

South Concho River

2019 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in the South Concho River were surveyed in 2017 and 2019 using electrofishing and trap netting, and in spring 2018 and 2020 with tandem hoop nets. Vehicle counts at access points were surveyed from February 2018 through January 2019 using game cameras. Historical data are presented with the 2017-2020 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

River Description: The South Concho River from below Nasworthy Dam to Bell Street Dam is in total 216 acres of water, composed of four separate pools formed by concrete dams. It is located in Tom Green County and is entirely within the city limits of San Angelo. Habitat at time of sampling consisted primarily of natural and rocky shoreline. Native aquatic plants were present and consisted primarily of water-willow and yellow pond-lily.

Management History: Important sport fish include Largemouth Bass, crappie, and catfish. Hybrid Striped Bass are present in this section of the South Concho River as they have migrated downstream from Lake Nasworthy. Previous management has been limited to stockings.

Fish Community

- **Prey species:** Threadfin Shad were present in the South Concho River in low abundance. Electrofishing catch of Gizzard Shad was marginal and size structure was poor. Electrofishing catch of Bluegill was low.
- **Catfishes:** The Channel Catfish population was low density with fish up to 17 inches observed during hoop netting. No Blue or Flathead Catfish were observed during sampling.
- **Temperate bass:** Palmetto bass were present in the river as they have moved downstream from Lake Nasworthy. White Bass were not observed during electrofishing, though it is likely they are present in the river.
- **Largemouth Bass:** Largemouth Bass abundance and size structure declined from 2017 to 2019. Largemouth Bass had marginal growth (age at 14 inches long was 3.1 years), and condition was below average. Florida strain Largemouth Bass alleles were 43% in 2017.
- **White Crappie:** White Crappie were highly abundant with legal length fish available to anglers. Growth was slow in 2019 with crappie reaching legal length in 3.3 years.

Management Strategies: Conduct general monitoring surveys with trap nets and electrofishing surveys in 2023. Access and vegetation surveys will be conducted in 2023.

Introduction

This document is a summary of fisheries data collected from the South Concho River in 2017-2020. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2017-2020 data for comparison.

River Description

Located within the city limits of San Angelo, the South Concho River between Lake Nasworthy Dam and the Bell Street Dam is comprised of four smaller reservoirs (Metcalf, Ben Ficklin, Lone Wolf, and Bell Street, Table 1, Appendix B) that combined make up 216 acres of surface water and 8.5 miles of river channel. Bell Street Reservoir includes a section of the North Concho and below the confluence forms the main stem Concho River. The City of San Angelo is the controlling authority and primary water uses included municipal water supply and recreation. A water treatment facility is located on Lone Wolf Reservoir and serves as a secondary water supply for the city. Aquatic vegetation is present in these reservoirs with yellow pond-lily and water willow most often observed. Overhanging and fallen trees are common structural habitat features along undeveloped shoreline areas. Mean monthly flows over the past 30 years have averaged 17 cubic feet per second (CFS) while mean monthly discharge has exceeded 100 CFS three times, 1997, 2014, and 2018 (Figure 1; USGS 2020). Other descriptive characteristics for the South Concho River are in Table 1.

Angler Access

The South Concho River has one concrete ramp (Bell Street), two unimproved gravel ramps (South Chadbourne and Loop 306 Bridge right-of way), and one concrete kayak launch (Glenmore Park). Glenmore Park and South Concho Park provide excellent bank access. Additional river access characteristics are in Table 2 and Appendix E.

Management History

Harvest regulation history: The four sections of the South Concho River from Nasworthy Dam to Bell Street Dam fall under community fishing lake (CFL) regulations. Current regulations are found in Table 3.

Stocking history: The South Concho River was frequently stocked with Channel Catfish in the 1990's and 2000's. The Bell Street section received palmetto bass from 1992-1999, but stocking was discontinued when a fishery failed to develop. The complete stocking history is in Table 4.

Vegetation/habitat management history: No significant vegetation or habitat management history exists on the South Concho River.

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 South Concho River (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 2017).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (2 hours at 24, 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 18 randomly selected fish (range 13.0 to 14.9 inches).

Trap netting – Crappie were collected using trap nets (20 net nights at 20 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Ages for crappie were determined using otoliths from 16 randomly selected fish (range 9.0 to 10.9 inches).

Tandem hoop nets – Channel Catfish were collected using 12 tandem hoop-net series at 12 stations. 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).

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

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_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). Standard error (SE) was calculated for structural indices and IOV. Relative standard error ($RSE = 100 \times SE$ of the estimate/estimate) was calculated for all CPUE and creel statistics.

Vehicle Counts – Vehicle counts were obtained from three access points along the South Concho River from February 1, 2018 to January 31, 2019 to assess river utilization. Cameras were mounted in locations to best count vehicles using the access point and programmed to take one picture every 15 minutes during daylight hours. Weekday, monthly, and annual effort estimates were calculated. Counts from the Loop 306 Bridge was collected over a 5-month period from February 1, to June 30, after which the game camera was stolen.

Habitat – A structural and vegetation survey were conducted in 2019. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

River Discharge – Source for river discharge data was the United States Geological Survey (USGS 2020).

Results and Discussion

Habitat: Shoreline habitat was primarily natural shoreline (85.3%) with lesser amounts of rocky shoreline (9.0%) (Table 9). Native emergent vegetation covered 3.8% of the rivers surface area and consisted primarily of water-willow (Table 10). As most of the shoreline had steep banks, emergent vegetation was restricted to the margins of water. Native floating vegetation, primarily American lotus and Yellow pond-lily covered 1.5% of the surface area. Trace amounts of submerged native vegetation was present in the river.

Vehicle Counts: Total vehicle hours for Beaty Road, Loop 306 Bridge, and Bell Street access points were 2,701, 2,951, and 3,701 hours, respectively (Table 11). Daily averages showed that 49.4% of all vehicle counts occurred on weekends (Saturday and Sunday) while the fewest counts occurred on Tuesdays (Table 12). Spring and early summer accounted for the majority of vehicle counts as March-July accounted for 57.5% of all vehicle counts, while November-February had the lowest counts with only 18.2% (Table 13). Vehicle counts were generally lowest in the morning and increased noticeably after 6 pm (Appendix C).

Angler effort was estimated using a vehicle occupancy factor and the ratio of anglers-to-people taken from literature. Adjusting for an assumed 1.67 persons per vehicle (FHWA 2017) and assumed 30 to 40% anglers-to-people ratio (Smucker et al. 2010), estimated angler effort was 1,353 to 1,804 hours for Beaty Road access, 1,478 to 1,971 hours for Loop 306 Bridge access, and 1,859 to 2,478 hours for Bell Street access (Table 13). Estimated angler effort for each river section was 19.7 to 26.2 hours/acre for Metcalf, 42.3 to 56.5 hours/acre for Ben Ficklin, and 36.2 to 48.3 hours/acre for Bell Street. The overall mean angler effort was 38.2 hours/acre and extrapolated to the entire river stretch (216 acres), estimated total effort was 8,251 angler hours. Although these access points are the primary locations anglers access the river, other access locations, both public and private, are present and total angler effort is likely higher than our estimate. Thus, these estimates should be viewed as the lower bound of possible angler effort. Despite these estimates being on the lower bound, they represent a above average level of effort per acre and underscores the importance of this river section to the local anglers in San Angelo.

