PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-33

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2007 Survey Report

H-4 Reservoir

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SURVEY AND MANAGEMENT SUMMARY

H-4 Reservoir was surveyed in the fall 2007 using trap nets and electrofishing and in the spring 2008 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:** H-4 is a 696-acre reservoir on the Guadalupe River in Gonzales County and is controlled by the Guadalupe-Blanco River Authority (GBRA). The reservoir was impounded in 1931 to provide water for a hydroelectric plant and recreational uses. The substrate is composed primarily of silt, sand, clay, and some gravel and rock. Angler and boat access was limited to only one pay-to-use boat ramp. There were no handicap specific facilities. At the time of sampling, the habitat was composed of boat docks, stumps, floating-leaved vegetation, limited submersed and emergent vegetation, and water hyacinth.

- **Management history:** Important sport fish species include channel catfish, largemouth bass, and crappie. Anglers have reported catching white, palmetto and striped bass from this reservoir but these species were not collected in gill net surveys. Palmetto and striped bass migrate downstream from a stocked upstream reservoir (Canyon Lake). Flathead catfish were present in the reservoir and blue catfish have been stocked in this reservoir but have yet to become the dominant catfish species as seen in other reservoirs throughout Texas. The 2004 management plan focused on working with GBRA on constructing a new boat ramp and increasing bank access and monitoring nuisance aquatic vegetation. The GBRA does not own enough land surrounding the reservoir to construct a new boat ramp and increase bank access. The GBRA contracted a certified commercial applicator to conduct herbicide treatments, specifically for water hyacinth, since the last report. Beginning in 2007 GBRA and TPWD started working cooperatively towards a better focused control of water hyacinth. A nuisance aquatic management plan was drafted in January 2008. Hydrilla, once present in the reservoir, was last observed in 2004.

- **Fish Community**

  - **Prey species:** Gizzard shad, threadfin shad, and several sunfish species were the primary forage species available to predators. Relative abundance of gizzard shad has continuously increased since 2003. Additionally, the percentage of gizzard shad available to most predators has also increased.

  - **Catfishes:** Blue, channel, and flathead catfish were present in the reservoir with channel catfish being the dominant species. The majority of channel catfish collected were legal-size ($\geq$ 12-inches) with several over 20-inches in total length.

  - **Black basses:** Largemouth, Guadalupe, spotted, and smallmouth bass were present in the reservoir with largemouth bass being the most abundant. Recruitment of largemouth bass appears to be limited as very few adult-sized individuals were collected. Complex habitat types such as fallen trees and submersed aquatic vegetation were insufficient to support abundant black bass populations.

  - **Crappie:** White and black crappie were present in the reservoir with white crappie being the most abundant. Poor habitat may be limiting crappie recruitment as well.

- **Management strategies:** Continue managing the fish populations under current regulations. Continue to work with GBRA on controlling water hyacinth, enhance habitat, and monitor the spread and colonization of East Indian hygrophila. Introductions of native aquatic vegetation will be explored and implemented once water hyacinth is controlled. East Indian hygrophila has become established in the boat ramp slough; however, floating fragments were found throughout the reservoir. Additional spring electrofishing surveys will be conducted to further assess largemouth bass, sunfish, and shad populations.

INTRODUCTION

This document is a summary of fisheries data collected from H-4 Reservoir in 2007-2008. 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. Management strategies are included to address existing problems or opportunities. Historical data is presented with the 2007-2008 data for comparison.

Reservoir Description

H-4 is a 696-acre mainstream reservoir on the Guadalupe River in Gonzales County and is controlled by GBRA. The reservoir was impounded in 1931 to provide water for a hydroelectric plant and recreational uses. The substrate is composed primarily of silt, sand, clay, and some gravel and rock. The reservoir is relatively shallow with the exception of the river channel. Angler and boat access was limited to one pay-to-use ramp. There were no handicap specific facilities at this ramp. Public bank access was non-existent due to private property surrounding the reservoir. Littoral habitat consisted of native aquatic vegetation (coontail, spatterdock, and American lotus), overhanging brush, piers, and boat docks. Exotic vegetation (water hyacinth, water lettuce, and East Indian hygrophila) was present in the reservoir with water hyacinth being the most abundant. The GBRA has hired a private contractor to conduct herbicide treatments for water hyacinth. Other descriptive characteristics for H-4 Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Findeisen and Walters 2004) included:

1. Work with GBRA on acquiring funds for the construction of a new public boat ramp on the reservoir and improving bank access through GBRA owned land.
   Action: District staff discussed with GBRA staff the potential for constructing a new boat ramp and improving bank access at H-4 Reservoir. GBRA owns very little land surrounding the reservoir and did not have the area needed to construct a boat ramp or substantially increase area for bank fishing.

2. Monitor nuisance aquatic vegetation, water hyacinth and water lettuce, on the reservoir and work with GBRA on controlling these nuisance aquatic species before becoming problematic.
   Action: District staff met with GBRA staff concerning these issues. The result was for TPWD to conduct vegetation surveys and GBRA to hire a contractor to conduct herbicide applications. The applications were ineffective for total control as only the boat ramp area and a few backwater areas were sprayed. Sprayed areas remained open for a short time, quickly refilling as water hyacinth moved back to these areas and resident colonies flourished. In November 2007 GBRA, in conjunction with TPWD, met with lake-front property owners and recreational users to discuss current status of water hyacinth and vegetation control. TPWD district staff met again with GBRA staff in December 2007 to discuss viable vegetation control options and potential for cost-share funding. From this meeting, TPWD created a nuisance aquatic vegetation management plan for the reservoir to begin a multi-pronged control approach. As of April 2008, GBRA was scheduled to receive a 3:1 match from the for a grand total of $52,000 to be used to control water hyacinth on this reservoir and Lake Wood. The multi-pronged approach will consist of using a mechanical shredder to shred as much water hyacinth as possible, beginning in April 2008. This will be followed shortly by herbicide treatments on the remaining plants and finally installing floating barriers/booms to prevent any remaining water hyacinth from moving back into areas that had been controlled.

Harvest regulation history: Sport fish in H-4 Reservoir are currently managed with statewide harvest regulations (Table 2).

Stocking history: No stockings have occurred since the previous report. A complete stocking history is in Table 3.

Vegetation/habitat history: H-4 Reservoir supported native emergent, native floating, native submersed, and exotic vegetation and had 2.5 miles of shoreline containing piers and boat docks (Table 4). Water hyacinth has been a problematic species for years. Prior to 1998, TPWD controlled water hyacinth on this reservoir using herbicide. After 2001, the GBRA began herbicide treatments through a contractor to only treat specific problematic sections of the reservoir. These efforts were ineffective as far as long-term control of water hyacinth. Water hyacinth weevils, *Neochetina eichorniae* and *Neochetina bruchi*, were both present but provided little control of this plant. Water lettuce, while present, has not been as problematic as water hyacinth. Water lettuce weevils, *Neohydronomous affinis*, were introduced on April 22, 1997 (N=280) and again on June 24, 1998 (N=1,400). Shortly after the 1998 release, the reservoir experienced a 100-yr flood, flushing most of the water lettuce downstream. Hydrilla, once present in the reservoir, has not been observed since the previous report.

