

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-2

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2011 Survey Report

Lake Hawkins

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Hawkins were surveyed in 2011 using electrofishing and in 2012 using gill netting. Aquatic vegetation, habitat, and access surveys were conducted during August 2011. Additional vegetation surveys were conducted in May and June 2011 to monitor an increase in the hydrilla coverage. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Lake Hawkins is a 634-acre impoundment located in Wood County, Texas, on Little Sandy Creek, a tributary of the Sabine River. The reservoir was constructed by Wood County for flood control and recreation. Habitat consists primarily of native submerged and emergent aquatic vegetation. Hydrilla and Eurasian watermilfoil are also present in the reservoir. Standing timber is present but is concentrated in the northern portion of the lake.
- **Management history:** Largemouth bass is the most important sport fish. The management plan from the 2007 survey report recommended conducting electrofishing sampling every two years and monitoring the genetics of the Florida largemouth bass population using fin clips from a sample of largemouth bass collected during fall electrofishing. Periodic vegetation surveys were scheduled to monitor hydrilla in the lake and the controlling authority stocked 200 additional triploid grass carp in November 2011 in response to the increase in abundance and distribution of hydrilla.
- **Fish community**
 - **Prey species:** Historically, clupeids have been low in abundance in Lake Hawkins due to low primary productivity. Electrofishing catch of gizzard shad was low, and only large individuals were collected. Threadfin shad were also collected. The predominant prey species in the reservoir are sunfishes, including bluegill, redear sunfish, redbreast sunfish and other less abundant species. Electrofishing catch of bluegill was good, but few bluegill measured over 6 inches. Larger redbreast sunfish and redear sunfish (≥ 7 inches) were present and provided additional fisheries resources.
 - **Catfishes:** No catfish were sampled in the reservoir during the spring 2011 gill net survey. Although channel catfish were stocked as recently as 1992, few fish have been collected in population sampling.
 - **Largemouth bass:** Electrofishing catch rate of largemouth bass in 2011 (88.0/h) was higher than in the previous two surveys (2007, 64/h; 2009, 68/h). Catch rates were influenced by high water clarity and abundant aquatic vegetation. Relative weights of bass were high with most inch classes averaging 90 to 100. Few individuals of legal-size (≥ 14 inches) were collected.
 - **Crappies:** Black crappie have historically occurred in low abundance. Optional fall trap netting was not conducted during 2011 because sampling with this gear has traditionally collected few fish.

Management strategies: Conduct annual vegetation surveys in spring and fall to monitor hydrilla coverage and make management recommendations based on survey findings. Continue with standard monitoring using electrofishing, gill netting, and access surveys in 2015-2016 along with largemouth bass-only electrofishing in 2013. A roving creel survey is planned for March through May 2016.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Hawkins from June 2011 through May 2012. 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 and 2012 data for comparison.

Reservoir Description

Lake Hawkins is a 634-acre impoundment constructed in 1962 on Little Sandy Creek, a tributary of the Sabine River. The reservoir is located in Wood County approximately 18 miles north of Tyler, Texas, and is operated and controlled by Wood County. Primary water uses included flood control and recreation. Habitat at the time of sampling consisted of natural shoreline with extensive cover provided by native submerged and emergent aquatic vegetation. Boat docks and standing timber also provided available habitat for fish. Boat access consisted of four public boat ramps. Bank fishing access was excellent and could be found near all public boat ramps, the RV park, and along much of the shoreline. Other descriptive characteristics for Lake Hawkins are in Table 1.

Management History

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

1. Monitor hydrilla coverage.
 - Action:** Conduct vegetation surveys as appropriate. Comprehensive vegetation and habitat surveys were conducted in August 2011. The controlling authority, Wood County, submitted a stocking request for 300 triploid grass carp and stocked 200 in November 2011 in response to increases in distribution and abundance of hydrilla. The Wood County Precinct 2 commissioner and the Lake Hawkins Association of Property Owners were informed of the hydrilla status via a public meeting in August 2011.
2. Monitor the largemouth bass population and enhance population genetics through the stocking of FLMB, if justifiable.
 - Action:** Lake Hawkins was sampled using electrofishing in fall 2009 and 2011. Fin clips were taken from a sample of largemouth bass collected in fall 2011 and subjected to genetic analysis. Florida largemouth bass fingerlings were stocked (N = 20,800, 32.8/acre) in 2010 following a donation from Tyler Fish Farms.
3. Promote the fisheries potential for crappie, catfish, and chain pickerel in Lake Hawkins whenever appropriate.
 - Action:** Initial contact was made with an outdoor writer regarding Lake Hawkins' alternative fisheries, but the project was never developed into an article.

Harvest regulation history: Sport fishes in Lake Hawkins are currently managed with statewide regulations (Table 2).

Stocking history: Florida largemouth bass (FLMB) were initially introduced in 1975 and stocked again in 1990. In 2010, a private hatchery donated 20,800 FLMB which were stocked by District staff. Blue catfish were stocked in 1982, but the population did not develop as no blue catfish have been sampled during

the past three decades. Channel catfish were introduced in 1967 and three more times thereafter, but are rarely collected. Smallmouth bass were stocked five times between 1987 and 1991, but none have been collected. Triploid grass carp were stocked by Wood County in 2006 and 2011 as a part of a management plan to help control hydrilla. The complete stocking history is in Table 3.

