PERFORMANCE REPORT

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STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2015 Fisheries Management Survey Report

Whitney Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Whitney Reservoir were surveyed in 2015 using electrofishing and in 2016 using gill nets. Historical data are presented with the 2015-2016 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Whitney Reservoir is a 23,200-acre impoundment of the Brazos River, in Bosque and Hill Counties. Water level has been18 feet below conservation pool (approximately 517.0 feet above mean sea level [MSL]) to over 20 feet above conservation pool (approximately 556.0 feet above MSL) since 2011. Water levels were within three feet of conservation pool (533.0 feet above MSL) during the 2015-2016 surveys. Fish habitat at the time of sampling was dominated by natural rock shorelines. Boat access (23 ramps) on the reservoir is excellent.

- **Management History:** Important sport fish include Striped Bass, White Bass, Largemouth Bass, White Crappie, and catfishes. All have been impacted by periodic toxic golden alga blooms since 2001. Efforts to mitigate these losses have included enhanced collection of fisheries data, annual Striped Bass stockings, and Smallmouth Bass stocking requests. Recent management efforts include cooperating with the controlling authority to post appropriate signage at access points to try and prevent the spread of the invasive zebra mussel into the reservoir.

  Fish Community
  - **Prey species:** Threadfin and Gizzard Shad catch rates were above historical averages. Other forage species above their historical averages included Bluegill, Redear Sunfish, Longear Sunfish, Green Sunfish and Warmouth. Redbreast Sunfish catch rates were below the historical average, but higher than any sample since 2001.

  - **Catfishes:** The Blue Catfish and Channel Catfish catch rates were higher than historical averages. Individuals of both species were in good to excellent body condition.

  - **Temperate Bass:** The White Bass and Striped Bass catch rates were higher than the historical average and body condition was good to excellent.

  - **Black Bass:** The Largemouth Bass catch rate was the highest on record and body condition was excellent. Smallmouth Bass were not collected, but Spotted Bass were collected for the first time since 2003 at a rate higher than the historical average.

  - **White Crappie:** White Crappie were collected with a non-standard gear and in too few numbers to draw any meaningful conclusions.

- **Management Strategies:** Continue managing sport fishes at Whitney Reservoir with statewide regulations. Consider cessation of Smallmouth Bass stocking in the reservoir. Maintain invasive species signage and inform the public about the negative impacts of aquatic invasive species. Conduct a supplemental gill net survey in 2018, access and vegetation surveys in summer 2019, and general monitoring surveys with electrofishing, gill nets, and an angler creel survey in 2019 and 2020.

INTRODUCTION

This document is a summary of fisheries data collected from Whitney Reservoir in 2012-2016. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2015-2016 data for comparison.

Reservoir Description

Whitney Reservoir is a 23,200-acre impoundment of the Brazos River, in Bosque and Hill counties originally completed in 1951. It is owned and operated by the United States Army Corps of Engineers (USACE) and primary water uses include power generation, flood control, and recreation. The reservoir has a drainage area of 17,656 square miles, a storage capacity of 627,100 acre-feet, and a shoreline length of 225 miles at the conservation pool of 533 feet above MSL. Whitney Reservoir is eutrophic with a TSI *chl-a* of 59.12 (Texas Commission on Environmental Quality 2015). Habitat at time of sampling was dominated by natural and rock shoreline, rock bluff, with a few piers and boat docks (Table 6). Littoral vegetation is dominated by common buttonbush with some giant reed, which is an invasive (Table 7). Water level has varied from 18 feet below conservation pool (approximately 517.0 feet above MSL) to over 28 feet above conservation pool (approximately 561.0 feet above MSL) since 2011. Water levels were within three feet of conservation pool during the 2015-2016 surveys. Other descriptive characteristics for Whitney Reservoir are in Table 1.

Angler Access

Whitney Reservoir has 23 public boat ramps including several marina boat ramps (Table 2). Much of Whitney Reservoir's shoreline is accessible to anglers through USACE property; however convenient shoreline access is limited to the public boat ramp and camping areas.

Management History

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

1. Discontinue supplemental electrofishing surveys (initiated due to golden alga fish kills).
   Action: Electrofishing surveys are being completed every four years.
2. Continue annual stocking requests for Striped Bass and Smallmouth Bass. Also, continue Smallmouth Bass brood fish procurement from Belton Reservoir as needed to help support the stocking program.
   Action: Smallmouth and Striped Bass stockings have been requested every year. The recent zebra mussel infestation on Belton Reservoir has halted Smallmouth Bass brood fish procurement from that source for the foreseeable future.
3. Complete a supplemental gill net survey during spring 2014.
   Action: Gill netting was completed in spring 2014.
4. Cooperate with the controlling authority to post appropriate invasive species signage at access points throughout the reservoir, and maintaining zebra mussel samplers. Educate the public about invasive species through the use of media and the internet. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) all existing and future inter-basin water transfer routes to facilitate potential invasive species responses.
   Action: Invasive species signage was posted at all Whitney Reservoir access points during summer 2013 and replaced as needed in 2015. In summer, 2015, Waco District interns visited the lake on three weekend days and interfaced with 107 boat owners regarding zebra mussels. District biologists have made a speaking point about invasive species, how

to prevent their spread, and potential effects on Whitney Reservoir, while speaking to constituent groups such as the Central Texas Flyrodders, Legacy Outfitters, and Brazos River Sportsman's Club over the past several years. Inter-basin water transfers are a permanent fixture in this report now, and will be updated appropriately.

Harvest Regulation History: All sport fishes are currently managed with statewide regulations (Table 3).

Vegetation/habitat management history: Invasive aquatic vegetation has never been an issue in Whitney Reservoir. The size of the reservoir makes any attempt to improve habitat very difficult.

Stocking History: Whitney Reservoir received stockings of Striped Bass from 2013 through 2015, and Smallmouth Bass stockings in 2011. The complete stocking history is in Table 4.

Water Transfer: There are currently no major raw water intake stations on the reservoir. However, the Brazos River Authority has water rights and a contract with the USACE to use approximately 50,000 acre-feet of water per year from the reservoir. Currently, this water is released through the dam to meet water supply needs downstream. There is also a proposal to install a raw water intake station on Whitney Reservoir to be used by the city of Cleburne for municipal purposes. If constructed, the City of Cleburne could withdraw up to 10,000 acre-feet of water per year from the lake. This volume of water is relatively small in comparison to the size of Whitney Reservoir and represents only about six inches of depth when the lake is full.

Reservoir capacity: Whitney Reservoir was impounded in 1951. A US Army Corps of Engineers resurvey conducted in 1959 calculated the reservoir's capacity at conservation pool (533 feet above MSL) to be 627,100 acre-feet with a surface area of 23,560 acres. A volumetric survey was conducted by the Texas Water Development Board (TWDB) on Whitney in 2005. This survey found a volume of 554,203 acre-feet and a surface area of 23,200 acres at conservation pool elevation. The difference between the two surveys suggests an 11.6% decrease in volume and 1.4% decrease in surface area.

METHODS

Surveys were conducted to achieve objectives in accordance with the objective-based sampling (OBS) plan for Whitney Reservoir (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad and Threadfin Shad were collected by electrofishing (20, 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.

Gill netting – White and Striped Bass, Blue Catfish, Channel Catfish, and White Crappie were collected by gill netting (10 net nights at 10 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

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 to present, 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 (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.

Golden alga – Water samples were collected on a monthly basis during winter every year and tested for the presence of golden alga and toxicity at the A. E. Wood Laboratory in San Marcos.

Habitat – A structural habitat survey was conducted in 2011 (Tibbs and Baird 2012). Habitat was assessed using 2010 U.S. Department of Agriculture National Agricultural Imagery Program, 1-meter resolution satellite imagery (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Vegetation surveys were conducted using an adaptation of the point method during 2015 (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Points were randomly generated on the shoreline and averaged a minimum of one point per shoreline mile. Aquatic vegetation has always been found close to the shore in Whitney Reservoir, so stratifying the random points to exclude deep-water areas increased precision and resulted in better data.

