PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-2

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2011 Survey Report

Greenbelt Reservoir

Prepared by:

Charles Munger and John Clayton
Inland Fisheries Division
District 1-A, Canyon, Texas

Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Greenbelt Reservoir were surveyed in 2011 using electrofishing and trap nets and in 2012 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Greenbelt Reservoir is a 1,990-acre impoundment located on the Salt Fork of the Red River five miles north of Clarendon in Donley County, Texas. It is owned by the Greenbelt Municipal and Industrial Water Authority, is used for water supply and recreational purposes, and has a history of significant water level fluctuations. The reservoir covered 1,300 acres in 2000 and declined to 550 surface acres by April 2012. Angler access was good but boat access is limited to one low-water ramp. At the time of sampling, the habitat was primarily silt and gravel shoreline and Eurasian watermilfoil.

- **Management History:** Important sport fish included largemouth bass, walleye, white bass, white crappie, and catfish. Harvest of most species has been managed with statewide limits. An experimental 18-inch minimum length limit, three-fish bag limit was implemented on smallmouth bass in 1994 with no documented success. The special regulation was rescinded in 2001. An attempt to establish yellow perch as an additional game fish and forage for the walleye population had limited success.

- **Fish Community**
  - **Prey species:** Electrofishing catch of gizzard shad was high, and most were available as prey to sport fish. Electrofishing catch of bluegills was much lower than in previous surveys, and most bluegills were less than 5-inches long.

  - **Catfishes:** Channel catfish abundance has increased. Channel catfish were in good condition and reproducing. Flathead catfish abundance has remained steady.

  - **White bass:** White bass gill net catch rates were good and most fish collected were legally harvestable.

  - **Smallmouth bass:** The relative abundance of smallmouth bass has remained low. They do appear to be reproducing as the majority of fish collected in 2011 were less than 6 inches in length.

  - **Largemouth bass:** Largemouth bass were relatively abundant and had good size structure. Body condition was below average for nearly all size classes but is similar to previous samples.

  - **Crappie:** White crappie abundance appears to be increasing in the reservoir. Body condition of white crappie was good and most fish are reaching 10 inches by age 2.

  - **Walleye:** Walleye abundance has declined but they continue to reproduce in the reservoir. Body condition has declined but fish are still reaching 16 inches by age 4.

  - **Management Strategies:** Continue management under current statewide harvest regulations. The proposed sampling schedule is a continuation of the current schedule. A creel survey will be conducted in spring 2014 to determine angling pressure and preferences.

INTRODUCTION

This document is a summary of fisheries data collected from Greenbelt Reservoir in 2011-2012. 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 is presented for comparison.

Reservoir Description

Greenbelt Reservoir is a 1,990-acre impoundment on the Salt Fork of the Red River five miles north of Clarendon in Donley County, Texas. It is owned by the Greenbelt Municipal and Industrial Water Authority and is used for water supply and recreational purposes. The reservoir has a history of water level fluctuations (Figure 1). The reservoir surface area was approximately 1,300 acres in 2000 and declined to approximately 550 acres by April 2012. Greenbelt Reservoir was mesotrophic with a mean Trophic State Index chl-*a* of 44.3, which was an increase of 7.98 from previous samples (Texas Commission on Environmental Quality 2011). At the time of sampling, the habitat was primarily silt and gravel shoreline with submerged Eurasian watermilfoil (Table 1). At full pool, angler and boat access is good with five boat ramps and large shoreline access areas. At current water levels (2,624 msl), angler shoreline access is good but boat access is limited to one low-water ramp (Table 2). Other descriptive characteristics for Greenbelt Reservoir are in Table 3.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Munger 2008) included:

1. Electrofishing data indicate a possible decline in relative abundance of smallmouth bass in the reservoir. There was a coincidental decline in smallmouth bass habitat due to drought conditions since 2000. It was unknown if the decline was an artifact of sampling or a true decline in fish abundance. The management strategy was to ensure that habitat suitable for smallmouth bass was sampled during electrofishing surveys.
   Action: Electrofishing surveys have been conducted biannually to sample these bass habitats and monitor smallmouth bass abundance in the reservoir.

Harvest regulation history: Sport fishes in Greenbelt Reservoir have been and currently are managed with statewide regulations (Table 4). The exception was from 1994 to 2002 when smallmouth bass were managed under a 18-inch minimum length limit and 5-fish daily bag limit.

Stocking history: Greenbelt Reservoir has not been stocked since 2006. The reservoir was experimentally stocked with northern pike (1967) and yellow perch (1983-1986) with limited success. Walleye were introduced in 1974, and smallmouth bass in 1980. Both species were still present in the reservoir and are sustaining populations through natural reproduction. The complete stocking history is in Table 5.

Vegetation/habitat history: Greenbelt Reservoir habitat was surveyed in August 2011. Primary shoreline habitats were silt (77.8%) and gravel (12.1%). When habitat surveys were conducted in 2003 (Munger and Henegar 2004), the reservoir supported a mix of aquatic vegetation species including coontail, Eurasian watermilfoil, chara, pondweed, and areas of cattail and common reed. Vegetation in the reservoir was limited to Eurasian watermilfoil in 2011 (Table 1).

Water Transfers: Greenbelt Municipal and Industrial Water Authority provides water from Greenbelt

Reservoir, on the Salt Fork of the Red River, to approximately 25,000 people through a 121-mile aqueduct system. There are five cities that use water from this reservoir (Clarendon, Hedley, Childress, Quanah and Crowell).

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net-nights at 5 stations), and trap netting (8 net-nights at 8 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 gill and trap nets, as the number of fish per net night (fish/nn). All fish survey sites were randomly selected and were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Habitat and Angler Access surveys were conducted according to TPWD procedures manuals (revised 2009 and 2004, respectively).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD)] as defined by Guy et al. (2007), and condition [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). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics. Ages were determined using otoliths from the entire sample of 16 walleye collected in gill nets and a subsample of 66 white crappie from trap nets. Source for water level data was the United States Geological Survey (USGS website link).

RESULTS AND DISCUSSION

Habitat: A habitat survey was conducted in August 2011. Primary shoreline habitat was silt followed by gravel and rock (Table 1). Offshore habitat was primarily open water with stands of Eurasian watermilfoil and standing dead timber.

Prey species: Electrofishing catch rates of gizzard shad and bluegill in 2011 were 333.0/h and 72.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was good, indicating 93% of gizzard shad were available to existing predators (Figure 2). No small gizzard shad were collected in 2009 resulting in an IOV of 0 but the IOV in 2007 was 82. The poor sample of small gizzard shad in 2009 appears to be an anomaly. Total CPUE of gizzard shad was considerably lower in 2009 compared to the 2007 and 2011 surveys (Figure 2) and may be related to changing reservoir conditions with the drought. Total CPUE of bluegill in 2011 (72.0/h) was much lower than in 2007 (367.0/h) and 2009 (450.0/h), and size structure continued to be dominated by small individuals (Figure 3).

Catfishes: The gill net catch rate of channel catfish was 6.0/nn in 2012. Catch rates of channel catfish have increased from 1.2/nn in 2008 to 4.6/nn in 2010 (Figure 4). Channel catfish were in relatively good condition as most inch classes, 15 inches and longer, had a W_r of 95 or greater. Reproduction was indicated by the catch of smaller fish. Gill net catch rates of flathead catfish in 2012 (2.4/nn) increased from 1.0/nn in 2010 but was a decline from 3.4/nn in 2008 (Figure 5). Relative weights were considered average for this reservoir.

White bass: The gill net catch rate of white bass was 6.6/nn in 2012 which was similar to the 2008 catch rate of 6.8/nn and much higher than 2010 at 1.2/nn (Figure 6). Most of the fish collected were legally harvestable (10 inches or longer). Relative weights were mostly below 90 and considered poor.

