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INLAND FISHERIES DIVISION FISHERIES MONITORING AND MANAGEMENT PROGRAM

2011 Survey Report

Twin Buttes Reservoir

Prepared by:

Mandy K. Scott
and
Mukhtar Farooqi

Inland Fisheries Division
District 1-C, San Angelo, Texas

Carter P. Smith
Executive Director

Gary Saul
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Twin Buttes Reservoir were surveyed in 2009 and 2011 using electrofishing and trap nets, and in 2009-2010 using an access creel survey. Planned gill net sampling was not conducted due to low water levels in 2012. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Twin Buttes Reservoir is a 9,080-acre (currently 689-acre) impoundment located 3 miles southwest of San Angelo, Texas in Tom Green County. The reservoir consists of two pools ("North Pool" and "South Pool") connected by an equalization channel. This hypereutrophic reservoir experiences dramatic water level fluctuations, and has extensive fish habitat mostly in the form of flooded terrestrial vegetation. Boating access was poor due to low water levels.

- **Management History:** Important sport fish include white bass, largemouth bass, white crappie, and catfishes. Striped bass were stocked in 1995, and are still occasionally caught by anglers or in gill nets. Sport fishes have been managed with statewide regulations.

- **Fish Community**
  - **Prey species:** Gizzard shad abundance was good, but their availability to predators dropped to 37%. Bluegill abundance has decreased substantially over the past three surveys.
  - **Catfishes:** Channel catfish provided a good fishery, as evidenced in the creel survey. No gill net data are available due to low water levels.
  - **Temperate basses:** White bass also provided a good fishery, with many harvested individuals in the 12- to 13-inch length range. No gill net data were available due to low water levels. No striped bass or hybrid striped bass were encountered.
  - **Largemouth bass:** Catch rate of largemouth bass remained stable over the past three surveys. Size structure improved slightly towards more individuals greater than 8 inches in length.
  - **White crappie:** Crappie catch rates increased over the survey period and size structure of the population was good. Angler catch rate was good (1.1/angler-h).

- **Management Strategies:** Communicate with San Angelo Parks Department to voice angler concerns over potential blockage of angler access sites, as well as impacts of declining water levels on the fishery. As soon as water level rises to the point where boat launching is possible, conduct additional electrofishing, trap netting, and gill netting. Conduct standard monitoring in 2015-2016.

INTRODUCTION

This document is a summary of fisheries data collected from Twin Buttes Reservoir in 2011. 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 species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2011 data for comparison.

Reservoir Description

Twin Buttes Reservoir was constructed in 1963 on the South and Middle Concho Rivers three miles southwest of San Angelo. The 9,080-acre (when full) impoundment is used for recreation, municipal water supply and irrigation. The reservoir consists of two pools ("North Pool" and "South Pool") connected by an equalization channel. At the time of fish population sampling the reservoir was 49 feet below conservation pool (Figure 1), and was approximately 689 surface acres in size. During the creel year (March 2009 thru February 2010) the reservoir ranged from approximately 2700 to 2090 acres. Twin Buttes Reservoir was hypereutrophic with a mean TSI chl-*a* of 61.76 (Texas Commission on Environmental Quality 2011). Habitat at time of sampling consisted primarily of flooded dead terrestrial vegetation and native submerged vegetation (e.g., pondweed, coontail). Boat access on the North Pool was limited to shoreline-launching in 2011, and was non-existent in spring 2012. Boat access at the South Pool was limited to launching off of a gravel shoreline. Bank fishing access was fair; however, no fishing piers or disabled access facilities were available. Other descriptive characteristics for Twin Buttes Reservoir are presented in Table 1.

Management History

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

1. Frequently check for signs of recurring blue-green alga blooms.
   Action: The bloom that occurred in 2008 cleared up before the end of the summer, and no other blue-green alga blooms have occurred since that time.
2. Conduct a creel survey to investigate potential for new largemouth bass regulations.
   Action: An access creel survey was conducted from March 2009 thru February 2010.
3. Collect an intensive age-and-growth sample of largemouth bass before considering new bass harvest regulations.
   Action: Electrofishing in 2009 and 2011 did not produce enough fish for intensive age-and-growth analysis.
4. If creel and age-and-growth data warrant, present potential harvest regulation changes to the public and law enforcement to get feedback.
   Action: Age-and-growth data were inadequate. Creel survey data indicated that black bass anglers at Twin Buttes Reservoir mostly practice catch-and-release or tournament fishing, so a regulation change would probably not significantly impact harvest rates. The pursuit of new largemouth bass regulation changes has been suspended indefinitely.

Harvest regulation history: Sportfishes in Twin Buttes Reservoir are currently managed with statewide regulations (Table 2).

Stocking history: Species stocked have included threadfin shad, blue catfish, channel catfish, Florida and northern largemouth bass, and striped bass. Smallmouth bass and walleye were stocked in the past but they failed to establish viable fisheries. The complete stocking history is in Table 3.

Vegetation/habitat history: Historically, Twin Buttes Reservoir has had severely fluctuating water levels (Figure 1). Flooded terrestrial vegetation has been the primary fish habitat, but native submerged vegetation (e.g., Illinois pondweed, coontail) has recently become more abundant. The reservoir has no significant habitat management history.

Water transfer: Water from Twin Buttes Reservoir is used by the City of San Angelo to maintain water levels in Nasworthy Reservoir, which is directly downstream and surrounded by parks and residences. No interbasin water transfers are known to occur at this reservoir.

