

PERFORMANCE REPORT

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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

Lewisville Reservoir

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July 31, 2016

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lewisville Reservoir were surveyed in 2015 using electrofishing, and trap nets and in 2016 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lewisville Reservoir is a 29,592-acre impoundment constructed on the Elm Fork of the Trinity River by the U.S. Army Corps of Engineers in 1954 to provide flood control, municipal and industrial water, and recreation. Located 25 miles northwest of Dallas, Texas in Denton County, much of Lewisville Reservoir is surrounded by urban development. The upper end of the reservoir is experiencing further development as well. Zebra mussels were discovered in Lewisville in 2012. Angler and boat access is adequate. There is one handicap specific facility on the reservoir. At the time of sampling the fisheries habitat was primarily natural shoreline, rocky shoreline, and standing timber.
- **Management History:** Important sport fishes include Largemouth Bass, White Crappie, White Bass, Hybrid Striped Bass, and Blue and Channel Catfish. All species are managed with statewide regulations with the exception of Blue Catfish, which are managed by a 30- to 45-inch slot length limit. The daily bag limit for Blue and Channel Catfish remains 25 in the aggregate with only one Blue Catfish over 45 inches. Hybrid Striped Bass stocking is requested annually at a rate of 5 fish/acre. Florida Largemouth Bass were stocked in 2013 and 2014.
- **Fish Community**
 - **Prey species:** Gizzard and Threadfin Shad are abundant in the reservoir. Bluegill and Longear Sunfish are also available as prey.
 - **Catfishes:** The Blue Catfish population declined from the previous survey and the relative abundance of Channel Catfish remained similar to previous surveys. No Flathead Catfish were sampled during annual gill netting, but are present in the reservoir.
 - **Temperate basses:** White Bass catch rates decreased from the previous survey. Hybrid Striped Bass catch rates were similar to the previous two surveys. Three year classes of Hybrid Striped Bass were collected in 2016. Growth of Hybrid Striped Bass was average.
 - **Black basses:** Relative abundance of the Spotted Bass population was the lowest since 1997. The Largemouth Bass population increased in abundance from the previous survey, due to a strong year class in response to water level increase. The population was dominated by six- to eight-inch fish.
 - **Crappie:** The White Crappie population increased compared to the previous survey. Condition of White Crappie was good. Black Crappie relative abundance decreased since the previous survey.

Management Strategies: Request Hybrid Striped Bass fingerlings at a rate of 5/acre annually. Inform the public about the negative impacts of aquatic invasive species. Gill netting will be conducted every two years to monitor Hybrid Striped Bass. Electrofishing and trap netting surveys will be conducted in 2019/2020.

INTRODUCTION

This document is a summary of fisheries data collected from Lewisville Reservoir 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 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

Lewisville Reservoir, Denton County, is a 29,592-acre impoundment constructed by the U.S. Army Corps of Engineers (USACE) in 1954 on Elm Fork of the Trinity River. It was built to provide flood control, water for municipal and industrial purposes, and recreation. Other principal tributaries are Hickory Creek and Little Elm Creek. In 1989 the conservation pool level of the reservoir was raised from 514 ft. mean-sea-level (msl) to 522 ft. msl. Lewisville Reservoir has a drainage area of approximately 968 square miles. Rainfall in the watershed averages 33.5 inches per year. Zebra mussels were first found in Lewisville in 2012. Angler and boat access is adequate. There is one handicap accessible facility.

Angler Access

Lewisville Reservoir has seventeen public boat ramps and no private boat ramps. Recent renovations at Little Elm Park include a new 4-lane boat ramp, loading dock, swim beach, and event pavilion have been completed. Additional boat ramp characteristics are in Table 2. There is abundant shoreline access found in the public boat ramp areas and the fishing barge located at Lewisville City Park.

Management History

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

1. Maintain Palmetto Bass fishery through annual stockings.
Action: Continued requesting Palmetto Bass annually at 5 fish per acre. A total of 577,808 Palmetto Bass fingerlings and 978, 866 fry have been stocked since 2013. Additionally, 450,000 Sunshine Bass fry were stocked in 2016.
2. Habitat consisting of 123 acres of standing timber was illegally cut down by a land developer during an extended drought in 2006. The USACE formed a team to assess habitat loss while the developer was mandated by a court ruling to pay restitution.
Action: We attended meetings to discuss habitat improvements and associated site selection. To date, several areas in Hickory Creek near the site of the cutting have been planted with emergent vegetation. Posts have also been set to replace fish habitat and roosting sites for birds. Enclosures have been placed in the reservoir also and will be planted with submersed aquatic vegetation during the summer and fall of 2016. Discussion is ongoing regarding placement of rock piles as well.
3. Communicated with USACE regarding posting of signs and boat ramp stencils educating the public about the spread of aquatic nuisance species; specifically zebra mussels. Emphasized the importance of cleaning, draining, and drying vessels when leaving all reservoirs to reduce the risk of spreading zebra mussels.
Action: Signs were distributed to the USACE for display at public access points. We made a speaking point when talking to the public about the importance of cleaning, draining, and drying vessels prior to launching at other water bodies.

Harvest regulation history: Sport fish populations in Lewisville Reservoir are managed with statewide regulations with the exception of the slot length limit on Blue Catfish (Table 3). Since 2009, an experimental slot-length limit of 30-45 inches with one fish over 45 inches allowed per day on Blue Catfish

has been in effect on this reservoir. The regulation is part of a new catfish management strategy, and will be an important tool to explore the potential for improving the size distribution of blue catfish in Texas waters.

Stocking history: Striped Bass were stocked annually from 1989 until 1999. Stockings were discontinued because of low catch rates and several summer fish kills. Palmetto Bass have been stocked almost every year since 1999. ShareLunker Largemouth Bass were stocked in the spring of 2006. Florida Largemouth Bass were stocked in 2013 and 2014. The last stocking of Lewisville Reservoir occurred in 2016 and was Palmetto Bass and Sunshine Bass fry (Table 4).

Vegetation/habitat history: In January 2006, approximately 123 acres of stumps and standing timber in the Hickory Creek arm of the reservoir were illegally cut by a land developer during an extended drought which had water levels 7-8 feet below conservation pool. A team organized by the USACE was formed to assess the damage as well as develop a mitigation plan for fish and wildlife. The habitat restoration plan is ongoing and will incorporate rock piles, brush piles, and vegetation planted in cages by Lewisville Aquatic Ecosystem Research Facility (LAERF) staff and volunteers. Lewisville Reservoir aquatic vegetation, while sparse, is currently comprised mainly of sporadic stands of native shoreline emergent species. Natural shoreline, rocky shoreline, and standing timber make up the majority of the habitat currently (Table 6). Emergent plant species were planted in 2010 and 2011 in the area affected by the clear cutting. Some of the plants were doing well prior to the floods of 2015 and 2016. As of July, 2016, water levels were still completely inundating those plants. Plants that will be added during the summer/fall of 2016 include American Water Willow, Common Threesquare, Creeping Burhead, Delta Arrowhead, Flatstem Spikerush, Giant Bulrush, Halberdleaf Rosemallow, Needle Spikerush, Rosemallow, Softstem Bulrush, Sparestem Spikerush, American Lotus, American White Waterlily, American Eelgrass, American Pondweed, Coontail, Grassleaf Mudplantain, Illinois Pondweed, Muskgrass, and Southern Naiad.

Water transfer: Lewisville Reservoir is infested with zebra mussels. Lewisville Reservoir is a major municipal drinking water supply for many cities in North Texas. The Upper Trinity Regional Water District also uses water from Lewisville Reservoir. There is a 1.7 megawatt hydroelectric power generation unit owned by Garland Power and Light utilizing water released through the dam. There are no known water transfers entering the reservoir besides tributaries and water released from Ray Roberts Reservoir directly above Lewisville on the Elm Fork of the Trinity River.

METHODS

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lewisville (TPWD, Inland Fisheries Division, unpublished manual revised 2015). 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 – Black Basses, Sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.8 hours at 21, 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 (15 net nights at 15 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting – Blue and Channel Catfish, White and Hybrid Striped Bass were collected by gill netting (15 net nights at 15 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for Hybrid Striped Bass were determined using otoliths.

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 from 2005 through 2015 and by electrophoresis for previous years.

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 (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Water level – Source for water level data was the United States Geological Survey (USGS 2016).

RESULTS AND DISCUSSION

Habitat: Water level at the time of the electrofishing survey was near conservation pool. Fish habitat at the time of the survey was primarily natural shoreline followed by rocky shoreline as well as flooded terrestrial vegetation (Table 6). In response to the destruction of 123 acres of submersed timber due to unauthorized cutting by a developer, LAERF placed poles to mitigate for fish habitat as well as roosting habitat of birds. In the fall and summer of 2015, approximately 400 planting cages were installed in the Hickory Creek arm of reservoir. Plants will be added in the summer/fall of 2016.

Prey species: Electrofishing CPUE of Threadfin Shad was 150.3/h in 2015, which was lower than the previous 2 surveys (Appendix C). Electrofishing CPUE of Gizzard Shad of 389.7/h (Figure 2) was higher than the samples in 2011 and 2013. Index of vulnerability for Gizzard Shad remains high, with 95% of Gizzard Shad captured in 2015 available to existing predators. Electrofishing CPUE of Bluegill was 79.4/h (Figure 3) which was similar to 2013. The Longear Sunfish electrofishing CPUE observed in 2015 (34.9/h) was lower than the previous 3 surveys (Appendix C). The relative abundance of shad species remains good.

Catfishes: The gill netting CPUE of Blue Catfish in 2016 of 4.8/nn was higher than 2014, but lower than the 7.1/nn in 2012 (Figure 4). Since 2009, an experimental slot-length limit of 30-45 inches with one fish over 45 inches allowed per day on Blue Catfish has been in effect on this reservoir. The regulation is part of a new catfish management strategy, and will be an important tool to explore the potential for improving the size distribution of blue catfish in Texas waters. Size structure of the Blue Catfish population dropped from the 2012 and 2014 surveys. Relative weights of Blue Catfish remained similar with most size groups being below 90. Gill netting CPUE of Channel Catfish was 2.3 /nn in 2016, similar to 2012 and 2014 (Figure 5). Size structure declined as indicated by a drop in PSD value from 26 in 2014 to 10 in 2016. Mean relative weights of Channel Catfish were below average for the species and hovered near 80 for most size classes.