Vegetation/habitat history: Lake Hawkins has historically harbored a rich diversity of native aquatic plants (Appendix C). In 2007, 215 acres of aquatic vegetation representing 33.9% of the reservoir's surface area was documented. Hydrilla in Lake Hawkins reached a peak in December 2006 at 479 acres (Storey and Jubar 2008). To reduce hydrilla coverage, the controlling authority stocked 1,000 triploid grass carp in May 2006 and applied Sonar herbicide in spring 2007.

Water transfer: Lake Hawkins is primarily used for recreation and flood control. There are no pump stations on the reservoir.

METHODS

Fishes were collected by electrofishing in fall 2009 and 2011 (1 hour at 12, 5-min stations) and gill netting (5 net nights at 5 stations) in spring 2012. 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 nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected. Aquatic vegetation, littoral habitat, and access surveys were conducted in August 2011. Shoreline distances and areas of vegetation were estimated using ArcView GIS software. All surveys were conducted according to the Fishery Assessment Procedures (Texas Parks and Wildlife Department (TPWD), Inland Fisheries Division, unpublished manual revised 2011).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and 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 ($RSE = 100 \times SE$ of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV.

Ages were determined from otoliths of largemouth bass collected by electrofishing ($N = 9$). A sample of 27 largemouth bass were collected by electrofishing in fall 2011 and subjected to genetic analysis using DNA microsatellite techniques in accordance with Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

RESULTS AND DISCUSSION

Vegetation/habitat: A comprehensive vegetation survey conducted in August 2011 showed an aquatic plant community dominated by native submerged (199.8 acres) and native emergent species (23.5 acres) which accounted for 39.2% of the reservoir surface area (Table 4). Hydrilla was the most abundant invasive species occupying 25.4 acres. Eurasian watermilfoil was found in trace amounts. The history of hydrilla in Lake Hawkins from 2005 through 2008 was described by Storey and Jubar (2008). Vegetation surveys were conducted in May and June 2011 in response to angler reports of the reappearance of hydrilla. An additional stocking of 200 triploid grass carp was conducted in November 2011 by the controlling authority based on a recommendation by the District office. Total coverage of aquatic vegetation in 2011 was similar to the 2007 level of 215.0 acres (Storey and Jubar 2008), but the hydrilla has been replaced by native submerged species. A habitat survey conducted in 2011 revealed a shoreline dominated by natural shoreline (55%) bordered by native aquatic species (71% emergent and 92% submerged). Boat docks were observed on 15% of the shoreline (Table 4).

Prey species: The abundance of aquatic vegetation and high water clarity in Lake Hawkins provides the right conditions for sunfish to dominate the prey base. Historically, gizzard shad catch has been low. In 2011, CPUE was 10.0/h, with fish being too large to make any significant contribution to the prey base (Figure 1). Threadfin shad were also collected (Appendix A). Total CPUE of bluegill in 2011 (247.0/h) was higher than in 2007 (159.0/h) but lower than in 2003 (369.0/h). The majority of fish collected were less than 5 inches in length, making most suitable prey for predators (Figure 2). Redear sunfish CPUE (53.0/h) (Figure 3) was traditionally lower than bluegill CPUE. The redbreast sunfish population followed a similar pattern to bluegill with the 2011 CPUE (104.0/h) being midway between 2007 and 2003 levels (Figure 4). Because of their potential to grow to larger sizes, redbreast and redear sunfish offer better recreational opportunities.

Channel catfish: No channel catfish have been collected in gill netting since 2003. Historically low catches of catfish likely result from high water clarity, extensive aquatic vegetation, and consequent predation by largemouth bass.

Largemouth bass: The electrofishing catch rate of largemouth bass was 88.0/h in 2011, higher than in 2009 (68.0/h) and 2007 (64.0/h) (Figure 5). Over 55% of the fish collected in 2011 were at or above stock size (8 inches), but only 10% were of legal size. The population has historically been dominated by fish less than 10 inches in length and in 2011 this segment of the population represented 66% of the fish collected. Body condition in fall 2011 was good (W_r ranged from 90 to 100) for all size classes of fish, indicating an ample supply of prey species. Growth of largemouth bass in Lake Hawkins was good; average age at 14 inches (mean = 13.7 inches, range = 13.1 – 14.3 inches) was 2.3 years ($N = 9$; range = 2 – 4 years). Genetic assessment of largemouth bass collected during fall 2011 indicated a FLMB allele frequency of 54.0% and 11% of the sampled fish were pure FLMB (Table 5).

Crappies: No trap net sampling was conducted in 2011. The trap net catches have historically been low which indicates a low-density population, or an inefficient sampling method caused by abundant aquatic vegetation and high water clarity or both.

Fisheries management plan for Lake Hawkins, Texas

Prepared – July 2012

ISSUE 1: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels 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 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.

