

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

Lake Fairfield

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TABLE OF CONTENTS

Survey and Management Summary	2
Introduction	3
Reservoir Description	3
Angler Access	3
Management History.....	3
Methods	4
Results and Discussion	5
Fisheries Management Plan	7
Literature Cited.....	9
Figures and Tables.....	10-24
Reservoir Characteristics (Table 1)	10
Boat Ramp Characteristics (Table 2).....	10
Harvest Regulations (Table 3).....	10
Stocking History (Table 4)	11
Habitat Survey (Table 5)	13
Percent Directed Angler Effort per Species (Table 6).....	13
Total Fishing effort and Fishing Expenditures (Table 7)	14
Gizzard Shad (Figure 1).....	15
Bluegill (Figures 2 and 4; Table 8).....	16 and 18
Redear Sunfish (Figure 3).....	17
Channel Catfish (Figure 5 -6; Table 9).....	19
Largemouth Bass (Figures 6-8; Table 10).....	21
Proposed Sampling Schedule (Table 11)	25
Appendix A	
Catch Rates for all Species from all Gear Types.....	26
Appendix B	
Fish Kill Histogram of Largemouth Bass, Red Drum and Channel Catfish per inch group.....	27
Appendix C	
Annual Fish Kill Tables for all Species, 2008 – 2012.....	33
Appendix D	
Daily Dissolved Oxygen Levels, North Cove and South Ramp, 08/31 – 09/14, 2011	44
Appendix E	
Map of 2012-2013 Sampling Locations.....	45

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Fairfield were surveyed from June 2012 through March 2013 using electrofishing and gill netting. A vegetation survey was conducted in the summer of 2012. Anglers were surveyed from March through May 2013 with a creel survey. This report summarizes results of the surveys and contains a management plan based on those findings.

- **Reservoir Description:** Lake Fairfield is a 2,032-acre reservoir on Big Brown Creek, Texas, a tributary of the Trinity River, providing cooling water for two 575-megawatt lignite-fired electric generation units. Bank access is adequate and two boat ramps are present, although boat access is limited during low water levels. Giant cane and cattails form a fringe in the littoral zone around most of the lake. American lotus is present in shallow water (<4 feet deep), primarily in the backs of coves.
- **Management History:** Lake Fairfield has experienced late-summer fish kills since 2005 (annually since 2008), primarily attributed to rapid declines in dissolved oxygen levels. Annual stocking of Red Drum was halted after 2011 until further characterizations and knowledge of the annual fish kills were understood. Fish kills from single events ranged from an estimated 189 fish valued at \$1,041 to 1,261,494 fish with an estimated value of \$4,381,494. Traditionally, important sport fish included sunfishes, Largemouth Bass, Channel Catfish, and Red Drum. An access creel survey was conducted during the spring quarter, March through May 2013, to further assess the effects of annual fish kills on directed angler effort and success.
- **Fish Community**
 - **Prey species:** Threadfin Shad and Gizzard Shad were present in the reservoir; however, electrofishing catch rates in 2012 were down from long term averages. Only twenty percent of the current shad population appears to be readily available as prey. Redear Sunfish and Bluegill catch rates were also down from long term averages, but a substantial population of sunfish ≤ 4 inches still remains, providing adequate prey for sport fish.
 - **Channel Catfish:** Spring 2013 gill net catch rates for Channel Catfish were the highest they have been since 2005. These data are very promising compared to the 2011 survey which only collected three fish. The majority of catfish appear to be within 13 to 22 inches, indicating abundant fish available for angler harvest.
 - **Largemouth Bass:** Fall 2012 electrofishing catch rates were the highest they have been since 2004. Similar to Channel Catfish, these data are very promising compared to extremely low catch rates in 2010. No fish were collected over 15 inches; however, average fish condition was excellent, indicating a healthy, rapidly growing population.
 - **Red Drum:** Red Drum have not been collected in spring gill net surveys since 2009. A small number of individuals were sampled during fall electrofishing in 2010 (N = 2) and 2012 (N = 1). Stocking of Red Drum ceased in 2011. No additional fish will be stocked until annual fish kills abate.

Blue Tilapia: Blue Tilapia are a prohibited exotic species likely introduced in Lake Fairfield by anglers. Sustained warm temperatures during winter have allowed population numbers to remain high. Anglers target tilapia primarily by cast netting and to a lesser extent, bowfishing, providing a substantial food fishery. Tilapia may offer another food source to the predator species in Lake Fairfield.
- **Management Strategies:** Work in conjunction with TPWD park staff, TPWD Kills and Spills Team and Luminant to monitor late summer fish kills in Lake Fairfield. Conduct biennial electrofishing and gill netting to monitor the condition of Largemouth Bass and Channel Catfish populations if annual fish kills do not occur. Conduct angler access and aquatic vegetation surveys every four years.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Fairfield from June 2012 through May 2013. The purpose of this document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2012-2013 data for comparison.

Reservoir Description

Lake Fairfield is a 2,032-acre reservoir on Big Brown Creek, Texas, a tributary of the Trinity River. The lake was constructed by Texas Utilities (now owned and operated by Luminant) to provide cooling water for the nearby Big Brown lignite-fueled power plant. Littoral habitat primarily consists of emergent vegetation such as cattails and common reed which surround the majority of the reservoir. American lotus is abundant in the upper third of the reservoir, and in the backs of some coves. Lake Fairfield is void of shoreline housing developments and prolonged low water levels have reduced littoral vegetation, resulting in eroded shoreline over 35% of the lake (Table 5). Other descriptive characteristics for Lake Fairfield are found in Table 1.

Lake Fairfield has experienced annual late-summer fish kills to varying degrees since 2008. Rapid declines in dissolved oxygen (D.O.) levels are believed to be primarily responsible for the kills. Artificial heating of Lake Fairfield, from the warm water discharge of Big Brown power plant, cause higher than normal levels of evaporation from the lake. However, naturally occurring solids (i.e. calcium and salts) are left behind and remain in solution, producing highly concentrated nutrient levels over time. Prolonged periods of drought and make-up water pumped from the Trinity River increased the nutrient concentrations in Lake Fairfield further, resulting in highly productive algal blooms in late summer. As solar radiation (day light) decreases in late summer, night-time respiration from algal colonies exceeds day time production causing overall drops in D.O. and eventually resulting in fish kills. Appendix D displays the late summer D.O. drops in conjunction with declining daily solar radiation exposure to Lake Fairfield.

Angler Access

Two public boat ramps provide adequate boat access to Lake Fairfield. Additional boat ramp characteristics are in Table 2. Fairfield Lake State Park occupies the entire South East shoreline of the lake, offering ample bank fishing opportunities. An improved fishing pier was installed this spring (2013) adjacent to the swimming beach.

Previous management strategies and actions: Management strategies and actions from the previous survey report (Bennett and Ott 2009) included:

1. Continue annual stockings of Red Drum (*Sciaenops ocellatus*) fingerlings and assess the fishery through biennial gill net surveys.
Action: Annual stockings of Red Drum were conducted each spring through 2011. Biennial gill netting was removed from the Lake Fairfield sampling schedule after 2011 due to annual fish kills. Standard sampling (every four years) still occurs on Lake Fairfield.
2. Continue biennial electrofishing to assess Largemouth Bass (*Micropterus salmoides*) population.
Action: Biennial electrofishing was removed from the sampling schedule after 2010 due to annual fish kills. Standard sampling (every four years) still occurs on Lake Fairfield.
3. Monitor access facilities maintained by Fairfield Lake State Park, make recommendations and provide regulation signs to park staff.
Action: Low water levels in 2008 prompted the recommendation to dredge both boat ramps to maintain adequate access. Both ramps were dredged during 2011. The North

boat ramp also had rubber mesh installed past the end of the ramp, allowing trailers a firm surface to access the lake during periods of extreme low water.

4. Work with Luminant, TPWD Kills and Spills Team, and state park staff to investigate fish kills.
Action: Annual fish kills have been documented through 2012. Stocking and additional sampling have been halted until further characterization of the annual fish kills is obtained.
5. Monitor aquatic vegetation during routine habitat surveys, and discuss the possibility of a native plant establishment project with the controlling authority.
Action: Treatment of American lotus has been required in the swimming area of the state park, and has been conducted by TPWD Aquatic Habitat Enhancement staff. Native plant establishment has not been initiated due to low water levels.

Harvest regulation history: Sport fish in Lake Fairfield are currently managed with statewide harvest regulations with exceptions for Largemouth Bass and Red Drum. Largemouth Bass at Lake Fairfield are currently managed with an 18-inch minimum-length limit, and Red Drum are managed with a 20-inch minimum length limit (Table 3).

Stocking history: Prior to the onset of annual fish kills, Red Drum had been stocked during most years since 1984. No Red Drum have been stocked in Lake Fairfield since 2011. Florida Largemouth Bass (*M. s. Floridanus*) were initially stocked from 1976-1979, and Lake Fairfield continues to maintain a productive fishery with a high percentage of Florida alleles (Bennett and Ott 2009). Multiple attempts to stock White Crappie and hybrid Black x White Crappie failed to establish a fishery. Palmetto Bass were annually stocked in Lake Fairfield between 1975 and 1999, and established a popular fishery. Due to limitations in total hatchery production, stocking of Palmetto Bass at Lake Fairfield was discontinued after 1999. Six hundred and fifty adult Largemouth Bass, 109,073 Florida Largemouth Bass fingerlings, 107,815 Bluegill fingerlings and 21,156 Channel Catfish fingerlings were stocked in 2011 to re-establish populations following several fish kills. A complete stocking history is found in Table 4.

Vegetation/habitat management history: Native emergent vegetation (common reed and cattails) form a fringe in the littoral zone around most of the lake. American lotus is typically abundant within the upper shallow water reaches (<4 feet deep) of the lake along with the backs of coves. Historically, lotus has required herbicide treatment in the state park swimming area (Ott and Bister 2005). Hydrilla historically occupied a narrow fringe in shallow-water areas. In 2000, hydrilla covered approximately 10% of the reservoir. However, the distribution of hydrilla has naturally declined to trace amounts.

Water transfer: Lake Fairfield is used as a water cooling reservoir for Big Brown power plant (owned and operated by Luminant). During periods of drought, water is pumped into Lake Fairfield from the nearby Trinity River to provide adequate cooling water for Big Brown power plant. Due to high evaporation, little water is ever discharged from the reservoir. No other inter-basin transfers are known to exist.

METHODS

Fish were collected by electrofishing (1 hour at 12, 5-min stations) and gill netting (5 net nights at 5 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and as the number of fish per net night (fish/nn) for gill nets. All standard surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Fish kill investigations and enumerations were conducted according to the Kills and Spills Team (KAST) Standard Operating Procedures Manual (TPWD, Inland Fisheries Division – KAST, unpublished manual revised 2006).

An access-point creel survey was conducted during the spring quarter of 2013 (March through May). Angler interviews were conducted on 5 weekend days and 5 weekdays to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries

Division, unpublished manual revised 2011).

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_t)] were calculated for target species 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. Largemouth Bass otoliths were removed to determine length at age (N = 92, range: 3.9 – 15.6 inches).

RESULTS AND DISCUSSION

Habitat: A comprehensive vegetation survey of the littoral zone was conducted in August 2012. Prolonged drought conditions from 2008-2011 reduced a substantial amount of the littoral vegetation. Hydrilla continued to naturally decline (likely due to high water temperature) and was only found in trace amounts in 2012. American lotus accounted for the majority of aquatic vegetation identified in Lake Fairfield, covering approximately 195 surface acres. Common reed and cattails occupied 16 acres and 4 acres, respectively. A detailed habitat description is found in Table 5. The last structural survey was conducted in 2000 (Ott and Bister 2001).

Creel: Fishing efforts and expenditures for Lake Fairfield have shifted since the last report (Bennett and Ott 2008). Historically, Red Drum were the primary species targeted, accounting for roughly 50% of all fishing effort. The most recent creel data revealed Largemouth Bass are now the most pursued species in the lake, accounting for 74.4% of all directed effort, while Red Drum only accounted for 6.2% (Table 6). Anglers spent a total of 9,087 hours and an estimated \$82,848 fishing Lake Fairfield during the spring quarter (March 2013 – May 2013) (Table 7).

