PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

Lake Bellwood

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Bellwood were surveyed in 2006 using electrofishing and trap nets and in 2007 using gill nets. Habitat was assessed in 2007. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Bellwood is a 160-acre reservoir on Indian Creek (a tributary of the Neches River), Texas, built to provide water for municipal and industrial purposes. The reservoir is owned and controlled by Tyler Water Utilities (TWU). Boat access is adequate, but bank angler access is limited. There are no handicap-specific facilities. The north and west shorelines are dominated by giant cutgrass.

- **Management history:** Important sport fish include channel catfish, largemouth bass, and crappie. The minimum-length of largemouth bass was increased from 14 to 18 inches in 1994. Advanced-size channel catfish fingerlings have been stocked as available since 1994. Hydrilla was controlled by herbicide in 1998-2000. Hydrilla has not been problematic since that time. Several native submersed aquatic plant species were introduced from 1999-2002 and continue to be monitored. Giant cutgrass has been removed along part of the south shoreline as part of a private recreational development.

- **Fish Community**
  - **Prey species:** Threadfin shad were present in good abundance. The electrofishing catch of gizzard shad was lower than in previous surveys, with few of suitable size as prey for most sport fish. Electrofishing catch rate of bluegill was higher than previous surveys, and most were of a size suitable as prey. Redear sunfish and longear sunfish were present and provided a valuable addition to the prey base. Redear sunfish, although fewer in number than bluegill, were large enough to be desirable to anglers.

  - **Catfish:** Only adult channel catfish were collected and all were large (22-31 inches). The fish collected were likely the result of stocking conducted in the 1990s through 2001. There was no evidence of natural recruitment.

  - **Largemouth bass:** Largemouth bass were abundant. The electrofishing catch rate was higher than previous surveys with an increase in legal-sized individuals. Largemouth bass had good body condition; an indication of good prey availability. Growth rate was acceptable with largemouth bass growing to 14 inches by age 2 or 3.

  - **Crappies:** Both white crappie and black crappie were present. Trap net catch rates of both species were similar but a higher percentage of white crappie were harvestable size. White crappie body condition and growth rate was better than black crappie and multiple year classes of both species were evident.

  - **Management Strategies:** Continue stocking channel catfish as available. Continue monitoring size distribution and genetic composition of largemouth bass as necessary. Coordinate with TWU to monitor the hydrilla as needed. Continue maintenance of native aquatic vegetation nursery structures as necessary. Coordinate with TWU in bringing developer into compliance with aquatic vegetation management regulations.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Bellwood in 2006-2007. 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 2006-2007 data for comparison.

Reservoir description

Lake Bellwood is a 160-acre reservoir on Indian Creek (a tributary of the Neches River), Texas, built to provide water for municipal and industrial purposes by Tyler Water Utilities (TWU). Boat access is adequate, but bank angler access is limited. There are no handicap-specific facilities. The north and west shorelines are dominated by giant cutgrass *Zizaniopsis miliacea*. Hydrilla *Hydrilla verticillata*, had become a significant problem by the mid 1990s; by 1998 hydrilla occupied over 80% of the reservoir area. Following a whole lake herbicide treatment in 1998 and spot treatments in 1999 and 2000, hydrilla is no longer a problem. Several native submersed aquatic plant species including water star-grass *Heteranthera dubia,* pondweed *Potamogeton nodosus & P. Illinoensis*, and Wild celery *Vallisneria americana,* were introduced as part of a native aquatic plant restoration program from 1999-2002. These species and native floating species such as yellow water-lily *Nuphar luteum* and American lotus *Nelumbo lutea* currently occupy 35% of reservoir area. Boat access consisted of one public boat ramp. Bank fishing access was restricted to the area immediately around the boat ramp and several unimproved trail areas. Other descriptive characteristics for Lake Bellwood are in Table 1.

Management history

Previous management strategies and actions: Management strategies and actions from the previous survey report (Ott and Storey 1994) included:

1. Increase abundance and catch of largemouth bass *Micropterus salmoides* 14-18 inches, and harvest of largemouth bass >18 inches.
   Action: The minimum-length for largemouth bass was increased from 14 to 18 inches in 1994. Five thousand Florida largemouth bass *M. s. floridanus* fingerlings provided by a private contractor were stocked in 2005.
2. Increase numbers and size of crappie available for harvest by 1996.
   Action: Hybrid crappie stocking was not conducted due to poor success in stocking other lakes.
3. Increase numbers and size of catfish available for angler harvest.
   Action: Advanced-size channel catfish fingerlings were stocked annually (as available) from 1994-2001.
4. Increase numbers, size, and species diversity of sunfish available for harvest by 1996.
   Action: Coppernose bluegill *L. m. purpurescens* obtained from a private contractor were stocked in 1996.
5. Enhance availability of prey fishes and improve growth rates of largemouth bass and crappie by controlling excessive growth of aquatic vegetation.
   Action: Lake Bellwood was chosen as a demonstration site by the Aquatic Ecosystem Research Foundation. As part of that demonstration, hydrilla was controlled by herbicide from 1998-2000. Hydrilla has not been problematic since that time. Several native submersed species were introduced from 1999-2002 and continue to be monitored.
6. Improve access for shore anglers.
   Action: Giant cutgrass has been removed along part of the south shoreline as part of a private residential development. Unfortunately this action was needed on the north shoreline.

Harvest regulation history: Sport-fishes in Lake Bellwood are currently managed with statewide regulations with the following exceptions: 18-inch minimum-length limit for largemouth bass and 12 inch minimum length, 5 fish daily bag limit for catfishes; use of juglines, throwlines, and trotlines is prohibited (Table 2). From 1985 to 1994 largemouth bass were managed with a 14-inch minimum-length limit.

Stocking history: Lake Bellwood was stocked with threadfin shad *Dorosoma petenense* in 1991. The initial stocking of Florida largemouth bass was in 1980 and the lake was restocked with fry in 1989 and 1990. A private contractor provided Florida largemouth bass fingerlings in 2005; the same contractor provided coppernose bluegill in 1996. Advanced-size channel catfish were stocked from 1992 to 2001. The complete stocking history is presented in Table 3.

Vegetation/habitat history: Hydrilla was discovered at Lake Bellwood in 1991 near the boat ramp. Texas Parks and Wildlife Department (TPWD) Aquatic Habitat Enhancement team treated approximately 0.5 acres of hydrilla using herbicide provided byTWU. Through 1993 and 1994 the infestation remained less than 1 acre. However, in 1995 anglers began reporting that hydrilla was once again "getting bad". By 1996 TPWD staff found that hydrilla had rapidly expanded and now infested approximately 100 acres. TPWD staff contacted TWU and reported the infestation but funding for treatment was not available until 1998. In May 1998, small patches of native plant species remained in the lake, including American lotus, yellow water-lily, white water-lily *Nymphaea odorata*, coontail *Ceratophyllum demersum*, and watershield *Brasenia schreberi*. However, hydrilla had infested 130 acres (all water less than 12 feet deep) and had severely limited both boat and bank fishing access.