Hydrilla coverage in Lake Hawkins has decreased from a peak of 479 acres in December 2006 but evidence of an increase was observed in 2011. Hydrilla continues to pose a threat to the reservoir.

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 via 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.
6. Conduct hydrilla surveys as appropriate.
7. Conduct comprehensive vegetation and habitat surveys every 4 years.
8. Make management recommendations to the controlling authority (Wood County) regarding additional triploid grass carp stockings or herbicide applications if hydrilla coverage increases.
9. Provide progress reports on the status of hydrilla to the Wood County Commissioner and the Association of Lake Hawkins Property Owners.

ISSUE 2 The largemouth bass population in Lake Hawkins received a stocking of FLMB in 2010 through a donation of 20,800 fingerlings from a private fish hatchery. The population is characterized by good body condition and is dominated by fish under the minimum length limit. In 2011, the population contained 54% FLMB alleles and 11% pure FLMB.

MANAGEMENT STRATEGIES

1. Monitor largemouth bass abundance, condition, and population size structure, by conducting electrofishing surveys every other year beginning in 2013.
2. Continue to monitor the genetics of the largemouth bass population through collection of fin samples every four years.
3. Attempt to collect bass tournament data to provide supplementary information on the quality of the largemouth bass population.
4. Conduct roving creel survey in spring 2016 (March to May) to estimate angler catch and harvest rates and angling effort of Lake Hawkins' game fish populations.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional electrofishing in 2013, and mandatory monitoring in 2015-2016 (Table 6). Gill net surveys will be discontinued because no target species have been collected in recent history. A quarterly roving creel survey will be conducted in spring 2016. Annual hydrilla surveys will continue in the near future. If coverage remains low and stable, sampling frequency will be reduced.

LITERATURE CITED

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- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson 2007. Proportional Size Distribution (PSD): A further refinement of population size structure index terminology. Fisheries 32(7):348.
- Storey, K., and A.K. Jubar. 2008. Statewide freshwater fisheries monitoring and management program survey report for Lake Hawkins, 2003. Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Performance Report, Project F-30-R-33, Job A, 21 pages.

Table 1. Characteristics of Lake Hawkins, Texas.

| Characteristic | Description |
|-----------------------------------|--------------------|
| Year constructed | 1962 |
| Controlling authority | Wood County |
| Surface area | 634 acres |
| Counties | Wood |
| Reservoir type | Tributary |
| Mean depth | 15.0 ft. |
| Maximum depth | 30.0 ft. |
| Shoreline development index (SDI) | 5.8 |
| Conductivity | 130 μ mho / cm |
| Secchi disc range | 8 – 12 ft. |

Table 2. Harvest regulations for Lake Hawkins.

| 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: largemouth | 5 | 14 - No limit |
| Crappie: white and black crappie, their hybrids and subspecies | 25 (in any combination) | 10 - No limit |

Table 3. Stocking history of Lake Hawkins, Texas. Size categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

| Species | Year | Number | Size |
|-------------------------|-------|---------|------|
| Threadfin shad | 1991 | 500 | ADL |
| | Total | 500 | |
| Tripliod grass carp | 2006 | 1,000 | ADL |
| | 2011 | 200 | ADL |
| | Total | 1,200 | |
| Blue catfish | 1982 | 56,154 | FGL |
| | Total | 56,154 | |
| Channel catfish | 1967 | 4,000 | AFGL |
| | 1981 | 54,500 | FGL |
| | 1982 | 55,000 | FGL |
| | 1992 | 8,028 | AFGL |
| | Total | 121,531 | |
| Smallmouth bass | 1987 | 21,500 | FGL |
| | 1988 | 157,300 | FRY |
| | 1989 | 1,550 | FGL |
| | 1989 | 38,476 | FGL |
| | 1991 | 3,740 | FGL |
| | Total | 222,566 | |
| Florida largemouth bass | 1975 | 55,000 | FGL |
| | 1990 | 80,546 | FGL |
| | 2010 | 20,800 | FGL |
| | Total | 156,346 | |

Table 4. Survey of littoral zone and physical habitat types, Lake Hawkins, Texas, August 2011. A linear shoreline distance (miles) was recorded for each habitat type found. The sum of shoreline distances exceeds the lake perimeter because of overlap of habitat types.

| Shoreline habitat type | Shoreline Distance | | Surface Area | |
|---|--------------------|------------------|--------------|-----------------------------------|
| | Miles | Percent of total | Acres | Percent of reservoir surface area |
| Boat docks | 2.43 | 15.0 | | |
| Flooded terrestrial | 0.48 | 3.0 | | |
| Natural shoreline | 8.88 | 54.9 | | |
| Rocky shoreline | 0.42 | 2.6 | | |
| Standing timber | 4.76 | 29.4 | | |
| Native emergent (<i>American lotus, arrowhead, cattail, maidencane, pickerelweed, pondweed, spatterdock, waterprimrose, water lily, watershield, waterwillow</i>) | 11.42 | 70.6 | 23.49 | 3.7 |
| Native submerged (<i>bladderwort, coontail, fanwort, muskgrass</i>) | 14.90 | 92.1 | 199.77 | 31.5 |
| Invasive species | 5.73 | 35.4 | | |
| Eurasian watermilfoil | | | 0.14 | <0.1 |
| Hydrilla | | | 25.35 | 4.0 |
| Total | 16.18 | | 248.75 | 39.2 |

