PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-2

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2016 Fisheries Management Survey Report

Wichita Reservoir

Prepared by:

Tom Lang, District Management Supervisor
and
Robert Mauk, Assistant District Management Supervisor

Inland Fisheries Division
Wichita Falls District
Wichita Falls, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

July 31, 2017

TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Wichita Reservoir were surveyed in 2016 using electrofishing and trap netting. Historical data are presented with the 2016 data for comparison. This report summarizes the results of the surveys and contains a management plan based on those findings.

- **Reservoir Description:** Wichita Reservoir is a 1,224-acre municipal reservoir owned and operated by the City of Wichita Falls for flood control and recreation. The dam and most of the reservoir is in Wichita County and the southern portion is in Archer County. The reservoir was built in 1901, impounding Holliday Creek, a tributary to the Wichita River. Mean depth is 4.5 feet and maximum depth is 9.5 feet. Angler and boat access is adequate when reservoir elevation is within one foot of conservation pool. Habitat includes large stands of native emergent vegetation when full. Starting in 2004, the reservoir has suffered periodical golden alga caused fish kills. In 2012, a drought began that lasted until 2015 and nearly dried up the reservoir.

- **Management History:** Historically important sport fish include Channel Catfish, White Bass, Palmetto Bass, and White Crappie. The 2012 management plan recommended minimum management activity because of the developing initiative to rehabilitate the reservoir which called for dewatering the reservoir.

- **Fish Community**
  - **Prey species:** The 2016 electrofishing survey catch rates of Gizzard Shad and Bluegill were well below previous surveys and were at historic lows for both species. Without stocking to reestablish these species after the drought, these populations are in poor condition.

  - **Catfishes:** No survey work has been completed on catfishes since 2011.

  - **Temperate Bass:** No survey work has been completed on White or Palmetto Bass since 2011.

  - **Largemouth Bass:** The 2016 survey observed low abundance of Largemouth Bass. Historically, since 1995 when the reservoir elevation was lowered, Largemouth Bass presence in the reservoir would be characterized as rare.

  - **White Crappie:** The 2016 trap net survey had the highest catch rate observed at this reservoir. White Crappie are quite abundant and should provide good fishing until work begins on excavating and revitalizing the reservoir.

- **Management Strategies:** Continue working with the City of Wichita Falls' Lake Wichita Revitalization Committee with the goal of deepening the reservoir, increasing fisheries habitat, increasing fishing access, and adding amenities around and to the reservoir. Management activities will consist of supporting the committee's efforts. Traditional management activities will not be conducted until appropriate.

INTRODUCTION

This document is a summary of fisheries data collected from Wichita Reservoir in 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 2016 data for comparison.

Reservoir Description

Wichita Reservoir is a 1,224-acre municipal reservoir owned and operated by the city of Wichita Falls for flood control and recreation. The dam is on the city limit line for Wichita Falls in Wichita County and a portion of the reservoir is in Archer County. The reservoir was built in 1901, impounding Holliday Creek, a tributary to the Wichita River. Originally, the reservoir was 2,200 acres and was built as a municipal water supply reservoir. After alternative water supplies were developed, Wichita Falls initiated a project with the Corps of Engineers to control flooding below the reservoir. This project culminated in a new spillway being completed in August 1995 which is 4.7 feet lower than the original one. This reduced the surface acreage to 1,224 acres, mean depth to 4.5 feet and maximum depth to 9.5 feet. In an effort to sustain recreational use, the City of Wichita Falls diverts water from the local irrigation district to maintain elevation at or near spillway level. When the reservoir is near full, habitat includes relatively large stands of bulrush *Scirpus spp*. In March of 2004 a toxic golden alga event killed approximately 7,700 fish of which 93% were non-game fish. In March of 2007 another event occurred with an estimated 15,000 fish (primarily non-game species) dying. In February of 2009, a much larger golden alga event killed greater than 201,000 fish, including many game fish. In early 2012, another major kill occurred caused by a toxic golden alga bloom. Also in 2012, a prolonged drought significantly decreased water levels driving water temperatures and dissolved oxygen to lethal levels, resulting in two fish kill events. It has since refilled to the conservation elevation. Other descriptive characteristics for Wichita Reservoir are in Table 1.

Angler Access

Wichita Reservoir has a one lane boat ramp that is unusable for boat access if the reservoir is one foot below conservation pool. Extending the ramp is not feasible without lake-bottom excavation. Additional boat ramp characteristics are in Table 2. Shoreline access is considered good with public access at the ramp, along the dam where a new fishing pier was erected, and at the City of Wichita Falls' Lake Wichita Park located on the reservoir.