METHODS

Fishes were collected by electrofishing (1.0 hour at 12 5-minute stations), trap nets (5 net nights at 5 stations), and gill nets (5 net nights at 5 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for trap and gill nets as the number of fish caught in one net set overnight (fish/nn). Random and fixed trap net surveys were used in 2005 to collect white crappie for and age and growth analysis. Access, littoral habitat, and aquatic vegetation surveys were conducted in August 2007. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)] and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). The Index of Vulnerability (IOV) was calculated for gizzard shad according to DiCenzo et. al. (1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Growth parameters were estimated using the von Bertalanffy growth equation utilizing non-linear least squares methodology (Haddon 2001). Mean length-at-age was described by: $L_a = L\infty\ (1\text{-}e^{-K(t-to)})$; where L_a = length-at-age, $L\infty$ = average asymptotic length, K = metabolic growth coefficient, and t_o = hypothetical age where the fish has a length of zero. White crappies were aged using otoliths.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted of overhanging brush, eroded bank, bulkhead, non-descript, and concrete along the shoreline and piers and boat docks adjacent to shoreline. Vegetation consisted of native floating vegetation (American lotus and spatterdock), native emergent vegetation (bulrush, cattail, and water willow), native submersed vegetation (coontail) and exotic (water hyacinth, water lettuce, and East Indian hygrophila (Table 4). Rooted stands of East Indian hygrophila were noted during the August 2007 habitat/vegetation survey and January 2008 vegetation survey. Floating East Indian hygrophila had been observed during previous fisheries surveys but no rooted stands were observed until 2007. In 2007 and 2008, East Indian hygrophila was only located in the boat ramp creek. This species does not appear to be problematic at this time. Fish habitat in this reservoir is limited to stands of native floating-leaved vegetation, providing insufficient habitat for supporting abundant centrachid populations. Native submersed vegetation and fallen timber are lacking in this reservoir and could explain the low recruitment of centrarchid species.

Prey species: The 2007 electrofishing catch rate of gizzard shad and threadfin shad was 106.0/hr and 23.0/h, respectively. The gizzard shad catch rate and Index of Vulnerability (IOV) increased from previous years (Figure 1). The IOV for gizzard shad was 63, indicating 63% of the gizzard shad collected were less than eight inches in length and available to most predators.

The 2007 electrofishing catch rate for bluegill and redear sunfish were 88.0/hr and 35.0/hr, respectively. The bluegill catch rate decreased substantially from 2003 (213.0/h) but was higher than in 2005 (68.0/h) (Figure 2). Bluegill size structure was dominated by sizes available to most predators. Redear sunfish catch rates fluctuated slightly between 2003 and 2007 (Figure 3). Redear sunfish size structure indicated that most fish were available to predators. Poor habitat may explain the decreased catch rates and recruitment to larger size classes once present in this reservoir.

Channel catfish: The 2008 gill net catch rate of channel catfish was 9.6/nn, substantially lower than in 2004 (30.8/nn) but higher than in 1999 (3.2/nn) (Figure 4). The 2004 size structure for channel catfish was dominated by smaller sized fish (PSD=12) while the 2008 size structure was dominated by larger size classes (PSD=73), indicating good recruitment. Channel catfish of stock size and greater exhibited good condition, as mean relative weights were generally at or over 100.

Largemouth bass: The 2007 electrofishing catch rate of largemouth bass was 13.0/hr, lower than 2003 (29.0/h) and 2005 (22.0/h) (Figure 5). Very few fish of stock size or greater have been collected since 2003, indicating poor survival and recruitment. Poor habitat was probably contributing to low survival and poor recruitment. Mean relative weights of the few fish collected, greater than stock size, were below average.

White crappie: The 2007 trap net catch rate for white crappie was 4.8/nn, lower than in both 2003 (11.3/nn) and 2005 (7.2/nn) (Figure 6). Location of trap nets during the 2007 survey may explain some of the decrease in catch rate, as four of the five sample sites were deep water sets in the river channel that historically has not yielded good crappie catch rates. The one net set on a shallow flat caught 71% (N=17) of the crappie collected during the 2007 survey. Mean relative weights of crappie greater than 10 inches declined as size increased. Based on von Bertalanffy growth model, white crappie in H-4 reached the 10-inch minimum size limit by age-2 in 2005 (Figure 7), where $L\infty = 367$ and $K = 0.44$.

Fisheries management plan for H-4 Reservoir, Texas.

Prepared – July 2008

ISSUE 1: Water hyacinth has been a problematic species on this reservoir for many years. Post 2001 control efforts have been limited to certain areas of the reservoir rather than control throughout the reservoir. Until April 2008, sufficient funds necessary for complete control were not available, however, GBRA is scheduled to receive a 3:1 cost-share funding to be used for the control of water hyacinth in 2008.

MANAGEMENT STRATEGIES

1. Continue to work with GBRA to meet the goals of the nuisance aquatic management plan.
2. Conduct an annual post-treatment water hyacinth survey in September.
3. Meet with all involved parties every year to discuss results of treatment efforts.
4. Construct and implement a new nuisance aquatic vegetation management plan for the next year.
5. Continue to assist GBRA in acquiring cost-share funding.

ISSUE 2: Water lettuce and East Indian hygrophila while currently not problematic exotic species in this reservoir, will have the potential to create problems once the water hyacinth is controlled.

MANAGEMENT STRATEGIES

1. Monitor water lettuce and East Indian hygrophila
2. Work with GBRA if treatment becomes necessary

ISSUE 3: Results from the standard fall electrofishing surveys suggest poor recruitment and survival may be issues concerning largemouth bass and sunfish populations however, sample sizes are too small to make valid conclusions. Additional electrofishing surveys conducted earlier in the year may provide better insight into the population dynamics of recruitment and survival.

MANAGEMENT STRATEGIES

1. Conduct spring electrofishing surveys at randomly selected sites in the same year as the standard,fall electrofishing surveys.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes routine electrofishing and trap netting in the fall 2009, additional spring electrofishing surveys in spring 2009 and 2011, and mandatory monitoring in 2010/2011 (Table 6). Routine electrofishing and trap net surveys are necessary to monitor largemouth bass, sunfish, shad, and crappie. Additional spring electrofishing surveys in 2009 and 2011 are necessary to provide additional data for largemouth bass, sunfish, and shad. Gill net surveys are only necessary once every four years at this point to ensure presence or absence of catfish species. A Federal Aid report will be prepared in 2012.

LITERATURE CITED

Anderson, R. O., and R. M. Neumann, 1996. Length, weight, and associated indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, second edition. American Fisheries Society, Bethesda, Maryland.

DiCenzo, V.J., M.J. Maceina, and M.R.Stimpert. 1996. Relationships between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Findeisen, J. A. and A. Walters. 2004. Statewide freshwater fisheries monitoring and management program survey report for: H-4 Reservoir, 2003. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Haddon, M. 2001. Modeling and quantitative methods in fisheries. Chapman and Hall, New York.

Table 1. Characteristics of H-4 Reservoir, Texas.