Smallmouth bass: The electrofishing catch rate of smallmouth bass was 11.0/h in 2011, which is much higher than in 2007 and 2009 (Figure 7) but the majority of fish collected in 2011 were less than 6 inches in length. The electrofishing catch rate of stock-size smallmouth bass remains consistently low with 3.0/h caught in 2011, 2.0/h in 2009 and no stock size fish collected in 2007.

Largemouth bass: The electrofishing catch rate of largemouth bass was 127.0/h in 2011 with the sample being dominated by fish 4-5 inches in length (Figure 8). The catch rate of stock-size fish was only 26.0/h in 2011 compared to 63.0/h in 2009 and 44.0/h in 2007. Size structure was still good with a PSD of 65 and PSD-P has remained stable (near 12) for the last two samples. Body condition in 2011 was below average for nearly all size classes of fish and was similar to previous surveys.

White crappie: The trap net catch rate of white crappie was 15.9/nn in 2011 and was higher than in the past two samples (Figure 9). The catch rate of white crappie in Greenbelt Reservoir seems to show the same trend as Meredith Reservoir with catch rates increasing as water levels decline (Munger and Clayton 2010). The PSD was above 80 for all three sample years (Figure 9). Mean relative weight was over 90 for most size classes in 2011. Most white crappie reach legal size by age 2 (Figure 10).

Walleye: The electrofishing catch rate for walleyes was much lower in 2011 at 4.0/h (Figure 11). Electrofishing catch rates in 2007 and 2009 were 16.0/h and 34.0/h, respectively. Gill net catch rate for walleyes in 2012 remained low at 3.2/nn (Figure 12). The gill net catch rate in 2010 was 2.6/nn while it was 7.8/nn in 2008. Most of the fish collected in 2012 were longer than 16 inches but relative weights have declined from over 90 in 2010 to less than 90 in 2012. Reproduction was evident as one age-1 walleye was collected in gill nets (Figure 13). Growth of walleyes remained good even with lower body condition indices as fish are reaching 16 inches by age 4.

Fisheries management plan for Greenbelt Reservoir, Texas

Prepared – July 2012.

ISSUE 1: The extended drought has reduced the amount and quality of spawning areas for sport fish species and reduced the diversity of aquatic vegetation species in the reservoir. Water levels in the reservoir have declined to the point where most of the spawning areas consist of silt substrates instead of sand or gravel. The only remaining aquatic vegetation documented in the reservoir was Eurasian watermilfoil which can become a problem in some reservoirs. Historically Eurasian watermilfoil has not been a problem in any large reservoir in this district, but now water levels are reaching new record lows which could result in vegetation problems.

MANAGEMENT STRATEGY

1. Monitor the reproductive success of sport fish species through standard sampling to determine if supplemental stocking is needed.
2. Monitor Eurasian watermilfoil density to ensure it does not become an obstruction to angler access. If vegetation becomes a problem, coordinate treatment options with the controlling authority.

ISSUE 2: Habitat evaluation and enhancement is typically conducted when the habitat area is flooded which makes accurate surveys difficult and enhancement efforts more expensive and difficult. Current extreme low water conditions provide the opportunity to evaluate existing habitat with the potential for lower cost enhancement activities.

MANAGEMENT STRATEGY

1. Evaluate the exposed reservoir basin for potential habitat enhancement projects.
2. If enhancement possibilities are identified, coordinate potential action with the controlling authority.

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. 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. Current low water conditions and high chlorides have reduced the risk of infestation, but inflows could return the reservoir to high risk.

MANAGEMENT STRATEGIES

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

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule is a continuation of the current schedule and includes trap net and electrofishing sampling in 2013, gill netting in 2014 and a full management survey in 2015-2016 to monitor all sport fish populations (Table 6). A creel survey will be conducted in spring 2014 to update angling pressure and preference data.

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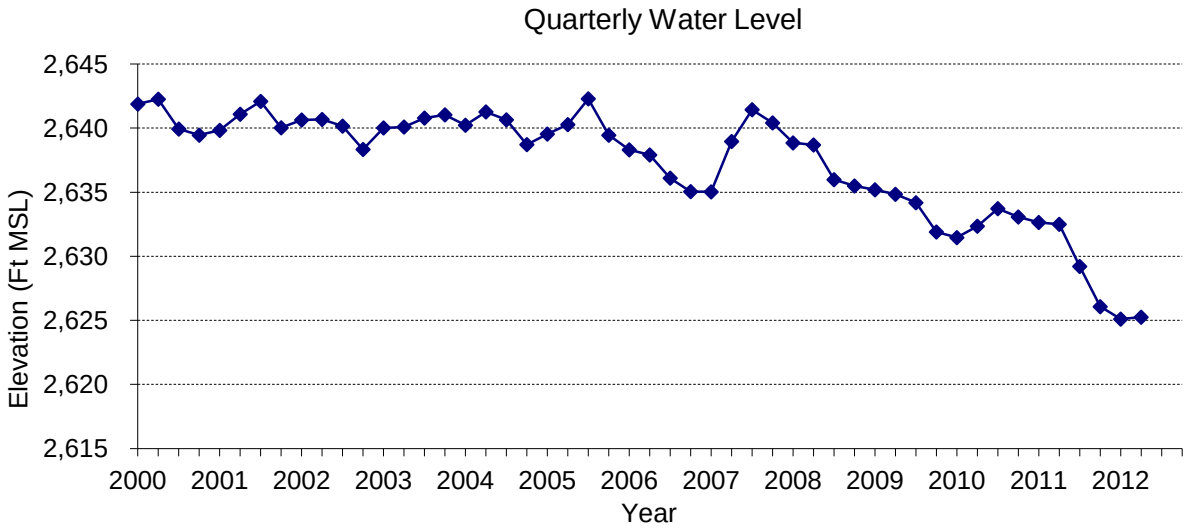

Figure 1. Quarterly water level elevations in feet above mean sea level (ft MSL) recorded for Greenbelt Reservoir, Texas. Conservation pool elevation is 2,663 feet above mean sea level.

Table 1. Habitat survey summary for Greenbelt Reservoir, Texas. Data were collected in August, 2011.

Habitat	Miles	Percent (miles)	Acres	Percent (acres)
Natural shore	8.3	77.8		
Gravel shore	1.3	12.1		
Rock shore	0.7	6.7		
Natural shore with docks	0.4	3.4		
Open water			586.8	83.3
Eurasian watermilfoil			112.7	16.0
Standing timber			4.5	0.7
Total	10.7	100	704.0	100

Table 2. Angler access facilities at Greenbelt Reservoir, Texas. Data were collected in August, 2011.

Facility	Location	Lanes	Parking capacity	Facilities for physically challenged	Current status
Boat ramp	Lakeside marina	2	20	No	Out of water, no access
Boat ramp	Kincaid park	2	15	Yes	Out of water, no access
Boat ramp	Kelly Creek	1	15	No	Out of water, no access
Boat ramp	North ramp	1	30	No	Out of water, no access
Boat ramp	Salt Fork ramp	2	15	No	Out of water, no access
Boat ramp	Low water	2	15	No	Shallow, rough ramp conditions

Table 3. Characteristics of Greenbelt Reservoir, Texas.

Characteristic	Description
Year constructed	1967
Controlling authority	Greenbelt Municipal and Industrial Water Authority
County	Donley
Reservoir type	Mainstream
Shoreline Development Index (SDI)	2.87
Conductivity	1,032 µmhos/cm

Table 4. Harvest regulations for Greenbelt Reservoir, Texas.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No limit
Catfish, flathead	5	18 - No limit
Bass, white	25	10 - No limit
Bass: smallmouth and largemouth	5 (in any combination)	14 – No limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No limit
Walleye	5	No more than 2 under 16

Table 5. Stocking history of Greenbelt Reservoir, Texas. Size categories are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Average total length (TL; mm) of each species stocked is given by size category and year.