METHODS

Fishes were collected by electrofishing (1 h at 12, 5-min stations) and trap netting (5 net nights at 5 stations). Number of stations was based on surface acreage at time of sampling rather than surface acreage at conservation pool. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per h (fish/h) of actual electrofishing and, for trap nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

An access creel survey was conducted at the North Pool boat ramp from March 2009 through February 2010. The survey was broken into morning and afternoon time blocks, with 5 weekend days and 4 weekdays sampled per quarter. Only pole-and-line anglers were interviewed. We used an approximation of 2500 acres to calculate statistics per reservoir surface acre.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined 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). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics. Ages were determined using otoliths for white crappie (N = 25; range = 9 – 11 inches) to calculate mean-age-at-length for 10-inch white crappie. Water level data were provided by U.S. Geological Survey website (http://nwis.waterdata.usgs.gov).

RESULTS AND DISCUSSION

Habitat: The last habitat and vegetation surveys were conducted in 2007 (Scott and Farooqi 2008). Twin Buttes had abundant submerged terrestrial vegetation (saltcedar, willow baccharis) that provided most of the littoral fish habitat. Good amounts of native submerged vegetation (e.g. Illinois pondweed, coontail) and a smaller amount of native emergent plants (cattail, water willow) were also present. Both the North Pool and South Pool had spring-influenced tributary arms where the water was somewhat clearer and overhanging willow trees provided extra fish cover near the banks. With the lower water level in 2011-2012, there was clearly less submerged aquatic and terrestrial vegetation than in 2007 (observed during fall 2011 sampling).

Creel: Most anglers targeted black basses, comprising over 69% of the total directed fishing effort (Table 4). Around 18% of the black bass angler effort was spent during live-release tournaments. Thirteen percent of anglers fished for “anything”. Crappie (10%), white bass (4%) and catfish (2%) comprised the other targeted sportfish in this reservoir. Total angler effort was estimated to be 84 h (0.03 h/acre) for bank anglers, and 36,774 h (14.7 h/acre) for boat anglers. Overall catch rate for all species averaged 1.1 fish per angler-h. Total trip expenditures were estimated to be $156,484.

Prey species: Gizzard shad abundance was good (CPUE 222/h; Figure 2), but IOV estimates showed that only 37 percent of the shad were available to predators. Bluegill abundance dropped from 2007 (135/h) to 2009 (91/h) and 2011 (25/h), and size structure shifted towards more large individuals (Figure

3). The decreasing water level is exposing much of the available fish cover on dry land. As a result, existing predators could reduce prey population abundance.

Channel catfish: Since gill netting was not performed due to low water levels, no catch rate or body condition data were available for this report. The creel survey indicated that channel catfish provided a good pole-and-line fishery in 2009-2010. No channel catfish larger than 24 inches were encountered in the creel survey (Figure 4). Anglers spent an estimated 792 h targeting channel catfish, and caught them at a rate of 0.60 fish/h (Table 5). Almost all legal-sized fish in the creel survey were harvested; total harvest was estimated to be 723 fish.

White bass: No catch rate or body condition data are available due to suspension of gill net sampling in 2012. The creel survey results showed many harvested fish in the 12- to 13-inch size range (Figure 5). Anglers caught white bass at a rate of 0.79/h (Table 6), and harvested an estimated 2,133 fish during the creel period.

Largemouth bass: This population has remained relatively stable since 2007, with CPUE of 86/h, 60/h, and 64/h over the last three electrofishing samples, respectively (Figure 6). Size structure has shifted towards more stock-size (≥ 8-in) and larger fish; PSD has remained around 50. Body condition has dropped slightly overall; in 2007 most inch groups had a W_r of 90 or above, but in 2011 most inch groups were below 90, especially for fish in the 10- to 16-inch size range. Availability of prey for these predators may be becoming an issue as water levels and habitat continue to decrease.

The creel survey results revealed that this species was the most sought-after species by anglers, comprising an estimated 25,674 h (10 h/acre) of directed angling effort. Catch rate was 0.71 fish per angler-h, and an estimated 1,418 bass were harvested. Size distribution of harvested largemouth bass was good; individuals up to 22 inches were observed (Figure 7). Most (85%) of the legal-sized bass were released. Of the fish that were counted as harvested, 59% were weighed-in at a bass tournament.

White crappie: The crappie population was excellent in 2011, with a CPUE of 24/nn, and PSD of 67 (Figure 6). Crappie abundance improved from 2007 estimates (8.8/nn). Body condition was good, with average W_r around 90 for most inch groups. Age and growth data collected in 2009 showed that crappie grow well in Twin Buttes Reservoir, attaining legal size in approximately two years. Large crappie are available to anglers. Trap nets captured crappie up to 12 inches in length, and creel results showed harvested individuals up to 15 inches in length. Anglers spent an estimated 3,544 h targeting crappie, and the catch rate was high at 1.14 per angler-h.

Fisheries management plan for Twin Buttes Reservoir, Texas

Prepared – July 2012.

ISSUE 1: Extremely low water level has hindered boating access since fall 2011. The city of San Angelo has installed new pipe fencing around the North Pool park area to prevent people from driving off-road. Currently there is a small opening in the fence where people are allowed to drive through and access the water's edge, but local anglers have shown concern that access to the water could be totally blocked.

MANAGEMENT STRATEGY

1. Communicate with City of San Angelo Parks Department and voice anglers' concerns to prevent possible blockage of angler access to Twin Buttes.

ISSUE 2: Extreme fluctuating water level is likely to have a detrimental effect on fish populations as well as angling activity on the reservoir.

MANAGEMENT STRATEGY

1. Communicate with City of San Angelo Water Utilities Department to share information about negative effects on the fishery and the portion of the local economy that is linked to fishing.

ISSUE 3: Low water levels have prevented regularly-scheduled monitoring of the fish populations.

MANAGEMENT STRATEGY

1. As soon as water level increases and boat access is possible, conduct additional electrofishing, trap netting, and gill netting.