Prey species: Long term fall electrofishing catch rates of Gizzard Shad (*Dorosoma cepedianum*) have declined over the last four surveys. Gizzard Shad CPUE from the most recent 2012 survey was 20.0/h (Figure 1); compared to 36.0/h in 2008 (Bennett and Ott 2009) and 89.0/h in 2006 (Ott and Bister 2005). No Gizzard Shad were collected in 2010 electrofishing surveys. The 2012 survey also revealed only 20% of the shad population was vulnerable to predation by most predators. Only two Threadfin Shad (*Dorosoma petenense*) were collected in 2012. Sunfish in Lake Fairfield are primarily comprised of Bluegill (*Lepomis macrochirus*) and Redear Sunfish (*Lepomis microlophus*). Bluegill catch rates in 2012 were 94.0/h (Figure 2); down substantially from long term averages. Catch rates for Bluegill prior to the reoccurring fish kills were 571.0/h in 2004 and 350.0/h in 2006. A majority of the Bluegill collected in 2012 were ≤ 4 inches however, providing a moderate food source for sport fish. Redear Sunfish catch rates in 2012 were 27.0/h (Figure 3) and have remained stable over the last four surveys (see Bennett and Ott 2009). Declining prey species catch rates can largely be attributed to annual fish kills. In addition, drought conditions during 2008 and 2010 surveys reduced habitat and likely contributed to low catch rates. Shallow water habitat was reduced to a barren, 2- to 3-foot shelf across much of Lake Fairfield. Very few anglers targeted sunfish during the creel period.

Channel Catfish: Lake Fairfield has historically supported a low-abundance Channel Catfish population with poor recruitment (Ott and Bister 2005). Channel Catfish < 12 inches were typically scarce in surveys; while the majority of the fish collected were over 20 inches (PSD = 100, Bennett and Ott 2009). Gill net catch rate of Channel Catfish in 2012 (13.8/nn) was the highest reported since 2005 (Figure 5). The Channel Catfish size structure (PSD = 64) was also better than previous surveys; however, the presence of smaller Channel Catfish is likely from stocking in 2011 rather than natural recruitment. While preliminary, these data suggest stocking may develop a sustainable sport fishery for Channel Catfish. The interactions between prey fish abundance and late summer fish kills need to be monitored over the following years before stocking (and accumulation of more fish biomass) can be justified. Blue Catfish were stocked in 1971 and 1975; however, no fish have been collected in subsequent surveys since 1992. Only 6.3% of all angling effort was directed towards catfish (6.3%) and none were caught by anglers targeting them (Table 9).

Largemouth Bass: The Largemouth Bass population in Lake Fairfield was historically stable and offered anglers a very productive fishery. A combination of annual fish kills and low water levels have negatively affected the population. This was very apparent during the 2010 fall electrofishing survey. Only 5 Largemouth Bass were collected and all were less than ten inches (Figure 6). However, the catch rate from the 2012 survey (92.0/h) was the highest since 2004 (137.0/h), indicating a rebounding population. The majority of Largemouth Bass collected measured < 12 inches (PSD = 24); however, that should be expected in a recently developing fishery (following several fish kills). Many of the fish collected were likely the product of Florida Largemouth Bass fingerlings stocked in 2011 (N = 109,073). The average body condition of all Largemouth Bass collected was excellent, ranging from 105 – 118. These data are also indicative of a newly rebounding population, with low overall fish abundance allowing for fast growth rates and healthy fish (W_t). Growth was fast, as every Largemouth Bass was \leq age 1 (N = 90; length 3.9-15.6 inches) (Figure 8). Largemouth Bass were the most sought after species on Lake Fairfield in 2013, accounting for 74.4% of all directed angling effort (Table 10). Current data represent the potential for an excellent Largemouth Bass fishery in coming years. However, the threat of annual fish kills is still present and needs to be continually monitored.

Red Drum: Prior to the recent late-summer fish kills, Red Drum had been stocked during most years since 1984. A very successful and popular fishery developed. However, recent fish kills negatively affected both the Red Drum population and anglers alike. Total angling effort for Red Drum declined from 46.6% in 2008/2009 to only 6.2% in 2013 (Table 6). Red Drum have not been collected in spring gill net surveys since 2009. Few were sampled in fall electrofishing in 2010 (N = 2) and 2012 (N = 1). Stocking ceased in 2011, and will remain in cessation until annual fish kills abate.

Blue tilapia: Blue tilapia is a prohibited exotic species likely introduced in Lake Fairfield by anglers. Sustained warm temperatures during winter have allowed population numbers to remain high. Blue Tilapia are heavily harvested by anglers, primarily by cast netting and to a lesser extent, bowfishing. Tilapia not only provide a substantial food fishery to anglers, but may also offer another food source to the predator species in Lake Fairfield.

Fisheries management plan for Lake Fairfield, Texas

Prepared – July 2013

ISSUE 1: Lake Fairfield has experienced annual late-summer fish kills from 2008 – 2012, resulting in millions of fish and dollars lost from the fishery (Appendices B and C).

MANAGEMENT STRATEGIES

1. Monitor Lake Fairfield during late summer (July-September) for the occurrence/evidence of fish kills. This will be accomplished primarily by working in collaboration with park staff and the TPWD Kills and Spills Team to identify whenever fish kills have occurred.
2. Investigate the feasibility of a nutrient sequestration agent (i.e. Phospholoc) to eliminate high nutrient loads in Lake Fairfield which are largely to blame for the fish kills.
3. Investigate aeration/oxygen additive systems to remediate summer D.O. crashes.
4. Distribute information on the fish kills to anglers, park staff and Luminant.

ISSUE 2: Recent surveys indicate a rebounding Largemouth Bass and Channel Catfish populations, offering recreational opportunities to anglers.

MANAGEMENT STRATEGIES

1. Determine the status of annual fish kills over multiple years of observations (2 or more).
2. Consider biennial fish monitoring of Largemouth Bass via fall electrofishing and Channel Catfish via spring gill netting if no major fish kill events have been reported.
3. Distribute information to area anglers about the condition of the Lake Fairfield fishery via press-releases.

ISSUE 3: Historically, Red Drum have been prolific in Lake Fairfield and extremely popular with the anglers.

MANAGEMENT STRATEGIES

1. Similar to Issue 2, determine the status of annual fish kills before any action is taken.
2. Consider restocking Red Drum annually after significant fish kills have not been observed for a minimum of four years.
3. Distribute information to area anglers about the condition of the Lake Fairfield fishery via press-releases.

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

1. Cooperate with the state park to post appropriate signage at access points around the reservoir.
2. Contact and educate state park staff about invasive species, and provide them with posters, literature, etc., so that they can in turn educate their customers.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule is highly dependent upon the status of annual fish kills in Lake Fairfield. If fish kills continue to occur at the current rate, all additional sampling of Lake Fairfield should be removed and surveys reduced to the required four year rotation. If fish kills are contained during summer of 2013 and 2014, additional sampling can be resumed. This would include fall electrofishing in 2014 and spring gill netting in 2015. Standard electrofishing and gillnetting will be conducted in fall 2016 and spring 2017 respectively, regardless of the fish kill status. Angler access and aquatic vegetation surveys will be conducted in 2016.

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Table 1. Characteristics of Lake Fairfield, Texas.

Characteristic	Description
Year completed	1969
Controlling authority	Luminant
County	Freestone
Reservoir type	Cooling-water reservoir
Shoreline Development Index (SDI)	3.7
Conductivity	1200 μ S/cm

Table 2. Boat ramp characteristics for Lake Fairfield, Texas, February, 2013. Reservoir elevation at time of survey was 310 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
South Park Ramp	31.78141 -96.07068	Y	50	306	Excellent, no access issues
North Park Ramp	31.79417 -96.05902	Y	25	304	Excellent, no access issues

Table 3. Harvest regulations for Lake Fairfield, 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, Largemouth	5	18-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum
Red Drum	3	20-inch minimum

Table 4. Stocking history of Lake Fairfield, Texas. FGL = fingerling; ADL = adults.

Species	Year	Number	Size
Channel Catfish	1969	25,000	FGL
	2011	<u>21,156</u>	
		46,156	
Bluegill	2011	<u>107,815</u>	FGL
		107,815	
Palmetto Bass	1975	25,000	FGL FRY FGL FGL FGL FGL FGL FGL FGL FGL FGL FGL FGL FGL
	1977	23,985	
	1979	24,500	
	1982	25,422	
	1986	35,650	
	1987	49,025	
	1988	49,226	
	1991	36,700	
	1992	36,265	
	1993	21,200	
	1994	37,100	
	1995	43,100	
	1996	35,285	
	1997	35,441	
	1998	22,647	
	<u>35,625</u>		
	536,171		
Largemouth Bass	1970	250,000	FGL
	2010	650	ADL
		250,650	
Florida Largemouth Bass	1975	123,100	FGL
	1976	122,500	FGL
	1977	130,000	FGL
	1979	129,145	FGL
	2011	<u>109,073</u>	FGL
		613,815	
White Crappie	1985	87,601	FGL
	1986	29,450	FGL
	1987	<u>353,439</u>	FGL
		470,490	
Black x White Crappie	1993	117,650	FGL
	1994	118,177	FGL
	1995	<u>249,208</u>	FGL
		485,035	
Nile Perch	1983	<u>1,310</u>	
		1,310	

Stocking history of Lake Fairfield, Texas, continued.

Species	Year	Number	Size
Red Drum	1984	235,455	FGL
	1985	283,700	FGL
	1986	217,323	FGL
	1987	473,340	FGL
	1991	515,751	FGL
	1992	245,118	FGL
	1993	217,923	FGL
	1994	253,280	FGL
	1995	231,523	FGL
	1996	266,633	FGL
	1997	158,890	FGL
	1999	222,340	FGL
	2000	276,602	FGL
	2001	287,820	FGL
	2002	21,938	FGL
	2003	385,367	FGL
	2004	7,125	FGL
	2005	208,440	FGL
	2006	2,439	FGL
	2007	423,732	FGL
2008	207,102	FGL	
2009	207,683	FGL	
2010	433,480	FGL	
2011	<u>327,320</u>	FGL	
		6,110,324	

Table 5. Survey of aquatic vegetation, Lake Fairfield, Texas, 2012. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	Acres (% of total)
Native floating-leaved	
American lotus	195 (9.5)
Native emergent	
Cattail	4 (<0.2)
Common reed	16 (<0.7)
Non-Native	
Hydrilla	Trace

Table 6. Percent directed angler effort by species for Lake Fairfield, Texas, September 2008 through February 2009 and March 2013 through May 2013.

Species	2008/2009	2013
Red Drum	46.6	6.2
Largemouth Bass	24.7	74.4
Sunfish	15.9	3.6
Catfish	0	6.3
Anything	12.7	9.6

Table 7. Total fishing effort (h) for all species and total directed expenditures at Lake Fairfield, Texas, September 2008 through February 2009 and March 2013 through May 2013. Relative standard error is in parentheses.

Creel statistic	Year	
	2008/2009	2013
Total fishing effort (hours)	19,473 (42)	9,086 (71)
Total directed expenditures	\$155,130 (88)	\$82,848 (85)