Management History

Previous management issues and actions: Management issues and actions from the previous survey report (Lang and Mauk 2013) included:

1. The reservoir was in poor condition because of drought, age of reservoir, and a water source that was conducive to golden alga caused fish kills.

   Action: Developed partnerships with other groups interested in fixing existing problems at Lake Wichita. We helped to establish a Lakeside City/Lake Wichita Chapter of Friends of Reservoirs. We worked through the Wichita Falls Parks Board to request the Wichita Falls City Council to establish the Lake Wichita Study Committee to identify problems at the reservoir and how to fix them. Committee was approved in May of 2013. Following historical research, public surveys, and regulatory research a plan was developed and presented to the City Council. Council approved the plan and renamed the committee the Lake Wichita Revitalization Committee altering their charge to making the plan come to fruition by obtaining permits and raising funds to enact the plan. The City of Wichita Falls

hired a consulting firm to conduct needed studies and draft a U.S. Army Corps of Engineers (USACE) 404 Permit application which includes studies on bathymetry, wetlands, water quality, water quantity, and habitat. Permit application was submitted to the USACE in October 2016.

2. Boat ramp usage was impeded because of low water conditions and the overall shallowness of the reservoir.

   Action: The Lake Wichita Revitalization Plan calls for building and improving boat ramps at the reservoir during excavation of the lake bed. The drought ending and Wichita Reservoir refilling in May of 2015 enabled the ramp to be usable. Multiple Boating Access Grant applications have been submitted to aid this effort. One grant for nearly $500,000 was approved for the Kemp Blvd. boat ramp.

3. Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically.

   Actions:
   1. The district office monitored the reservoir for invasive species and erected educational signage.
   2. Made a speaking point about invasive species when presenting to constituent and user groups.
   3. Kept track of existing and future inter-basin water transfers to facilitate potential invasive species responses.

4. The Lake Wichita Study Committee was formed and TPWD was offered a place on the committee as a non-voting member.

   Action: Biologist Tom Lang took the non-voting membership on the committee and actively worked on solving siltation, water quality and quantity as well as fish habitat issues. Lang continued this role when the committee was renamed the Lake Wichita Revitalization Committee. Numerous partnerships and events have ensued ultimately increasing public awareness and support of the project.

Harvest regulation history: Sport fish species in Wichita Reservoir are currently managed under statewide regulations (Table 3).

Stocking history: The reservoir nearly went dry in 2015 and no stockings have occurred since because of the possible excavation of the lake bed. The complete stocking history is shown in Table 4.

Vegetation/habitat management history: There is no history of vegetation issues at this reservoir. Brush piles were last installed in 2011 near the old pavilion posts.

Water transfer: There are no interbasin water transfers occurring at the reservoir. The City of Wichita Falls periodically conducts intrabasin water transfers from Diversion Reservoir to Wichita Reservoir.

METHODS

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Wichita Reservoir (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) except electrofishing was performed during the day at six sites and only three sites were selected for trap netting.

Electrofishing – Largemouth Bass, Sunfishes, and Gizzard Shad were collected by electrofishing (0.5 hour at 6, 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.

Trap netting – Crappie were collected using trap nets (3 net nights at 3 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

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 X SE of the estimate/estimate) was calculated for all CPUE statistics.

Habitat – A structural habitat survey was conducted in 2016. Vegetation surveys were conducted in 2004, 2008, 2012, and 2016 to monitor vegetation coverage. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

RESULTS AND DISCUSSION

Habitat: A physical habitat survey was conducted August, 2016 and indicated the littoral zone habitat consisted entirely of natural shoreline with some rocky shoreline. There was both emergent and floating vegetation noted at the reservoir. This is the first time floating aquatic vegetation has been noted and it covered an estimated 8.6% of the surface acreage (Table 5).

Prey species: The 2016 electrofishing survey resulted in a Gizzard Shad catch rate of 40.0/hr, which is the lowest catch rate sampled and well below historical numbers (Figure 2). Gizzard Shad IOV was 100 indicating all Gizzard Shad surveyed were vulnerable to predation. Bluegill were also sampled in historically low numbers with a catch rate of 2.0/hr (Figure 3).