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

RESULTS AND DISCUSSION

Habitat: Whitney is a mainstem reservoir with stained water in the upper end and clear, deep water in the lower end of the reservoir. Habitat was last surveyed in 2011 and consisted primarily of natural shoreline, rocky shoreline, and rock bluff (Tibbs and Baird, 2012). A full vegetation survey conducted during summer 2015 found dominant shoreline vegetation to be common buttonbush (*Cephalanthus occidentalis*) (37%) and one noxious species of vegetation, giant reed (*Arundo donax*), which comprised 2.5% of the littoral shoreline (Table 6).

Prey species: Threadfin and Gizzard Shad were collected by electrofishing at catch rates of 90/h and 401/h respectively in 2015, and these catch rates were above historical averages (Figure 2 and Appendices A and B). The IOV for Gizzard Shad was good, with 81% of Gizzard Shad available to existing predators as forage (Figure 2). Other forage species collected were Bluegill (320/h), Longear Sunfish (48/h), Redear Sunfish (19/h), Redbreast Sunfish (15/h) Warmouth (5/h), and Green Sunfish (19/h), (Figure 3 and Appendices A and B).

Catfishes: Blue Catfish were collected from gill nets at 2.5/nn in 2016. This catch rate equates to 41 collected individuals, and is higher than the historical average (Figure 4; Appendices A and B). The OBS target of 50 stock-size fish was not achieved. Values for PSD improved in 2016 as more individuals exceeded quality size (Figure 4). Body condition (*Wr*), ranged from good to excellent across size classes (Figure 4).

Channel Catfish were collected from gill nets at 4.6/nn in 2016. This catch rate equates to 46 collected individuals, and is well above the historical average (Figure 5; Appendices A and B). The OBS target of 50 stock-size fish was not achieved. Proportional size distribution was 33, indicative of a balanced population (Figure 5). Body condition was good to excellent and generally improved with increasing size classes (Figure 5).

Flathead Catfish are a low-density population in Whitney Reservoir, and are generally caught incidentally to other targeted species. This species was not targeted or collected during the 2016 survey, but are still included in Appendices A and B.

Temperate Bass: White Bass were collected from gill nets at a catch rate of 9.9/nn in 2016. This equated to 99 collected individuals, and was above the historical average (Figure 6; Appendix A and B). The OBS target of 50 stock-size fish was achieved. The PSD for White Bass has remained high over the past three surveys, but was lower in the current survey, indicative of increased recruitment of smaller fish.

Body condition was good with relative weights averaging around 90 and increasing with length (Figure 6).

Striped Bass were collected from gill nets at a catch rate of 6.6/nn in 2016. This equated to 66 collected individuals and was well above the historical average (Figure 7; Appendix A and B). In fact, catch rates were comparable to those in the early 90's. In addition, the catch rate of legal-sized Striped Bass increased dramatically over the 2014 sample (2.7/nn versus 0.1/nn). The OBS target of 50 stock-size fish was achieved. The PSD for Striped Bass dropped to 29. This is likely due to increased recruitment during the previous two years. Body condition was good with relative weights averaging around 95 regardless of length (Figure 7).

Black Basses: Largemouth Bass were collected by electrofishing at a rate of 254/h in 2015; this catch rate equated to 423 collected individuals and was much higher than both the previous two surveys and historical average for the reservoir (Figure 8 and Appendices A and B). The RSE value for the Largemouth Bass sample was less than 25, which was the desired level of precision in the OBS plan. Proportional size distribution declined to a new low (12) and was lower than the PSD of 32 in 2011. This decrease in PSD is likely indicative of uneven recruitment, with a strong spawn in 2015 indicated by the large numbers of small fish. Few legal-sized bass were present in the sample, indicating possible recruitment issues from previous years due to the effects of drought or golden alga. Body condition was good to excellent and ranged from approximately 90 to 110 (Figure 8). Largemouth Bass genetics were analyzed in 2015 and showed increased Florida influence (66%; Table 7). Three pure FLMB were observed in the genetic sample (10%), despite the fact that they have not been stocked since 2004.

Smallmouth and Spotted Bass are species with low-density populations in Whitney Reservoir, and are generally caught incidentally to other targeted species. No Smallmouth and few Spotted Bass were collected during the 2015-2016 electrofishing surveys, but both are still included in Appendices A and B.

White Crappie: Only 13 White Crappie were sampled in 2015 using gill nets. They ranged from 6" – 14" long and body condition was excellent. The OBS target of 50 stock-size fish was not achieved. Crappie can be effectively targeted by experienced anglers, but are not a large component of the fishery.

Fisheries management plan for Whitney Reservoir, Texas

Prepared – July 2016

ISSUE 1: The Smallmouth Bass fishery in Whitney Reservoir continues to struggle as it is dependent on stocking. Golden alga has abated over the past several years, but Smallmouth Bass fingerlings have not been produced in quantities sufficient to stock the reservoir since 2011.

MANAGEMENT STRATEGY

1. Continue requesting Smallmouth Bass for stocking on an annual basis.

ISSUE 2: Gill net catch rates of Striped and White Bass were at their highest since the early 90's in the most recent survey. Other species are also doing extremely well. This is tremendously good news, the public needs to know, and angling pressure and economic impact need to be assessed.

MANAGEMENT STRATEGIES

1. Publicize this information via news releases and social media. Continue authoring the Lake Whitney Fishing Forecast. Consider writing an article for a magazine or other popular press.
2. Complete a 12-month angler creel survey in 2018-2019 to quantify angling pressure and success, as well as economic impact. Successful completion of this creel survey is dependent on no significant golden alga kill over the next four years.

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. On June 11, 2014, one of three PCR replicates on Lake Whitney was positive, indicating the presence of zebra mussel genetic material. Follow up tests and inspections did not detect any zebra mussels. 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 USACE to maintain appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.
5. Continue monitoring for the presence of zebra mussels.

Objective - Based Sampling Plan and Schedule 2016-2020

Sport fish, forage fish and other important fishes

Sport fishes in Whitney Reservoir include Largemouth Bass, Striped Bass, White Bass, Channel Catfish, and Blue Catfish. Important forage fish species include Gizzard Shad, Threadfin Shad, Bluegill, Redear and Longear Sunfish.

Low-density fisheries

Smallmouth Bass, Spotted Bass, Flathead Catfish, White and Black Crappie, Warmouth, and Redbreast Sunfish occur in very low abundance in Whitney Reservoir and are generally caught incidentally to other targeted species. We will continue collecting and reporting data for these species, and upgrade their status if appropriate.

Reservoir-specific issue - Golden Alga

Creel survey information for Whitney Reservoir was collected annually until 2000, when golden alga altered the dynamics of the fishery and continues to do so today. The cycle is predictable except for the year in which the kill occurs and the magnitude of its effects. During years when golden alga kills are minimal, angling pressure increases as fish populations improve. Inevitably at some point a golden alga kill will occur and angling success and pressure will decline drastically. Recovery begins with a massive spawn of prey, followed by high relative weights of predator species and subsequent repopulation either by spawning (e.g. Black Bass, White Bass) or stocking (e.g. Striped Bass). This cycle has been well documented with standard and non-standard sampling over the past 15 years. During that time, collection of creel survey information has been suspended because angling pressure is so dependent on presence or absence of toxic golden alga. It is possible that circumstances will change in the future due to increased rainfall, and we may be seeing that in the data we collected in 2014-15.

