PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2014 Fisheries Management Survey Report

Travis Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Travis Reservoir were surveyed in 2014 using electrofishing and in 2015 using gill netting. Historical data are presented with the 2014-2015 data for comparison. This report summarizes results of the surveys and contains a fisheries management plan for the reservoir based on those findings.

- **Reservoir Description:** Travis Reservoir is an 18,622-acre impoundment of the Colorado River located in Travis and Burnet Counties, approximately 12 miles northwest of Austin, Texas. It was constructed in 1942 by the Lower Colorado River Authority (LCRA) for purposes of flood control, municipal and industrial water supplies, irrigation, and hydroelectric power. Travis Reservoir has a shoreline development index of 18.3. The basin is steep-sided with relatively few shallow coves and shoal areas. This reservoir experiences extreme water level fluctuations and lies within the Edwards Plateau ecological area. Land use is predominantly ranching in the upper reservoir, with residential properties common in the lower reservoir. Significant stands of aquatic vegetation have never been documented in the reservoir.

- **Management History:** Important sport fish include White Bass, Striped Bass, Largemouth Bass, and catfish species. Florida Largemouth Bass were originally stocked in the reservoir in the late 1980's to increase Florida Largemouth Bass genetic influence in the population. Blue and Channel Catfish were stocked in the 1970's to help establish a sustainable population. White Bass were managed under an experimental 12-inch minimum length limit from 1995 to 2003. The regulation was rescinded after analysis indicated environmental factors, not angler harvest, were probably more influential in determining White Bass population density.

- **Fish Community**
  - **Prey species:** Threadfin Shad, Gizzard Shad, Bluegill, and Redbreast Sunfish were the predominant prey species. Overall, the forage base was adequate to support sport fish.

  - **Catfishes:** Flathead Catfish and Blue Catfish were the predominant species of catfish surveyed in 2015. Large Flathead Catfish and Blue Catfish were available to anglers. Channel Catfish were also present in lower densities.

  - **Temperate Basses:** White Bass abundance decreased since the previous two surveys; body condition for most fish was low. White Bass growth to harvestable size was average for this species. Striped Bass abundance improved since the previous two surveys. Abundance of harvestable-size fish increased.

  - **Black Basses:** Largemouth Bass abundance in 2015 was low; growth and body condition were adequate. Low lake levels in recent years may have decreased recruitment of this species. Guadalupe Bass were present.

- **Management Strategies:** Based on current information, the reservoir should continue to be managed with existing regulations. Subject to availability, Striped Bass should continue to be stocked to maintain the fishery. Florida Largemouth Bass should be stocked when water levels are favorable for stocking since this reservoir is known to produce trophy fish (>8 lbs.). Conduct an additional gill net survey in 2017, and general monitoring surveys with gill nets and electrofishing surveys in 2018-2019. A yearlong creel survey will be conducted in 2016 to collect data on the Striped Bass fishery and determine future stocking strategies. Access, structural, and vegetation surveys will be conducted in 2018/2019.

INTRODUCTION

This document is a summary of fisheries data collected from Travis Reservoir in 2014 - 2015. 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 2014 - 2015 data for comparison.

Reservoir Description

Travis Reservoir is an 18,622-acre impoundment (when full) of the Colorado River located in Travis and Burnet Counties, approximately 12 miles northwest of Austin. It was constructed in 1942 by the Lower Colorado River Authority (LCRA) for purposes of flood control, municipal and industrial water supplies, irrigation, and hydroelectric power. Travis Reservoir has a shoreline development index of 18.3. The basin is steep-sided with relatively few shallow coves and shoal areas. This reservoir experiences extreme water level fluctuations. Since 2011, drought conditions had significantly reduced water levels, but rainfall in May and June 2015 brought water level to within 9.5 ft. below conservation pool and raised capacity to 84% full (Figure 1). The reservoir lies within the Edwards Plateau ecological area and is mesotrophic with a mean TSI chl-*a* of 41.28, and a 10-year change of +3.07 (Texas Commission on Environmental Quality 2011). Land use is predominantly ranching in the upper reservoir, with residential properties common in the lower reservoir. Habitat at time of sampling consisted primarily of rocky bluff with piers and docks, natural shoreline, and rocky shoreline with piers and docks, and native and non-native submerged vegetation. In 2014, the non-native species Hydrilla (13.9 acres) was present. The population of the Austin – Round Rock Metropolitan Statistical Area (MSA) was over 1.45 million people in 2006 having grown almost 16% from 1.25 million in 2000. Much of the development associated with that population growth is moving toward Travis Reservoir and the Hill Country. Population data indicate census tracts immediately north and south of Travis Reservoir fell into the two highest growth categories between 1990 and 2000 and that they grew at a greater rate than a vast majority of census tracts in the MSA (City of Austin, 2007). Other descriptive characteristics for Travis Reservoir are in Table 1.

Angler Access

Availability of boat access on Travis Reservoir is highly sensitive to water level variation (Daugherty et. al. 2011). At water levels above 667 msl, angler access was excellent for boat anglers. Eleven concrete public boat ramps were available when water level exceeded this level. As water level falls due to releases from the reservoir the number of usable boat ramps available declines. Under low-water conditions (<650 msl) boat access was poor and only two public boat ramps were available, although anglers frequently launch boats from the shoreline using four-wheel drive vehicles. Increased municipal water demand and potential effects of climate change (i.e., less rainfall) may make future recreational boating access to Travis Reservoir difficult (Daugherty et. al. 2011). Bank fishing was available at 18 public parks. Handicapped access was poor with no specific handicap accessible fishing sites available. Additional boat ramp characteristics are in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Magnelia and De Jesus 2011) included:

1. Continue to request Striped Bass fingerlings be stocked once per year at a rate of 5/acre.
   Action: Striped Bass fingerlings were stocked in 2013 and 2014, and Striped Bass fry were stocked in 2013 and 2015.

2. An additional gill netting survey should be conducted spring 2013 to monitor Striped Bass abundance and condition.
   Action: An additional gill netting survey was conducted in spring 2013.

3. A yearlong creel survey should be conducted in 2014. The survey should measure directed effort for Striped Bass and angler attitude and opinions regarding the fishery and future stockings.
   Action: Lack of access due to drought conditions prevented the creel survey. Creel survey will be rescheduled.

4. Stock Florida Largemouth Bass fingerlings at a rate of 25/acre every two-four years if the reservoir is above 660 ft. above msl in May of the year when stocking is planned.
   Action: Florida Largemouth Bass fingerlings were stocked in 2011, but no further stocking took place until 2015 when water level again surpassed 660 ft. above msl.

5. Use Largemouth Bass fishing tournament results and Florida Largemouth Bass genetic analysis to track the effectiveness of these stockings.
   Action: This issue could not be fully addressed since low-water levels prevented stocking of Florida Largemouth Bass until 2015, and many tournaments were cancelled as access was limited.

6. Work with controlling authorities to post signage about invasive species, monitor for zebra mussels, and inform the public about threats from invasive species.
   Action: Zebra mussel signage was posted at selected locations. The Lower Colorado River Authority has installed settlement samplers for zebra mussels at Travis Reservoir (Appendix D). Preliminary examination (CPLM testing) of a water sample collected from Emerald Point Marina (May 2015), as part of a region-wide monitoring program, proved to be negative for zebra mussel veligers and is pending PCR testing.

7. Recommend to all controlling authorities that current concrete boat ramps be extended during periods of low water to maintain future access under lower reservoir water levels.
   Action: Extensions were not an option due to a funding shortage. However, Travis County was able to invest matching funds for a new low-water ramp.

8. Recommend that all controlling authorities construct unimproved (i.e. – rock gabion) boat ramps specifically designed and designated for low water use by 2-wheel drive vehicles.
   Action: A new low-water level boat ramp was built by Travis County in 2014 at Pace Bend Park. This was built with a Texas Parks and Wildlife Department boat ramp grant.

Harvest regulation history: The lake has historically been managed with statewide harvest regulations. White Bass were managed under an experimental 12-inch minimum length limit from 1995 to 2003. This was reduced to the statewide minimum length limit of 10 inches in September 2003, as analyses suggested that population densities were probably determined by environmental factors (inflow and water level) rather than angler harvest. Current regulations are found in Table 3.

Stocking history: Florida Largemouth Bass, Striped Bass, Blue Catfish, and Channel Catfish have been important species stocked in the reservoir. Annual Striped Bass stockings at a rate of 5/acre have been requested since 2002 to maintain a fishery. Florida Largemouth Bass were introduced in 1988, 2008, 2011, and 2015 to increase Florida Largemouth Bass genetic influence. Blue Catfish were stocked in 1979 and a self-sustaining population is now present. The complete stocking history is in Table 4.

Vegetation/habitat management history: Significant stands of aquatic vegetation have never been documented in the reservoir probably due to extended periods of low-water levels and predominance of steep sided banks. Most of the shoreline habitat was comprised of rocky shoreline/bluff with piers and docks, and natural shoreline. Water levels at Travis Reservoir fluctuated widely, but shoreline habitat in the middle and lower portions of the reservoir change very little because the shorelines were generally steep sided.

Water Transfer: Travis Reservoir is primarily used for flood control, municipal and agricultural water supply, and recreation. The reservoir forms part of the chain of "Highland Lakes" on the Colorado River, receiving water from Marble Falls Reservoir and discharging in to Austin Reservoir. There are no inter-basin transfers.

METHODS

Fishes were collected by electrofishing (1.5 hours at 18, 5-min stations) and gill netting (10 net nights at 10 stations, reduced from 15 net nights due to a reduction in reservoir acreage). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and for gill nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Texas Parks and Wildlife Department Fishery Assessment Procedures Manual (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

A structural habitat survey was conducted in 2014 to include any vegetation that might be present. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Aquatic vegetation coverage was estimated by the use of Trimble® GPS unit in conjunction with sonar depth finder. Species identification was confirmed on samples collected with a modified aquatic rake. Littoral habitat was observed and documented along the entire shoreline from a survey boat.

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.

Ages were determined using otoliths for Largemouth Bass, Striped Bass and White Bass (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Micro-satellite DNA analysis was used to determine genetic composition of individual fish.