Gizzard shad

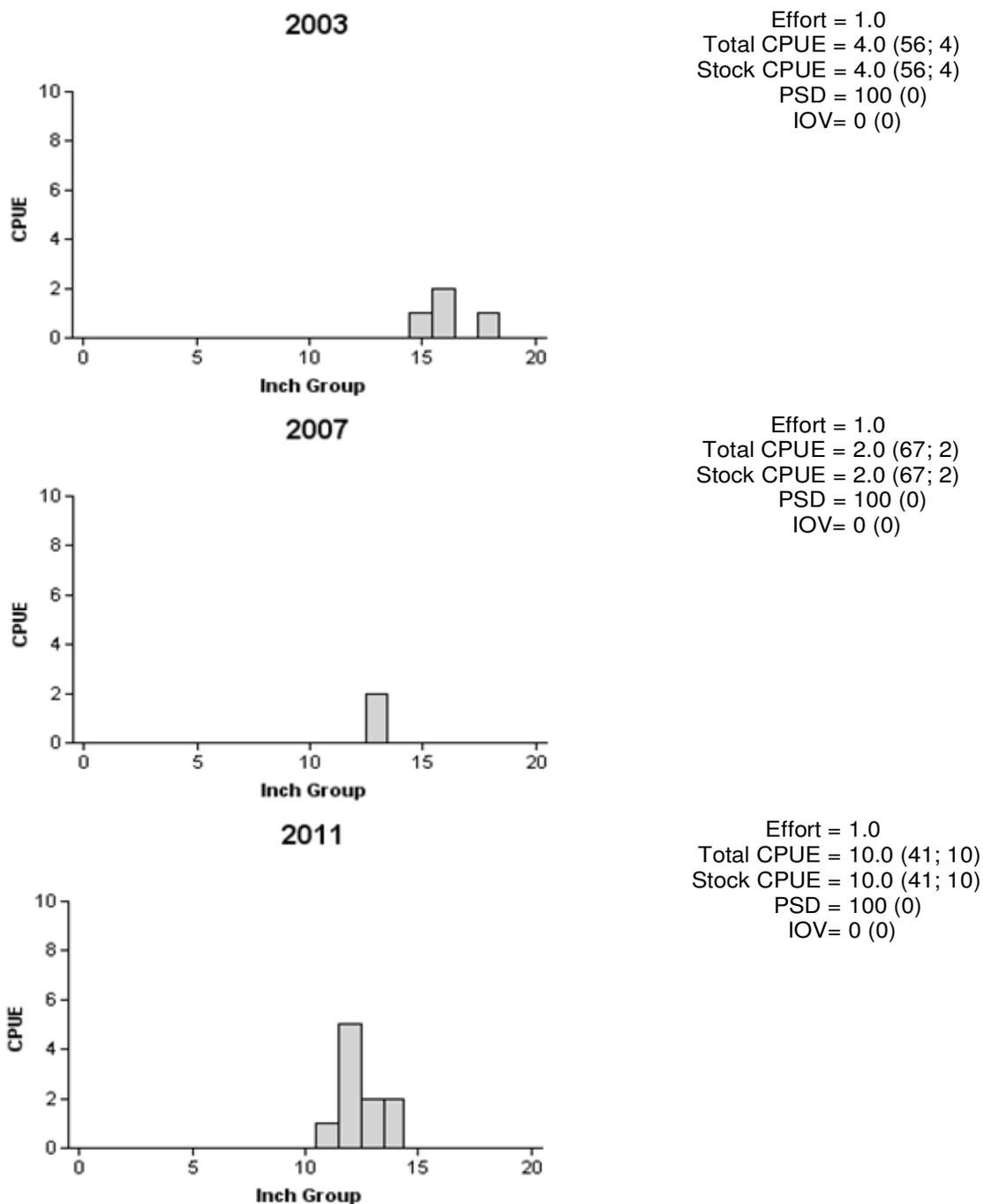


Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2003, 2007, and 2011.