Characteristic	Description
Year constructed	1931
Controlling authority	Guadalupe-Blanco River Authority
County	Gonzales
Reservoir type	Mainstream
Shoreline Development Index	2.91
Conductivity	
Access: Boat	Adequate – one pay-to-use ramp
Bank	Inadequate – no public bank access
Handicapped	Inadequate – no handicapped access

Table 2. Harvest regulations for H-4 Reservoir, Texas.

Species	Bag Limit (per person)	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	5	18 – No Limit
Bass, palmetto	5	18 – No Limit
Bass, smallmouth	5	14 – No Limit
Bass, largemouth	5	14 – No Limit
Bass, spotted and Guadalupe	5 (in any combination)	No Limit – No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 – No Limit

Table 3. Stocking history of H-4 Reservoir, Texas. Sizes categories are: FGL = 1-3 inches and ADL = adult (sexually mature fish).

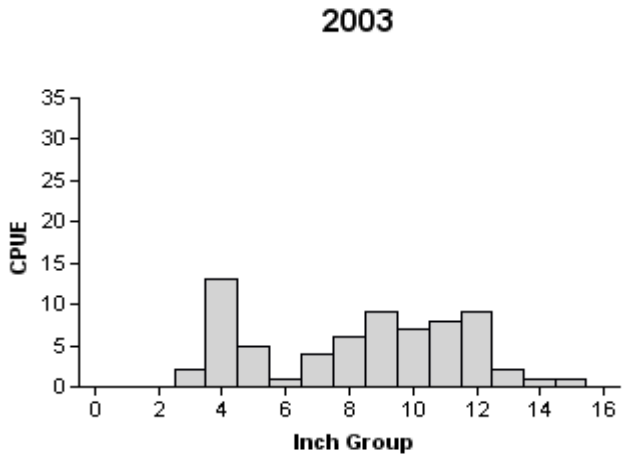
Year	Number	Size
Blue catfish		
1985	7,040	FGL
1986	7,000	FGL
1988	16	ADL
1994	114,199	FGL
1995	69,602	FGL
1997	69,600	FGL
Species Total	267,457	
Channel catfish		
1972	53,000	FGL
1991	77	ADL
Species Total	53,077	
Striped bass		
1978	6,650	FGL
Species Total	6,650	
Florida largemouth bass		
1978	27,900	FGL
1990	69,754	FGL
1991	69,722	FGL
Species Total	167,376	
Triploid grass carp*		
1995	25	ADL
1996**	5	ADL
1996**	6	ADL
Species Total	36	

* Radio-tagged fish
** Replace dead radio-tagged fish

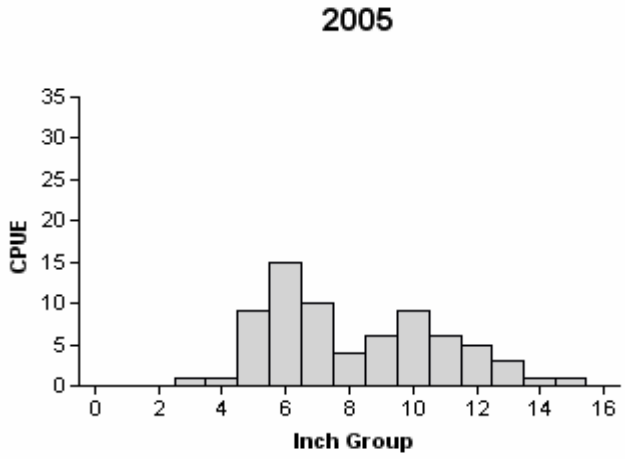
Table 4. Survey of littoral zone and physical habitat types, H-4 Reservoir, Texas, 2007. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area and percent of reservoir surface acre were determined for each type of aquatic vegetation found. Surface area estimates are based on the acreage of water containing a specific vegetation type not the total acreage of vegetation.

Habitat type	Shoreline Distance		Surface Area of Water with Vegetation	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Shoreline habitat				
Overhanging brush	17.2	69.8		
Eroded bank	6.1	24.7		
Bulkhead	0.8	3.4		
Non-descript	0.3	1.4		
Concrete	0.2	0.7		
Total	24.6	100		
Vegetation				
Native floating vegetation			76.8	11.0
American lotus			1.1	0.2
Spatterdock			75.7	10.8
Native submerged vegetation			0.8	0.1
Coontail			0.8	0.1
Native emergent vegetation			1.8	0.3
Bulrush			0.8	0.1
Cattail			0.5	0.1
Water willow			0.6	0.1
Exotic vegetation			85.3	12.3
Water hyacinth			70.7	10.2
Water lettuce			14.0	2.0
East Indian hygrophila			0.6	0.1
Adjacent to shoreline				
Piers and Boat docks	2.5	10.1		

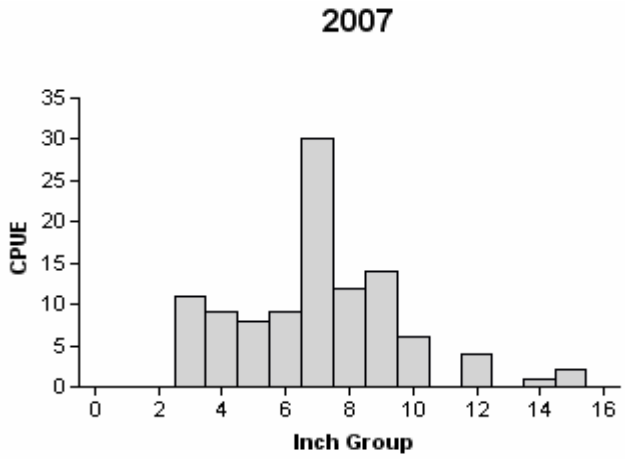
Gizzard shad



Effort = 1.0
Total CPUE = 68.0 (29; 68)
IOV = 36 (15)



Effort = 1.0
Total CPUE = 71.0 (36; 71)
IOV = 50 (7)



Effort = 1.0
Total CPUE = 106.0 (39; 106)
IOV = 63 (10)

Figure 1. Comparison of the 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, H-4 Reservoir, Texas, 2003, 2005, and 2007.

