

Lake Quitman

2017 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Lake Quitman were surveyed in 2017 using baited hoop netting, electrofishing, and trap netting. Anglers were surveyed from March through May 2018 with a creel survey. Historical data are presented with the 2017-2018 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: Lake Quitman is an 814-acre impoundment located in Wood County, Texas, on an unnamed tributary of the Sabine River. It was constructed by Wood County for recreation and flood control. Habitat consists primarily of natural shoreline, boat docks, and emergent aquatic vegetation including the exotic species alligatorweed. Water hyacinth is also present and presents an ongoing threat to the ecosystem.

Management History: Important sport fish included Largemouth Bass, White Crappie, and Channel Catfish. Florida Largemouth Bass were initially introduced in 1980 and the most recent stockings were in 2008 and 2009. Efforts to mitigate the loss of fish habitat due to reservoir shoreline development included planting water willow in 2013 and 2014. Treatment efforts for water hyacinth have included physical removal as well as aquatic herbicide applications.

Fish Community

- **Prey species:** Threadfin Shad and Gizzard Shad were equally abundant and most Gizzard Shad were available as prey to most sport fish. Electrofishing catch of Bluegill was high, and most fish were less than 5-inches long.
- **Catfishes:** The Channel Catfish fishery provided a good resource with desirable numbers of fish available for harvest. Flathead Catfish are present in the reservoir.
- **Black Basses:** Largemouth Bass were abundant but few legal-size fish were available to anglers. Spotted Bass were present but much less abundant than Largemouth Bass. Anglers seeking black basses accounted for 14% of total directed effort.
- **Crappie:** Black and White Crappie were both present but White Crappie were the dominant species. Crappie anglers accounted for 54% of total directed angler effort. White Crappie reached legal length in under two years.
- **Management Strategies:** Stock Florida Largemouth Bass in spring 2019 and 2020 to influence Largemouth Bass genetics in the system and increase the growth and trophy potential. Continue to research opportunities to improve aquatic habitat through the introduction of native aquatic plants and natural and artificial fish attractors and seek local constituents interested in assisting with aquatic habitat enhancement. Inform the public about invasive species and coordinate treatment of water hyacinth.

Introduction

This document is a summary of fisheries data collected from Lake Quitman from June 2017 through May 2018. 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 2017-2018 data for comparison.

Reservoir Description

Lake Quitman is an 814-acre impoundment constructed in 1962 on Dry Creek, a tributary of Lake Fork Creek, which is a tributary of the Sabine River. It is located in Wood County approximately 34 miles north of Tyler, Texas, and is operated and controlled by Wood County. Primary water uses included recreation and flood control. Habitat consisted primarily of natural shoreline with limited cover in the form of native emergent vegetation and boat docks. Water hyacinth was first discovered in September 2001 in the western one-third of the reservoir and persists in a limited area in Brushy Creek. Since that time, treatment activities have included manual removal and herbicide applications. Other descriptive characteristics for Lake Quitman are in Table 1.

Angler Access

Boat access at Lake Quitman consists of three public boat ramps and several private individual and community restricted boat ramps. Bank fishing access was adequate within three day-use areas. Boat ramps provide adequate access to the reservoir.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Bennett and Storey 2014) included:

1. Management of the Largemouth Bass fishery.

Action: The fishery was sampled using electrofishing in fall 2017 to monitor length distribution, growth rate, and genetic composition. A spring roving creel survey was conducted in spring 2018 to assess fishing effort, angler catch and harvest of Largemouth Bass and other game fishes.

2. Management of aquatic invasive species (AIS).

Action: The distribution and abundance of water hyacinth was monitored through annual vegetation surveys. Abundance was low and no recommendations were made for herbicide treatment.

Harvest regulation history: Historically, all sport fishes in Lake Quitman have been managed with statewide regulations (Table 3).

Stocking history: Lake Quitman was stocked with Florida Largemouth Bass (FLMB) in 2008 and 2009. FLMB were initially introduced in 1980 (311 adults) and also stocked in 1999 and 2000. Channel Catfish were introduced in 1982, and a fishery persists. Flathead Catfish and Green x Redear Sunfish hybrids were stocked in 1971, and Striped Bass were stocked once in 1972. A complete stocking history is in Table 4.

Vegetation/habitat management history: Water hyacinth was first documented in September 2001 and has persisted in limited areas. Treatment efforts have consisted of periodic manual removal by district staff and volunteers from fishing clubs and periodic spraying with aquatic herbicides by AHE staff. Water hyacinth was not detected during the standard vegetation survey in 2013; however, it was subsequently discovered after rainfall allowed plants to escape a restricted population in Brushy Creek. This spread prompted physical removal by district staff in fall 2013, installation of a containment boom, and herbicide applications by the TPWD AHE crew during fall 2013 and summer 2014. Alligatorweed has not required

treatment. The native plant American waterwillow was introduced in multiple locations in 2013 and 2014 to attempt to improve aquatic habitat.

Water transfer: No interbasin transfers are known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Quitman (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly-selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.1 hr at 13, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from all 5 fish collected in the 13.0 to 14.9 inch range.

Trap netting – Crappie were collected using trap nets (5 net nights at 5 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Ages for White Crappie were determined using otoliths from 13 randomly-selected fish (range 9.0 to 10.9 inches).

Tandem hoop nets – Channel Catfish were collected using 10 tandem hoop-net series at 10 stations in August 2017. Nets were baited with soap and deployed for 2-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series). Fish for age and growth estimates were not collected per OBS plan.

Genetics – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Micro-satellite DNA analysis was used to determine genetic composition of 30 individual fish collected in electrofishing in fall 2017.

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_t)] were calculated for target fishes according to Anderson and Neumann (1996). Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Creel survey – A roving creel survey was conducted from March through May 2018. Angler interviews were conducted on 5 weekend days and 4 weekdays to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Habitat – An aquatic vegetation survey was performed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Results and Discussion

Habitat: A structural habitat survey was last conducted in 2013 (Bennett and Storey 2014) at which time shoreline habitat was composed primarily of natural shoreline, native emergent vegetation, and boat docks. The aquatic vegetation in Lake Quitman in 2017 was dominated by emergent species (cattails, maidencane, and waterwillow) but coverage is very limited, accounting for less than 1% of reservoir surface area (Table 6). The exotic plant species alligatorweed and water hyacinth are both present in the reservoir but they do not currently pose a threat to the lake's ecosystem.

Creel: Directed fishing effort by anglers was highest for Crappie (54%), followed by "Anything" (26%), black basses (14%) and Catfish (6%) (Table 7). Total fishing effort (7,422 h) and direct expenditures (\$30,887) at Lake Quitman were higher in 2018 than estimates in 2010 (Table 8).

Prey species: Total CPUE of Gizzard Shad in 2017 (420.9/h) was higher than in 2013 (202.0/h) and 2009 (327.0/h) and the index of Vulnerability (IOV) remained consistently high across all years indicating they were available to most existing predators (Figure 1). Threadfin Shad were also present but at higher

CPUE (643.5/h) than Gizzard Shad (Appendix A). Bluegill were the most abundant sunfish in Lake Quitman (Appendix A). Bluegill CPUE in 2017 (399.7/h) was higher than in 2013 (111.0/h) and 2009 (241.0/h) (Figure 2). Most Bluegill were 4-inches or less in length.