Aquathol™ (3ppm) was applied in a whole-lake treatment in early summer 1998 reducing hydrilla coverage to below 1 acre. Supplemental spot treatments were made of residual hydrilla with 3 ppm Aquathol™ as necessary in fall 1998, early summer 1999, and spring 2000. Final spot treatment was conducted in fall 2000 with a combination of 1 ppm Aquathol™ and 1/4 ppm Cutrene™ (copper). No additional treatments were necessary in 2001 and hydrilla was reduced to trace levels. Native macrophytes were avoided during all spot treatments allowing survival of a substantial fringe (10.6 acres) of native emergent and submersed species.

From 1998–2000, sixty 6-foot circular mesh "nursery" exclosures were constructed and planted with 5 species of native submersed aquatic plants. These species included wild celery, American pondweed *s*), Illinois pondweed, water stargrass, and common elodea *Elodea canadensis*. Survival and expansion of these species was evaluated through 2003 as a cooperative project by TPWD and the U.S. Army Corps of Engineers and University of North Texas. Nursery exclosures have been maintained and all species except common elodea survived and expanded.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (5 net nights at 5 stations) (Appendix B). 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). A vegetation/structural habitat survey was conducted in spring 2007. Survey sites for trap nets and gill nets were randomly selected. Electrofishing sites were selected by randomly determining starting direction from the boat ramp, sampling for 5 minutes, moving an equivalent distance in the direction sampled, and starting again thereby sampling the entire shoreline. All surveys (except electrofishing) were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Chlorophyll-*a* data was obtained from the Texas Commission on Environmental Quality (TCEQ 2002).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] 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 and SE was calculated for structural indices and IOV. Ages were determined for largemouth bass, white crappie, and black crappie using otoliths from 13 specimens (13-15.9 inches in length for largemouth bass and 9-12 inches in length for crappie).

RESULTS AND DISCUSSION

Habitat: Lake Bellwood supported a diverse aquatic vegetation community (Table 4). Native emergent species such as giant cutgrass, bulrush *(Scirpus spp.)*, maiden-cane *(Panicum hemitomon)*, and arrowhead *(Sagittaria spp.)* occupied 70% of the shoreline. Native floating-leaved species (yellow water-lily and American lotus) and submersed aquatic species (Water star-grass, American and Illinois pondweed, wild celery, and coontail) occupied approximately 35% of reservoir area and was similar to previous surveys. Hydrilla was found in historical areas, but occupied only a trace of the reservoir area. This aquatic plant has the potential to interfere with boat or bank angling access, and the potential exists for rapid growth. TWU has sold a portion of the south shoreline to a development for home construction and the developer has conducted un-permitted removal of emergent vegetation along approximately 30% of the south shoreline and in a marsh area at the upper end. Increased conversion of vegetated shoreline to bulkhead habitat can lead to poor littoral fish assemblages (Trial et al. 2001). Other authors have found a negative correlation between occurrence of emergent and floating-leaf vegetation and the percentage of lakeshore development (Radomski and Goeman 2001). The controlling authority has notified the developer that those actions are in violation of state statute.

Prey species: Electrofishing catch rates of bluegill *Lepomis macrochirus* and gizzard shad *D. cepedianum* were 682/h and 39/h, respectively. Index of vulnerability (IOV) for gizzard shad was poor, indicating that only 3% of gizzard shad were available to predators; this was lower than IOV estimates in previous years (Figure 1). Total CPUE of gizzard shad was also considerably lower in 2006 compared to the 2001 or 2002 surveys (373/h and 410/h respectively). Threadfin shad were collected at a rate of 111/h in the 2006 survey (Appendix A) but were not collected in the two previous surveys (2001 and 2002) (unpublished data TPWD). Total CPUE of bluegill in 2006 (682/h), was considerably higher than in 2001 or 2002 (149/h and 175/h respectively). Size structure of bluegill (Figure 2) was dominated by small individuals suitable as prey. Redear sunfish *L. microlophus* and longear sunfish *L. megalotis* were present and provided a valuable addition to the prey base. PSD of redear sunfish was 46, and individuals up to 9 inches in length were collected (Figure 3).

Channel catfish: The gill net catch rate of channel catfish was 1.0/nn in 2007 (Figure 4). All of the channel catfish were large (22-31 inches in length) and there was no evidence of natural recruitment. The fish collected were likely from previous stockings. Because of lack of spawning habitat and extensive predation by largemouth bass it is unlikely that this fishery can be maintained without additional stocking of advanced size ($\geq$ 9 inch) fingerlings.

Largemouth bass: The fall electrofishing catch rate of stock-size largemouth bass was 83/h in 2006 (Figure 5) and is much higher than previous surveys (37/h in 2001 and 34/h in 2002 respectively). Stock structure (PSD) has remained in the target range since 2001 (PSD = 54; RSD-P = 24). Body condition was acceptable (relative weight $\geq$ 90) for most size classes and exhibits a general increase with size. Spring electrofishing followed a similar trend (Figure 6). Growth was very good (Figure 7); average age at 14-inch (13.0 -15.7) was 2.5 years (N =13, range 2-3 years). No genetic testing of largemouth bass was conducted at Lake Bellwood in 2006. However, the percentage of pure Florida largemouth bass in past surveys has ranged form 20-24% and the percentage of fish with Florida largemouth bass alleles remained above 60% (Table 5).

White and Black crappie: Both white crappie and black crappie were present in 2006 sampling but white crappie were more abundant (Appendix A). The trap net catch rate of white crappie was 11.6/nn compared to 9.8/nn for black crappie (Figures 8 and 9). Few legal length black crappie were collected but the majority of white crappie collected were legal length. Overall size distributions of the two species were acceptable; PSD was 88 for white crappie and 80 for black crappie. Mean relative weight was $\geq$ 90 for most size classes of white crappie and black crappie. White crappie growth (Figure 10) was adequate;

average age at 10-inch (9.3 -11.9) was 2.2 years (N =13, range 1-4 years). Growth was slower (Figure 11) for black crappie; average age at 10-inch (9.0 -11.4) was 3.6 years (N =13, range 1-7 years). For both species, multiple year classes were collected and suggest annual recruitment.

Fisheries management plan for Lake Bellwood, Texas

Prepared – July 2007

ISSUE 1: Only large channel catfish were collected in the 2007 survey and there was no evidence of natural recruitment. Stocking will be necessary to maintain a fishery.

MANAGEMENT STRATEGY

1. Stock advanced-size fingerling channel catfish (25/acre) every other year starting in 2008. I f fish are not available from TPWD hatcheries, solicit donations of fish from private sources.

ISSUE 2: Development of a new subdivision on the south shoreline leads to the possibility of new public access areas on the northeast shoreline and closure of the current launch area.

MANAGEMENT STRATEGY

1. Coordinate with Tyler Water Utilities regarding new access development. Provide input on ramp construction and offer assistance in providing regulation signage.
2. Continue monitoring of habitat manipulation by the developer of the new subdivision. Coordinate with Tyler Water Utilities and TPWD law enforcement if necessary to ensure that regulations are followed.
3. Recommend Tyler Water Utilities allow only rock for construction of bulkhead.

ISSUE 3: Electrophoresis conducted on age-0 largemouth bass collected in fall 2001 indicated that allele frequency and percentage of pure Florida strain largemouth bass are stable and within the target range of > 20%.