Bluegill

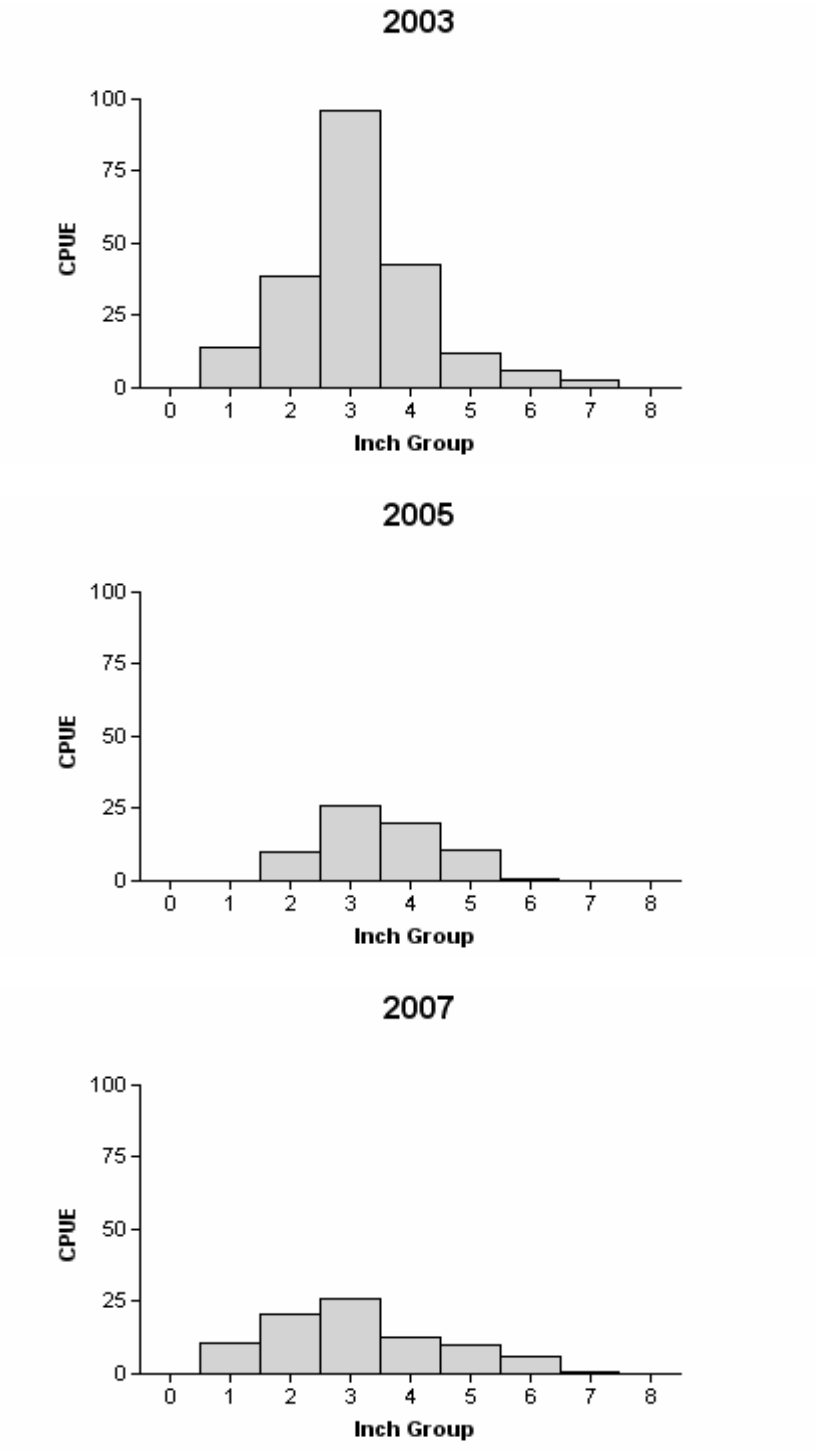
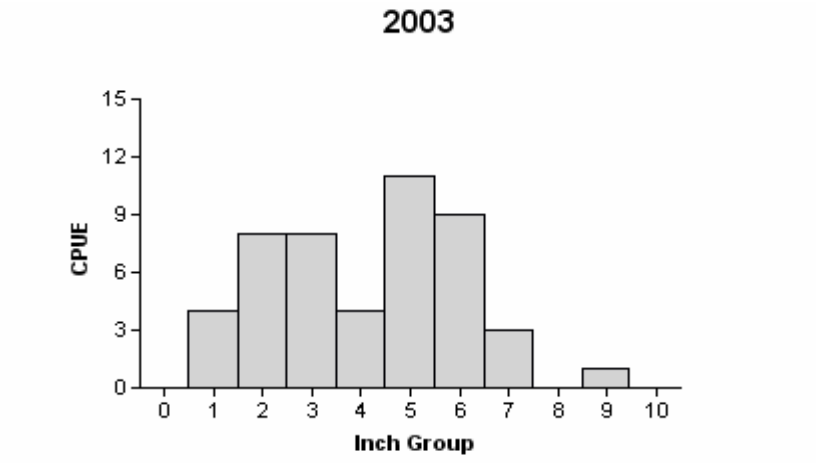


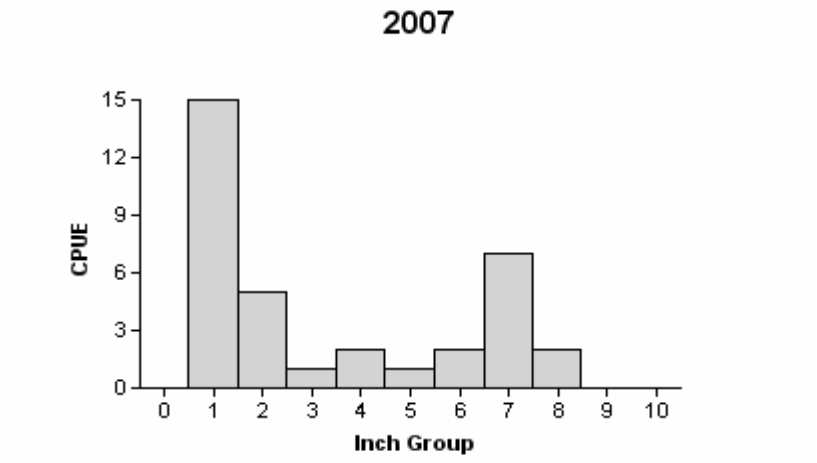
Figure 2. Comparison of the number of bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, H-4, Reservoir, Texas, 2003, 2005, and 2007.

Redear sunfish



Effort = 1.0
Total CPUE = 48.0 (27; 48)
PSD = 14 (6)

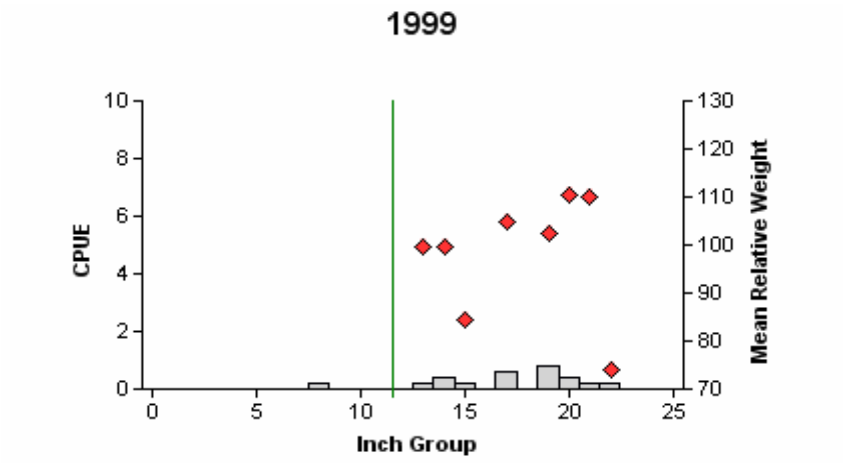
Effort = 1.0
Total CPUE = 31.0 (24; 31)
PSD = 7 (6)