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 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 includes mandatory monitoring in 2015-2016 (Table 9). When water levels rise adequately, conduct additional electrofishing, trap netting, and gill netting.

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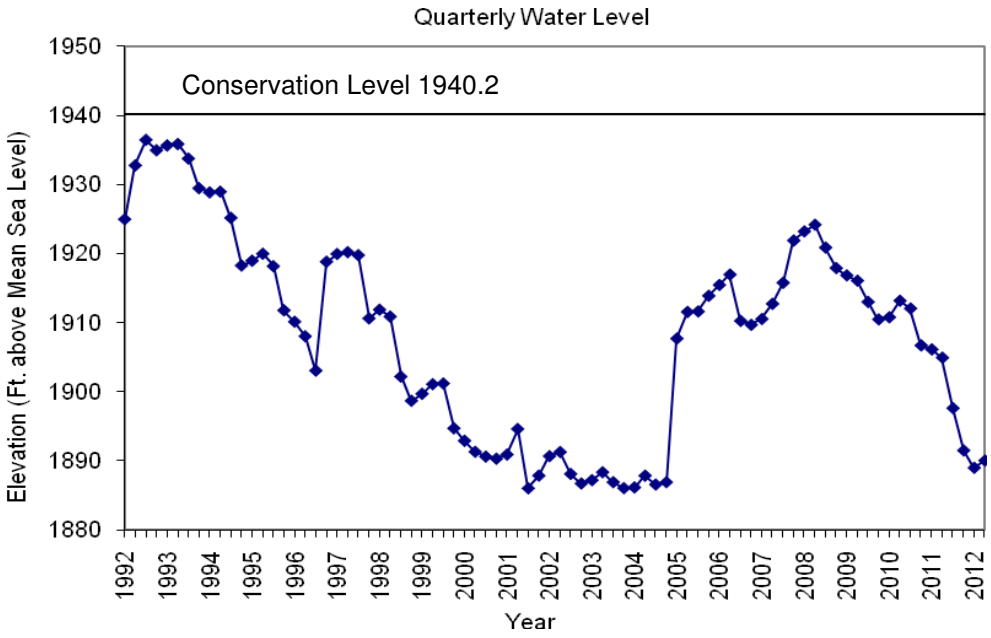


Figure 1. Quarterly water level elevations recorded for Twin Buttes Reservoir, Texas.

Table 1. Characteristics of Twin Buttes Reservoir, Texas.

Characteristic	Description
Year constructed	1963
Controlling authority	City of San Angelo, U.S. Bureau of Reclamation
County	Tom Green
Reservoir type	Mainstream
Shoreline Development Index	4.0 [north (3.8) and south (4.2) pools, averaged]
Conductivity	1817 µmhos/cm

Table 2. Harvest regulations for Twin Buttes 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, striped, its hybrids and subspecies	5	18 - No Limit
Bass, largemouth	5	14 - No Limit
Crappie: white and black crappie, their hybrids and subspecies (in any combination)	25	10 - No Limit

Table 3. Stocking history of Twin Buttes Reservoir, Texas. Size categories are: FRY =<1 inch; FGL = 1-3 inches; ADL = adult, and UNK = unknown.

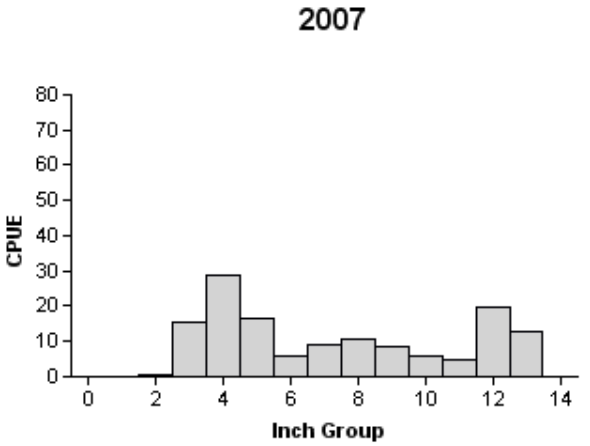
Year	Number	Size
Channel Catfish		
1966	9,550	UNK
1967	20,000	UNK
1970	10,500	UNK
1971	100,549	UNK
1974	20,000	UNK
1987	100,300	FGL
2004	41,950	FGL
2005	154,733	FGL
Species Total	457,582	
Blue Catfish		
1972	1,400	UNK
1973	11,610	UNK
1974	4,840	UNK
1976	28,000	UNK
1977	39,200	UNK
1978	24,515	UNK
1979	83,903	UNK
1980	57,130	UNK
Species Total	250,598	
Florida Largemouth Bass		
1975	188,500	FGL
1976	200,500	FGL
1977	199,900	FRY
1977	25,750	FGL
1978	183,776	FGL
1986	14,981	FGL
1996	139,304	FGL
2005	150,017	FGL
2005	135	ADL
2008	190,545	FGL
Species Total	1,201,734	
Walleye		
1971	100,000	UNK
1972	782,325	UNK
1973	1,400,000	UNK
1974	105,000	UNK
Species Total	2,387,325	
Largemouth Bass		
2005	295	ADL
Green Sunfish X Redear Sunfish		
1966	24,500	UNK
1967	9,000	UNK
1972	7,200	UNK
Species Total	40,700	
Northern Largemouth Bass		
1966	100,000	UNK
1967	10,000	UNK
1968	416,000	UNK
1970	33,725	UNK
1976	6,100	UNK
Species Total	565,825	
Striped Bass		
1995	51,196	FGL
Palmetto Bass		
1979	90,720	UNK
1982	27,526	UNK
Species Total	118,246	
Smallmouth Bass		
1982	105,611	
1983	80,901	UNK
1984	168,070	UNK
1987	30	FGL
Species Total	354,612	ADL
Warmouth		
1966	4,000	UNK
Threadfin Shad		
1982	2,000	UNK
1984	8,500	UNK
Species Total	10,500	
White Crappie		
1972	53,000	UNK
Redear Sunfish		
1972	3,000	UNK

Table 4. Percent directed angler effort by species for Twin Buttes Reservoir, Texas, March 2009-February 2010.