Survey objectives, fisheries metrics, and sampling objectives

Fall Electrofishing: This survey will be used to evaluate Largemouth Bass and the primary forage species (Bluegill, Redear Sunfish, Longear Sunfish, Gizzard Shad and Threadfin Shad). Black bass were the third most sought species group by anglers in Whitney Reservoir during the 2000 creel survey (0.8 hours/acre), whereas few anglers targeted any of the forage fish species. This information is somewhat dated and it should be noted that the species anglers target and the effort expended varies substantially in Whitney reservoir due to large fluctuations in water level and toxic golden alga blooms. The popularity of bass fishing at this reservoir, including tournaments, justifies sampling time and effort. Trend data on CPUE and size structure (all listed species), and body condition of Largemouth Bass were collected annually with nighttime fall electrofishing from 1990 through 1999, biennially from 1999 through 2011, and then every four years thereafter, with the next sample in 2019. The goal of the 2019 electrofishing survey would be general monitoring of trend data to characterize the Largemouth Bass population and make comparisons with historical and future data. Catch rates of Largemouth Bass during 2015 electrofishing were sufficient to achieve a CPUE RSE $\leq$ 0.25 in 18 stations. A minimum of 18 randomly selected 5-minute stations will be sampled at night in fall 2019. This will allow us to compare CPUE data among years with a calculated RSE $\leq$ 0.25. If the Largemouth Bass objective is not attained in 18 stations, and catch rates indicate that collecting the proposed number of fish is reasonable, sampling will continue. Since the forage species survey objectives are only exploratory, additional sampling will not be necessary beyond that which is done for Largemouth Bass.

Spring Gill Netting: This survey will be used to evaluate temperate bass (Striped and White Bass), Blue and Channel Catfish. Temperate bass were the most sought species group by anglers in Whitney Reservoir during the 2000 survey (3.0 hours/acre for Striped Bass, 0.3 hours/acre for White Bass). Catfish as a group are the second most sought by anglers in Whitney Reservoir. Results from the 2000

creel survey showed directed angling effort for the Catfish group to be 1.0 hours/acre (0.5 hours/acre each for Blue and Channel Catfish). Trend data on CPUE, Size structure, and body condition of temperate bass and catfish have been collected biennially since 2004 with spring gill netting. Collecting a minimum of 50 stock-length fish of each species during spring 2018 and 2020 gill netting will allow us to calculate proportions (i.e., size structure indices) with an 80% confidence interval. After reviewing efforts from 2012 through 2016, gill net catch rates of all species except Blue Catfish were sufficient to collect 50 stock size fish in 15 randomly selected gill net stations. If the goal for a species isn't attained, and catch rates indicated that collecting the proposed number of fish is reasonable, sampling will continue at random stations until a minimum of 50 stock size fish have been collected.

Angler Creel: This survey will be used to evaluate angler effort, success, preferences, and economic impact in 2018-2019. The purpose would be to document angler response to the tremendously improved fishery and help determine the direction of future management efforts. If a significant golden alga kill occurs prior to this survey, it may be rescheduled.

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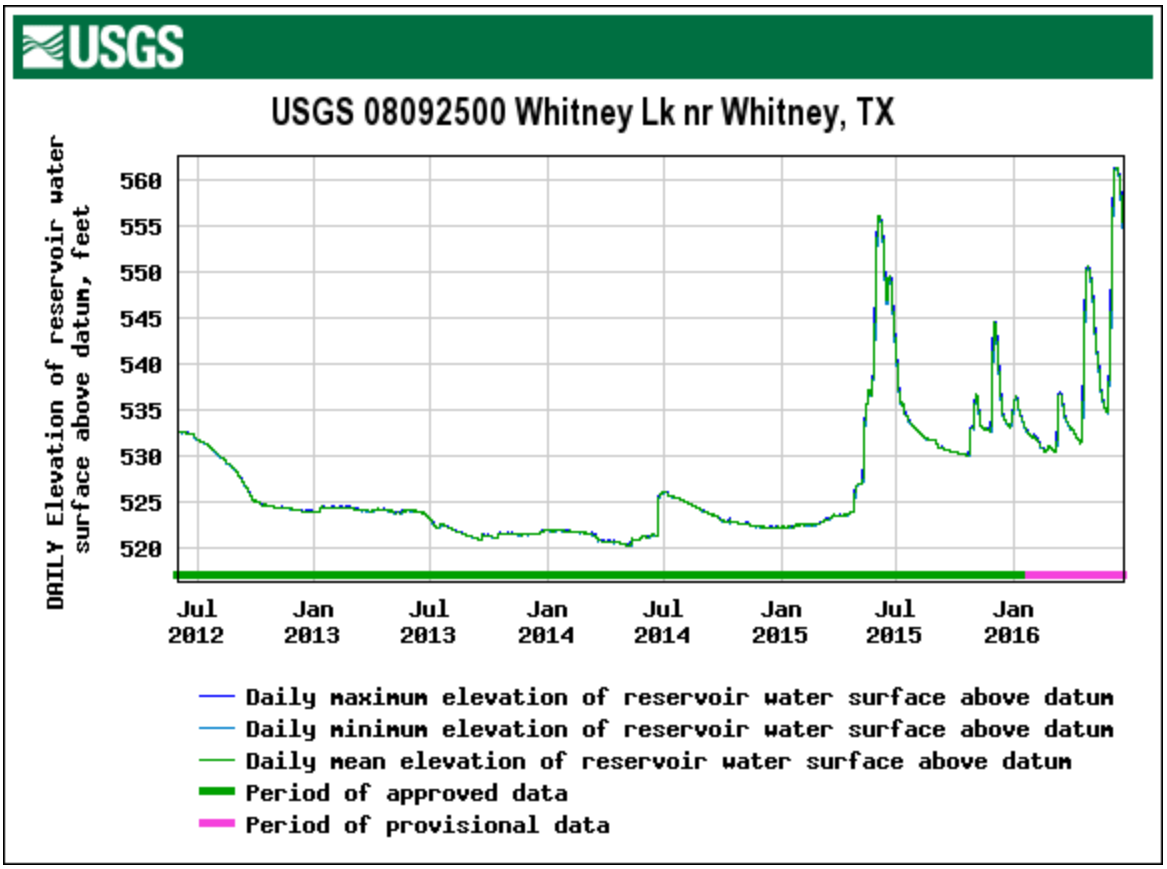


Figure 1. Daily mean water levels for Whitney Reservoir from June 1, 2012 through June 22, 2016 (USGS 2016). Conservation pool level is 533.0 feet above mean sea level.

Table 1. Characteristics of Whitney Reservoir, Texas.

Characteristic	Description
Year Constructed	1951
Controlling authority	U.S. Army Corps of Engineers
Counties	Bosque and Hill
Reservoir type	Mainstem
Shoreline Development Index	10.5
Conductivity	1,800 umhos/cm

Table 2. Boat ramp characteristics for Whitney Reservoir, Texas, July, 2015. Reservoir elevation at time of survey was 533.1 feet above mean sea level (at conservation pool). Parking capacity numbers are for trucks with boat trailers/vehicles.

Boat ramp	Latitude Longitude (dd)	Parking capacity (N)	Condition
Ham Creek Park	32.17212,-97.48740	28/0	Good
Kimball Bend Park	32.12149,-97.49361	38/0	Good
Nolan River Park	32.09584,-97.45181	6/4	Fair
Plowman Creek Park	32.06656,-97.49241	18/0	Good
Lakeside Park	32.02402,-97.49062	12/0	Fair
Steele Creek Park (N)	32.00980,-97.44907	16/0	Good
Steele Creek Park (S)	32.00232,-97.45099	12/0	Good
White Bluff Park	32.01299,-97.41491	20/26	Good
Cedar Creek Park	31.98830,-97.37279	20/0	Good
Juniper Cove Park	31.98597,-97.37005	24/10	Fair
Serenity Cove Ramp	31.97377,-97.37463	6/0	Fair
McCown Valley Park	31.94879,-97.40074	48/0	Good
Cedron Creek Park	31.96025,-97.41684	20/0	Good
Long Branch Ramp	31.90623,-97.41938	8/0	Fair
FM1630 Ramp	31.88259,-97.39296	18/0	Good
Uncle Gus' Marina	31.87524,-97.40196	6/0	Fair
Cliffview Resort Ramp	31.85714,-97.38667	12/0	Fair
Lofers Bend Park Day Use	31.87364,-97.36716	74/0	Good
Lofers Bend Park West	31.88261,-97.37188	10/0	Good
Lofers Bend East	31.88934,-97.35715	10/0	Good
Walling Bend	31.89919,-97.39574	10/0	Good
Harbor Master Marina	31.88697,-97.35855	6/0	Fair
Lake Whitney State Park	31.92361,-97.37323	15/0	Good

Table 3. Harvest regulations for Whitney Reservoir.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish, Blue	25 (in any combination)	12 - No Limit
Catfish, Channel	25 (in any combination)	12 - No Limit
Catfish, Flathead	5	18 - No Limit
Bass, White	25	10 - No Limit
Bass, Striped	5	18 - No Limit
Bass: Largemouth, Smallmouth, and Spotted[1]	5	14 - No Limit
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

[1] There is no minimum length limit on spotted bass.

