PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-221-M-5

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2014 Fisheries Management Survey Report

Bastrop Reservoir

Prepared by:

Marcos J. De Jesus, District Management Supervisor
and
Mukhtar Farooqi, Assistant District Management Supervisor

Inland Fisheries Division
San Marcos/Austin District
San Marcos, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

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

- **Reservoir Description:** Bastrop Reservoir is a 906-acre impoundment of Spicer Creek, a tributary of the Colorado River, and is located approximately 3 miles northeast of the City of Bastrop, Bastrop County, Texas. The reservoir was constructed in 1965 to supply water for cooling a natural-gas-fired power plant operated by the Lower Colorado River Authority (LCRA). The reservoir has a shoreline development index of 10.5, and lies within a unique ecological area known as the Lost Pines, a 70 square mile area of the Post Oak Savannah ecological area comprised of loblolly pine forests.

- **Management History:** Important sport fish include Largemouth Bass and Channel Catfish. The Florida subspecies of Largemouth Bass was last stocked in Bastrop Reservoir in 1992 to increase Florida Largemouth Bass genetic influence. A 14- to 21-inch slot length limit and a 5-fish daily bag limit (one greater than 21 inches) for Largemouth Bass was implemented in 1993.

- **Fish Community**
  - **Prey species:** Bluegill was the dominant prey species, with Gizzard Shad and other sunfish species available as forage.

  - **Catfishes:** Channel Catfish were present, but population statistics could not be determined due to low sample size. Flathead Catfish were known to be present in lower density.

  - **Largemouth Bass:** Largemouth Bass were abundant. Growth rate to 14 inches remained good. Individuals within the slot limit were abundant and healthy, while individuals above the slot length limit (≥21 inches) remained rare.

- **Management Strategies**
  The reservoir should continue to be managed under current regulations. The harvest of Largemouth Bass less than 14 inches in length should be promoted when possible. Aquatic plant coverage should be monitored annually. Invasive species awareness should be communicated.

INTRODUCTION

This document is a summary of fisheries data collected from Bastrop Reservoir in 2014 and 2015. The purpose of the document is to provide fisheries information and make fisheries 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 species and important prey species. Fisheries management strategies are included to address existing problems or opportunities. Historical data is presented with the 2014 and 2015 data for comparison.

Reservoir Description

Bastrop Reservoir is a stable-level 906-acre impoundment of Spicer Creek, a tributary of the Colorado River, and is located northeast of the City of Bastrop, Bastrop County, Texas. The dam was constructed in 1965 to supply water for cooling a natural-gas-fired power plant operated by the Lower Colorado River Authority (LCRA). The reservoir has a shoreline development index of 10.5, and lies within a unique ecological area known as the Lost Pines, a 70 square mile area of the Post Oak Savannah ecological area comprised of loblolly pine forests. Bastrop Reservoir was hypereutrophic with a mean TSI chl-*a* of 58.2, (Texas Commission on Environmental Quality 2011). Habitat at time of sampling consisted mainly of native and non-native submerged vegetation, emergent native vegetation, and standing timber. Submerged aquatic vegetation in 2014 consisted primarily of eel grass and marine naiad. Other descriptive characteristics for Bastrop Reservoir are listed in Table 1.

Angler Access

At the time of survey Bastrop Reservoir had two public boat ramps and no private boat ramps. The two public ramps, North Shore Park and South Shore Park were controlled by the LCRA, and required entrance fees. Additional boat ramp characteristics are in Table 2. Public bank access included a fishing pier and dock located in each park. Fish-cleaning stations were also available at the parks.

Management History

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

1. Promote the harvest of sub-slot bass on Bastrop Reservoir using signage at the boat ramps and measure the effect of this signage with pre- and post-surveys.
   Action: This approach was not taken due to tasking priorities arrangements caused by staff changes and workforce shortage in 2011 – 2012. Hindsight observations in subsequent years and the implementation of objective based sampling at this reservoir led us to reconsider this approach.

2. Conduct an intensive age-and-growth analysis to measure changes in growth from effects of harvest promotion.
   Action: This strategy became irrelevant when the previous strategy was reconsidered.

3. Cooperate with the controlling authority to post appropriate invasive species awareness signage at access points around the reservoir and educate public on the prevention of spread of aquatic invasive species.
   Action: Invasive species signage was posted at both boat ramp facilities and a sediment sampler was installed at the lake to monitor the presence of zebra mussels.

4. Continue annual aquatic vegetation monitoring.
   Action: Standard aquatic vegetation surveys were conducted every year during this period.

Harvest regulation history: Sport fish in Bastrop Reservoir have been managed with statewide regulations, except for a special slot length limit regulation for Largemouth Bass. The 14- to 21-inch slot-length limit was implemented in 1993 to improve the population size structure. Current regulations are found in Table 3.

Stocking history: Bastrop Reservoir has not been stocked with any species since 1997, when Channel Catfish (CCF) were stocked to supplement the CCF population. Florida Largemouth Bass were introduced starting in 1983 to increase Florida Largemouth Bass genetic influence. The complete stocking history is in Table 4.

Vegetation/habitat management history: Bastrop Reservoir has had a diverse and dynamic submersed aquatic vegetation community history. Aquatic plants offered excellent fish habitat and consistently met optimal levels for maintaining fish production for phylophitic species (Durocher et al. 1984, Dibble et al. 1996). The exotic species *Hydrilla verticillata* has been present in the reservoir and has been monitored closely to prevent operational issues at the power plant. Other exotics, *Myriophyllum spicatum and Najas minor* (slender naiad) remained present in the reservoir; though haven't presented operational concerns.

Water transfer: There are no inter-basin water diversion structures at Bastrop Reservoir.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations) and hoop netting (17 tandem sets for two nights at 17 stations). Catch-per-unit-effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing, and for hoop netting as the number of fish caught per tandem set. Surveys were conducted to achieve survey and sampling objectives in accordance with objective-based sampling plan (Appendix E). All survey sites were randomly selected and all surveys were conducted according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (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) and structural indices [Proportional Size Distribution (PSD); as defined by Guy et al. (2007)], and condition indices [relative weights (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). The Index of Vulnerability (IOV) was used to determine the percentage of Gizzard Shad vulnerable to predation (DiCenzo et al. 1996). Relative standard error (RSE = 100 x SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Ages were determined for Largemouth Bass in fall 2014 using otoliths from 13 individuals between 331 and 381 mm in length (category 2 age analysis; TPWD Procedures Manual, revised 2014).

A structural habitat survey was conducted in 2014. Vegetation surveys were conducted in 2011 – 2014 to monitor expansion of hydrilla. Habitat was assessed with the digital shapefile method (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 from 2005 through 2014 and by electrophoresis for previous years.