Channel Catfish: Baited tandem hoop-net series set at 10 stations in August 2017 collected sufficient fish to satisfy sampling criteria of the objective-based sampling protocol. Legal-sized fish from the hoop-net survey accounted for 38% of the total catch (112 fish) and represented an apparently underutilized fisheries resource available for angler harvest (PSD-12 = 82). Relative weight values were above 80 for all inch groups (Figure 3). Catfish were the lowest ranked species group, by angler effort, in the 2018 spring creel survey with 6% of the total directed fishing effort.

Black basses: Total CPUE of Spotted Bass in 2017 (13.8/h) was low as in previous surveys (Figure 5). Catch rates of Largemouth Bass are consistently higher than Spotted Bass. In 2017 total CPUE (96.9/h) was higher than in 2013 (48.0/h) but lower than in 2011 (121.0/h). Although PSD in 2017 (30) was higher than in 2013 (17) or 2011 (19), catches of legal-sized fish were consistently low. Mean relative weights (Wr) of most inch classes of Largemouth Bass exceeded 90 indicating adequate prey populations are present in Lake Quitman. Growth of Largemouth Bass in Lake Quitman was potentially good, but conclusions are limited by a small sample size; average age at 14 inches (13.1 to 14.6 inches) was 2.0 years (N = 5; range = 2 years). Largemouth Bass were the third most sought after species in the spring 2018 creel survey with only 14% of the directed effort, approximately half the level observed in 2010 (Table 7). Directed effort for black basses (1,020 h) was lower than in 2010 (1,483 h), and no live-release tournaments were observed during spring 2018 (Table 10). Bass >7 lbs and <10 lbs accounted for 2% of total releases (Table 10). Genetic analysis indicated a low percentage of Florida Largemouth Bass alleles in 2017 (29%) and 2013 (26%) (Table 11) despite FLMB stockings in 2008 and 2009 (Table 4).

White Crappie: Total CPUE of White Crappie in trap nets in 2017(13.6/nn) was lower than in 2013 (20.6/nn) or 2009 (15.4/nn) (Figure 8) although the relative contribution of legal-sized fish was higher than in the previous surveys. White Crappie grew to an average length of 9.8 inches in 1.6 years. Crappies were the most important sport fish group at Lake Quitman in the spring 2018 creel survey, accounting for 54% of the directed fishing effort (Table 7). Harvest of crappie was estimated at 2,846 and 26% of legal-sized fish were released (Table 12). All fish harvested by anglers in spring 2018 were above the minimum length limit (Figure 7).

Fisheries Management Plan for Lake Quitman, Texas

Prepared – July 2018

ISSUE 1: Few legal-length Largemouth Bass have been collected in recent surveys. Lake Quitman exhibits a low frequency of FLMB alleles despite of stockings of FLMB in 2008 and 2009 at 100/acre. The spring 2018 creel had an estimated 47 fish between 7-10 pounds indicating that there is the potential for trophy fish.

MANAGEMENT STRATEGY

1. Stocking of 100/acre of FLMB fingerlings in spring 2019 and 2020 to influence Largemouth Bass genetics in the system and increase the growth and trophy potential.

ISSUE 2 Aquatic habitat in Lake Quitman is limited and may influence the poor size structure of Largemouth Bass and Bluegill and limit fishing opportunities for crappie anglers. Lake Quitman could benefit from the introduction of native aquatic vegetation and other habitat enhancements.

MANAGEMENT STRATEGY

- Continue to research opportunities to improve aquatic habitat through the introduction of native aquatic plants and natural and artificial fish attractors.
- Seek local partners interested in coordinating efforts to improve habitat.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. Water hyacinth, first documented in Lake Quitman in September 2001, poses a risk to the reservoir ecosystem and recreational access, and it is imperative to continue close monitoring and implement treatment activities when necessary. Its distribution and abundance have been monitored annually through aquatic vegetation surveys. Whenever feasible, efforts have included manual removal and chemical treatment to control the infestation.

MANAGEMENT STRATEGIES

1. Provide information on distribution and abundance of water hyacinth and recommend treatments to Wood County staff.
2. Coordinate chemical treatment and physical removal of water hyacinth plants using district staff, volunteers, or contractors whenever practical.
3. Educate the public about invasive species with media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.

Objective-Based Sampling Plan and Schedule (2018–2022)

Sport fish, forage fish, and other important fishes

Sport fishes in Lake Quitman include Largemouth Bass, crappie, Channel Catfish, and Flathead Catfish. Gizzard Shad and Bluegill are the primary prey species.

Low-density fisheries

Spotted Bass: Spotted Bass are present in Lake Quitman in low abundance. Any incidental data on Spotted Bass collected during future sampling for Largemouth Bass during creel and electrofishing surveys will be recorded.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Although Lake Quitman has traditionally supported a popular Largemouth Bass fishery, in spring 2018 bass anglers only accounted for 14% of total directed effort and only a few legal-length fish were collected in the last three electrofishing surveys.

Sampling Lake Quitman's Largemouth Bass fishery will be used to monitor general trend data (every four years) of relative abundance, size structure, body condition, and growth. These data will allow for determination of any large-scale changes in the population that may initiate further investigation. Analysis of the data from the electrofishing surveys in 2009, 2011, 2013 and 2017, predicts a sample of 50 stock-sized Largemouth Bass could be obtained at the 80th percentile by sampling between 12 and 24 stations yielding an RSE <25. A minimum of 18 randomly-selected nighttime electrofishing stations will be sampled and an additional six random stations will also be generated in the event additional sampling is required to meet sampling objectives for Largemouth Bass in fall 2021. To document long-term changes in growth of Largemouth Bass a sample of 13 fish (13.0 to 14.9 inches) will be collected during electrofishing sampling and processed to calculate average age at minimum length limit. A spring quarter roving creel survey will be conducted from March to May 2022 to estimate fishing effort, catch and harvest rates of black basses and to assess trophy potential of the fishery.

Crappie: Both White and Black Crappie are present in Lake Quitman and White Crappie are the dominant species caught by anglers, an atypical pattern in East Texas reservoirs. Crappie anglers accounted for 54% of total fishing effort in spring 2018. Sampling Lake Quitman's crappie fishery will be used to monitor general trend data (every four years) of relative abundance, size structure, body condition, and angler effort and harvest. These data will allow for determination of any large-scale changes in the population that may initiate further investigation. CPUEs of White Crappie from trap netting surveys conducted in 2005, 2009, 2013, and 2017 were 30.8/nn, 15.4/nn, 15.2/nn, and 13.6/nn respectively. Analysis of these data predicts a sample of 50 stock-sized White Crappie could be obtained at the 80th percentile by sampling either 5 or 6 stations although twice that sampling effort would be required to yield an RSE <25. A survey consisting of 5 randomly-selected single-cod, shoreline trap net sets will be conducted in fall 2021 to assess the status of combined species of crappie populations in the reservoir. No additional sampling will be conducted. A spring quarter roving creel survey will be conducted from March to May 2022 to estimate fishing effort and harvest.