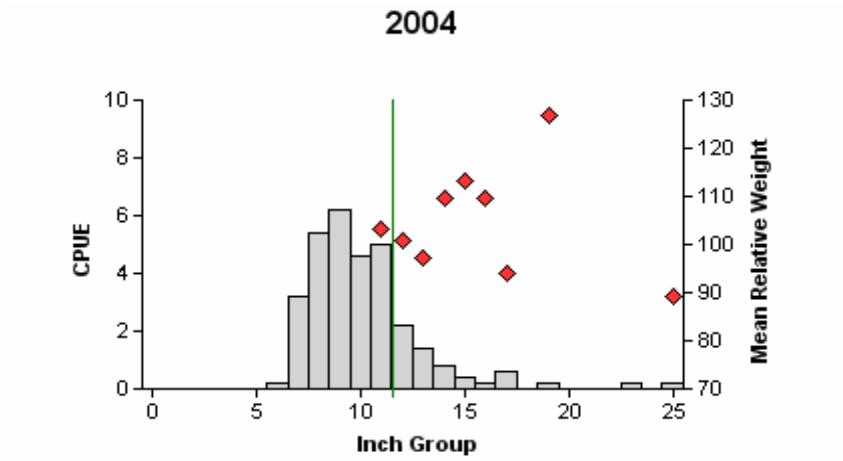
Effort = 1.0
Total CPUE = 35.0 (34; 35)
PSD = 64 (12)

Figure 3. Comparison of the number of redear sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, H-4 Reservoir, Texas, 2003, 2005, and 2007.

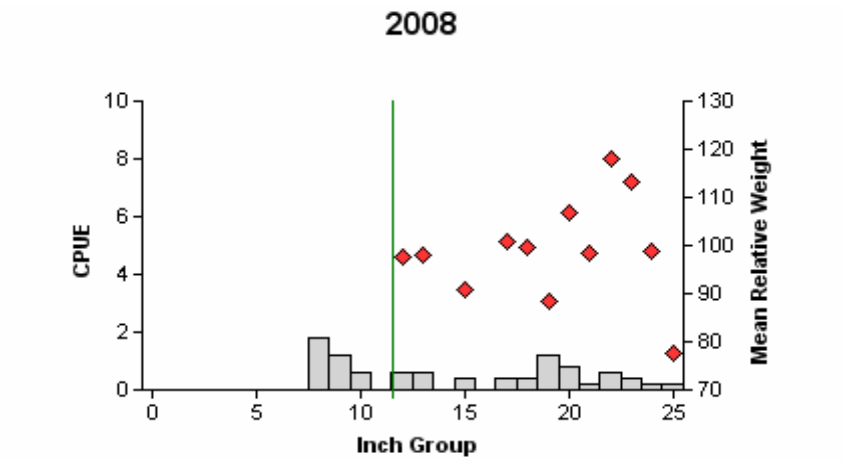
Channel catfish



Effort = 5.0
Total CPUE = 3.2 (30; 16)
Stock CPUE = 3.0 (30; 15)
PSD = 73 (16)



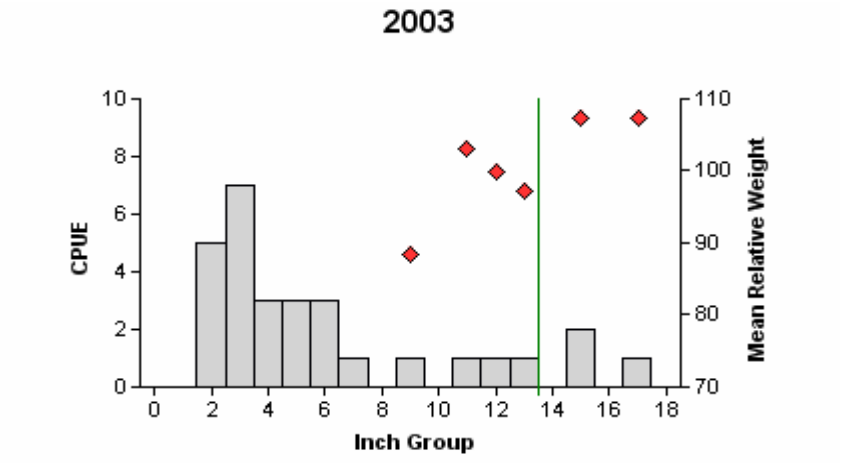
Effort = 5.0
Total CPUE = 30.8 (55; 154)
Stock CPUE = 6.2 (45;31)
PSD = 12 (5)



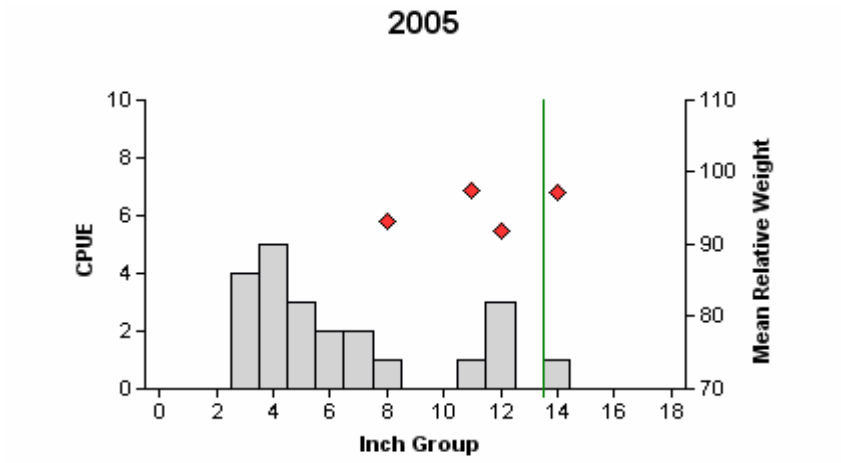
Effort = 5.0
Total CPUE = 9.6 (44; 48)
Stock CPUE = 6.0 (30; 30)
PSD = 73 (19)

Figure 4. Comparison of the 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, H-4 Reservoir, Texas, 1999, 2004, and 2008. Vertical lines denote 12-inch minimum length limit.

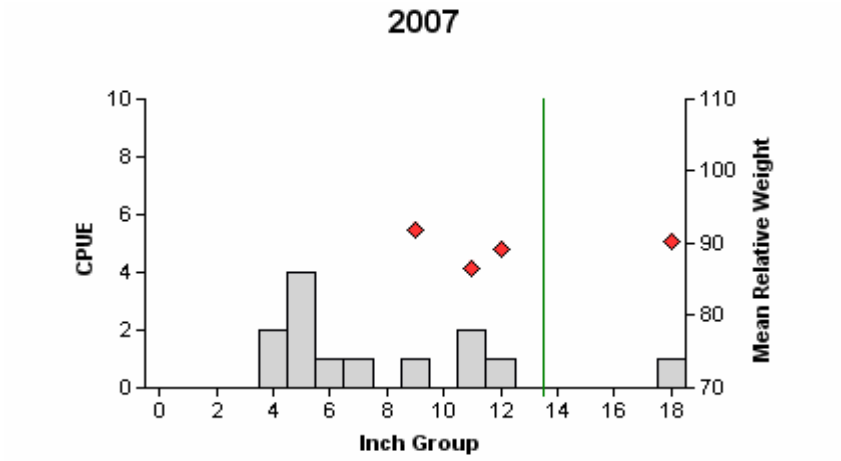
Largemouth bass



Effort = 1.0
Total CPUE = 29.0 (26; 29)
Stock CPUE = 7.0 (25; 7)
PSD = 71 (18)