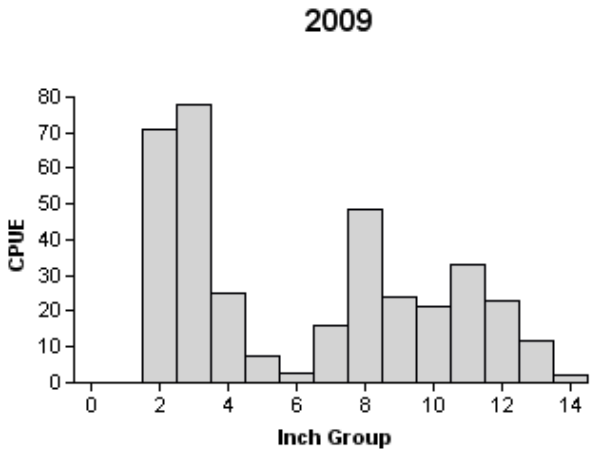
Species	Percent of Effort
Longnose gar	0.1
Common carp	0.2
Bluegill	0.3
Catfishes (any species)	0.3
Channel catfish	2.1
White bass	4.4
White crappie	9.6
Anything	13.2
Black basses (any species)	69.7[1]

[1]17.7% of the black bass directed effort was expended during live-release tournaments (12.3% of total directed angler effort at Twin Buttes Reservoir).

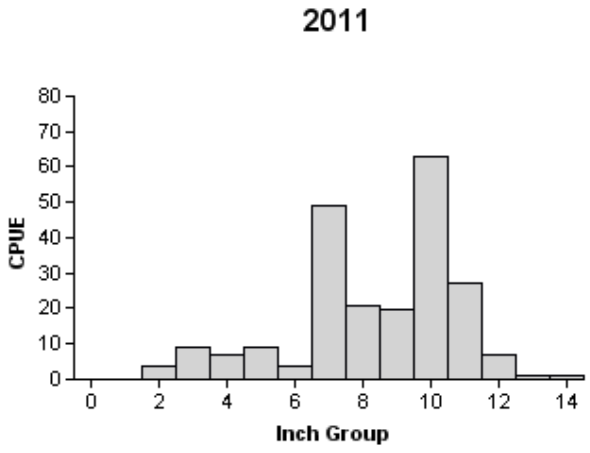
Gizzard Shad



Effort = 1.5
Total CPUE = 139.3 (27; 209)
IOV = 55 (12)



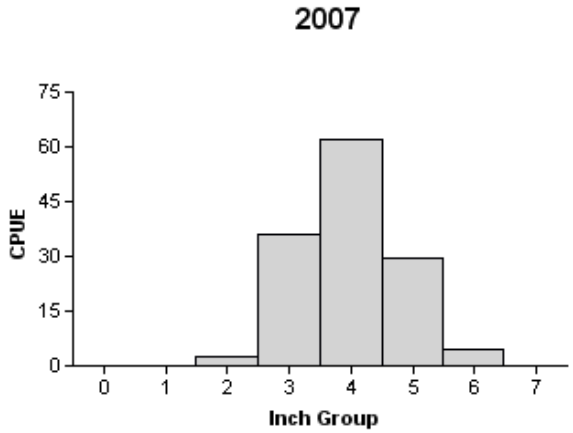
Effort = 1.5
Total CPUE = 364.0 (30; 546)
IOV = 55 (16)



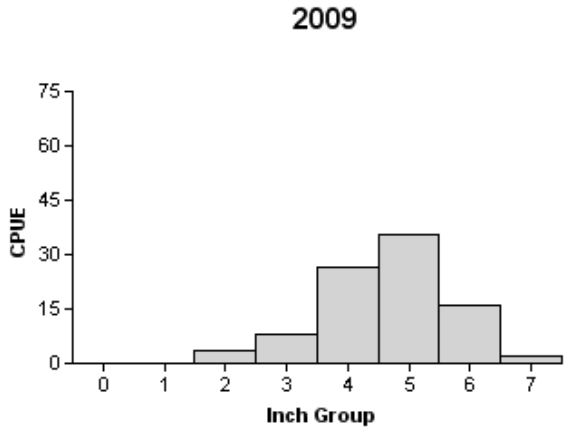
Effort = 1.0
Total CPUE = 222.0 (22; 222)
IOV = 37 (11)

Figure 2. Number of gizzard shad caught per h (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Twin Buttes Reservoir, Texas, 2007, 2009, and 2011.

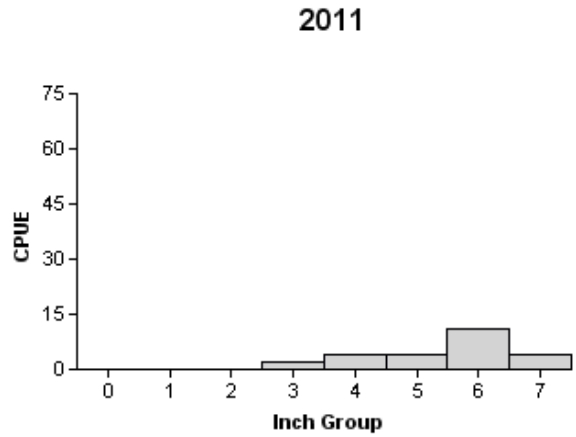
Bluegill



Effort = 1.5
Total CPUE = 134.7 (42; 202)
Stock CPUE = 132.0 (42; 198)
CPUE-6 = 4.7 (52; 7)
PSD = 4 (1)



Effort = 1.5
Total CPUE = 91.3 (55; 137)
Stock CPUE = 88.0 (56; 132)
CPUE-6 = 18.0 (81; 27)
PSD = 20 (6)



Effort = 1.0
Total CPUE = 25.0 (31; 25)
Stock CPUE = 25.0 (31; 25)
CPUE-6 = 15.0 (36; 15)
PSD = 60 (14)

Figure 3. Number of bluegill caught per h (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Twin Buttes Reservoir, Texas, 2007, 2009, and 2011.