Largemouth Bass: The 2016 electrofishing survey catch rate of 2.0/hr was comparable to the 2008 catch rate of 3.0/hr and the 2004 catch rate of 0.0/hr (Figure 4). Multiple prior electrofishing surveys resulted in zero Largemouth Bass being sampled. These catch rates are very low but not surprising as the reservoir is very shallow and lacks suitable habitat for Largemouth Bass. It is unlikely any Largemouth Bass survived the little water that remained in the reservoir during the extreme drought conditions. After the reservoir refilled, it was not stocked with Largemouth Bass. It is presumed that the bass sampled came from watershed ponds that over-flowed into Wichita Reservoir or were illegally stocked by the public.

White Crappie: The 2016 trap netting survey catch rate of White Crappie was the highest ever sampled at 186.3/nn with over 85% of those being 10 inches or greater in length (Figure 5). The 2010 trap net survey had a catch rate of 49.0/nn, which was the highest ever observed until this 2016 survey (Figure 5). Body condition was excellent for the crappie, especially for legal-length fish.

Fisheries management plan for Wichita Reservoir, Texas

Prepared – July 2017

ISSUE 1: Wichita Reservoir is prone to golden alga fish kill events. The reservoir also has a mean depth of 4.5 feet and is prone to dewatering from droughts. The reservoir is void of habitat and has silted in. These problems make having a viable, sustained fishery very difficult.

MANAGEMENT STRATEGIES

1. Continue working through the Lake Wichita Revitalization Committee to renovate the waterbody by dredging/excavation and habitat work.
2. Investigate alternative water sources that are not prone to golden alga blooms or high salinities. Currently Lake Diversion water feeds the reservoir to keep the reservoir near constant pool, but this has not always been the case. At one time Holiday Creek was the sole source of water which has lower chloride concentrations that inhibit golden alga blooms.
3. Work through the Lake Wichita Revitalization Committee to establish a Lake Wichita Watershed Group to address the watershed issues affecting the reservoir.

ISSUE 2: The public boating access (Lake Wichita boat ramp) was impeded by low water level in 2012 until May 2015 when the reservoir refilled. The boat ramp cannot be extended because the lake bottom levels out at the end of the ramp with no access to deeper water. This ramp is also unlikely to provide sufficient access for the reservoir once the revitalization is complete.

MANAGEMENT STRATEGIES

1. Discuss with the City of Wichita Falls expanding the ramp to accommodate more boats launching at the same time and ensure appropriate depths are planned to be excavated for this usage during the planned revitalization/excavation.
2. Discuss with the City of Wichita Falls and City of Lakeside City adding additional boat launching facilities.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so 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.

ISSUE 4: Lake Wichita is an extremely old reservoir with siltation, water quantity, water quality, and fish habitat issues.

MANAGEMENT STRATEGY

1. Serve on the city of Wichita Falls Lake Wichita Revitalization Committee as a non-voting member and actively work on a plan that addresses each of the issues keeping Wichita Reservoir from being a viable fisheries resource.

Objective-Based Sampling Plan and Schedule

Sport fish, forage fish, and other important fishes

Sport fishes in Lake Wichita Reservoir have historically included Channel Catfish, White Bass, Palmetto Bass, and White Crappie. The primary forage species has been Bluegill and Gizzard Shad.

Low Density fisheries

Due to the reservoir going nearly dry and not being restocked, all species except White Crappie would be considered low density from a fisheries standpoint until the reservoir has been excavated or a decision has been made that no revitalization will take place and stocking and recruitment occurs.

Survey objectives, fisheries metrics, and sampling objectives

The possibility of revitalizing the reservoir, including dewatering and excavation makes future survey objective determination and sampling objectives uncertain. No sampling will be planned until the reservoir has been excavated or a decision has been made that no revitalization will take place

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. 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.

Lang, T., and R. Mauk. 2013. Statewide freshwater fisheries monitoring and management program survey report for Wichita Reservoir, 2012. Texas Parks and Wildlife Department, Federal Aid Report F-221-M, Austin.

Table 1. Characteristics of Wichita Reservoir, Texas.

Characteristic	Description
Year constructed	1901
Controlling authority	City of Wichita Falls
Counties	Wichita and Archer
Reservoir type	Tributary
Shoreline development index (SDI)	2.5
Conductivity	1,347 μS/cm
Secchi disc reading	30 cm

Table 2. Boat ramp characteristics for Wichita Reservoir, Texas, August, 2016.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Lake Wichita Boat Ramp	33.84078 -98.53159	Y	30	974	Excellent except very shallow. Extension is not practical.