Channel Catfish: Directed effort for Channel Catfish was ranked lowest in importance in spring 2018 at 6% of total effort. Sampling Lake Quitman's Channel Catfish fishery will be used to monitor general trend data (every four years) of relative abundance, size structure, body condition, and angler effort, catch, and harvest. These data will allow for determination of any large-scale changes in the population that may initiate further investigation. Baited tandem hoop nets were an effective gear for channel catfish. Analysis

of hoop netting data predicted a sample of 50 stock-sized Channel Catfish can be obtained at the 80th percentile by sampling 12 stations which would also yield an RSE ≤ 25 . A spring quarter roving creel survey will be conducted from March to May 2022 to estimate fishing effort, catch and harvest of catfish.

Sunfish and other prey species: Gizzard Shad, and Bluegill are the primary prey species in Lake Quitman. Long-term trend data is desired for these populations to evaluate their relative abundance (CPUE) and size structure (PSD). Relative weights of the Largemouth Bass population, along with size structure of Bluegill and the IOV of Gizzard Shad, will be used to gauge prey fish availability for sport fishes. Prey species will be sampled using the effort expended to sample the Largemouth Bass fishery in fall 2021.

Habitat: Aquatic invasive plants are an issue at Lake Quitman. Water hyacinth potentially poses a threat to angler and boater access as well potentially outcompeting desirable native vegetative species. While Lake Quitman is currently not infested with giant salvinia, this reservoir is at risk for giant salvinia introduction. Annual aquatic vegetation monitoring is required to identify potential threats to boating and angling access so control and rapid response efforts can be implemented to reduce or eliminate threats associated with invasive aquatic plants. Each summer the reservoir will be circumnavigated and any invasive species encountered will be documented and geo-referenced.

Literature Cited

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Bennett, D. L. and K.W. Storey, K. W. 2014. Statewide freshwater fisheries monitoring and management program, Lake Quitman, Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Performance Report, Project F-221-M-4, Job A, 24 pages.
- 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.

Tables and Figures

Table 1. Characteristics of Lake Quitman, Texas

| Characteristic | Description |
|-----------------------------------|---------------------------------|
| Year constructed | 1962 |
| Controlling authority | Wood County |
| Surface area | 814 acres |
| Counties | Wood |
| Reservoir type | Tributary |
| Mean depth | 10.0 ft. |
| Maximum depth | 25.0 ft. |
| Shoreline Development Index (SDI) | 3.39 |
| Conductivity | 130 $\mu\text{mho} / \text{cm}$ |
| Secchi disc range | 4 – 6 ft. |
| Watershed area | 31 mi^2 |

Table 2. Boat Ramp characteristics for Lake Quitman, Texas, August 2017. The water level was near full pool at the time of the survey.

| Boat ramp | Latitude Longitude (dd) | Public | Parking capacity (N) | Elevation at end of boat ramp (ft. msl) | Condition |
|--------------|-------------------------------|--------|----------------------------|---|--|
| East Dam | 32.85896 -95.45095 | Y | 30 | 391 | Excellent. |
| West Dam | 32.86011 -95.45878 | Y | 5 | 393 | Adequate. Extension is feasible |
| North Access | 32.87566 -95.44687 | Y | 3 | 393 | Adequate for small boats/kayaks, Parking limited |

Table 3. Harvest regulations for Lake Quitman, Texas.

| Species | Bag limit | Length limit |
|--|----------------------------|-----------------|
| Catfish: Channel and Blue Catfish, their hybrids and subspecies | 25 (in any combination) | 12-inch minimum |
| Catfish, Flathead | 5 | 18-inch minimum |
| Bass, Largemouth | 5 ^a | 14-inch minimum |
| Bass, Spotted | 5 ^a | None |
| Crappie: White and Black Crappie, their hybrids and subspecies | 25 (in any combination) | 10-inch minimum |

^a Daily bag for Largemouth Bass, Spotted Bass, and Guadalupe Bass = 5 fish in any combination.

Table 4. Stocking history of Lake Quitman, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

| Species | Year | Number | Size |
|-------------------------|-------|---------|------|
| Channel Catfish | 1982 | 8,205 | |
| | 1986 | 40,230 | AFGL |
| | 1992 | 40,000 | AFGL |
| | Total | 88,435 | |
| Flathead Catfish | 1971 | 200 | |
| Striped Bass | 1972 | 2,160 | |
| Green x Redear Sunfish | 1971 | 5,000 | |
| Florida Largemouth Bass | 1980 | 311 | ADL |
| | 1999 | 81,443 | FGL |
| | 2000 | 82,267 | FGL |
| | 2008 | 80,145 | FGL |
| | 2009 | 80,972 | FGL |
| Total | | 325,138 | |

Table 5. Objective-based sampling plan components for Lake Quitman, Texas 2017–2018

| Gear/ target species | Survey objective monitor trend in... | Metrics | Sampling objective |
|-----------------------------------|--|--|---------------------------------------|
| <i>Baited Tandem hoop netting</i> | | | |
| Channel Catfish | Abundance | CPUE– stock | RSE-Stock ≤ 25 |
| | Size structure | PSD, length frequency | $N \geq 50$ stock |
| <i>Electrofishing</i> | | | |
| Largemouth Bass | Abundance | CPUE – stock | RSE-Stock ≤ 25 |
| | Size structure | PSD, length frequency | $N \geq 50$ stock |
| | Genetics | % FLMB | $N = 30$, any age |
| | Age-and-growth | Category 2 | Estimate mean age of 14- inch fish |
| Bluegill ^a | Abundance | CPUE – Total | |
| | Size structure | PSD, length frequency | |
| Gizzard Shad ^a | Size structure | PSD, length frequency | |
| | Prey availability | IOV | |
| <i>Trap netting</i> | | | |
| Crappies | Abundance | CPUE– stock | |
| | Size structure | PSD, length frequency | $N \geq 50$ stock |
| | Condition | Wr | |
| <i>Creel survey</i> | | | |
| Largemouth Bass | Characterize fishery and document trophy potential | Directed effort, angler CPUE, harvest, and release of fish by weight categories | |
| Catfish & Crappies | Characterize fishery | Directed effort, angler CPUE, harvest | |

^a No additional effort will be expended to achieve an $RSE \leq 25$ for CPUE of Bluegill and Gizzard Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Survey of aquatic vegetation, Lake Quitman, Texas, 2017. Surface area in acres is listed with percent coverage in parentheses

| Vegetation | 2005 | 2009 | 2013 | 2017 |
|-----------------|-----------|------------|------------------------|------------------------|
| Native Emergent | 2.3 (0.3) | 8.0 (1.0) | 4.0 ¹ (0.5) | 4.6 ² (0.6) |
| Alligatorweed | 0 | 9.0 (1.1) | 13.0 (1.5) | 2.3 (0.3) |
| Waterhyacinth | tr | tr | 2.0 (0.2) | 0.3 (tr) |
| Total | 2.3 (0.3) | 17.0 (2.1) | 19.0 (2.3) | 7.1 (0.9) |

¹Cattails, Maidencane, Water primrose, Waterwillow

²Cattails, Giant bulrush, Maidencane, Waterwillow

Table 7. Percent directed angler effort by species for Lake Quitman, Texas, March through May 2010 and 2018.

| Species | Spring 2010 | Spring 2018 |
|--------------|-------------|-------------|
| Catfish spp. | 16 | 6 |
| Black basses | 31 | 14 |
| Crappie spp. | 49 | 54 |
| Anything | 4 | 26 |