Temperate basses: The gill netting CPUE of White Bass in Lewisville Reservoir have historically been high (Appendix C). The 2016 survey was an exception with a catch rate of 5.6/nn (Figure 6). Size structure of the 2016 survey was dominated by smaller fish as indicated by the PSD value of 25. The gill netting CPUE of Hybrid Striped Bass was 3.3/nn which was similar to the two previous surveys (Figure 7). Mean relative weights of Hybrid Striped Bass were good with most size groups near 100 or better. Only three year classes of Hybrid Striped Bass were collected in 2016, however, no stockings occurred in 2011 and 2012. In Lewisville, Hybrid Striped Bass reach 18 inches between age 2 and 3 (Figure 8).

Black basses: The electrofishing CPUE of Spotted Bass in 2016 of 9.7/h was lower than the catch rates observed in 2011 and 2013 (Figure 9), and the lowest catch rate since 1997 (Appendix C). The electrofishing CPUE of Largemouth Bass has generally varied with water level ranging from 34.5/h in 2013 to 217.1/h in 2015. A strong year class was produced in 2015 coincident with the substantial increase in water level. Most of these 2015 fish were between 6 and 8 inches in fall 2015 and comprise the majority

of the population (PSD of 7 in 2015; Figure 10). The stock CPUE of Largemouth Bass at Lewisville was 69.1/h with an RSE of 25, thus meeting our objective set prior to sampling. Mean relative weights were good for nearly all sizes of fish. The Florida Largemouth Bass allele percentage decreased from 61.0% in 2011 to 31.0% in 2016 despite stocking FLMB in 2013 and 2014 (Table 7). This is probably due to high spawning success of resident Largemouth Bass due to an increase in flooded terrestrial habitat following large water level increases.

Crappies: The trap netting catch rate of White Crappie was 29.3/nn in 2015, which is higher than the two previous surveys (Figure 11). The size structure of the population was dominated by quality-size fish as indicated by a PSD value of 96. Mean relative weights generally increased with fish length and were all 100 or above for fish 8 inches and bigger. The Black Crappie trap netting catch rate was 0.7/nn in 2015, which is much lower than in previous years (Figure 12). Lewisville Reservoir continues to provide good crappie populations.

Fisheries management plan for Lewisville Reservoir, Texas

Prepared – July 2016

ISSUE 1: A quality fishery for Hybrid Striped Bass has persisted in Lewisville Reservoir since annual stockings resumed in 1999. The fishery supports several guides targeting Hybrid Striped Bass and creel survey data suggests anglers harvested 1,748 fish during the spring of 2012 (Hungerford and Brock 2012). Maintenance of the population relies on annual stockings.

MANAGEMENT STRATEGIES

1. Request annual stockings of fingerling Palmetto Bass and/or Sunshine Bass at a rate of 5 fish per surface acre. As hatchery production varies, consideration will be given to alternating requests of fingerlings and fry.
2. Conduct gill netting surveys every other year to monitor Palmetto Bass and/or Sunshine Bass population.

ISSUE 2: Lewisville Reservoir has been infested with zebra mussels since 2012. 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 USACE to maintain appropriate signage at access points around the reservoir.
2. Practice proper decontamination procedures when finished working on Lewisville prior to moving to another water body. When possible, sample Lewisville after other, non-infested reservoirs.
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 Lewisville Reservoir include Blue Catfish, crappies, White Bass, Hybrid Striped Bass (Palmetto Bass and Sunshine Bass), and Largemouth Bass. Known important forage species include Bluegill, Gizzard and Threadfin Shad.

Low-density fisheries

Flathead Catfish: Flathead Catfish are present in Lewisville Reservoir, however, there was no directed effort for them. We will record CPUE and size structure data from all Flathead Catfish coincidentally collected by gill nets targeting White and Hybrid Striped Bass.

Channel Catfish: Channel Catfish had very little directed effort (no anglers stated they were fishing for only Channel Catfish; only 1.1% of anglers indicated they were fishing for 'catfishes') in the Spring quarter of the 2012 creel survey at Lewisville Reservoir and relative abundance is low. The past three gill netting surveys have produced an average CPUE-stock of just 1.9 fish/nn with RSEs in the 30s. Catch per unit effort and body condition data will be collected from all Channel Catfish coincidentally captured in gill netting surveys conducted for White and Hybrid Striped Bass.

Spotted Bass: Spotted Bass are present in rocky areas of Lewisville Reservoir, however, there is no directed effort for them. We will record CPUE and size structure data from all Spotted Bass coincidentally captured by electrofishing surveys directed at Largemouth Bass.

Survey objectives, fisheries metrics, and sampling objectives

Creel Survey: A year-long, 36-day annual creel survey will be conducted from June 1, 2018 through May 31, 2019 to obtain catch and harvest statistics on sport fishes. The roving survey will be conducted in accordance with TPWD standard procedures.

Largemouth Bass: Largemouth Bass are the second most popular sport fish in Lewisville Reservoir. The popularity and reputation for quality Largemouth Bass fishing at this reservoir warrant sampling time and effort. Results from a 2012 creel survey showed directed angling effort for Largemouth Bass to be 0.8 hours/acre, and harvest of Largemouth Bass was estimated to be 2,420 fish. Largemouth Bass have always been managed with the statewide 14-in MLL regulation. Trend data on CPUE, size structure, and body condition have been collected often since 1986 with fall nighttime electrofishing. The population appears to be in good shape. Continuation of trend data every four years 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 15 randomly selected 5-min electrofishing sites will be sampled in 2019, but sampling will continue at random sites until 50 stock-size fish are collected and the RSE of CPUE-S is ≤ 25 (the anticipated effort to meet both sampling objectives is 12-15 stations with 80% confidence). Fifteen random stations will be determined. Exclusive of the original 15 random stations, 3 additional random stations will be pre-determined in the event some extra sampling is necessary. If failure to achieve either objective has occurred after two nights of sampling and objectives can be attained with 6-12 additional random stations, another night of effort will be expended.

Blue Catfish: Blue Catfish were the fifth most sought after sport fish in the spring quarter of 2012 at Lewisville Reservoir. Historically, 15 random gill net nights have provided good relative abundance and size structure data but RSEs ranged from 18 to 28. A special project evaluating a slot-length limit on Blue Catfish is currently being conducted at Lewisville Reservoir. Additionally, all CPUE and body condition data will be collected from Blue Catfish collected in the 15 random gill net nights planned for assessing White and Hybrid Striped Bass in 2016 and 2018. Day-time, low-frequency electrofishing surveys will be conducted at random stations in 2017 and 2019 to obtain population statistics of Blue Catfish population and to determine if this is a more efficient method of sampling.

White Bass: White Bass were the most popular sport fish in Lewisville Reservoir according to the Spring quarter creel in 2012, accounting for 65.1% of all directed effort (3.1 h/acre). Over the past 3 surveys (2010, 2012, and 2014), 15 random gill net nights have produced an average CPUE of 12.0 fish/nn with RSEs varying from 23-30. We plan on conducting 15 random gill net nights in 2018 to monitor CPUE trend data and size structure.

Hybrid Striped Bass: Hybrid Striped Bass were the fourth most sought after sport fish at Lewisville according to a Spring quarter creel survey in 2012 with 4.9% of all directed effort. Total harvest from the Spring quarter was 1,748 fish. The population is maintained through annual stockings. Over the past 3 surveys (2010, 2012, and 2014), 15 random gill net nights have produced an average CPUE of 3.2 fish/nn with RSEs varying from 36-49. In all but 2010, at least 50 stock-sized fish were collected. We plan on conducting 15 random gill net nights in 2018 to monitor CPUE trend data, while attempting to collect at least 50 stock-sized fish. In addition to our objectives, Lewisville Reservoir is a study site for a special project evaluating stocking success of Hybrid Striped Bass fry in alternating years with fingerlings. All Hybrid Striped Bass collected will be aged to assess life history stocking success and year class contribution.

Crappies: Spring 2012 creel data suggested crappies were the third most sought after sport fish in Lewisville Reservoir, with 6.4% of all directed effort. Over the past three surveys (2003, 2007, and 2011), single-cod, shoreline trap netting CPUE averaged 21.3/nn, providing an average of 244 stock-size and larger fish per survey. We would like to collect information allowing us to monitor size structure and time required for fish to grow to the MLL. We feel single-cod, shoreline trap nets set are adequate for obtaining these data. We anticipate that setting a minimum of 15 single-cod trap nets, with a soak time of 1 night, will achieve our sampling objective (50 White Crappie >5 inches) in 2019.

Bluegill, Longear Sunfish, Threadfin Shad, and Gizzard Shad: Bluegill, Longear Sunfish, Threadfin Shad, and Gizzard Shad are the primary forage at Lewisville Reservoir. Like Largemouth Bass, trend data on CPUE and size structure of all four species have been collected often since 1986. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in Bluegill, Longear Sunfish, Threadfin Shad, and Gizzard Shad relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers of Bluegill, Longear Sunfish, Threadfin Shad, and Gizzard Shad for size structure estimation (PSD and IOV; 50 fish minimum at 5-12 stations with 80% confidence) but may not provide RSE ≤ 25 for relative abundance estimates (anticipated effort is 20 stations). At the sampling effort needed to achieve sampling objectives for Largemouth Bass, the expected RSE for CPUE-total will likely be greater than 25 for Bluegill. No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill and Gizzard Shad. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density. Relative weight of Largemouth Bass ≥ 8 " TL will be determined from their length/weight data (maximum of 10 fish weighed and measured per inch class).