Table 3. Harvest regulations for Wichita Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue, their hybrids, and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Hybrid Striped	5	18-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black, their hybrids, and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Wichita Reservoir, Texas. FRY = fry; FGL = fingerlings; AFGL =adult fingerling; ADL = adult; and UNK = unknown.

Species	Year	Number	Life Stage	Mean TL (in)
Bluegill	2009	55,566	AFGL	2.1
	2010	124,355	AFGL	2.2
	Total	179,921		
Channel Catfish	1969	10,000	AFGL	7.9
	1971	50,000	AFGL	7.9
	1972	22,000	AFGL	7.9
	1990	22,319	FGL	2.5
	1995	67,000	FGL	2.0
	2009	110,341	FGL	3.3
	Total	281,660		
Florida Largemouth Bass	1977	20,800	FRY	0.7
	1995	122,000	FGL	1.2
	2009	113,456	FGL	1.8
	Total	256,256		
Largemouth Bass	1966	80,000	UNK	UNK
	1967	75,000	UNK	UNK
	1997	120,000	FGL	1.2
	1998	125,415	FGL	1.4
	2000	131,875	FGL	1.7
	2005	62,271	FGL	1.6
	2006	63,078	FGL	1.7
	2010	129,592	FGL	1.6
	Total	787,231		

Table 4. Stocking history continued.

Species	Year	Number	Life Stage	Mean TL (in)
Palmetto Bass (Striped X White Bass hybrid)	1977	50,000	UNK	UNK
	1984	66,000	FGL	2.0
	1986	33,000	FRY	1.0
	1987	65,925	FRY	1.0
	1988	11,705	FGL	2.0
	1988	55,700	FRY	1.0
	1989	54,359	FGL	1.4
	1994	15,947	FGL	1.7
	1996	18,407	FGL	1.1
	1998	12,374	FGL	1.3
	1999	12,646	FGL	1.5
	2000	14,180	FGL	1.5
	2002	18,447	FGL	1.5
	2003	18,381	FGL	1.6
	2004	19,843	FGL	1.4
	2004	1,169,624	FRY	0.2
	2005	18,666	FGL	1.5
	2007	103	AFGL	7.2
	2007	18,401	FGL	1.4
	2008	9,003	FGL	1.4
	2010	8,795	FGL	1.7
	Total	1,691,506		
	1983	95,600	UNK	UNK
Red Drum	Total	95,600		
	2009	780	AFGL	2.6
Threadfin Shad	Total	780		
	2010	392		UNK
White Crappie	2010	213	ADL	10.0
	Total	605		

Table 5. Objective-based sampling plan components for Lake Wichita Reservoir, Texas 2016.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Exploratory	Presence/absence	Practical effort
Bluegill [a]	Exploratory	Presence/absence	Practical effort
Gizzard Shad [a]	Exploratory	Presence/absence	Practical effort
Trap netting			
Crappie	Exploratory	Presence/absence	Practical effort

Table 6. Survey of structural habitat types, Wichita Reservoir, Texas, 2016. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Bulkhead	0.2 miles	1.6
Natural	10.5 miles	83.3
Rocky	1.9 miles	15.1
Flooded terrestrial	407.0 acres	33.3

Table 7. Survey of aquatic vegetation, Wichita Reservoir, Texas, 2004 - 2016. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2004	2008	2012	2016
Native floating-leaved				105.0 (8.6)
Native emergent	11.3 (<0.1)	10.2 (<0.1)		71.0 (5.8)

