

Lake Waxahachie

2021 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 Lake Waxahachie were surveyed in 2021 using electrofishing. Historical data are presented with the 2021 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 Waxahachie is a 656-acre impoundment located on Prong Creek in the Trinity River Basin approximately 4 miles south of Waxahachie, Texas. Water level has fluctuated up to three feet below spillway elevation since 2018. Lake Waxahachie has high productivity. Habitat features consisted of standing timber, rocks, boat docks and native emergent aquatic plants.

Management History: Important sport fish include White Bass, Largemouth Bass, White and Black Crappie, and catfishes. Blue Catfish were stocked in 2003, 2005, 2007 and 2018. The management plan from the 2017 survey report primarily focused on monitoring the sport and prey-fish populations through a combination of electrofishing and trap netting in 2021, and gill netting in 2022.

Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch of Gizzard Shad was poor, and few (14%) were available as prey to most sport fish. Electrofishing catch of Bluegill was poor and most were less than 6-inches long.
- **Catfishes:** Blue, Channel and Flathead Catfish are present within the reservoir; however, no sampling was conducted to describe these fisheries due to low water levels.
- **White bass:** White Bass are present in the reservoir. Recruitment is inconsistent, likely due to variable water levels and associated inflow.
Largemouth Bass: Largemouth Bass were less abundant and displayed moderate body condition. Largemouth Bass growth to legal length was moderate (average age at 14 inches long was 2.6 years)
- **Crappie:** Black and White Crappie are present in the reservoir and historically have provided a popular fishery. No sampling was conducted to describe these fisheries due to low water levels.

Management Strategies: Continue standard surveys on four-year rotation. Continue to manage the fishery with current harvest regulations. Contact the city about possible boat ramp improvements to improve access during low water levels.

Introduction

This document is a summary of fisheries data collected from Lake Waxahachie from 2021. 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 2021 data for comparison.

Reservoir Description

Lake Waxahachie is a 656-acre impoundment constructed in 1958 on Prong Creek, a tributary of the Trinity River. It is located in Ellis County 4 miles south of Waxahachie, Texas and is operated and controlled by the city of Waxahachie. Primary water uses included municipal water supply and recreation. Lake Waxahachie was eutrophic with a mean trophic state index (TSI) chl-a of 57.7 (Texas Commission on Environment Quality 2022). Habitat at time of sampling consisted of rocks, standing timber, and native emergent vegetation. Water level has fluctuated from conservation pool to three feet below conservation pool since 2018 (Figure 1). Other descriptive characteristics for Lake Waxahachie are in Table 1.

Angler Access

Lake Waxahachie has three public boat ramps. Access was limited to boat anglers in the fall of 2021 and winter of 2022 because the end of the boat ramp was above the waterline. Additional boat ramp characteristics are in Table 2. Shoreline access is limited to the public boat ramp areas and Waxahachie City Park located around Public Ramp 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Norman and Ott 2018) included:

1. Develop proposal to deploy artificial habitat structures and pursue local partnerships with the City of Waxahachie and local angler groups.

Action: No local partnerships were able to be identified and deployment of artificial habitat did not occur during this report cycle.

2. Continue invasive species monitoring.

Action: Invasive species monitoring is on-going. Additional actions to address invasive species not warranted at this time.

Harvest regulation history: Largemouth Bass regulations reverted from a 14- to 18-inch slot-size limit to a 14-inch minimum-length limit on September 1, 2003. The statewide regulation for Blue Catfish, Channel Catfish and their hybrids were changed September 1, 2021 to a 25 daily bag, with no minimum length and only 10 over 20 inches. Current regulations are found in Table 3.

Stocking history: Lake Waxahachie was stocked with Blue Catfish fingerlings in 2018 to enhance angling opportunities. The complete stocking history is in Table 4.

Vegetation/habitat management history: Pilot introductions of several native aquatic plant species (wild celery, Illinois pondweed, water stargrass, pickerel weed and bull tongue) were conducted in 2007 however, fluctuating water levels prevented the introduced plants from establishing within the reservoir.