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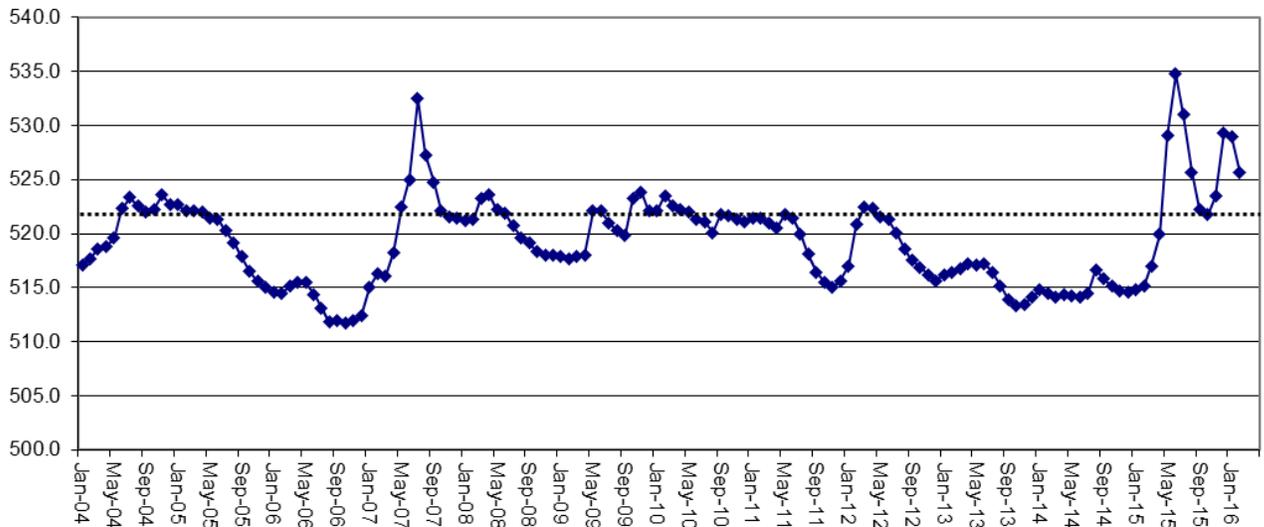


Figure 1. Mean monthly water level elevations in feet above mean sea level (MSL) recorded for Lewisville Reservoir, Texas from January 2004-April 2016. Dashed line indicates conservation pool (522 feet above MSL). Data were obtained from the USGS.

Table 1. Characteristics of Lewisville Reservoir, Texas.

Characteristic	Description
Year Constructed	1954
Controlling authority	US Army Corps of Engineers
Counties	Denton
Reservoir type	Mainstream Trinity River (Elm Fork)
Conductivity	277 $\mu\text{S}/\text{cm}$

Table 2. Boat ramp characteristics for Lewisville Reservoir, Texas, August, 2015. Reservoir elevation at time of survey was 522.5 feet above mean sea level. N/A indicates data not currently available.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Crescent Oaks	33.1767 -97.0116	Y	5	514.0	Small boat only
Big Sandy	33.1639 -97.0272	Y	24	515.2	Excellent, no access issues
Willow Grove	33.1234 -97.0140	Y	24	N/A	Excellent, no access issues
Westlake Park	33.1157 -97.0039	Y	68	515.0	Excellent, no access issues
Pilot Knoll	33.1031 -97.0728	Y	30	507.7	Excellent, no access issues
Sycamore Bend	33.1079 -97.0615	Y	26	509.8	Excellent, no access issues
Hickory Creek	33.1090 -97.0415	Y	20	515.2	Excellent, no access issues
Point Vista	33.1091 -97.0401	Y	50	505.6	Excellent, no access issues
Arrowhead #1	33.1064 -97.0243	Y	28	508.1	Excellent, no access issues
Arrowhead #2	33.1054 -97.0256	Y	31	504.2	Good, no access issues
Copperas Branch	33.0963 -97.0344	Y	50	N/A	Temporarily closed for IH- 35 expansion.
Tower Bay	33.0870 -97.0231	Y	50	503.4	Excellent, no access issues
Lake Park #1	33.0778 -97.0051	Y	50	503.5	Excellent, no access issues
Lake Park #2	33.0765 -96.9989	Y	75	509.6	Excellent, no access issues
Doe Branch	33.1849 -96.9407	Y	20	519.2	Fair, one lane ramp. Shallow area.

Table 2 continued.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Little Elm	33.1571 -96.9495	Y	50	514.0	Excellent, no access issues. Newly renovated.
Hidden Cove	33.1295 -96.9316	Y	50	512.0	Excellent, no access issues.
Stewart's Creek	33.0829 -96.9142	Y	50	506.5	Good, no access issues
East Hill Park	33.0752 -96.9245	Y	59	504.8	Good, no access issues

Table 3. Harvest regulations for Lewisville Reservoir, Texas.

Species	Bag Limit	Length Limit (inches)
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-minimum (Channel) 30-45 slot (Blue: only 1 ≥ 45)
Catfish, Flathead	5	18-minimum
Bass, White	25	10-minimum
Bass, Palmetto	5	18-minimum
Bass: Spotted	5 ^a In any combination	none
Bass: Largemouth		14-minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-minimum

^a Daily bag for Largemouth Bass and Spotted Bass, = 5 fish in any combination.

Table 4. Stocking history of Lewisville, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Bluegill	1975	250	UNK	UNK
	Total	250		
Channel Catfish	1966	170,000	AFGL	7.9
	1967	30,000	AFGL	7.9
	1968	23,870	AFGL	7.9
	1969	204,200	AFGL	7.9
	1970	25,000	AFGL	7.9
	1971	21,000	AFGL	7.9
	1972	117,800	AFGL	7.9
	1981	76,844	AFGL	7.9
	1993	250	FRY	0.3
	Total	668,964		
Florida Largemouth Bass	1978	141,588	FGL	2.1
	1978	18,156	FRY	1.0
	1990	743,646	FRY	0.7
	1993	739,751	FGL	1.2
	1998	741,380	FGL	1.4
	2006	507,625	FGL	1.7
	2007	501,720	FGL	1.6
	2013	498,757	FGL	1.5
	2014	505,230	FGL	1.6
	Total	4,397,853		
Largemouth Bass	1966	1,400,500	FRY	0.7
	1967	402,200	FRY	0.7
	1968	640,990	FRY	0.7
	1968	11,385	UNK	UNK
	1969	578,275	FRY	0.7
	1970	35,450	UNK	UNK
	1971	340,000	FRY	0.7
	1975	82	UNK	UNK
	Total	3,408,882		

Table 4. Stocking history continued.

Species	Year	Number	Life Stage	Mean TL (in)
Palmetto Bass (Striped X White Bass hybrid)	1974	97,570	UNK	UNK
	1976	68,310	UNK	UNK
	1979	232,300	UNK	UNK
	1981	230,740	UNK	UNK
	1983	236,039	UNK	UNK
	1986	18,576	FGL	2.0
	1986	264,239	FRY	1.0
	1999	222,892	FGL	1.3
	2000	221,969	FGL	1.5
	2002	221,983	FGL	1.7
	2003	147,923	FGL	1.4
	2004	295,986	FGL	1.7
	2005	148,670	FGL	1.6
	2006	150,399	FGL	1.5
	2006	1,090,919	FRY	0.2
	2007	149,032	FGL	1.4
	2008	149,121	FGL	1.6
	2009	90,600	FGL	1.4
	2010	2,278,868	FRY	0.3
	2013	251,222	FGL	1.6
2014	106,790	FGL	1.7	
2015	219,796	FGL	1.6	
2016	978,866	FRY	0.0	
	Total	7,872,810		
ShareLunker Largemouth Bass	2006	3,585	FGL	2.3
	Total	3,585		
Striped Bass	1989	120,537	FGL	1.5
	1990	123,827	FGL	1.5
	1991	294,247	FGL	1.3
	1992	133,786	FRY	0.8
	1993	168,107	FGL	1.1
	1994	589,269	FGL	1.1
	1994	3,018,000	FRY	0.8
	1995	272,024	FGL	1.3
	1996	4,617	FGL	1.3
	1997	297,111	FGL	1.2
	1998	151,071	FGL	1.3
		Total	5,172,596	

Table 4. Stocking history continued.

Species	Year	Number	Life Stage	Mean TL (in)
Sunshine Bass (White x Striped Bass hybrid)	2016	450,000	FRY	0.2
	Total	450,000		
Threadfin Shad	1984	3,200	AFGL	3.0
	Total	3,200		
Walleye	1972	405,000	FRY	0.2
	1973	207,800	FRY	0.2
	1974	475,000	FRY	0.2
	Total	1,087,800		

Table 5. Objective-based sampling plan components for Lewisville Reservoir, Texas 2015 – 2016.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	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
Gizzard Shad ^a	Abundance	CPUE – Total	RSE \leq 25
	Size structure	PSD, length frequency	N \geq 50
	Prey availability	IOV	N \geq 50

Table 5, continued.
Trap netting

	Crappie	Size structure	PSD, length frequency	N = 50
<i>Gill Netting</i>				
	Blue Catfish	Abundance Size structure	CPUE	N≥50 N ≥ 50 stock
	Channel Catfish ^b	Abundance	CPUE– stock	RSE-Stock ≤ 25
	White Bass	Abundance Size structure	CPUE-stock PSD, length frequency	N≥50 N≥50 stock
	Hybrid Striped Bass ^b	Abundance Size structure Age-and-growth Genetics	CPUE-total PSD, length frequency Length at age Identify cross	N≥50 N≥50 All fish collected All fish collected

^a No additional effort will be expended to achieve objectives of Bluegill and Gizzard 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.

^bNo additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Channel Catfish if not reached from designated Hybrid Striped Bass and Blue Catfish sampling effort.