Gizzard Shad

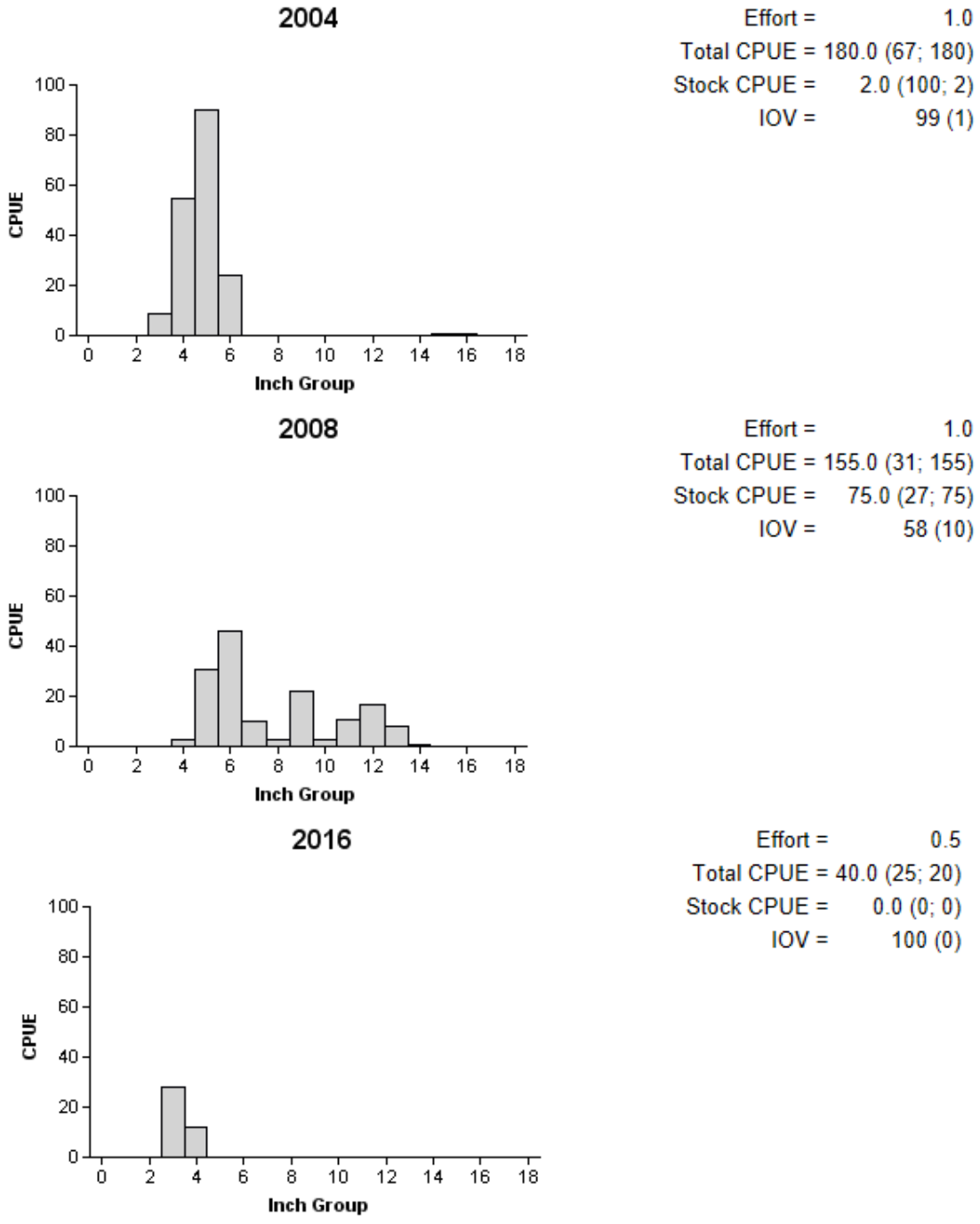


Figure 1. Number of Gizzard Shad caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Wichita Reservoir, Texas, 2004, 2008, and 2016.