Prey species: Threadfin Shad electrofishing catch rate was 47.5/h in 2019 (Appendix A). Electrofishing catch rates of Gizzard Shad were 65.0/h in 2019, which was down from 131.5/h in 2017 (Figure 2). Index of Vulnerability (IOV) for Gizzard Shad was 49 and 13 in 2019 and 2017, respectively. Although IOV was higher in 2019 compared to 2017, overall the Gizzard Shad IOV was less than ideal (Figure 2). Total CPUE of Bluegill was 121.0/h and 89.5/h in 2019 and 2017, respectively (Figure 3). Size structure of Bluegill was low with few fish over 6 inches (Figure 3). Abundance and size structure of Bluegill was similar between the 2017 and 2019 surveys. Other sunfish species observed include Longear (22.5/h), Warmouth (8.5/h), Redear (6.5/h), Green (5.5/h), and Redbreast Sunfish (5.0/h) (Appendix A). Total catch rate of all sunfish species was 169.0/h in 2019. Overall catch rates of sunfish and shad species were low and was revealed in poor relative weights for Largemouth Bass and some size classes of crappie. Based on low catch rates, poor Gizzard Shad IOV, and below average relative weights for Largemouth Bass, we conclude these species provide only a marginal prey base for sportfish in the South Concho River. Survey objectives were not met for Bluegill CPUE-T RSE which was 29 in 2019, but was only slight higher than the stated objective of 25.

Channel Catfish: The tandem hoop net catch rate of Channel Catfish was 2.2 and 0.6/net series in 2018 and 2020 (Figure 4). Chaneel Catfish from 10 to 17 inches were collected. Condition was poor in 2018 as relative weights ranged from 80 to 90 among inch groups. Survey objectives for precision of CPUE-stock and size structure were not met due to poor catch rates.

Temperate Bass: No specific sampling was conducted targeting palmetto bass in the South Concho River, but they were observed during electrofishing surveys in 2019. Palmetto bass was stocked upstream in Lake Nasworthy and likely migrated downstream in 2018 when floodgates were opened. No White Bass were observed during electrofishing surveys.

Largemouth Bass: The electrofishing catch rate of stock-length Largemouth Bass was 59.5/h in 2019, slightly lower than the 82.5/h in 2017. Size structure also declined from 2017 to 2019 as PSD dropped from 41 to 24 (Figure 5). Growth of Largemouth Bass in the South Concho was marginal in 2017; mean age at 14 inches (13.0 to 14.9 inches) was 3.1 years (N = 18; range = 2 – 6 years). Body condition in 2017 and 2019 was generally poor. In 2017, Largemouth Bass relative weights ranged from 85 to 88 for most inch groups. In 2019, relative weights were slightly better, but were still less than desirable and ranged from 87 to 94 for most inch groups (Figure 5). Florida Largemouth Bass alleles were 43% in 2017 (Table 14). Florida Largemouth Bass were last stocked in 1994. The only other potential source of Florida alleles was from downstream migration of fish from Twin Buttes Reservoir, through Lake Nasworthy and into the South Concho River. Comparing catch rates among the river sections, from 2017 to 2019, the catch rate at Bell Street went up significantly while the catch rates declined at the other sections above Bell Street (Appendix D). Historic flooding occurred in 2018, and it's possible many of the Largemouth Bass that were in the upper river sections moved downstream and ended up in Bell Street.

Crappie: The trap net catch rate of stock-length White Crappie declined slightly from 19.6/nn in 2017 to 14.7/nn in 2019. The percentage of White Crappie that were legal-length was adequate with a PSD-P of 17 and 36 in 2017 and 2019, respectively (Figure 6). Although size structure was adequate, few large fish were present and no fish over 13 inches were collected. Mean relative weight were generally near 100 for crappie from 7 to 9 inches but declined for larger sizes (Figure 6). Growth of White Crappie in the South Concho was average in 2017; mean age at 10 inches (9.0 to 10.9 inches) was 2.5 years (N = 16; range = 2-3 years) and below average in 2019; mean age at 10 inches (9.0 to 10.9 inches) was 3.3 years (N = 16; range = 1-5 years). Although we did not sample the South Concho prior to 2017, a strong white crappie year-class was produced just upstream in 2014 in Lake Nasworthy. It is likely that either a strong year-class was also produced in the South Concho River or that fish from the Nasworthy year class migrated downstream into the South Concho. Either scenario would explain the high number of 3-year-old crappie observed in 2017 and 5-year-old fish in 2019. All survey objectives met for White Crappie, except for CPUE-stock in 2019, which had an RSE of 37.

Black Crappie were also present in the South Concho, but abundance was low with 1.6/nn in 2017 and 0.4/nn in 2019. Black Crappie ranged in size from 6 to 11 inches. Six Black Crappie were aged in 2017 and all were 3 years old. Relative weights were similar to White Crappie and showed a decline in fish condition with increasing length.

Fisheries Management Plan for South Concho River, Texas

Prepared – July 2020

ISSUE 1: This section of the South Concho River supports abundant White Crappie and adequate Largemouth Bass populations. However, growth and condition were below average. More data is needed before any changes in management strategies could be made.

MANAGEMENT STRATEGIES

1. Monitor sportfish populations with fall electrofishing and trap netting every 4 years.
2. Explore the feasibility of a spring bus-route creel survey, utilizing game camera data to increase probability of intercepting anglers.

ISSUE 2: Access sites for the South Concho River between Nasworthy Dam and Bell Street Dam are limited. The only public access for the Metcalf section was closed by the city in 2019 due to security concerns. Other sites at highway rights-of-ways could be at risk of being closed to access due to problems with dumping and vandalism. The importance of these access sites for anglers need to be communicated to the controlling authorities.

MANAGEMENT STRATEGIES

1. Provide the local controlling authorities vehicle count data, angler effort estimates, and communicate the importance of maintaining open access for anglers.
2. Explore opportunities to enhance angler access, potentially through leased access sites and/or boater access grant funds, if suitable sites can be found.
3. Discontinue sampling the Metcalf river section since there is no longer public access.

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. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the river.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. Keep track of (i.e., map) future inter-basin water transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule (2021–2024)

Sport fish, forage fish, and other important fishes

Primary sport fishes in the South Concho River include Largemouth Bass, Channel Catfish, and White Crappie. Known important forage species include sunfish species, and Gizzard and Threadfin Shad.

Low-density fisheries

Black Crappie: Black Crappie abundance was low in 2017 and 2019, with catch rates of 1.6 to 0.4 fish/nn. While Black Crappie will be collected incidentally during trap netting for White Crappie, no survey objectives for Black Crappie will be established for this species.

Catfishes: Low frequency electrofishing was attempted in 2017, however this produced no catch of either Blue or Flathead Catfish. Though they are likely present in the system, these species are likely in low abundance. Additionally, tandem hoop nets have failed to collect significant numbers of Channel Catfish. Tandem hoop net catch rates ranged from 0.6-2.2/net series and provided little meaningful data. No sampling objectives will be established for any catfish species in the South Concho River from 2021-2024.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are an important sportfish in the South Concho River. Largemouth Bass are managed with the statewide 14-in MLL regulation. Continued collection of trend data with day-time electrofishing in the fall every 4 years will allow for determination of any large-scale changes in the largemouth bass population. Survey objectives will include abundance, size structure, condition, and growth. Sampling data from 2017 and 2019 indicates that 50 stock size fish could be collected with 18 stations. Additionally, 18 stations will provide a high level of precision in abundance estimates. Three river section (Ben Ficklin, Lone Wolf, and Bell Street) will have 6 randomly selected 5-min electrofishing sites for a total 18 stations and will be sampled in fall 2023 (Table 7). This level of effort should be adequate to achieve an CPUE-stock RSE ≤ 25 and collect 50 stock size fish for size structure analysis. Otoliths from 15 fish (5 each section) between 13.0 and 14.9 inches will be collected in 2023 to determine mean age at 14 inches to monitor large-scale changes in growth. Relative weight of Largemouth Bass > 8 inches (total length) will be determined from their length/weight data.