Table 6. Survey of structural habitat types, Lewisville Reservoir, Texas, 2011. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of open water habitat found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Natural shoreline	205.6	85.4		
Rocky shoreline	30.0	12.5		
Natural shoreline + piers/docks	2.4	1.0		
Gravel shoreline	2.2	0.9		
Rock bluff	0.2	0.1		
Bulkhead	0.2	0.1		
Boat docks/marinas			172.9	0.6
Standing timber			6621.0	22.4

Gizzard Shad

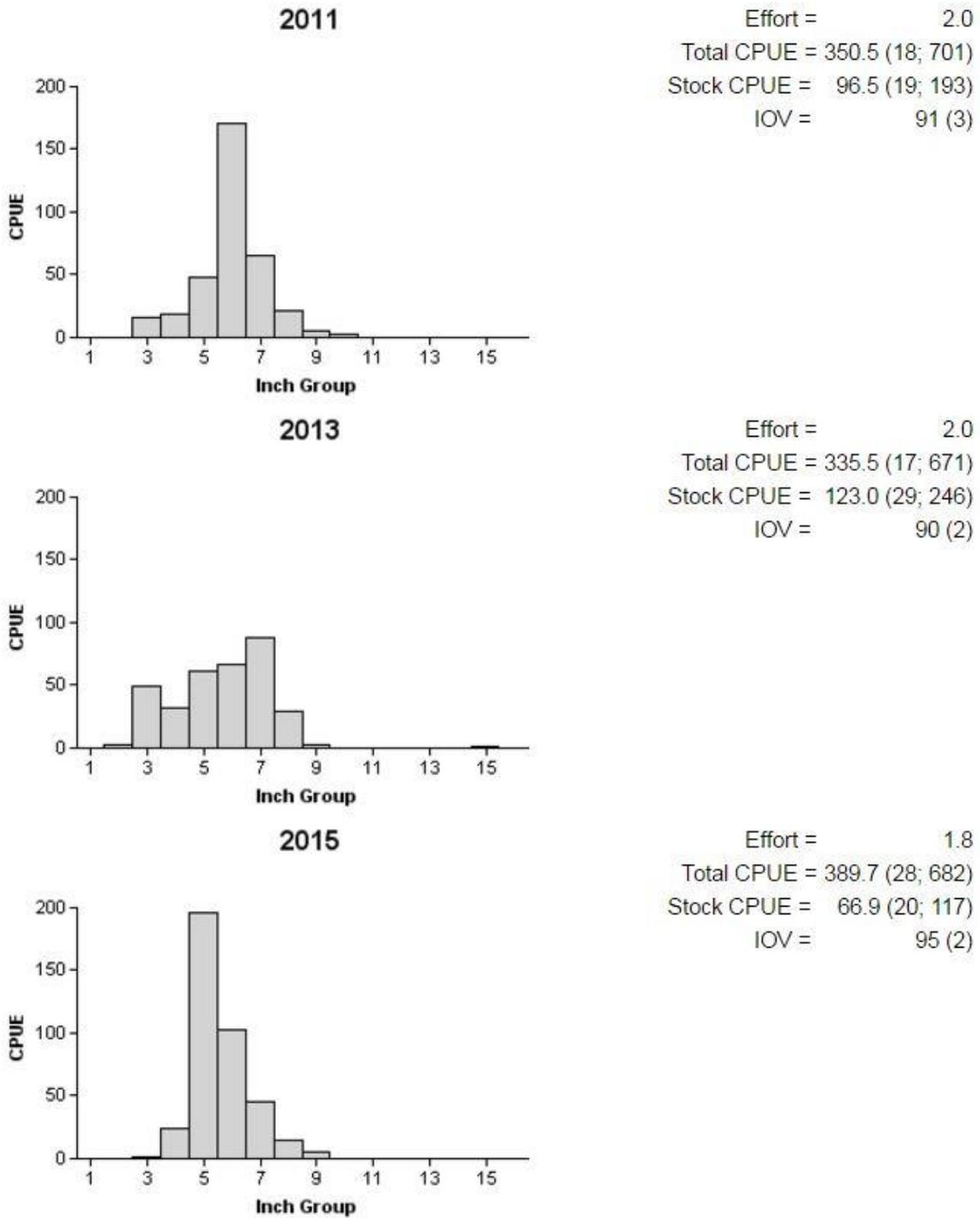
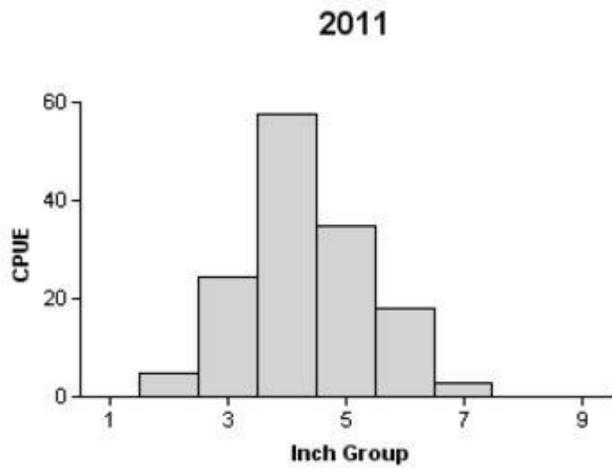
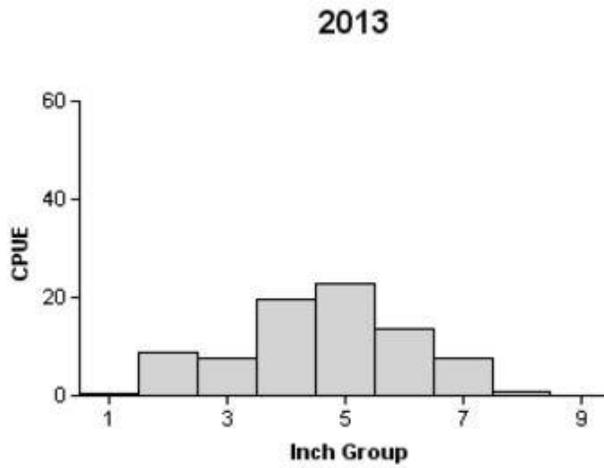


Figure 2. Number of Gizzard Shad caught per hour (CPUE; bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lewisville Reservoir, Texas, 2011, 2013, and 2015.

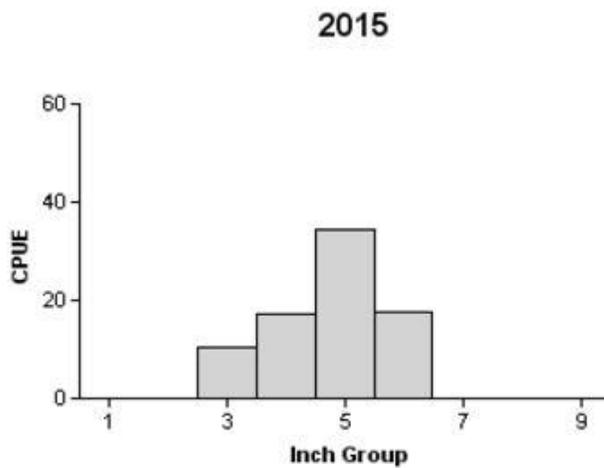
17
Bluegill



Effort = 2.0
 Total CPUE = 143.0 (29; 286)
 Stock CPUE = 138.0 (29; 276)
 CPUE-6 = 21.0 (32; 42)
 PSD = 15 (4)



Effort = 2.0
 Total CPUE = 81.5 (45; 163)
 Stock CPUE = 72.0 (47; 144)
 CPUE-6 = 22.0 (58; 44)
 PSD = 31 (8)



Effort = 1.8
 Total CPUE = 79.4 (27; 139)
 Stock CPUE = 79.4 (27; 139)
 CPUE-6 = 17.7 (35; 31)
 PSD = 22 (4)

Figure 3. 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, Lewisville Reservoir, Texas, 2011, 2013, and 2015.

18
Blue Catfish

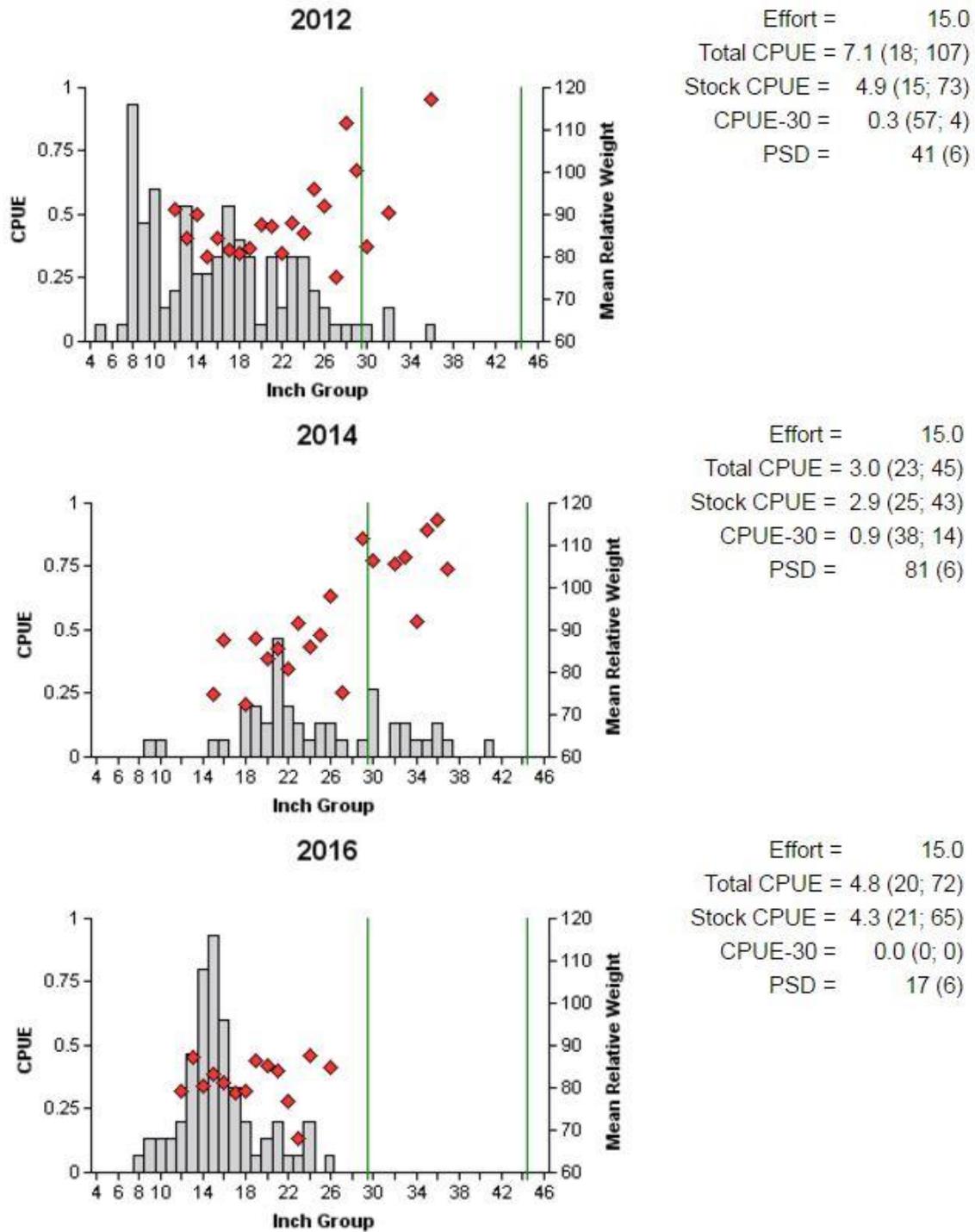


Figure 4. Number of Blue Catfish caught per net night (CPUE; bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lewisville Reservoir, Texas, 2012, 2014, and 2016. Vertical line represents length limit at time of sampling.