Bluegill

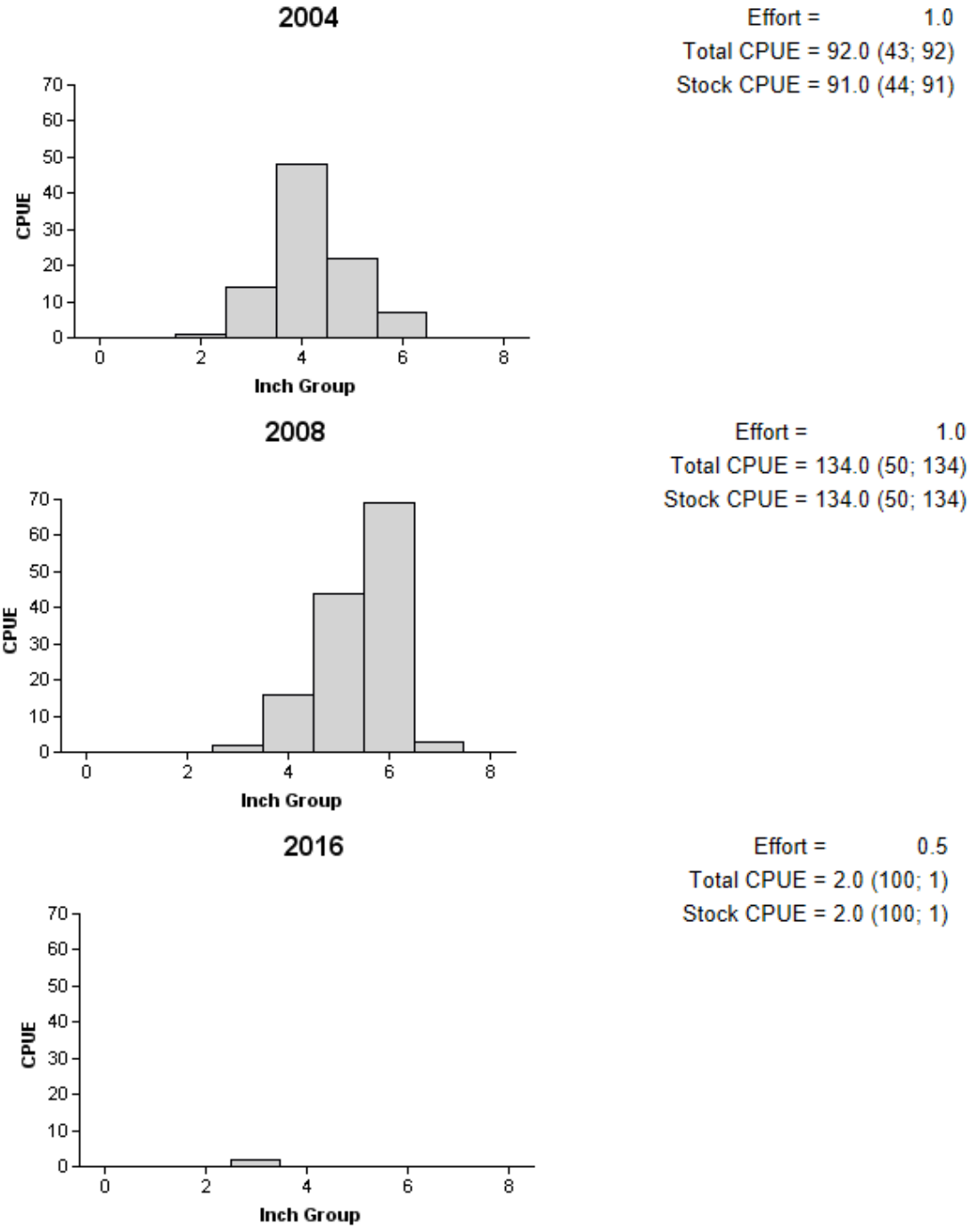
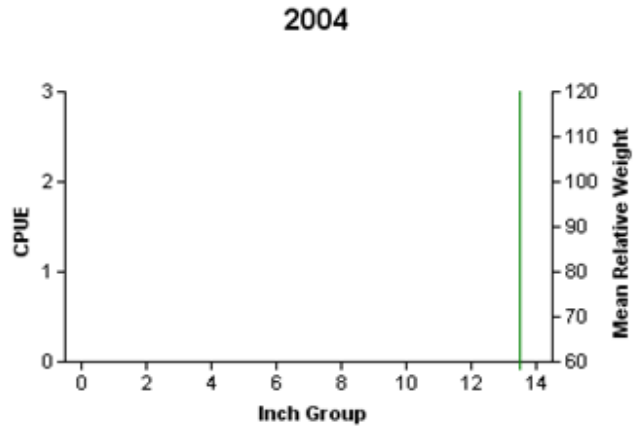
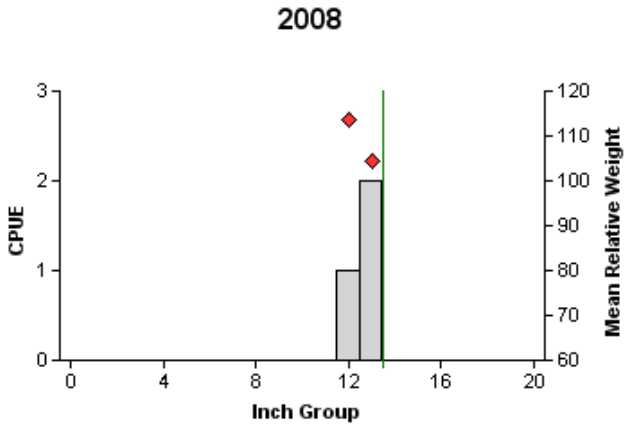


Figure 2. Number of Bluegill caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Wichita Reservoir, Texas, 2004, 2008, and 2016.