RESULTS AND DISCUSSION

Habitat: Littoral zone structural habitat consisted primarily of natural shoreline with emergent native aquatic vegetation. Rocky shoreline sections and mixed-in docks provided extra habitat (Table 5). Submersed aquatic vegetation has remained consistent over the years, consisting mainly of eelgrass *Vallisneria americana. Other native species were present in the system* as well as non-native species, including *Hydrilla verticillata*, *Myriophyllum spicatum* and *Najas minor*. A healthy aquatic vegetation community has been essential in maintaining a robust centrarchid population composition over many years; as aquatic vegetation coverage has remained between 18 and 31% of the lake's surface acreage between 2011 and 2014 (Table 6).

Prey species: Gizzard Shad, Threadfin Shad, and Bluegill electrofishing catch rates were 10.0/h, 1.0/h, and 177.0/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad indicated 20% of the Gizzard Shad were vulnerable to existing predators, better than the IOV estimate in 2010 when it was 0.0% (Figure 1). Gizzard Shad electrofishing CPUE has consistently been low in recent surveys, with the forage base normally dominated by Threadfin Shad and small sunfish. Threadfin Shad catch rate in 2014 declined to 1.0/h from 210/h in 2010; possibly a factor of simply missing them in the survey (sampling error). Future surveys will determine if a true decline is evident. Total CPUE of Bluegill in 2014 was high, but also declined since 2010 (305/h) and 2008 (290/h); while size structure continued to be dominated by small individuals, < 5 inches (Figure 2). Sunfish abundance tends to be correlated with aquatic vegetation coverage. Vegetation coverage was estimated at 25 and 31% in 2010 and 2008, respectively; higher than the 18% estimated in 2014 (Table 6). Other sunfish species were available as forage (Appendix A).

Channel Catfish: Channel Catfish were the focus of objective-based sampling procedures in 2014 – 2015. The total 2015 catch rate for Channel Catfish was 0.18/tandem set; while stock-size catch rate was 0.06/tandem set. This represented three total fish caught over 17 tandem sets of two nights. These results did not meet the objective of collecting a minimum 50 stock-size (11 inches) Channel Catfish for an RSE_{25} at 9 tandem sets. While the high effort might suggest a very low density of Channel Catfish, we suspect that seasonal sampling error might have underrepresented the Channel Catfish population. Bastrop Reservoir has supported a Channel Catfish fishery for years and has been promoted as a prime catfish destination in the district. Gill netting total catch rate for Channel Catfish in 2003, 2007 and 2011 was 9.4/nn, 7.6/nn and 4.4/nn, respectively; with a historical average total catch rate of 6.5/nn since 1998 (De Jesus and Magnelia, 2011). Though a declining trend was noticeable, we doubt the tandem hoop net results were representative of the population. Most likely we failed to collect fish due to set dates in spring (May 2015). Studies by Cunningham and Cofer (2000) and Wallace et al. (2011) suggest that Channel Catfish catch rates in tandem hoop nets increase significantly in summer and fall seasons relative to spring when catch rates were low. The TPWD procedure recommends late summer sets; however the late availability of our new gear during the sample year forced us to wait until spring to have our best chances for returns. Further surveys need to follow this effort to get a better feel for the Channel Catfish population.

Largemouth Bass: The electrofishing catch rate of stock-length Largemouth Bass was 143/h and 122/h in 2012 and 2014, respectively (Figure 3). These catch rates were similar to the last reported survey in 2010 (119/h). Size structure slightly improved since 2010, with PSD's in the 70's. The catch rate of Largemouth Bass greater than 14 inches (CPUE14) increased to 75/h in 2014 since 2010 when it was 45/h (Figure 3). Once again, electrofishing surveys in 2012 and 2014 have failed to collect a single bass ≥21 inches in length, confirming low abundance of these individuals. It is expected that slow growth within the slot length limit makes it rare to see individuals live long enough to surpass the upper slot length of 21 inches. As previously reported (De Jesus and Magnelia 2007), the forage base in Bastrop Reservoir is almost exclusively composed of small individuals (2 - 4 inches). Predators of all sizes are limited to this

smaller forage and larger predators must expend more energy to fulfill their energetic needs with the lack of larger-sized forage species. Even though the practice of catch-and-release among bass anglers is persistently strong, and recommended large-scale harvest of sub-slot fish to help improve population structure has been minimal; growth of sub-slot fish appears to have improved since the last survey in 2010. Individuals averaged 14 inches by age-2 (N = 13; range = 1 – 3 years) (Figure 4). This growth was above average for the ecological region (Prentice 1987). Strategies to develop a trophy Largemouth Bass fishery in Bastrop Reservoir have been presented since the 1980's; still this fishery has resiliently maintained itself a quality-size, high-catch fishery. While trophy-size fish are seldom reported or sampled, we consistently see good numbers of healthy quality fish. Body condition (W_r) in 2014 and 2012 were very good (relative weights above 90) for nearly all size classes of fish, with many size groups being optimal (≥ 100; Figure 3). This was similar to what was seen in the 2010 survey. Florida Largemouth Bass influence has remained relatively constant as Florida alleles have ranged from 74 to 86%, despite no Florida genotype collected in 2014 (Table 7).

Fisheries management plan for Bastrop Reservoir, Texas

Prepared - July 2015.

ISSUE 1 Largemouth Bass growth within the slot has been historically poor, with few fish in older age classes exceeding 18 inches in length. There have been no bass collected during electrofishing surveys since 1998 exceeding 21 inches in length. Many approaches to develop a trophy bass fishery or generate more memorable catches have been proposed since the 1980's without success. Age and growth, angler catch and electrofishing data since the slot length limit regulation change indicated there was little potential for trophy (>21 inches) bass in this reservoir. Slow growth may be explained by possible intraspecific competition among all size groups and/or lack of larger forage items. Decreasing intraspecific competition may improve growth. In all, Bastrop reservoir is a very popular bass fishery providing quality/quantity fishing experiences.

MANAGEMENT STRATEGY

1. Fish cleaning tables are available at both boat ramps. In collaboration with the Lower Colorado River Authority, promote the harvest of sub-slot bass on Bastrop Reservoir using signage at the boat ramps.
2. Continue to manage fishery under existing regulations.

ISSUE 2: Bastrop Reservoir has been known to support a quality Channel Catfish fishery over the years. Historic gill netting surveys have revealed a moderate-density population with a declining catch rate from 2003 to 2011. The use of tandem hoop net sets, designed to target this species failed to capture data for this species; most likely due to seasonal sampling error. It is important to gather data for this population to monitor its sustainability for the fishery.

MANAGEMENT STRATEGIES

1. Conduct an additional tandem hoop netting survey in summer 2016 to replicate our effort during the recommended sampling season (Table 8).