Water transfer: No interbasin transfers exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Waxahachie (Norman and Ott 2018). Primary components of the OBS plan are listed in Table 5. Objective-based sampling plan components for Lake Waxahachie, Texas 2021–2022.. 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). Trap net and gill net surveys were not conducted due to low water conditions during the fall of 2021 and spring of 2022.

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1 hour at 12, 5-min stations). Standard nighttime surveys were conducted in 2013 and 2017 and daytime electrofishing in 2021. 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 15 randomly selected fish (range 13.0 to 14.9 inches).

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.

Habitat – A vegetation habitat survey was conducted in 2021. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Water level – Source for water level data was the United States Geological Survey (USGS 2022) and from the Heaven County Water Control & Irrigation District No. 1.

Results and Discussion

Habitat: Aquatic vegetation in Lake Waxahachie continued to be limited (< 3% of total reservoir surface area); likely attributable to fluctuating water levels and substrate composition. Water willow was the only aquatic species with considerable surface coverage (~ 16 acres; Table 6). Approximately 2 acres of smartweed surrounded the shoreline of the upper end of the reservoir. Other species present (< 2 acres) included American lotus, bulrush, American pondweed, waterleaf, river cane, and buttonbush.

Prey species: Electrofishing catch rates of Bluegill and Gizzard Shad were 45.0/h and 197.0/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was poor indicating that just 14% of Gizzard Shad were available to existing predators, notably lower than the nighttime survey in 2013 (72%) and similar to 2017 (9%) (Figure 2). Sunfish continued to be the primary forage option in the reservoir (Appendix A). Total CPUE of sunfish was 76/hr in 2021. Nighttime surveys in 2013 and 2017 yielded higher relative abundance estimates (range: 403.0 – 418.0/hr). Bluegill CPUE was 45/hr and Longear sunfish CPUE was 30/hr in 2021 (Figure 3 and Figure 4). Nighttime surveys in 2013 and 2017 yielded higher relative abundance estimates for both Bluegill and Longear sunfish. Total CPUE of Redear sunfish was similar over the past three surveys (40.0 – 55.0 /hr) despite changes in sampling design (Figure 4).

Largemouth Bass: The electrofishing catch rate of stock-length Largemouth Bass was 78.0/h in 2021, which was lower than the nighttime surveys conducted in 2013 (134/hr) and 2017 (146/hr, Figure 5). The relative abundance of harvestable fish (CPUE-14) has remained consistent over the past three surveys. Growth of Largemouth Bass in Lake Waxahachie was moderate for the region; average age at 14 inches (13.1 to 14.9 inches) was 2.6 years ($N = 15$; range = 2 – 4 years). Body condition in 2021 was sub-optimal (relative weight under 90) for nearly all size classes of fish and similar to body condition in previous surveys.

Fisheries Management Plan for Lake Waxahachie, Texas

Prepared – July

ISSUE 1: Low water conditions in 2021 - 2022 limited boating access on Lake Waxahachie. Removal of sediment at all existing boat ramps would greatly benefit angler access during future drought periods.

MANAGEMENT STRATEGY

1. Consult with the City of Waxahachie about providing equipment to clear boat ramp sediment and pursuing a boater access grant to extend existing boat ramps.

ISSUE 2: 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.

MANAGEMENT STRATEGIES

1. Cooperate with the City of Waxahachie to post appropriate signage at access points around the reservoir.
2. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule (2022-2026)

Sport fish, forage fish, and other important fishes

Sport fishes in Lake Waxahachie include Black and White Crappie, Blue and Channel Catfish, White Bass, and Largemouth Bass. Important forage species are Gizzard and Threadfin Shad, and sunfishes.

Low-density fisheries

White Bass: White bass are present in low-densities and no directed effort for this species was documented in the most recent (spring 2007) creel survey. In accordance with the catfish sampling objectives, up to 10 randomly selected gill netting sites will be sampled in the winter of 2026 to determine presence or absence. No additional effort will be expended.