Bluegill

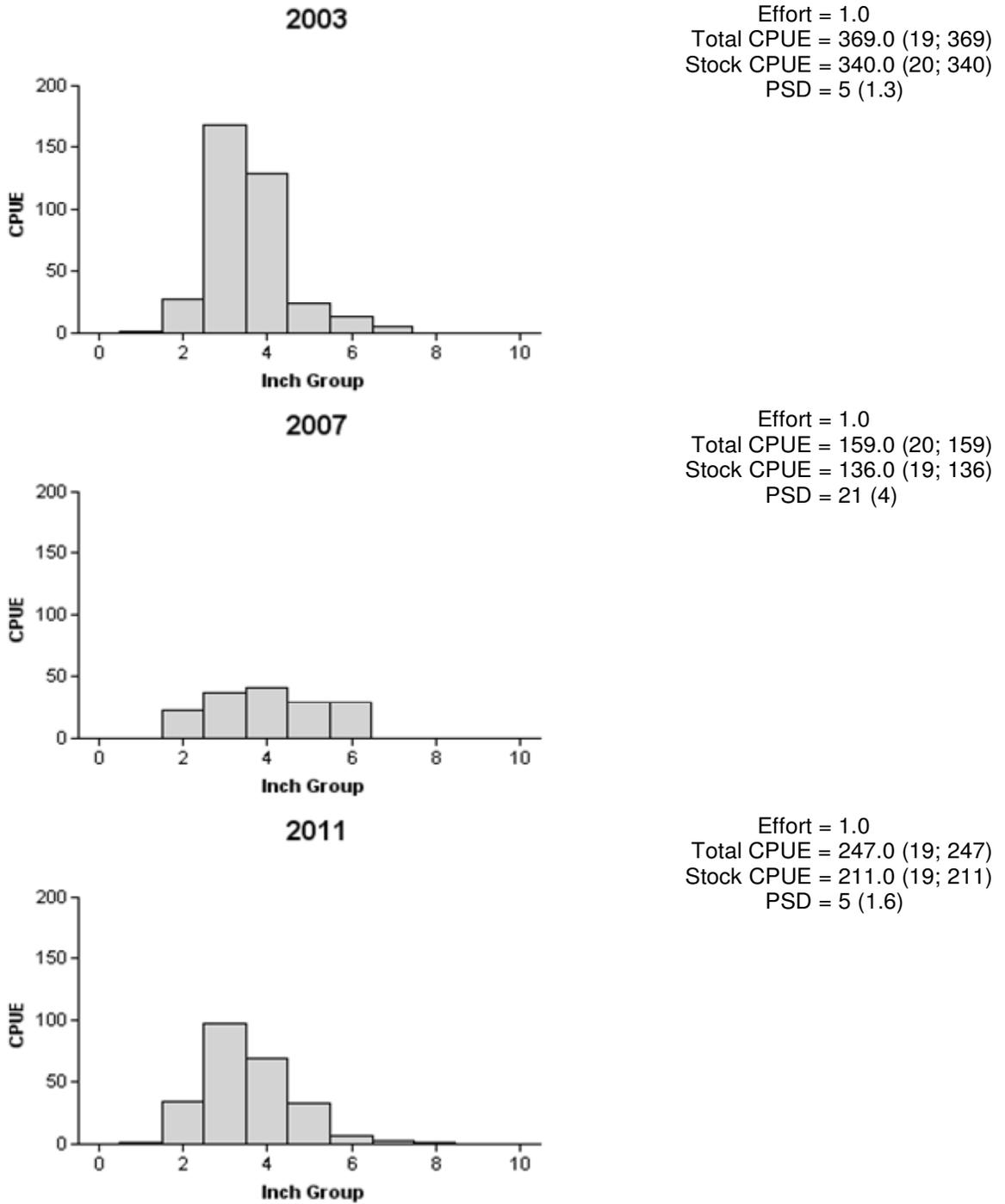


Figure 2. Number of bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2003, 2007 and 2011.