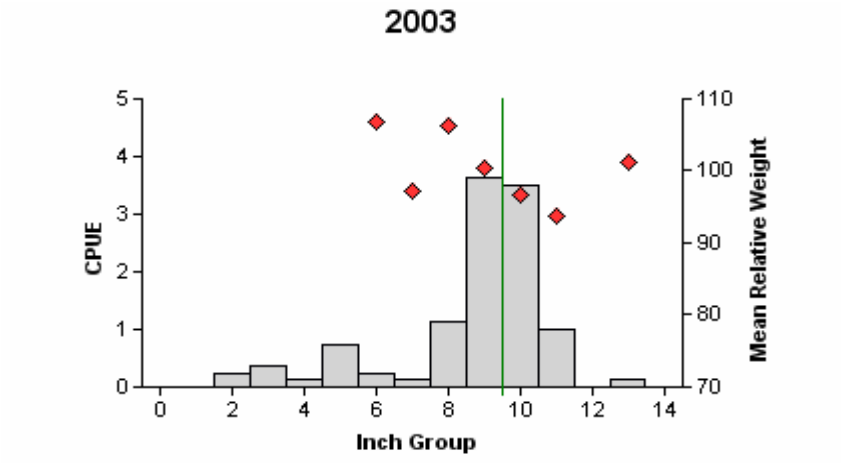
Effort = 1.0
Total CPUE = 22.0 (32; 22)
Stock CPUE = 6.0 (39; 6)
PSD = 67 (16)



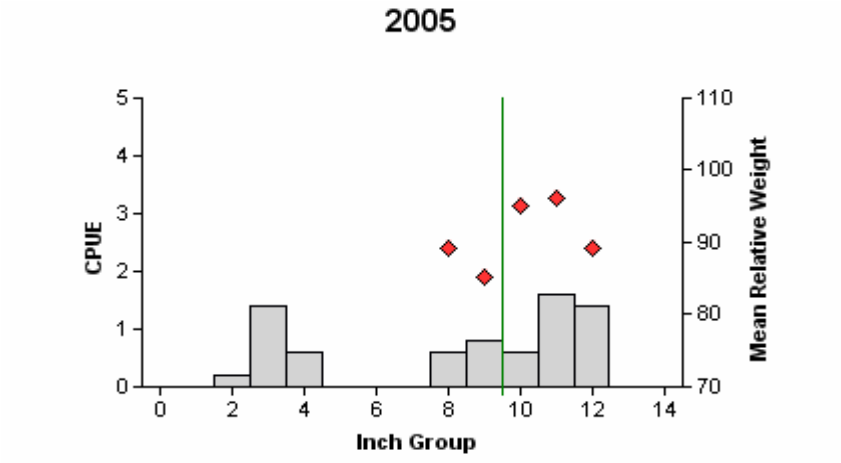
Effort = 1.0
Total CPUE = 13.0 (42; 13)
Stock CPUE = 5.0 (62; 5)
PSD = 40 (21)

Figure 5. Comparison of the 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, H-4 Reservoir, Texas, 2003, 2005, and 2007. Vertical lines denote 14-inch minimum length limit.

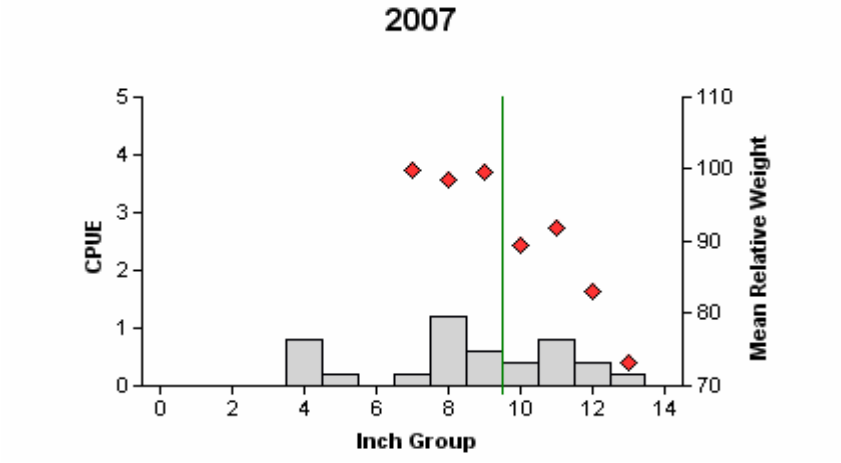
White crappie



Effort = 8.0
Total CPUE = 11.3 (78; 90)
Stock CPUE = 10.5 (77; 84)
PSD = 89 (3)



Effort = 5.0
Total CPUE = 7.2 (64; 36)
Stock CPUE = 5.0 (68; 25)
PSD = 100 (0)



Effort = 5.0
Total CPUE = 4.8 (63; 24)
Stock CPUE = 4.0 (57; 20)
PSD = 90 (5)

Figure 6. Comparison of the number of white crappie 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 fall trap net surveys, H-4 Reservoir, Texas, 2003, 2005, and 2007. Vertical lines denote 10-inch minimum length limit.

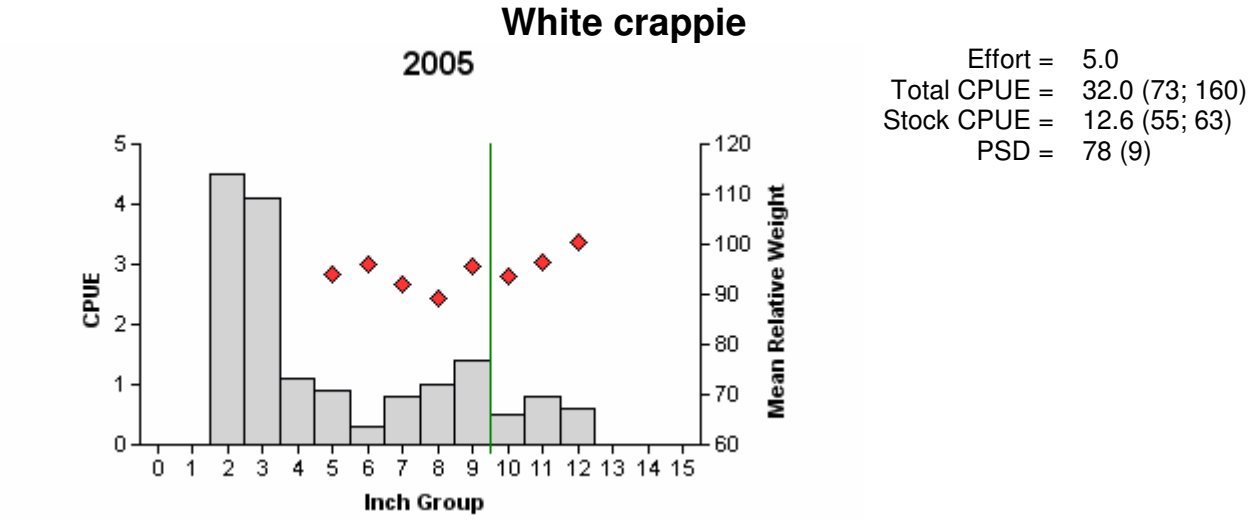


Figure 7. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net survey at biologist selected sites, H-4 Reservoir, Texas, 2005. Vertical line denotes 10-inch minimum length limit.

