redear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Welsh, Texas, 2011, 2013, and 2015.

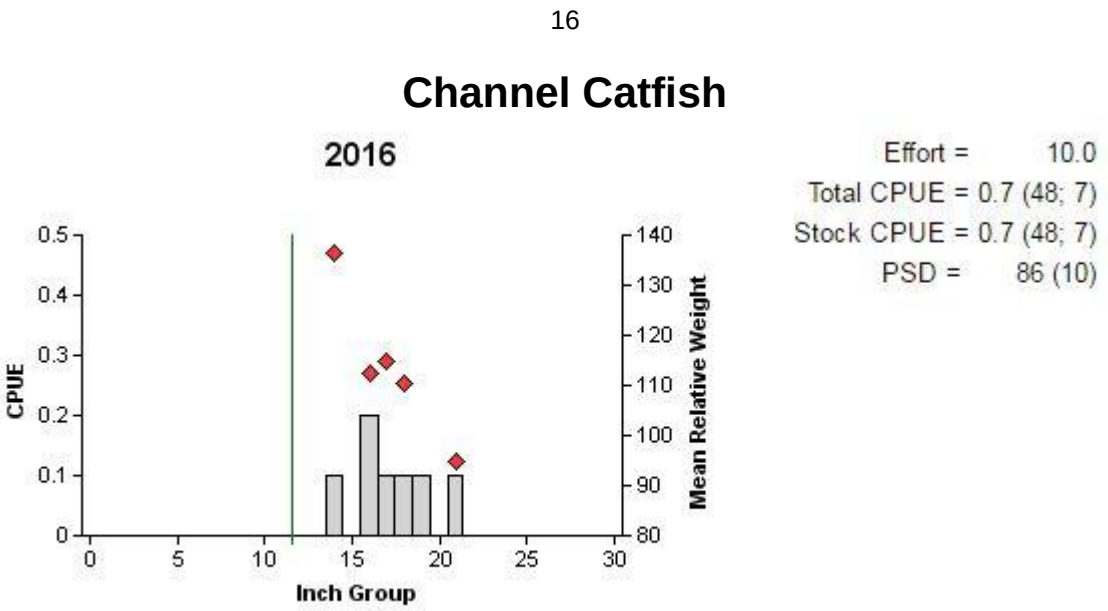


Figure 4. Number of Channel Catfish caught per net series (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring tandem hoop net surveys, Lake Welsh, Texas, 2016. Vertical line indicates the minimum length limit.

Table 9. Creel survey statistics for Channel Catfish at Lake Welsh, Texas, from December 2007 through February 2008 and December 2015 through February 2016. Total catch per hour is for anglers targeting Channel Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Statistic	2007/2008	2015/2016
Surface area (acres)	1,333	1,333
Directed effort (h)	173 (96)	1,178 (56)
Directed effort/acre	0.13 (96)	0.88 (24)
Total catch per hour	0.23 (77)	0.03 (NA)
Total harvest	877 (98)	55 (88)
Harvest/acre	0.66 (98)	0.04 (88)
Percent legal released	0	0