Source for water level data was the LCRA website.

RESULTS AND DISCUSSION

Habitat: Littoral zone structural habitat consisted primarily of rocky bluff with piers and docks, natural shoreline, and rocky shoreline with piers and docks (Table 5). Significant stands of aquatic vegetation have never been documented in the past. However, in 2014, 13.9 acres of the non-native species hydrilla was present near the Mansfield Dam boat ramp, covering 0.16% of the reservoir's surface area at the time of sampling (Appendix C). Saltcedar is an invasive plant which when allowed to form dense monocultures will affect access to waterways, increase salinity by exuding salt, and increase water loss through transpiration. Saltcedar has become established around Travis Reservoir and is being monitored by TPWD and its partners (Appendix E to G) with the aim of controlling its expansion by introducing saltcedar beetles in 2015.

Prey species: Threadfin Shad, Gizzard Shad, Bluegill, and Redbreast Sunfish were the predominant prey species. The IOV for Gizzard Shad was 76, indicating that 76.0% of Gizzard Shad were < 8 inches in length, thereby making them susceptible to most predators. The IOV was higher than in the 2010 survey (49), but similar to that obtained in 2006 (73). In 2014, total CPUE for Gizzard Shad (130.7/h) was higher than in 2010 (83.5/h) and close to the value in the 2005 (134.0/h) survey (Figure 2). Threadfin Shad were collected at the rate of 790.0/h in 2014, which is substantially higher than in the 2010 (20.5/h) and 2006 (11.0/h) surveys. Total CPUE of Redbreast Sunfish in 2014 was 53.3/h and has steadily declined since the 2010 (112.5/h) and 2006 (163.5/h) surveys. Abundance of all size classes less than 7 inches in length has been reduced. Larger fish (7 to 8 inches in length) continue to provide fishing opportunities for panfish anglers, especially on light tackle (Figure 3). Bluegill total electrofishing CPUE was 74.7/h in 2014, and as was the case with Redbreast Sunfish, CPUE has declined since the 2010 (204.5/h) and 2006 (410.5/h) surveys. In 2013, larger Bluegill (7 to 8 inches in length) were present (Figure 4). In recent years, low water levels due to drought conditions have likely negatively impacted recruitment of sunfish.

Catfishes: Flathead Catfish and Blue Catfish were the predominant species of catfish surveyed in 2015. Total CPUE of Blue Catfish in 2015 was 1.7/nn and has gradually declined since the 2013 (2.3/nn) and 2011 (2.9/nn) surveys (Figure 5). In 2015, all Blue Catfish sampled were above harvestable-size with the majority of the fish ranging in size from 12 to 21 inches; the largest fish was 29 inches in length. However, CPUE-12 has also declined since the two previous surveys. Body condition (W_r) for most of the specimens collected in 2015 was adequate. A new water body record (rod and reel) for Blue Catfish was established in 2011 (49.7 pounds, 46.0 inches). Gill net catch rate for Channel Catfish was 0.3/nn in 2015 which is lower than in 2013 (1.2/nn) and 2006 (0.8/nn); catch rates for harvestable-size fish (CPUE-12) was correspondingly lower (Figure 6). In 2015, the largest Channel Catfish only measured 15 inches in length. Total CPUE of Flathead Catfish in 2015 was 1.9/nn which is higher than in the 2013 (0.7/nn) and 2011 (0.9/h) surveys. Catch rate of harvestable-size fish (CPUE-18) was also higher than in the previous two surveys (Figure 7). Body condition (W_r) for most of the specimens collected in 2015 was adequate. The largest fish was 30 inches in length.

White Bass: White Bass are a popular species on this reservoir with spring spawning runs in the Pedernales and Colorado River arms of the reservoir when flows permit. The total gill net catch rate of White Bass was 1.1/nn in 2015. This was lower than that recorded in 2013 (2.8/nn) and 2011 (4.0/nn) (Figure 7). Most individuals sampled exceeded the minimum length limit of 10 inches. However, the gillnet CPUE of harvestable size White Bass decreased in 2015 (1.0/nn) compared to surveys in 2013 (2.5/nn) and 2011 (3.8/nn); the largest fish was 14 inches in length. Body condition (W_r) for most fish was poor. On average, White Bass reached harvestable-size (10 inches) between age 1 and 2, n=11 (Figure 9). The lower CPUE values recorded in 2015, may be an indication that weaker year-classes were produced because of drought conditions affecting spawning success in tributaries. In other reservoirs such as Buchanan and Georgetown, White Bass are known to congregate in large numbers along windblown gravel shorelines to spawn in spring, which may help conserve the population during periods of drought when flowing water is restricted. This may be a factor in Travis Reservoir too.

Striped Bass: The gill net catch rate of Striped Bass in 2015 was 1.9/nn which is higher than in 2013 (0.1/nn) and 2011 (0.1/nn) (Figure 10). This is a promising sign since Stripped Bass abundance has been so poor in previous years despite annual stockings (except for 2011 and 2012 due to production issues). Sampling variability and absent year classes in 2011-12 may explain previous low catch rates to some extent, but temperature and dissolved oxygen limitations are known to negatively affect the Striped Bass population in Travis Reservoir. A substantial kill of large (mean length = 24 inches, TPWD unpublished data) Striped Bass occurred near the dam in summer 2010. (Magnelia and De Jesus 2011). Adult Striped Bass will seek water temperature less than 25^{o}C and dissolved oxygen levels greater than 3-4 mg/L (Coutant 1985), but they can tolerate higher temperatures for brief periods if dissolved oxygen concentrations remain above 2 mg/l (Farquhar and Gutreuter 1989: Zale et al. 1990). Adult Striped Bass seek out lower temperatures as they age, and are often “squeezed” between their thermal and dissolved oxygen preferences (Coutant 1985). Adults often seek cooler water that becomes low in dissolved oxygen (Coutant 1985). Remaining in this environment causes stress, and in some cases, kills of Striped Bass occur. Striped Bass reached harvestable-size (18 inches) in 2 years (18.01 inches average length at age 2, n = 17, Figure 11). Body condition (W_r) for most of the specimens collected in 2015 was adequate.

Largemouth Bass: The total CPUE of Largemouth Bass was 18.7/h in 2014 and was low compared to catch rates of 69.5/h in 2010, and 115.5/h in 2006 (Figure 12). In addition, the electrofishing catch rate of harvestable-size Largemouth Bass (CPUE-14 = 4.7/h) was much lower than in 2010 (13.5/h) and in 2006 (18.0/h). Body condition for most fish was sub-optimal (W_r <100), but adequate (W_r >85) whereas in 2010, body condition was close to optimal (W_r =100) with most length groups between 90 and 100. On average, Largemouth Bass reached harvestable-size (14 inches) in Travis Reservoir between age 2 and 3 (sample size limited to n=6) (Figure 13). All Largemouth Bass sampled in 2014 (n=28) were intergrades and the Florida Largemouth Bass influence was 51.0% (Table 6). The reservoir was last stocked with Florida Largemouth Bass in 2011.

Largemouth Bass are an important sport fish in Travis Reservoir. Prior to the current drought, the reservoir hosted many fishing tournaments for Largemouth Bass each year. A fall 2001 creel survey indicated 91% of the directed fishing effort was for this species (Magnelia and Bonds 2003). The reduction in catch rate of Largemouth Bass observed in 2015 may be a reflection of below average year classes resulting from loss of habitat under low water conditions in 2008 and 2009. Chronically low water levels may be the norm on Travis Reservoir in the future. This may ultimately decrease overall abundance of Largemouth Bass and other species dependent on littoral zone habitat (Daugherty 2009).

Guadalupe Bass: The total CPUE of Guadalupe Bass was 19.3/h in 2014. Directed effort for this species is not known, but some interest in this population is evidenced by an annual tournament on this reservoir organized by Texas Tournament Zone.

Fisheries management plan for Travis Reservoir, Texas

Prepared – July 2015.

ISSUE 1: Striped Bass is an important sport fish in this Reservoir. However, population abundance and size distribution has been highly variable. The species is vulnerable to fish kills, which have been attributed to temperature/oxygen squeeze conditions in summer. Additional information is required to better manage this fishery e.g., angling effort, catch rate, and harvest.

MANAGEMENT STRATEGIES

1. Continue to request annual stockings of Striped Bass at a rate of 5/acre fish.

2. Conduct an additional gill net survey in spring 2017 to monitor the Striped Bass population.

3. Conduct a yearlong creel survey in June 2016 to determine angling effort, catch rate, harvest, and angler opinion regarding the fishery and future stockings.

ISSUE 2: Largemouth Bass catch rates have been declining since 2010. However, based on past surveys and angling reports, the reservoir is capable of producing trophy bass.

MANAGEMENT STRATEGY

1. Request Florida Largemouth Bass fingerling stockings at 25 per acre if water level exceeds 660 ft. above msl by May 2016.

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. The threat of zebra mussel infestation in Georgetown Reservoir has been elevated due to their recent establishment in a reservoir within the Brazos River watershed. Belton Reservoir has been confirmed to have zebra mussels and poses a significant threat to nearby Stillhouse Hollow Reservoir, which supplies water to Georgetown Reservoir.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Visually inspect rocks along the shoreline of the reservoir to confirm presence or absence of zebra mussels.
3. Establish a zebra mussel monitoring program to target adults and veligers.
4. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers.
5. Educate the public about invasive species with media and the internet.
6. Make a speaking point about invasive species when presenting to constituent and user groups.
7. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional gill netting in 2017 and mandatory monitoring in 2018/2019 (Table 7). Additional gill netting in 2017 is necessary to continue monitoring recruitment success of Striped Bass. Electrofishing surveys are only necessary every four years at this point to monitor the Largemouth Bass population and forage species. A creel survey in 2016 will provide valuable information about the utilization of this fishery.