Survey objectives, fisheries metrics, and sampling objectives

Crappie: Crappie provide a popular fishery in Lake Waxahachie and were the most targeted species during the spring 2007 creel survey, accounting for 38% of the directed angler effort (Bennet and Ott 2010). Due to the popularity of this fishery, crappie relative abundance, size structure, and body condition (CPUE, PSD and W_r) will continue to be monitored every four years to determine large-scale changes that may spur further investigation. A minimum of 10 randomly selected trap netting sites will be sampled in the fall of 2025. No additional sampling will occur if sampling objectives are not achieved for relative abundance ($RSE \leq 25$) and size structure ($N \geq 50$) for combined crappie species (Table 7).

Catfishes: It is unclear if the Blue Catfish population is still expanding, stable or decreasing. Previous surveys have indicated slow growth and no natural recruitment for Blue Catfish and limited directed effort among anglers for all catfish species (Bennett and Ott 2010, Norman and Ott 2018). Historical data suggests over 25 net nights may be necessary to estimate relative abundance, size structure and body condition with acceptable precision, however intensive sampling (i.e., over 10 net nights) is not warranted for this under-utilized fishery. Five randomly selected sites will be sampled with gill nets in the winter of 2026, to estimate relative abundance with an $RSE \leq 25$ and size structure of at least 50 stock-size fish, for both catfish species. An additional five sites will be considered if survey objectives are not met after 10 total net nights. Lower precision ($RSE < 35$) of CPUE estimates will be acceptable, if necessary, to make historical comparisons and determine further sampling needs (e.g., age and growth analysis) or listing as a low-density fishery (Table 7).

Largemouth Bass: Largemouth Bass were the second most targeted species in the most recent (spring 2007, Bennet and Ott 2010) creel survey, accounting for 17% of the directed angling effort. Due to the relative importance of this fishery, Largemouth Bass trend data on relative abundance, size structure, body condition, and growth (CPUE, PSD, W_r , average age at 14") will continue to be monitored in fall 2025 with daytime electrofishing. A minimum of 12 randomly selected daytime electrofishing stations will be sampled with up to six additional stations if sampling objectives are not met for stock-sized fish ($RSE \leq 25$, $N = 50$). Additional daytime effort or reinstating nighttime surveys will be considered if total catch rates are $N\text{-stock} < 50$ in 2025. Otoliths will be removed from 13 specimens collected (13.0-14.9 inches), if available, for age and growth analysis (Table 7).

Prey Species: Gizzard Shad, Threadfin Shad and sunfish are all important prey species in Lake Waxahachie. Traditionally, trend data (CPUE and IOV for Gizzard Shad, CPUE and PSD for sunfishes) was monitored every four years with fall nighttime electrofishing. Following Largemouth Bass sample objectives, 12 randomly selected daytime electrofishing sites will be sampled in the fall of 2025 to monitor the prey base. No additional effort will be expended, regardless of survey precision or sample size; relative weight of Largemouth Bass will provide supplemental information on the prey base availability within Lake Waxahachie (Table 7).