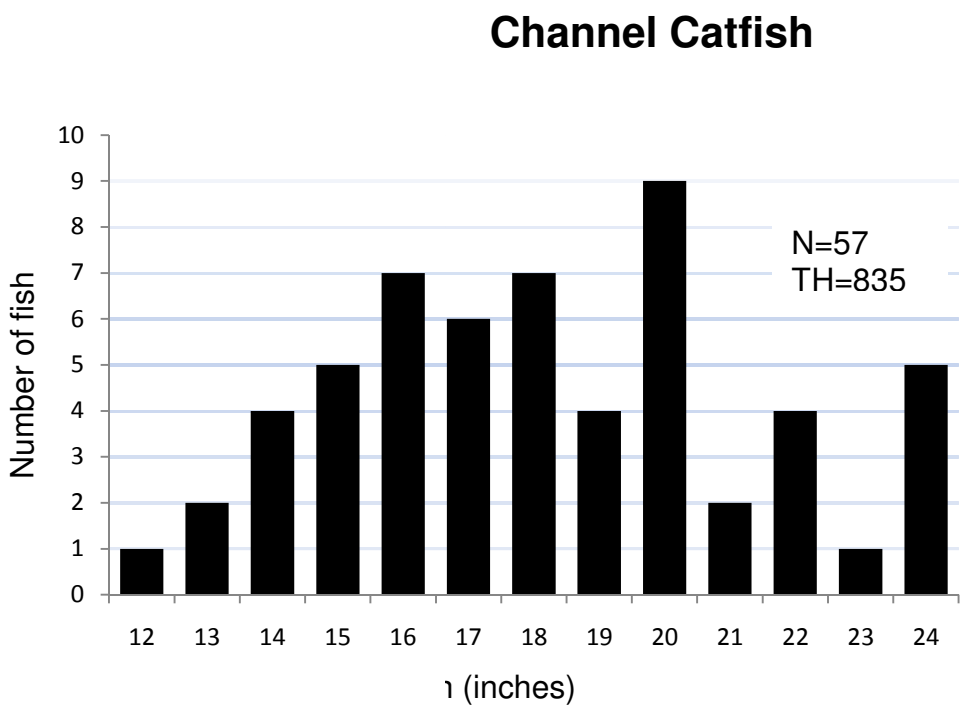


Figure 4. Length frequency of harvested channel catfish observed during creel surveys at Twin Buttes Reservoir, Texas, March 2009 through February 2010, all anglers combined. N is the number of harvested channel catfish observed during creel surveys and TH is the total estimated harvest for the creel period.

Table 5. Creel survey statistics for channel catfish at Twin Buttes Reservoir from March 2009 through February 2010, where total catch per h is for anglers targeting channel catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	
Directed effort (h)	792 (36)
Directed effort/acre	0.32
Total catch per h	0.60 (139)
Total harvest	728 (66)
Harvest/acre	0.29
Percent legal released	6

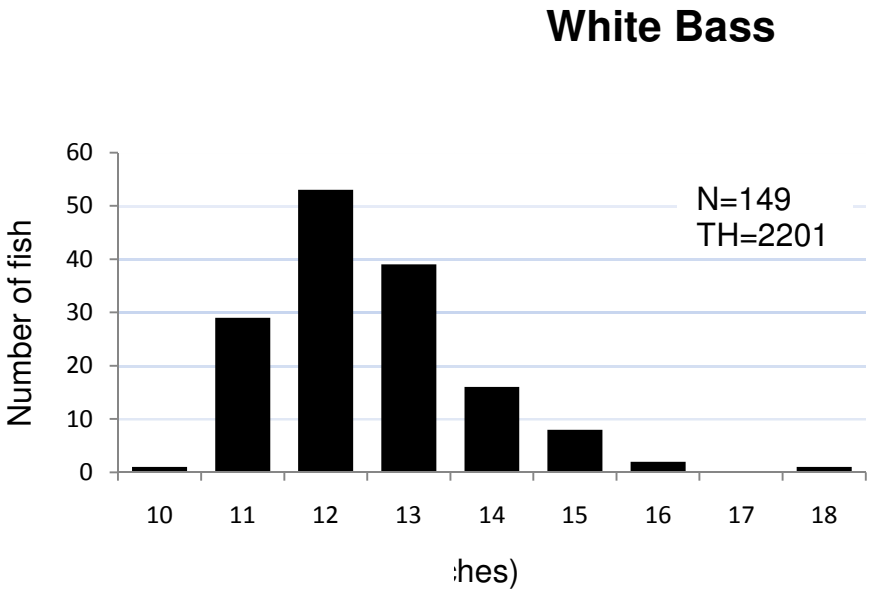
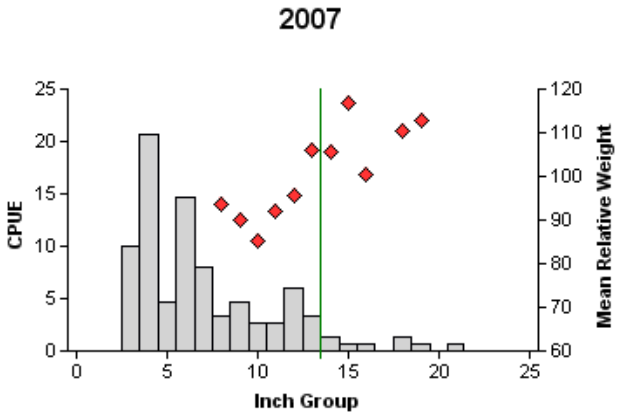


Figure 5. Length frequency of harvested white bass observed during creel surveys at Twin Buttes Reservoir, Texas, March 2009 through February 2010, all anglers combined. N is the number of harvested white bass observed during creel surveys and TH is the total estimated harvest for the creel period.