Species	Year	Number	Life Stage	Length (mm)
Blue catfish	1967	9,600	UNK	UNK
	1971	8,000	UNK	UNK
	1982	20,000	UNK	UNK
	1987	6,240	FGL	25 - 102
	Total	43,840		
Channel catfish	1967	30,000	AFGL	102 - 279
	1968	45,000	AFGL	102 - 279
	1969	51,000	AFGL	102 - 279
	1971	8,000	AFGL	102 - 279
	1995	131,455	FGL	25 - 102
	2000	50,000	AFGL	102 - 279
	Total	315,455		
Flathead catfish	1977	39	UNK	UNK
	Total	39		
Florida largemouth bass	1982	75,333	FGL	25 - 102
	1982	4,000	FRY	1 - 25
	2000	201,025	FGL	25 - 102
	Total	280,358		
Green sunfish x redear sunfish	1967	201,000	UNK	UNK
	Total	201,000		
Largemouth bass	1967	240,000	UNK	UNK
	1980	14,523	UNK	UNK
	1981	20,000	UNK	UNK
	Total	274,523		
Northern pike	1967	150,000	UNK	UNK
	Total	150,000		
Rainbow trout	1991	3,339	ADL	>=229
	Total	3,339		
Smallmouth bass	1980	5,000	UNK	UNK
	1981	72,400	UNK	UNK
	1982	100,500	UNK	UNK
	1987	30	ADL	>=178
	Total	177,930		

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Table 5 continued from previous page

Walleye	1974	100,000	FRY	1 - 25
	1976	100,000	FRY	1 - 25
	1977	4,600	FRY	1 - 25
	2001	99,000	FGL	25 - 127
	2006	41,200	FGL	25 - 127
	Total	344,800		
White crappie	1967	97	UNK	UNK
	1968	96	UNK	UNK
	Total	193		
Yellow perch	1983	7,500	FGL	UNK
	1985	1,145	FGL	UNK
	1986	330	FGL	UNK
	Total	8,975		

Gizzard Shad

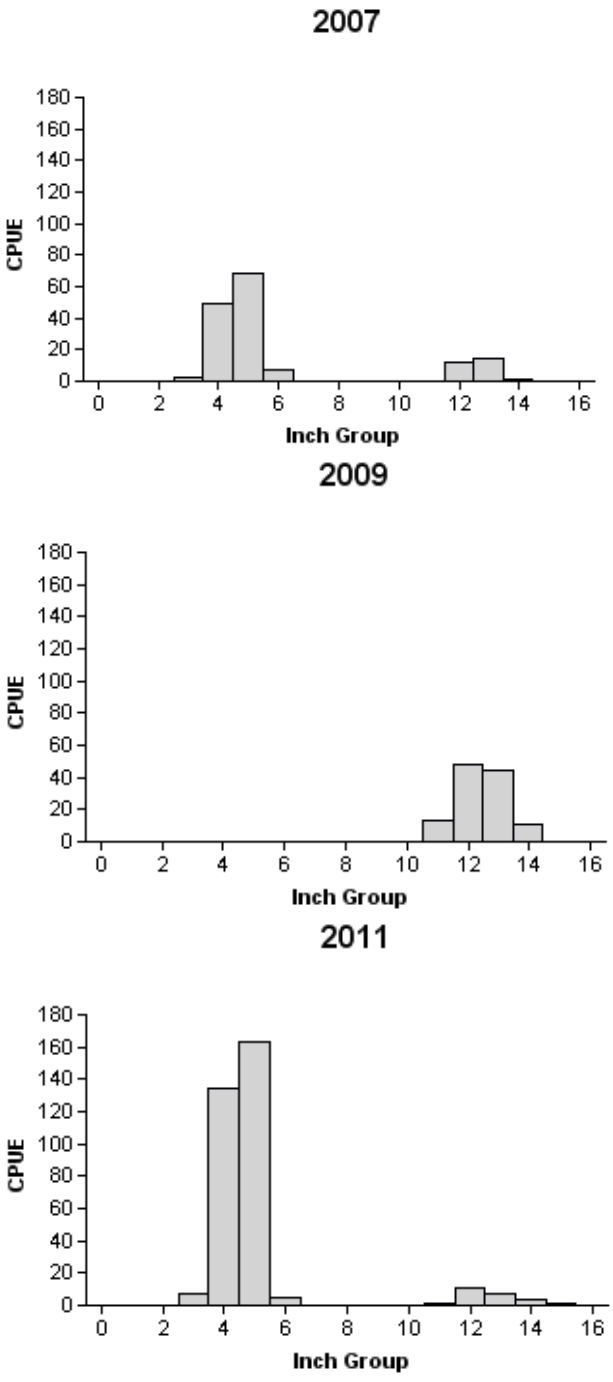
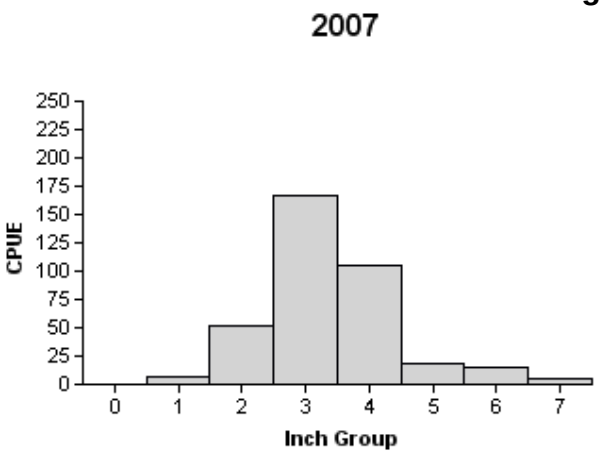
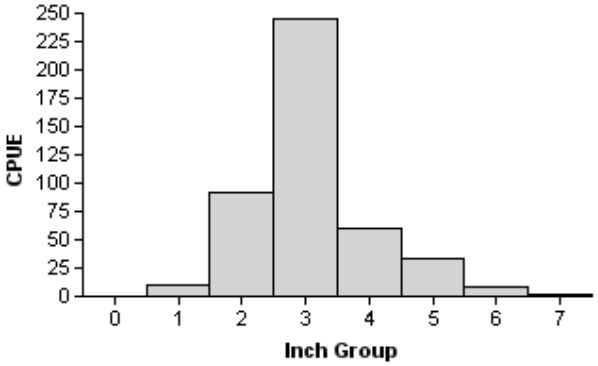


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE or SE and N are in parentheses) for fall electrofishing surveys, Greenbelt Reservoir, Texas, 2007, 2009, and 2011. RSE is used for CPUE values and SE is used for PSD and IOV values.

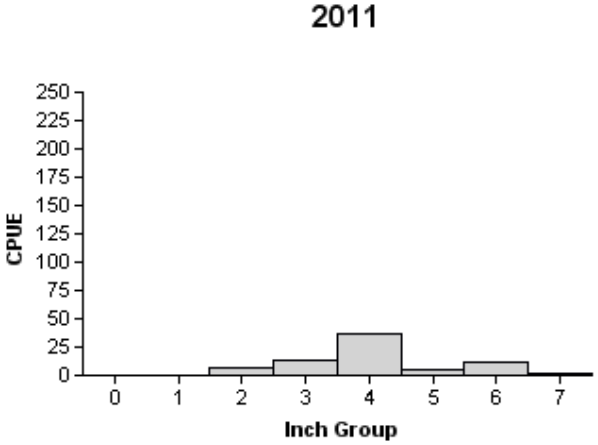
Bluegill



Effort = 1.0
Total CPUE = 367.0 (15; 367)
Stock CPUE = 310.0 (14; 310)
PSD = 6 (3)
PSD-P = 0 (0)



Effort = 1.0
Total CPUE = 450.0 (19; 450)
Stock CPUE = 349.0 (18; 349)
PSD = 3 (1)
PSD-P = 0 (0)



Effort = 1.0
Total CPUE = 72.0 (22; 72)
Stock CPUE = 66.0 (22; 66)
PSD = 18 (7)
PSD-P = 0 (0)

Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE or SE and N are in parentheses) for fall electrofishing surveys, Greenbelt Reservoir, Texas, 2007, 2009, and 2011. RSE is used for CPUE values and SE is used for PSD values.