Table 8. Total fishing effort (h) for all species and total directed expenditures at Lake Quitman, Texas, March through May, 2010 and 2018.

| Creel Statistic | Spring 2010 | Spring 2018 |
|------------------------------|-------------|-------------|
| Total fishing effort (hours) | 4,736 | 7,422 |
| Total directed expenditures | \$17,737 | \$30,887 |

Gizzard Shad

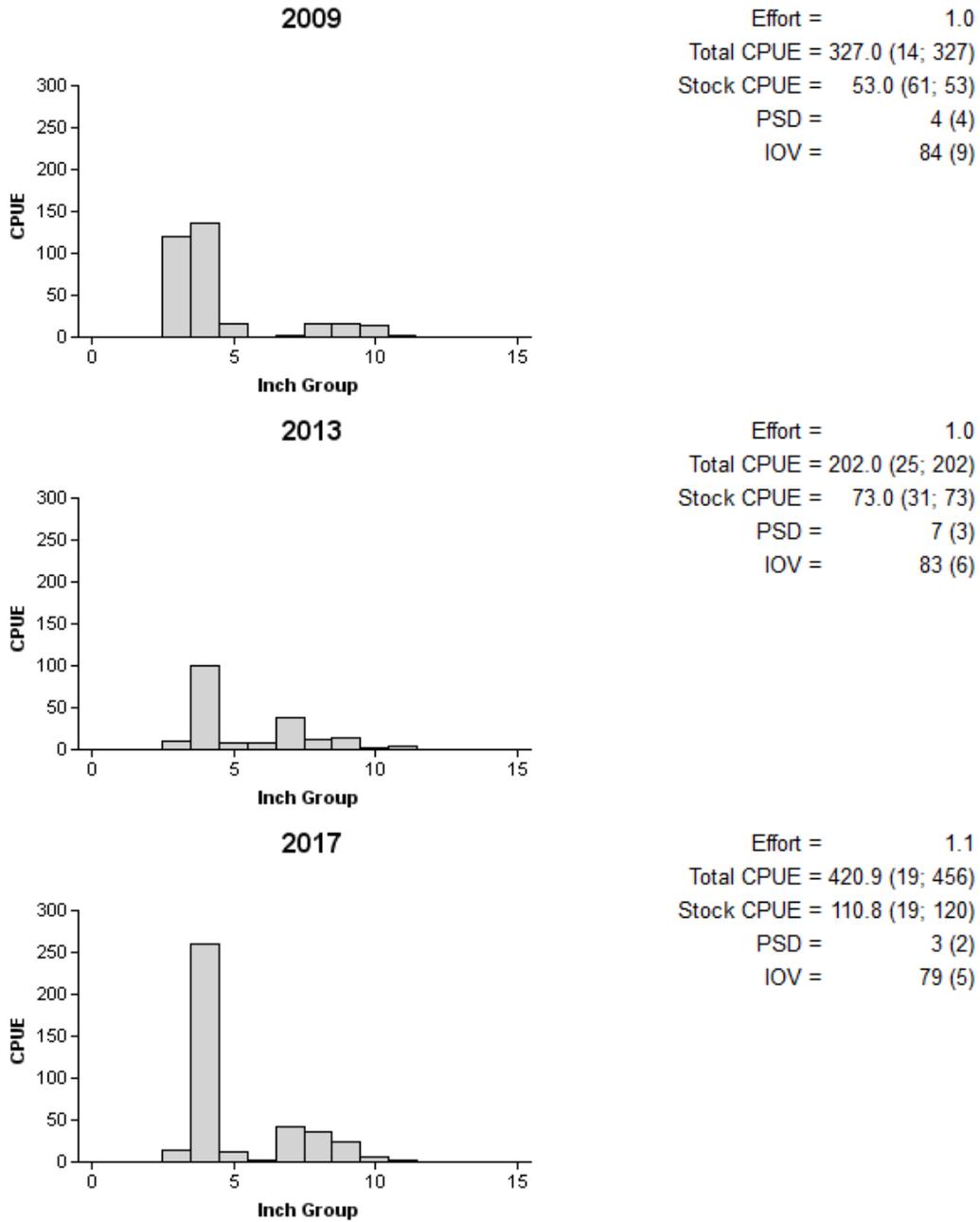
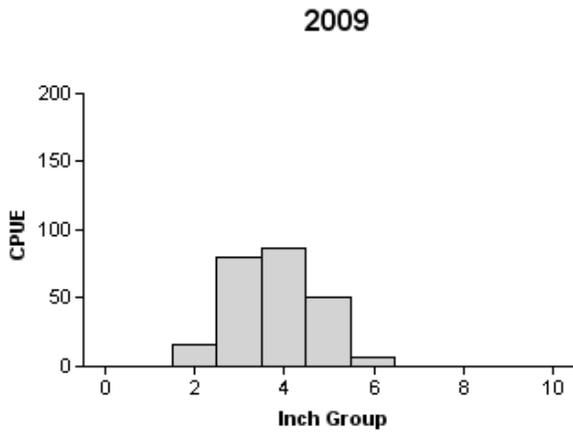
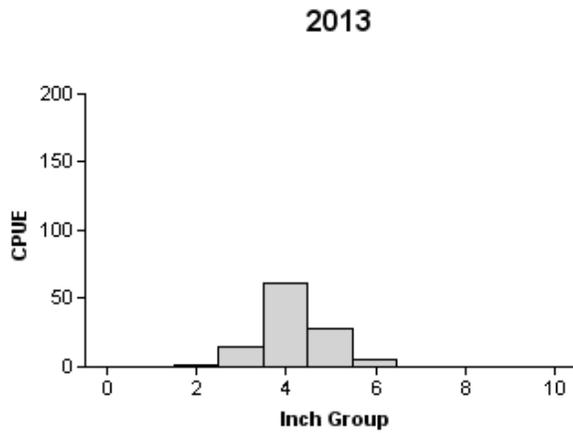


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Quitman, Texas, 2009, 2013, and 2017.

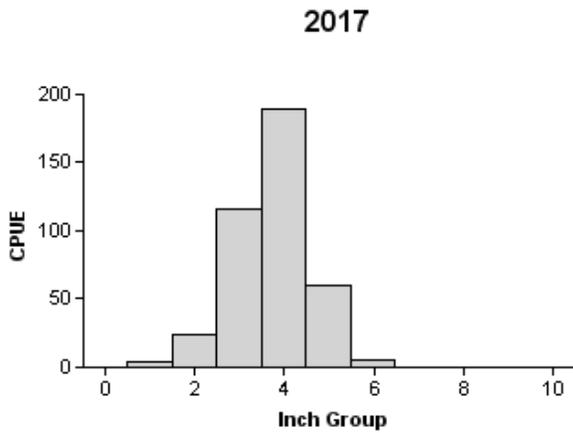
Bluegill



Effort = 1.0
 Total CPUE = 241.0 (22; 241)
 Stock CPUE = 225.0 (22; 225)
 PSD = 3 (1)



Effort = 1.0
 Total CPUE = 111.0 (26; 111)
 Stock CPUE = 110.0 (26; 110)
 PSD = 5 (2)



Effort = 1.1
 Total CPUE = 399.7 (16; 433)
 Stock CPUE = 371.1 (16; 402)
 PSD = 1 (0)

Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Quitman, Texas, 2009, 2013, and 2017.