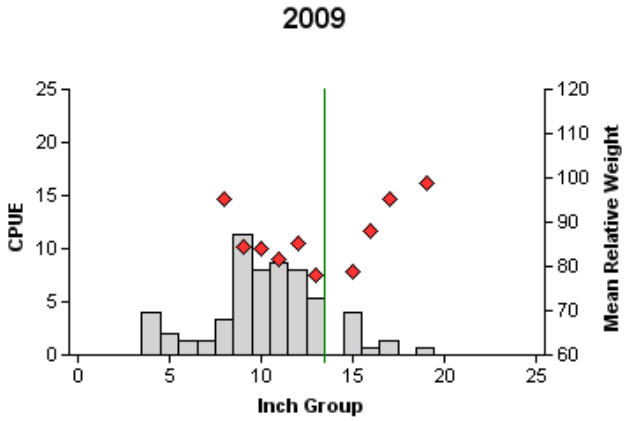
Table 6. Creel survey statistics for white bass at Twin Buttes Reservoir from March 2009 through February 2010, where total catch per h is for anglers targeting white bass and total harvest is the estimated number of white bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	
Directed effort (h)	1,622 (30)
Directed effort/acre	0.65
Total catch per h	0.79 (57)
Total harvest	2,133 (37)
Harvest/acre	0.85
Percent legal released	69

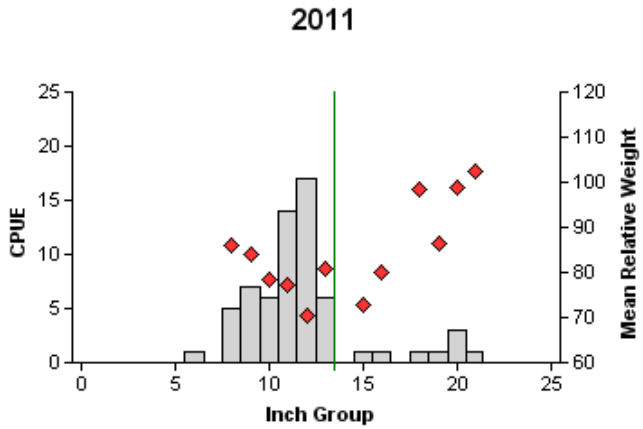
Largemouth Bass



Effort =	1.5
Total CPUE =	86.0 (34;
Stock CPUE =	129)
CPUE-14 =	28.0 (25; 42)
PSD =	5.3 (45; 8)
PSD-P =	52 (7)
PSD-M =	14 (5)
PSD-14 =	2 (2)
	19 (6)



Effort =	1.5
Total CPUE =	60.0 (22; 90)
Stock CPUE =	51.3 (19; 77)
CPUE-14 =	6.7 (42; 10)
PSD =	39 (5)
PSD-P =	13 (5)
PSD-M =	0 (0)
PSD-14 =	13 (5)



Effort =	1.0
Total CPUE =	64.0 (28; 64)
Stock CPUE =	63.0 (28; 63)
CPUE-14 =	8.0 (38; 8)
PSD =	49 (7)
PSD-P =	13 (6)
PSD-M =	6 (5)
PSD-14 =	13 (6)

Figure 6. Number of largemouth bass caught per h (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Twin Buttes Reservoir, Texas, 2007, 2009, and 2011. Vertical line represents the 14-in minimum length limit.

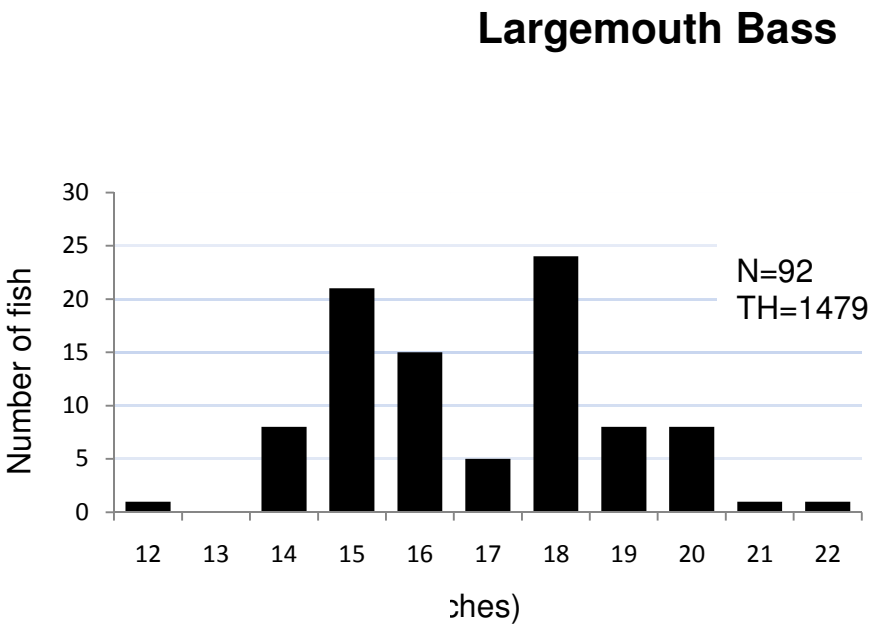


Figure 7. Length frequency of harvested largemouth bass observed during creel surveys at Twin Buttes Reservoir, Texas, March 2009 through February 2010, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys and TH is the total estimated harvest for the creel period.