ISSUE 3: Bastrop Reservoir supported a diverse aquatic plant community typified by between-year variability in total and individual plant coverage. Mechanical harvesters and herbicide treatments have historically been utilized by the LCRA to control plants, especially hydrilla. However, these plants offered excellent habitat for littoral fishes (e.g., Largemouth Bass and sunfishes) and major changes in plant coverage had the potential to impact fish populations. Monitoring information on aquatic vegetation coverage was valuable when interpreting fisheries data.

MANAGEMENT STRATEGY

1. Continue annual aquatic vegetation monitoring.

ISSUE 4: 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

2. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
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 for Bastrop Reservoir

2018 - 2019

Sport fish, forage fish, and other important fishes

Sport fishes in Bastrop Reservoir include Largemouth Bass and Channel Catfish. Known important forage species include Bluegill, Redear Sunfish, Redbreast Sunfish, and Threadfin Shad.

Negligible fisheries

White Crappie: White Crappie were stocked in Bastrop reservoir in 1992 and are present, but population abundance is very low, based on poor captures in historic trap netting surveys. A creel survey in 2004 did not identify directed effort for this species, revealing little interest by anglers to pursue this species at Bastrop reservoir. Sampling this population is unnecessary in FYs 2018-2019.

Blue Catfish: Blue Catfish were stocked in Bastrop Reservoir from 1969 to 1971 and are expected to be present in low abundance. Anecdotal catch reports for this species by anglers in recent years are the only evidence of their existence in the lake. The high abundance and dominance of Channel Catfish in this reservoir hints at the failure of Blue Catfish to have established a strong population. The effect of strong Blue Catfish populations outcompeting Channel Catfish is seen in other district lakes. Water conditions at this power plant reservoir do not provide the typical habitat features of lakes where Blue Catfish flourish. Our gill netting surveys since 2006 have failed to collect Blue Catfish specimens. Sampling this population is unnecessary in FYs 2018-2019.

Flathead Catfish: Flathead Catfish were present in low abundance, based on gill netting surveys conducted between 1998 and 2011. During this time, CPUE total averaged 0.8 fish/nn, and ranged between 0.2 and 2.0 fish/nn. A creel survey in 2004 did not identify directed effort for this species, revealing little interest by anglers to pursue this species at Bastrop reservoir. Sampling this population is unnecessary in FYs 2018-2019.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are the most popular sport fish in Bastrop Reservoir. The popularity and reputation for quality Largemouth Bass fishing at this reservoir warrant sampling time and

effort. Results from a 2004 creel survey showed directed angling effort for Largemouth Bass to be 17 hours/acre, and accounted for 69% of the total directed effort. Largemouth Bass are managed with a 14- to 21-inch slot regulation. While few fish grow past the slot, this lake is known for quality fish and good catch rates (0.77/h in 2004). Trend data on CPUE, size structure, and body condition have been collected biennially since 2002 with fall nighttime electrofishing. The population appears to be in good shape, and anglers are anecdotally satisfied with the fishing; most were satisfied with the restrictive harvest regulation in the 2004 creel survey. Continuation of biennial trend data in this clear reservoir with night electrofishing in the fall will allow for determination of any large-scale changes in the Largemouth Bass population that may spur further investigation. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in 2018, 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). Exclusive of the original 12 random stations, three additional random stations will be pre-determined in the event some extra sampling is necessary. If failure to achieve either objective has occurred after one night of sampling and objectives can be attained with 6-12 additional random stations, another night of effort will be expended.

Channel Catfish: The 2004 creel survey indicated Channel Catfish angling comprised >3.7% of total angling effort (second to Largemouth Bass). Gill netting total CPUE ranged from 4.4 to 9.4 fish/nn (6.6 fish/nn average) from 2001 to 2011, providing only an average of 32 stock-size and larger fish per survey. These data only allowed us to determine presence or absence of the population. We would like to collect information allowing us to monitor size structure and body condition. We propose switching from standard gill nets, set overnight to tandem hoop nets set for two nights. We anticipate that setting a minimum of nine tandem hoop nets, with a soak time of two nights, will achieve our sampling objective (50 Channel Catfish >11 inches; RSE of CPUE-S ≤ 0.25). A minimum of nine randomly selected tandem hoop netting sites will be sampled in summer 2018, 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 nine stations with 75% confidence). Exclusive of the original nine random stations, nine additional random stations will be pre-determined in the event some extra sampling is necessary. If failure to achieve either objective has occurred after one soak session, and objectives can be attained with up to nine additional random stations, another soak session of effort will be expended.

Sunfish and Threadfin Shad: Bluegill, Redear Sunfish, Redbreast Sunfish, and Threadfin Shad are the primary forage at Bastrop Reservoir. Like Largemouth Bass, trend data on CPUE and size structure of these sunfish have been collected biennially since 1996. Abundance of Threadfin Shad was also measured as a function of CPUE during those surveys, and will remain the main sampling objective to measure Threadfin Shad abundance. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in sunfish relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers of sunfish for size structure estimation (PSD and IOV; 50 fish minimum at 5-12 stations with 80% confidence) but not for relative abundance estimates (RSE ≤ 25 of CPUE-Total; anticipated effort is 25-30 stations). At the sampling effort needed to achieve sampling objectives for Largemouth Bass, the expected RSE for CPUE-T is 30 for sunfish species combined. No additional effort will be expended to achieve an RSE25 for CPUE of sunfish. 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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Table 1. Characteristics of Bastrop Reservoir, Texas

Characteristic	Description
Year constructed	1965
Controlling authority	LCRA
Counties	Bastrop
Reservoir type	Power plant cooling reservoir
Shoreline development index (SDI)	10.5
Conductivity	1,573 µs/cm

Table 2. Boat ramp characteristics for Bastrop Reservoir, Texas, September, 2014. Reservoir elevation at time of survey was 450 feet above mean sea level. This is a stable-level reservoir.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
North Shore Park	30.16571 -97.28069	Y	54	443	Good
South Shore Park	30.14109 -97.28503	Y	36	443	Good; some aquatic vegetation encroaching

Table 3. Harvest regulations for Bastrop Reservoir.

Species	Bag limit	Length limit (inches)
Flathead Catfish	5	18 minimum
Catfish: Channel and Blue	25	12 minimum
Bass: Largemouth	5*	14- to 21-inch slot
Crappie: White and Black Crappie, their hybrids and subspecies	25	10 minimum

*Only one may be over 21 inches.