Gizzard Shad

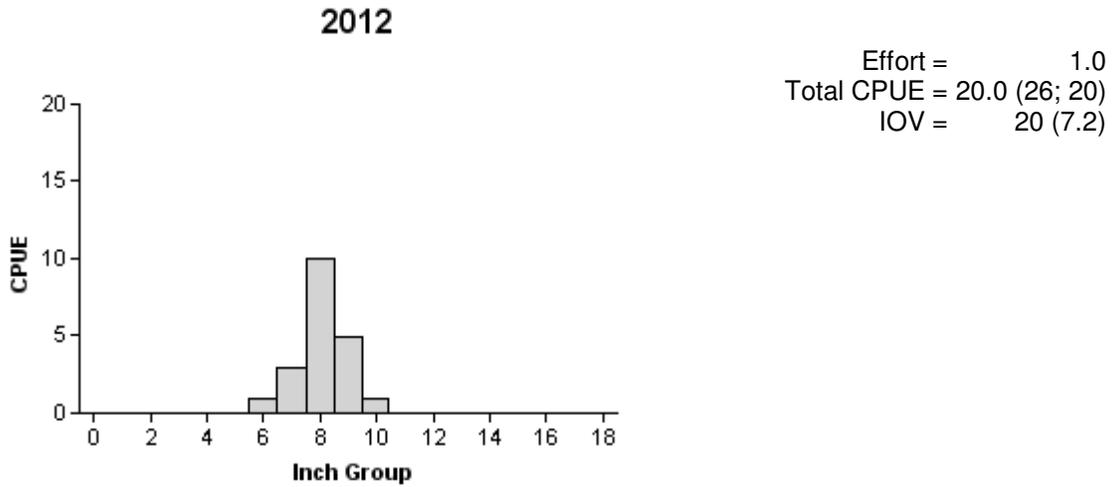
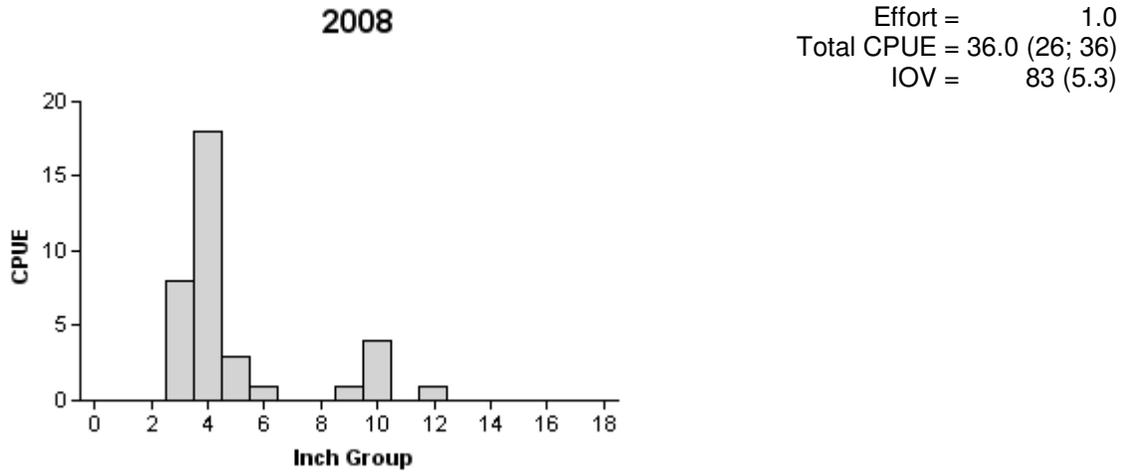


Figure 1. Number of Gizzard Shad caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Fairfield, Texas, 2008 and 2012. No Gizzard Shad were collected in 2010.

Bluegill

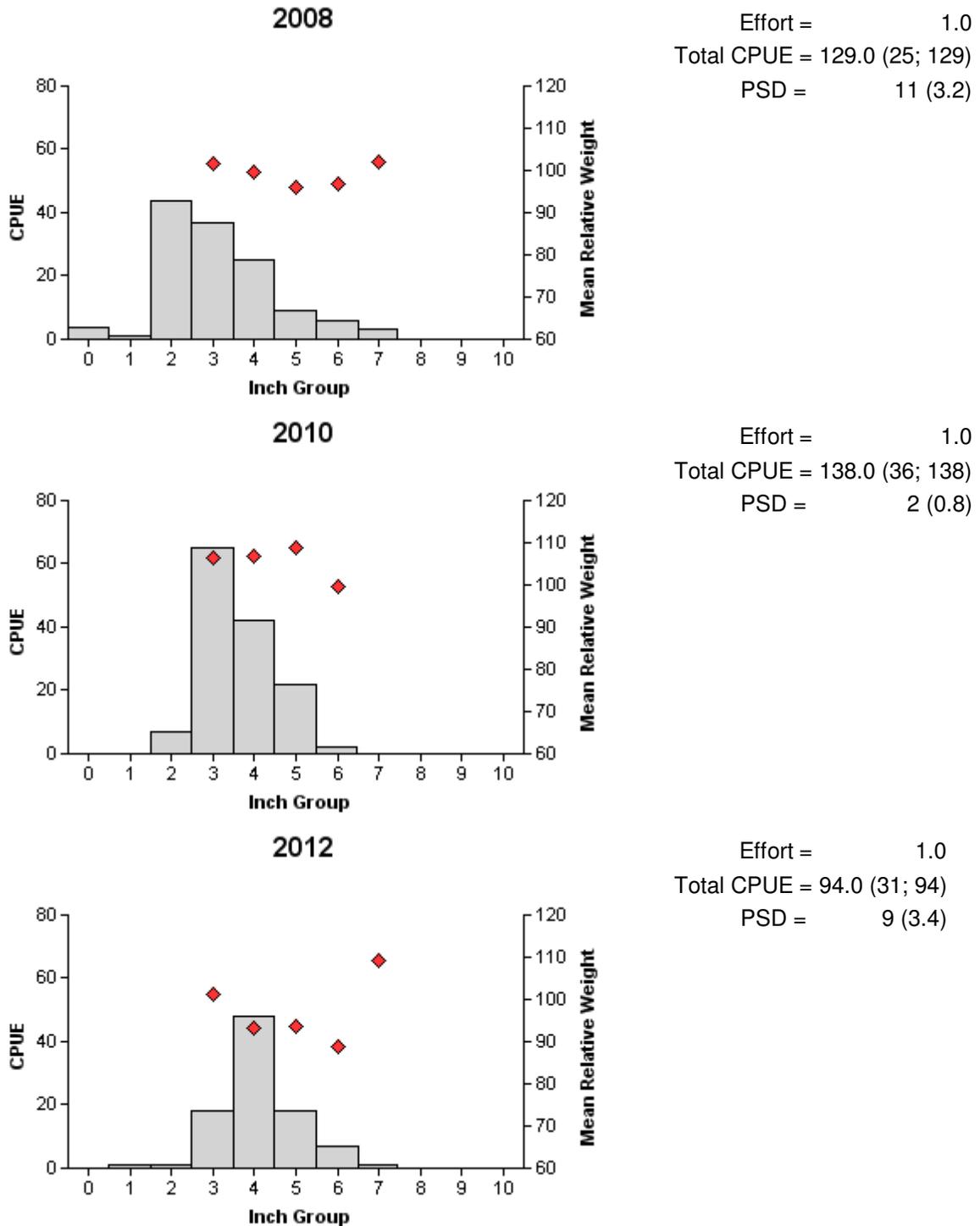
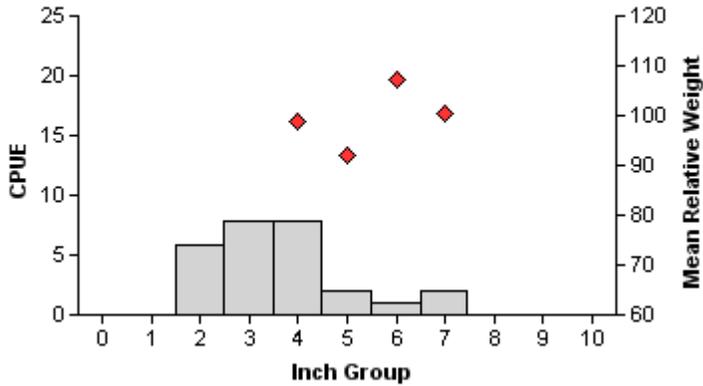


Figure 2. Number of Bluegill caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for PSD are in parentheses) for fall electrofishing surveys, Lake Fairfield, Texas, 2008, 2010, and 2012.

Redear Sunfish

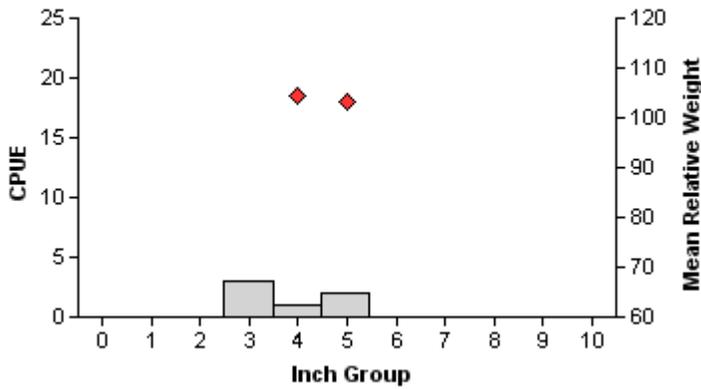
2008

Effort = 1.0
 Total CPUE= 27.0 (31; 27)
 PSD = 15 (5.8)



2010

Effort = 1.0
 Total CPUE= 6.0 (58; 6)
 PSD = 0 (130.3)



2012

Effort = 1.0
 Total CPUE= 23.0 (59; 23)
 PSD = 0 (66)

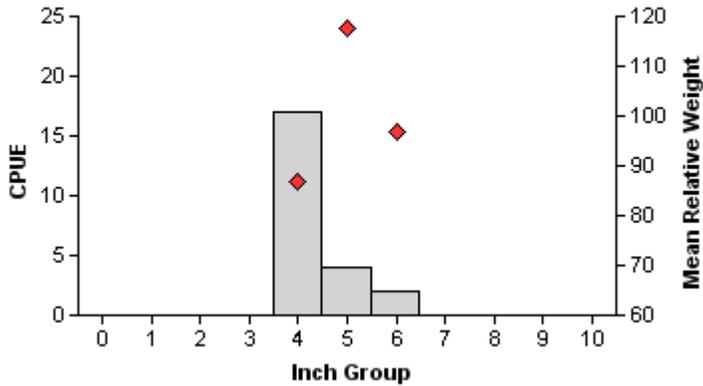


Figure 3. Number of Redear Sunfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for PSD are in parentheses) for fall electrofishing surveys, Lake Fairfield, Texas, 2008, 2010, and 2012.

Sunfish

Table 8. Creel survey statistics for sunfish at Lake Fairfield from September 2008 through February 2009 and March 2013 through May 2013. Total catch per hour is for anglers targeting sunfish and total harvest is the estimated number of sunfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year
	2013
Directed effort (h)	323 (115)
Directed effort/acre	0.2 (115)
Total catch per hour	8.7
Total harvest	2,069 (96)
Harvest/acre	1 (96)
Percent legal released	84



Figure 4. Length frequency of harvested Bluegill observed during creel surveys at Lake Fairfield, Texas, March 2013 through May 2013, all anglers combined. N is the number of harvested sunfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Channel Catfish

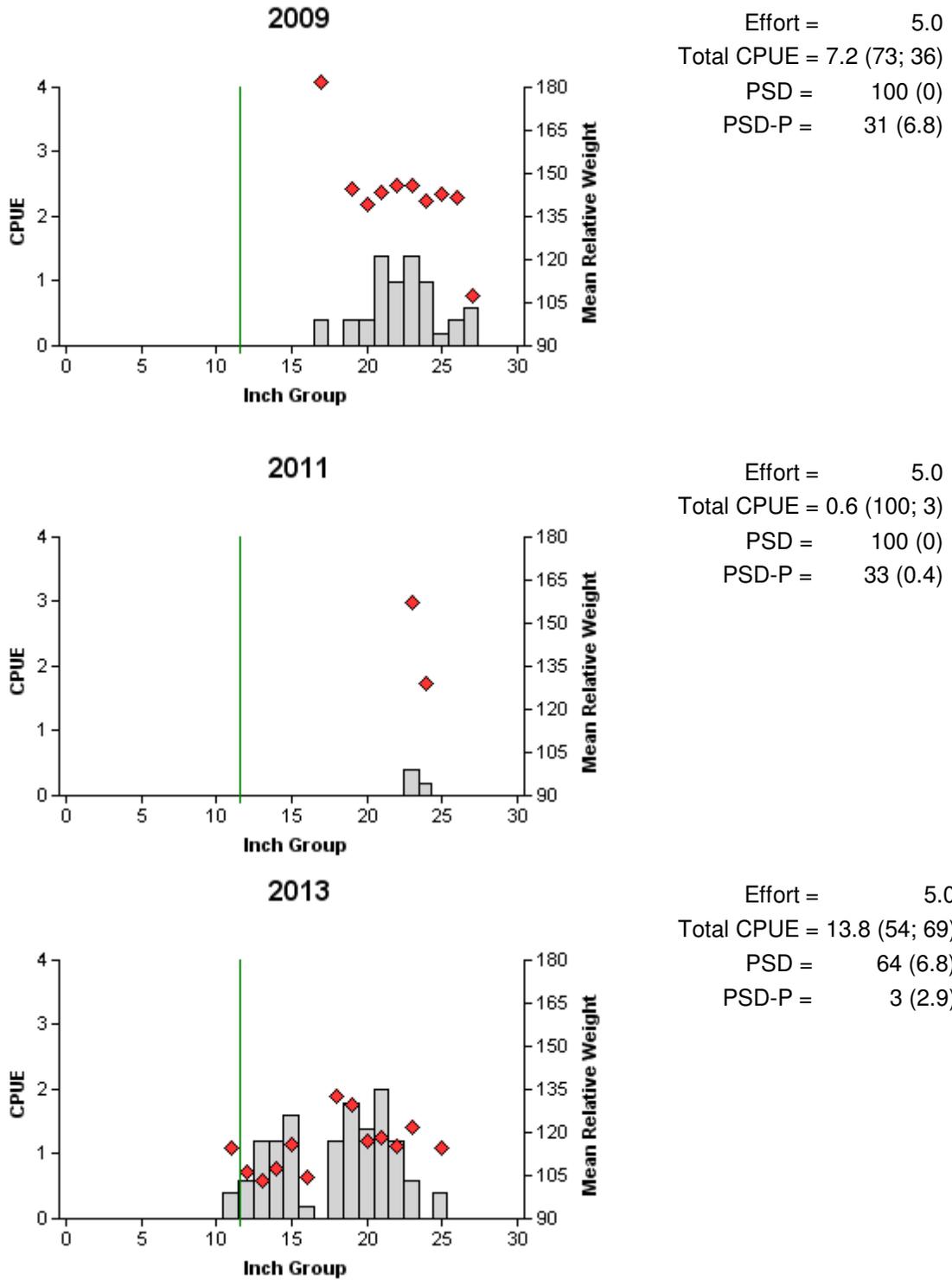


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for PSD are in parentheses) for spring gill net surveys, Lake Fairfield, TX, 2009, 2011, and 2013.