MANAGEMENT STRATEGIES

1. Continue monitoring size distribution and genetic composition during optional electrofishing sampling in 2008.
2. If allele frequency is below 20% solicit donations of Florida largemouth bass fingerlings from private sources.

ISSUE 4: Hydrilla has been present at Lake Bellwood since 1991 and exceeded 80% coverage prior to herbicide treatment and native plant introduction from 1998-2001. Hydrilla is still present at trace levels but has not been problematic since that time. Native aquatic plant introductions have been conducted.

MANAGEMENT STRATEGIES

1. Coordinate with Tyler Water Utilities to monitor the hydrilla as needed.
2. Conduct reconnaissance surveys of the aquatic plant community as necessary.
3. Recommend TWU spot treat hydrilla as necessary.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes electrofishing in 2008 vegetation reconnaissance annually and trap net sampling and gill netting as necessary (Table 6). Sampling at the scheduled intervals is sufficient to monitor trends in this fishery.

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Radomski, P., and T. J. Goeman. 2001. Consequences of human lakeshore development on emergent and floating-leaf vegetation abundance. North American Journal of Fisheries Management 21:46-61.

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Table 1. Characteristics of Lake Bellwood, Texas.

Characteristic	Description
Year constructed	1892
Controlling authority	Tyler Water Utilities
Counties	Smith
Reservoir type	Tributary
Shoreline Development Index (SDI)	1.3
Conductivity	135 umhos/cm

Table 2. Harvest regulations for Lake Bellwood[a], Texas.

Species	Bag Limit	Minimum-maximum length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	5 (in any combination)	12 - No limit
Catfish, Flathead	5	18 - No limit
Bass, largemouth	5	18-No limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No limit

[a] Use of juglines, throwlines, and trotlines is prohibited.

Table 3. Stocking history of Lake Bellwood, Texas. Size categories are: FRY < 1 inch, FGL = 1-3 inches, ADFGL = advanced-size fingerlings, and ADL = adults.

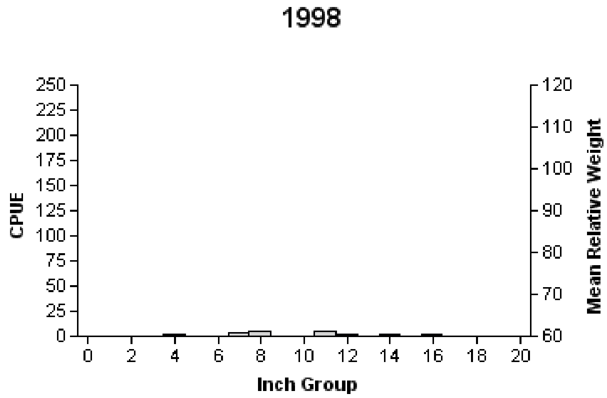
Species	Year	Number	Size
Threadfin shad	1991	7,600	ADL
	Total	7,600	
Northern pike	1974	4,100	
	1976	5,778	
	Total	9,878	
Blue catfish	1976	1,700	
	Total	1,700	
Channel catfish	1975	5,098	
	1992	4,250	FGL
	1993	39	ADL
	1993	4,263	ADFGL
	1994	4,274	ADFGL
	1995	4,250	ADFGL
	1996	4,250	ADFGL
	1998	4,250	ADFGL
	1999	4,433	ADFGL
	2000	4,250	ADFGL
	2001	4,250	ADFGL
	Total	43,607	
Coppernose bluegill	1996	19,720	FRY
	Total	19,720	
Largemouth bass	1992	1,980	FGL
	Total	1,980	
Florida largemouth bass	1980	170,849	FGL
	1989	18,000	FRY
	1990	17,365	FRY
	2005	9,000	FGL
	Total	215,214	

Table 4. Survey of littoral zone and physical habitat types, Lake Bellwood, Texas, 2007. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area were determined for each type of aquatic vegetation found by species.

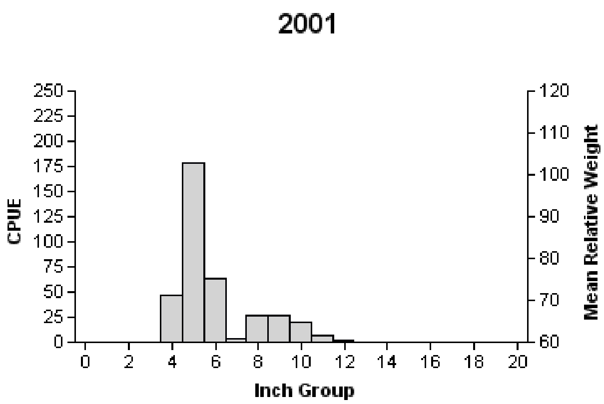
Shoreline habitat type	Shoreline distance		Surface area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Concrete[a]	<0.1	trace		
Featureless[a]	2.7	30		
Native emergent vegetation	6.2	70		
Bulrush			0.2	trace
Giant cut grass			5.0	3.1
Maiden-cane			2.0	1.2
Arrowhead			<0.1	trace
Total			7.2	4.3
Native floating vegetation				
Yellow water-lily			25.1	15.6
American lotus			9.3	5.8
Total			34.3	21.5
Native submersed vegetation				
Water star-grass			3.1	1.9
Pondweed			4.4	2.8
Wild celery			1.9	1.2
Coontail			10.3	6.5
Total			19.8	12.3
Non-native submersed				
Hydrilla			<0.1	trace
Total			<0.1	trace

[a] Abiotic habitat feature

Gizzard shad



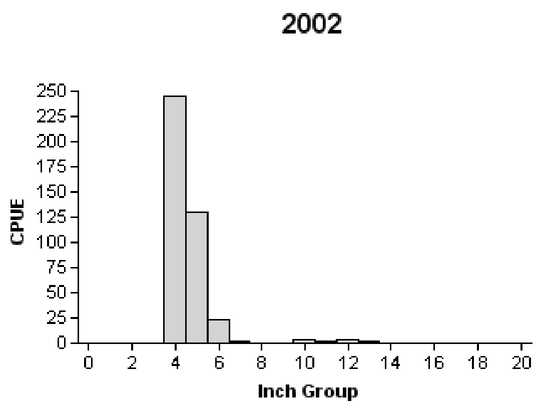
Effort = 1.0
Total CPUE = 18.0 (28; 18)
Stock CPUE = 17.0 (31; 17)
IOV = 22.22 (10.6)



Effort = 1.0
Total CPUE = 373.0 (14; 373)
Stock CPUE = 84.0 (15; 84)
IOV = 78.28 (3.2)

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 Bellwood, Texas 1998, 2001, 2002, and 2006. Continued on next page….