White Crappie: White Crappie are abundant in the South Concho River with stock length catch rates of 19.6/nn and 14.7/nn from the past two surveys. Anglers are known to target crappie, specifically in Lone Wolf and Ben Ficklin sections. Survey objectives are to collect abundance, size structure, condition, and growth. Due to high catch rates we observed from 2017 and 2019, we will reduce our effort from 20 to 12 net nights. Three river section (Ben Ficklin, Lone Wolf, and Bell Street) will have 4 randomly selected trap net sets for a total 12 stations and will be sampled in fall 2023 (Table 7). This should allow for us to collect 100-200 stock size White crappie for size structure estimation. Otoliths from 15 White Crappie (5 each section) between 9.0 and 10.9 inches will be collected in 2023 to determine mean age at 10 inches to monitor large-scale changes in growth. Relative weight of White Crappie > 5 inches (total length) will be determined from their length/weight data.

Sunfish and Shad: Sunfish, Gizzard Shad and Threadfin Shad are important forage fish in the South Concho River. Sampling in 2017 and 2019 revealed total catch rates of Bluegill and Gizzard Shad were relatively low, as neither species had a catch rate over 150 fish/hr of electrofishing. Threadfin Shad were present in low abundance. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in Bluegill and Gizzard Shad relative abundance and size structure.

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Tables and Figures

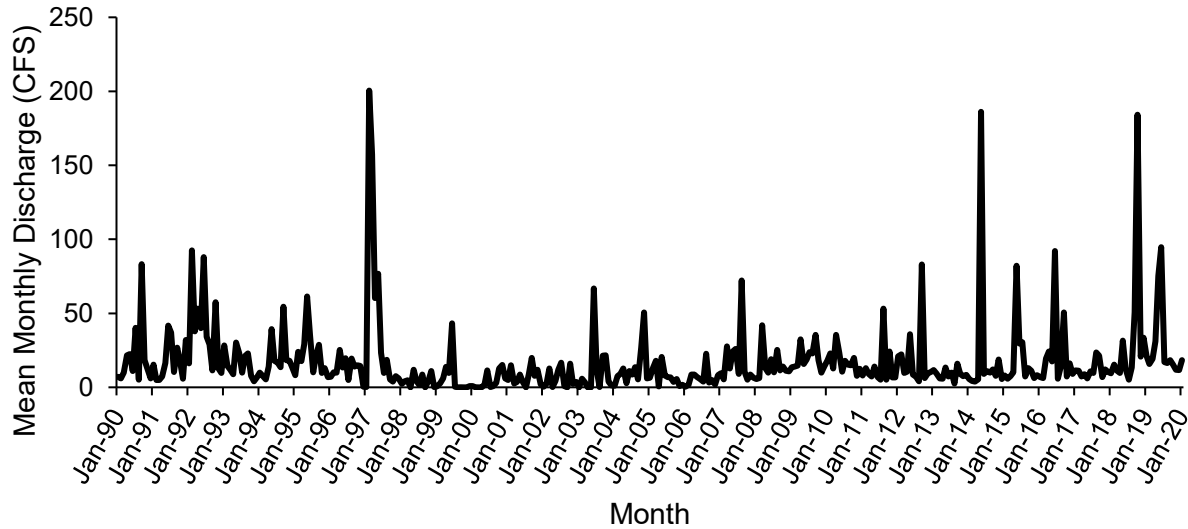


Figure 1. Mean monthly water discharge in cubic feet per second (CFS) at Bell Street Dam on the Concho River.

Table 1. Characteristics of the South Concho River between Lake Nasworthy and Bell Street Dam.

Characteristic	Description
Controlling authority	City of San Angelo
County	Tom Green
Total River Miles	8.5
Dam Elevation (ft. above MSL)	
- Metcalf	1831
- Ben Ficklin	1824
- Lone Wolf	1804
- Bell Street	1791
Conductivity	1,718 $\mu\text{S/cm}$

Table 1. River access characteristics for South Concho River, Texas, August 2019.

Kayak and bank access	Latitude Longitude (dd)	Public	Parking capacity (N)	Condition
Bell Street South Concho Park	31.45325 -100.4147	Y	10	Excellent Concrete boat ramp and abundant bank access
Lone Wolf Glenmore Park	31.44388 -100.4222	Y	20	Excellent Concrete kayak launch and abundant bank access
Lone Wolf S. Chadbourne bridge	31.43074 -100.4316	Y	10	Adequate Gravel ramp at highway right-of- way. Limited bank access.
Lone Wolf Ben Ficklin Rd low water crossing	31.41493 -100.4393	Y	5	Adequate Unimproved low water crossing
Ben Ficklin Loop 306 bridge	31.40808 -100.4487	Y	20	Adequate Gravel ramp at highway right-of- way. Limited bank access.
Metcalf Beaty Rd Access	31.38887 -100.4767	N	10	<i>Closed by the City of San Angelo in 2019</i>

Table 2. Harvest regulations for the South Concho River, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	5 (in any combination)	none
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Palmetto	5	18-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Bell Street Reservoir, Texas. FGL = fingerling; ADL = adults; UNK = unknown.

Species	Year	Number	Size
Blue Catfish	2003	1,129	FGL
Channel Catfish	1967	5,600	UNK
	1969	3,000	UNK
	1973	12,000	UNK
	1974	1,914	UNK
	1991	1,500	FGL
	1992	1,497	FGL
	1993	4,328	FGL
	1994	2,268	FGL
	1995	2,296	ADL
	1997	3,382	FGL/ADL
	1998	1,120	FGL
	1999	1,120	FGL
	2000	1,120	FGL
	2001	4,590	FGL
	2002	1,120	FGL
	2005	1,124	FGL
	2006	1,119	FGL
	2007	1,315	FGL/ADL
	2008	3,397	FGL
	2009	3,611	FGL
	2013	1,740	FGL
	2014	1,234	FGL
	Total	60,395	
Palmetto Bass	1992	2,896	FGL
	1993	275	FGL
	1994	9,390	FGL
	1996	1,453	FGL
	1997	1,653	FGL
	1998	584	FGL
	1999	648	FGL
	Total	16,899	
Warmouth	1969	600	UNK
Bluegill	2001	17,046	FGL
Largemouth Bass	1967	60,800	UNK
	1969	24,000	UNK
	1974	600	UNK
	2016	3,378	FGL
	Total	88,778	
Florida Largemouth Bass	1994	9,000	FGL
	2004	3,390	FGL
	Total	12,390	

Table 4 continued.

Species	Year	Number	Size
White Crappie	1967	1,000	UNK
	1969	1,500	UNK
	1973	1,000	UNK
	Total	3,500	
Green x Redear Sunfish	1967	6,150	UNK
	1993	17,800	UNK
	1995	45,455	UNK
		69,395	

Table 5. Stocking history of Lone Wolf Reservoir, Texas. FGL = fingerling; ADL = adults; UNK = unknown.