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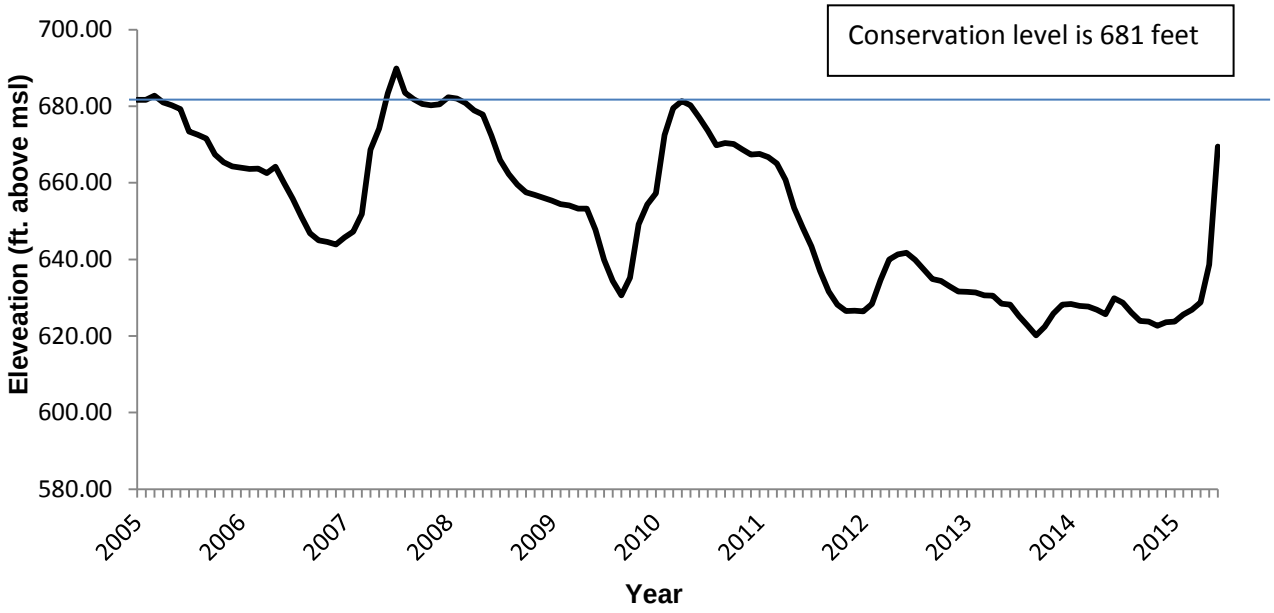


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Travis Reservoir, Texas 2005-2015.

Table 1. Characteristics of Travis Reservoir, Texas.

Characteristic	Description
Year constructed	1942
Controlling authority	LCRA
Counties	Burnett and Travis
Reservoir type	Mainstream: Colorado River
Shoreline Development Index	18.3
Conductivity	539 µS/cm

Table 2. Boat ramp characteristics for Travis Reservoir, Texas, October 2014. Reservoir elevation at time of survey was 622 ft. above msl (conservation level is 681 ft. above msl).

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft.)	Condition
Arkansas Bend	30.402735 -97.952565	Y	10	NA	Good
Bob Wentz at Windy Point	30.413122 -97.896830	Y	22	NA	Good
Camp Creek Park	30.563203 -98.191203	Y	10	NA	Good
Camp Pedernales	30.427056 -98.089623	Y	20	NA	Good
Cypress Creek Park	30.426549 -97.872510	Y	15	NA	Good
Dink Pearson Park	30.385470 -97.984830	N		NA	Unimproved boat ramp
Gloster Bend	30.466324 -98.076702	N	20	NA	Good
Hippie Hollow	30.409322 -97.877576	Y	17	NA	Good
Jones Brothers Park	30.487351 -97.925711	Y	20	NA	New 2-lane ramp
Mansfield Dam Park	30.397921 -97.908991	Y	112	NA	Good
Pace Bend, Camp Chautauqua	30.438890 -98.029439	Y		NA	Good
Pace Bend, Collier Cove	30.461510 -98.029834	Y		NA	Good
Pace Bend, Tatum Cove	30.452896 -98.016154	Y		NA	Good
Pace Bend, Tournament Point	30.475220 -98.007220	Y	100	NA	New low- water ramp, no paved parking or turnaround
Sandy Creek Park	30.467337 -97.907217	Y		NA	Good
Spicewood Beach	30.523603 -98.143541	N	20	NA	Good
The Narrows	30.523072 -98.147638	Y	29	NA	Good

Table 3. Harvest regulations for Travis Reservoir, 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, White	25	10-inch minimum
Bass, Striped	5	18-inch minimum
Bass, Largemouth	5[a]	14-inch minimum
Bass, Guadalupe	5[a]	None
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

[a] Daily bag for Largemouth Bass and Guadalupe Bass = 5 fish in any combination.

Table 4. Stocking history of Travis Reservoir, 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.

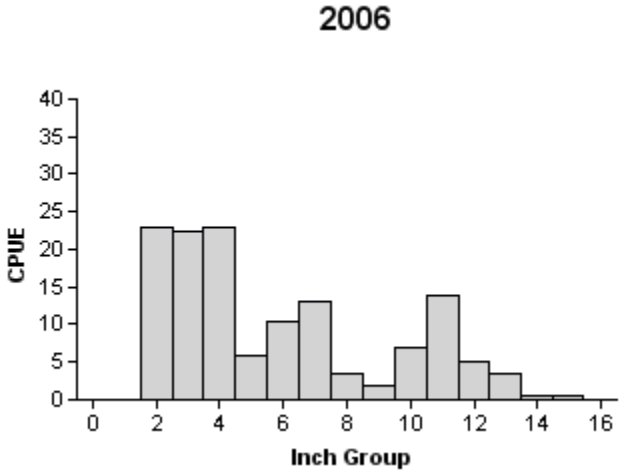
Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1979	101,313	UNK	UNK
	Total	101,313		
Channel Catfish	1971	13,000	AFGL	7.9
	1972	87,000	AFGL	7.9
	2005	457	ADL	15.4
	2008	400	ADL	13.0
	Total	100,857		
Florida Largemouth Bass	1988	474,535	FRY	1.0
	2008	464,568	FGL	1.7
	2011	232,106	FGL	1.7
	2015	424,979	FGL	1.7
	Total	1,596,188		
Largemouth Bass	1967	238,000	UNK	UNK
	Total	238,000		
Smallmouth Bass	1977	211,400	UNK	UNK
	1978	196,050	UNK	UNK
	1979	343,940	UNK	UNK
	Total	751,390		
Striped Bass	1973	206,285	FGL	1.7
	1974	163,611	FGL	1.7
	1976	175,854	UNK	UNK
	1978	90,250	UNK	UNK
	1981	180,000	UNK	UNK
	1983	183,699	UNK	UNK
	1991	94,600	FGL	1.4
	2002	110,490	FGL	1.5
	2005	96,000	FGL	1.6
	2006	98,842	FGL	1.9
	2007	103,569	FGL	1.8

Species	Year	Number	Life Stage	Mean TL (in)
	2008	94,734	FGL	1.7
	2009	101,813	FGL	1.6
	2010	99,097	FGL	1.8
	2013	87,425	FGL	2.1
	2013	579,363	FRY	0.2
	2014	88,509	FGL	1.6
	2015	63,021	FGL	1.8
	2015	442,047	FRY	0.2
	Total	3,059,209		
Walleye	1976	190,000	FRY	0.2
	1977	3,666,925	FRY	0.2
	1978	4,391,640	FRY	0.2
	1979	4,503,500	FRY	0.2
	Total	12,752,065		

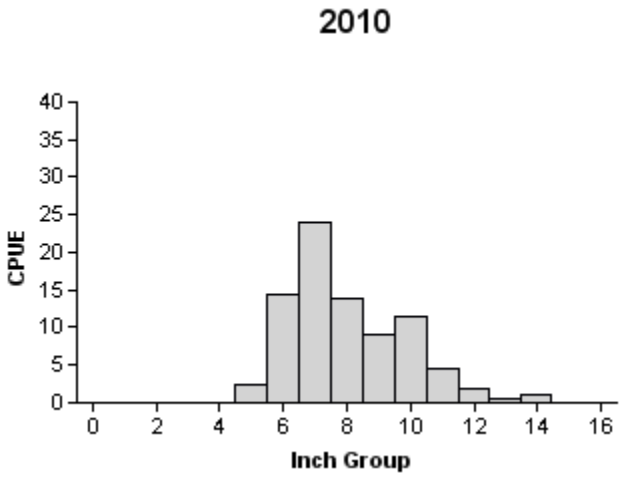
Table 5. Survey of structural habitat types, Travis Reservoir, Texas, 2014. Shoreline habitat-type units are in miles.

Habitat type	Estimate	% of total
Bulkhead	0.3 miles	0.2
Gravel shoreline	8.8 miles	5.9
Gravel shoreline/piers, docks	8.5 miles	5.7
Natural shoreline	28.2 miles	19.1
Natural shoreline/piers, docks	11.7 miles	7.9
Rocky bluff	21.5 miles	14.5
Rocky bluff/piers, docks	34.9 miles	23.7
Rocky shoreline	14.0 miles	9.5
Rocky shoreline/piers, docks	17.8 miles	12.0

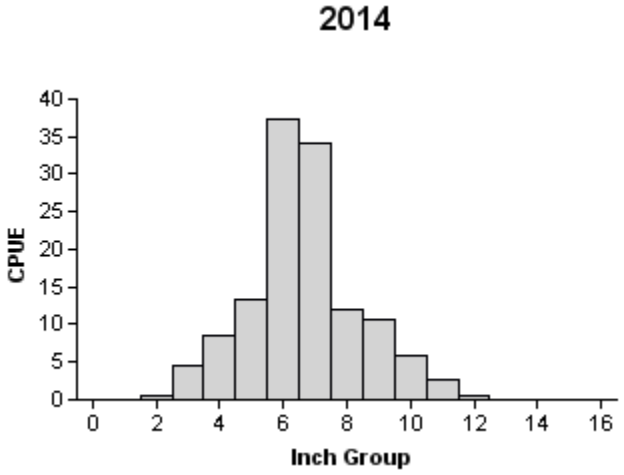
Gizzard Shad



Effort = 2.0
Total CPUE = 134.0 (35; 268)
IOV = 73 (9.4)