Table 4. Stocking history for Whitney 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	1966	8,000	UNK	0.0
	Total	8,000		
Bluegill	2005	13,747	AFGL	2.1
	Total	13,747		
Channel Catfish	1970	61,000	AFGL	7.9
	Total	61,000		
Florida Largemouth Bass	1985	204,099	FGL	2.0
	1986	151,900	FRY	1.0
	2003	760,159	FGL	1.5
	2004	589,978	FGL	1.7
	Total	1,706,136		
Largemouth Bass	1966	280,000	UNK	0.0
	1968	250,000	UNK	0.0
	1969	350,000	FRY	0.7
	1971	220,000	UNK	0.0
	Total	1,100,000		
Smallmouth Bass	1983	65,400	UNK	0.0
	1984	235,505	FGL	2.0
	1985	162,976	FGL	2.0
	1985	39,167	FRY	1.0
	1986	24,435	FGL	2.0
	1986	124,700	FRY	1.0
	1992	29,253	FGL	1.3
	1994	262,402	FGL	1.2
	1995	40,670	FGL	1.3
	1996	333,282	FGL	1.3
	1997	714,665	FGL	1.2
	1998	353,100	FGL	1.2
	1999	351,302	FGL	1.3
	2000	589,849	FGL	1.4
	2004	5,609	FGL	1.9
	2010	73,644	FGL	1.6
	2011	134,722	FGL	1.5
	Total	3,540,681		
Striped Bass	1973	267,711	FGL	1.7

Table 4. Stocking history for Whitney 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)
	1974	229,291	FGL	1.7
	1975	17,090	UNK	0.0
	1976	232,123	UNK	0.0
	1984	351,581	FGL	2.0
	1985	172,115	FRY	1.0
	1986	354,130	FGL	1.7
	1987	121,525	FGL	2.0
	1987	237,232	FRY	1.0
	1988	235,900	FRY	1.0
	1989	235,923	FGL	1.2
	1990	240,219	FGL	1.4
	1991	331,827	FGL	1.3
	1992	123,161	FGL	1.2
	1994	448,490	FGL	1.2
	1995	237,566	FGL	1.2
	1996	113,057	FGL	1.3
	1997	235,226	FGL	1.2
	1998	145,768	FGL	1.3
	1999	236,400	FGL	1.5
	2000	476,600	FGL	1.5
	2001	1,400,000	FRY	0.8
	2002	353,587	FGL	1.6
	2003	223,892	FGL	1.7
	2004	84,184	FGL	1.5
	2005	332,999	FGL	1.7
	2006	322,532	FGL	1.9
	2007	495,015	FGL	1.6
	2008	332,262	FGL	1.8
	2009	543,846	FGL	1.8
	2010	148,055	FGL	1.7
	2010	415,763	FRY	0.2
	2013	237,052	FGL	1.6
	2013	614,994	FRY	0.2
	2014	380,641	FGL	1.5
	2015	325,028	FGL	1.7
	2016	103,841	FGL	1.5
	Total	11,356,626		

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

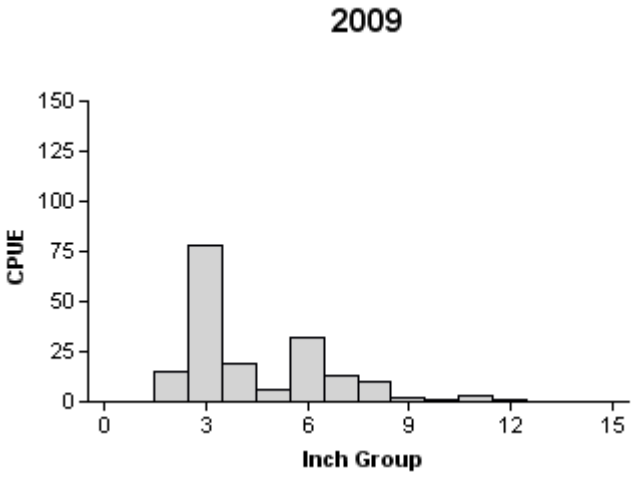
Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	General monitoring and trend data	Length frequency PSD, CPUE	RSE- Stock ≤ 25 10 fish/inch group
	Genetics	% FLMB	N = 30, any age
Bluegill [a]	Exploratory	Presence/Absence	Practical effort
Redear Sunfish [a]	Exploratory	Presence/Absence	Practical effort
Longear Sunfish [a]	Exploratory	Presence/Absence	Practical effort
Gizzard Shad [a]	Exploratory	Presence/Absence	Practical effort
Threadfin Shad [a]	Exploratory	Presence/Absence	Practical effort
Gill netting			
Channel Catfish	General monitoring and trend data	Size structure	N ≥ 50 stock
Blue Catfish	General monitoring and trend data	Size structure	N ≥ 50 stock
Striped Bass	General monitoring and trend data	Size structure	N ≥ 50 stock
White Bass	General monitoring and trend data	Size structure	N ≥ 50 stock
White Crappie	General monitoring and trend data	Size structure	N ≥ 50 stock

[a] No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of prey species if not reached

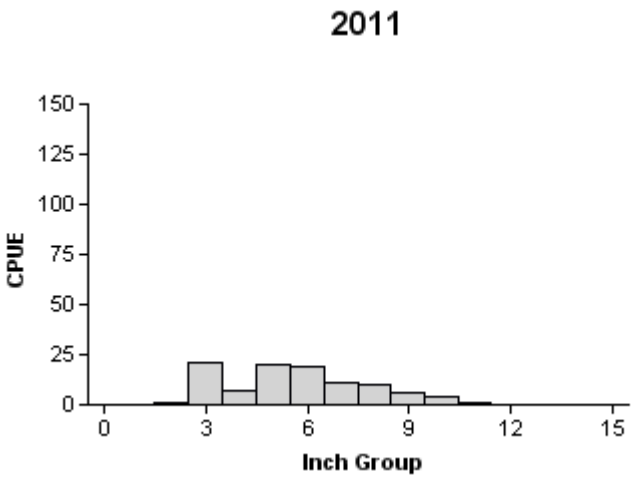
Table 6. Survey of aquatic vegetation, Whitney Reservoir, Texas, 2015. In July 2015, an adaptation of the point method was used to determine percent of shoreline distance, in which values represent the percentage of the randomly-selected points where species occurred. Only two species, Buttonbush and Giant Reed were observed.