Table 4. Stocking history of Bastrop 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)
Black Crappie x White Crappie	1993	90,400	FRY	0.9
	1994	110,753	FRY	0.9
	1995	103,738	FRY	0.9
	Total	304,891		
Blue Catfish	1969	4,425	UNK	UNK
	1970	4,615	UNK	UNK
	1971	4,644	UNK	UNK
	Total	13,684		
Channel Catfish	1969	5,517	AFGL	7.9
	1970	4,683	AFGL	7.9
	1971	4,610	AFGL	7.9
	1982	500	UNK	UNK
	1990	6,208	ADL	11.2
	1997	8,300	AFGL	7.0
	Total	29,818		
Florida Largemouth Bass	1983	41,713	FGL	2.0
	1984	17,056	FGL	3.0
	1990	90,551	FRY	0.8
	1991	771	ADL	9.0
	1991	90,872	FGL	1.3
	1992	59,509	FGL	1.1
	1992	31,101	FRY	0.9
	Total	331,573		
Green Sunfish x Redear Sunfish	1972	1,980		UNK
	Total	1,980		
Kemp's Largemouth Bass	1985	46,314		1.0
	1986	45,400		1.0
	Total	91,714		
Palmetto Bass (Striped X White Bass hybrid)	1972	1,800	FGL	1.5
	1973	9,760	FGL	1.5
	1974	10,400	UNK	UNK
	1975	9,086	UNK	UNK
	Total	31,046		
Peacock Bass	1978	519		UNK
	1979	3,234		UNK
	Total	3,753		
White Crappie	1992	94,577	FRY	0.6
	Total	94,577		

Table 5. Survey of structural habitat types, Bastrop Reservoir, Texas, 2014. Shoreline habitat type units are in miles and standing timber is acres.

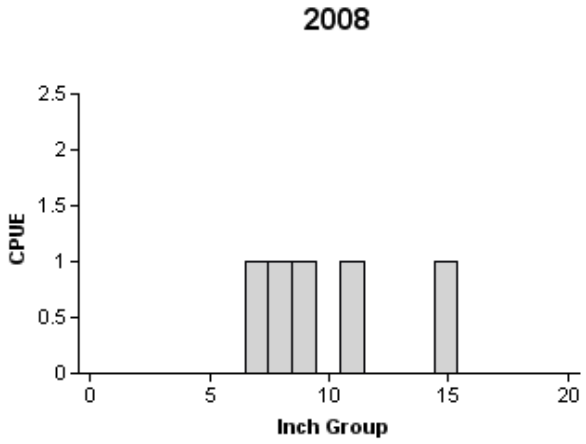
Habitat type	Estimate	% of total
Bulkhead	1.68 miles	10.0
Bulkhead with boat docks	0.18 miles	1.0
Natural	14.64 miles	84.0
Natural with boat docks	0.02 miles	< 1.0
Rocky	0.87 miles	5.0
Rocky with boat docks	0.03 acres	< 1.0
Standing timber	21.0 acres	2.0

Table 6. Survey of aquatic vegetation, Bastrop Reservoir, Texas, 2011 – 2014. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

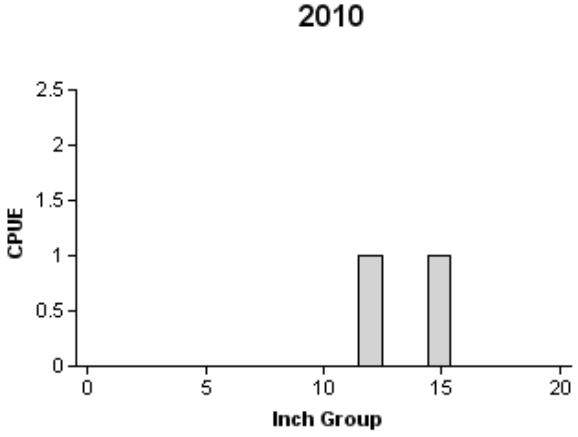
Vegetation	2011	2012	2013	2014
Native submersed	145.0 (16.0)	168.0 (18.5)	281.0 (31.0)	160.0 (17.7)
Native floating-leaved	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Native emergent*	7.0 (< 1.0)	7.0 (< 1.0)	7.0 (< 1.0)	7.0 (< 1.0)
Non-native				
Hydrilla (Tier I)**	95.0 (10.5)	1.5 (< 1.0)	9.0 (1.0)	1.0 (< 1.0)
Eurasian watermilfoil (Tier III)**	2.0 (< 1.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

*Coverage estimated from shoreline mileage of bulrush (2.9) from 2010 shoreline survey at an average 20 feet of width from the shoreline. Bulrush coverage changes little over the years at Bastrop Reservoir.
**Tier I is immediate Response, Tier III is Watch Status.

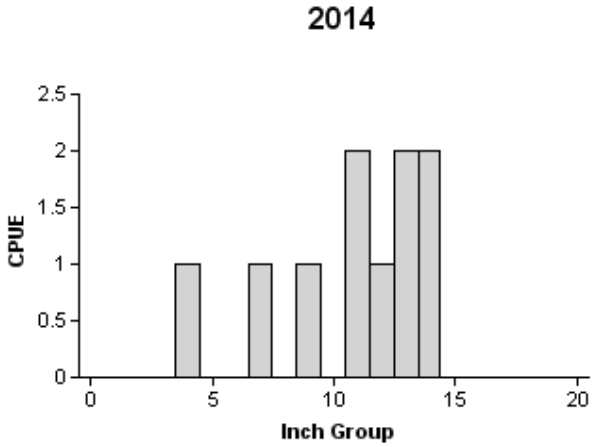
Gizzard Shad



Effort =	1.0
Total CPUE =	5.0 (55; 5)
IOV =	20 (15.6)



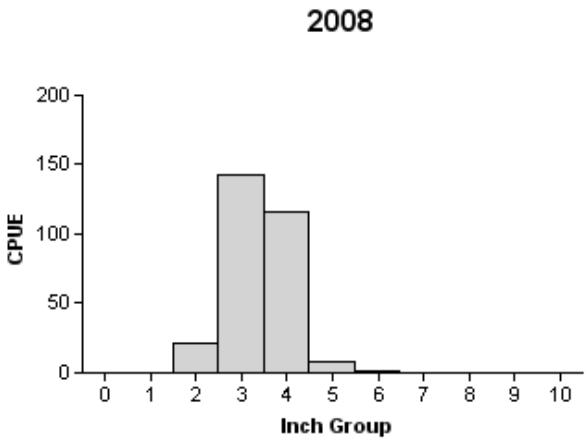
Effort =	1.0
Total CPUE =	2.0 (67; 2)
IOV =	0 (0)



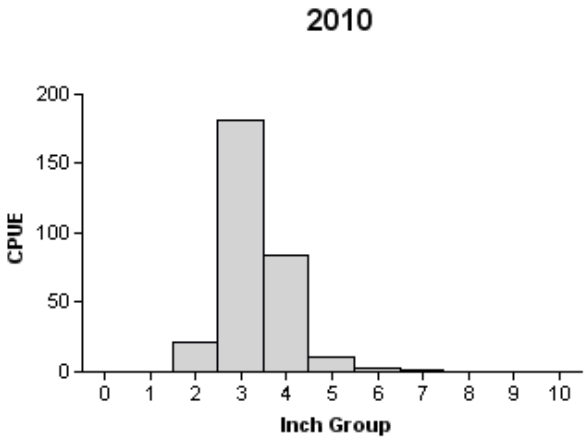
Effort =	1.0
Total CPUE =	10.0 (44; 10)
IOV =	20 (8.4)

Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Bastrop Reservoir, Texas, 2008, 2010, and 2014.