Channel Catfish

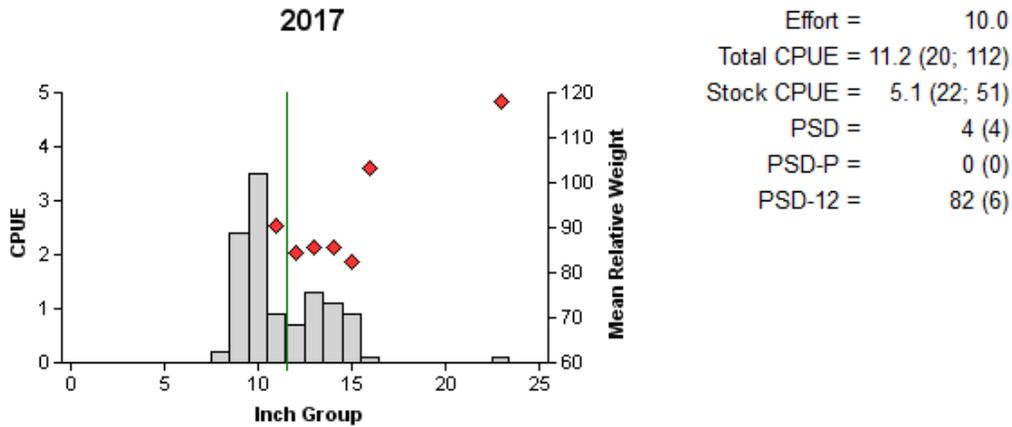


Figure 3. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for baited hoop net surveys, Lake Quitman, Texas, August 2017. Vertical line indicates minimum length limit.

Table 9. Creel survey statistics for catfish (species combined) at Lake Quitman, Texas, from March through May 2010, and 2018. Total catch per hour is for anglers targeting catfish and total harvest is the estimated number of catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel survey statistic | Year | |
|------------------------|-----------|------------|
| | 2010 | 2018 |
| Surface area (acres) | 814 | 814 |
| Directed effort (h) | 750 (52) | 421(66) |
| Directed effort/acre | 0.92 (52) | 0.52 (66) |
| Total catch per hour | 1.75 (87) | 1.35 (125) |
| Total harvest | 0 (0) | 480 (108) |
| Harvest/acre | 0 (0) | 0.59 (108) |
| Percent legal released | 0 | 27 |

Spotted Bass

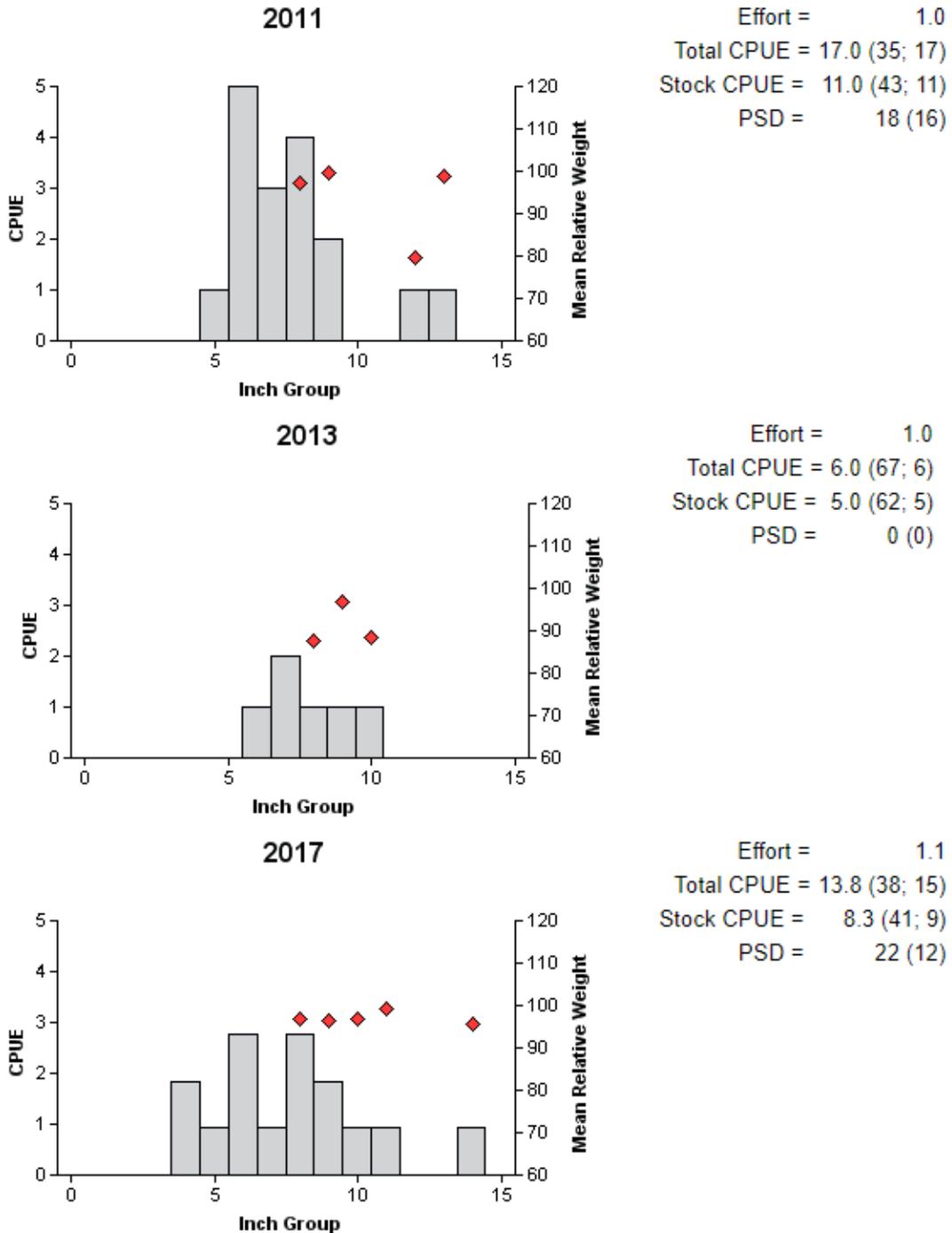


Figure 4. Number of Spotted Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Quitman, Texas, 2011, 2013, and 2017.