Vegetation	2015
Common Buttonbush (Cephalanthus o*ccidentalis*)	37% (88 of 236)
Giant Reed (*Arundo donax)*	2.5% (6 of 236)

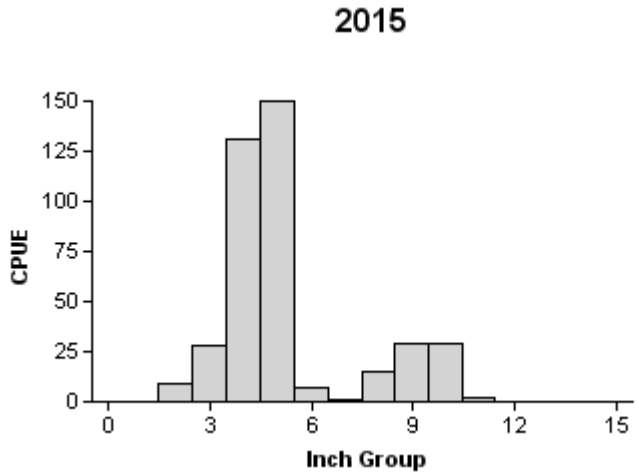
Gizzard Shad



Effort = 2.0
Total CPUE = 183.0 (25; 366)
Stock CPUE = 31.5 (25; 63)
IOV = 90 (4)



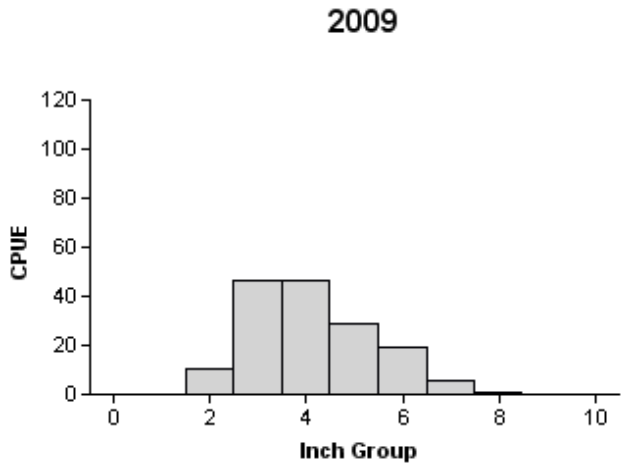
Effort = 2.0
Total CPUE = 101.0 (25; 202)
Stock CPUE = 32.5 (33; 65)
IOV = 79 (4)



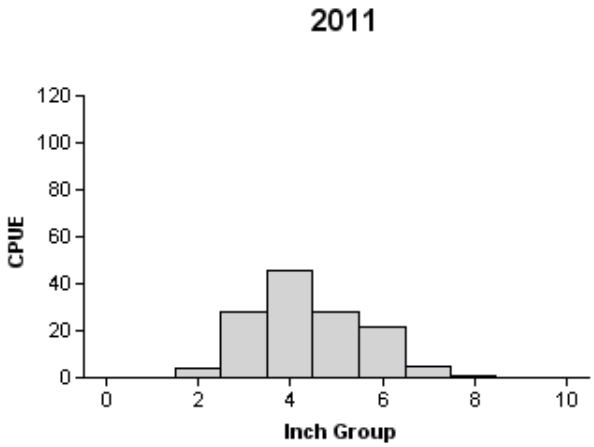
Effort = 1.7
Total CPUE = 400.8 (28;668)
Stock CPUE= 76.2 (41;127)
IOV = 81 (9)

Figure 2. 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, Whitney Reservoir, Texas, 2009, 2011 and 2015.

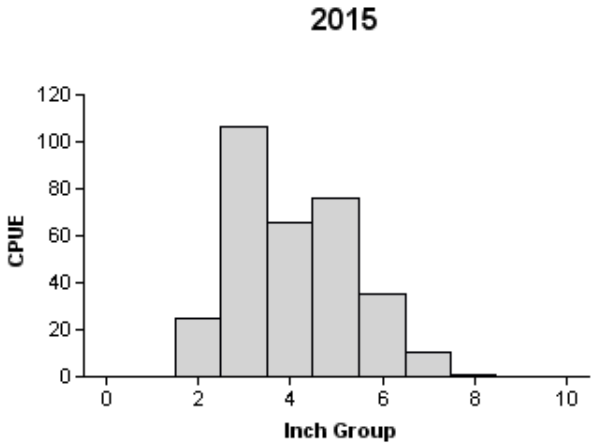
Bluegill



Effort = 2.0
Total CPUE = 158.5(25;317)
Stock CPUE = 148.0(25;296)
PSD = 18 (5)



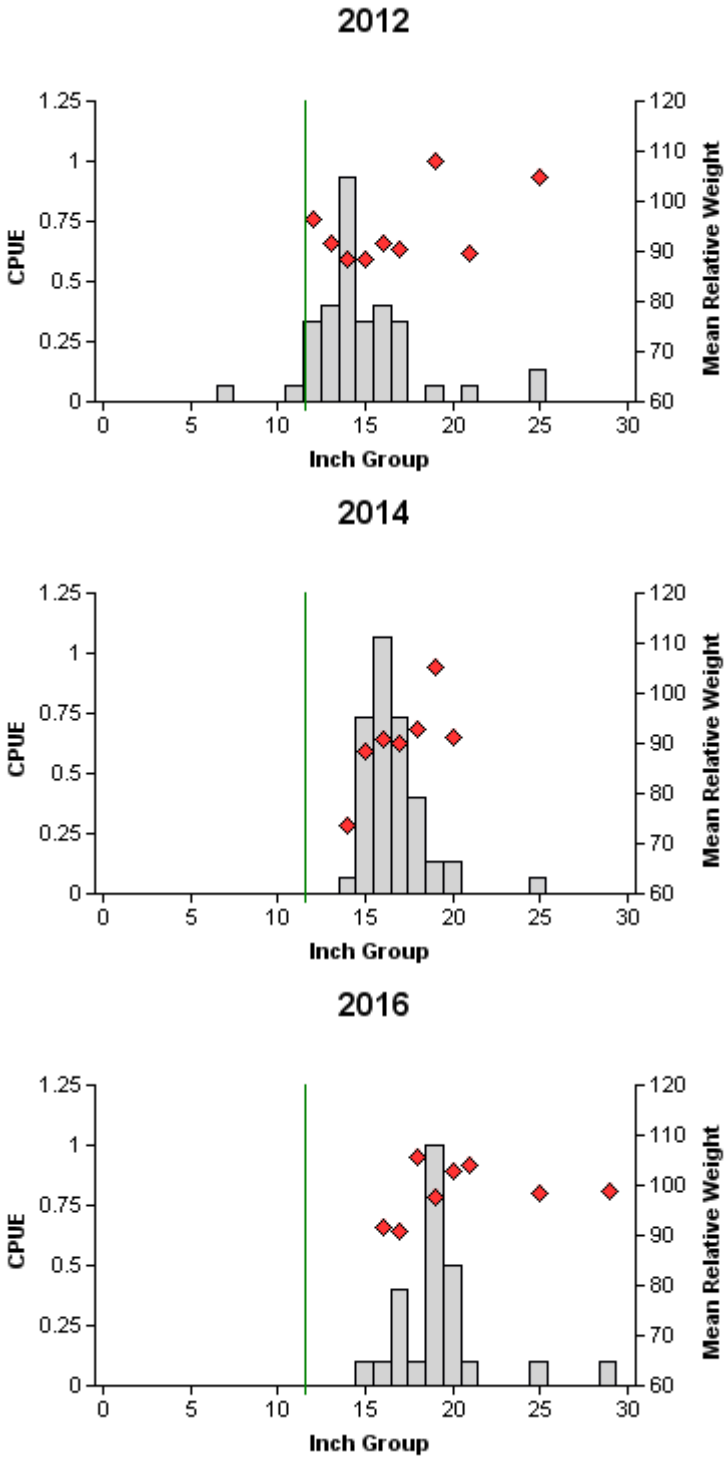
Effort = 2.0
Total CPUE = 133.5(22;267
Stock CPUE = 129.5(22;259)
PSD = 22 (3)



Effort = 1.7
Total CPUE = 319.8(22;533
Stock CPUE = 295.2(23;492)
PSD = 16 (2)

Figure 3. 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, Whitney Reservoir, Texas, 2009, 2011 and 2015.