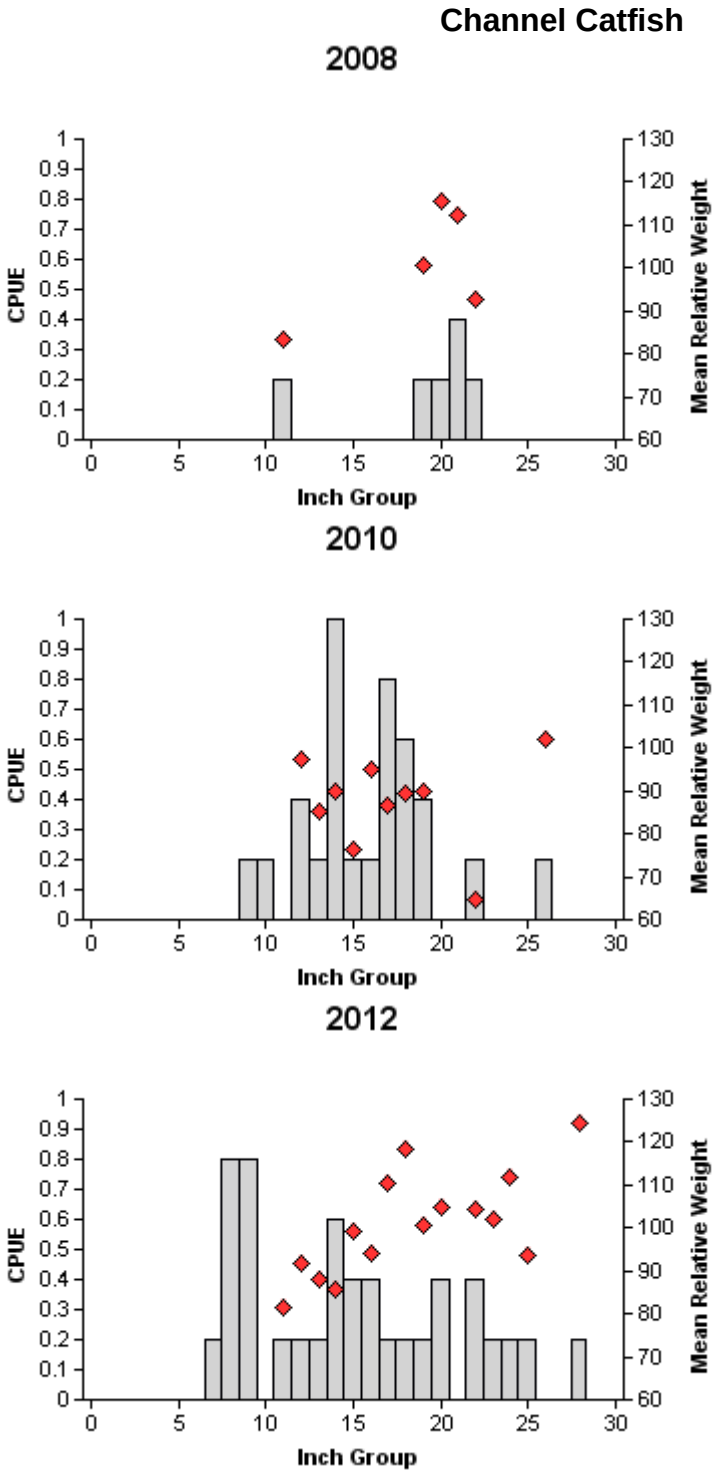


Figure 4. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for spring gill net surveys, Greenbelt Reservoir, Texas, 2008, 2010, and 2012. RSE is used for CPUE values and SE is used for PSD values.

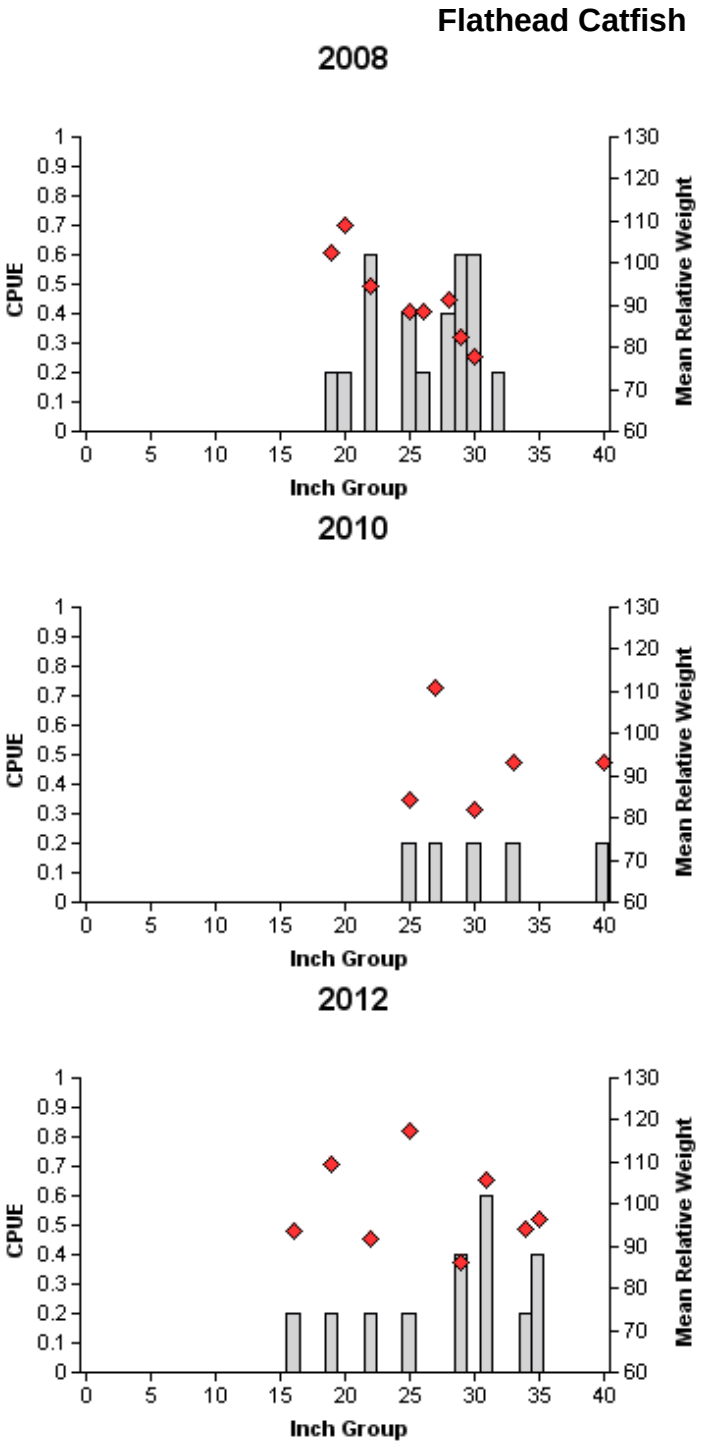


Figure 5. Number of flathead catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for spring gill net surveys, Greenbelt Reservoir, Texas, 2008, 2010, and 2012. RSE is used for CPUE values and SE is used for PSD values.