Gizzard shad



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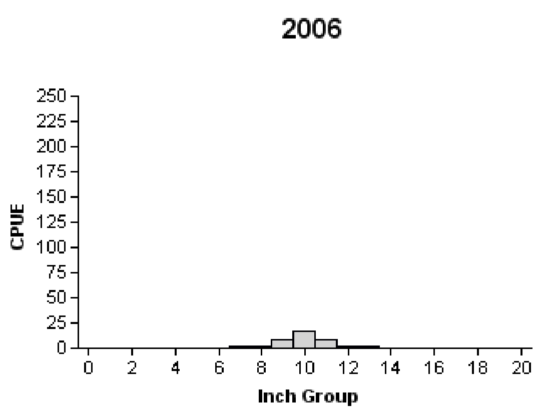
Total CPUE = 410.0 (25; 410)
Stock CPUE = 11.0 (43; 11)
IOV = 97 (1.1)

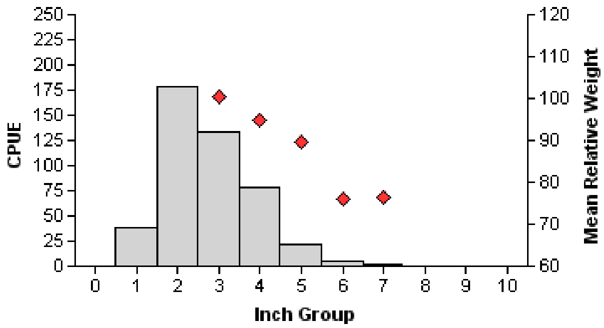


Effort = 1.0
Total CPUE = 39.0 (27; 39)
Stock CPUE = 39.0 (27; 39)
IOV = 3 (2.6)

Figure 1. cont…. 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 Bellwood, Texas 1998, 2001, 2002, and 2006.

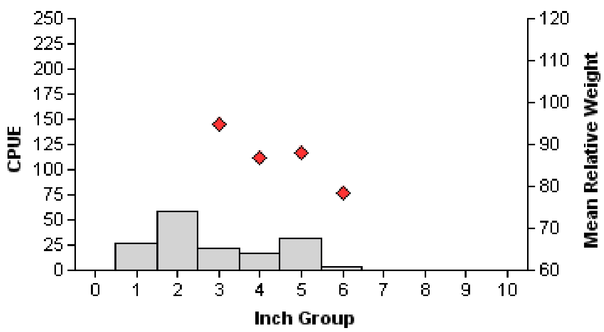
Bluegill

1998



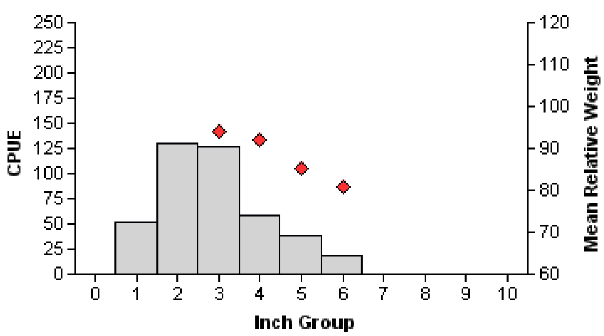
Effort = 1.0
Total CPUE = 456.0 (16; 456)
Stock CPUE = 239.0 (14; 239)
PSD = 3 (1.3)

1999



Effort = 1.0
Total CPUE = 160.0 (33; 160)
Stock CPUE = 74.0 (19; 74)
PSD = 5 (2.4)

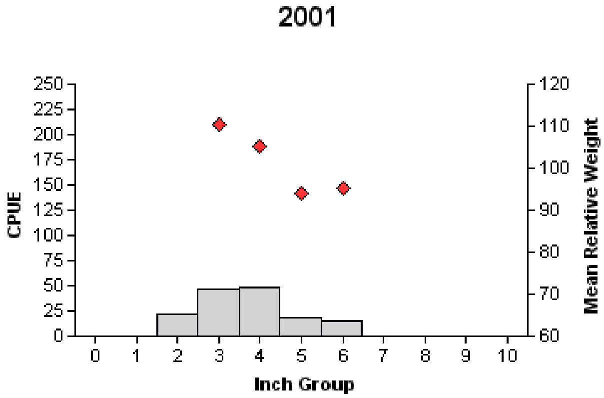
2000



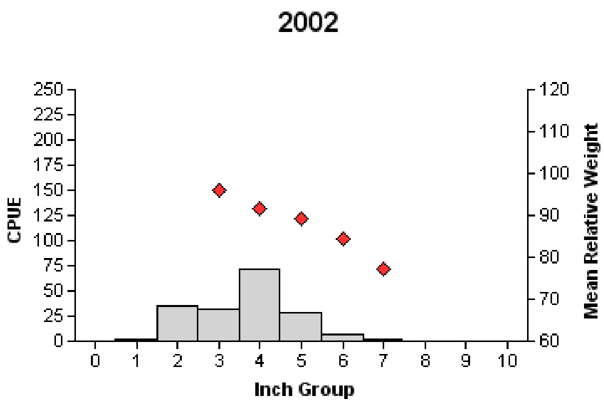
Effort = 1.0
Total CPUE = 424.0 (14; 424)
Stock CPUE = 243.0 (17; 243)
PSD = 8 (2.6)

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 size structure are in parentheses) for fall electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006. Continued on next page….

Bluegill



Effort = 1.0
Total CPUE = 149.0 (19; 149)
Stock CPUE = 128.0 (20; 128)
PSD = 12 (2.7)



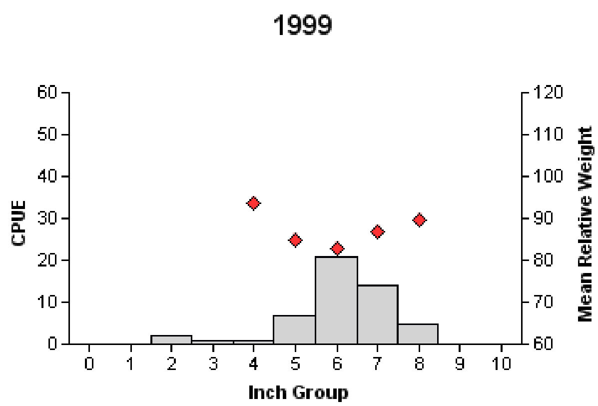
Effort = 1.0
Total CPUE = 175.0 (15; 175)
Stock CPUE = 139.0 (16; 139)
PSD = 5 (2.0)

Effort = 1.0
Total CPUE = 682.0 (10; 682)
Stock CPUE = 636.0 (9; 636)
PSD = 12 (1.3)

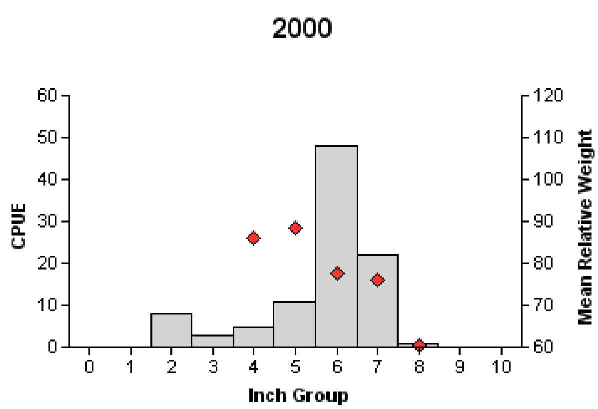
Figure 2. cont…. Number of bluegill caught per hour (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006.