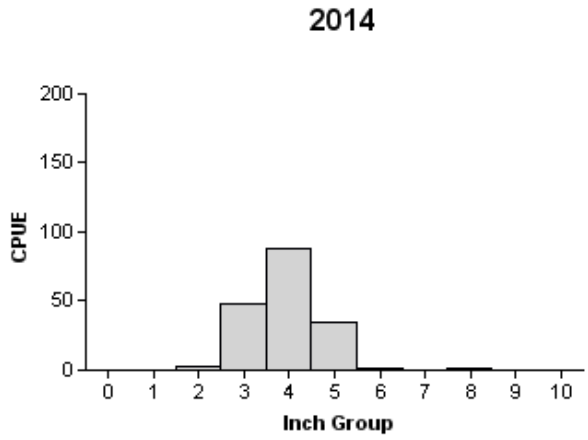
Bluegill



Effort = 1.0
Total CPUE = 290.0 (20; 290)
PSD = 0 (0.4)



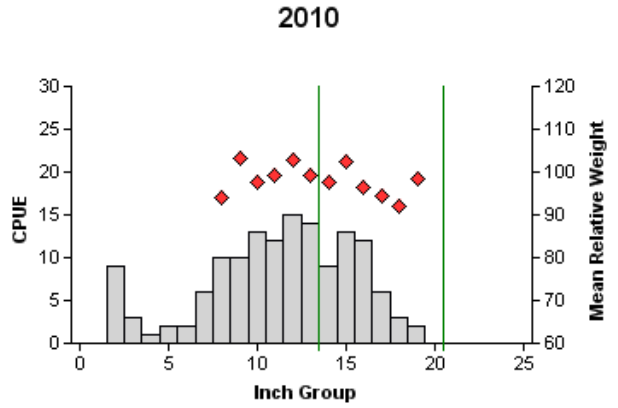
Effort = 1.0
Total CPUE = 302.0 (24; 302)
PSD = 1 (0.8)



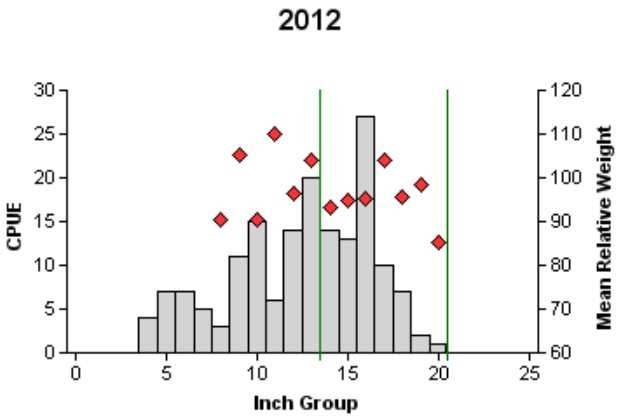
Effort = 1.0
Total CPUE = 177.0 (20; 177)
PSD = 2 (1)

Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Bastrop Reservoir, Texas, 2008, 2010, and 2014.

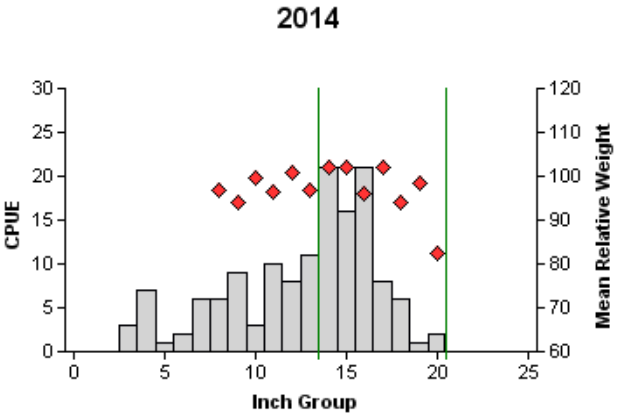
Largemouth Bass



Effort =	1.0
Total CPUE =	142.0 (21; 142)
Stock CPUE =	119.0 (26; 119)
CPUE-14 =	45.0 (32; 45)
CPUE-21 =	0.0 (0; 0)
PSD =	62 (8.3)
PSD-14 =	38 (5.4)
PSD-21 =	0 (0)