Literature Cited

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Tables and Figures

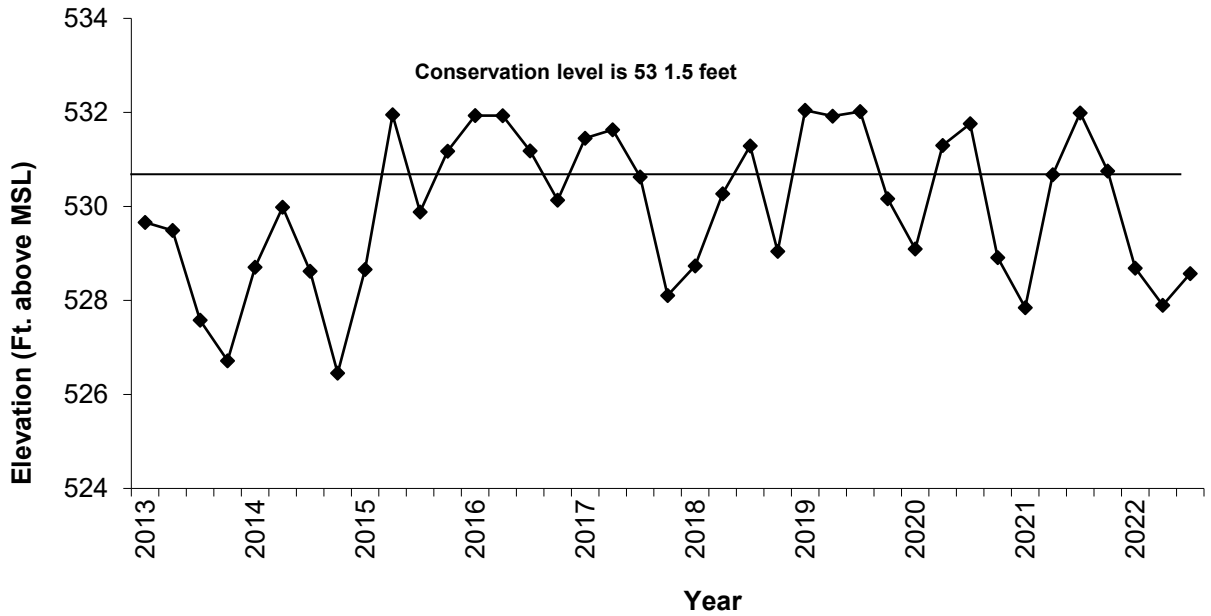


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Waxahachie, Texas.

Table 1. Characteristics of Lake Waxahachie, Texas.

Characteristic	Description
Year constructed	1958
City	City of Waxahachie
County	Ellis
Reservoir type	Tributary
Shoreline Development Index	2.8
Conductivity	240 μ S/cm

Table 2. Boat ramp characteristics for Lake Waxahachie, Texas, August 2021. Reservoir elevation at time of survey was 530.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Public Ramp 1	32.345181 -96.833542	Y	20	529.8	Adequate, limited use in low water conditions
Public Ramp 2	32.344442 -96.816928	Y	10	524.4	Adequate, limited use in low water conditions
Public Ramp 3	32.344294 -96.813308	Y	25	525.4	Adequate, limited use in low water conditions

Table 3. Harvest regulations for Lake Waxahachie, Texas.

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

^a Of which, only 10 can be 20 inches or greater in length.

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

Table 4. Stocking history of Lake Waxahachie, Texas. FGL = fingerling; ADL = adults.

Species	Year	Number	Size
Threadfin Shad	1987	<u>1,000</u>	ADL
	Total	1,000	
Blue Catfish	2003	57,658	FGL
	2005	49,594	FGL
	2007	55,200	FGL
	2018	<u>56,461</u>	FGL
	Total	218,913	
Florida Largemouth Bass	1988	69,459	FGL
	1997	70,051	FGL
	1998	<u>69,011</u>	FGL
	Total	208,521	

Table 5. Objective-based sampling plan components for Lake Waxahachie, Texas 2021–2022.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 14 inches	$N = 13, 13.0 - 14.9$ inches
	Condition	W_r	10 fish/inch group (max)
Bluegill ^a	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad ^a	Abundance	CPUE–Total	RSE ≤ 25
	Prey availability	IOV	$N \geq 50$
<i>Trap netting</i>			
Crappie	Size structure	PSD, length frequency	$N = 50$
	Age-and-growth	Age at 10 inches	$N = 13, 9.0 - 10.9$ inches
<i>Gill Netting</i>			
Channel and Blue Catfish	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure		$N \geq 50$ 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 6. Survey of aquatic vegetation, Lake Waxahachie, Texas, 2013–2021. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2013	2017	2021
Native submersed	0.1 (<1)	trace	
Native floating-leaved	0.8 (<1)	0.5 (<1)	0.5 (<1)
Native emergent		14.1 (1.8)	17.8 (2.8)