Redear sunfish

Effort = 1.0
Total CPUE = 163.0 (30; 163)
Stock CPUE = 142.0 (30; 142)
PSD = 32 (2.9)



Effort = 1.0
Total CPUE = 51.0 (18; 51)
Stock CPUE = 48.0 (19; 48)
PSD = 40 (5.9)

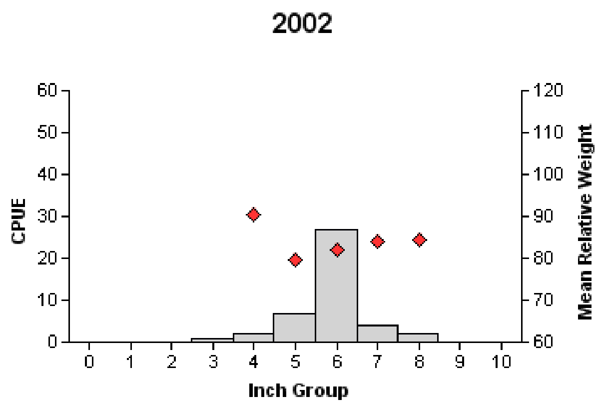


Effort = 1.0
Total CPUE = 98.0 (13; 98)
Stock CPUE = 87.0 (13; 87)
PSD = 26 (7.6)

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 size structure are in parentheses) for fall electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006. Continued on next page….

Redear sunfish

Effort = 1.0
Total CPUE = 15.0 (26; 15)
Stock CPUE = 14.0 (28; 14)
PSD = 43 (17.1)

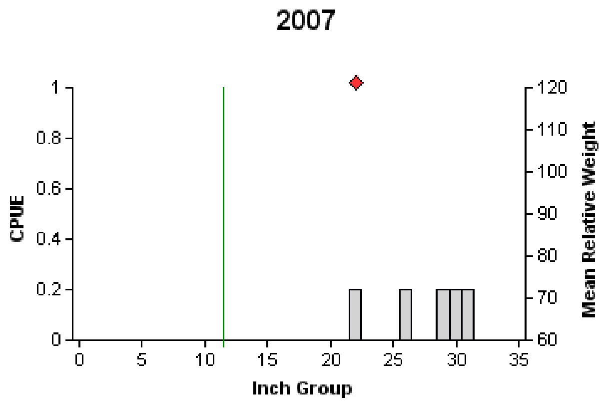


Effort = 1.0
Total CPUE = 43.0 (14; 43)
Stock CPUE = 42.0 (14; 42)
PSD = 14 (5.3)

Effort = 1.0
Total CPUE = 214.0 (19; 214)
Stock CPUE = 177.0 (20; 177)
PSD = 46 (5.1)

Figure 3. cont…. Number of redear sunfish caught per hour (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006.

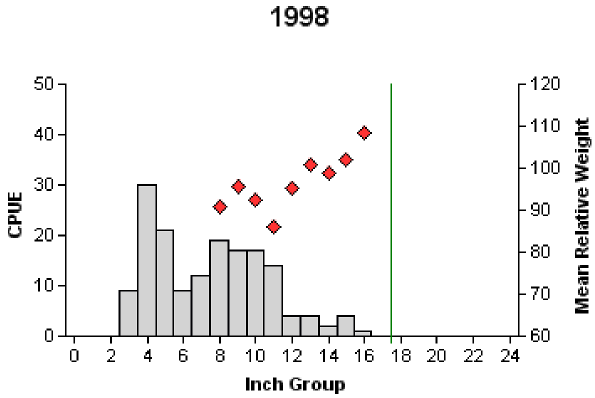
Channel Catfish



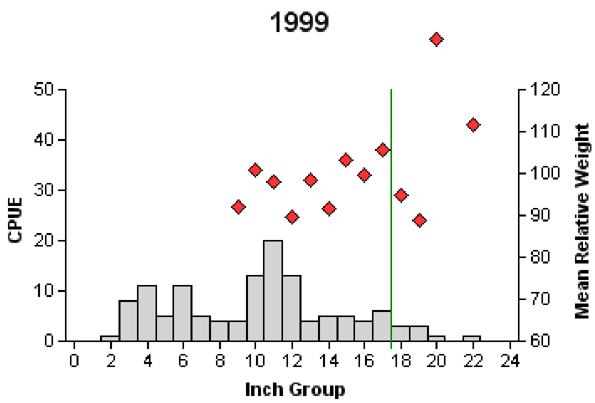
Effort = 5.0
Total CPUE = 1.0 (45; 5)
Stock CPUE = 1.0 (45; 5)
PSD = 100 (0)

Figure 4. 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 size structure are in parentheses) for spring gill net surveys, Lake Bellwood, Texas, 2007. Vertical line represents the length limit in effect at the time of survey.

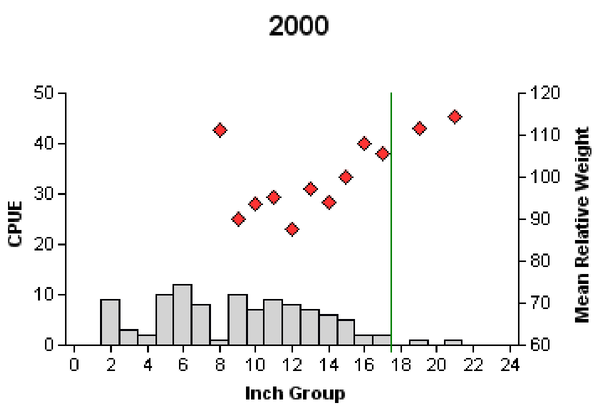
Largemouth bass, fall



Effort = 1.0
Total CPUE = 163.0 (22; 163)
Stock CPUE = 82.0 (22; 82)
PSD = 18 (4.8)
RSD-P = 6 (3)



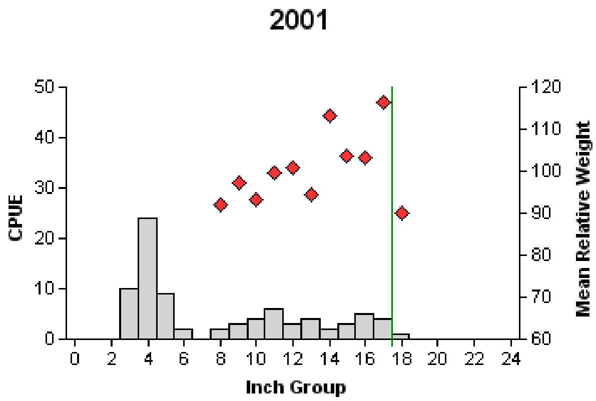
Effort = 1.0
Total CPUE = 127.0 (13; 127)
Stock CPUE = 86.0 (12; 86)
PSD = 52 (3.8)
RSD-P = 27 (4.4)



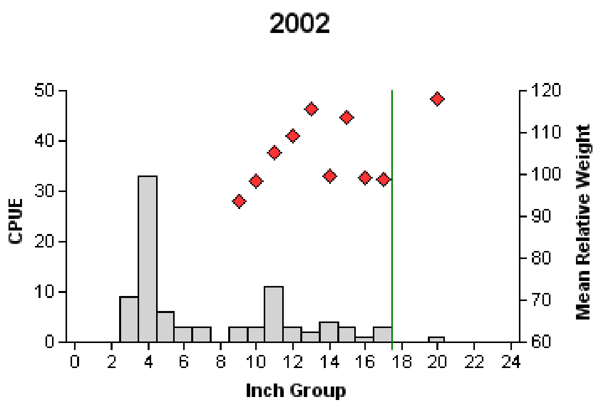
Effort = 1.0
Total CPUE = 103.0 (18; 103)
Stock CPUE = 59.0 (18; 59)
PSD = 54 (2.9)
RSD-P = 19 (4.4)

Figure 5. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006. Vertical line represents the length limit in effect at the time of survey. Continued on next page….