Species	Year	Number	Size
Flathead Catfish	1970	2,000	UNK
Channel Catfish	1969	20,000	UNK
	1970	10,000	UNK
	1973	10,000	UNK
	1992	1,992	FGL
	1997	1,275	ADL
	1998	1,250	FGL
	1999	1,250	FGL
	2000	1,250	FGL
	2004	1,282	FGL
	2009	2,577	FGL
	2010	1,310	FGL
	Total	52,186	
Largemouth Bass	1966	15,000	UNK
	1967	90,000	UNK
	1969	16,000	UNK
	1973	800	UNK
	2016	5,101	FGL
		126,901	
Florida Largemouth Bass	1992	8,615	FRY
	1994	8,000	FGL
	Total	16,615	

Table 6. Stocking history of Ben Ficklin Reservoir, Texas. FGL = fingerling; ADL = adults; UNK = unknown.

Species	Year	Number	Size
Flathead Catfish	1970	1,000	UNK
Channel Catfish	1968	4,000	UNK
	1970	4,000	UNK
	1973	2,100	UNK
	1991	1,250	FGL
	1997	1,080	ADL
	1998	1,080	FGL
	1999	1,080	FGL
	2000	1,080	FGL
	2010	1,213	FGL
	Total	16,883	
Largemouth Bass	2016	3,076	FGL
Florida Largemouth Bass	1992	5,169	FRY
	1994	5,000	FGL
	Total	12,390	

Table 7. Stocking history of Metcalf Reservoir, Texas. FGL = fingerling; UNK = unknown.

Species	Year	Number	Size
Channel Catfish	1968	8,000	UNK
	1969	12,450	UNK
	1973	3,000	UNK
	1991	1,250	FGL
	1992	1,996	FGL
	1998	1,475	FGL
	1999	1,475	FGL
	2000	1,475	FGL
	2010	1,281	FGL
	Total	32,402	
Largemouth Bass	1968	62,000	UNK
	2016	6,294	FGL
		68,294	
Florida Largemouth Bass	1994	5,000	FGL

Table 8. Objective-based sampling plan components for South Concho River, Texas 2017-2020.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 14 inches	N = 16, 13.0 – 14.9 inches
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	N = 30, any age
Bluegill ^a	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad ^a	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
<i>Trap netting</i>			
Crappie	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N = 50
	Age-and-growth	Age at 10 inches	N = 16, 9.0 – 10.9 inches
	Condition	W_r	10 fish/inch group (max)
<i>Tandem hoop netting</i>			
Channel Catfish	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure		N ≥ 50 stock

^a No additional effort will be expended to achieve an RSE ≤ 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 9. Survey of structural habitat types, South Concho River, Texas, 2019. Shoreline habitat type units are in miles.

Habitat type	Estimate	% of total
Bulkhead	0.9 miles	4.1
Natural with boat docks	0.3 miles	1.4
Natural	18.6 miles	85.3
Rocky	2.0 miles	9.2

Table 10. Survey of aquatic vegetation, South Concho River, Texas, 2019. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2019
Native submersed	Trace
Native floating-leaved	3.2 (1.5)
Native emergent	8.1 (3.8)

Table 11. Estimated angler hours derived from total vehicle hours observed from three access sites from February 2018 to January 2019.

Access	Total Annual Vehicle Hours	Mean Vehicle Occupancy ^b	Estimated Angler Hours ^c	
			30% Anglers-to-people ratio	40% anglers-to-people ratio
Beaty Road	2,701	1.67	1,353	1,804
Loop 306 Bridge	2,951 ^a	1.67	1,478	1,971
Bell Street	3,710	1.67	1,859	2,478

^a Estimate was extrapolated for a full year using data from the other surveys.

^b Source (FHWA 2017).

^c Source (Smucker et al. 2010).

Table 12. Percentage of daily vehicle counts by day from thee river access sites along the South Concho River February 2018 to January 2019.

Day	Beaty Road	Loop 306 Bridge	Bell Street	Average
Saturday	30.1%	21.1%	24.7%	25.3%
Sunday	24.1%	26.4%	21.8%	24.1%
Monday	8.9%	11.3%	12.0%	10.7%
Tuesday	8.1%	7.9%	9.2%	8.4%
Wednesday	8.8%	10.6%	10.8%	10.1%
Thursday	8.0%	12.3%	10.1%	10.1%
Friday	12.0%	10.5%	11.4%	11.3%

Table 13. Percentage of total monthly vehicle counts by month from thee river access sites along the South Concho River from February 2018 to January 2019. The game camera at the Loop 306 Bridge was stolen in July.

Month	Beaty Road	Loop 306 Bridge	Bell Street	Average
January	4.5%		4.3%	4.4%
February	2.9%	4.0%	5.3%	4.1%
March	13.1%	12.1%	11.3%	12.2%
April	11.3%	9.3%	9.4%	10.0%
May	13.4%	12.7%	12.7%	12.9%
June	8.6%	11.9%	11.7%	10.7%
July	12.1%		11.2%	11.7%
August	9.5%		9.7%	9.6%
September	6.7%		9.4%	8.1%
October	6.7%		6.7%	6.7%
November	6.1%		4.9%	5.5%
December	5.0%		3.3%	4.2%