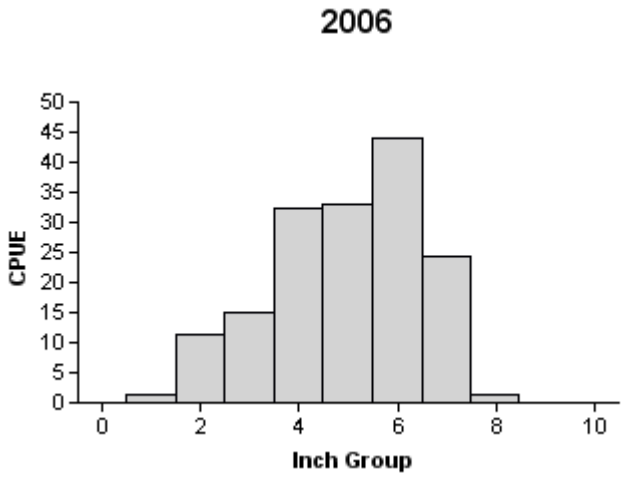
Effort = 2.0
Total CPUE = 83.5 (47; 167)
IOV = 49 (13.1)



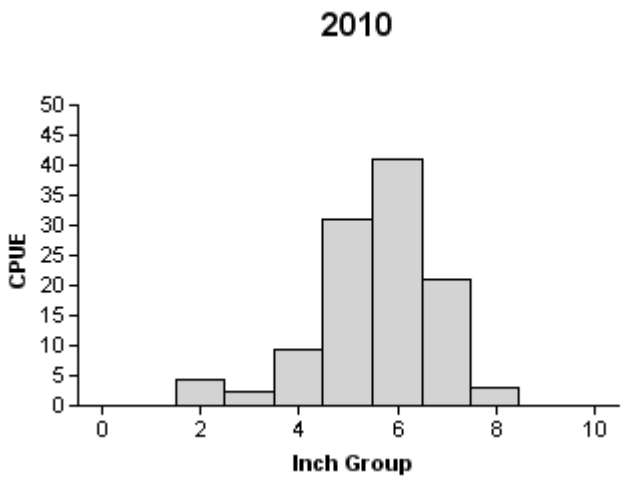
Effort = 1.5
Total CPUE = 130.7 (46; 196)
IOV = 76 (10.3)

Figure 2. Number of Gizzard Shad caught per hour (CPUE) population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Travis Reservoir, Texas, 2006, 2010 and 2014.

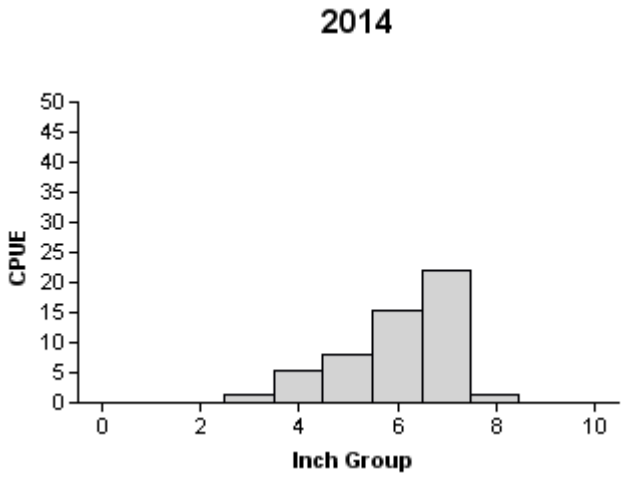
Redbreast Sunfish



Effort = 2.0
Total CPUE = 163.5 (17; 327)
PSD = 47 (5.2)
PSD-P = 1 (0.6)



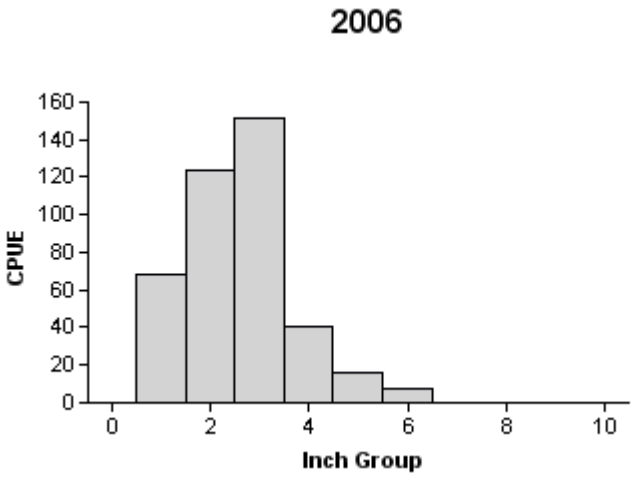
Effort = 2.0
Total CPUE = 112.5 (20; 225)
PSD = 60 (4.9)
PSD-P = 3 (0.8)



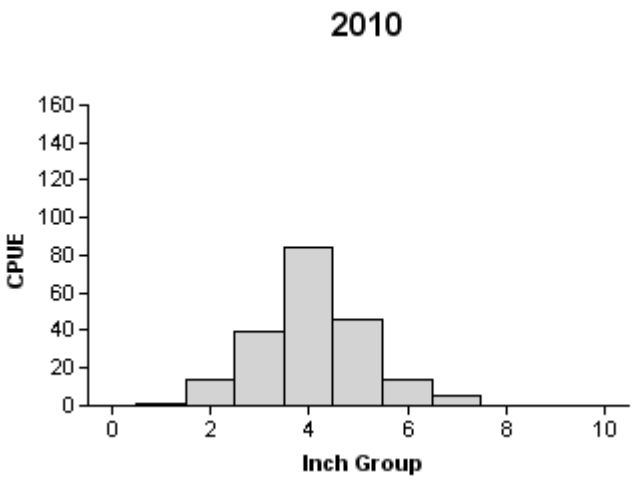
Effort = 1.5
Total CPUE = 53.3 (25; 80)
PSD = 72 (6.5)
PSD-P = 2 (1.5)

Figure 3. Number of Redbreast Sunfish caught per hour (CPUE) population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Travis Reservoir, Texas, 2006, 2010 and 2014.

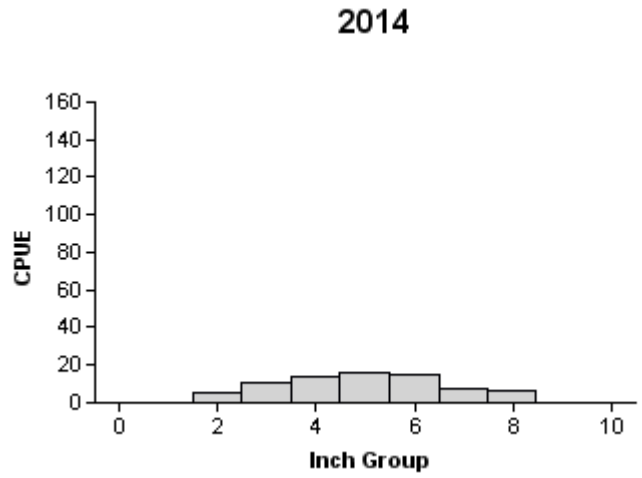
Bluegill



Effort = 2.0
Total CPUE = 410.5 (25; 821)
PSD = 4 (1.2)



Effort = 2.0
Total CPUE = 204.5 (25; 409)
PSD = 10 (2.4)



Effort = 1.5
Total CPUE = 74.7 (27; 112)
PSD = 41 (9.9)

Figure 4. Number of Bluegill caught per hour (CPUE) population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Travis Reservoir, Texas, 2006, 2010 and 2014.

Blue Catfish

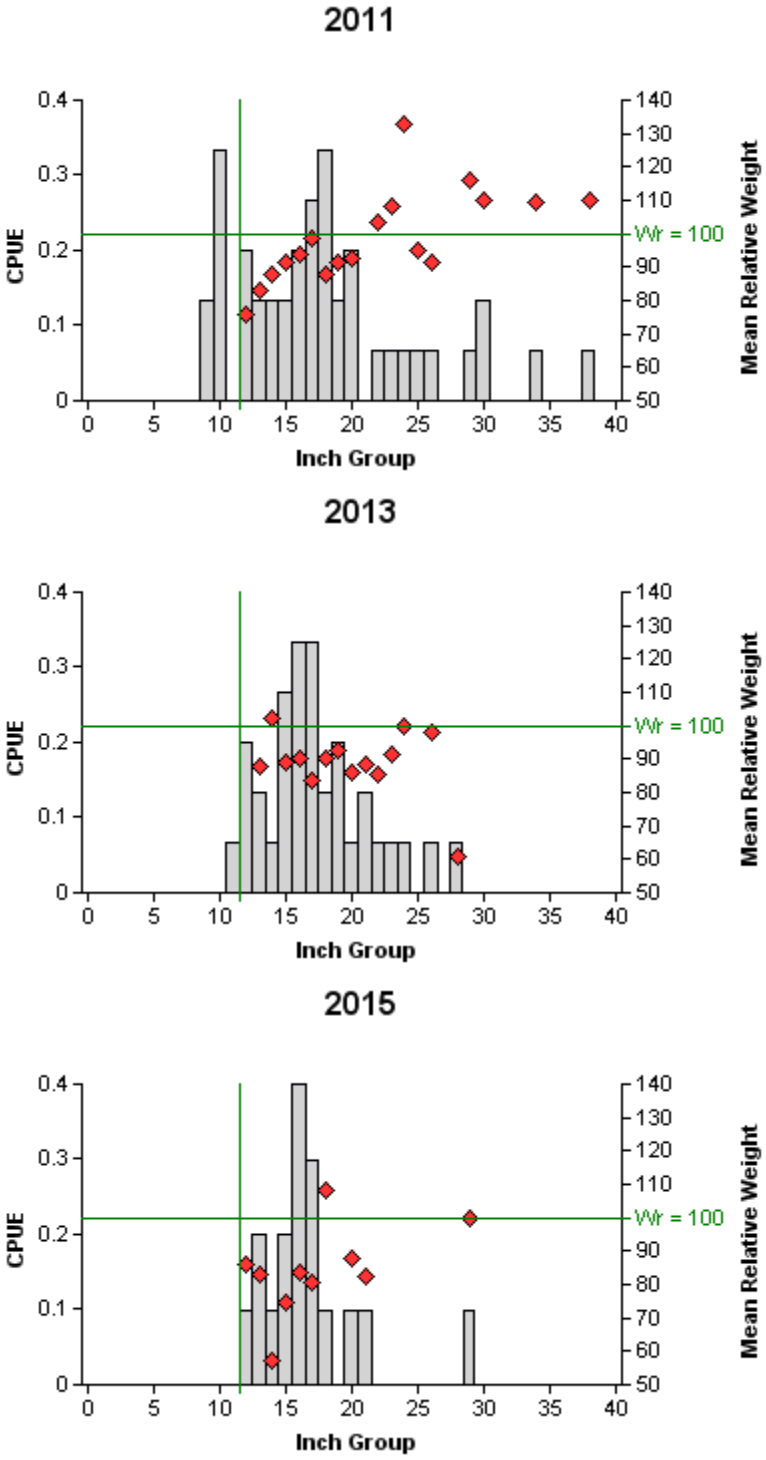


Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Travis Reservoir, Texas, 2011, 2013 and 2015. Vertical line represents minimum length limit at the time of sampling.