Redear sunfish

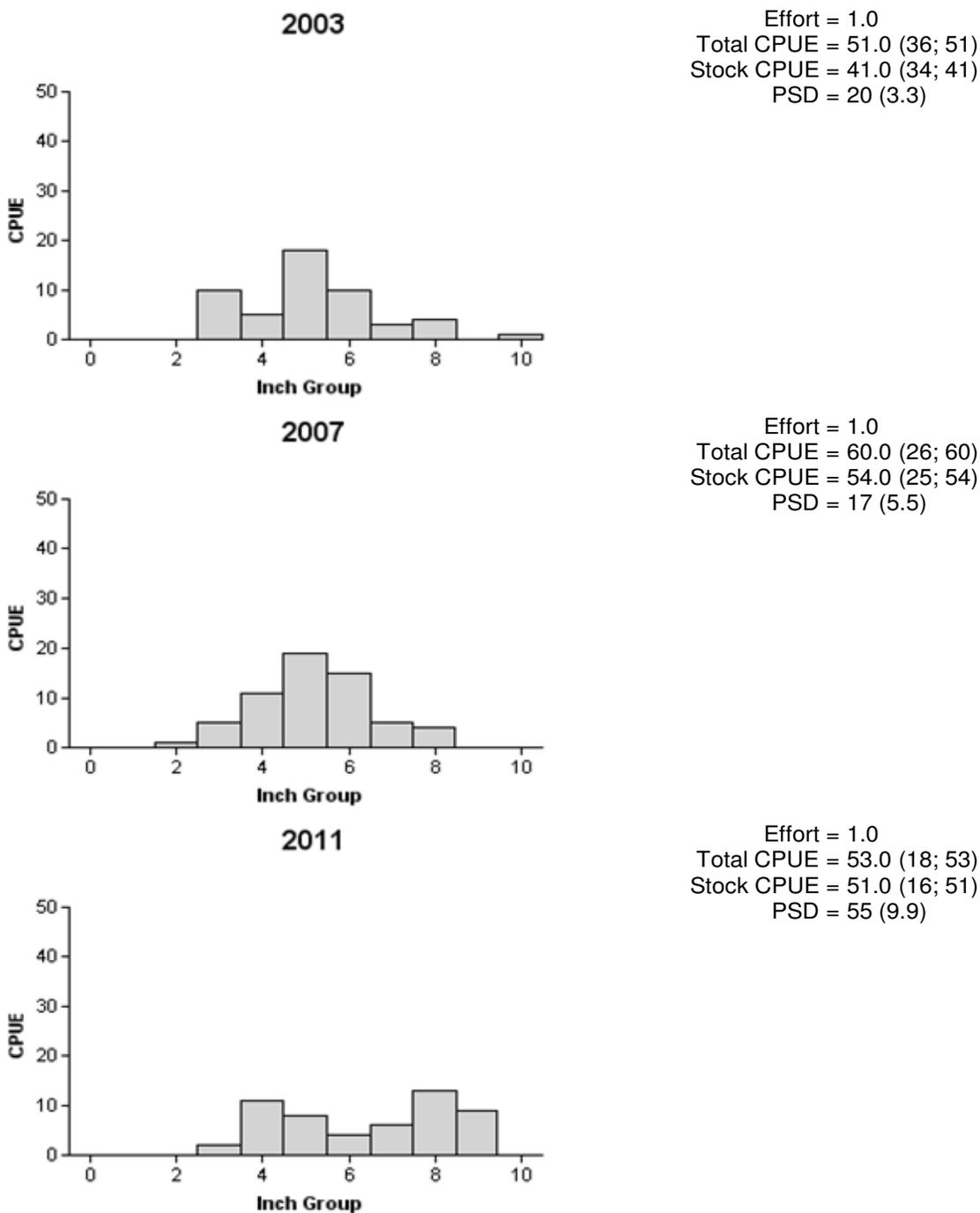
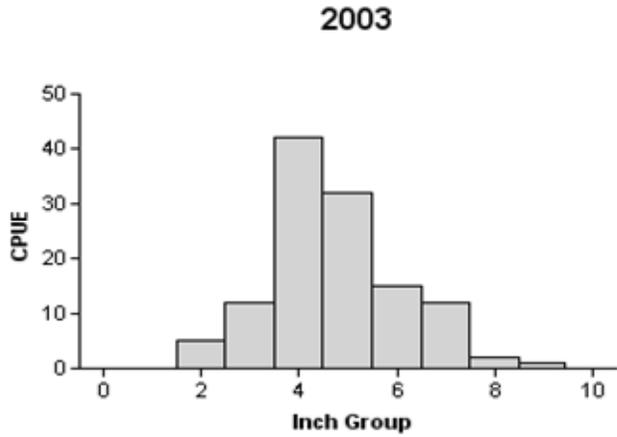
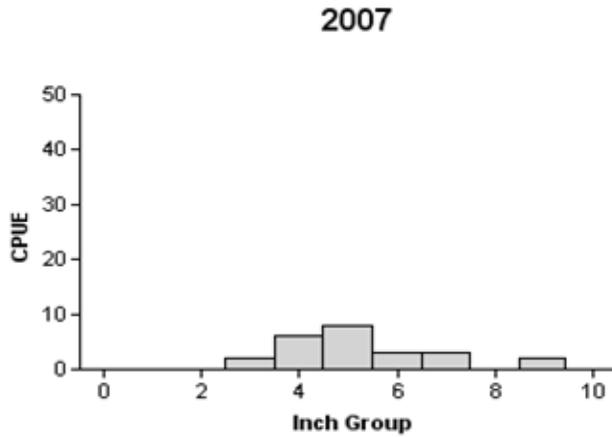


Figure 3. Number of redear sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2003, 2007 and 2011.

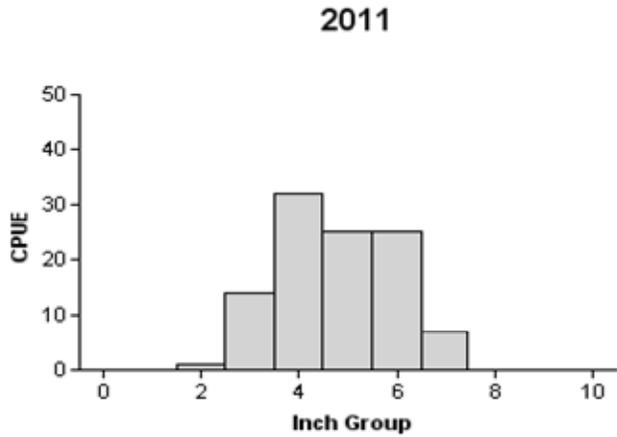
Redbreast sunfish



Effort = 1.0
 Total CPUE = 121.0 (38; 121)
 Stock CPUE = 116.0 (38; 116)
 PSD = 26 (5.3)



Effort = 1.0
 Total CPUE = 24.0 (51; 24)
 Stock CPUE = 24.0 (51; 24)
 PSD = 33 (14.7)



Effort = 1.0
 Total CPUE = 104.0 (30; 104)
 Stock CPUE = 103.0 (29; 103)
 PSD = 31 (6.8)

Figure 4. Number of redbreast 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, Lake Hawkins, Texas, 2003, 2007 and 2011.