Channel Catfish

Table 9. Creel survey statistics for Channel Catfish at Lake Fairfield from March 2013 through May 2013. Total catch per hour is for anglers targeting catfish and total harvest is the estimated number of catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year
	2013
Directed effort (h)	570 (91)
Directed effort/acre	0.3 (91)
Total catch per hour	0
Total harvest	80 (117)
Harvest/acre	<0.1 (117)
Percent legal released	0

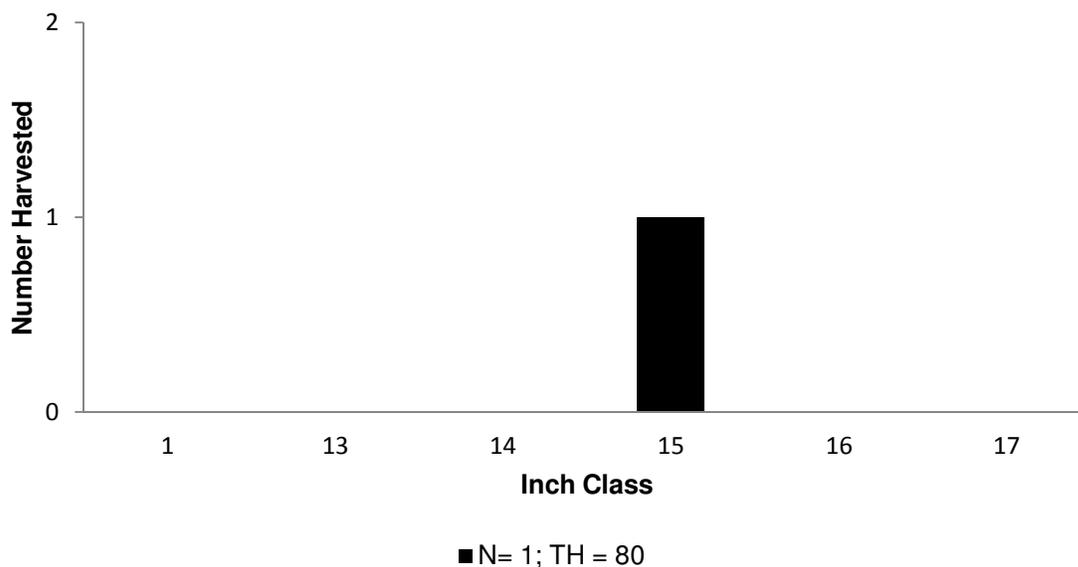
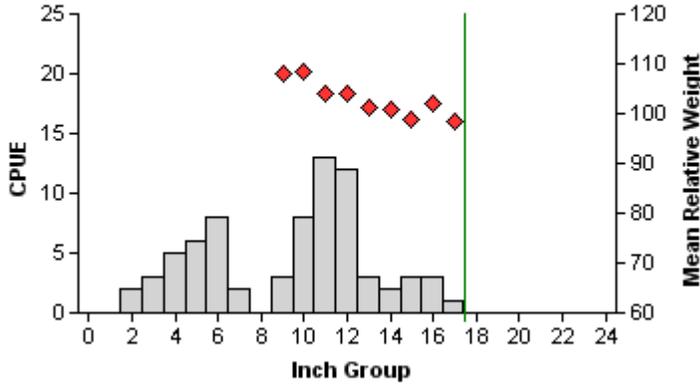


Figure 6. Length frequency of harvested Channel Catfish observed during creel surveys at Lake Fairfield, Texas, March 2013 through May 2013, all anglers combined. N is the number of harvested catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

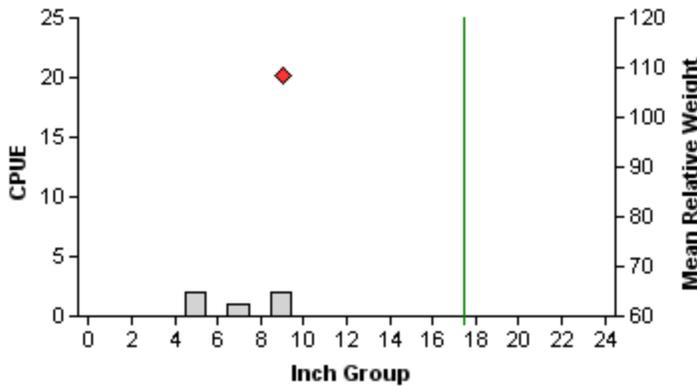
Largemouth Bass

2008



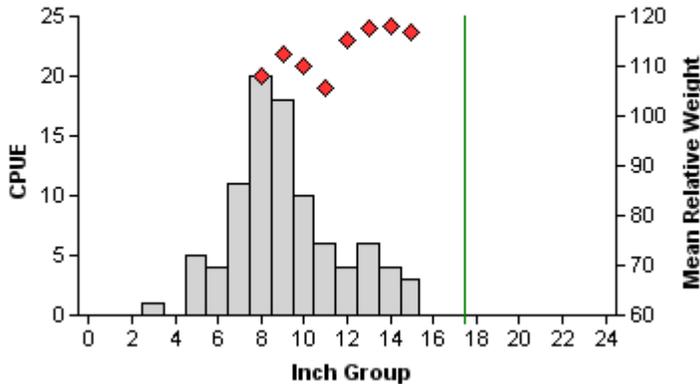
Effort = 1.0
 Total CPUE = 82.6 (30; 84)
 Stock CPUE = 57.0 (35; 58)
 PSD = 59 (11.3)
 PSD-18 = 0 (0)

2010



Effort = 1.0
 Total CPUE = 5.0 (46; 5)
 Stock CPUE = 2.0 (100; 2)
 PSD = 0 (138.2)
 PSD-18 = 0 (0)

2012



Effort = 1.0
 Total CPUE = 92.0 (32; 92)
 Stock CPUE = 71.0 (29; 71)
 PSD = 24 (5.8)
 PSD-18 = 0 (0)

Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for PSD are in parentheses) for fall electrofishing surveys, Lake Fairfield, Texas, 2008, 2010, and 2012. Vertical line represents length limit at time of survey.

Largemouth Bass

Table 10. Creel survey statistics for Largemouth Bass at Lake Fairfield from March 1, 2013 through May 31, 2013. Catch rate is for all anglers targeting Largemouth Bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Statistic	2013
Directed angling effort (h)	
Tournament	0
Non-tournament	6,757 (70)
All black bass anglers combined	6,757 (70)
Angling effort/acre	3.3 (70)
Catch rate (number/h)	0.3 (44)
Harvest	
Non-tournament harvest	80 (102)
Harvest/acre	<0.1 (102)
Tournament weigh-in and release	0
Release by weight	
<4.0 lbs	2,304 (82)
4.0-6.9 lbs	288 (90)
7.0-9.9 lbs	0
≥10.0 lbs	0
Percent legal released (non-tournament)	83

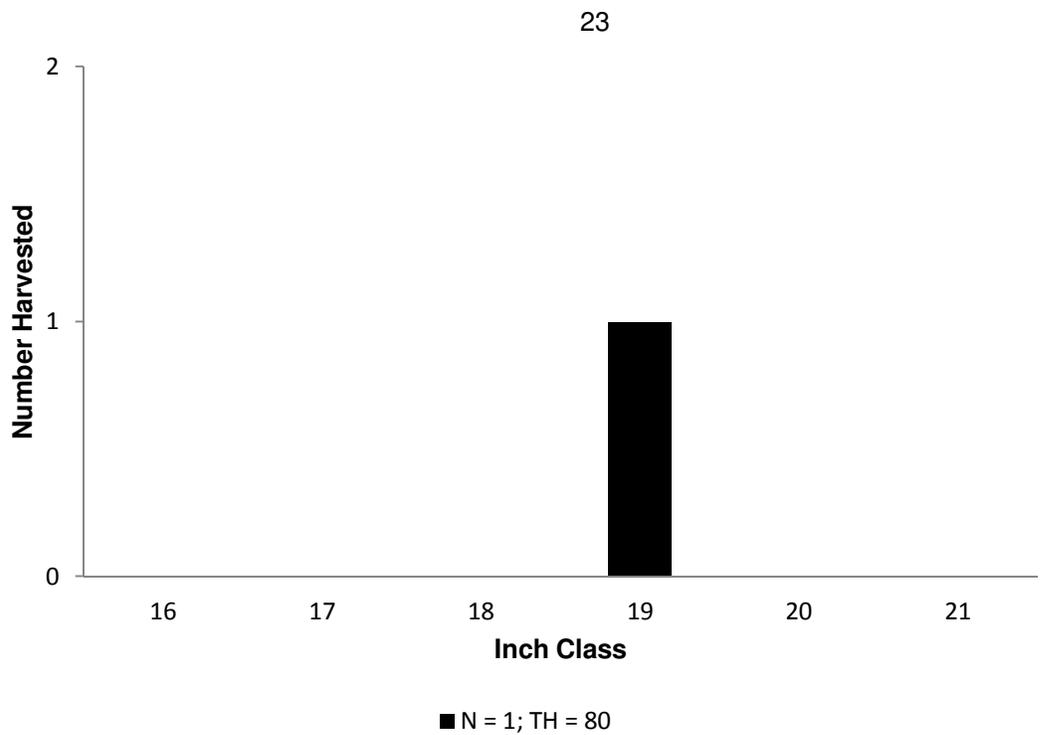


Figure 7. Length frequency of harvested Largemouth Bass observed during creel surveys at Lake Fairfield, Texas, March 2013 through May 2013, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

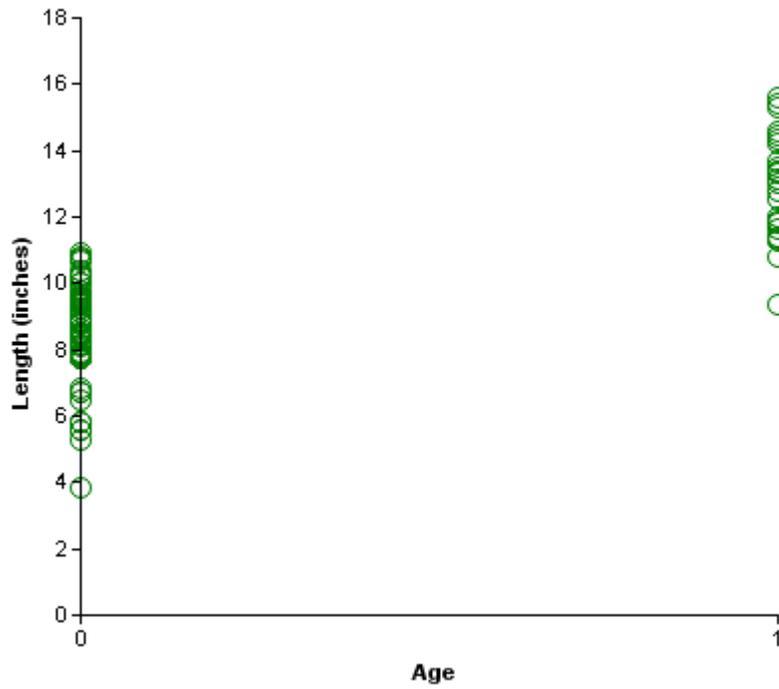


Figure 8: Length at age for Largemouth Bass collected during Fall electrofishing surveys (N=90; Length 3.9 – 15.6 inches), Lake Fairfield, Texas, 2012.