Gizzard Shad

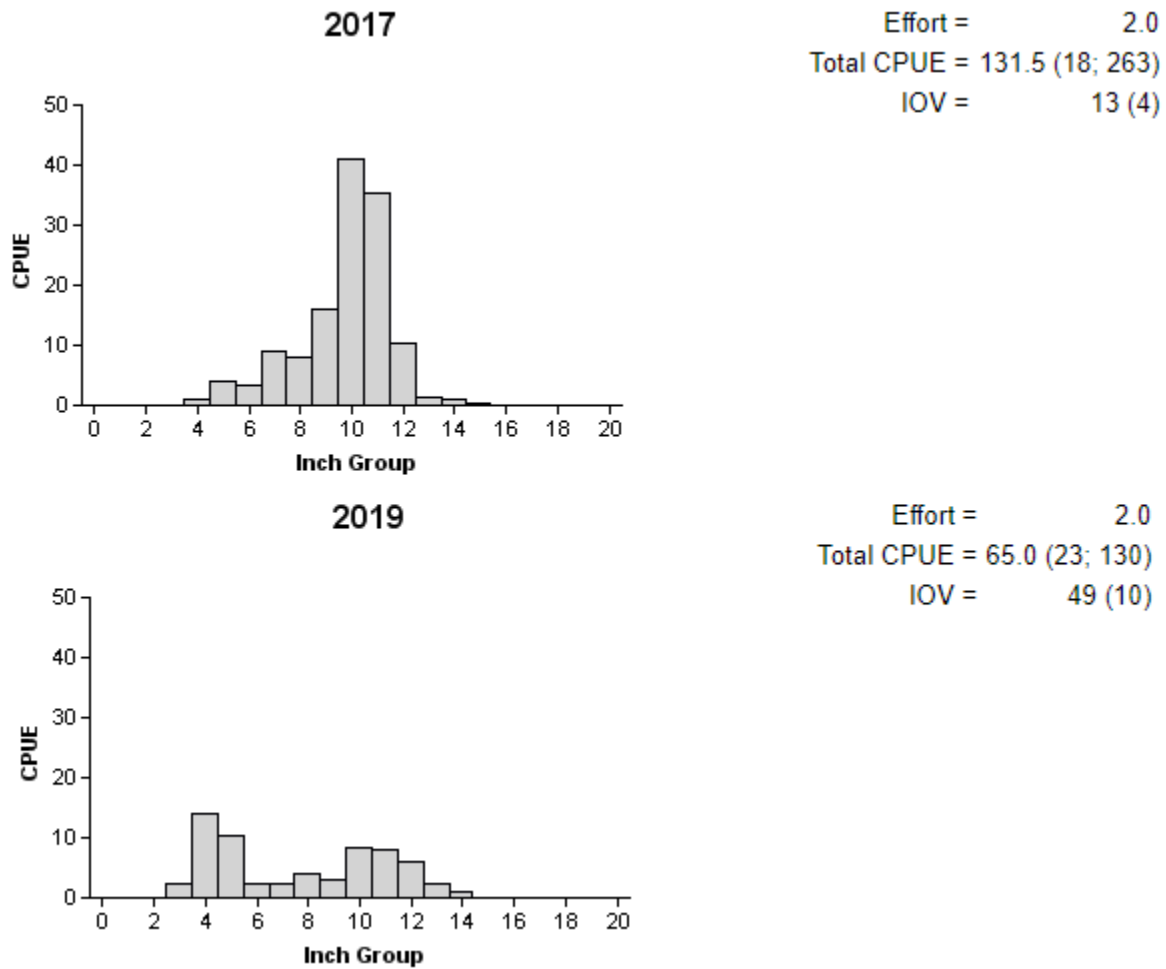


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, South Concho River, Texas, 2017 and 2019.

Bluegill

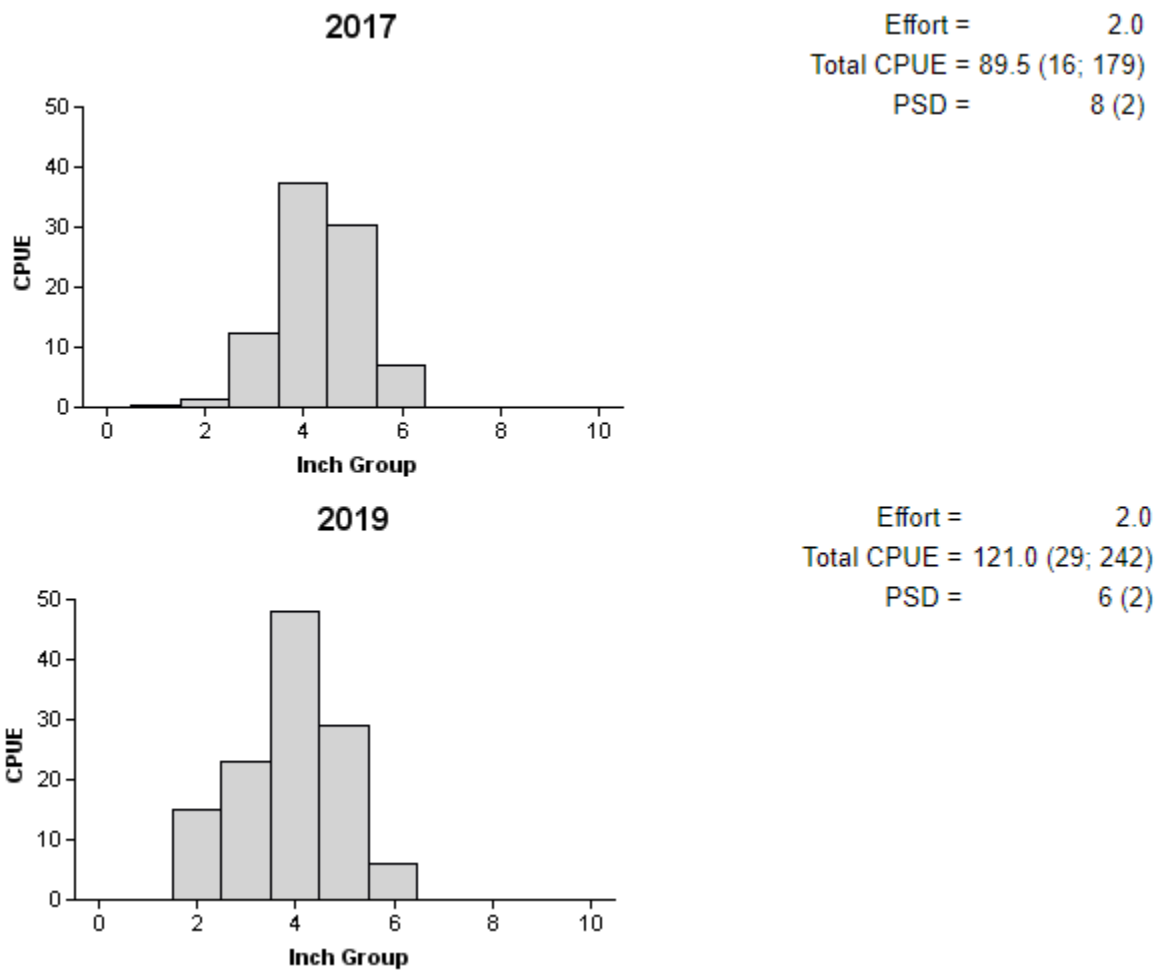


Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, South Concho River, Texas, 2017 and 2019.