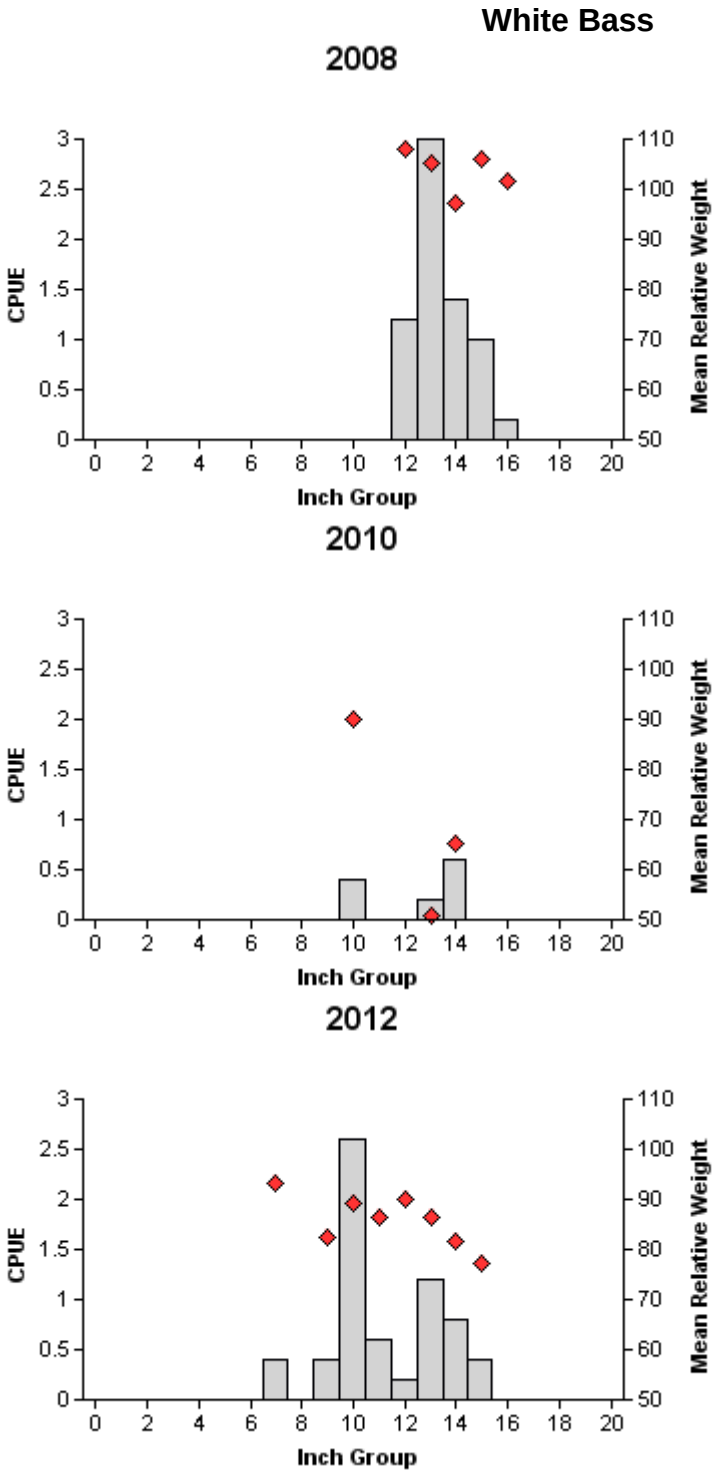


Figure 6. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for spring gill net surveys, Greenbelt Reservoir, Texas, 2008, 2010, and 2012. RSE is used for CPUE values and SE is used for PSD values.

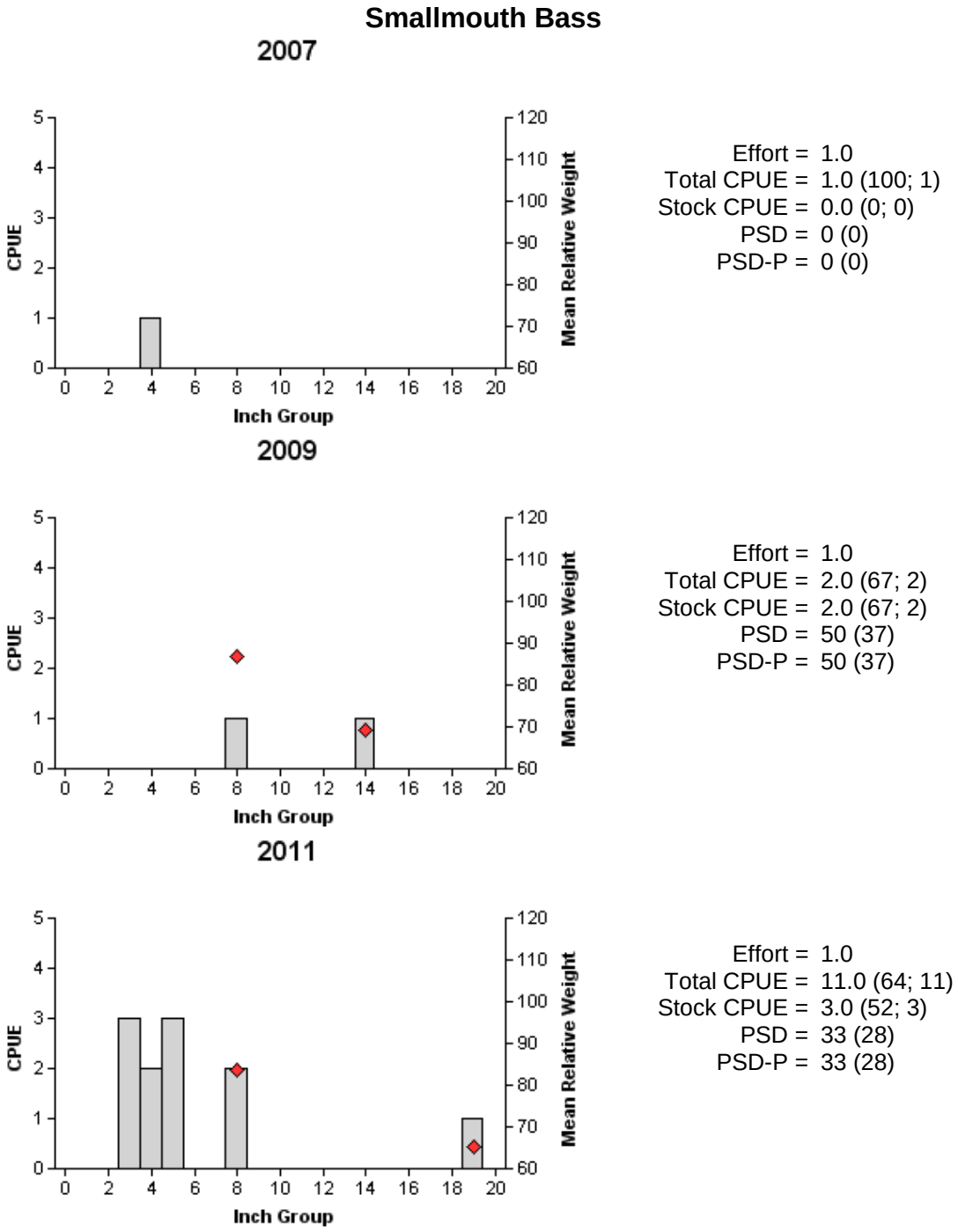


Figure 7. Number of smallmouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for fall electrofishing surveys, Greenbelt Reservoir, Texas, 2007, 2009, and 2011. RSE is used for CPUE values and SE is used for PSD values.