Blue Catfish



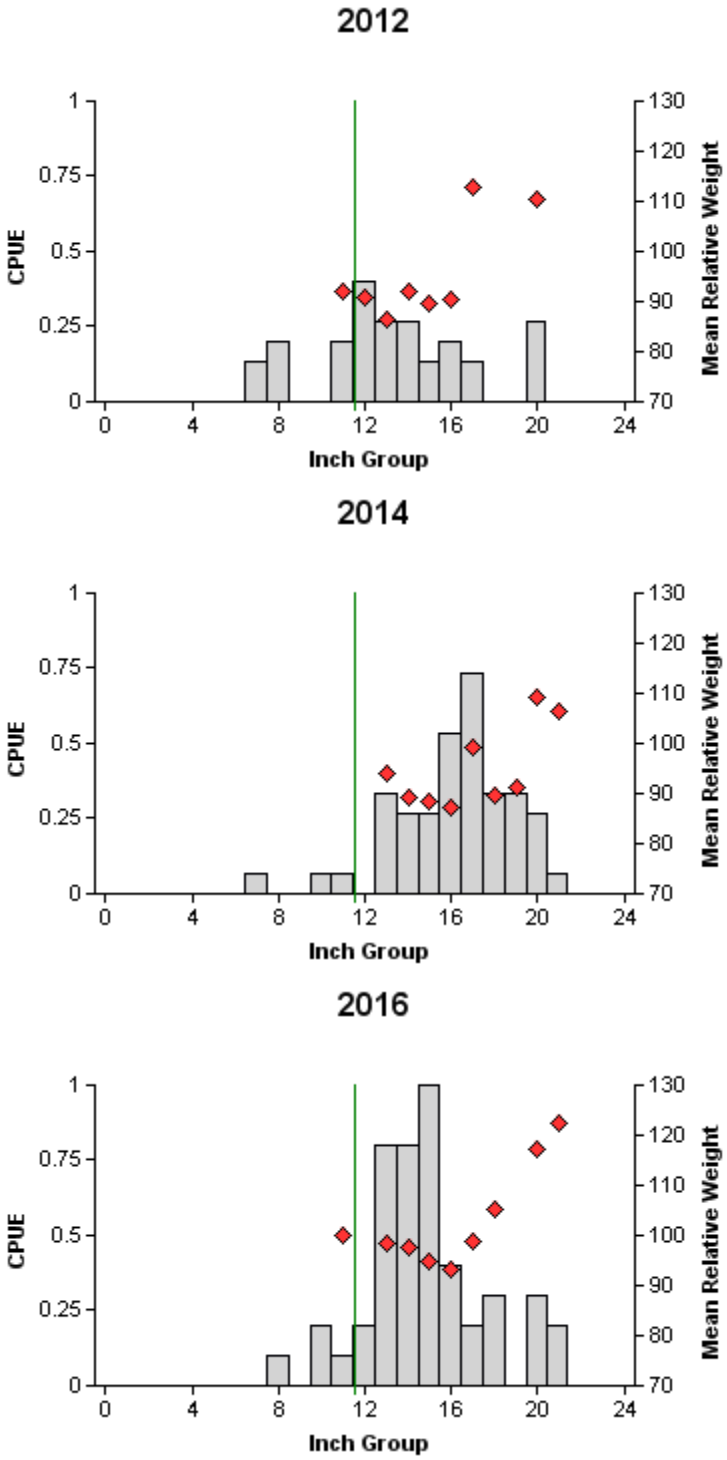
Effort = 15.0
Total CPUE = 3.1 (27; 47)
Stock CPUE 3.0 (27; 45)
CPUE-20 = 0.2 (53; 3)
PSD = 7 (4)
PSD-12 = 100 (0)

Effort = 15.0
Total CPUE = 3.3 (35; 50)
Stock CPUE 3.3 (35; 50)
CPUE-20 = 0.2 (53; 3)
PSD = 6 (4)
PSD-12 = 100 (0)

Effort = 10.0
Total CPUE = 2.5 (41; 25)
Stock CPUE 2.5 (41; 25)
CPUE-20 = 0.8 (49: 8)
PSD = 32 (10)
PSD-12 = 100 (0)

Figure 4. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Whitney Reservoir, Texas, 2012, 2014 and 2016. Vertical line represents the 12-inch minimum length limit.

Channel Catfish



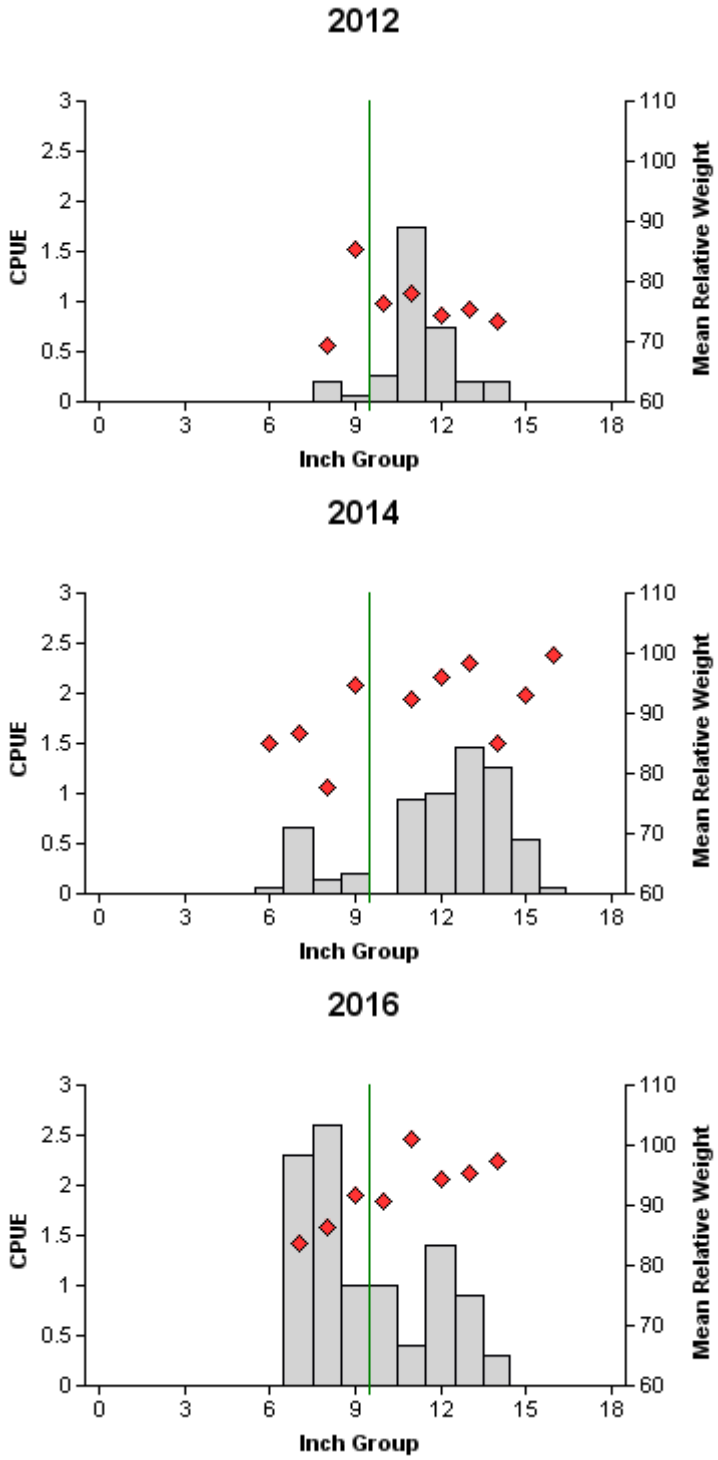
Effort =	15.0
Total CPUE =	2.2 (33; 33)
Stock CPUE =	1.9 (29; 28)
CPUE-12 =	1.7 (26; 25)
PSD =	32 (13)
PSD-12 =	89 (5)

Effort =	15.0
Total CPUE =	3.3 (18; 50)
Stock CPUE =	3.2 (19; 48)
CPUE-12 =	3.1 (19; 47)
PSD =	71 (5)
PSD-12 =	98 (2)

Effort =	10.0
Total CPUE =	4.6 (31; 46)
Stock CPUE	4.3 (33; 43)
CPUE-12 =	4.2 (34; 42)
PSD =	33 (12)
PSD-12 =	98 (3)

Figure 5. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Whitney Reservoir, Texas, 2012, 2014 and 2016. Vertical line represents the 12-inch minimum length limit.