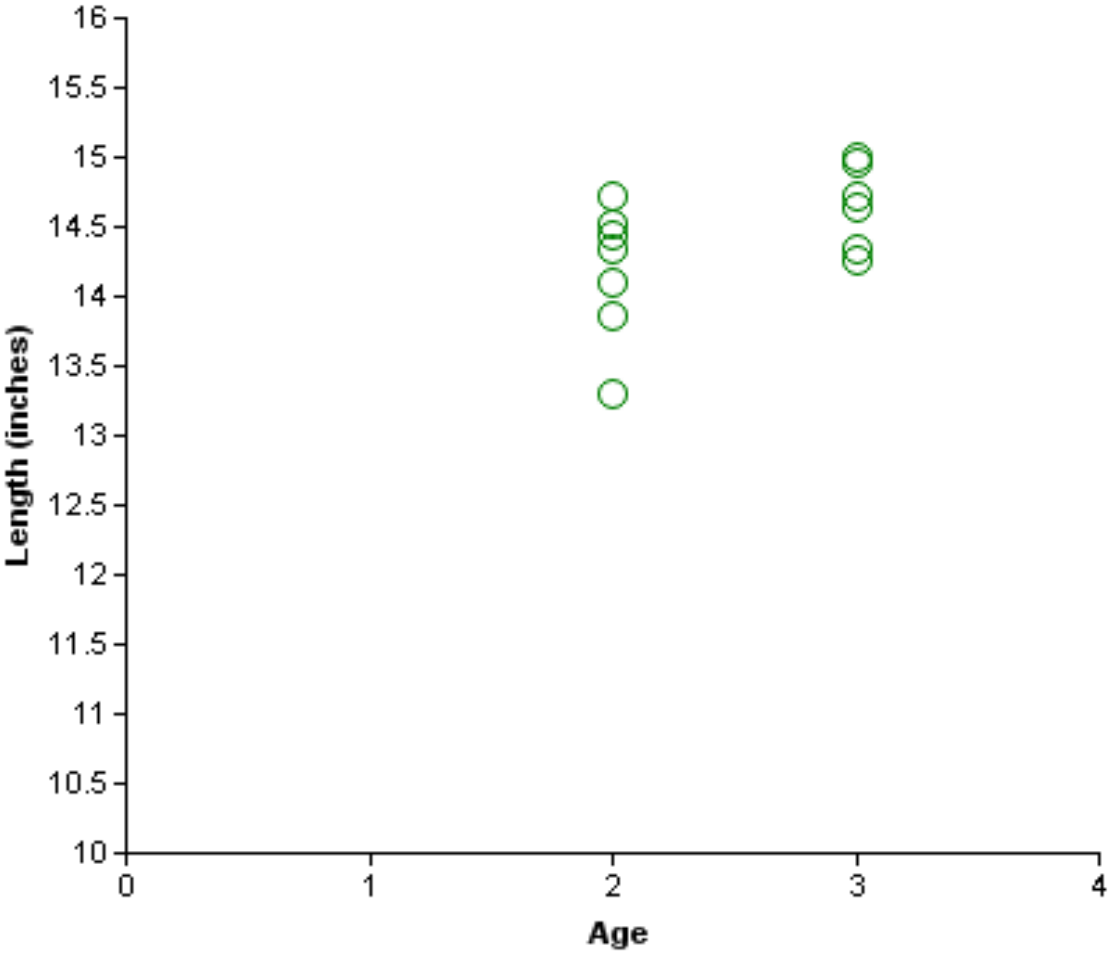


Effort =	1.0
Total CPUE =	166.0 (8; 166)
Stock CPUE =	143.0 (12; 143)
CPUE-14 =	74.0 (17; 74)
CPUE-21 =	0.0 (0; 0)
PSD =	76 (3.8)
PSD-14 =	52 (4.6)
PSD-21 =	0 (0)



Effort =	1.0
Total CPUE =	141.0 (14; 141)
Stock CPUE =	122.0 (13; 122)
CPUE-14 =	75.0 (17; 75)
CPUE-21 =	0.0 (0; 0)
PSD =	77 (5.1)
PSD-14 =	61 (5.3)
PSD-21 =	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, Bastrop Reservoir, Texas, 2010, 2012, and 2014. Slot length limit indicated by vertical lines.



Mean Length (in.)	Survey Year	Age	Number of Fish
14.18	2014	2	7
14.65	2014	3	6

Figure 4. Length at age for Largemouth Bass collected by electrofishing at Bastrop Reservoir, Texas, November 2014 (N=13).

Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Bastrop Reservoir, Texas, 2002, 2006, and 2014. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2002	29	16	13	0	86.4	55.2
2006	30	3	27	0	74.0	10.0
2014	30	0	30	0	81.0	0.0

Table 8. Proposed sampling schedule for Bastrop 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.

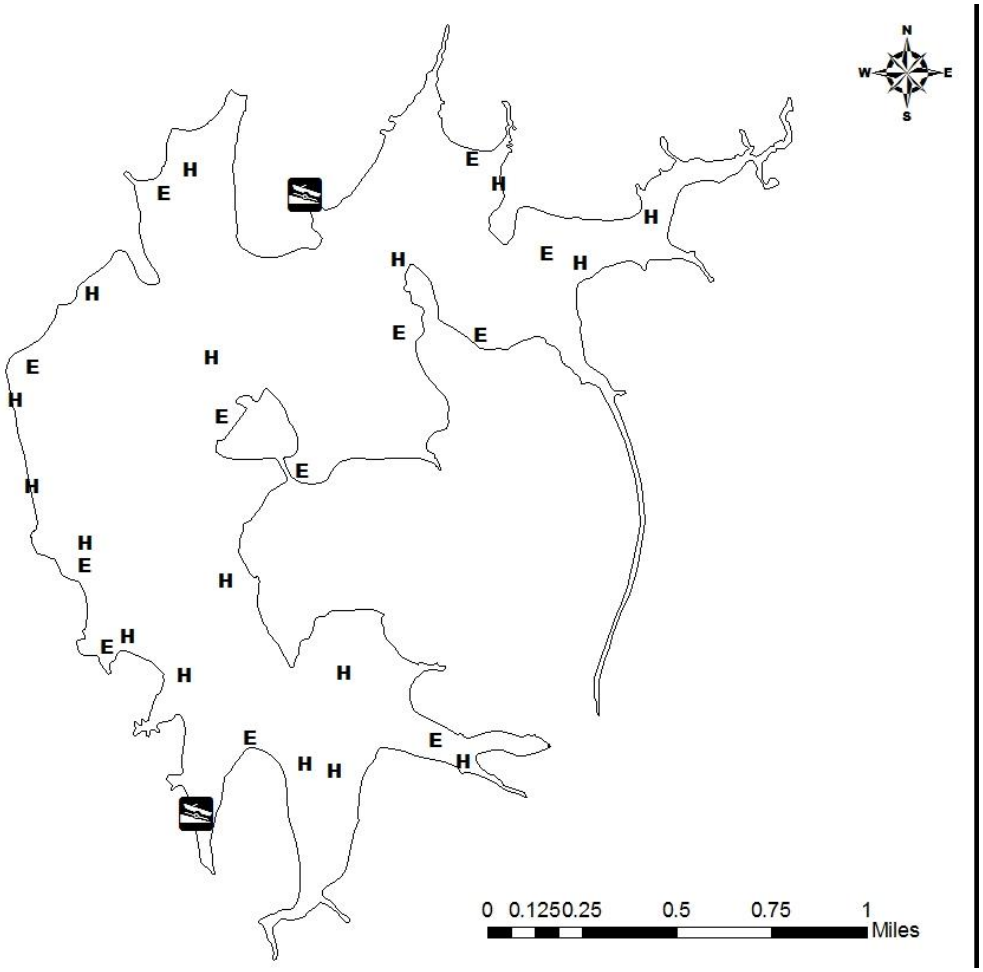
					Habitat				
Survey year	Electrofish Fall(Spring)	Trap net	Gill net	Hoop Net	Structural	Vegetation	Access	Creel survey	Report
2015-2016						A			
2016-2017	A			A		A			
2017-2018						A			
2018-2019	S			S		S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Bastrop Reservoir, Texas, 2014-2015. Sampling effort was 17 tandem sets for hoop netting and 1 hour for electrofishing.

	Electrofishing		Hoop Netting	
Species	CPUE	N	CPUE	N
Gizzard Shad	10.0	10		
Threadfin Shad	1.0	1		
Channel Catfish			0.2	3
Redbreast Sunfish	12.0	12		
Warmouth	1.0	1		
Bluegill	177.0	177		
Redspotted Sunfish	24.0	24		
Largemouth Bass	141.0	141		
Rio Grande Cichlid	3.0	3		
Hybrid sunfish	1.0	1		

APPENDIX B



Location of sampling sites, Bastrop Reservoir, Texas, 2014-2015. Hoop net and electrofishing stations are indicated by H and E, respectively. Water level was near full pool at time of sampling.