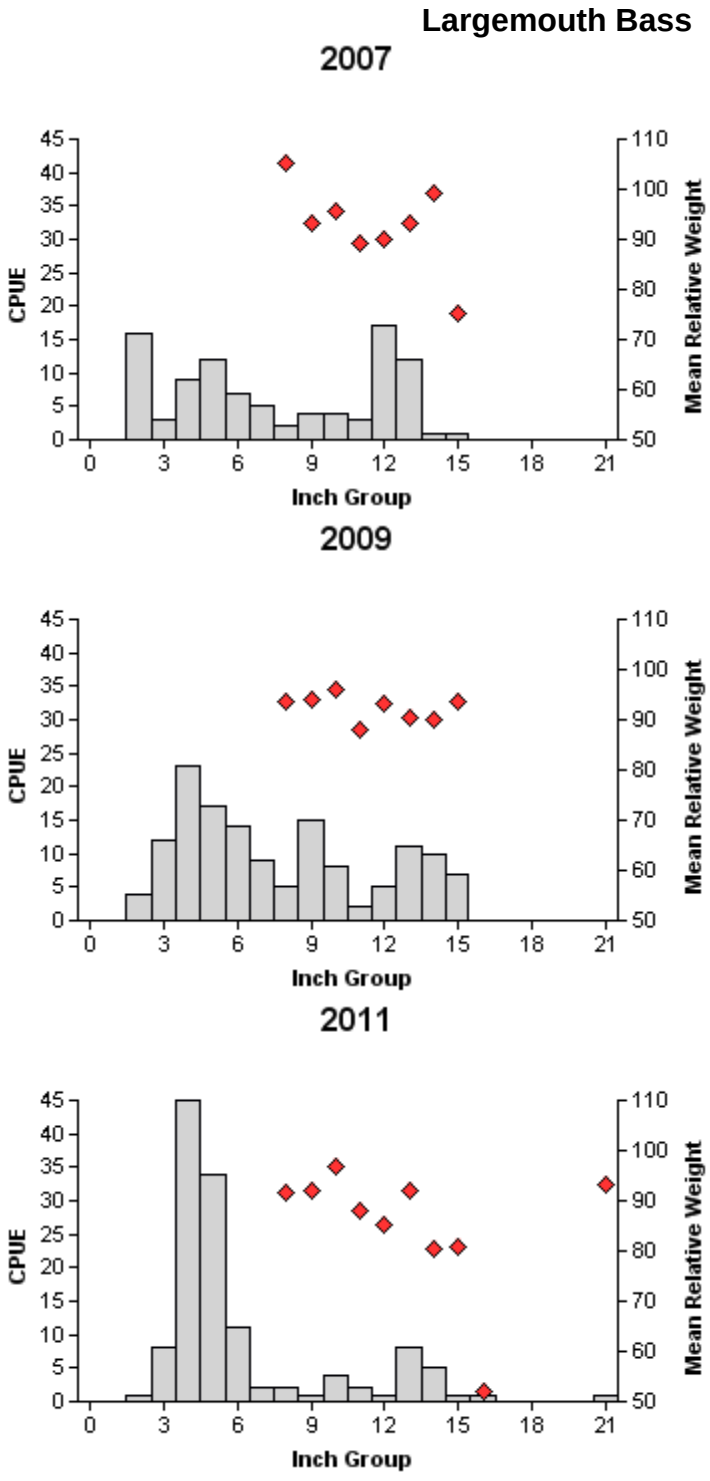


Figure 8. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for fall electrofishing surveys, Greenbelt Reservoir, Texas, 2007, 2009, and 2011. RSE is used for CPUE values and SE is used for PSD values.

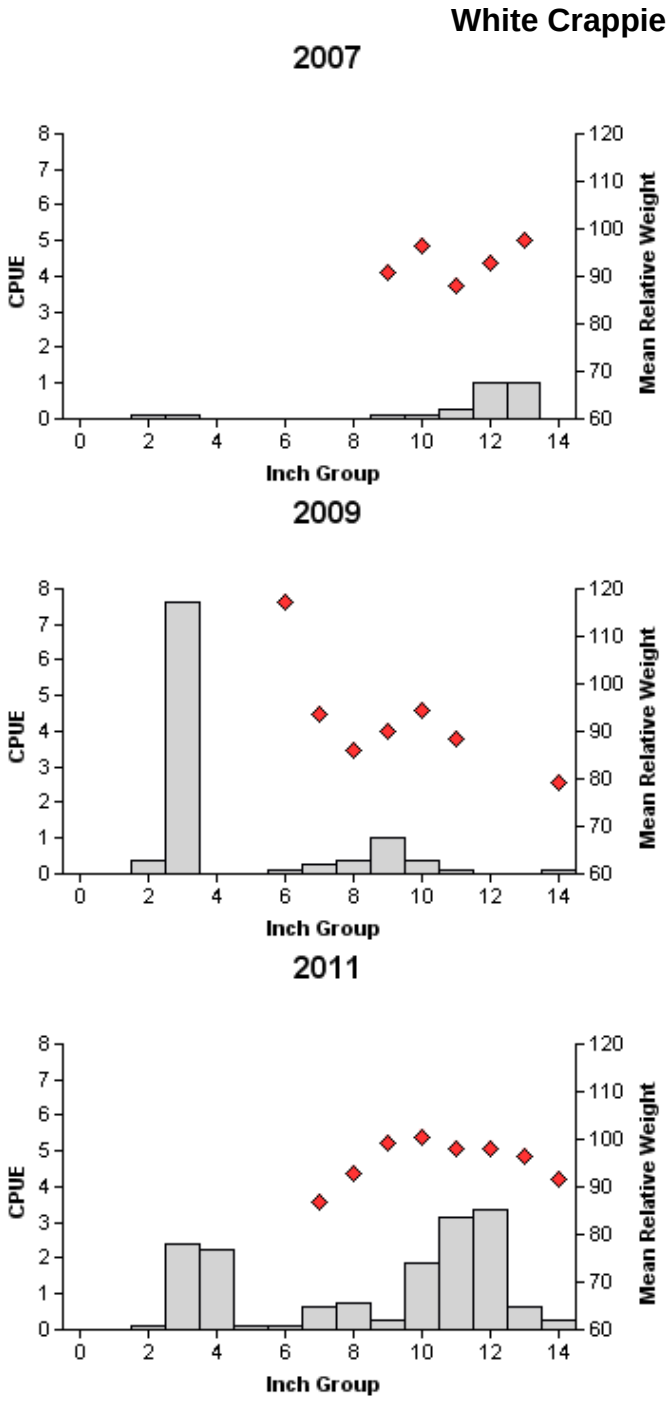


Figure 9. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for fall trap net surveys, Greenbelt Reservoir, Texas, 2007, 2009, and 2011. RSE is used for CPUE values and SE is used for PSD values.