Channel Catfish

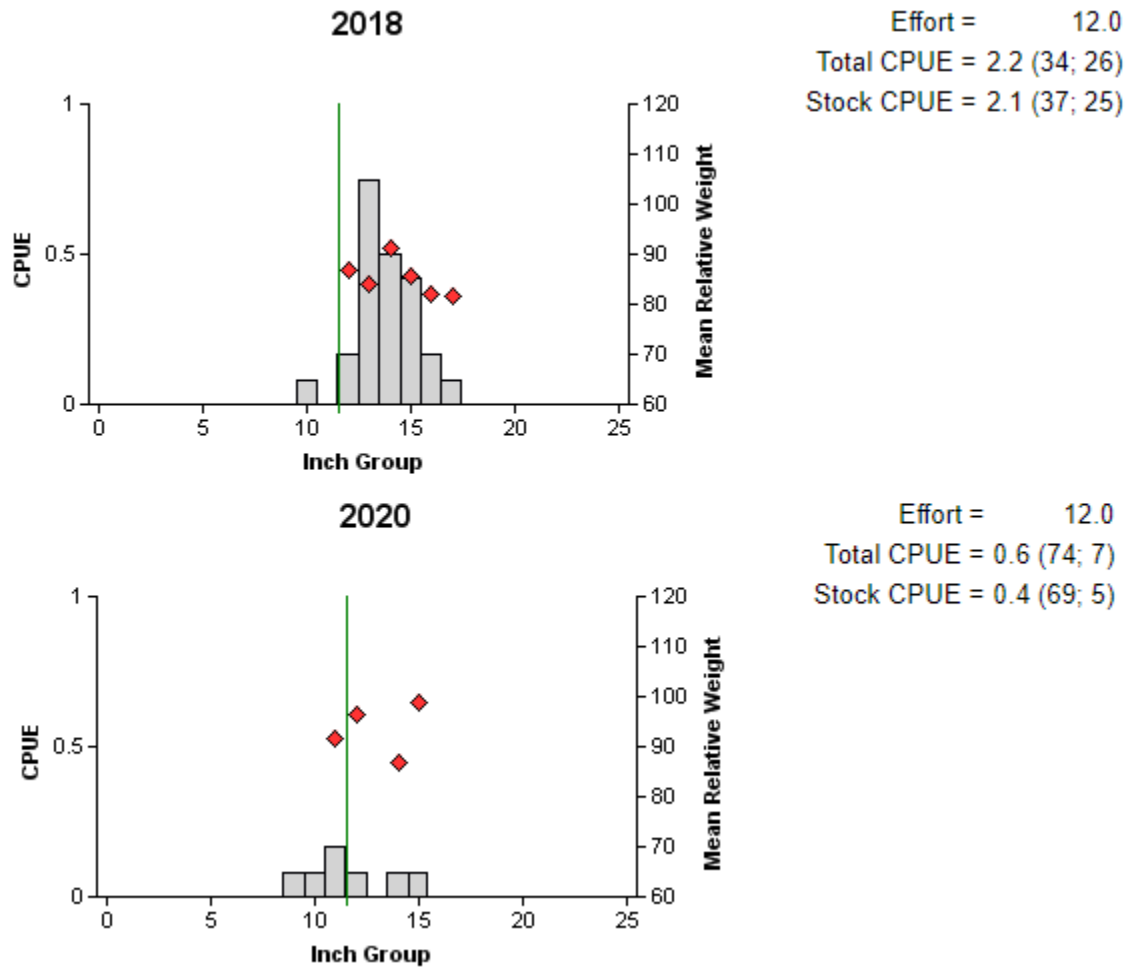


Figure 3. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE) for spring tandem baited hoop net surveys, South Concho River, Texas, 2018 and 2020. Vertical line indicates minimum length limit.

Largemouth Bass

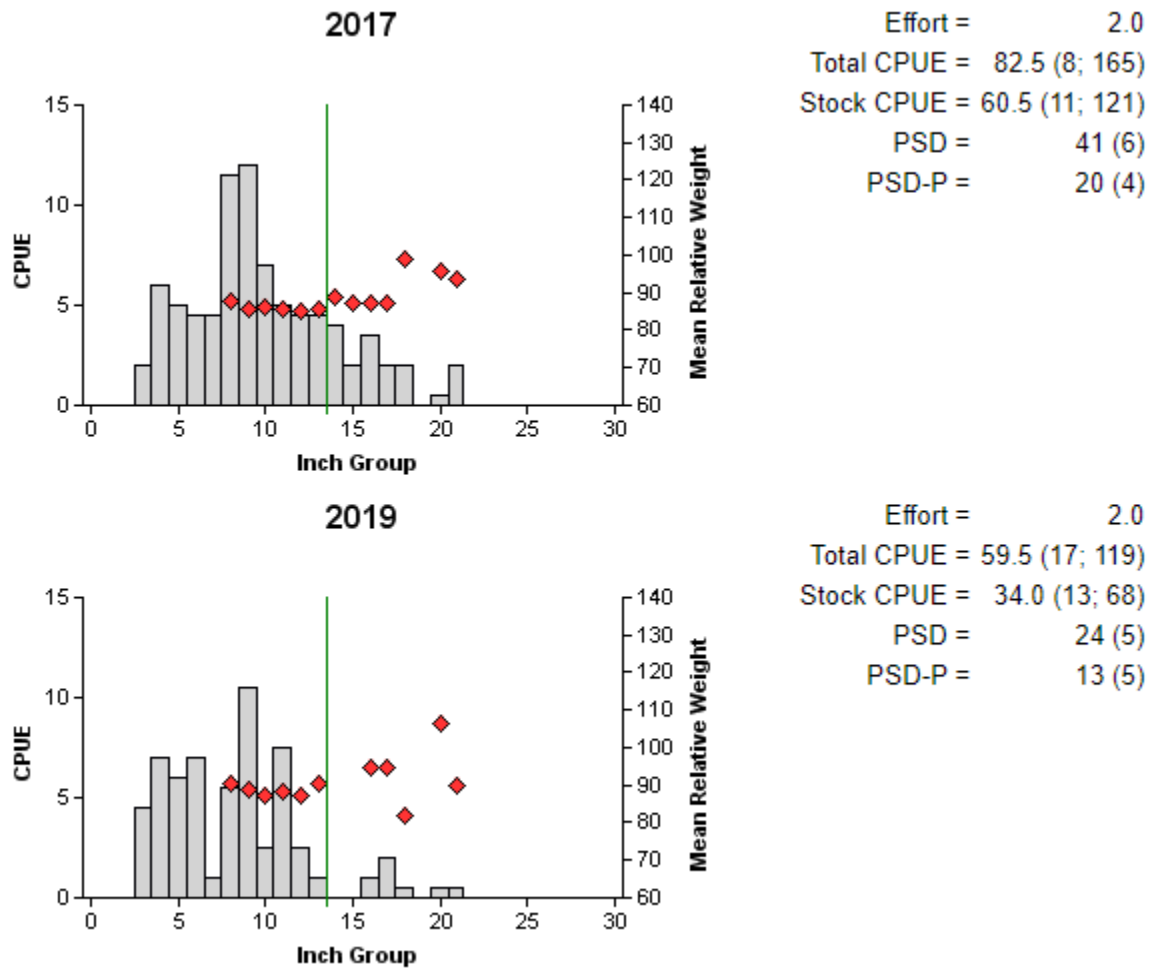


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, South Concho River, Texas, 2017 and 2019. Vertical line indicates minimum length limit.

Table 14. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, South Concho River, Texas in 2017. 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. Genetic composition was determined with micro-satellite DNA analysis.

Year	Sample size	Number of fish				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
2017	40	0	1	38	1	43.0	0