Table 11. Proposed sampling schedule for Lake Fairfield, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

Survey year	Electrofishing Fall	Gill net	Habitat			Report
			Vegetation	Structural	Access	
2013-2014						
2014-2015	A*	A*				
2015-2016						
2016-2017	S	S	S		S	S

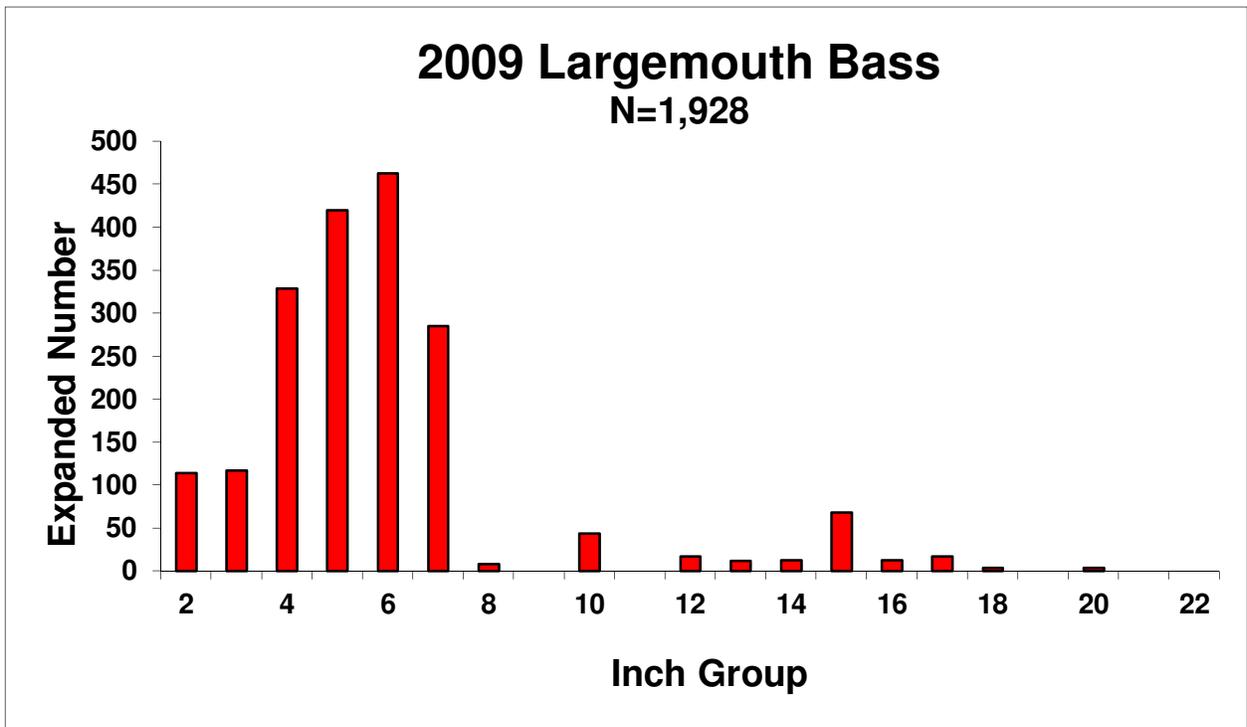
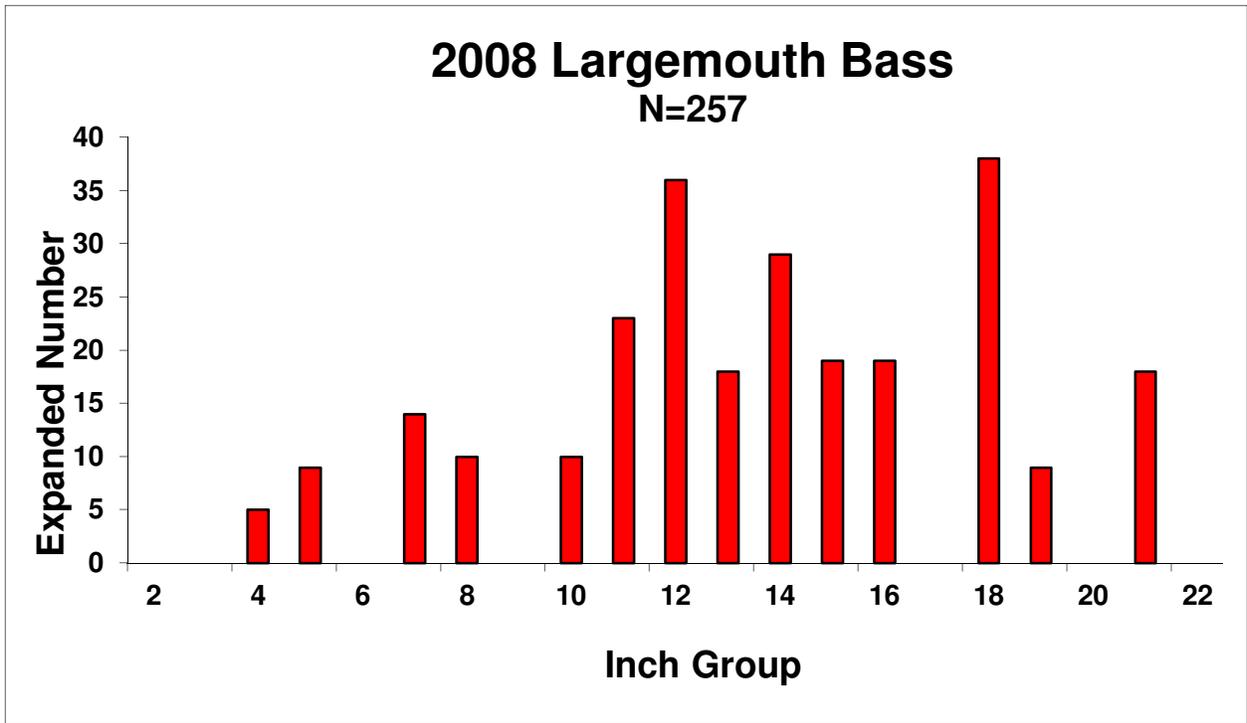
*contingent on absence of significant fish kills in 2013 and 2014

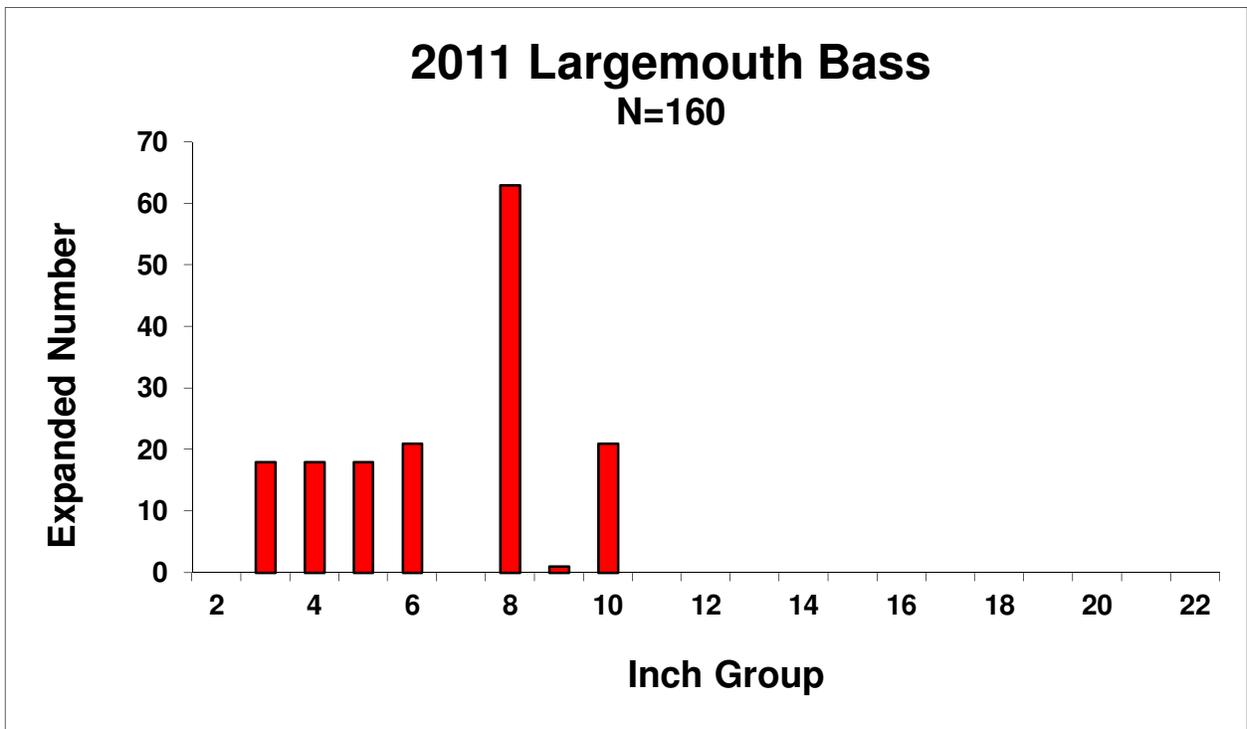
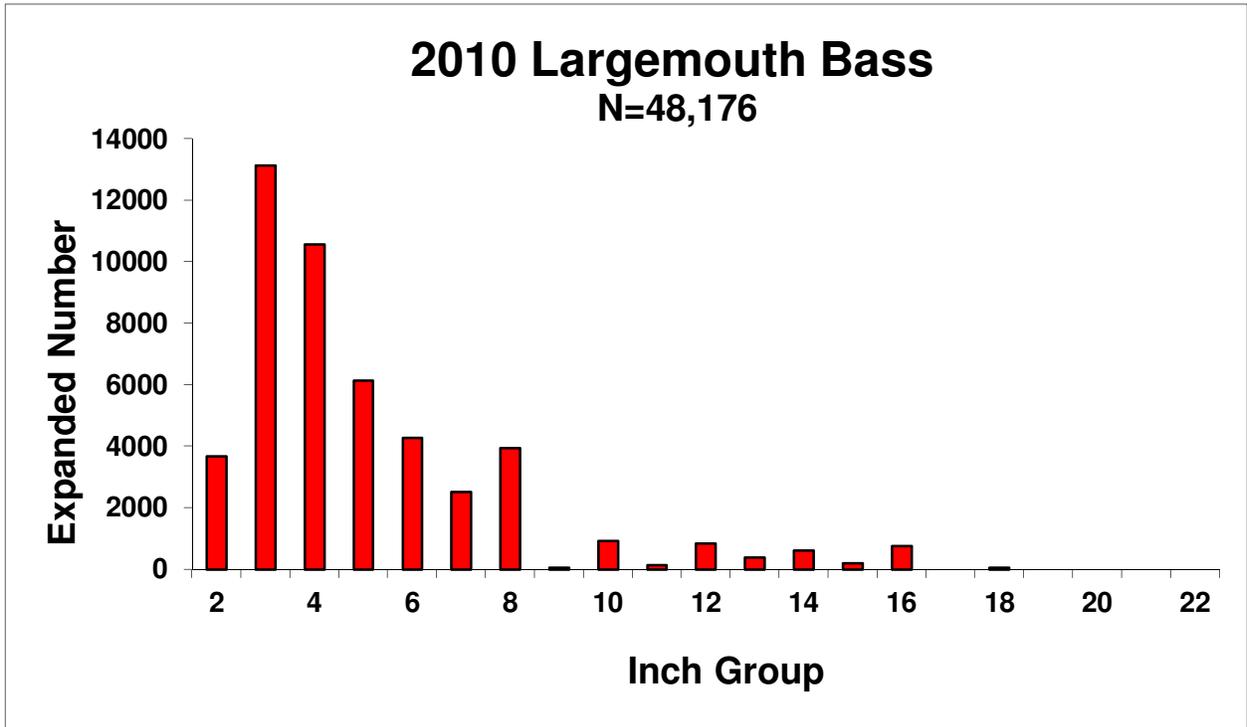
APPENDIX A