Channel Catfish

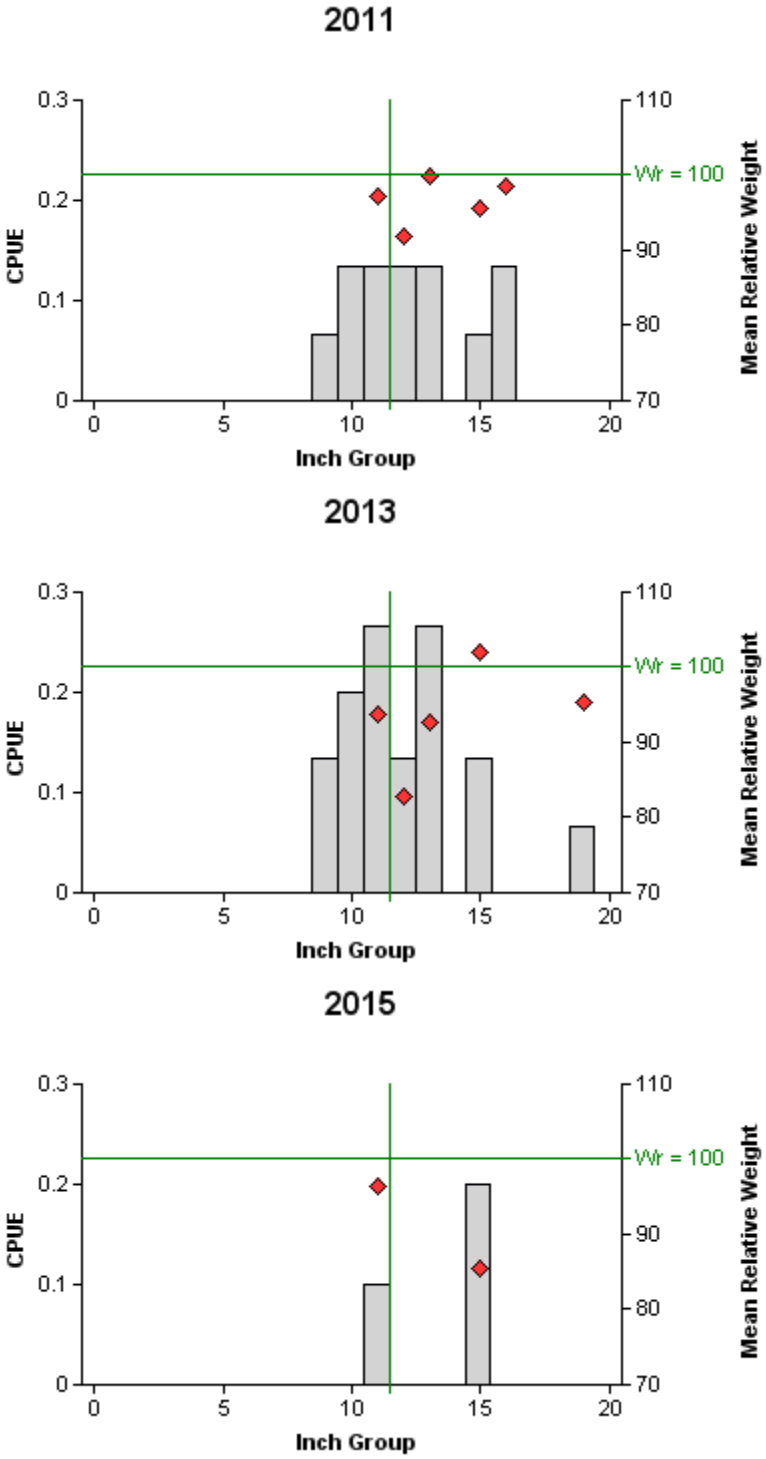


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Travis Reservoir, Texas, 2011, 2013 and 2015. Vertical line represents minimum length limit at the time of sampling.

Flathead Catfish

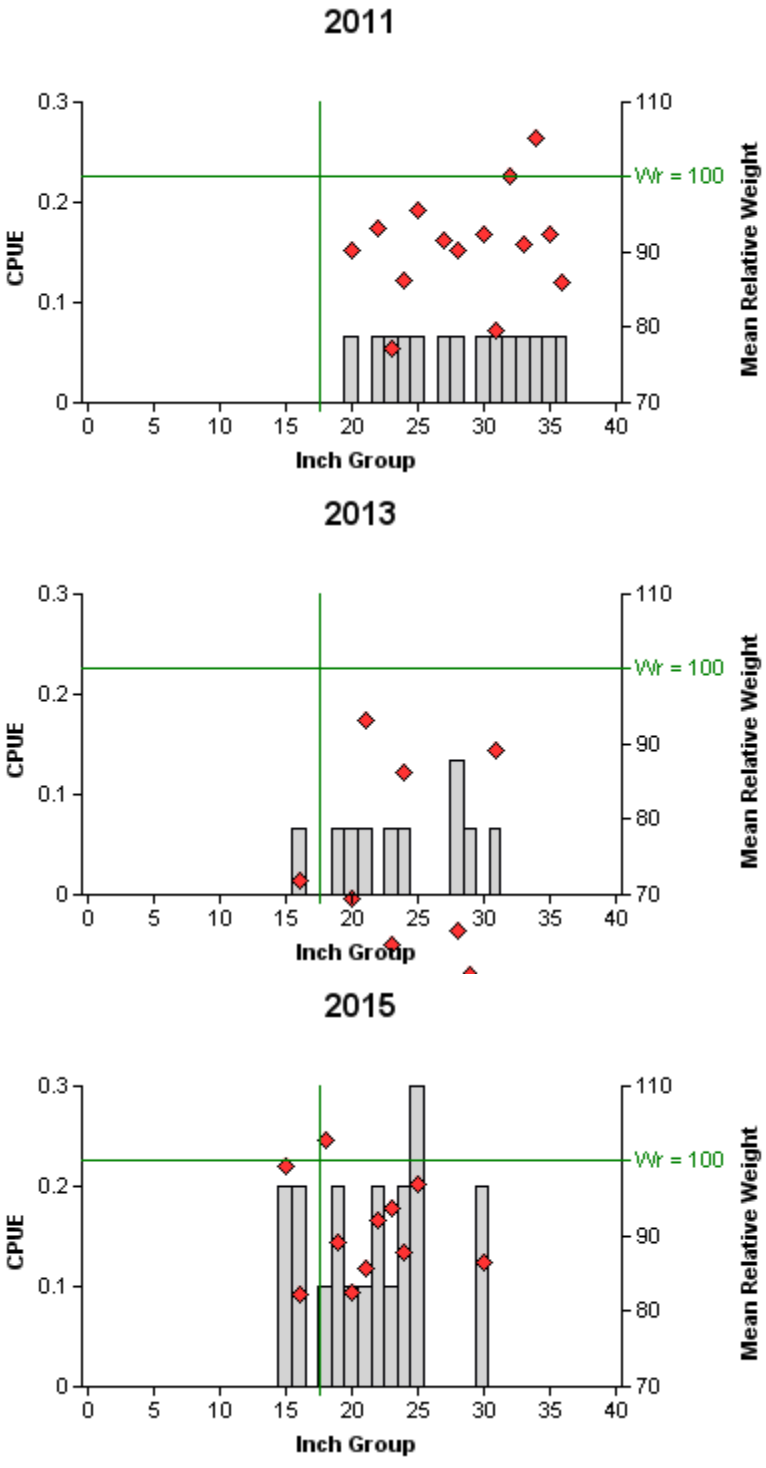


Figure 7. Number of Flathead Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Travis Reservoir, Texas, 2011, 2013 and 2015. Vertical line represents minimum length limit at the time of sampling.