Largemouth Bass

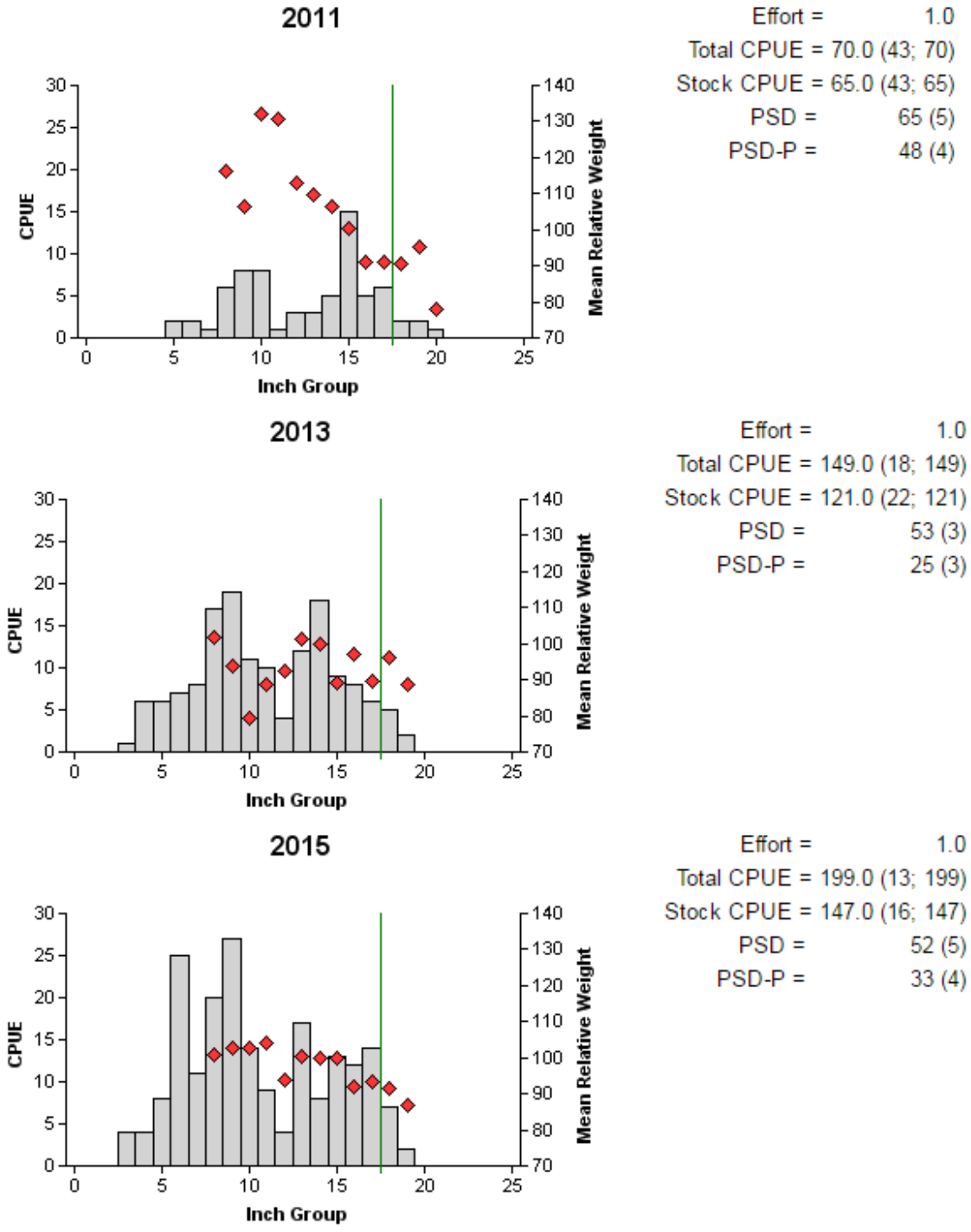


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Welsh, Texas, 2011, 2013, and 2015. Vertical line indicates the minimum length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

Largemouth Bass

Table 10. Creel survey statistics for Largemouth Bass at Lake Welsh, Texas, from December 2007 through February 2008 and December 2015 through February 2016. Catch rate is for all anglers targeting Largemouth Bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Statistic	2007/2008	2015/2016
Surface area (acres)	1,333	1,333
Directed angling effort (h)		
Tournament	6,629 (53)	5,994 (43)
Non-tournament	6,636 (53)	19,775 (41)
All black bass anglers combined	13,265 (52)	25,769 (41)
Angling effort/acre	10.0 (52)	19.3 (41)
Catch rate (number/h)	0.8 (9)	0.8 (7)
Harvest		
Non-tournament harvest	0 (0)	28 (84)
Harvest/acre	0.0 (0)	0.02 (84)
Tournament weigh-in and release	351 (97)	0 (0)
Release by weight		
<4.0 lbs		24,010 (42)
4.0-6.9 lbs		2355 (50)
7.0-9.9 lbs		0 (0)
≥10.0 lbs		0 (0)
Percent legal released (non-tournament)	100	99

Table 11. Results of genetic analysis of Largemouth Bass collected by fall electrofishing Lake Welsh, Texas, 2005, 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 NLMB. Genetic composition was determined with micro-satellite DNA analysis.

		Number of fish					
Year	Sample size	FLMB	F1	Fx	NLMB	% FLMB alleles	% pure FLMB
2005	60	39	[a]	[a]	0	93.5	65.0
2007	30	16	[a]	[a]	0	93.0	53.0
2011	30	5	0	25	0	89.0	17.0
2015	30	11	0	19	0	91.0	37.0

[a] Determination of hybrid status not conducted.