Largemouth Bass

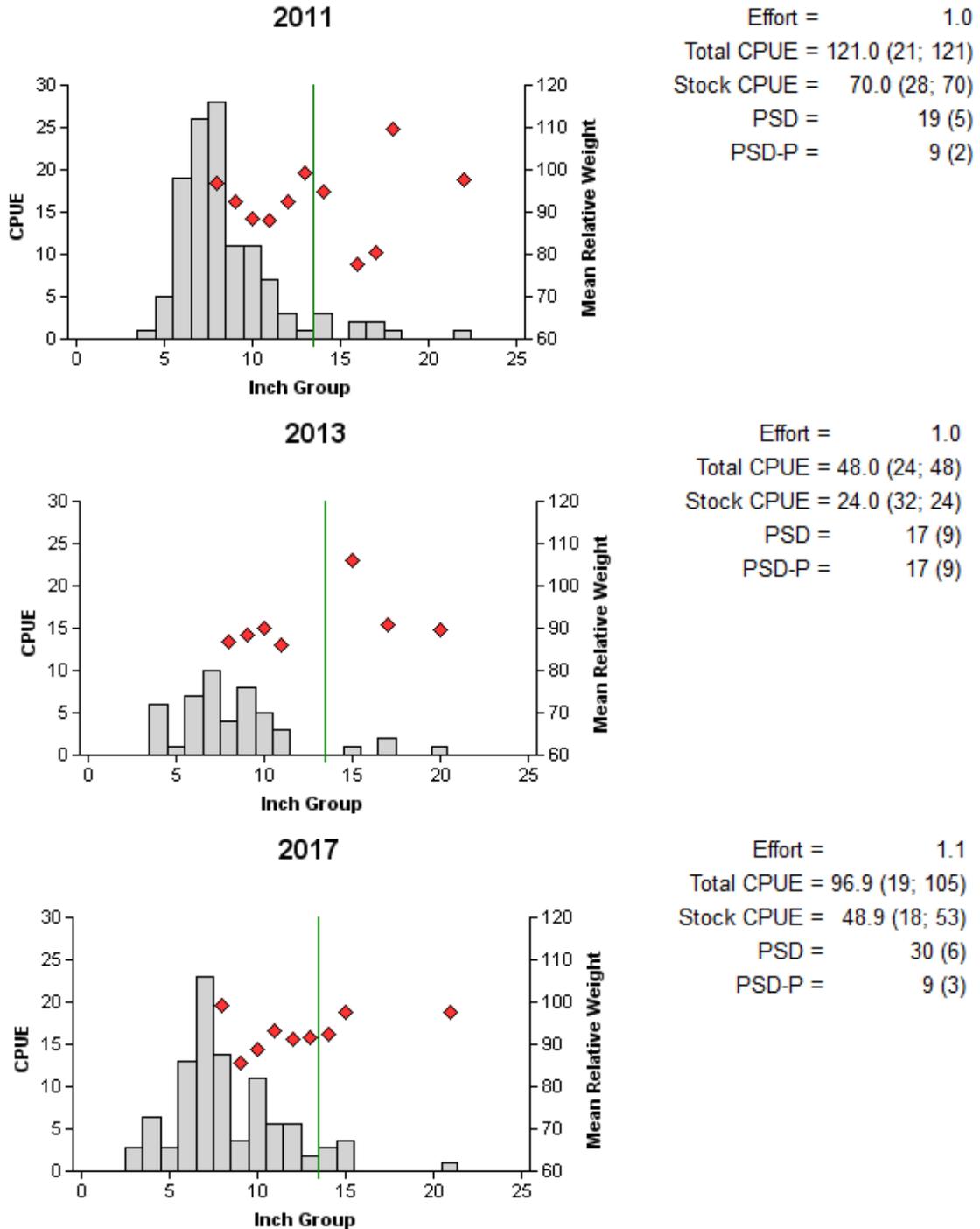


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Quitman, Texas, 2011, 2013, and 2017. Vertical lines indicate minimum length limit.

Table 10. Creel survey statistics for black basses (Largemouth Bass and Spotted Bass combined) at Lake Quitman, Texas, from March to May 2010 and 2018. Catch rate is for all anglers targeting black basses. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting black basses. Relative standard errors (RSE) are in parentheses.

| Statistic | 2010 | 2018 |
|---|------------|------------|
| Surface area (acres) | 814 | 814 |
| Directed angling effort (h) | | |
| Tournament | - | 0 |
| Non-tournament | - | 1,020 (44) |
| All black bass anglers combined | 1,483 (49) | 1,020 (44) |
| Angling effort/acre | 1.82 (49) | 1.25 (44) |
| Catch rate (number/h) | 0.30 (24) | 0.68 (48) |
| Harvest | | |
| Non-tournament harvest | - | 0 |
| Harvest/acre | 0.38 (117) | 0 |
| Tournament weigh-in and release | - | 0 |
| Release by weight | | |
| <4.0 lbs | - | 1,121 |
| 4.0-6.9 lbs | - | 747 |
| 7.0-9.9 lbs | - | 47 |
| ≥10.0 lbs | - | |
| Percent legal released (non-tournament) | 36 | 100 |

Table 11. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Quitman, Texas, 2013, and 2017. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = hybrids with half of their alleles derived from each lineage. Fx-F are hybrids with more than half their alleles derived from the FLMB. Fx-N are hybrids with more than half their alleles derived from the NLMB lineage. Genetic composition was determined with micro-satellite DNA analysis

| Year | Sample size | Genotype | | | | | | % FLMB alleles | % pure FLMB |
|------|-------------|----------|----|----|------|------|------|----------------|-------------|
| | | FLMB | F1 | Fx | Fx-F | Fx-N | NLMB | | |
| 2013 | 30 | 0 | 1 | 2 | 2 | 24 | 1 | 26 | 0 |
| 2017 | 30 | 0 | 1 | 2 | 5 | 17 | 5 | 29 | 0 |