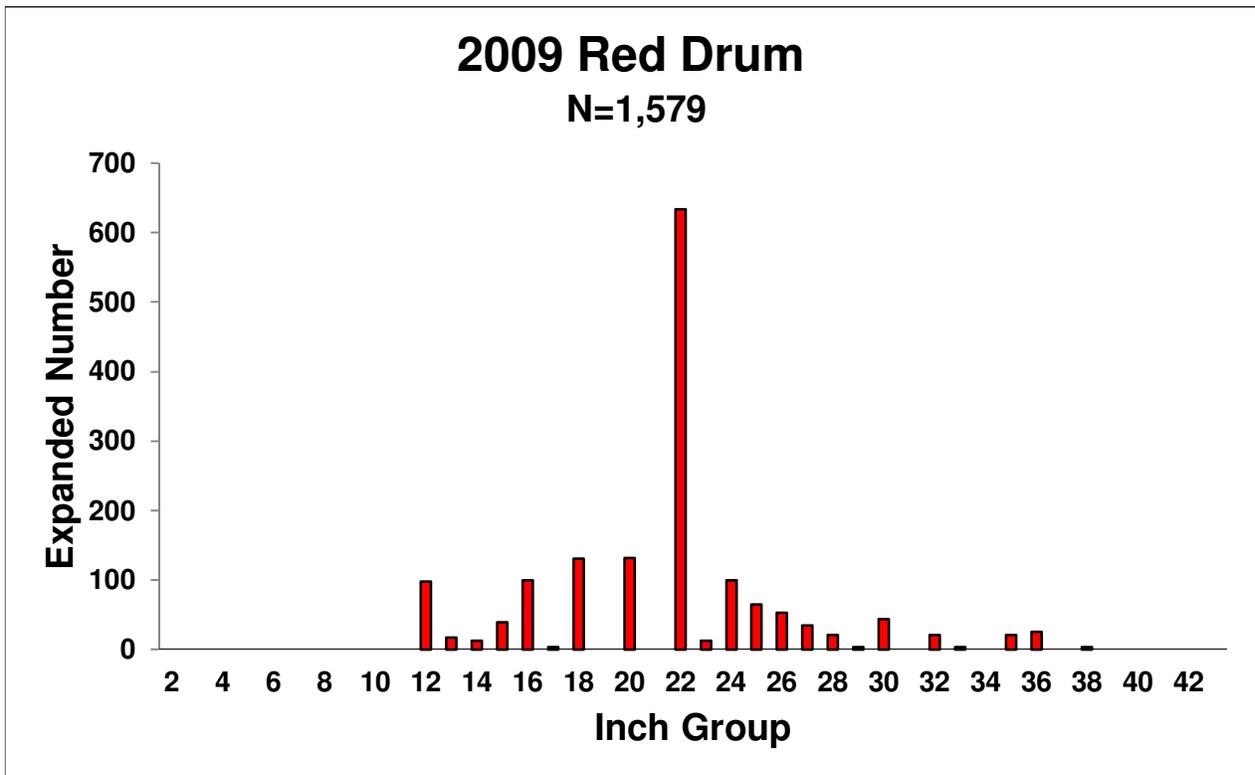
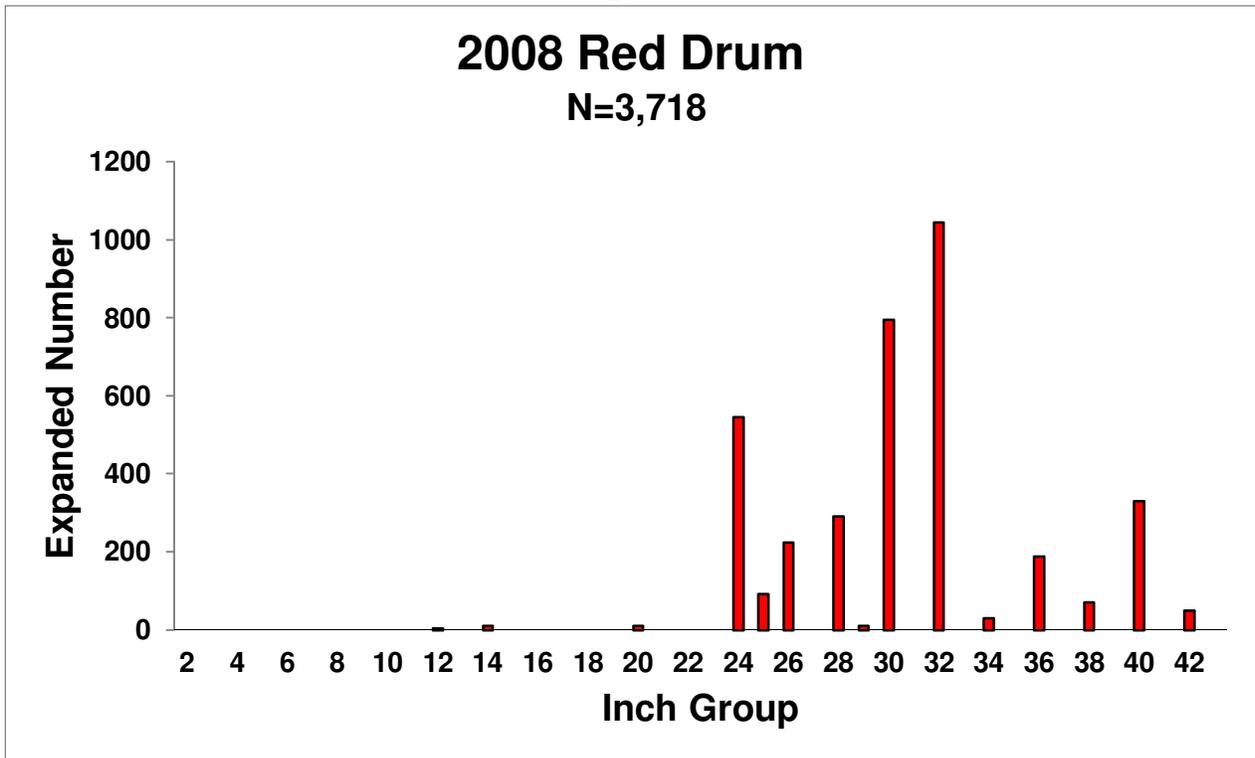
Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Fairfield, Texas, 2012-2013. Sampling effort was 5 net nights for gill netting and 1 hour for electrofishing.

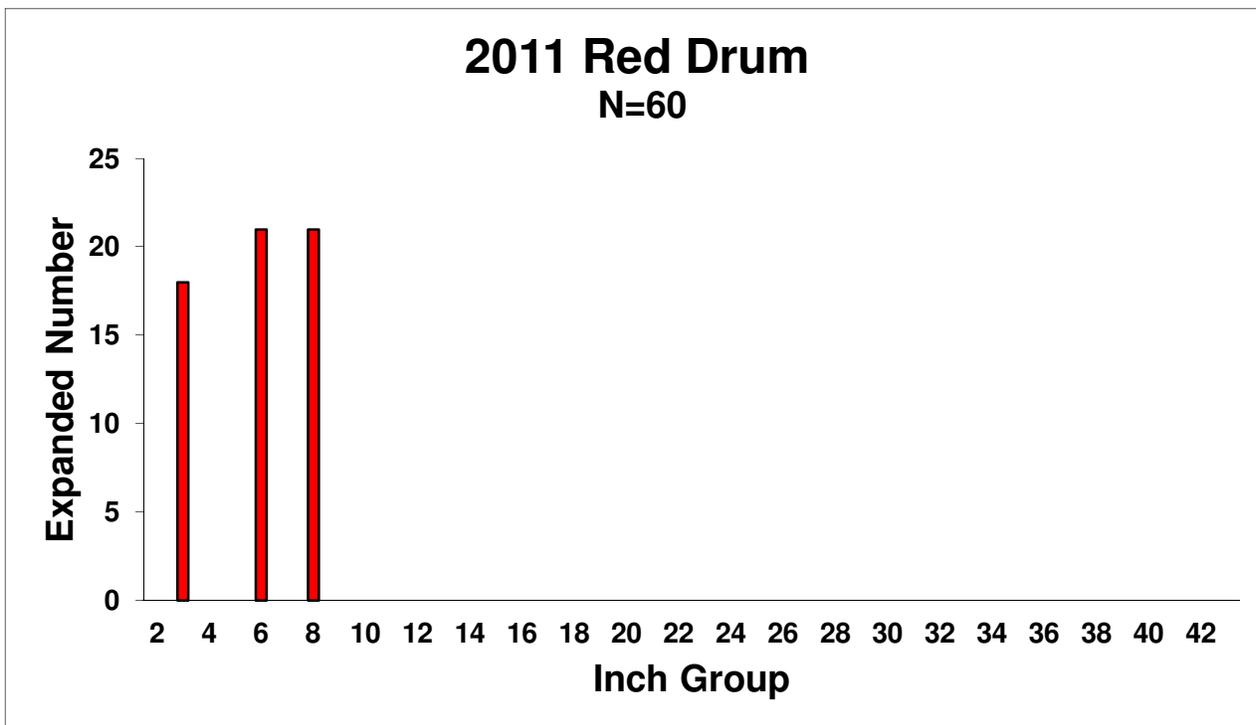
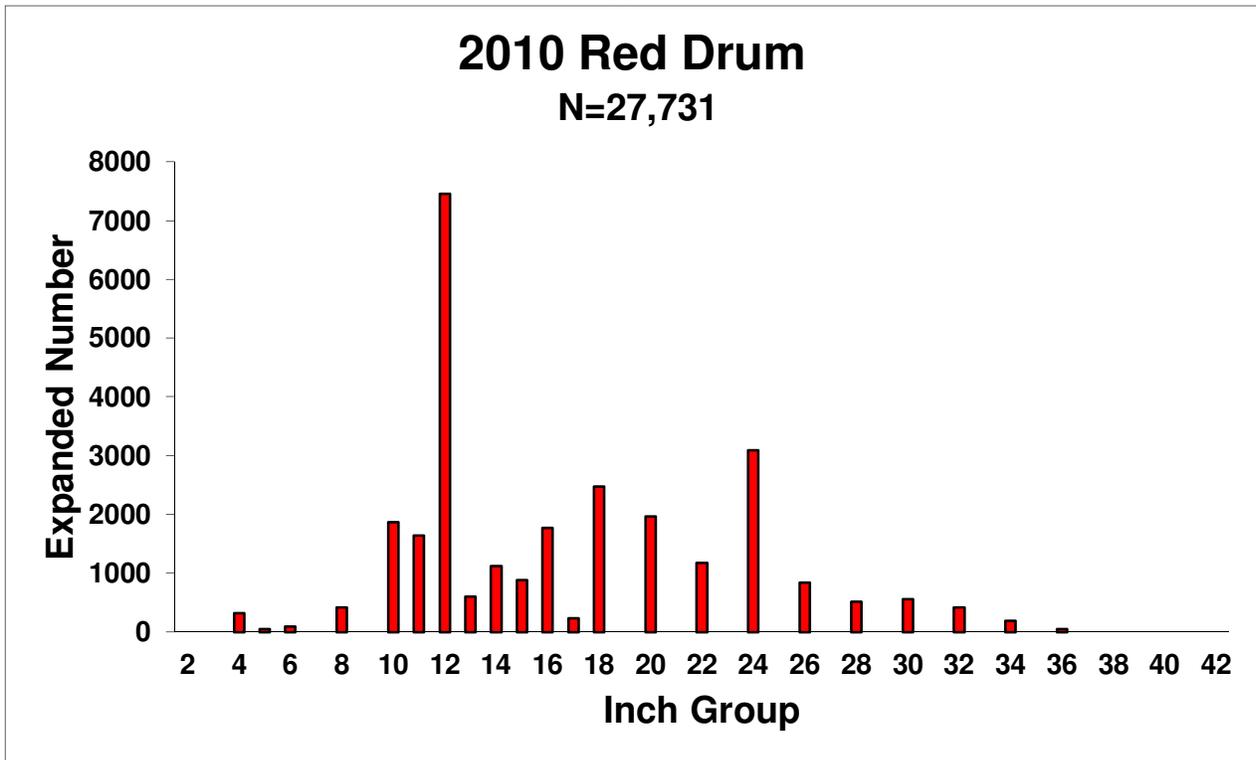
Species	Gill netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			20	20.0
Threadfin Shad			2	2.0
Channel Catfish	69	13.8		
Bluegill			94	94.0
Redear Sunfish			23	23.0
Largemouth Bass			92	92.0
Red Drum			1	1.0