Largemouth bass

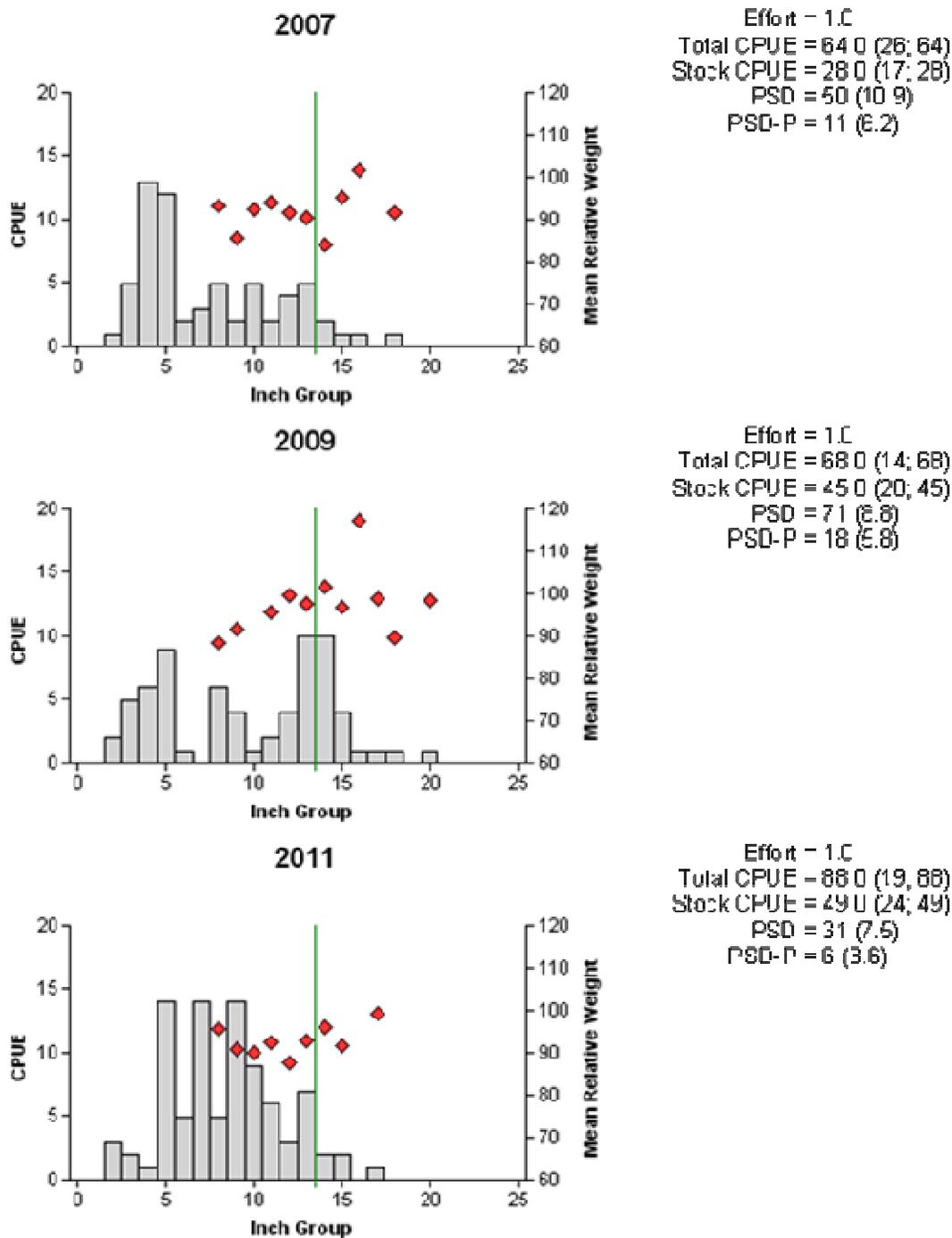


Figure 5. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2007, 2009, and 2011. Vertical lines indicate minimum length limit at time of survey.

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Lake Hawkins, Texas, 2003, 2007 and 2011. Data from 2003 is derived from starch-gel electrophoresis, and data from 2007 onward is from microsatellite DNA. 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.

| Year | Sample size | Genotype | | | | | % FLMB alleles | % pure FLMB |
|------|-------------|----------|--------------|--------------|------------------|------|----------------|-------------|
| | | FLMB | F1 | Fx | Combined hybrids | NLMB | | |
| 2003 | 30 | 4 | 7 | 17 | 24 | 2 | 50.0 | 13.3 |
| 2007 | 30 | 0 | ^a | ^a | 30 | 0 | 63.4 | 0.0 |
| 2011 | 27 | 3 | 0 | 24 | 24 | 0 | 54.0 | 11.0 |