APPENDIX C

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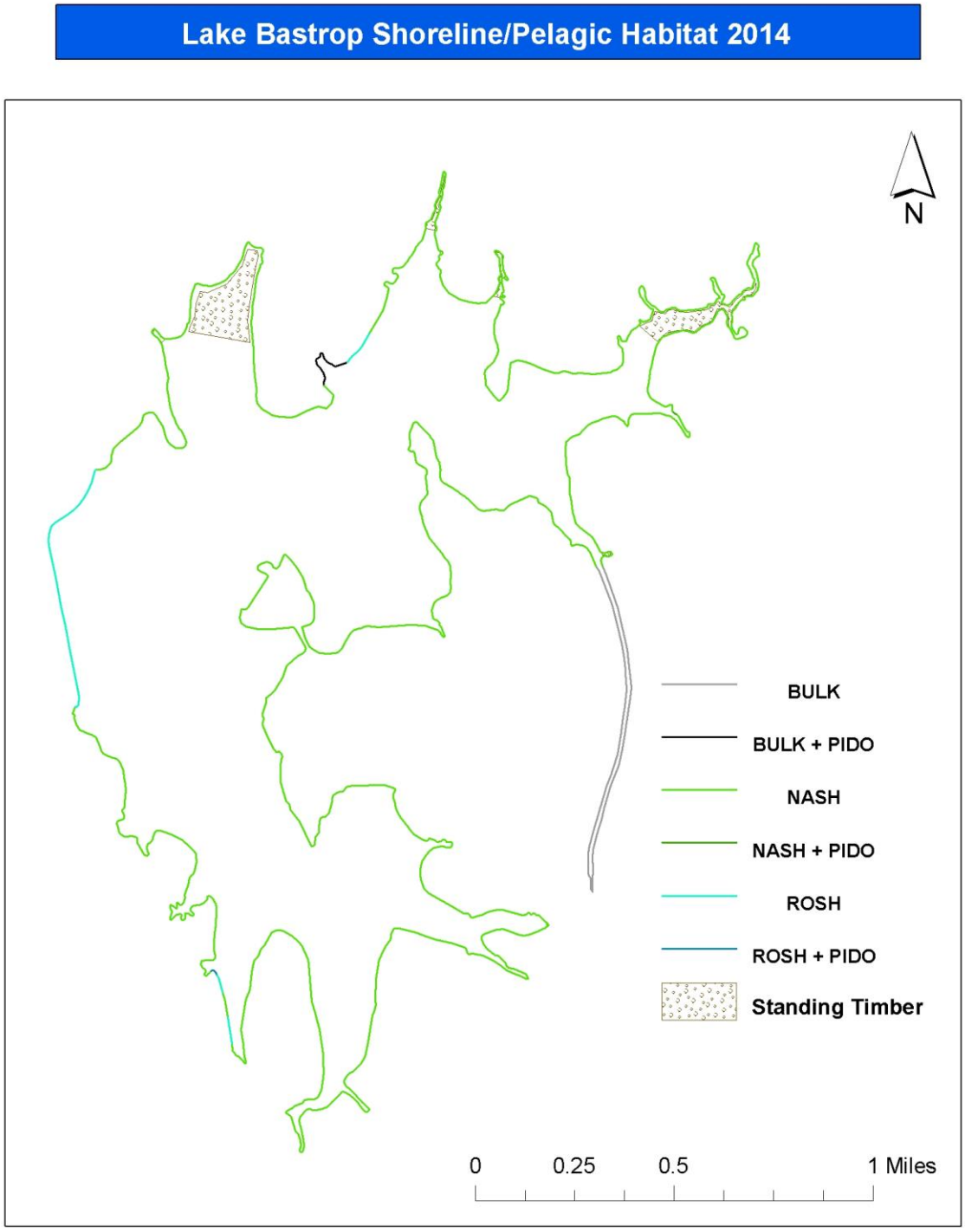
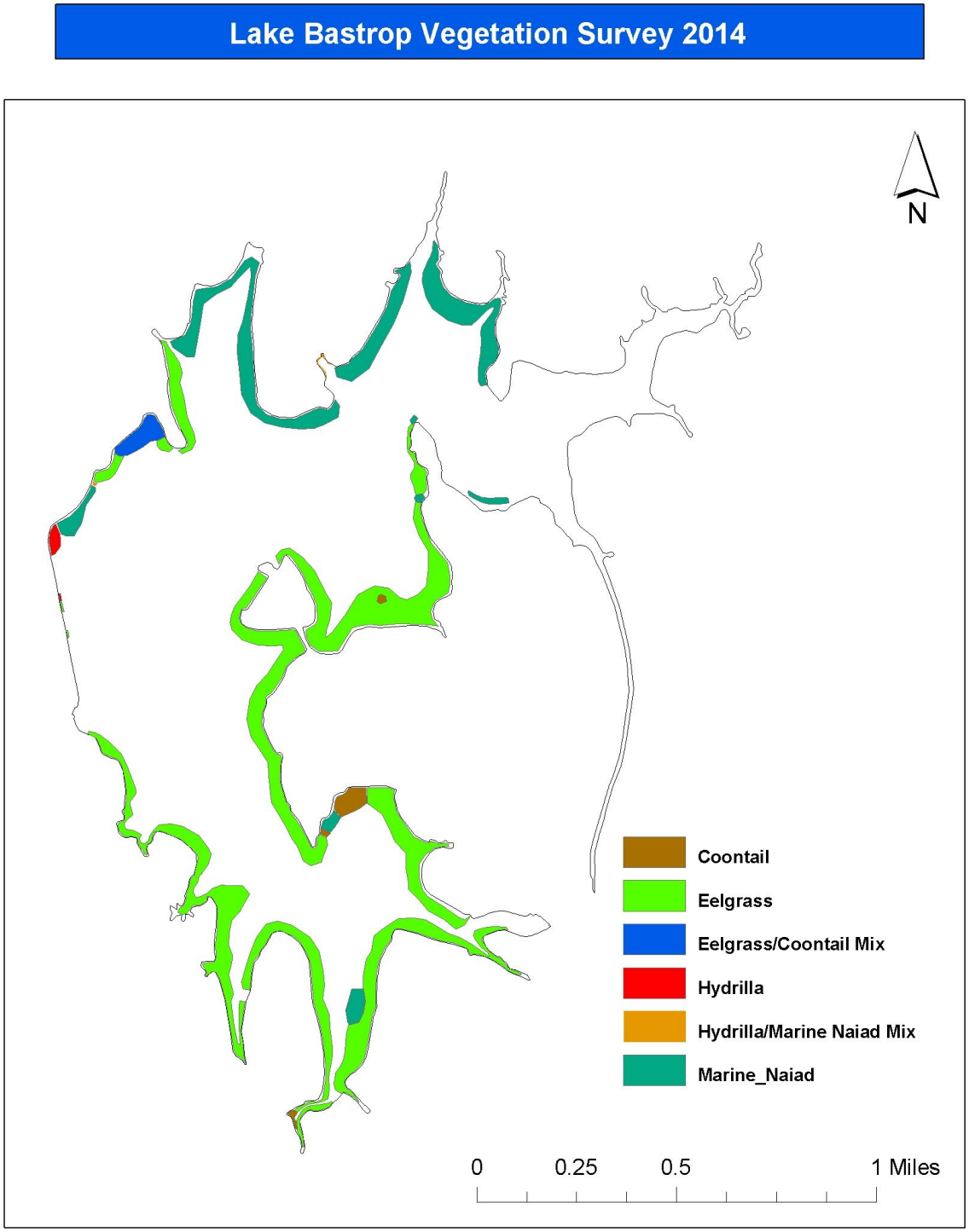