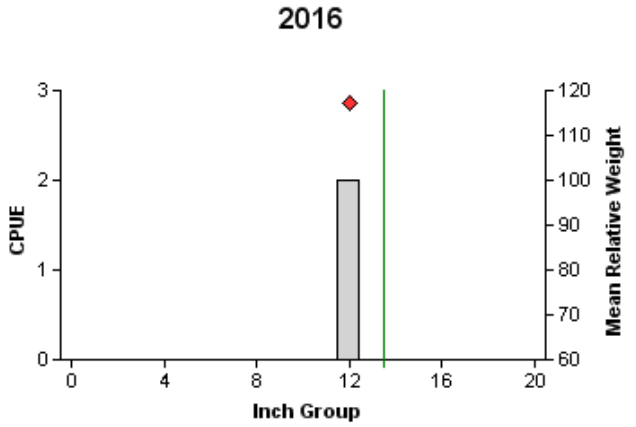
Largemouth Bass



Effort= 0.8
Total CPUE= 0.0 (0;0)
Stock CPUE= 0.0 (0;0)
PSD= 0 (-1)



Effort = 1.0
Total CPUE = 3.0 (72; 3)
Stock CPUE = 3.0 (72; 3)
PSD = 100 (0)
PSD-14 = 0 (0)



Effort = 0.5
Total CPUE = 2.0 (100; 1)
Stock CPUE = 2.0 (100; 1)
PSD = 100 (0)
PSD-14 = 0 (0)

Figure 3. 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, Wichita Reservoir, Texas, 2004, 2008, and 2016. Vertical line indicates minimum length limit at time of sampling.