Table 7. Creel survey statistics for largemouth bass at Twin Buttes Reservoir from March 2009 through February 2010, where total catch per h is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers (including fish entered into live-release tournaments). Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	
Directed effort (h)	25,674[1] (14)
Directed effort/acre	10.27
Total catch per h	0.71 (19)
Total harvest	1,418[2] (31)
Harvest/acre	0.57
Percent legal released	85[3]

[1] 4,536 h were expended during live-release tournaments
[2] 843 bass were harvested for live-release bass tournaments
[3] 94% of legal bass caught were either released or harvested for live-release tournaments

White Crappie

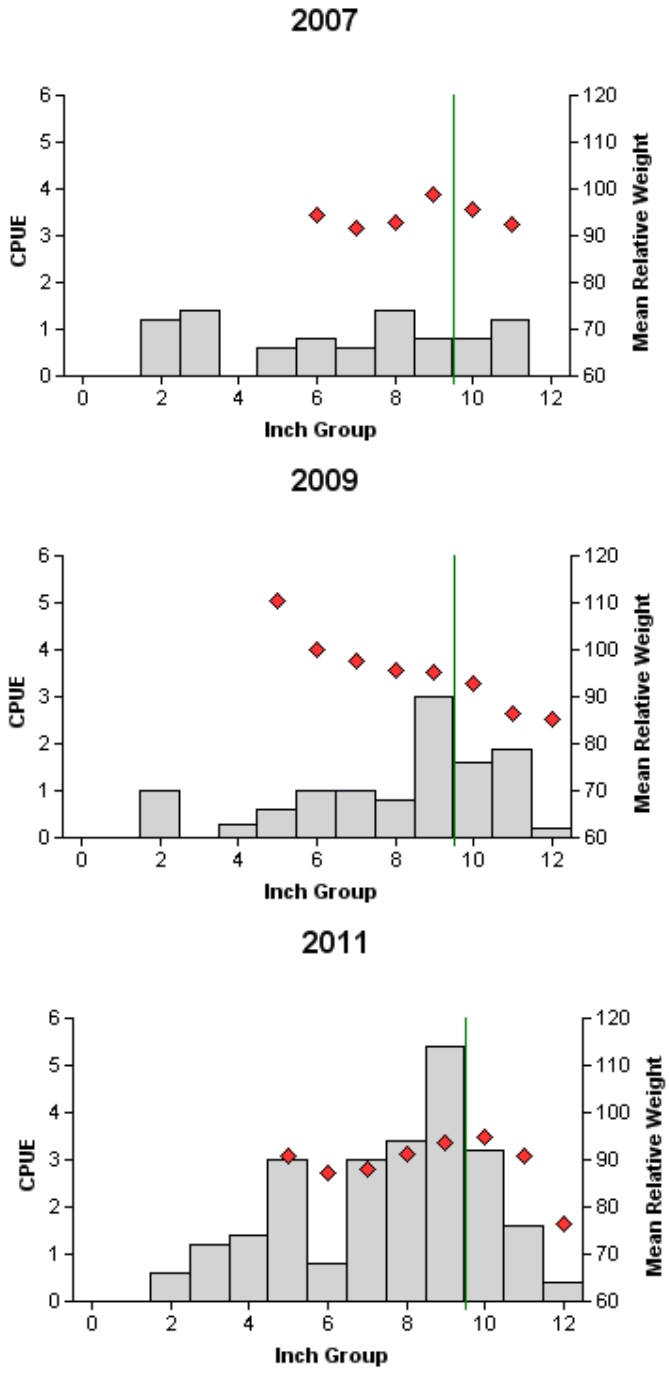


Figure 8. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall trap netting surveys, Twin Buttes Reservoir, Texas, 2007, 2009, and 2011. Vertical line represents the minimum length limit.

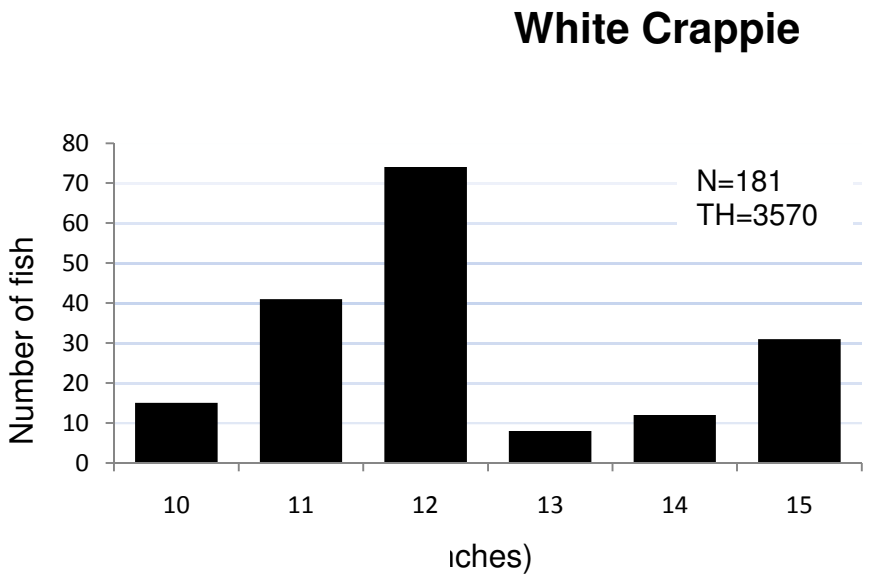


Figure 9. Length frequency of harvested white crappie observed during creel surveys at Twin Buttes Reservoir, Texas, March 2009 through February 2010, all anglers combined. N is the number of harvested white crappie observed during creel surveys and TH is the total estimated harvest for the creel period.