White Bass

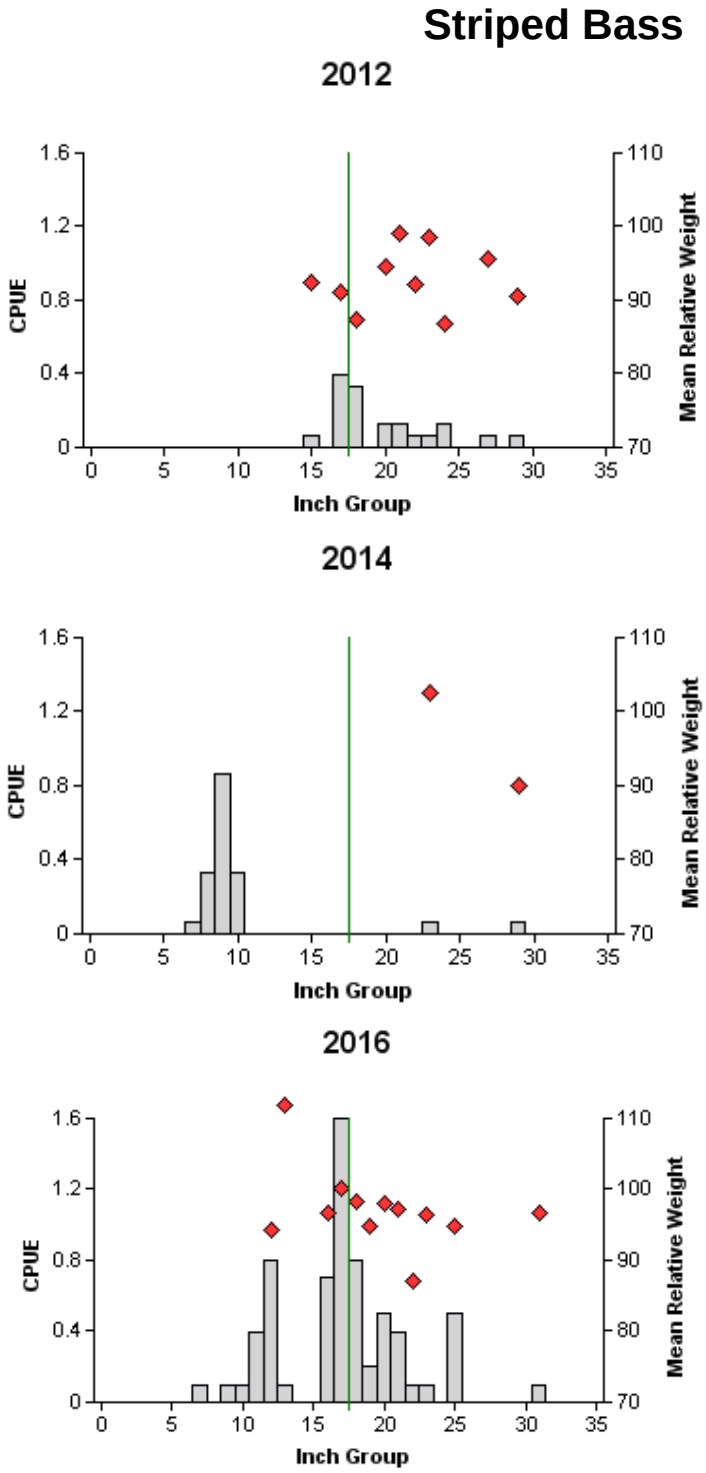


Effort = 15.0
Total CPUE = 3.4 (22; 51)
Stock CPUE = 3.4 (22; 51)
CPUE-10 = 3.1 (24; 47)
PSD = 94 (4)
PSD-10 = 92 (5)

Effort = 15.0
Total CPUE = 6.3 (18; 95)
Stock CPUE = 6.3 (18; 95)
CPUE-10 = 5.3 (20; 79)
PSD = 86 (11)
PSD-10 = 83 (11)

Effort = 10.0
Total CPUE = 9.9 (25; 99)
Stock CPUE = 9.9 (25; 99)
CPUE-10 = 4.0 (25; 40)
PSD = 51 (7)
PSD-10 = 40 (6)

Figure 6. Number of White Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Whitney Reservoir, Texas, 2012, 2014 and 2016. Vertical line represents the 10-inch minimum length limit.



Effort = 15.0
Total CPUE = 1.5 (44; 22)
Stock CPUE = 1.5 (44; 22)
CPUE -18 = 1.1 (41; 16)
PSD = 45 (16)
PSD-18 = 73 (7)

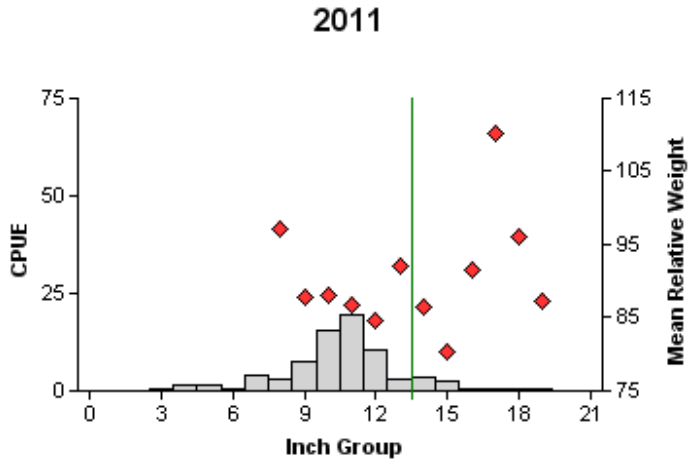
Effort = 15.0
Total CPUE = 1.7 (31; 26)
Stock CPUE = 0.1 (68; 2)
CPUE-18 = 0.1 (68; 2)
PSD = 100 (0)
PSD-18 = 100 (0)

Effort = 10.0
Total CPUE = 6.6 (28; 66)
Stock CPUE = 5.9 (30; 59)
CPUE-18 = 2.7 (23; 27)
PSD = 29 (8)
PSD-18 = 46 (5)

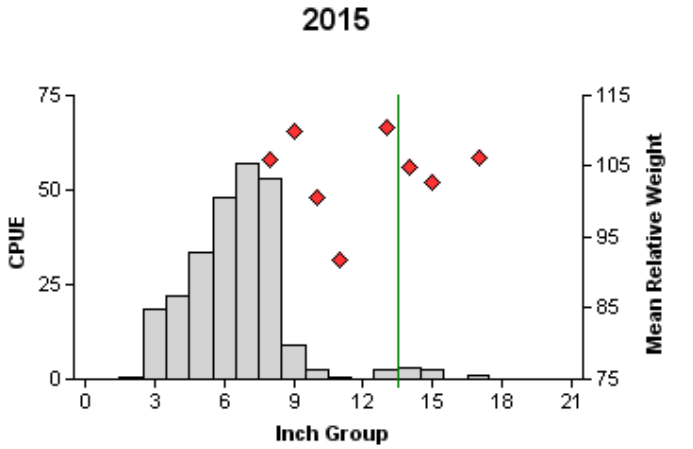
Figure 7. Number of Striped Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Whitney Reservoir, Texas, 2012, 2014 and 2016. Vertical line represents the 18-inch minimum length limit.