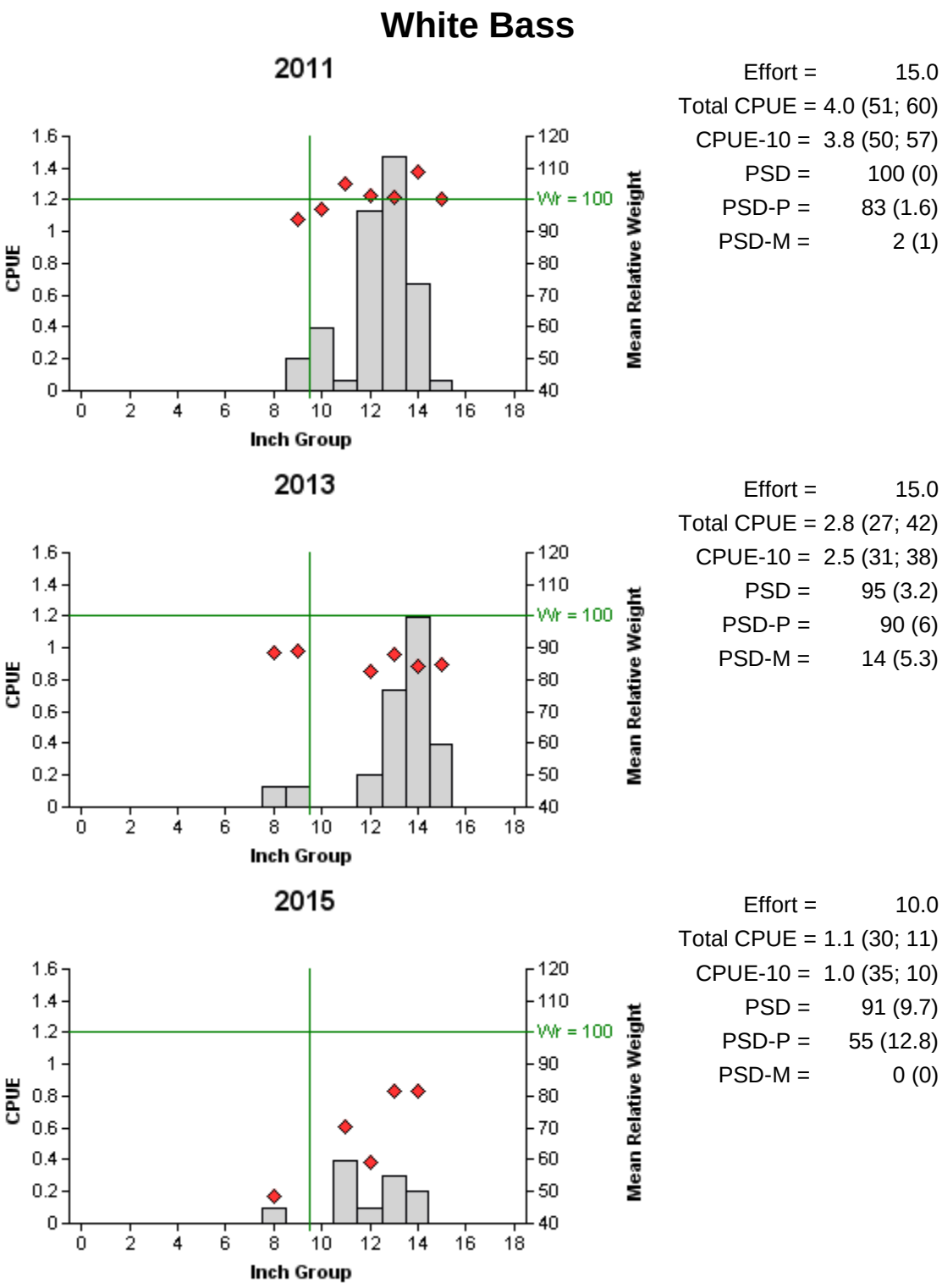


Figure 8. Number of White Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Travis Reservoir, Texas, 2011, 2013 and 2015. Vertical lines represent minimum length limit at the time of sampling.

White Bass

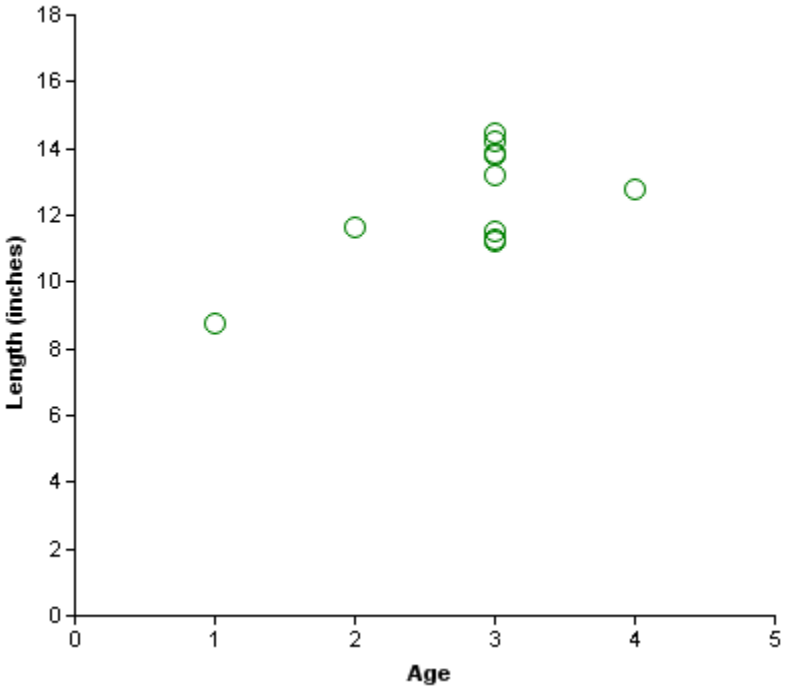


Figure 9. Length at age for White Bass (n=11) collected from gill nets at Travis Reservoir, Texas, April 2015.

Striped Bass

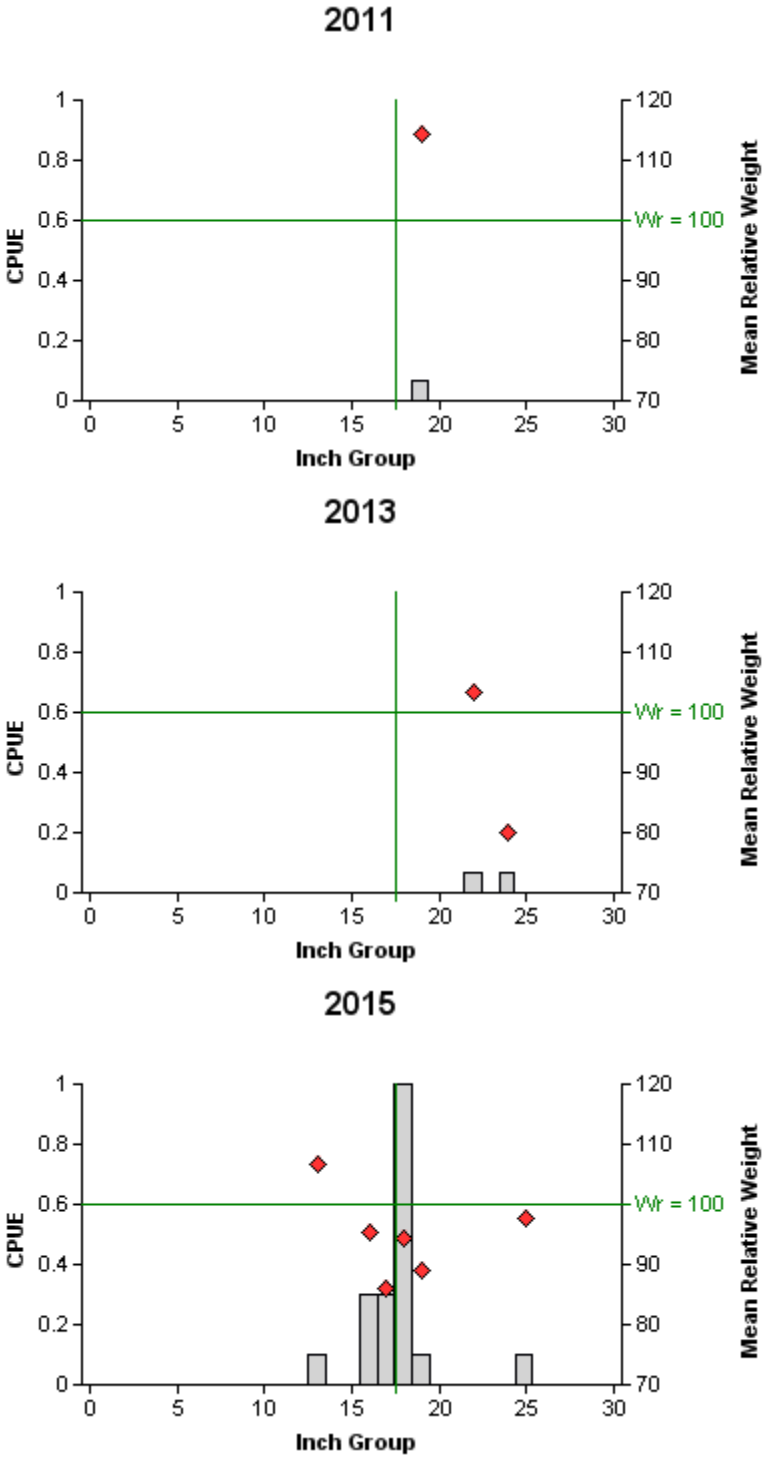


Figure 10. Number of Striped Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Travis Reservoir, Texas, 2006, 2010 and 2014. Vertical lines represent minimum length limit at the time of sampling.

Striped Bass

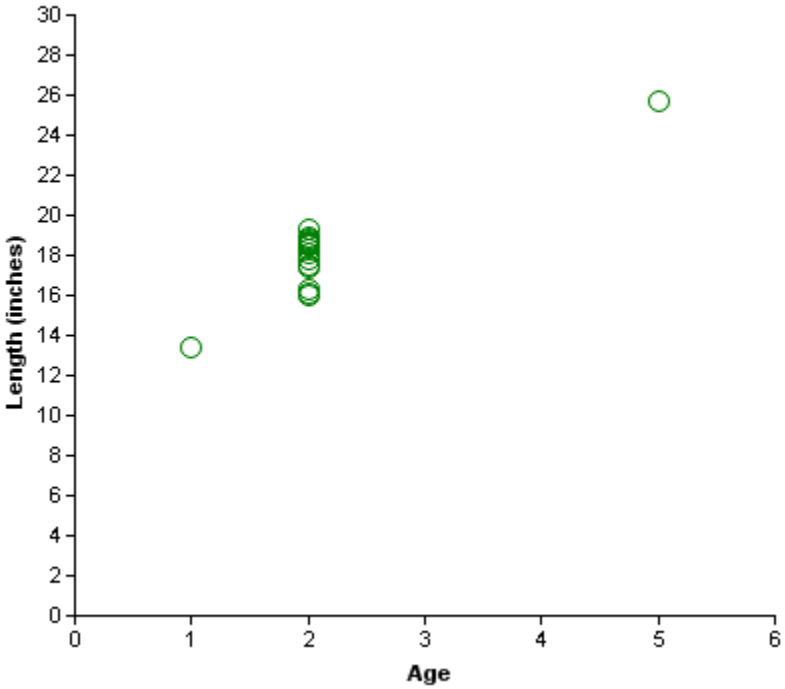


Figure 11. Length at age for Striped Bass (n=19) collected from gill nets at Travis Reservoir, Texas, April 2015.