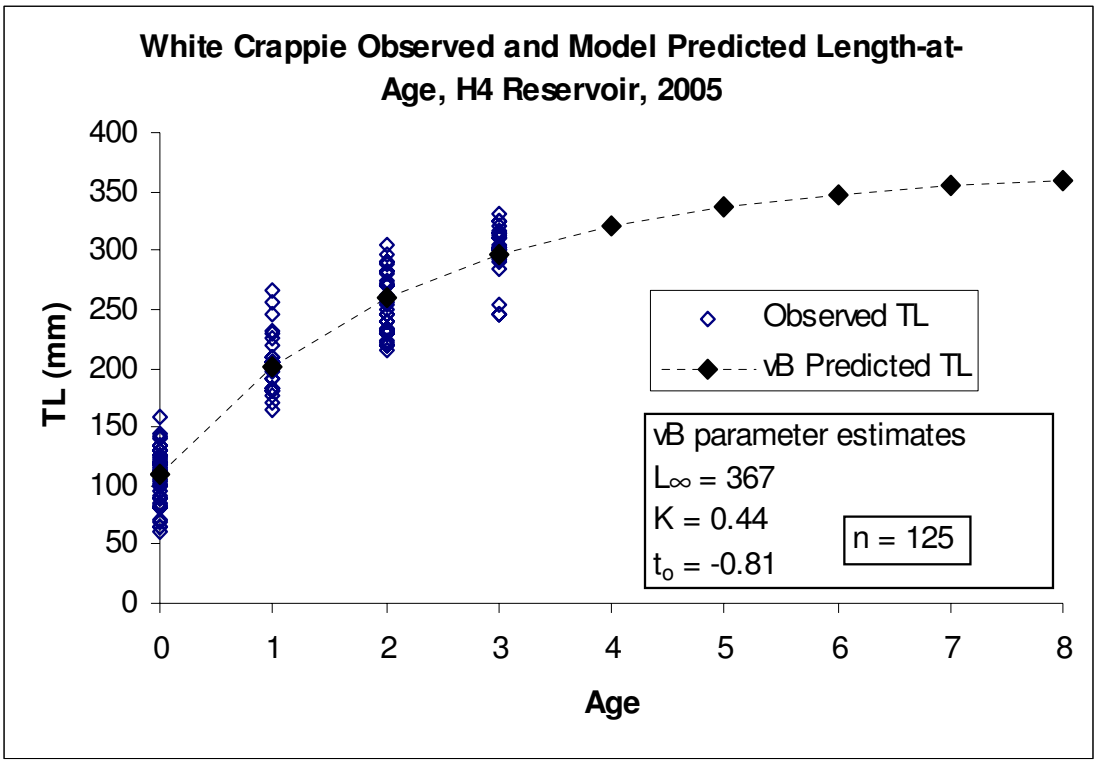


Figure 8. Observed and model predicted length-at-age from von Bertalanffy growth model, H-4 Reservoir, Texas, 2005. Growth model was generated with fish sampled from both random and fixed sample sites.

Table 5. Proposed survey schedule for H-4 Reservoir, Texas. Trap net and electrofishing surveys are conducted in the fall and the gill net survey is conducted in the spring. Standard surveys are denoted by S and A* denotes additional surveys conducted in the spring.

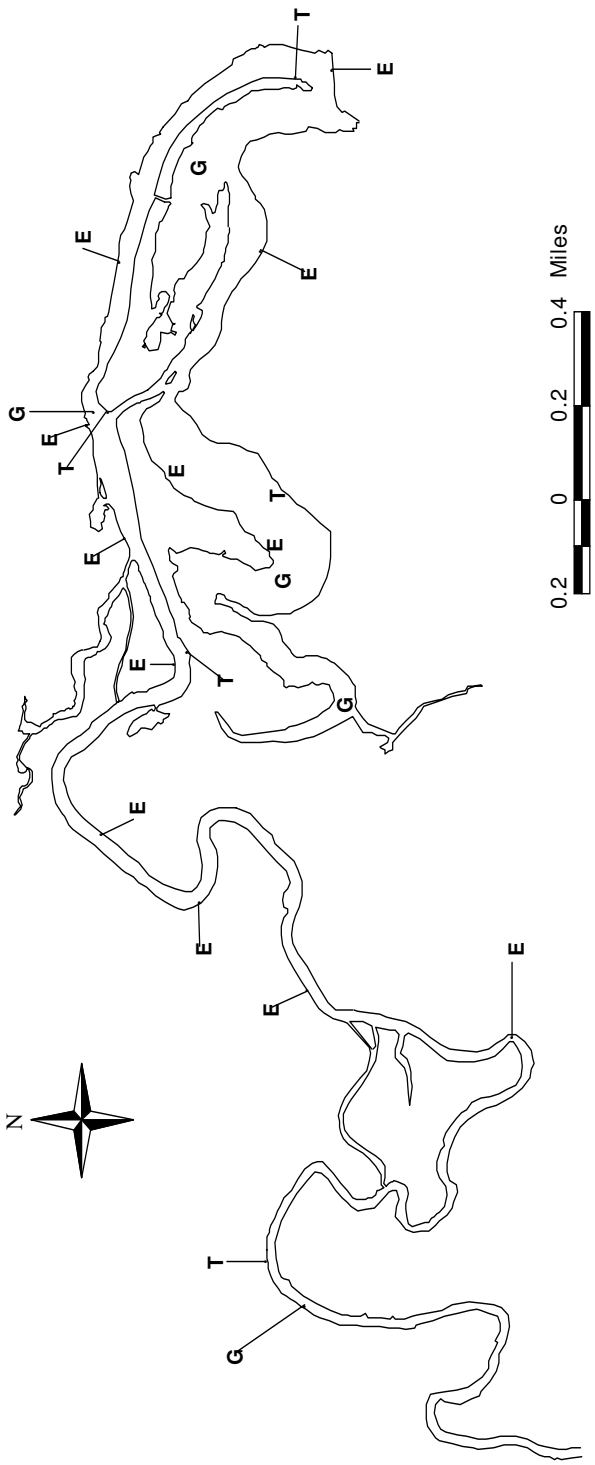
Survey Year	Electrofishing	Trap Netting	Gill Netting	Report
Fall 2008-Spring 2009	A*			
Fall 2009-Spring 2010	S	S		
Fall 2010-Spring 2011	A*			
Fall 2011-Spring 2012	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from H-4 Reservoir, Texas, 2007-2008.