White Crappie

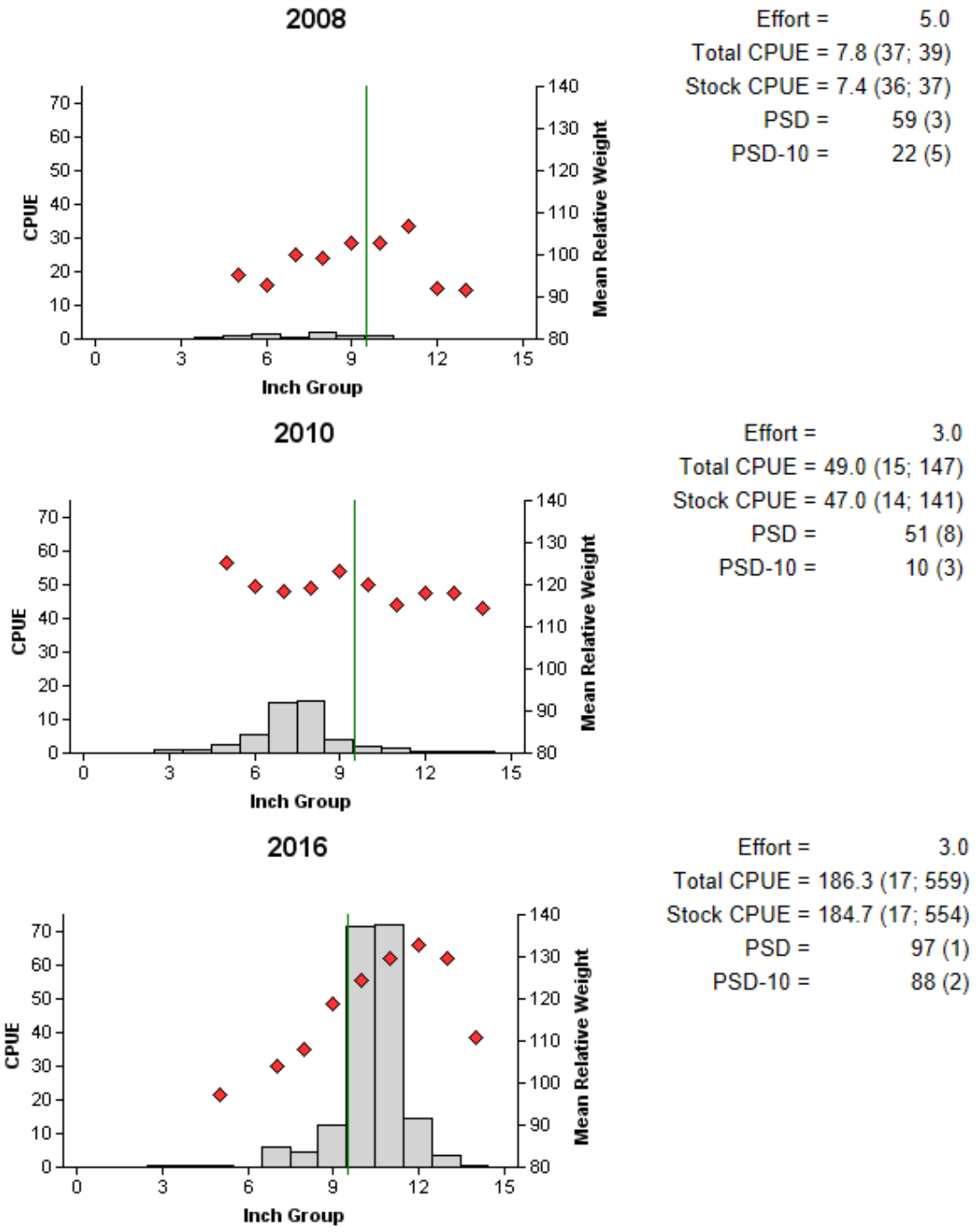


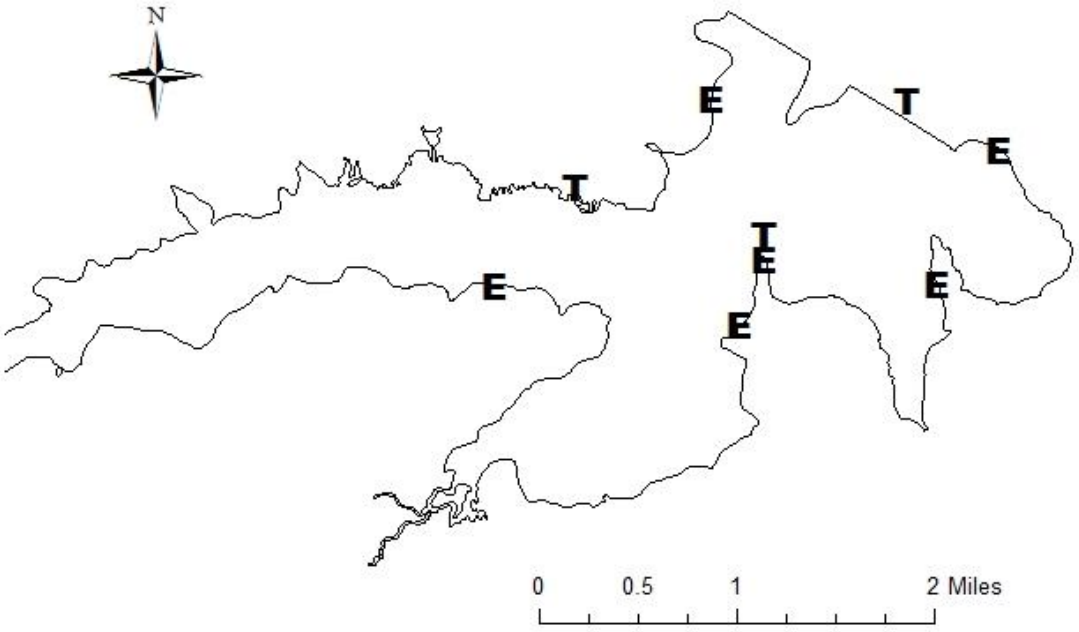
Figure 4. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for dual-cod trap netting surveys, Wichita Reservoir, Texas, 2008, and 2010 and single-cod trap netting in 2016. Vertical line indicates minimum length limit at time of sampling.

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Wichita Reservoir, Texas, 2016. Sampling effort was 3 net nights for trap netting, and 0.5 hour for electrofishing.

	Trap Nets		Electrofishing	
Species	N	CPUE	N	CPUE
Gizzard Shad	17	5.7	20	40.0
Common Carp	2	0.7		
Smallmouth Buffalo	1	0.3		
Black Bullhead	71	23.7		
Channel Catfish	1	0.3		
Green Sunfish	1	0.3	3	6.0
Orangespotted Sunfish	1	0.3		
Bluegill	21	7.0	1	2.0
Largemouth Bass	1	0.3	1	2.0
White Crappie	559	186.3		

APPENDIX B



Location of sampling sites, Wichita Reservoir, Texas, 2016. Trap net and electrofishing stations are indicted by T and E, respectively. Water level was near full pool at time of sampling.