Channel Catfish

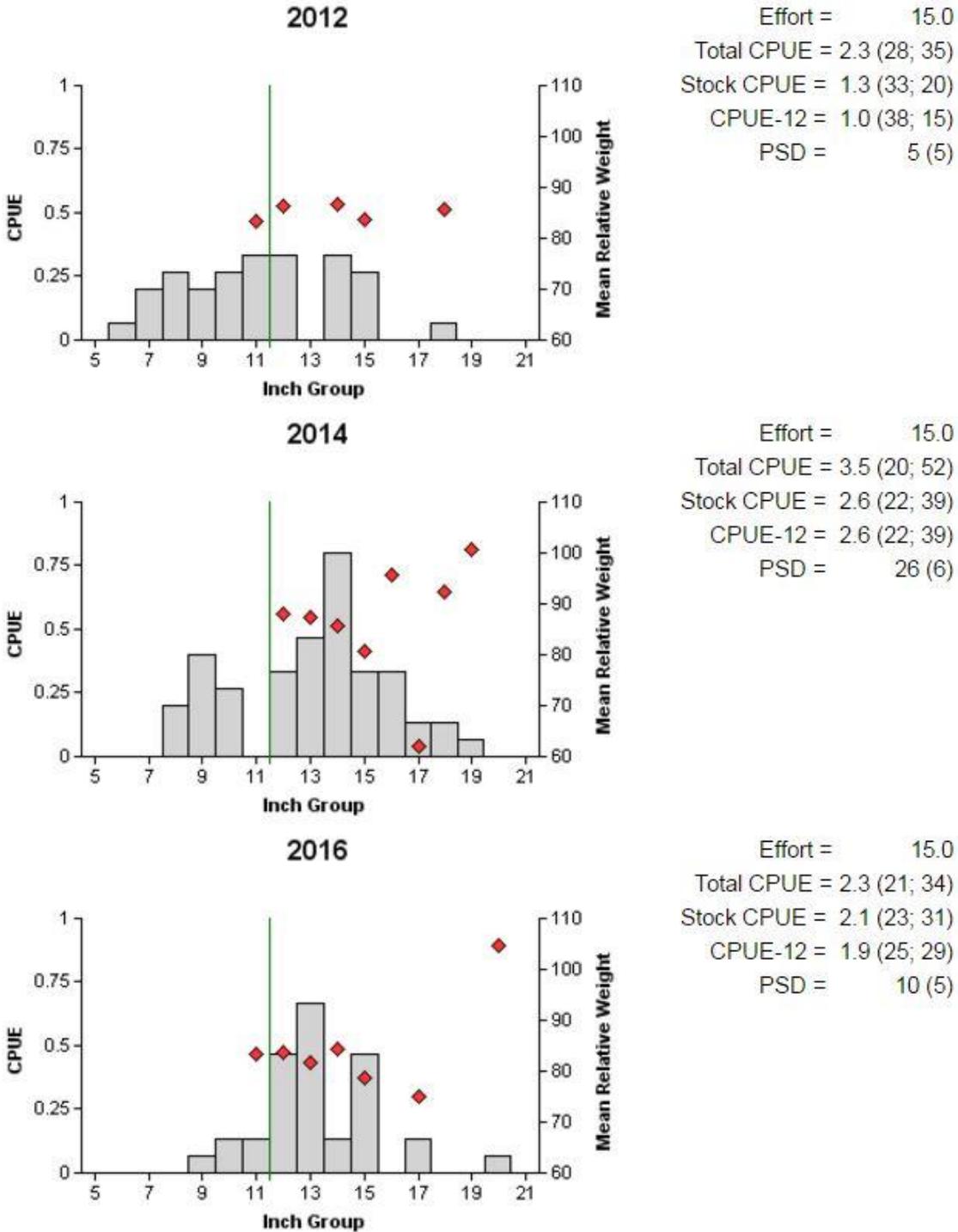


Figure 5. Number of Channel Catfish caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lewisville Reservoir, Texas, 2012, 2014, and 2016. Vertical line represents length limit at time of sampling.

White Bass

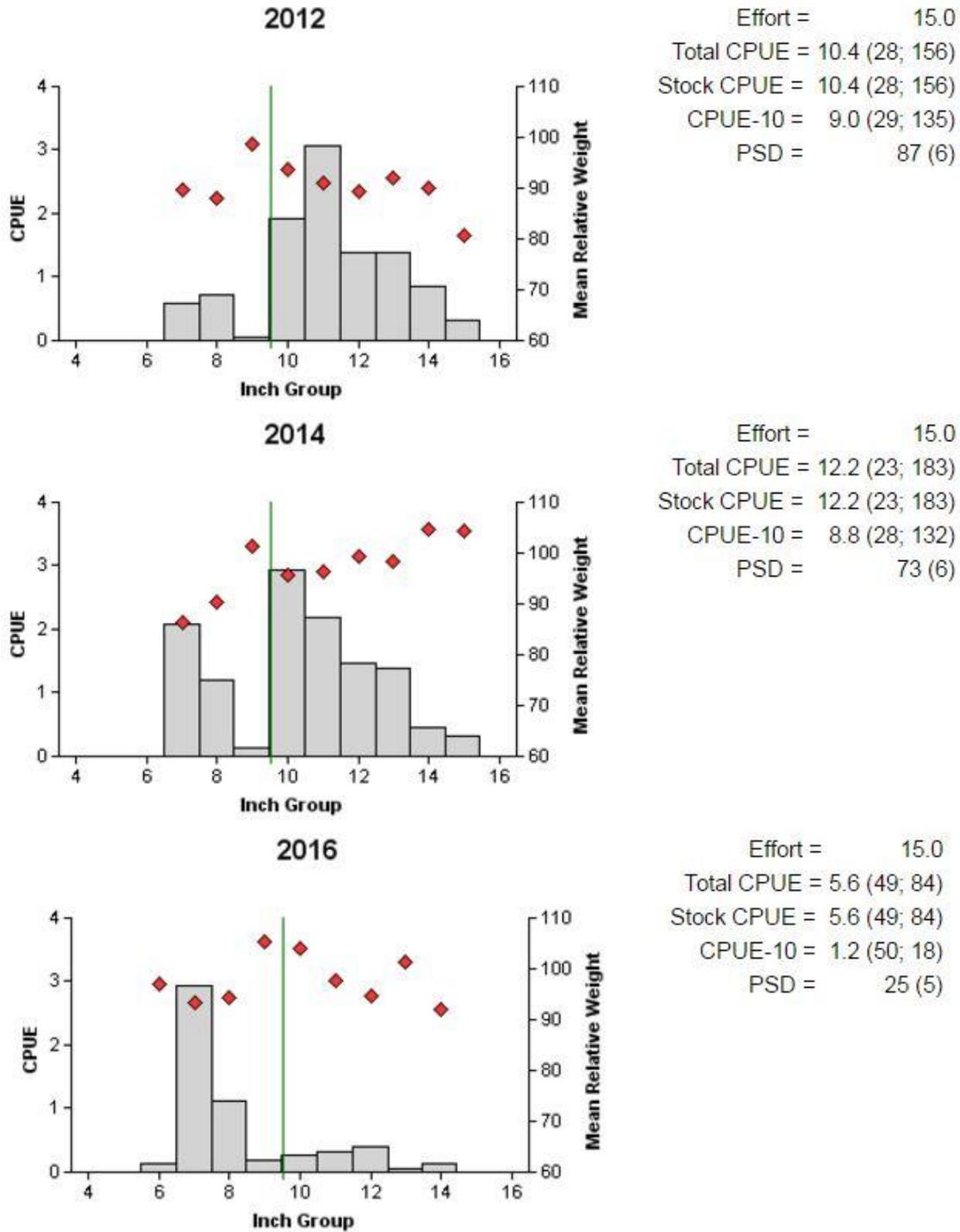


Figure 6. Number of White Bass caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Lewisville Reservoir, Texas, 2012, 2014, and 2016. Vertical line represents length limit at time of sampling.