White Crappie

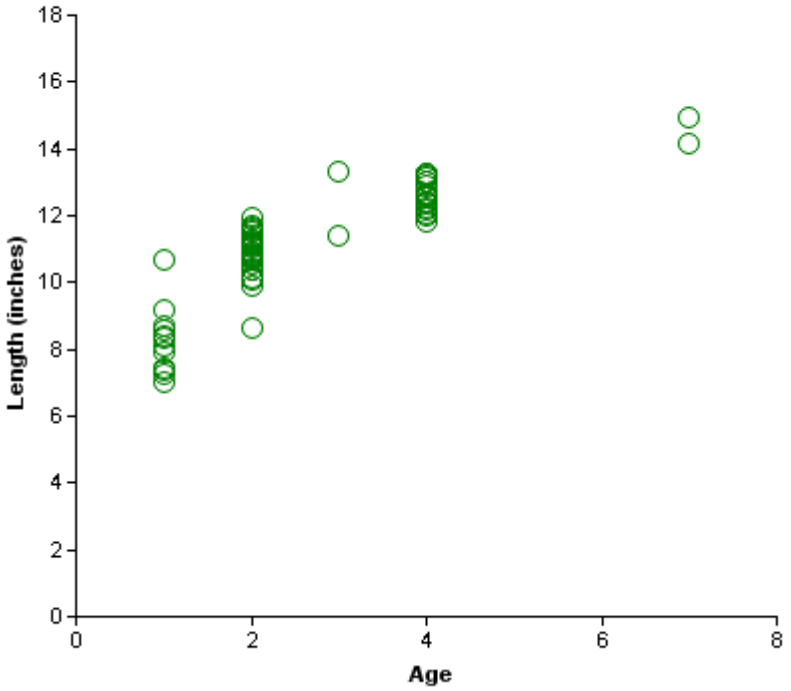


Figure 10. Length at age for 66 white crappie collected by trap nets at Greenbelt Reservoir, Texas, November, 2011.

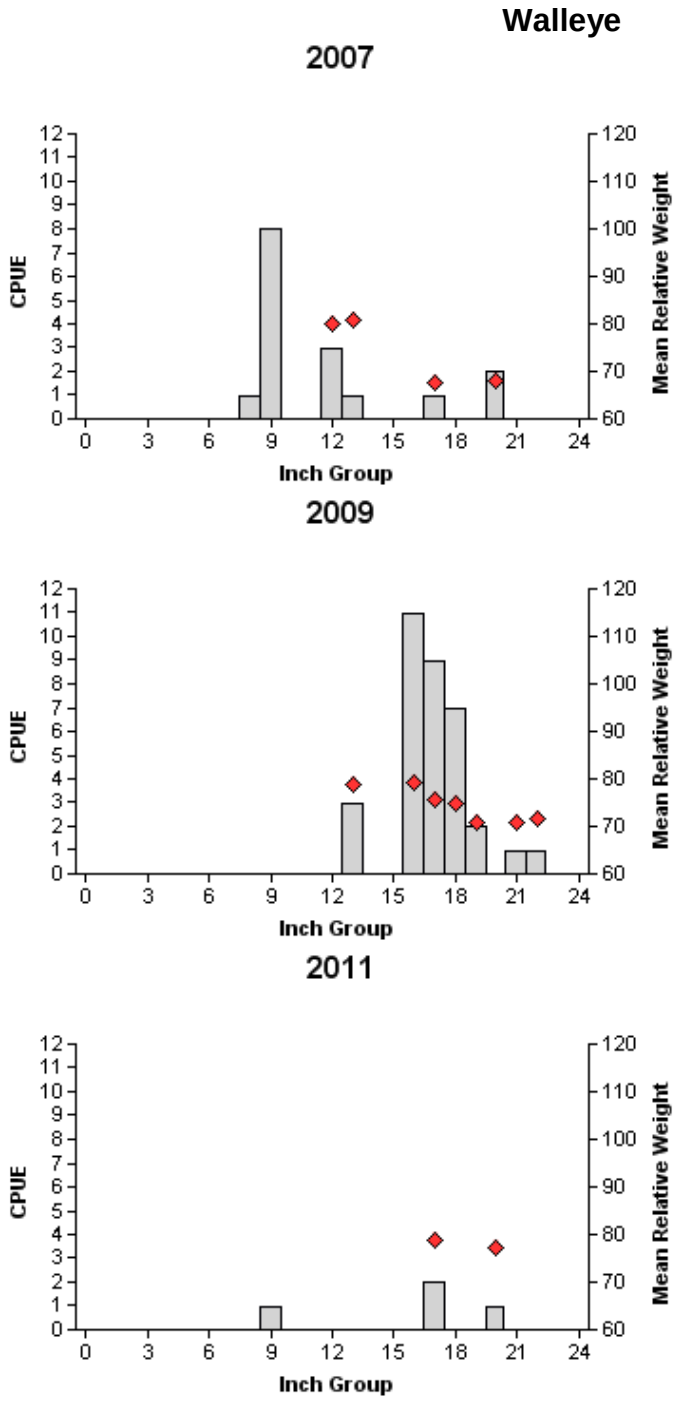


Figure 11. Number of walleye caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for fall electrofishing surveys, Greenbelt Reservoir, Texas, 2007, 2009, and 2011. RSE is used for CPUE values and SE is used for PSD values.

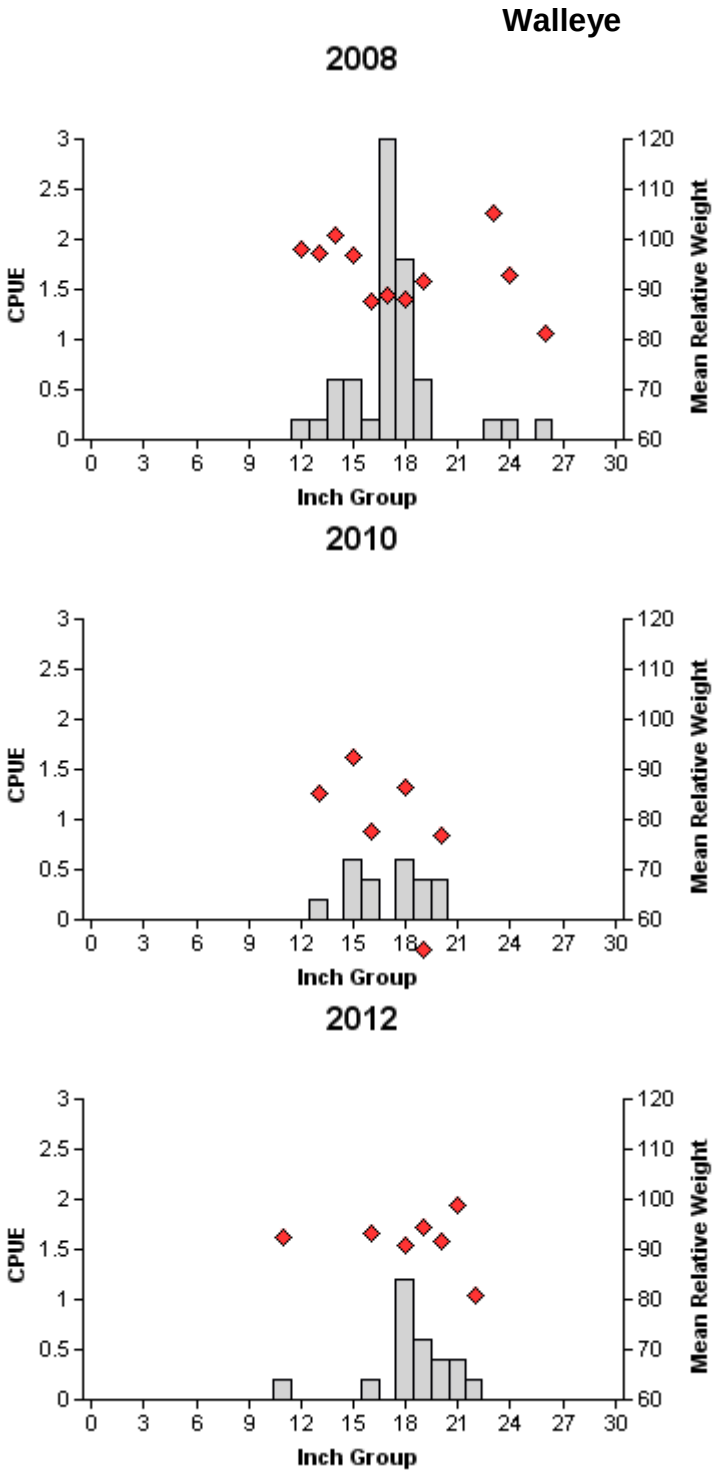


Figure 12. Number of walleye caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE or SE and N are in parentheses) for spring gill net surveys, Greenbelt Reservoir, Texas, 2008, 2010, and 2012. RSE is used for CPUE values and SE is used for PSD values.