Largemouth Bass

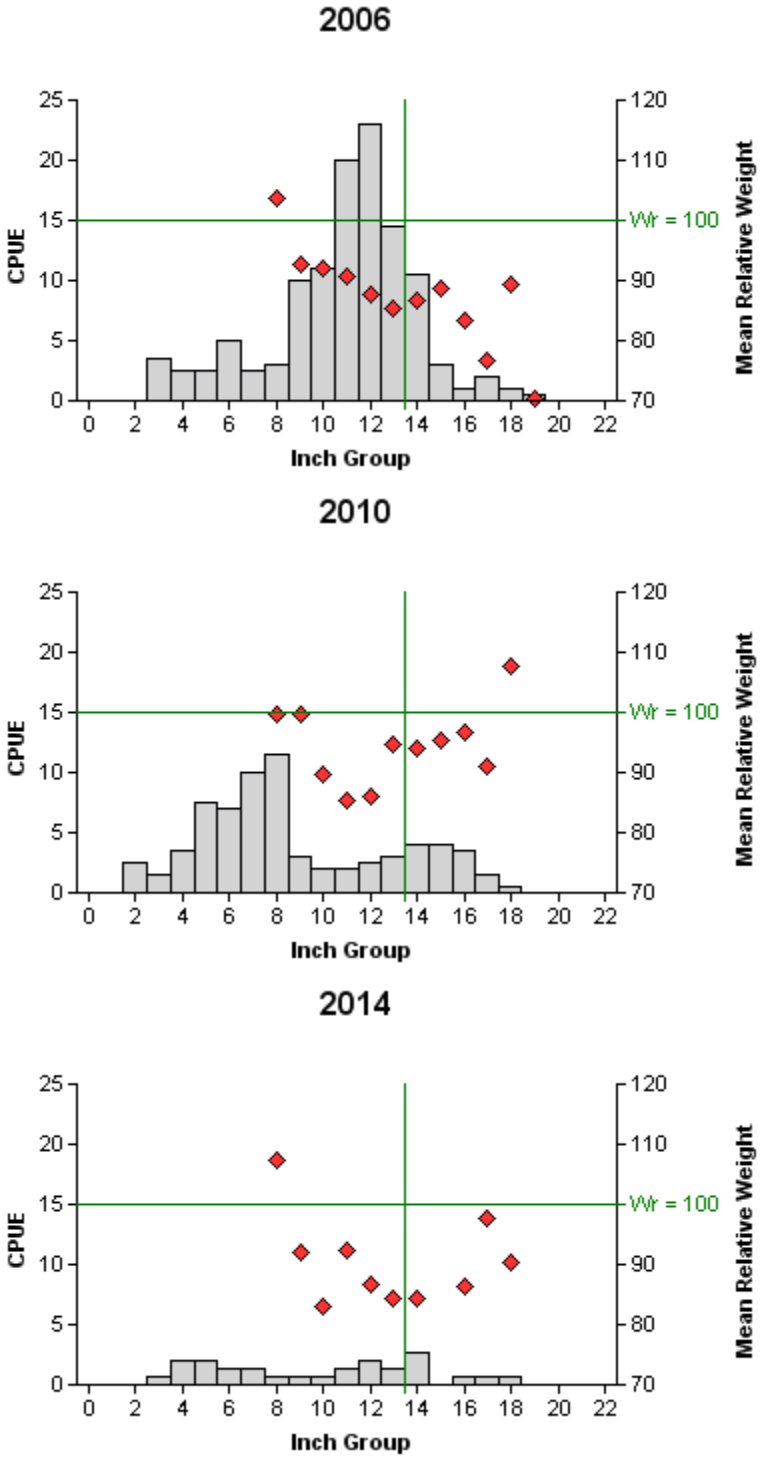


Figure 12. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Travis Reservoir, Texas, 2006, 2010, and 2014. Vertical line represent minimum length limit at the time of sampling.

Largemouth Bass

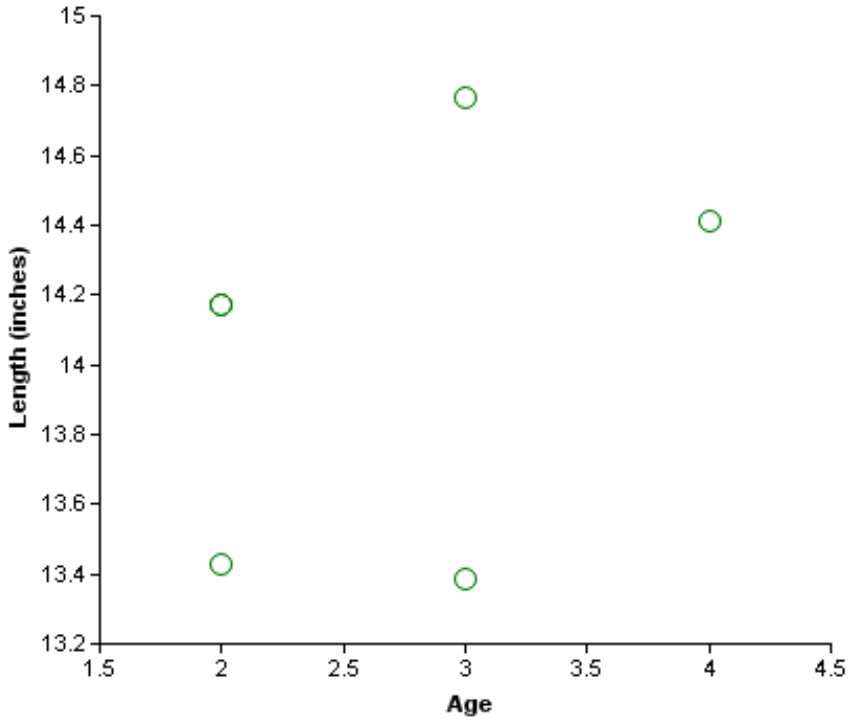


Figure 13. Length at age for Largemouth Bass (n=6) collected from electrofishing at Travis Reservoir, Texas, November 2014.

Table 6. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Travis Reservoir, Texas, 2006, 2010, and 2014. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by micro-satellite DNA analysis.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2006	30	0	29	1	40.0	0.0
2010	30	1	28	1	61.0	3.0
2014	28	0	28	0	51.0	0.0

Table 7. Proposed sampling schedule for Travis Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall (except where noted). Standard survey denoted by S and additional survey denoted by A.

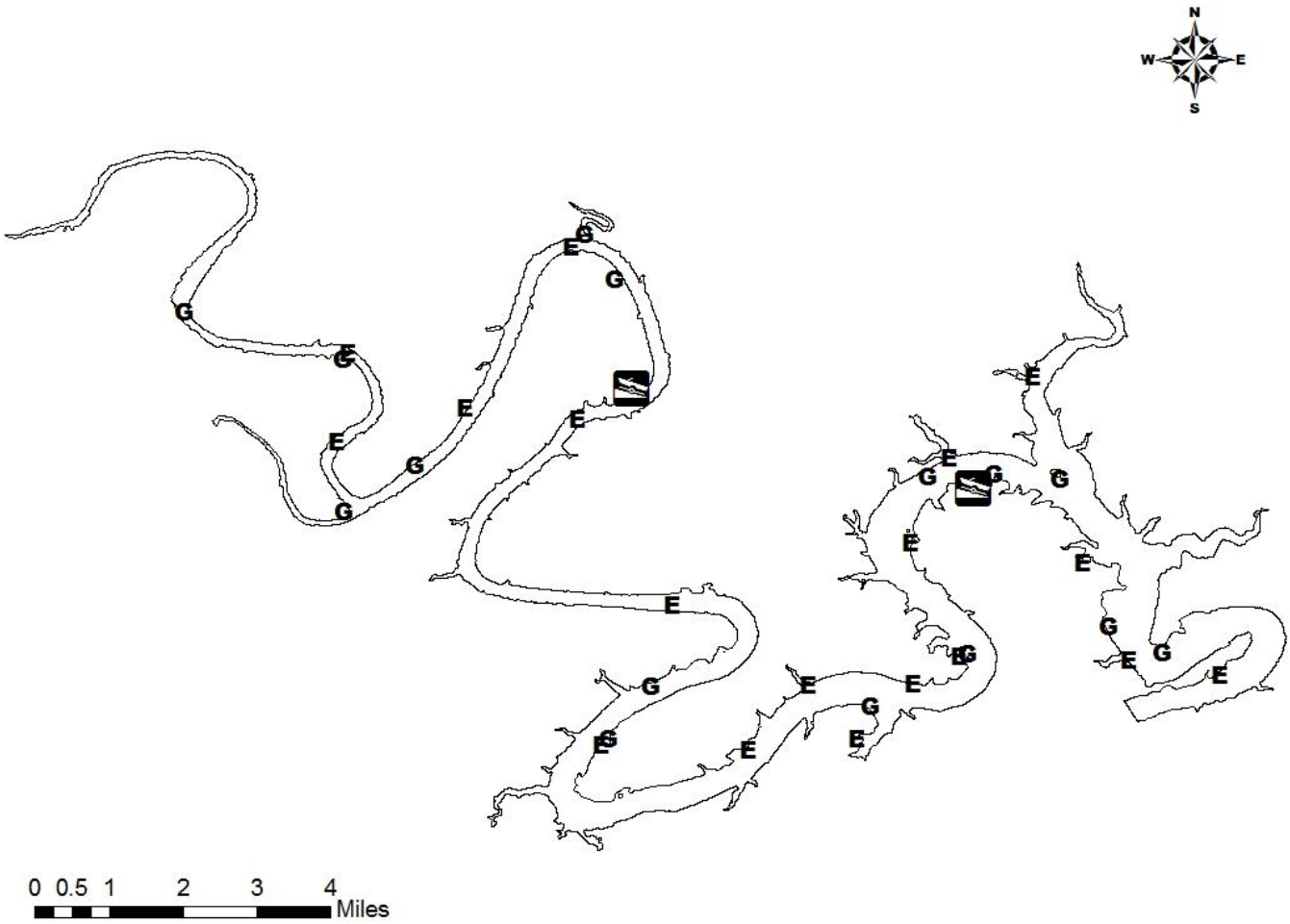
				Habitat				
Survey year	Electrofish Fall(Spring)	Trap net	Gill net	Structural	Vegetation	Access	Creel survey	Report
2015-2016								
2016-2017			A				S	
2017-2018								
2018-2019	S		S	S	S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Travis Reservoir, Texas, 2014-2015. Sampling effort was 10 net nights for gill netting and 1.5 hours for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			196	130.7
Threadfin Shad			1185	790.0
Inland Silverside			2	1.3
Blue Catfish	17	1.7		
Channel Catfish	3	0.3		
Flathead Catfish	19	1.9		
White Bass	11	1.1		
Striped Bass	19	1.9		
Redbreast Sunfish			80	53.3
Green Sunfish			7	4.7
Bluegill			112	74.7
Longear Sunfish			7	4.7
Largemouth Bass			28	18.7
Guadalupe Bass			29	19.3
Blue Tilapia			7	4.7