Hybrid Striped Bass

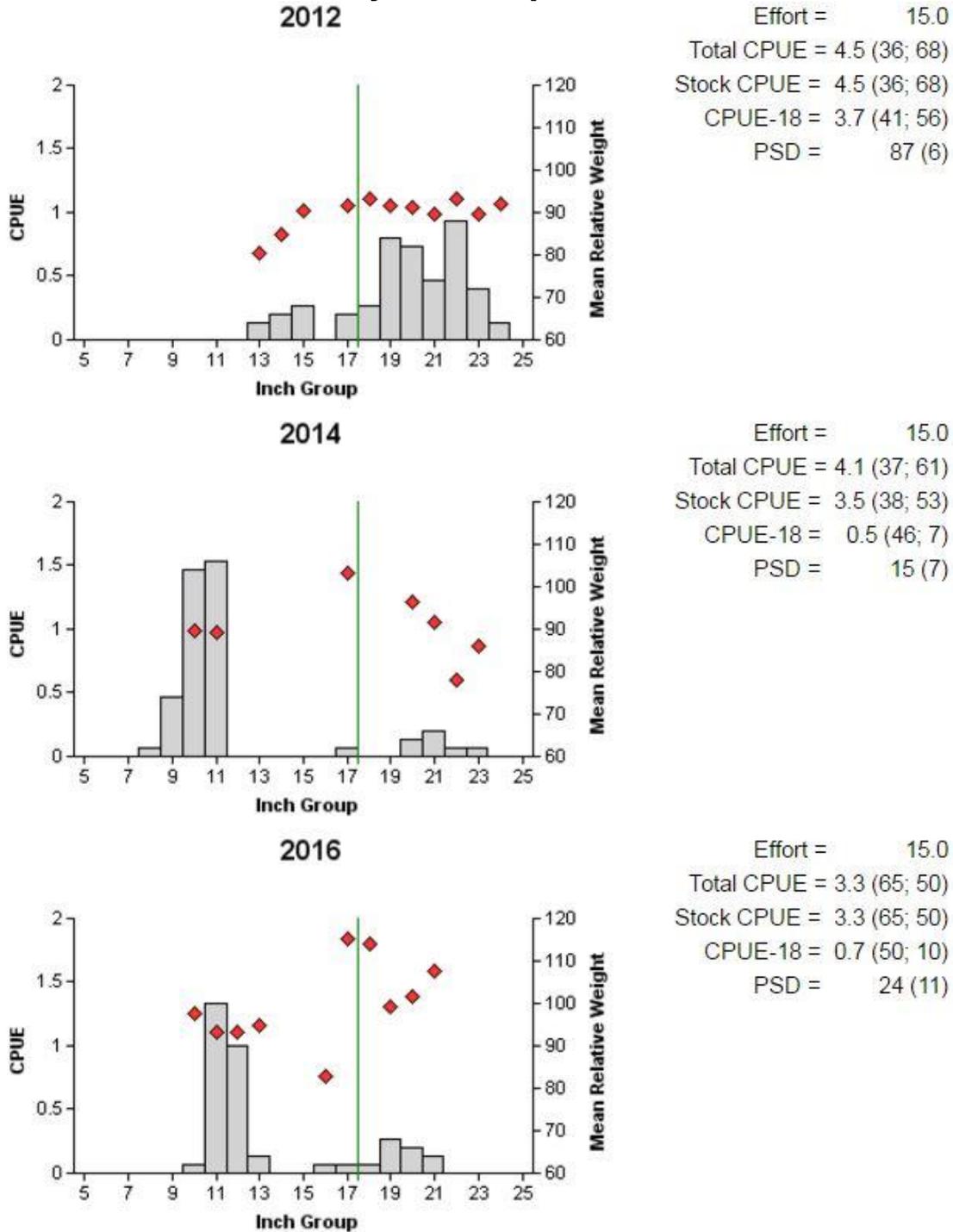


Figure 7. Number of Hybrid Striped Bass caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Lewisville Reservoir, Texas, 2012, 2014, and 2016. Vertical line represents length limit at time of sampling.

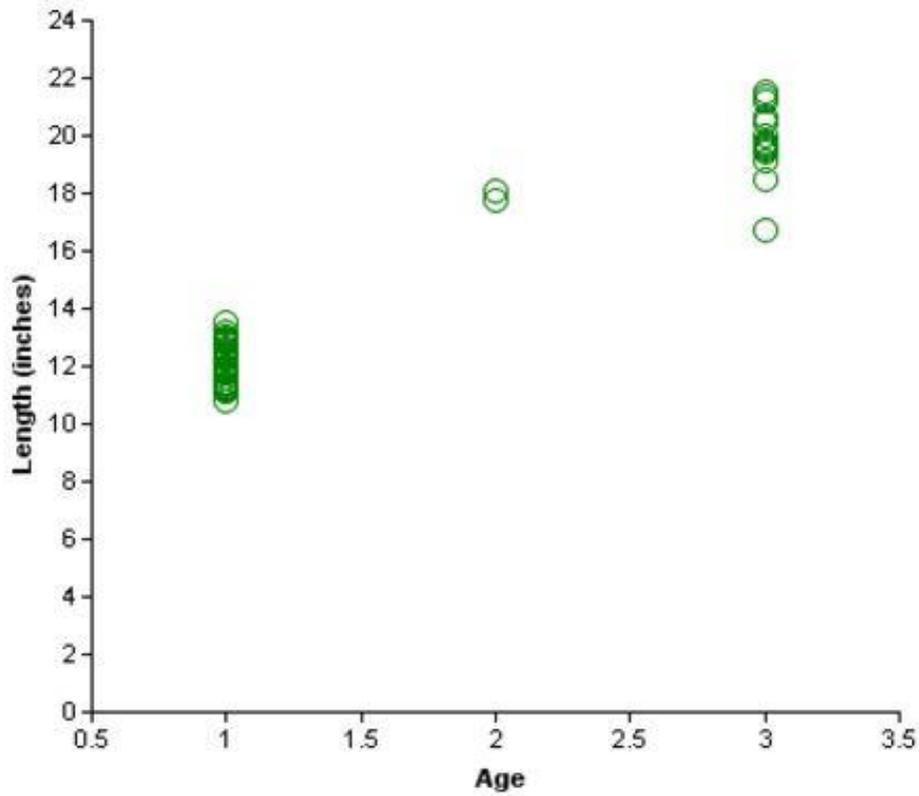


Figure 8. Length at age for Hybrid Striped Bass (sexes combined) collected from gill netting and angling at Lewisville Reservoir, Texas, for spring 2016 (N=102).

Spotted Bass

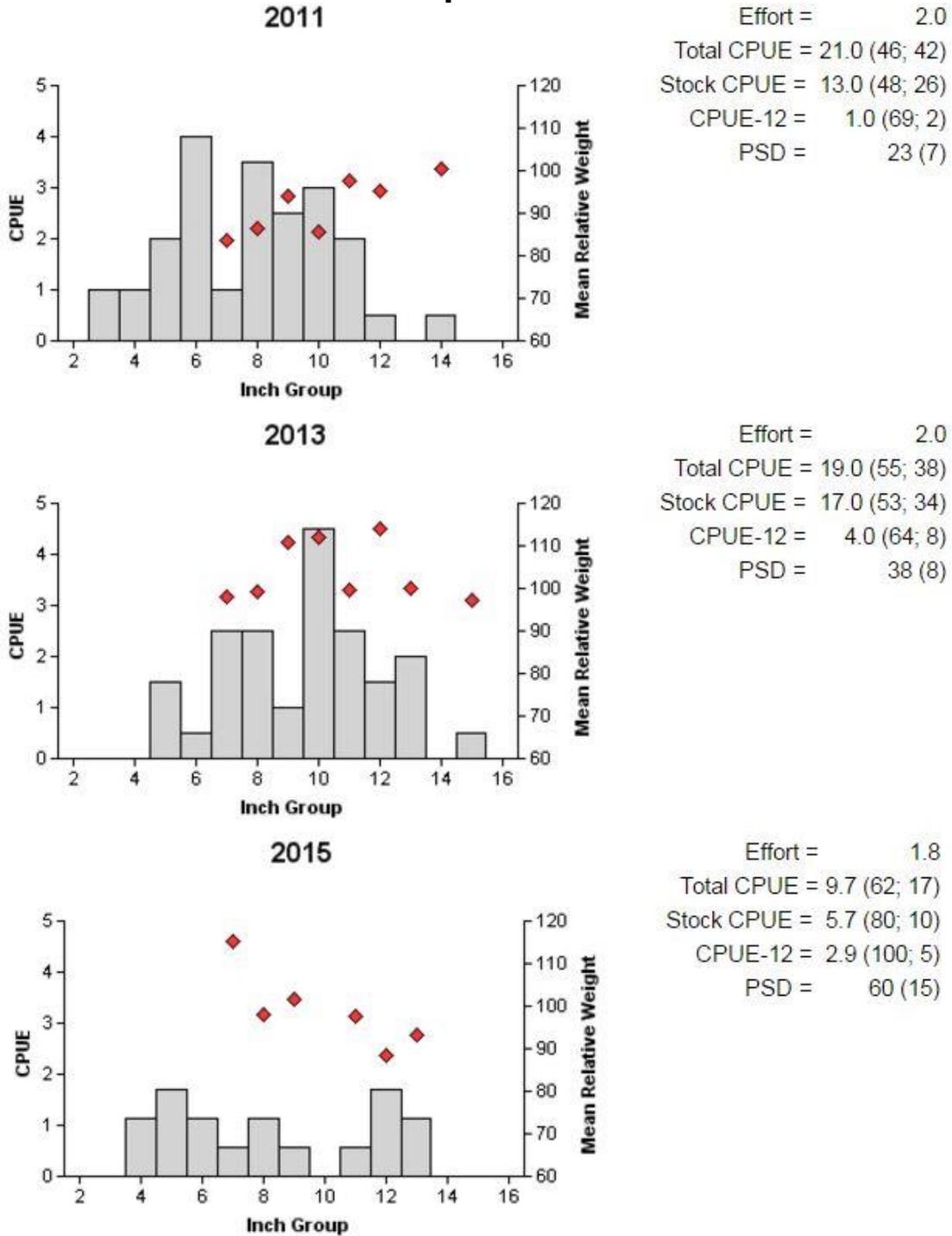


Figure 9. Number of Spotted Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lewisville Reservoir, Texas, 2011, 2013, and 2015.