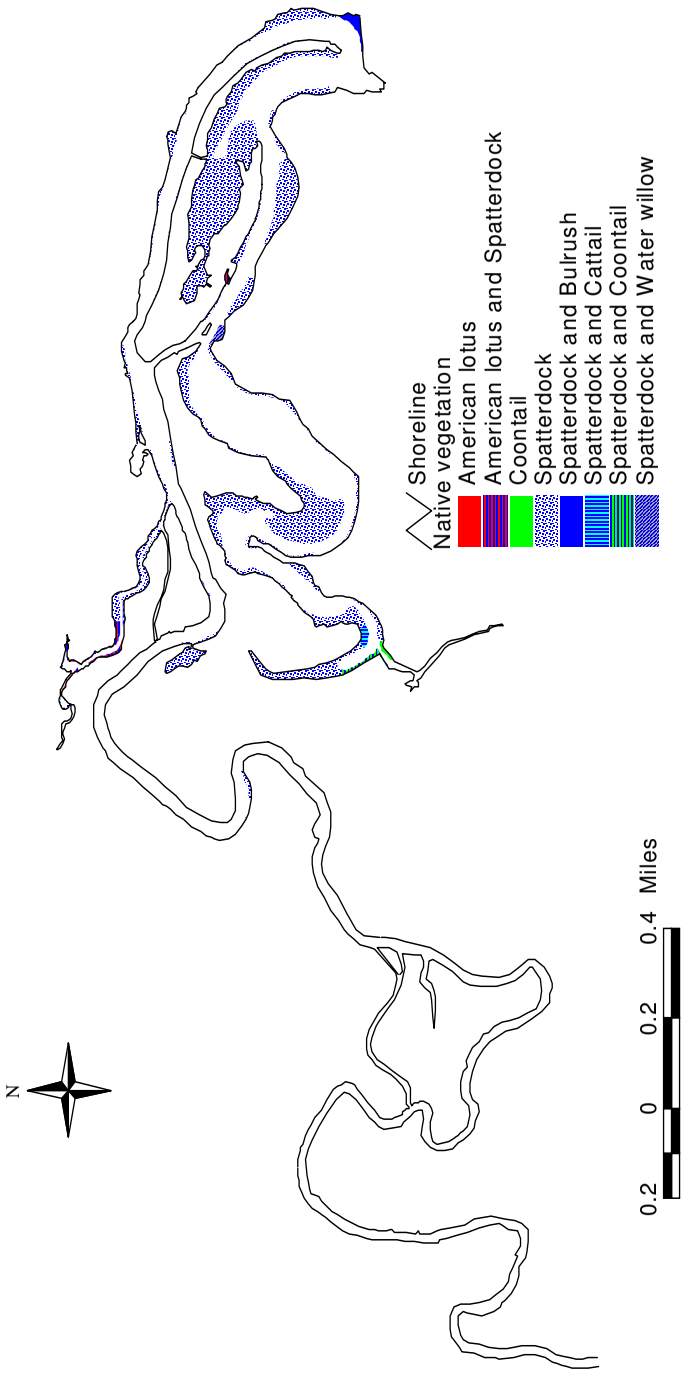
	Electrofishing		Trap Netting		Gill netting	
Species	N	CPUE	N	CPUE	N	CPUE
Spotted gar					1	0.2
Longnose gar					3	0.6
Gizzard shad	106	106.0			182	36.4
Threadfin shad	23	23.0				
Golden shiner					1	0.2
Bullhead minnow	13	13.0				
Inland silverside	1	1.0				
Smallmouth buffalo					46	9.2
Blue catfish					1	0.2
Channel catfish					48	9.6
Flathead catfish					1	0.2
Mexican tetra	12	12.0				
Redbreast sunfish	2	2.0				
Green sunfish	1	1.0				
Warmouth	8	8.0				
Bluegill	88	88.0	11	2.2	2	0.4
Longear sunfish	25	25.0	6	1.2	1	0.2
Redear sunfish	35	35.0			2	0.4
Spotted bass	1	1.0				
Largemouth bass	13	13.0			6	1.2
Guadalupe bass	2	2.0				
White crappie	4	4.0	24	4.8	14	2.8
Rio Grande cichlid	4	4.0			1	0.2
Blue tilapia	2	2.0			1	0.2
Grass carp					1	0.2

APPENDIX B



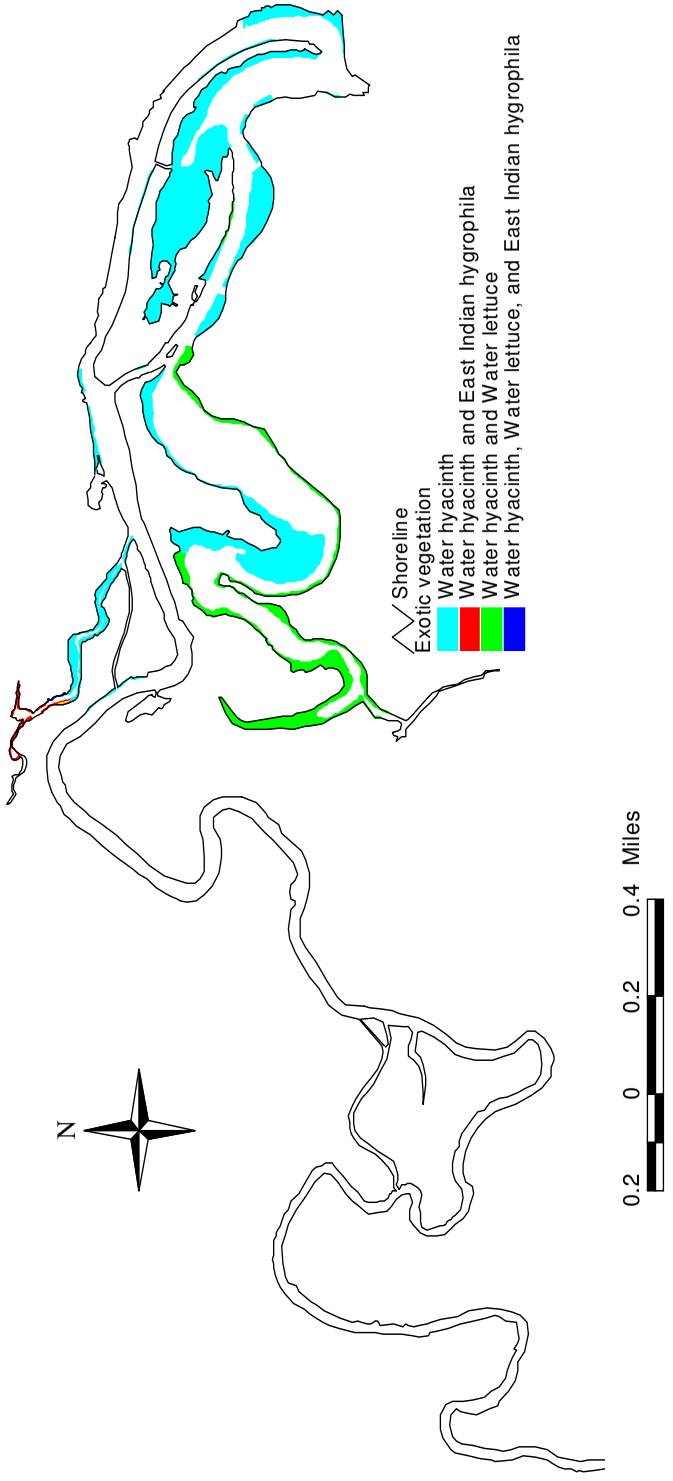
Location of sampling sites, H-4 Reservoir, Texas, 2007-2008. Electrofishing, trap net, and gill net stations are indicated by E, T, and G respectively.

APPENDIX C



Native aquatic vegetation map for H-4 Reservoir, Texas, 2007.

APPENDIX D



Exotic vegetation map for H-4 Reservoir, Texas, 2007.