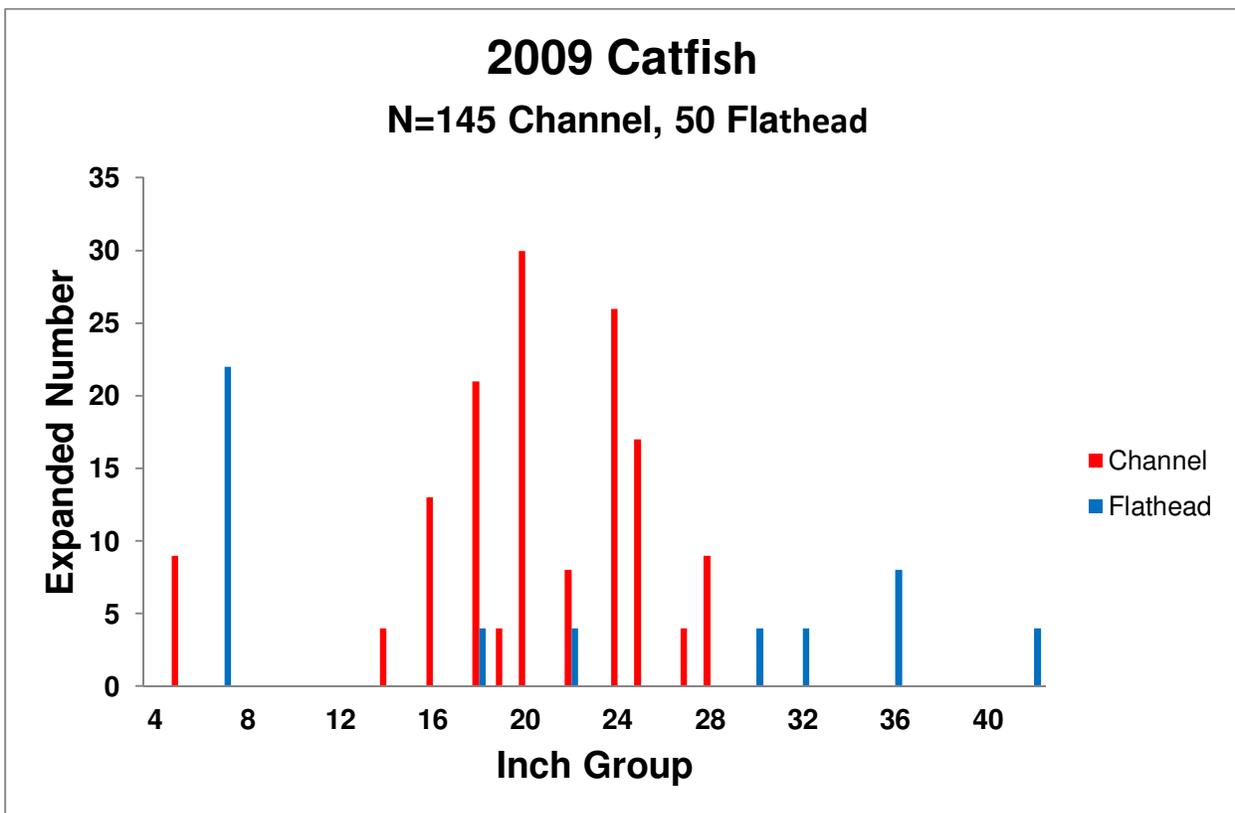
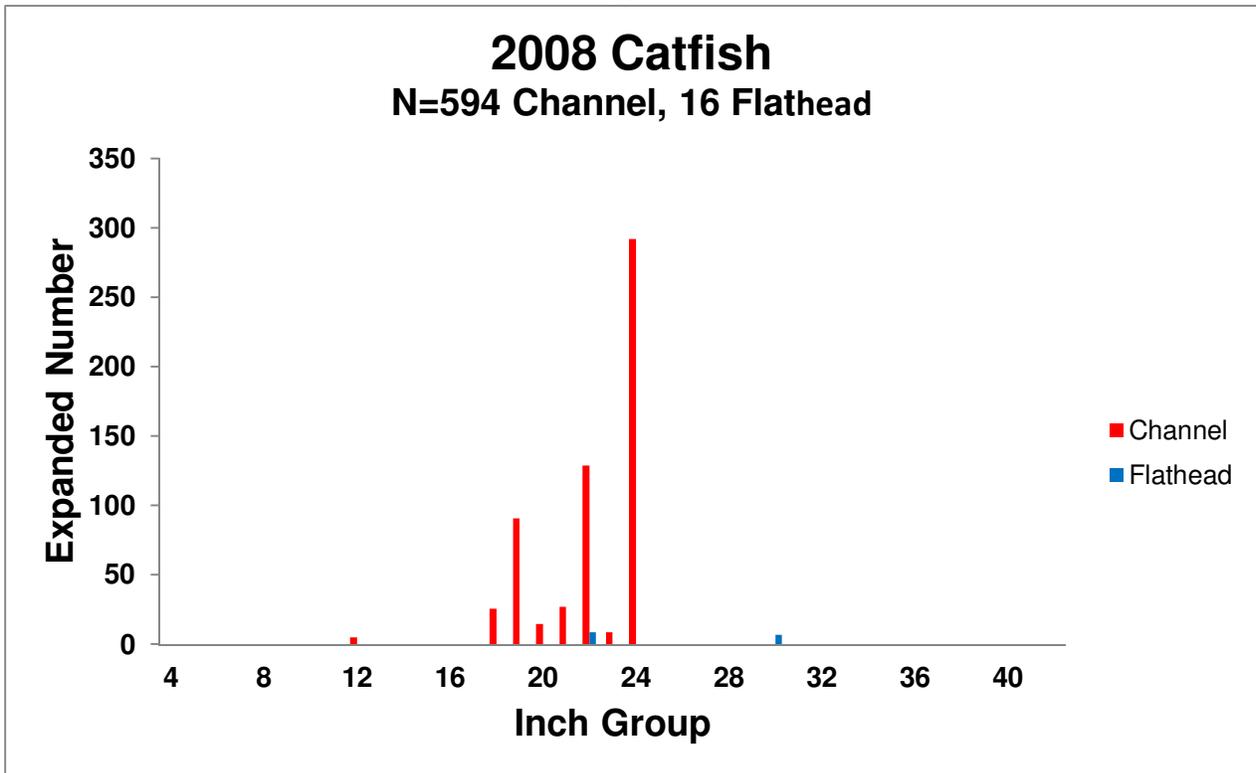
APPENDIX B

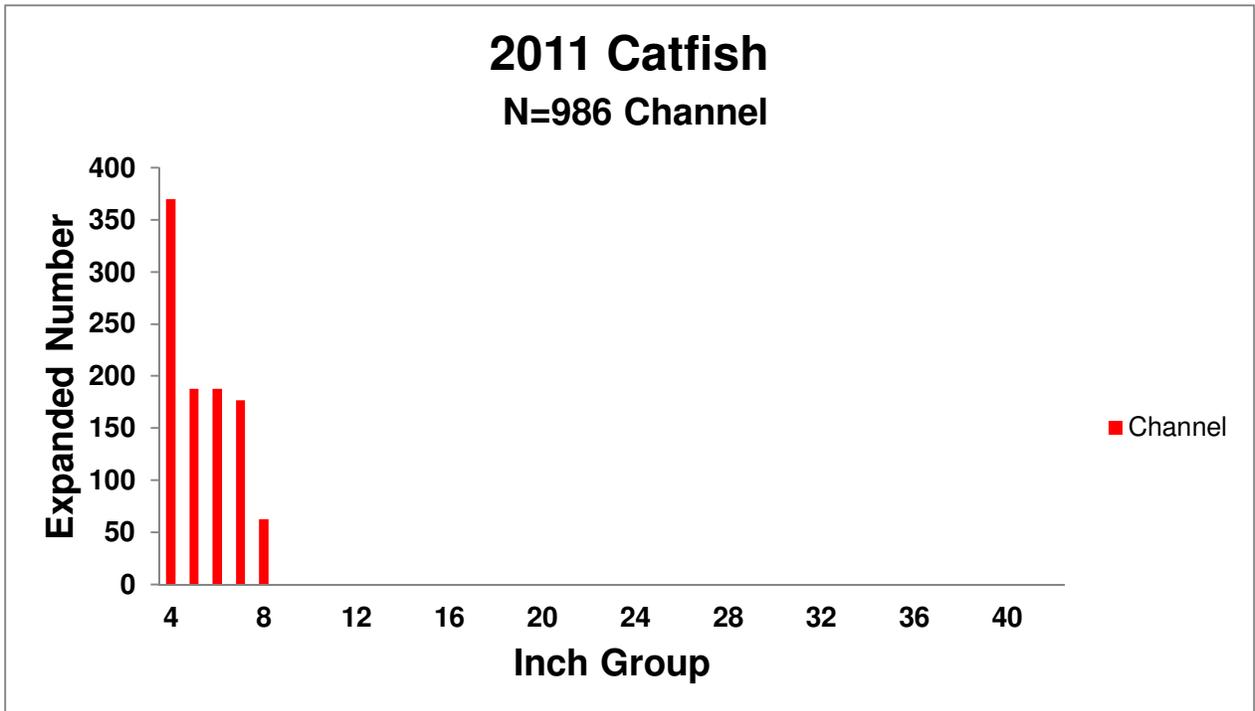
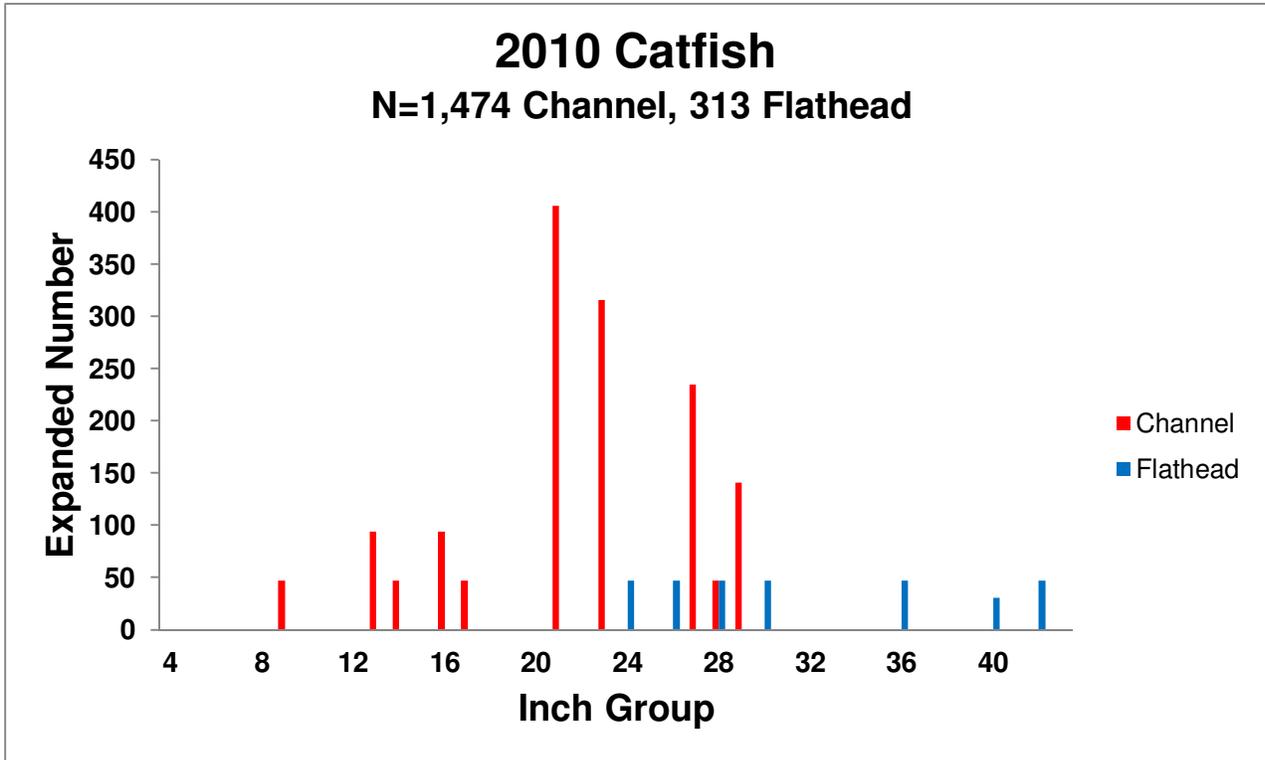












Summary of total fish lost from annual fish kills per inch group of Largemouth Bass, Red Drum and Channel and Flathead Catfish, Lake Fairfield, Texas. 2008 – 2011.

33
Appendix C

Total annual fish kill per species, Lake Fairfield, Texas, 2008.