Largemouth Bass

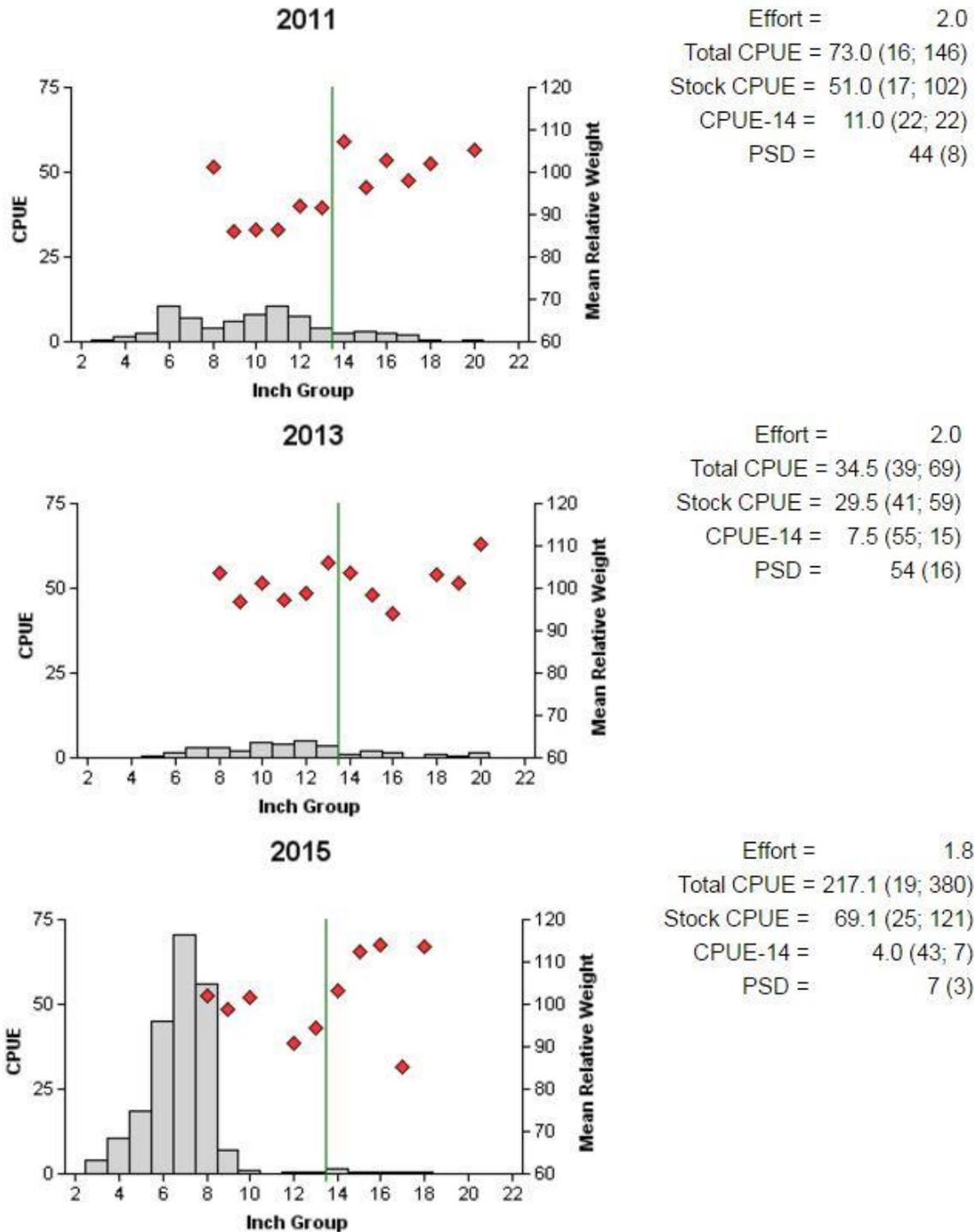


Figure 10. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lewisville Reservoir, Texas, 2011, 2013, and 2015. Vertical lines represent length limit at time of sampling.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Paradise Reservoir, Texas. 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	Number of fish				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
2011	30	0	1	26	3	61.0	0.0
2015	30	0	0	27	3	31.0	0.0

White Crappie

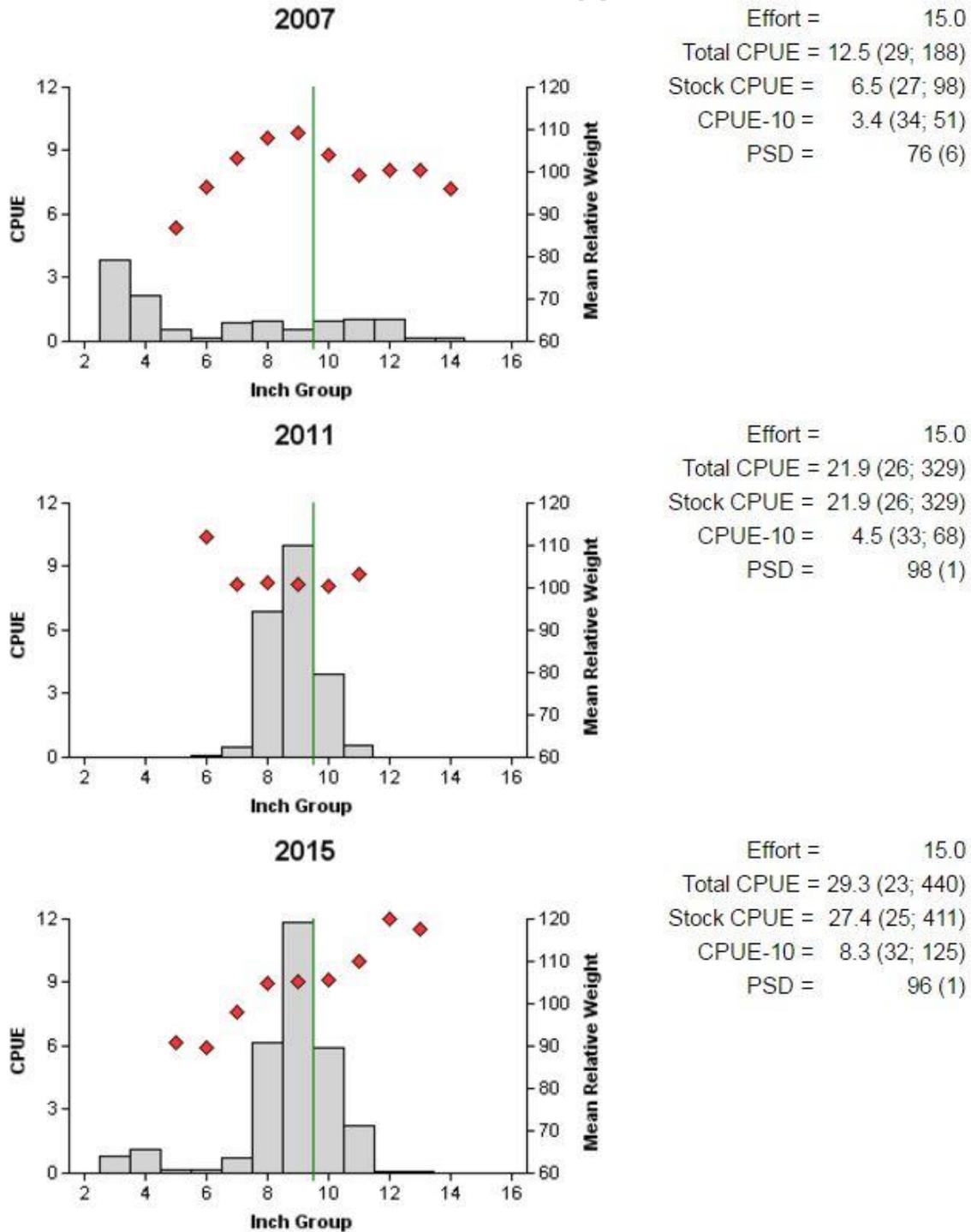


Figure 11. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lewisville Reservoir, Texas, 2007, 2011, and 2015. Vertical line represents length limit at time of sampling.

Black Crappie

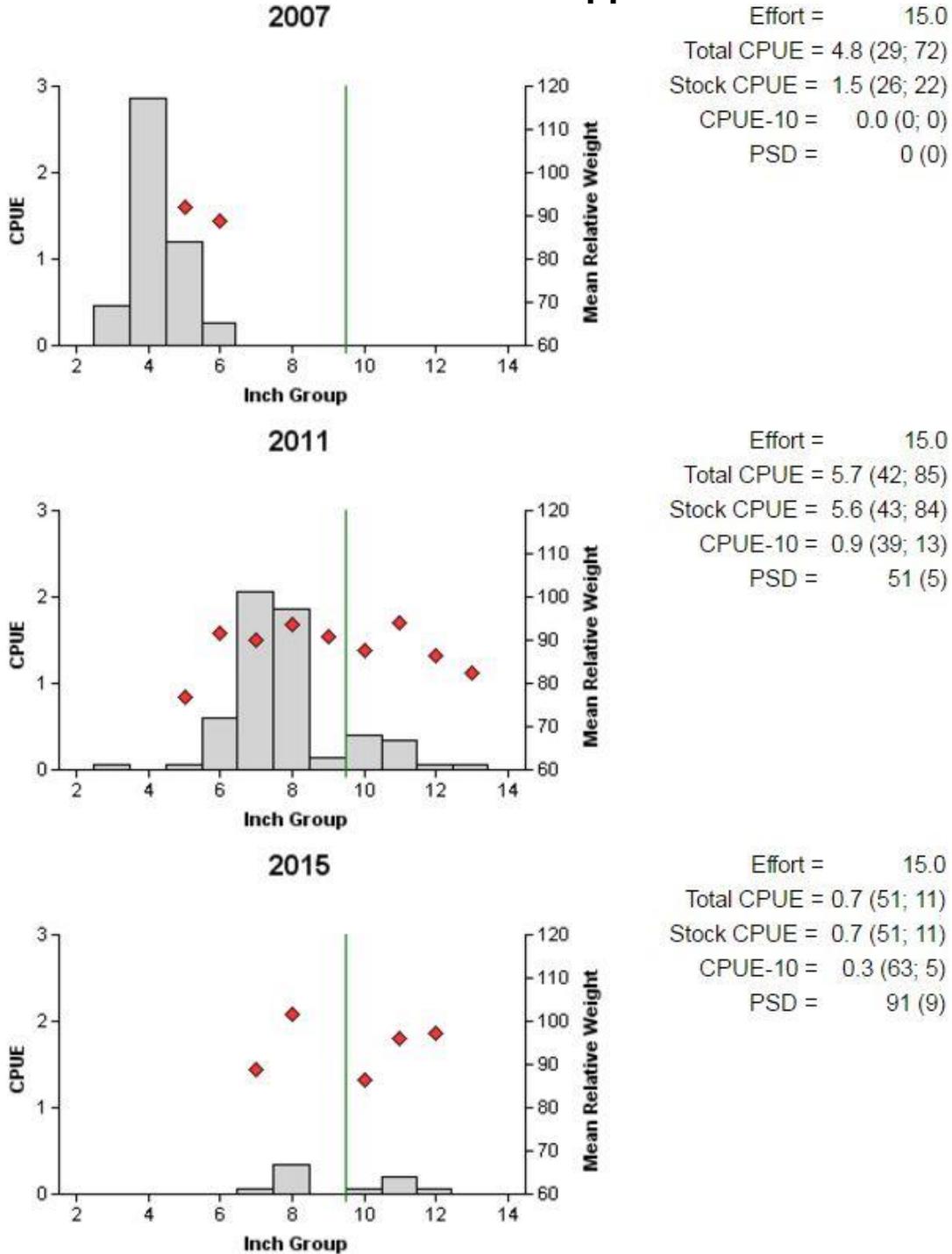


Figure 12. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lewisville Reservoir, Texas, 2007, 2011, and 2015. Vertical line represents length limit at time of sampling.