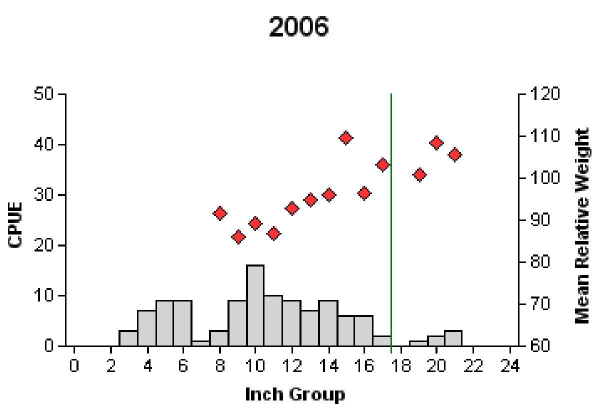
Largemouth bass, fall



Effort = 1.0
Total CPUE = 82.0 (14; 82)
Stock CPUE = 37.0 (20; 37)
PSD = 59 (6.4)
RSD-P = 35 (4.6)



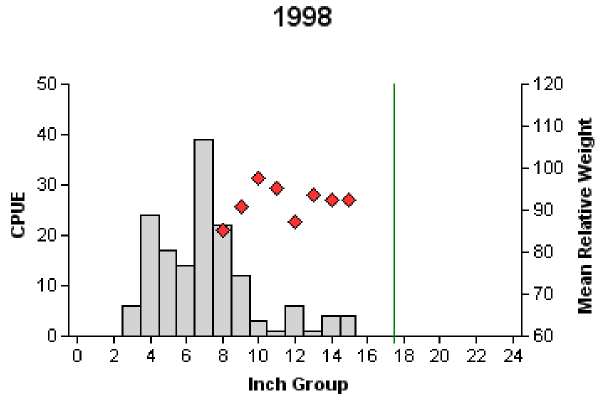
Effort = 1.0
Total CPUE = 88.0 (13; 88)
Stock CPUE = 34.0 (20; 34)
PSD = 50 (10.9)
RSD-P = 24 (8.5)



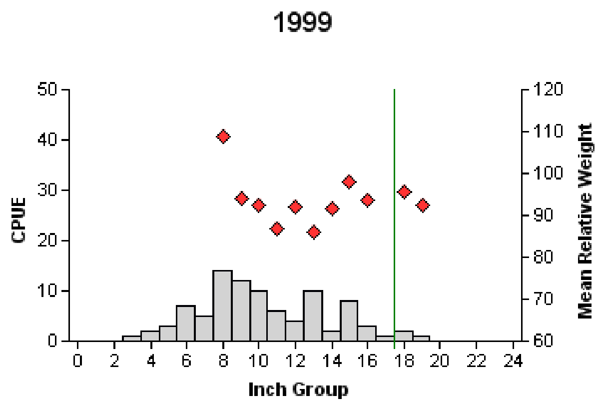
Effort = 1.0
Total CPUE = 112.0 (12; 112)
Stock CPUE = 83.0 (12; 83)
PSD = 54 (5.8)
RSD-P = 24 (5.2)

Figure 5. cont…. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006. Vertical line represents the length limit in effect at the time of survey.

Largemouth bass, spring



Effort = 1.0
Total CPUE = 153.0 (16; 153)
Stock CPUE = 53.0 (17; 53)
PSD = 28 (5.9)
RSD-P = 8 (3.6)



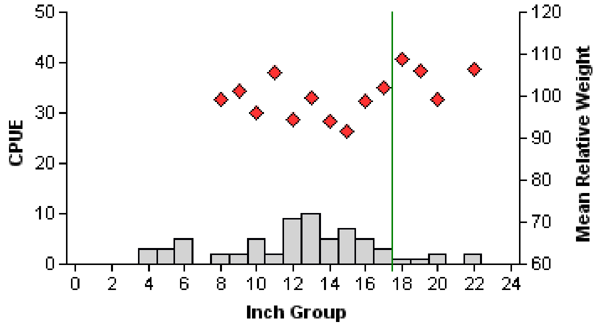
Effort = 1.0
Total CPUE = 91.0 (18; 91)
Stock CPUE = 73.0 (15; 73)
PSD = 42 (6.3)
RSD-P = 21 (6)

Effort = 1.0
Total CPUE = 47.0 (16; 47)
Stock CPUE = 39.0 (13; 39)
PSD = 56 (8.4)
RSD-P = 15 (4.4)

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 size structure are in parentheses) for spring electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006. Vertical line represents the length limit in effect at the time of survey. Continued on next page….

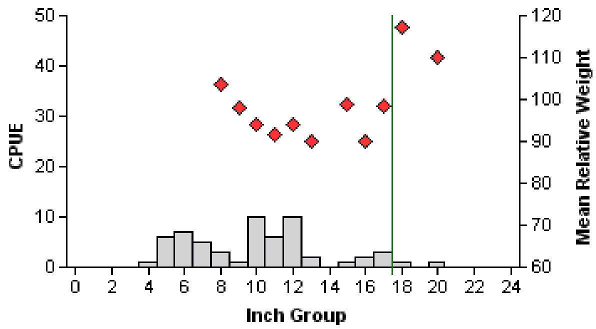
Largemouth bass, spring

2002



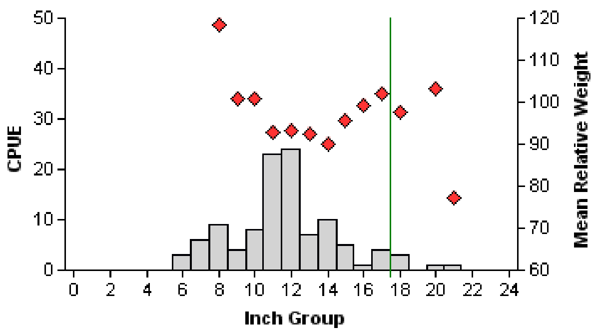
Effort = 1.0
Total CPUE = 67.0 (8; 67)
Stock CPUE = 56.0 (11; 56)
PSD = 80 (5.4)
RSD-P = 38 (7.4)

2003



Effort = 1.0
Total CPUE = 59.0 (14; 59)
Stock CPUE = 40.0 (21; 40)
PSD = 50 (9.8)
RSD-P = 20 (8.9)

2006



Effort = 1.0
Total CPUE = 109.0 (9; 109)
Stock CPUE = 100.0 (7; 100)
PSD = 56 (6.8)
RSD-P = 15 (4.4)

Figure 6. cont…. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Lake Bellwood, Texas, 1998, 1999, 2000, 2001, 2002, and 2006. Vertical line represents the length limit in effect at the time of survey.