^aAnalysis did not separate F1 from Fx hybrids

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

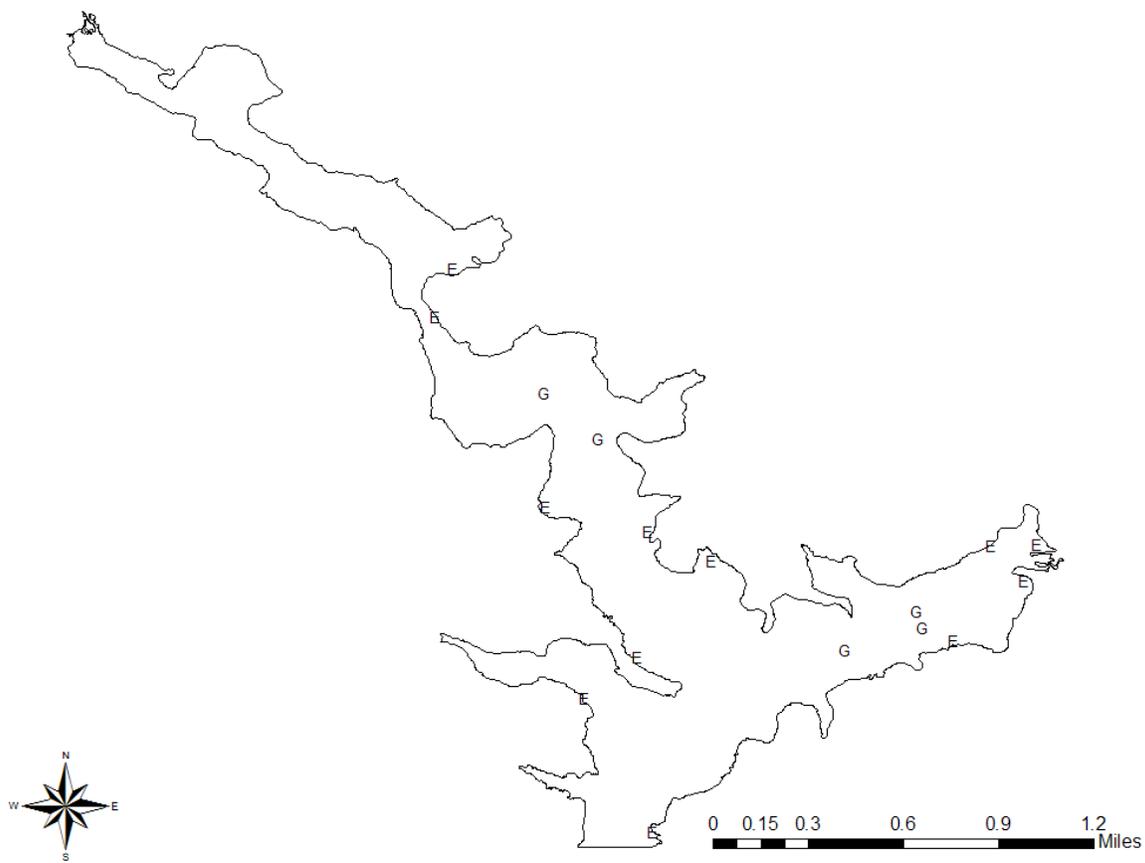
| Survey Year | Access | Creel | Electrofishing | Habitat | Report | Vegetation |
|-------------------------|--------|-------|----------------|---------|--------|------------|
| Summer 2012-Spring 2013 | | | | | | A |
| Summer 2013-Spring 2014 | | | A | | | A |
| Summer 2014-Spring 2015 | | | | | | A |
| Summer 2015-Spring 2016 | S | A | S | S | S | S |

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected by fall electrofishing from Lake Hawkins, Texas, 2011-2012. No target fish were collected in gill netting in spring 2012.

| Species | Electrofishing | |
|-------------------|----------------|-------|
| | N | CPUE |
| Gizzard shad | 10 | 10.0 |
| Threadfin shad | 26 | 26.0 |
| Redbreast sunfish | 104 | 104.0 |
| Warmouth | 8 | 8.0 |
| Bluegill | 247 | 247.0 |
| Longear sunfish | 7 | 7.0 |
| Redear sunfish | 53 | 53.0 |
| Largemouth bass | 88 | 88.0 |

APPENDIX B



Location of electrofishing (E), and gill net (G) sites, Lake Hawkins, Texas, 2011-2012.

APPENDIX C

Summaries of aquatic vegetation surveys conducted at Lake Hawkins, September 2003, September 2007, and August 2011. Surface area (acres) estimated by vegetation type.

| Vegetation type | 2003 | 2007 | 2011 |
|--|-------|-------|-------|
| Native emergent (<i>American lotus, arrowhead, cattail, maidencane, pickerelweed, pondweed, spatterdock, water lily, waterprimrose, watershield, waterwillow,</i> | 75.8 | 24.6 | 23.5 |
| Native submerged (<i>bushy pondweed, coontail, fanwort, muskgrass</i>) | 206.8 | 48.3 | 199.8 |
| Invasives | | | |
| Eurasian watermilfoil | 29.5 | 0.1 | 0.1 |
| Hydrilla | | 142.0 | 25.4 |
| Total area | 312.1 | 215.0 | 248.8 |
| Percent coverage | 49.2 | 33.9 | 39.2 |