Table 8. Proposed sampling schedule for Lewisville Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

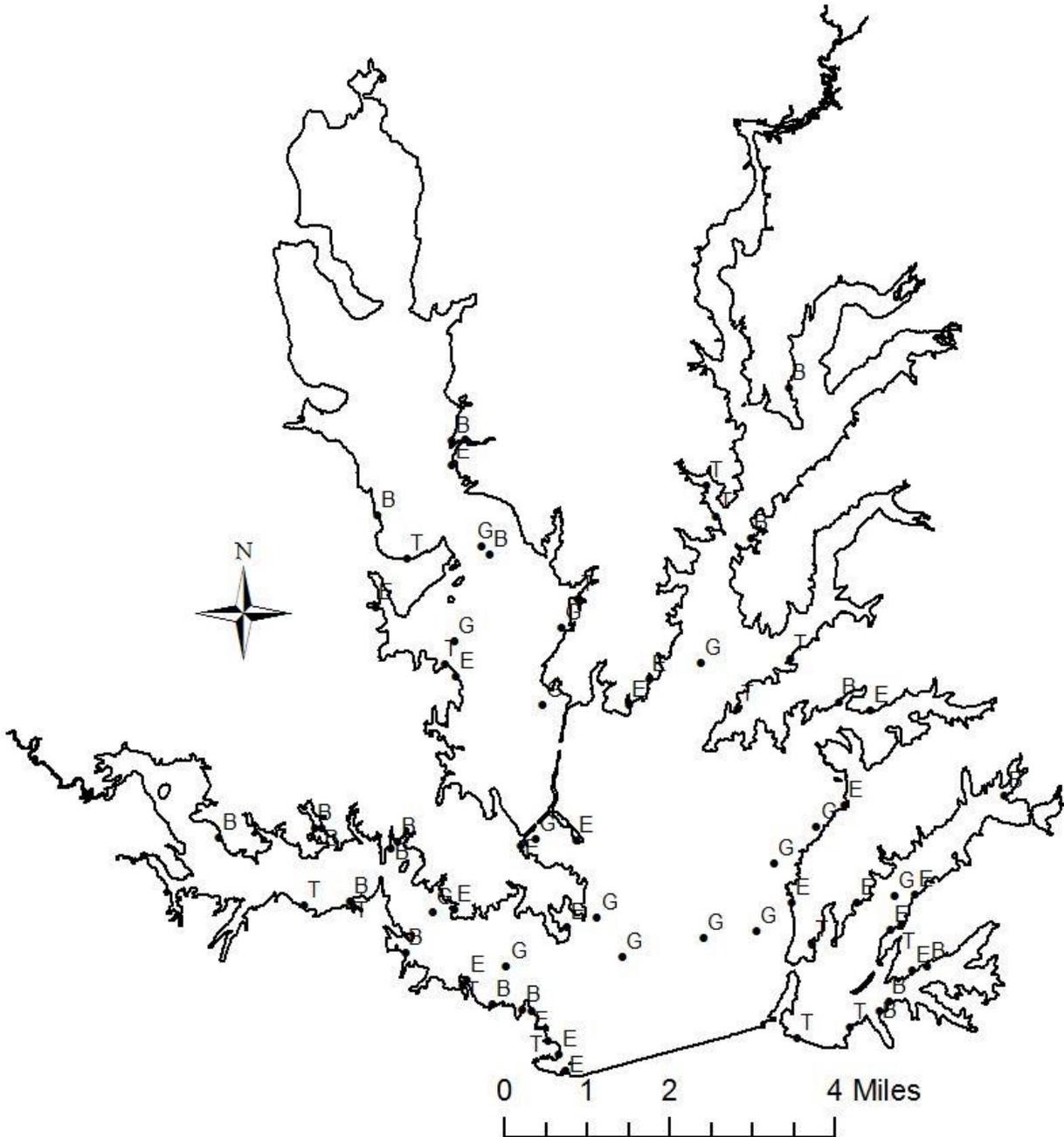
Survey year	Electrofishing Fall(Spring)	Low Frequency Electrofishing	Trapnet	Gillnet	Habitat			Creel survey	Report
					Structural	Vegetation	Access		
2016-2017									
2017-2018	A	A		A					
2018-2019							A		
2019-2020	S	A	S	S			S	S	

APPENDIX A

Number (N) and catch rate (CPUE) and relative standard error (RSE) of all species collected from all gear types from Lewisville Reservoir, Texas, 2015-2016.

Species	Gill Netting			Trap Netting			Electrofishing		
	N	CPUE	RSE	N	CPUE	RSE	N	CPUE	RSE
Gizzard Shad	257	17.1	18				682	389.7	28
Threadfin Shad							263	150.3	39
Common Carp	37	2.5	26						
River Carpsucker	9	0.6	47						
Smallmouth Buffalo	150	10.0	14						
Blue Catfish	72	4.8	20						
Channel Catfish	34	2.2	22						
White Bass	84	5.6	37						
Hybrid Striped Bass	50	3.3	54						
Bluegill							139	79.4	27
Longear Sunfish							61	34.9	28
Spotted Bass							17	9.7	62
Largemouth Bass							380	217.1	19
White Crappie	17	1.1	28	440	29.3	23			
Black Crappie	1	0.1	100	11	0.7	51			
Freshwater Drum	39	2.6	19						

APPENDIX B



Location of sampling sites, Lewisville Reservoir, Texas, 2015-2016. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Boat ramps are indicated with a B. Water level at time of electrofishing and trap netting was very near conservation pool and at the time of gill netting was about one foot low.

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APPENDIX C

Historical catch rates for targeted species by gear type for Lewisville Reservoir, Texas.

Gear	Species	Year													
		1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2001
Gill Netting (fish/net night)	Blue catfish	0.0	0.1	0.0	0.3	0.1	0.1	0.1	0.5	0.7	1.3	1.4	3.5	2.9	5.1
	Channel Catfish	5.0	7.0	5.0	6.0	6.2	3.0	3.3	2.3	2.7	2.1	1.9	3.0	0.7	1.7
	White Bass	17.0	6.0	8.0	31.0	14.1	13.0	18.5	19.8	12.3	16.6	7.1	20.0	24.7	3.7
	Palmetto Bass	2.0	4.0	1.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	Striped Bass	0.0	0.0	0.0	1.0	1.3	1.0	0.5	1.1	4.3	2.0	0.1	0.6	0.9	0.0
Electrofishing (fish/hour)	Gizzard Shad	475.0	343.0	385.0	486.0	241.0	430.0	1125.0	619.0	144.5	526.0	210.5	202.5	346.0	
	Threadfin Shad	799.0	450.0	370.0	544.0	435.0	53.0	230.0	94.0	123.5	60.0	305.5	273.0	235.0	
	Bluegill	248.0	82.0	160.0	202.0	163.0	73.0	65.0	69.0	50.5	6.0	138.0	119.5	42.0	
	Longear sunfish	203.0	126.0	91.0	94.0	136.0	0.0	39.0	40.5	25.5	4.0	40.0	35.0	38.0	
	Redear sunfish	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	0.0	
	Spotted Bass	25.0	19.0	9.0	16.0	24.0	37.0	37.0	23.5	19.0	8.0	5.0	15.5	21.0	
	Largemouth Bass	130.0	92.0	151.0	126.0	141.0	105.0	94.0	99.0	94.0	39.0	117.0	117.0	40.0	
Trap Netting (fish/net night)	White Crappie	25.0	13.0	15.0	26.0	5.3	9.9	10.6	4.4	19.1	2.4	12.9	12.1	4.7	40.5
	Black Crappie	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0

Appendix C continued

Gear	Species	Year											
		2003	2004	2006	2007	2008	2010	2011	2012	2013	2014	2015	2016
Gill Netting (fish/net night)	Blue catfish		4.9	5.2		4.9	2.6		7.1		3.0		4.8
	Channel Catfish		1.9	4.7		1.5	1.7		2.3		3.5		2.3
	White Bass		5.3	4.9		10.0	13.3		10.4		12.2		5.6
	Palmetto Bass		0.7	5.4		6.1	1.1		4.5		4.1		3.3
	Striped Bass		0.0	0.0		0.0	0.0		0.0		0.0		0.0
Electrofishing (fish/hour)	Gizzard Shad	552.5			364.5			350.5		335.5		389.7	
	Threadfin Shad	245.0			475.0			341.5		451.5		150.3	
	Bluegill	111.5			314.0			143.0		81.5		79.4	
	Longear sunfish	90.5			140.0			81.0		51.0		34.9	
	Redear sunfish	0.0			13.0			1.0		0.0		0.0	
	Spotted Bass	30.5			31.5			21.0		19.0		9.7	
	Largemouth Bass	76.5			111.5			73.0		34.5		217.1	
Trap Netting (fish/net night)	White Crappie	29.5			12.5			21.9				29.3	
	Black Crappie	0.5			4.8			5.7				0.7	