Table 12. Proposed sampling schedule for Lake Welsh, Texas. Survey period is June through May. Electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

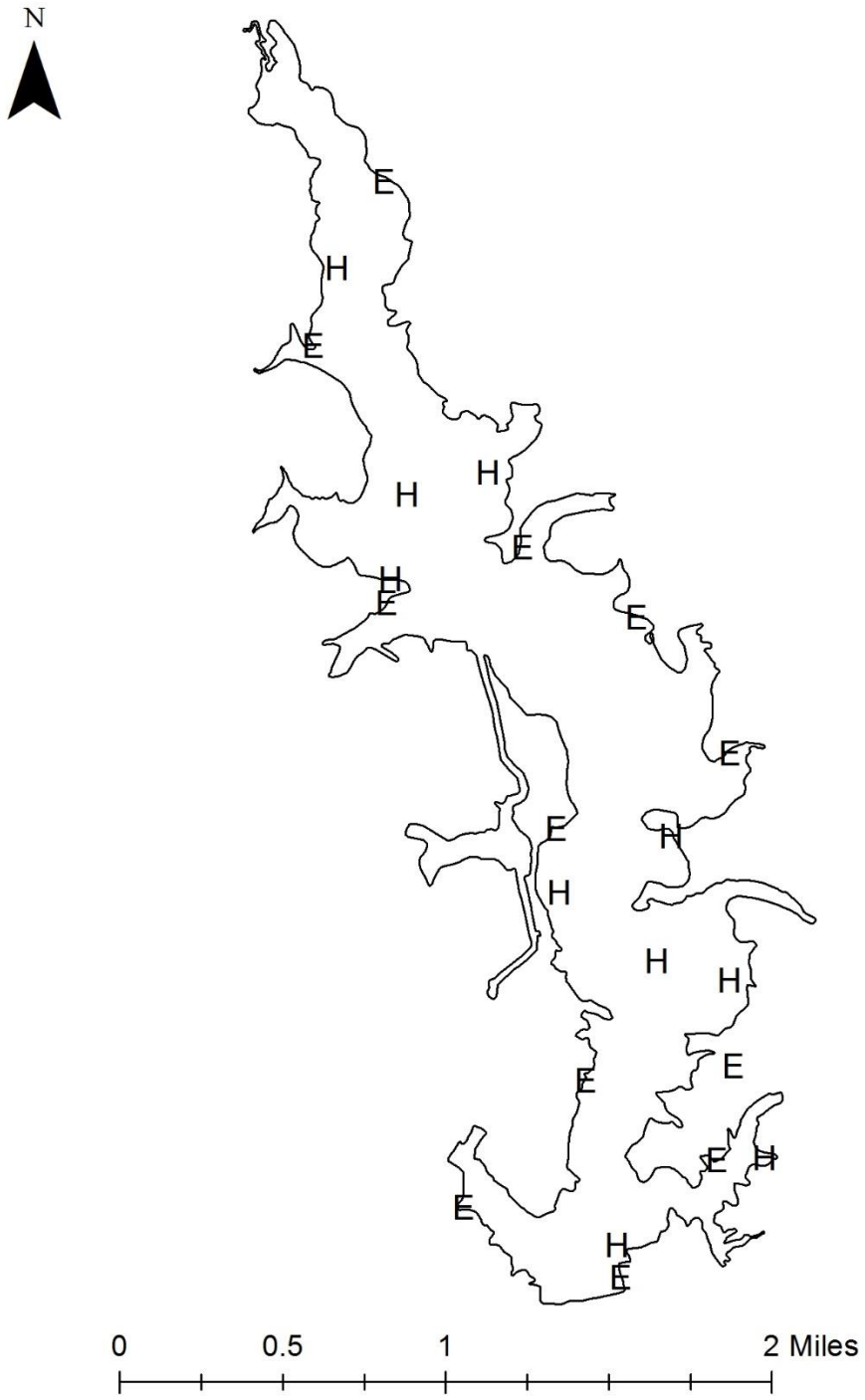
Survey year	Electrofish	Vegetation	Access	Report
2016-2017		A		
2017-2018	A	A		
2018-2019		A		
2019-2020	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Welsh Texas, 2015-2016. Sampling effort was 10 net series (two nights each) for hoop netting, and 1 hour for electrofishing.