White Crappie

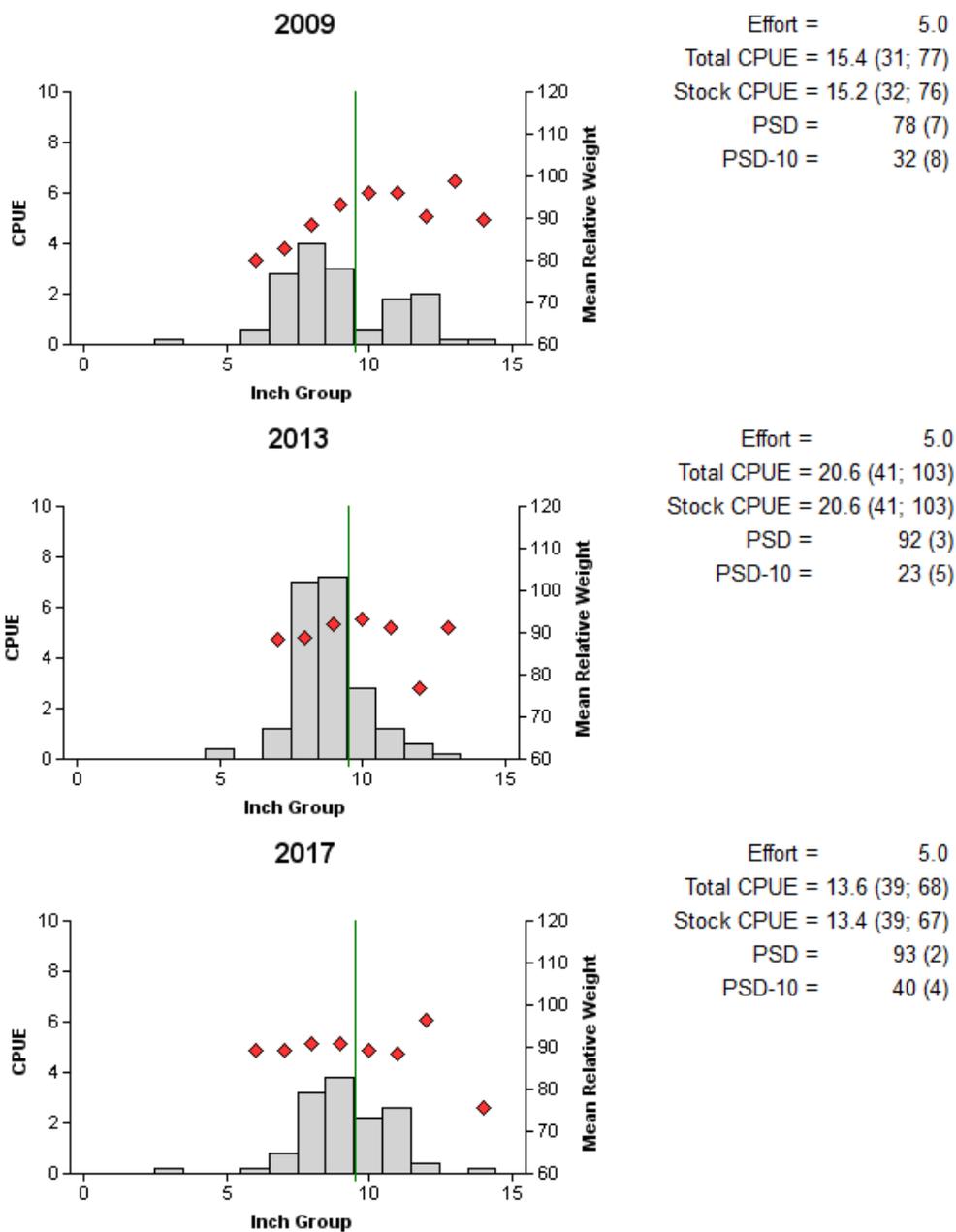


Figure 6. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Lake Quitman, Texas, 2009, 2013, and 2017. Vertical lines indicate minimum length limit.

Table 12. Creel survey statistics for crappie (combined species) at Lake Quitman, Texas, from March through May 2010 and 2018. Total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic | Year | |
|------------------------|------------|------------|
| | 2010 | 2018 |
| Surface area (acres) | 814 | 814 |
| Directed effort (h) | 2,339 (38) | 4,040 (31) |
| Directed effort/acre | 2.87 (38) | 4.96 (38) |
| Total catch per hour | 1.27 (52) | 1.51 (52) |
| Total harvest | 3,570 (72) | 2,846 (64) |
| Harvest/acre | 4.39 (72) | 3.50 (64) |
| Percent legal released | 0 | 10 |

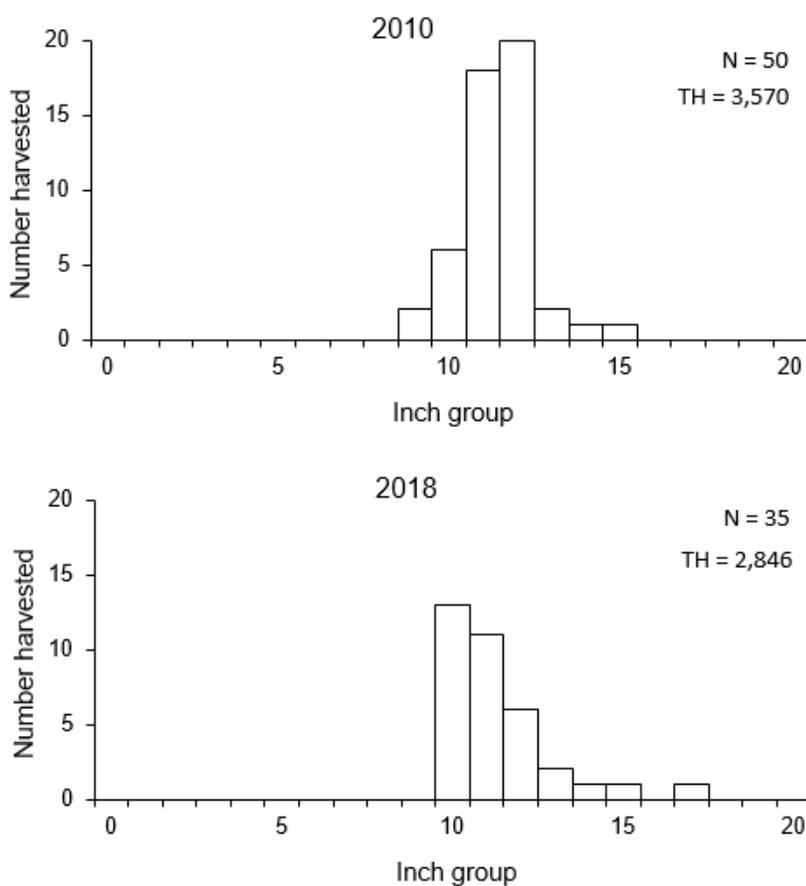


Figure 7. Length frequency of harvested crappie (combined species) observed during creel surveys at Quitman, Texas, March through May 2010 and 2018, all anglers combined. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Proposed Sampling Schedule

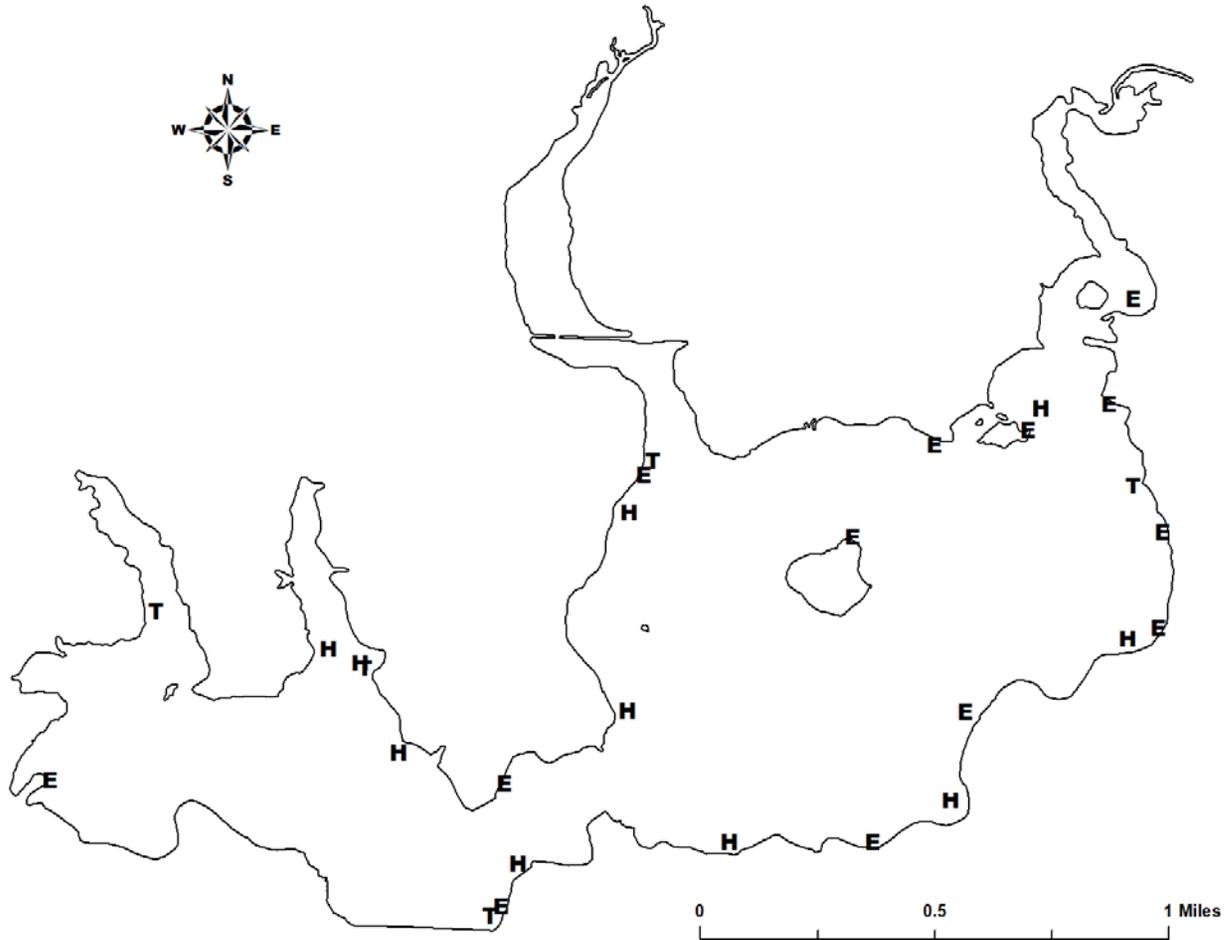
Table 13. Proposed sampling schedule for Lake Quitman, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