Common name	Scientific name	Inch class	Number	Species Total
Blue Catfish	<i>Ictalurus furcatus</i>	21	27	
		22	55	
		23	9	
		24	292	
				383
Blue Tilapia	<i>Tilapia aurea</i>	8	5	
		10	5	
		12	73	
		13	5	
		14	78	
		15	136	
				302
Bluegill	<i>Lepomis macrochirus</i>	1	1,506	
		2	485	
		3	168	
		4	510	
		5	85	
		6	246	
		7	133	
		8	307	
		9	312	
		10	42	
				3,794
Channel Catfish	<i>Ictalurus punctatus</i>	12	5	
		18	26	
		19	91	
		20	15	
		22	74	
				211
Common Carp	<i>Cyprinus carpio</i>	22	9	
				9
Flathead Catfish	<i>Pylodictis olivaris</i>	22	9	
		30	7	
				16
Gizzard Shad	<i>Dorosoma cepedianum</i>	7	5	
		8	182	
		9	10	
		10	20	
		11	45	
		12	5	
		13	329	
		14	109	
		15	9	
				714

		34		
Largemouth Bass	<i>Micropterus salmoides</i>	4	5	
		5	9	
		7	14	
		8	10	
		10	10	
		11	23	
		12	36	
		13	18	
		14	29	
		15	19	
		16	19	
		18	38	
		19	9	
		21	18	
				257
Red Drum	<i>Sciaenops ocellatus</i>	12	5	
		14	10	
		20	10	
		24	546	
		25	41	
		25	51	
		26	46	
		26	179	
		28	291	
		29	10	
		30	796	
		32	1,046	
		34	31	
		36	189	
		38	71	
		40	331	
		42	50	
		44	15	
				3,718
Redear Sunfish	<i>Lepomis microlophus</i>	1	9	
		3	292	
		4	91	
		5	27	
		6	36	
		7	137	
		8	9	
				601
Spotted Gar	<i>Lepisosteus oculatus</i>	24	7	
				7
Threadfin Shad	<i>Dorosoma petenense</i>	1	334	
		2	60,440	
		3	50,770	
		4	5	
				111,549

Total annual fish kill per species, Lake Fairfield, Texas, 2009.

Common name	Scientific name	Inch class	Number	Species Total
Blue Tilapia	<i>Tilapia aurea</i>	3	18	1,329
		4	31	
		5	135	
		6	4	
		7	9	
		8	5	
		10	14	
		12	361	
		13	87	
		14	481	
		15	127	
		16	57	
Bluegill	<i>Lepomis macrochirus</i>	4	30	582
		5	55	
		6	150	
		7	137	
		8	63	
		9	147	
Bullhead Minnow	<i>Pimephales vigilax</i>	2	14	14
Channel Catfish	<i>Ictalurus punctatus</i>	1	4	149
		5	9	
		14	4	
		16	13	
		18	21	
		19	4	
		20	30	
		22	8	
		24	26	
		25	17	
		27	4	
		28	9	
Flathead Catfish	<i>Pylodictis olivaris</i>	7	22	50
		18	4	
		22	4	
		30	4	
		32	4	
		36	8	
		42	4	
Gizzard Shad	<i>Dorosoma cepedianum</i>	4	5	661
		5	405	
		6	661	

		36		
Gizzard Shad	<i>Dorosoma cepedianum</i>	7	16,107	
		8	1,344	
		9	5	
		10	1,632	
		12	34,749	
		13	109	
		14	245	
		15	188	
				55,450
Inland Silverside	<i>Menidia beryllina</i>	2	2,126	
		3	1,294	
		5	14	
				3,434
Largemouth Bass	<i>Micropterus salmoides</i>	2	114	
		3	117	
		4	329	
		5	420	
		6	463	
		7	285	
		8	8	
		10	44	
		12	17	
		13	12	
		14	13	
		15	68	
		16	13	
		17	17	
		18	4	
		20	4	
				1,928
Red Drum	<i>Sciaenops ocellatus</i>	12	98	
		13	17	
		14	13	
		15	39	
		16	100	
		17	4	
		18	131	
		20	132	
		22	634	
		23	13	
		24	100	
		25	65	
		26	53	
		27	35	
		28	21	
		29	4	
		30	44	
		32	21	
		33	4	

		37		
Red Drum	<i>Sciaenops ocellatus</i>	35	21	
		36	26	
		38	4	
				1,579
Redear Sunfish	<i>Lepomis microlophus</i>	7	4	
				4
Threadfin Shad	<i>Dorosoma petenense</i>	2	820,231	
				820,231
Unclassified Sunfishes	<i>Lepomis sp.</i>	2	14,976	
		3	5,777	
		4	6,084	
		5	1,882	
		6	682	
				29,401
Yellow Bullhead	<i>Ameiurus natalis</i>	10	4	
				4

Total annual fish kill per species, Lake Fairfield, Texas, 2010

Common Name	Scientific Name	Inch class	Number	Species Total
Blue Catfish	<i>Ictalurus furcatus</i>	23	47	141
		26	47	
		28	47	
Blue Tilapia	<i>Tilapia aurea</i>	3	47	90,330
		5	939	
		6	5,979	
		7	469	
		8	1,390	
		9	47	
		10	1,801	
		11	270	
		12	33,204	
		13	9,133	
		14	25,795	
		15	9,755	
		16	1,501	
Bluegill	<i>Lepomis macrochirus</i>	1	135	101,131
		2	1,598	
		3	38,197	
		4	20,243	
		5	15,261	
		6	11,171	
		7	3,372	
		8	4,221	
		9	5,391	
		10	1,542	
Channel Catfish	<i>Ictalurus punctatus</i>	8	47	1,803
		12	94	
		13	47	
		15	94	
		16	47	
		20	406	
		22	316	
		24	329	
		26	235	
		27	47	
		28	141	
Common Carp	<i>Cyprinus carpio</i>	2	47	1,803
		5	47	
		9	47	
		10	219	

		39		
Common Carp	<i>Cyprinus carpio</i>	11	47	
		12	203	
		16	135	
		20	338	
		22	47	
		24	94	
		26	188	
		28	94	
		30	47	
		32	188	
				1,741
Flathead Catfish	<i>Pylodictis olivaris</i>	24	47	
		26	47	
		28	47	
		30	47	
		30	47	
		36	47	
		40	31	
		42	47	
				360
Gizzard Shad	<i>Dorosoma cepedianum</i>	4	370	
		5	1,911	
		6	2,883	
		7	2,159	
		8	21,318	
		9	1,636	
		10	33,378	
		11	6617	
		12	15858	
		14	2955	
				89,085
Green Sunfish	<i>Lepomis cyanellus</i>	4	47	
		5	47	
				94
Inland Silverside	<i>Menidia beryllina</i>	2	94	
		3	451	
				545
Largemouth Bass	<i>Micropterus salmoides</i>	2	3,683	
		3	13,139	
		4	10,561	
		5	6,147	
		6	4,267	
		7	2,515	
		8	3,942	
		9	47	
		10	931	
		11	141	
		12	839	
		13	375	

		40		
Largemouth Bass	<i>Micropterus salmoides</i>	14	604	
		15	188	
		16	750	
		18	47	
				48,176
Longear Sunfish	<i>Lepomis megalotis</i>	4	141	
		5	47	
				188
Red Drum	<i>Sciaenops ocellatus</i>	4	322	
		5	47	
		6	94	
		8	416	
		10	1,865	
		11	1,643	
		12	7,462	
		13	604	
		14	1,121	
		15	885	
		16	1,769	
		17	234	
		18	2,472	
		20	1,967	
		22	1,172	
		24	3,093	
		26	843	
		28	515	
		30	556	
		32	416	
		34	188	
		36	47	
				27,731
Redear Sunfish	<i>Lepomis microlophus</i>	4	47	
		5	329	
		6	564	
		7	94	
		8	657	
		9	141	
		10	282	
				2114
Smallmouth Buffalo	<i>Ictiobus bubalus</i>	10	47	
				47
Threadfin Shad	<i>Dorosoma petenense</i>	1	1276	
		2	890,548	
		3	317	
				892,141

Total annual fish kill per species, Lake Fairfield, Texas, 2011

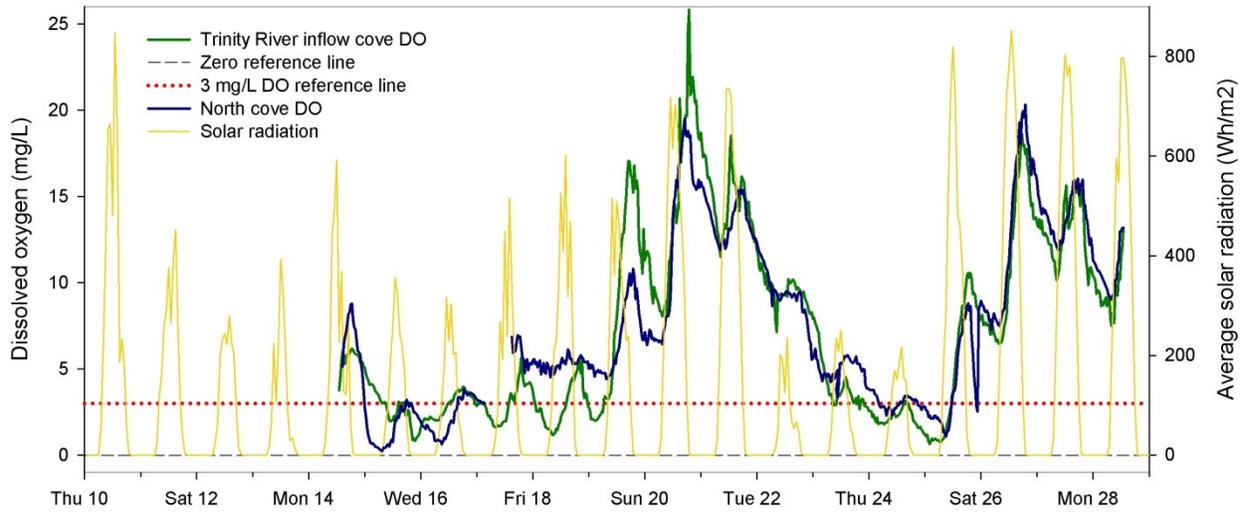
Common Name	Scientific Name	Inch class	Number	Species Total
Blue tilapia	<i>Tilapia aurea</i>	5	967	
		6	1,592	
		7	1,905	
		8	241	
		9	18	
		10	18	
		12	1,055	
		13	42	
		14	101	
		15	1,053	
		16	36	
				7,028
Bluegill	<i>Lepomis macrochirus</i>	1	3,485	
		2	28,812	
		3	17,448	
		4	7,264	
		5	1,267	
		6	81	
		7	134	
		8	21	
				58,512
Channel Catfish	<i>Ictalurus punctatus</i>	4	370	
		5	188	
		6	188	
		7	177	
		8	63	
				986
Common carp	<i>Cyprinus carpio</i>	16	549	
		18	1,753	
		20	1,224	
		21	21	
		22	1,140	
		24	21	
		28	21	
30	126			
				4,855
Gizzard Shad	<i>Dorosoma cepedianum</i>	2	317	
		3	21	
		4	2,459	
		5	3,646	
		6	6,588	
		7	5,422	
		8	2,175	
9	85			

		42		
Gizzard Shad	<i>Dorosoma cepedianum</i>	10	21	
		12	67	
		15	63	
		16	67	
				20,931
Inland silverside	<i>Menidia beryllina</i>	2	18,616	
		3	18	
				18,634
Largemouth Bass	<i>Micropterus salmoides</i>	3	18	
		4	18	
		5	18	
		6	21	
		8	63	
		9	1	
		10	21	
				160
Red Drum	<i>Sciaenops ocellatus</i>	3	18	
		6	21	
		8	21	
				60
Redear Sunfish	<i>Lepomis microlophus</i>	2	1,491	
		3	2,232	
		4	54	
		5	303	
				4,080
Threadfin Shad	<i>Dorosoma petenense</i>	1	67	
		2	40,500	
				40,567

Total annual fish kill per species, Lake Fairfield, Texas, 2012

Common name	Scientific name	Inch class	Number	Species Total
Blue Tilapia	<i>Oreochromis aureus</i>	6	1	3
		7	1	
		9	1	
Gizzard Shad	<i>Dorosoma cepedianum</i>	4	13,777	85,602
		7	22,962	
		8	46,475	
		9	2,388	
Redear Sunfish	<i>Lepomis microlophus</i>	3	184	370
		4	184	
		5	1	
		6	1	
Spotted Gar	<i>Lepisosteus oculatus</i>	13	1	3
		15	2	
Threadfin Shad	<i>Dorosoma petenense</i>	1	5,511	17,164
		2	10,000	
		4	1,653	

44
APPENDIX D



Daily dissolved oxygen readings for North Cove (Blue Line) and Trinity River inflow cove (Green Line), Lake Fairfield, Texas, September 10 – 28, 2009. Daily solar radiation is depicted by yellow line.