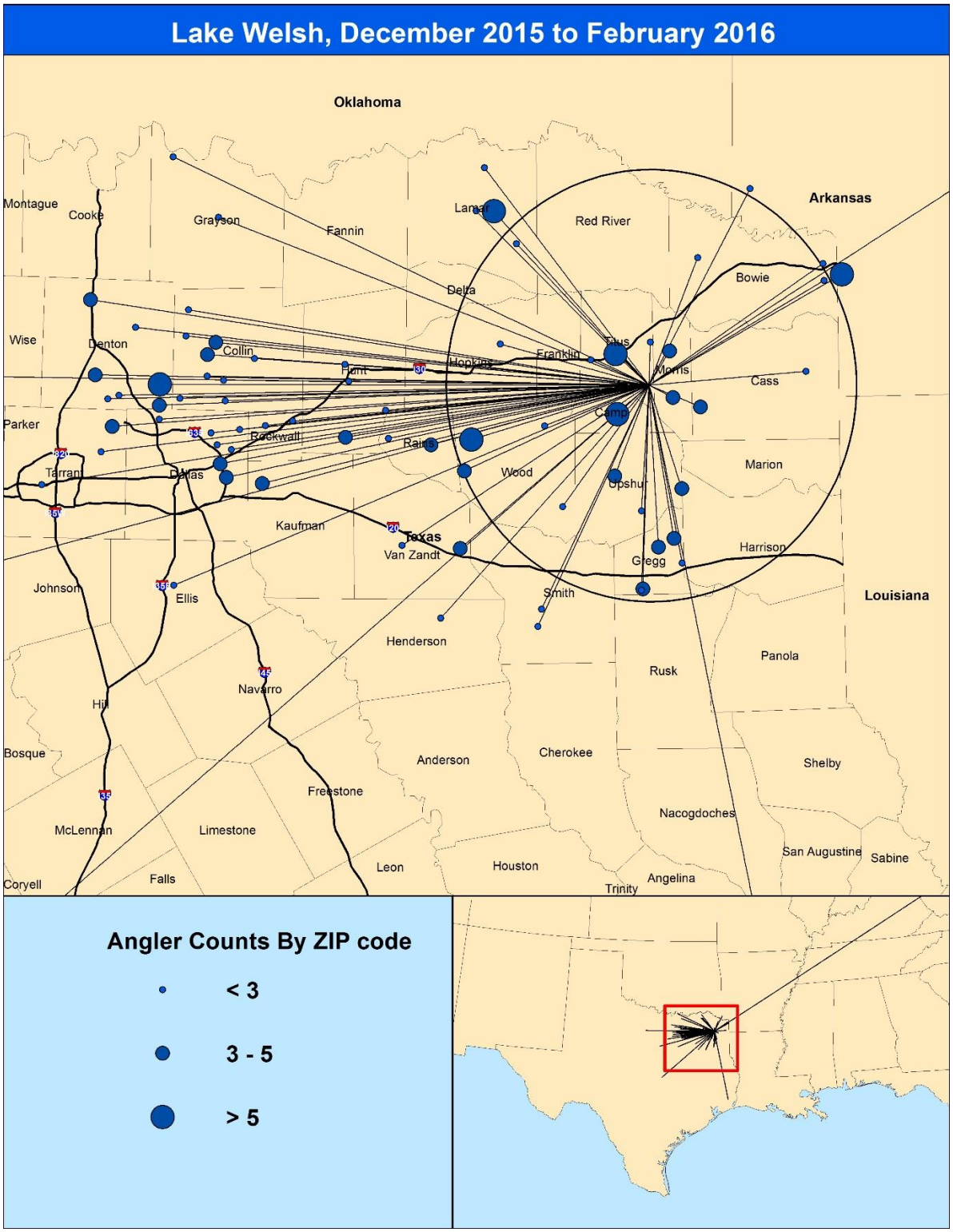
	Hoop Netting		Electrofishing	
Species	N	CPUE	N	CPUE
Threadfin Shad			16	16.0
Channel Catfish	7	0.7		
Flathead Catfish	1	0.1		
Green Sunfish			60	60.0
Warmouth			1	1.0
Bluegill			1,748	1,748.0
Longear Sunfish			26	26.0
Redear Sunfish			41	41.0
Largemouth Bass			199	199.0

APPENDIX B



Location of sampling sites, Lake Welsh, Texas, 2015-2016. Hoop net and electrofishing stations are indicated by H and E, respectively. Water level was near full pool at time of sampling.

APPENDIX C



Location, by ZIP code, and frequency of anglers that were interviewed at Lake Welsh, Texas, during the December 2015 through February 2016 creel survey. Circle indicates 50-mile radius from Lake Welsh.