Largemouth Bass

Effort =	2.0
Total CPUE =	40.0 (26; 80)
Stock CPUE =	27.5 (26; 55)
CPUE -14 =	5.5 (37; 11)
PSD =	53 (6)
PSD-14 =	20 (7)



Effort =	2.0
Total CPUE =	75.0 (29; 150)
Stock CPUE =	67.0 (28; 134)
CPUE-14 =	8.0 (31; 16)
PSD =	32 (5)
PSD-14 =	12 (4)



Effort =	1.7
Total CPUE =	253.8 (15; 423)
Stock CPUE =	73.8 (20; 123)
CPUE-14 =	6.6 (31; 11)
PSD =	12 (3)
PSD-14 =	9 (2)

Figure 8. Number of Largemouth Bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Whitney Reservoir, Texas, 2009, 2011 and 2015. Vertical line represents the 14-inch minimum length limit.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Whitney Reservoir, Texas, 2005, 2007 and 2015. 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
2005	26	1	25	0	49	4
2007	30	0	29	1	49	0
2015	30	3	26	1	66	10

Table 8. Proposed sampling schedule for Whitney 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. Structural habitat surveys are required only if large changes in structural habitat are suspected, i.e. increases in bulkhead, loss of standing timber, etc.

Survey year	Electrofish Fall	Trap net	Gill net	Habitat		Access	Creel survey	Report
				Structural	Vegetation			
2016-2017								
2017-2018			A					
2018-2019							S	
2019-2020	S		S		S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Whitney Reservoir, Texas, 2015-2016.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			668	400.8
Threadfin Shad			150	90.0
Blue Catfish	25	2.5		
Channel Catfish	46	4.6		
White Bass	99	9.9		
Striped Bass	66	6.6		
White Crappie	13	0.9		
Redbreast Sunfish			25	15.0
Green Sunfish			31	18.6
Warmouth			9	5.4
Bluegill			533	319.8
Longear Sunfish			80	48.0
Redear Sunfish			31	18.6
Spotted Bass			14	8.4
Largemouth Bass			423	253.8

APPENDIX B

Catch rates (CPUE) of targeted species by gear type for standard surveys on Whitney Reservoir, Texas, 1990 to present. Surveys prior to 1996 utilized biologist-selected stations while those after 1996 utilized randomly-selected stations. Electrofishing stations were shocked with a 5.0 Smith-Root GPP (Gas Powered Pulsator) until 2010, when a 7.5 Smith-Root GPP was used. Species averages are in bold. Asterisk denotes collection by a non-standard gear.

	Electrofisher							
	Shad		Sunfish					
Year	Gizzard	Threadfin	Bluegill	Redear	Longear	Green	Warmouth	Redbreast
1990	47.0	2.5	25.5	3.5	10.5	0	4.0	8.5
1991	19.5	1.5	26.0	0.5	8.0	0.5	2.0	1.5
1992	10.0	0	45.5	0.5	14.5	3.0	2.0	0
1993	69.0	2.0	30.0	2.0	5.5	1.5	0	18.0
1994	38.5	5.5	125.5	1.5	31.5	8.0	1.0	66.0
1995	206.5	87.5	252.0	5.5	22.0	3.5	8.5	45.5
1996	180.0	7.5	16.5	3.5	15.0	3.5	0.5	14.0
1997	62.0	12.0	74.5	1.0	2.5	1.0	0.5	30.0
1998	61.5	15.5	168.5	1.0	1.5	4.5	0	74.5
1999	11.0	14.0	43.0	1.5	6.0	9.0	1.0	22.0
2001	281.5	198.5	382.0	3.0	54.5	27.0	10.0	107.5
2003	149.5	15.0	179.0	0.5	8.0	25.0	0.5	13.5
2005	36.5	30.0	64.0	5.0	6.5	0	2.5	1.0
2007	144.0	130.5	139.5	36.0	9.0	4.0	0	0
2009	183.0	39.5	158.5	13.0	15.0	4.5	1.5	7.0
2011	101.0	49.5	133.5	12.5	8.0	0.5	0.5	1.0
2015	400.8	90.0	319.8	18.6	48.0	18.6	5.4	15.0
Avg.	**117.7**	**41.2**	**128.4**	**6.4**	**15.6**	**6.7**	**2.3**	**25.0**

	Electrofisher		
	Bass		
Year	Largemouth	Smallmouth	Spotted
1990	28.5	2.0	5.0
1991	14.5	0	1.5
1992	23.0	0	0
1993	50.5	3.0	14.0
1994	49.5	2.0	16.5
1995	119.5	16.5	13.0
1996	15.5	10.0	3.0
1997	56.5	12.5	3.5
1998	100.0	25.5	12.5
1999	35.0	4.0	6.0
2001	85.0	1.0	2.5
2003	49.0	0.5	2.5
2005	25.5	0	0.5
2007	113.0	0	0
2009	40.0	0.5	0
2011	75.0	1.0	0
2015	253.8	0	8.4
Avg.	**66.7**	**4.6**	**5.2**

	Gill nets					Trap nets	
	Catfish			Bass		Crappie	
Year	Blue	Channel	Flathead	White	Striped	White	Black
1990	1.3	4.4	0	15.0	5.2	13.1	0
1991	0.6	3.0	0.1	14.6	9.3	7.7	0.5
1992	0.8	2.6	0	4.3	6.9	32.9	0.7
1993	0.5	4.3	0.1	11.1	6.3	9.9	0
1994	1.3	1.2	0	5.1	7.9	4.8	0.1
1995	1.3	1.1	0	5.5	3.2	11.3	0
1996	1.6	1.7	0	7.5	4.7	0.8	0.1
1997	2.3	0.8	0.2	1.6	3.5	10.8	0
1998	1.4	1.6	0.1	1.9	2.1	28.4	0.4
1999	1.2	1.5	0.3	0.5	2.5	3.9	0.2
2000	1.5	1.3	0.3	4.1	1.8	-	-
2001	1.9	3.9	0.1	2.4	1.1	-	-
2002	0.9	3.1	0.7	0.7	2.3	-	-
2003	0.6	4.7	0.2	1.0	0.6	1.9	0.2
2004	1.1	2.1	0.1	1.1	1.5	-	-
2005	-	-	-	-	-	13.5	0.1
2006	0.3	4.6	0.1	4.0	1.5	-	-
2008	0.4	8.9	0	7.4	1.4	-	-
2010	1	6.1	0.1	6.5	5.5	-	-
2012	3.1	2.2	0.1	3.4	1.5	-	-
2014	3.3	3.3	0	6.3	1.7	-	-
2016	2.5	4.6	0	9.9	6.6	-	-
Avg.	**1.4**	**3.2**	**0.1**	**5.4**	**3.7**	**11.6**	**0.2**

APPENDIX C

Location of sampling sites, Whitney Reservoir, Texas, 2015-2016. Standard electrofishing and gill netting stations are indicated by circles and triangles respectively. Water level was within 3.0' of full pool at time of sampling.

APPENDIX D

	McCown Valley		Steele Creek		Lofers Bend	
Date	Cells/mL	ITU's	Cells/mL	ITU's	Cells/mL	ITU's
1/28/16	0	0	0	0	0	0
1/5/16	0	0	2,000	0	0	0
12/1/15	5,000	0	0	0	0	0
3/29/15	6,000	1	17,000	1	N/A	N/A
2/3/15	3,000	0	0	0	1,000	0
1/6/15	3,000	0	6,000	0	0	0
12/3/14	0	0	2,000	0	0	0
11/4/14	3,000	0	0	0	0	0
10/9/14	2,000	0	0	0	2,000	0
4/4/14	0	0	1,000	0	0	0
3/5/14	0	0	3,000	0	0	0
2/4/14	0	0	7,000	0	0	0
1/14/14	0	0	13,000	1	0	0
3/6/13	2,000	0	60,000	0	0	0

Results of golden alga testing, Whitney Reservoir, Texas, 2013-2016 showing low cell counts and lack of toxicity during the period of this report. Bioassay results (ITUs) are interpreted thusly: 0 = non-toxic, 1=slight/low toxicity, 5=moderate toxicity, and ≥25 = high toxicity.