White Crappie

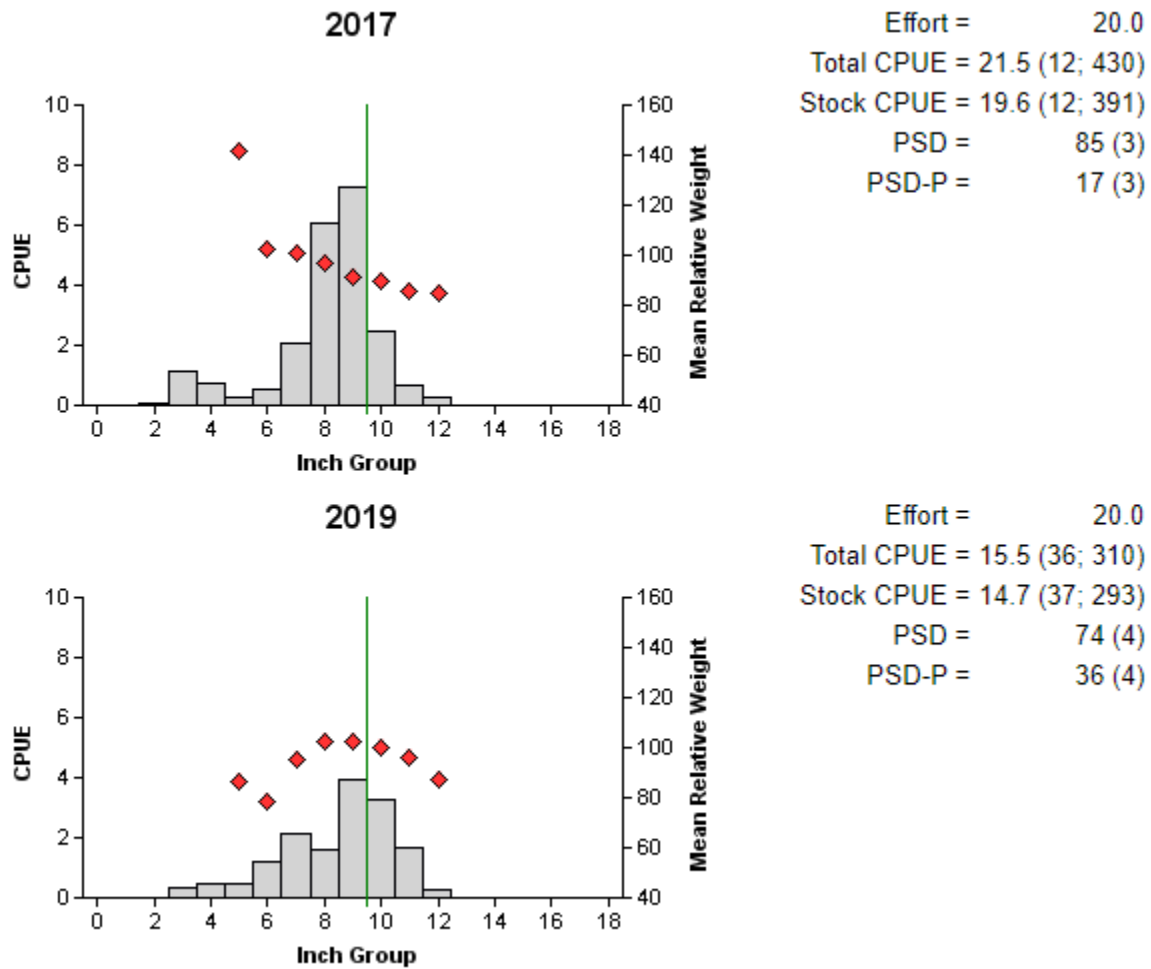


Figure 6. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, South Concho River, Texas, 2017 and 2019. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 15. Proposed sampling schedule for South Concho River, Texas. Survey period is June through May. Tandem hoop 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.

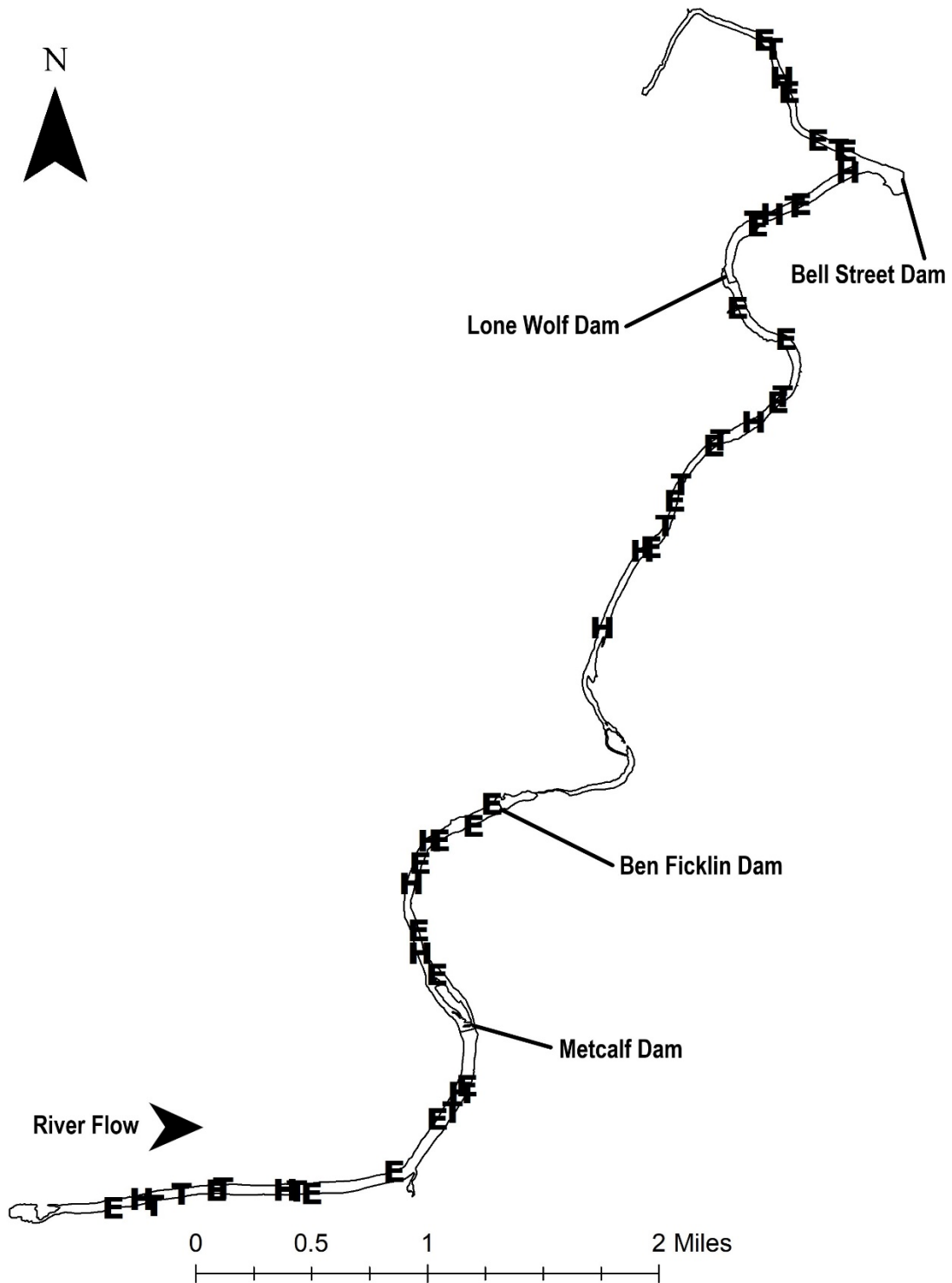
	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Structural Habitat				
Vegetation				S
Electrofishing – Fall (daytime)				S
Trap netting				S
Baited tandem hoop netting				
Report				S

APPENDIX A – Catch rates for all species from all gear types

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from South Concho River, Texas, 2019-2020. Sampling effort was 12 net nights for tandem hoop netting, 20 net nights for trap netting, and 2 hours for electrofishing.