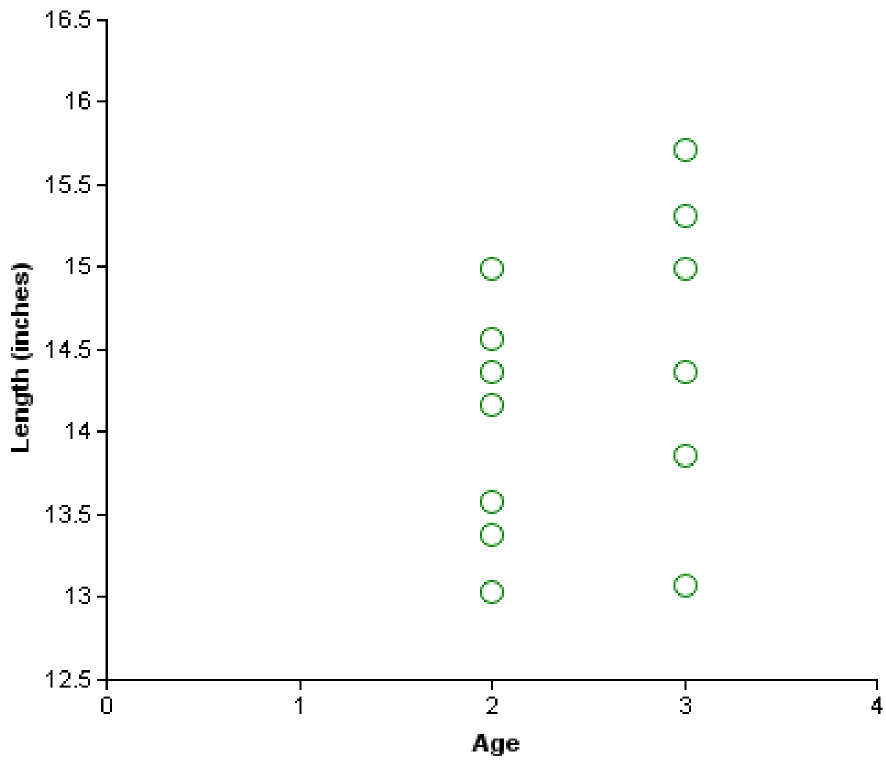
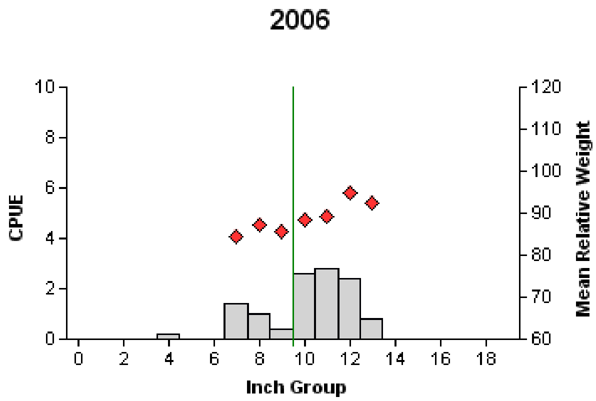


Figure 7. Length-at-age for largemouth bass collected by electrofishing, Lake Bellwood, Texas, October 2006.

Table 5. Results of genetic analysis of age-0 largemouth bass collected by fall electrofishing, Lake Bellwood, Texas, 2000, and 2001. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

		Genotype					
Year	Sample size	FLMB	F1	Fx	NLMB	% FLMB alleles	% pure FLMB
2000	30	18	6	12	4	61	24
2001	30	6	5	18	1	62	20

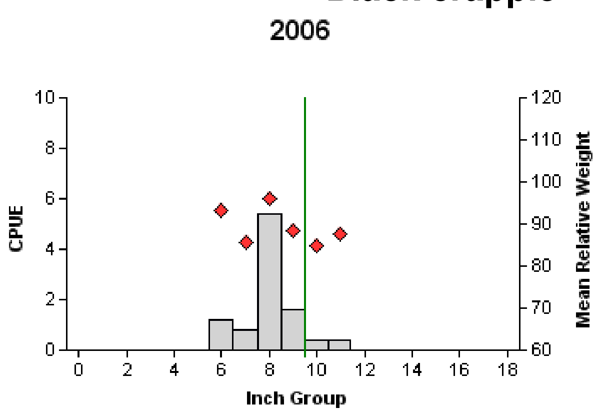
White crappie



Effort = 5.0
Total CPUE = 11.6 (30; 58)
Stock CPUE = 11.4 (31; 57)
PSD = 88 (7.2)
RSD-P = 75 (4.9)

Figure 8. Number of white crappie caught per trap net night (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Bellwood, Texas, 2006. Vertical line represents the length limit in effect at the time of survey.

Black crappie



Effort = 5.0
Total CPUE = 9.8 (24; 49)
Stock CPUE = 9.8 (24; 49)
PSD = 80 (3.1)
RSD-P = 8 (4.7)

Comment [TJB1]: I'm not sure what this is.

Figure 9. Number of black crappie caught per trap net night (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Bellwood, Texas, 2006. Vertical line represents the length limit in effect at the time of survey.

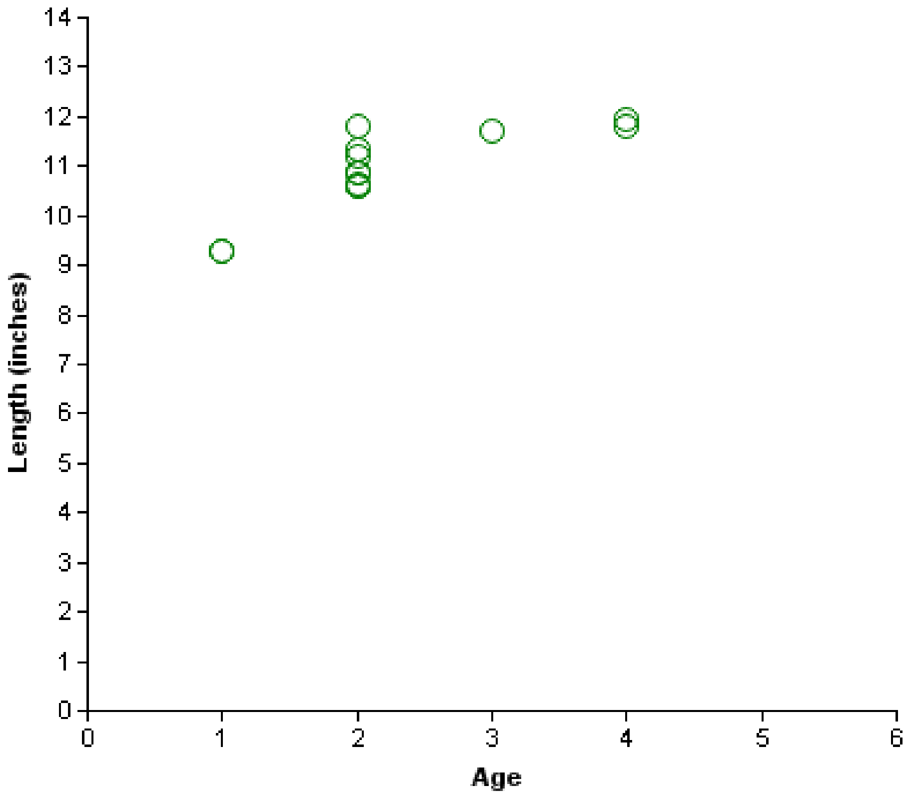


Figure 10. Length at age for white crappie collected from trap nets at Lake Bellwood, Texas, November 2006.