Walleye

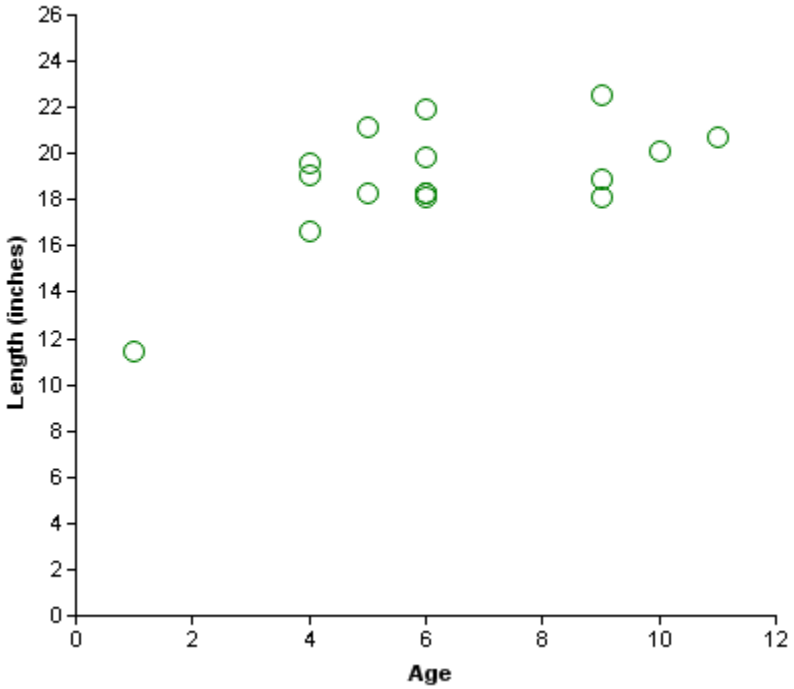


Figure 13. Length at age for 16 walleye collected by gill net at Greenbelt Reservoir, Texas, April 2012.

Table 6. Proposed sampling schedule for Greenbelt Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

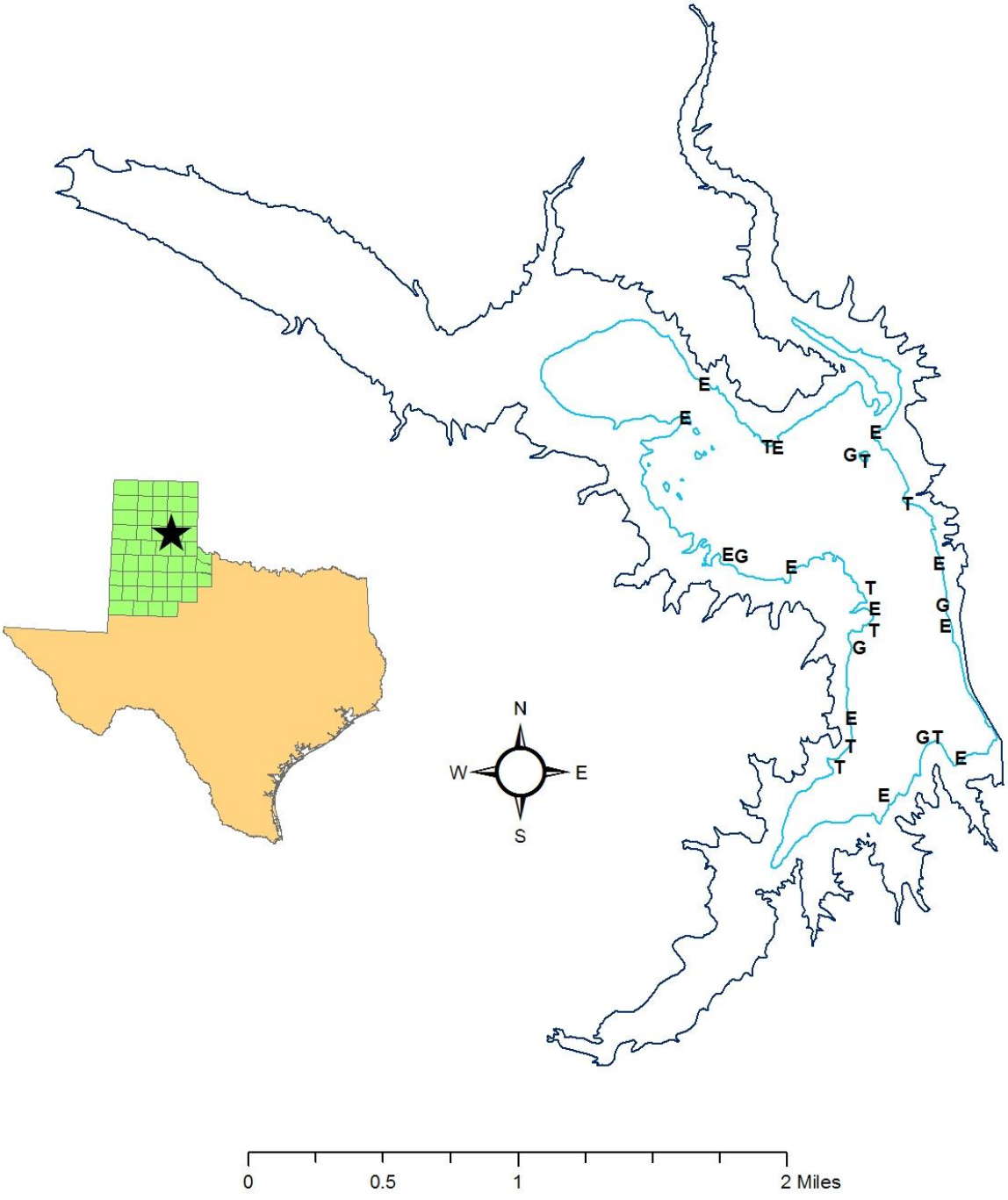
Survey Year	Electrofishing	Trap Net	Gill Net	Creel Survey	Access and Habitat	Report
Fall 2012-Spring 2013						
Fall 2013-Spring 2014	A	A	A	A		
Fall 2014-Spring 2015						
Fall 2015-Spring 2016	S	S	S		S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Greenbelt Reservoir, Texas, 2011-2012. Sampling effort was 1 hour for electrofishing, 5 net-nights for gill netting, and 8 net-nights for trap netting.

	Electrofishing		Gill Netting		Trap Netting	
Species	CPUE	N	CPUE	N	CPUE	N
Gizzard shad	333.00	333	18.80	94		
Goldfish	2.00	2				
Common carp	42.00	42	3.40	17		
Golden shiner	4.00	4				
Channel catfish	3.00	3	6.00	30		
Flathead catfish	1.00	1	2.40	12		
White bass	29.00	29	6.60	33	0.13	1
Green sunfish	38.00	38			0.38	3
Bluegill	72.00	72	1.00	5	16.75	134
Longear sunfish	17.00	17			0.13	1
Smallmouth bass	11.00	11				
Largemouth bass	127.00	127	2.60	13	0.13	1
White crappie	17.00	17	3.80	19	15.88	127
Yellow perch	2.00	2			0.13	1
Walleye	4.00	4	3.20	16	0.25	2

APPENDIX B



Location of sampling sites, Greenbelt Reservoir, Texas, 2011-2012. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Inner contour is the water level during the sampling season (2,625 ft MSL). The outer contour is the level at full pool (2,663 ft MSL).