| | Survey year | | | |
|----------------------------|-------------|-----------|-----------|-----------|
| | 2018-2019 | 2019-2020 | 2020-2021 | 2021-2022 |
| Angler Access | | | | S |
| Vegetation | A | A | A | S |
| Electrofishing – Fall | | | | S |
| Trap netting | | | | S |
| Baited tandem hoop netting | | | | S |
| Creel survey | | | | S |
| Report | | | | S |

APPENDIX A

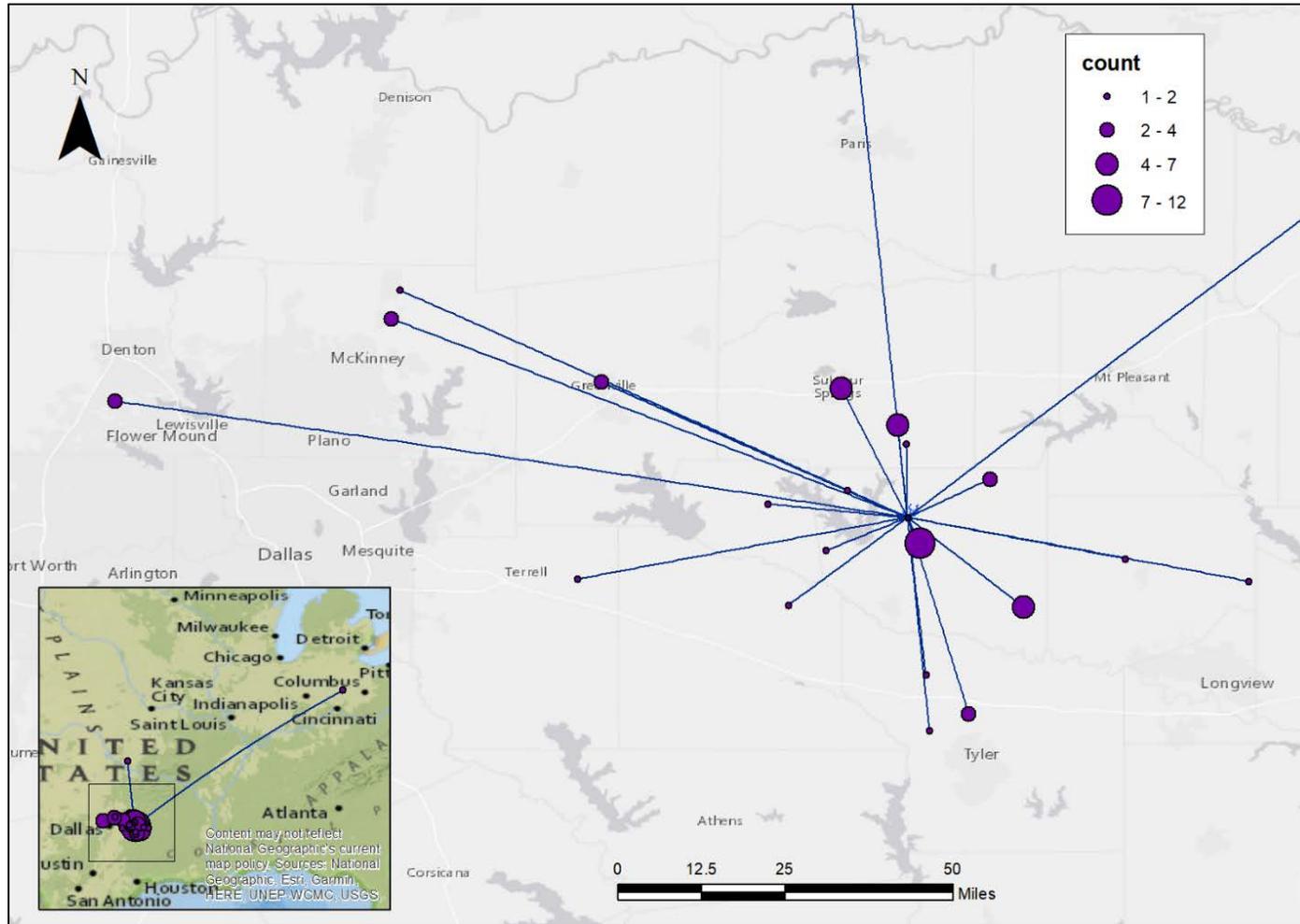
Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Quitman, Texas, 2017-2018. Sampling effort was 20 net nights for baited hoop netting, and 1.1 hours for electrofishing, and 5 net nights for trap netting.

| Species | Hoop netting | | Electrofishing | | Trap netting | |
|------------------|--------------|------|----------------|-------|--------------|------|
| | N | CPUE | N | CPUE | N | CPUE |
| Gizzard Shad | | | 456 | 422.2 | | |
| Threadfin Shad | | | 695 | 643.5 | | |
| Channel Catfish | 112 | 11.2 | | | | |
| Flathead Catfish | 1 | 0.1 | | | | |
| Warmouth | | | 9 | 8.3 | | |
| Bluegill | | | 433 | 400.9 | | |
| Longear Sunfish | | | 162 | 150.0 | | |
| Spotted Bass | | | 15 | 13.9 | | |
| Largemouth Bass | | | 105 | 97.2 | | |
| White Crappie | | | | | 68 | 13.6 |
| Black Crappie | | | | | 4 | 0.8 |

APPENDIX B

Location of sampling sites, Lake Quitman, Texas, 2017-2018. Hoop net, electrofishing, and gill netting stations are indicated by H, E, and G, respectively. Water level was near full pool at time of sampling.

APPENDIX C



Radial flow map showing location, by ZIP code, and frequency of anglers interviewed in the creel survey at Lake Quitman, Texas, from March through May 2018.



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