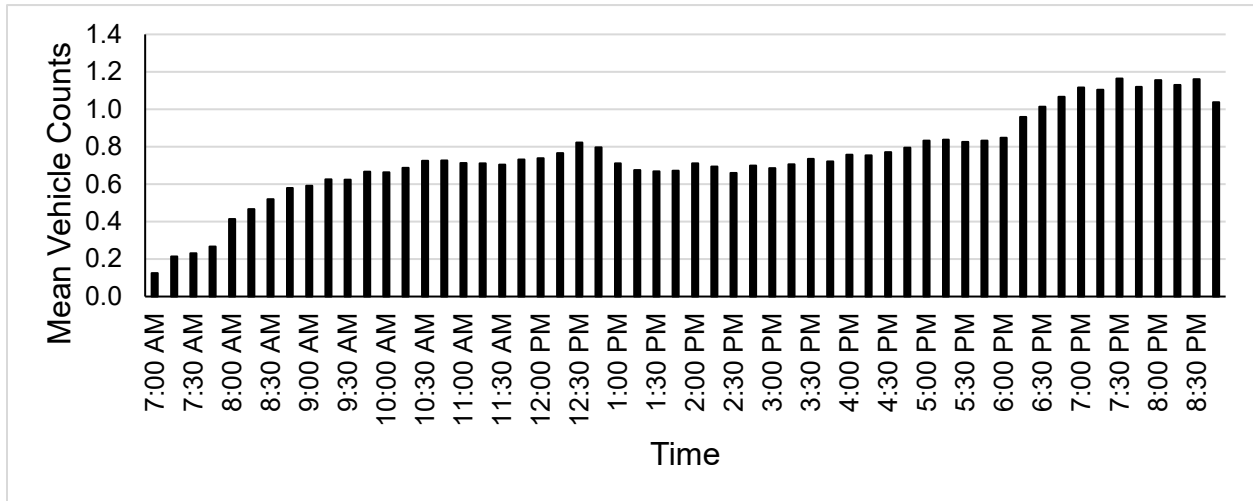
Species	Tandem Hoop Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					130	65.0 (23)
Threadfin Shad					95	47.5 (52)
Channel Catfish	7	0.6 (74)				
Redbreast Sunfish					10	5.0 (48)
Green Sunfish					11	5.5 (57)
Warmouth					17	8.5 (42)
Bluegill					242	121.0 (29)
Longear Sunfish					45	22.5 (44)
Redear Sunfish					13	6.5 (42)
Largemouth Bass					119	59.5 (17)
White Crappie			310	15.4 (36)		
Black Crappie			7	0.4 (60)		

APPENDIX B – Map of sampling locations



Location of sampling sites, South Concho River, Texas, 2019-2020. Trap net, tandem hoop net, and electrofishing stations are indicated by T, H, and E, respectively.

APPENDIX C – Mean vehicle counts per 15-minute time block



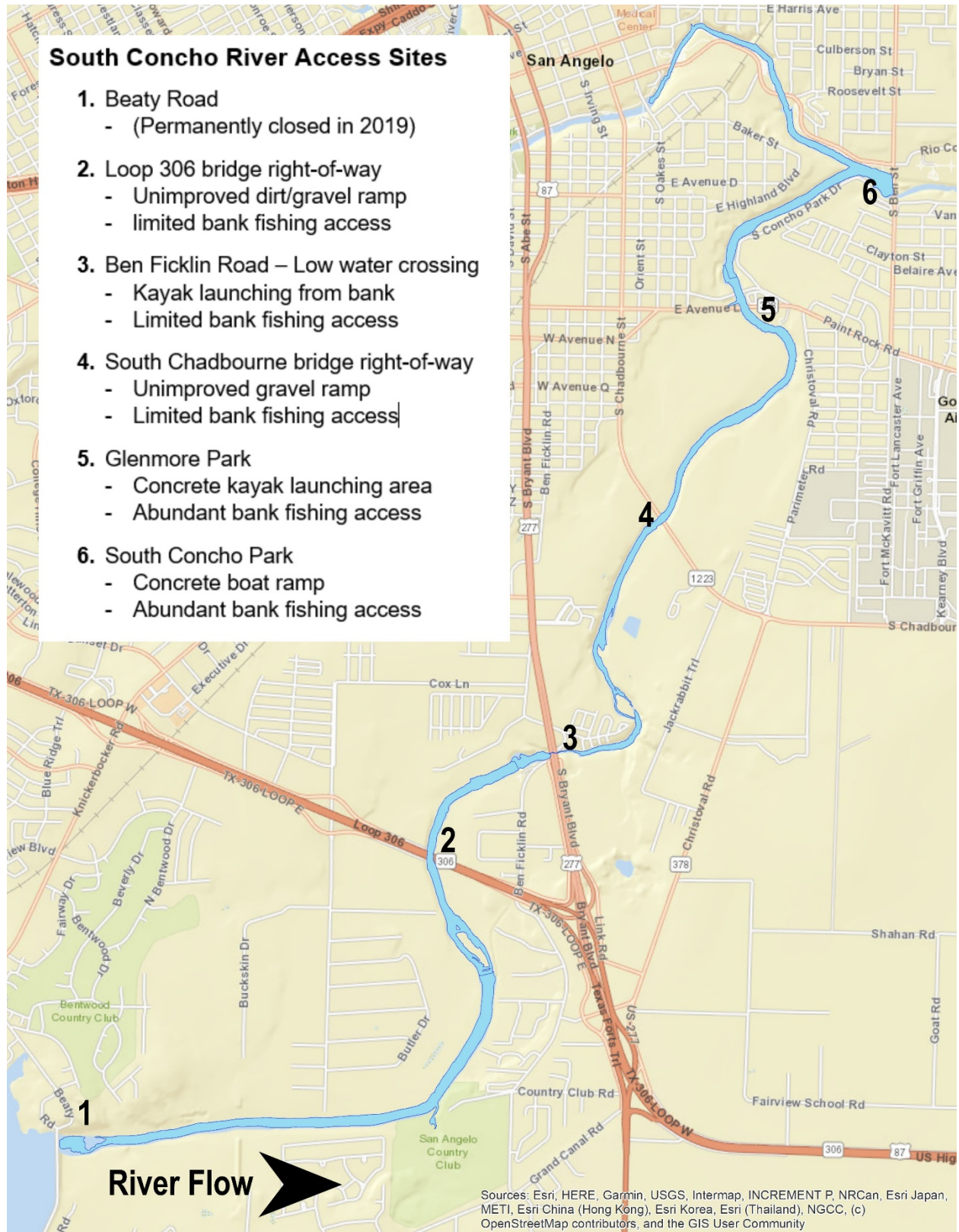
Mean daily vehicle counts per 15-minute increment from 7:00 am to 8:45 pm averaged among the Beaty Road, Loop 306 Bridge, and Bell Street access sites.

APPENDIX D – Catch and size structure among river sections

Total catch rate (CPUE-T), proportional size distribution (PSD), and index of vulnerability (IOV) for selected species among sample years and river sections for the South Concho River. Relative standard errors for CPUE-T and standard errors for PSD and IOV are in parenthesis.

River Section	Largemouth Bass		White Crappie		Bluegill		Gizzard Shad	
	CPUE-T	PSD	CPUE-T	PSD	CPUE-T	PSD	CPUE-T	IOV
Bell Street								
2017	72.0 (24)	40 (6)	25.0 (20)	71 (4)	94.0 (27)	0 (0)	60.0 (24)	63 (6)
2019	122.0 (15)	30 (10)	39.8 (49)	70 (4)	274.0 (43)	2 (1)	64.0 (40)	72 (19)
Lone Wolf								
2017	64.0 (13)	29 (15)	23.0 (15)	82 (5)	48.0 (35)	17 (6)	56.0 (22)	0 (0)
2019	50.0 (27)	10 (11)	10.4 (49)	74 (9)	34.0 (53)	29 (13)	46.0 (50)	4 (3)
Ben Ficklin								
2017	94.0 (16)	38 (10)	11.3 (34)	96 (1)	66.0 (32)	6 (4)	134.0 (18)	0 (0)
2019	46.0 (23)	31 (7)	5.2 (37)	100 (0)	82.0 (34)	6 (6)	64.0 (40)	38 (19)
Metcalf								
2017	100.0 (5)	50 (13)	16.8 (30)	93 (2)	144.0 (26)	11 (3)	276.0 (20)	12 (4)
2019	22.0 (26)	22 (15)	8.4 (14)	66 (8)	92.0 (42)	7 (3)	88.0 (51)	64 (7)

APPENDIX E – South Concho River Access Points





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