Gizzard Shad

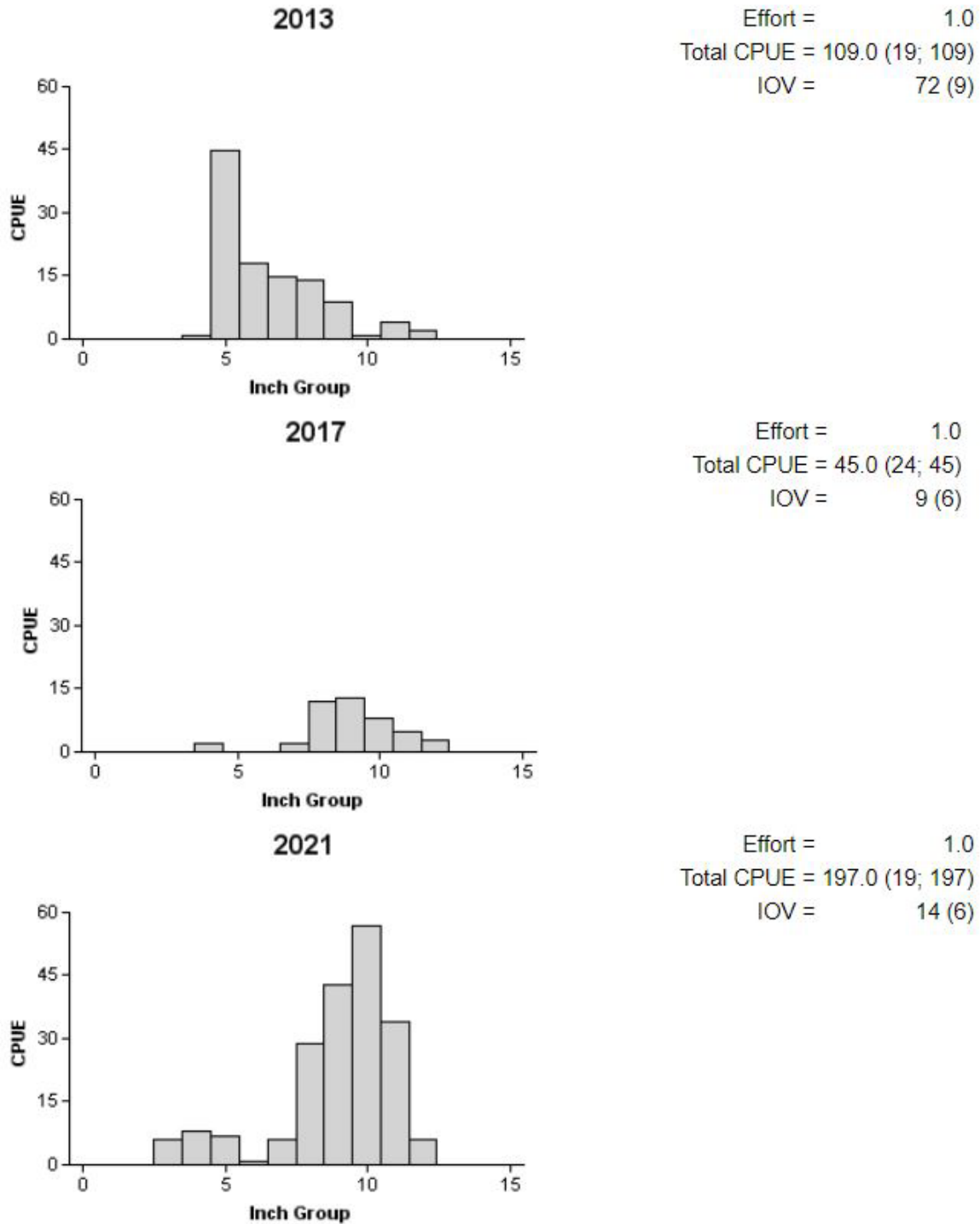


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Waxahachie, Texas, 2013, 2017 and 2021. Nighttime sampling occurred in 2013 and 2017, day-time sampling occurred in 2021.