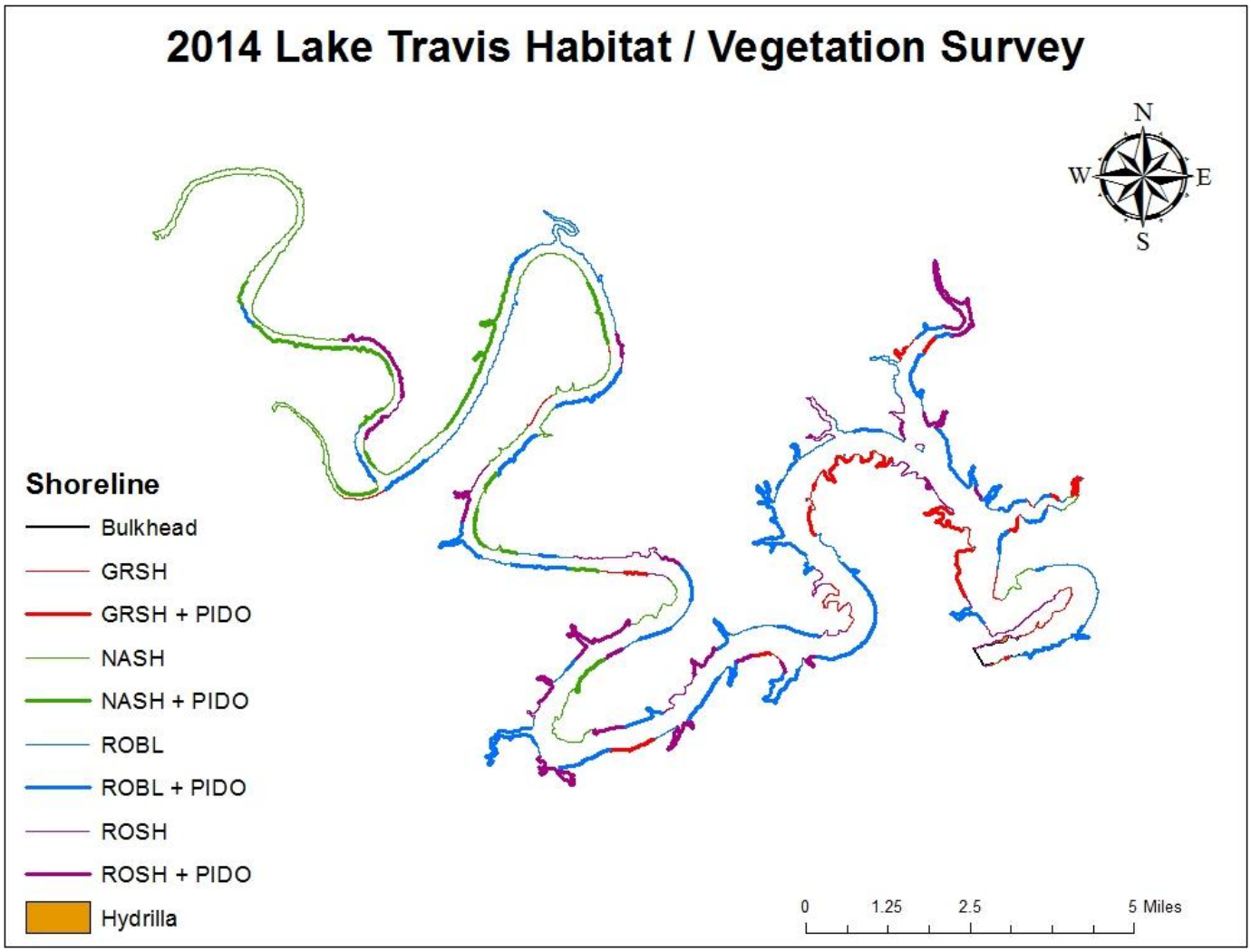
APPENDIX B



Location of sampling sites, Travis Reservoir, Texas, 2014-2015. Gill net and electrofishing stations are indicated by G and E respectively. Boat ramps (in service at the time of sampling) are indicated by the symbol. Water level was 59 ft. below conservation level at the time electrofishing was conducted in November 2014, and 52 ft. below conservation level at the time gill netting was conducted in April 2015.

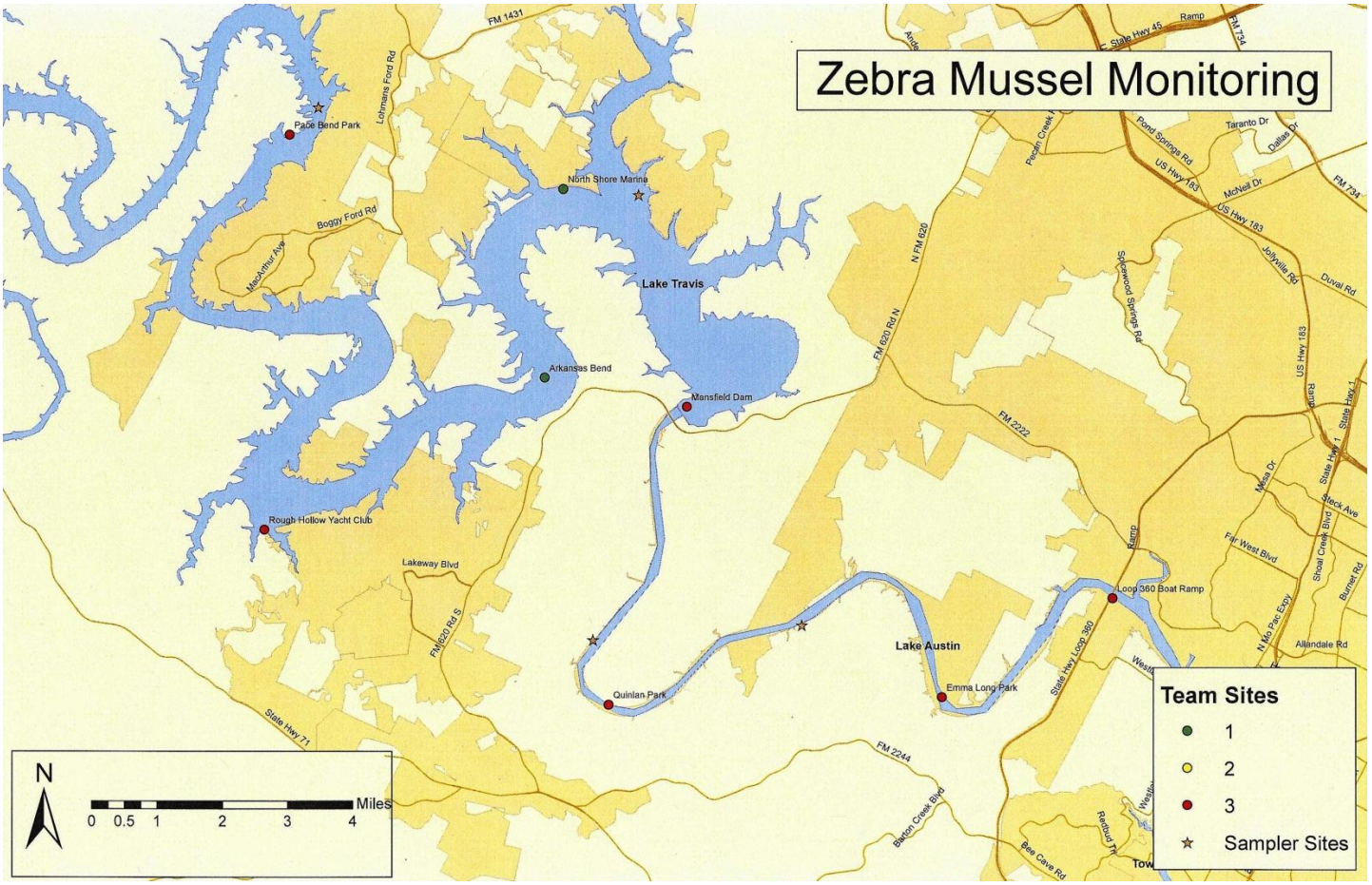
APPENDIX C

Aquatic shoreline habitat and aquatic vegetation survey map for Travis Reservoir, Texas, October 2014. GRSH = gravel shoreline; PIDO = piers and docks; NASH = natural shoreline; ROBL = rock bluff; ROSH = rocky shoreline.



APPENDIX D

Zebra mussel settlement sampler locations (checked monthly) and rock kick-sampling sites “Team Sites” (twice per year) coordinated by LCRA.



APPENDIX E

Saltcedar distribution map for Travis Reservoir, Texas, delineated by TPWD and LCRA, 2013

APPENDIX F

Saltcedar, Travis Reservoir, Texas.

APPENDIX G

Baccharis (front left) is often confused with saltcedar (front right), Travis Reservoir, Texas.