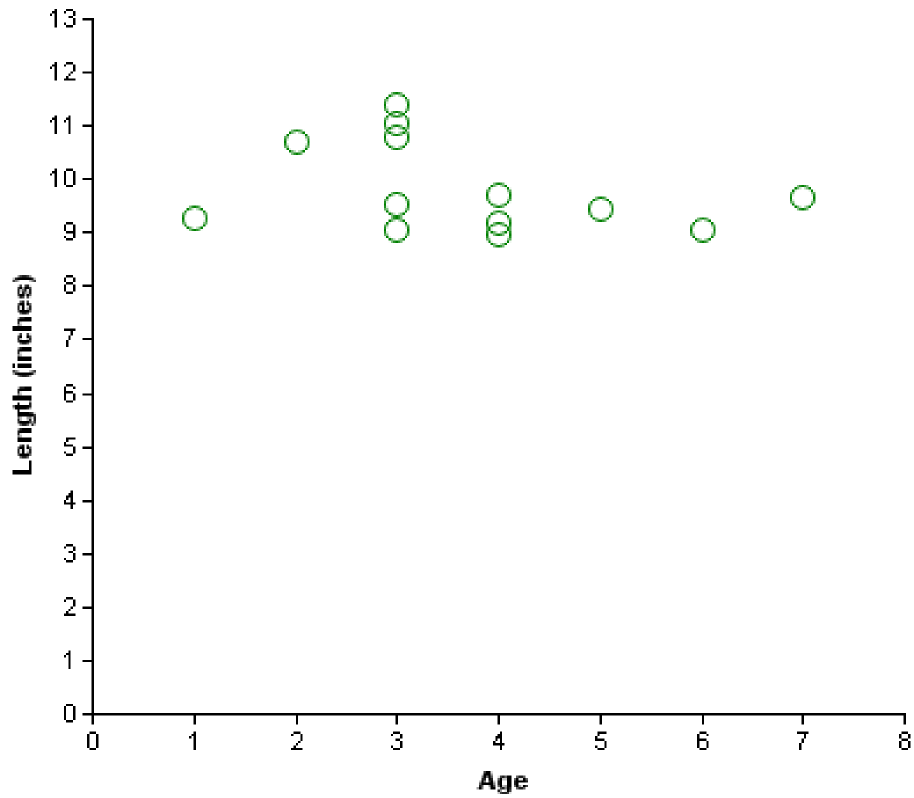


Figure 11. Length-at-age for black crappie collected from trap nets at Lake Bellwood, Texas, November 2006.

Table 6. Proposed sampling schedule for Lake Bellwood, 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[a]	Electrofisher	Trap net	Gill net	Habitat	Report
2008	A			A	
2009				A	
2010				A	
2011				A	

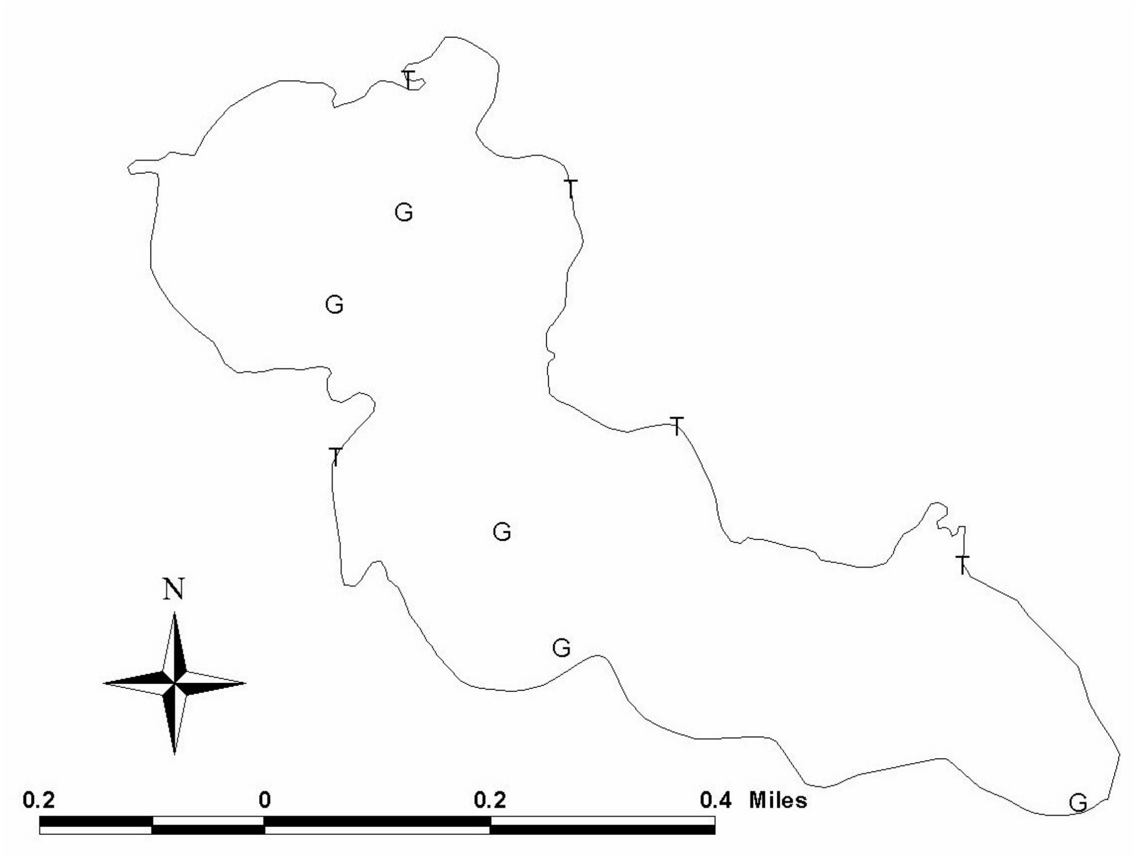
[a] Lake Bellwood is not on the standard survey schedule and the 2007 report is a substitution for the scheduled reservoir (Halbert) which was not surveyed due to water level.

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Bellwood, Texas, 2006-2007.

Species	Gill netting		Trap netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					39	39.0
Threadfin shad					111	111.0
Channel catfish	5	1.0				
Warmouth					8	8.0
Bluegill					682	682.0
Longear sunfish					4	4.0
Redear sunfish					214	214.0
Largemouth bass					112	112.0
White crappie			58	11.6		
Black crappie			49	9.8		

APPENDIX B



Location of sampling sites, Lake Bellwood, Texas, 2006-2007. Trap net and gill net stations are indicated by T and G, respectively. Electrofishing stations were biologist selected and included most of the shoreline.