Table 8. Creel survey statistics for white crappie at Twin Buttes Reservoir from March 2009 through February 2010, where total catch per h is for anglers targeting white crappie and total harvest is the estimated number of white crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	
Directed effort (h)	3,544 (23)
Directed effort/acre	1.42
Total catch per h	1.14 (31)
Total harvest	3,555 (37)
Harvest/acre	1.42
Percent legal released	11

Table 9. Proposed sampling schedule for Twin Buttes 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. Additional sampling will be conducted before 2016 if and when water levels make boat launching possible.

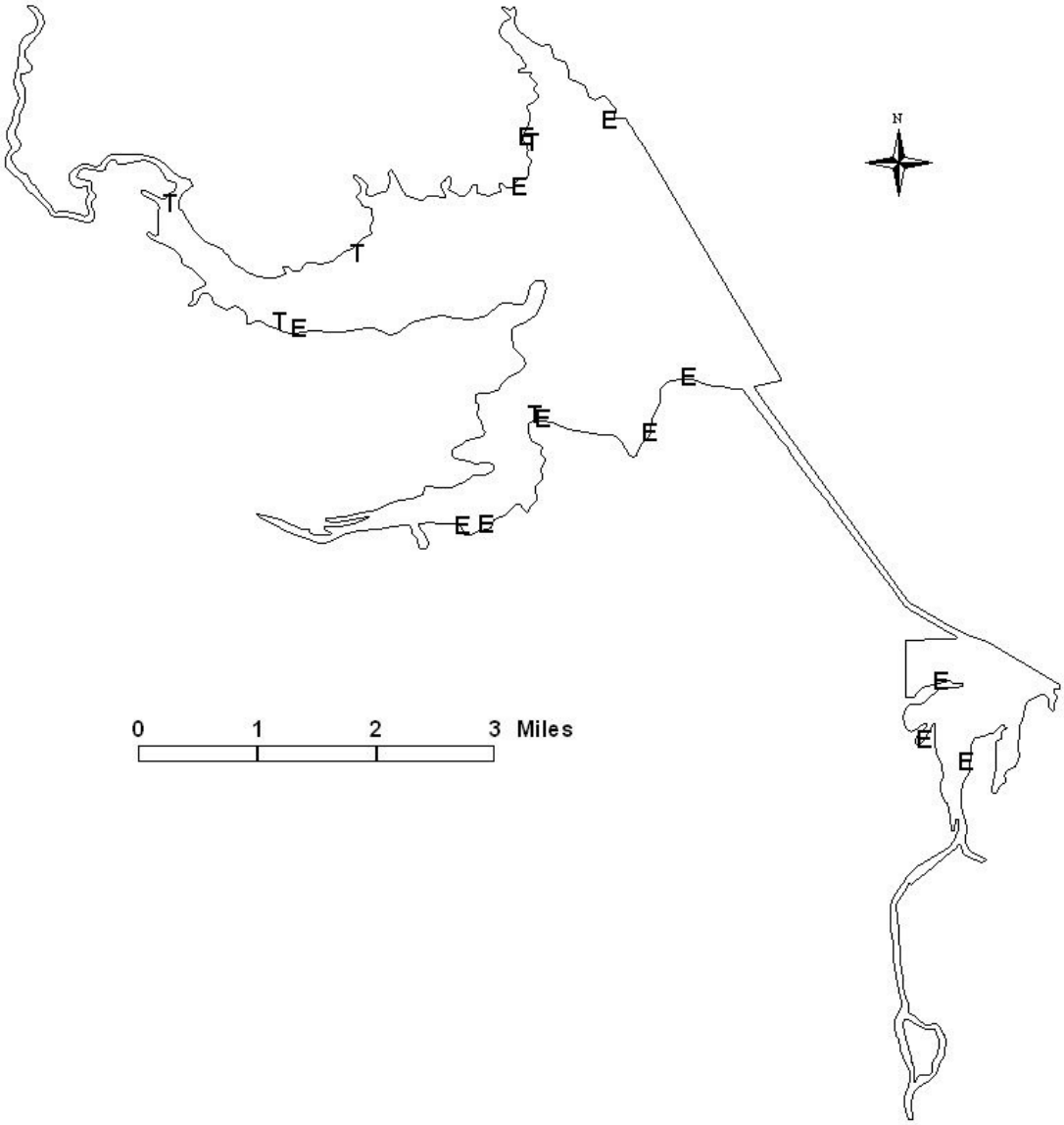
Survey Year	Electrofisher	Trap Net	Gill Net	Habitat	Access	Report
Summer 2012-Spring 2013						
Summer 2013-Spring 2014						
Summer 2014-Spring 2015						
Summer 2015-Spring 2016	S	S	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of target species collected from all gear types from Twin Buttes Reservoir, Texas, 2011. Due to low water levels, gill netting was not possible in 2012.

Species	Trap Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard shad	8	1.60	222	222.00
Threadfin shad			142	142.00
Redbreast sunfish			3	3.00
Bluegill	29	5.80	25	25.00
Longear sunfish			3	3.00
Largemouth bass			64	64.00
White crappie	120	24.0		
Black crappie	1	0.20		

APPENDIX B



Location of sampling sites, Twin Buttes Reservoir, Texas, 2011. Trap net and electrofishing stations are indicated by T and E, respectively. Water level was approximately 49 feet below conservation pool at time of fall sampling. Water levels in spring were too low for boat access, so gill netting was not conducted.