Map of shoreline and pelagic habitat at Bastrop Reservoir, Texas. Lake level was near full pool (450 ft. msl) during time of survey in September 2014. BULK = bulkhead; PIDO = piers and docks; NASH = natural shoreline; ROSH = rocky shoreline.

APPENDIX D



Map of shoreline aquatic vegetation at Bastrop Reservoir, Texas. Lake level was near full pool (450 ft. msl) during time of survey in September 2014.

APPENDIX E

Objective-Based Sampling Plan for Bastrop Reservoir

2014 - 2015

Sport fish, forage fish, and other important fishes

Sport fishes in Bastrop Reservoir include Largemouth Bass and Channel Catfish. Known important forage species include Bluegill, Redear Sunfish, Redbreast Sunfish, and Threadfin Shad.

Negligible fisheries

White Crappie: White Crappie were stocked in Bastrop reservoir in 1992 and are present, but population abundance is very low, based on poor captures in historic trap netting surveys. A creel survey in 2004 did not identify directed effort for this species, revealing little interest by anglers to pursue this species at Bastrop reservoir. Sampling this population is unnecessary in FYs 2015-2017.

Blue Catfish: Blue Catfish were stocked in Bastrop Reservoir from 1969 to 1971 and are expected to be present in low abundance. Anecdotal catch reports for this species by anglers in recent years are the only evidence of their existence in the lake. The high abundance and dominance of Channel Catfish in this reservoir hints at the failure of Blue Catfish to have established a strong population. The effect of strong Blue Catfish populations outcompeting Channel Catfish is seen in other district lakes. Water conditions at this power plant reservoir do not provide the typical habitat features of lakes where Blue Catfish flourish. Our gill netting surveys since 2006 have failed to collect Blue Catfish specimens. Sampling this population is unnecessary in FYs 2015-2017.

Flathead Catfish: Flathead Catfish were present in low abundance, based on gill netting surveys conducted between 1998 and 2011. During this time, CPUE total averaged 0.8 fish/nn, and ranged between 0.2 and 2.0 fish/nn. A creel survey in 2004 did not identify directed effort for this species, revealing little interest by anglers to pursue this species at Bastrop reservoir. Sampling this population is unnecessary in FYs 2015-2017.

White Bass: White Bass are not believed to be present in Bastrop Reservoir; however they are present in the Colorado River drainage, in which this reservoir stands. Gill netting surveys have not identified this species and no incidental catches have been reported in creel surveys nor anecdotally. Sampling this population is unnecessary in FYs 2015-2017.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are the most popular sport fish in Bastrop Reservoir. The popularity and reputation for quality Largemouth Bass fishing at this reservoir warrant sampling time and effort. Results from a 2004 creel survey showed directed angling effort for Largemouth Bass to be 17 hours/acre, and accounted for 69% of the total directed effort. Largemouth Bass are managed with a 14- to 21-inch slot regulation. While few fish grow past the slot, this lake is known for quality fish and good catch rates (0.77/h in 2004). Trend data on CPUE, size structure, and body condition have been collected biennially since 2002 with fall nighttime electrofishing. The population appears to be in good shape, and anglers are anecdotally satisfied with the fishing; most were satisfied with the restrictive harvest regulation in the 2004 creel survey. Continuation of biennial trend data in this clear reservoir with night electrofishing in the fall will allow for determination of any large-scale changes in the Largemouth Bass population that may spur further investigation. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in 2014, 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). Exclusive of the original 12 random stations, three additional random stations will be pre-determined in the event some extra sampling is necessary. If failure to achieve either objective has occurred after one night of sampling and objectives can be attained with 6-12 additional random stations, another night of effort will be expended.

Channel Catfish: The 2004 creel survey indicated Channel Catfish angling comprised >3.7% of total angling effort (second to Largemouth Bass). Gill netting total CPUE ranged from 4.4 to 9.4 fish/nn (6.6 fish/nn average) from 2001 to 2011, providing only an average of 32 stock-size and larger fish per survey. These data only allowed us to determine presence or absence of the population. We would like to collect information allowing us to monitor size structure and body condition. We propose switching from standard gill nets, set overnight to tandem hoop nets set for two nights. We anticipate that setting a minimum of nine tandem hoop nets, with a soak time of two nights, will achieve our sampling objective (50 Channel Catfish >11 inches; RSE of CPUE-S ≤ 0.25). A minimum of nine randomly selected tandem hoop netting sites will be sampled in 2015, 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 nine stations with 75% confidence). Exclusive of the original nine random stations, nine additional random stations will be pre-determined in the event some extra sampling is necessary. If failure to achieve either objective has occurred after one soak session, and objectives can be attained with up to nine additional random stations, another soak session of effort will be expended.

Sunfish and Threadfin Shad: Bluegill, Redear Sunfish, Redbreast Sunfish, and Threadfin Shad are the primary forage at Bastrop Reservoir. Like Largemouth Bass, trend data on CPUE and size structure of these sunfish have been collected biennially since 1996. Abundance of Threadfin Shad was also measured as a function of CPUE during those surveys, and will remain the main sampling objective to measure Threadfin Shad abundance. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in sunfish relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers of sunfish for size structure estimation (PSD and IOV; 50 fish minimum at 5-12 stations with 80% confidence) but not for relative abundance estimates (RSE ≤ 25 of CPUE-Total; anticipated effort is 25-30 stations). At the sampling effort needed to achieve sampling objectives for Largemouth Bass, the expected RSE for CPUE-T is 30 for sunfish species combined. No additional effort will be expended to achieve an RSE25 for CPUE of sunfish. 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).