Bluegill

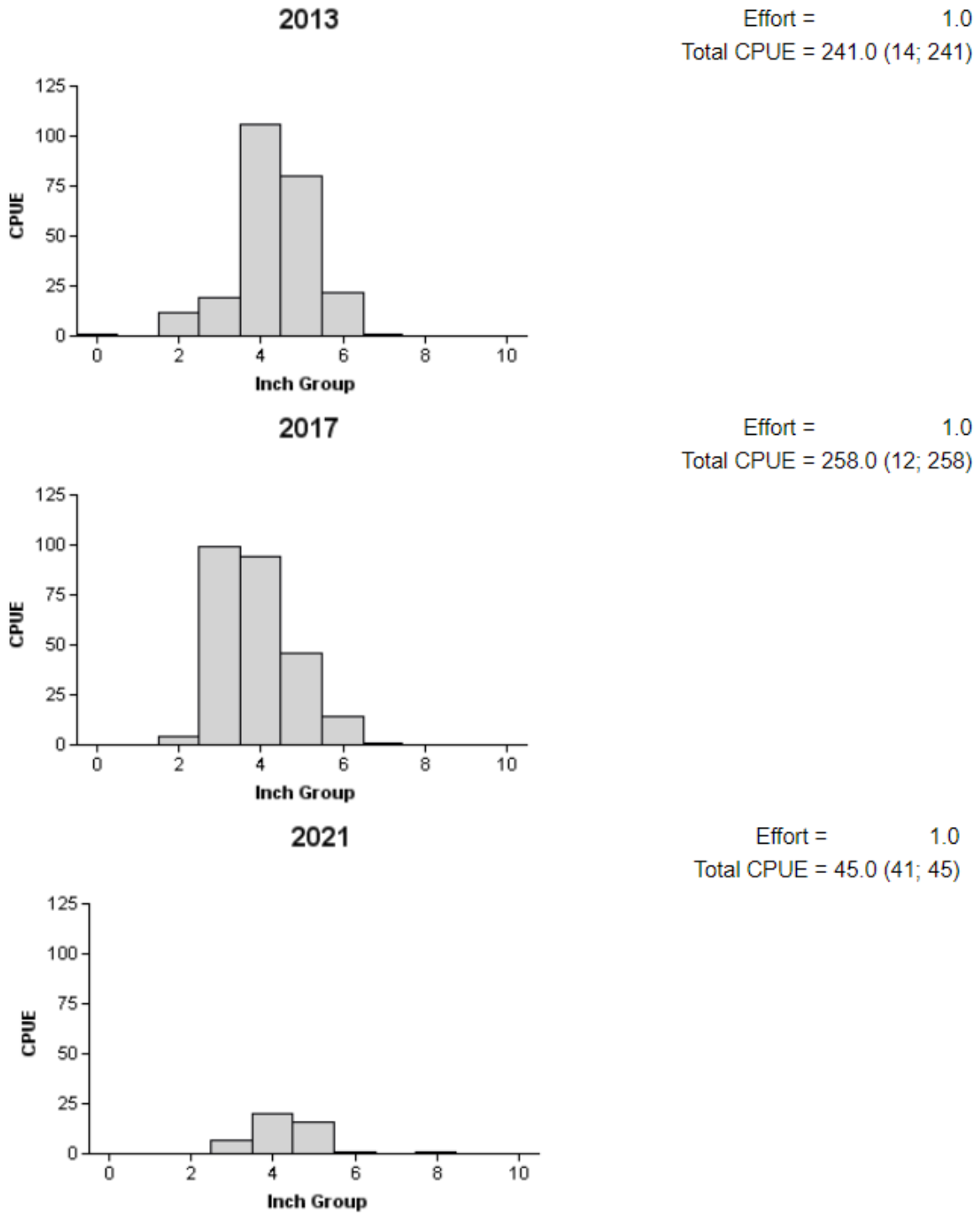


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE) for fall electrofishing surveys, Lake Waxahachie, Texas, 2013, 2017 and 2021. Nighttime sampling occurred in 2013 and 2017, day-time sampling occurred in 2021.

Redear Sunfish

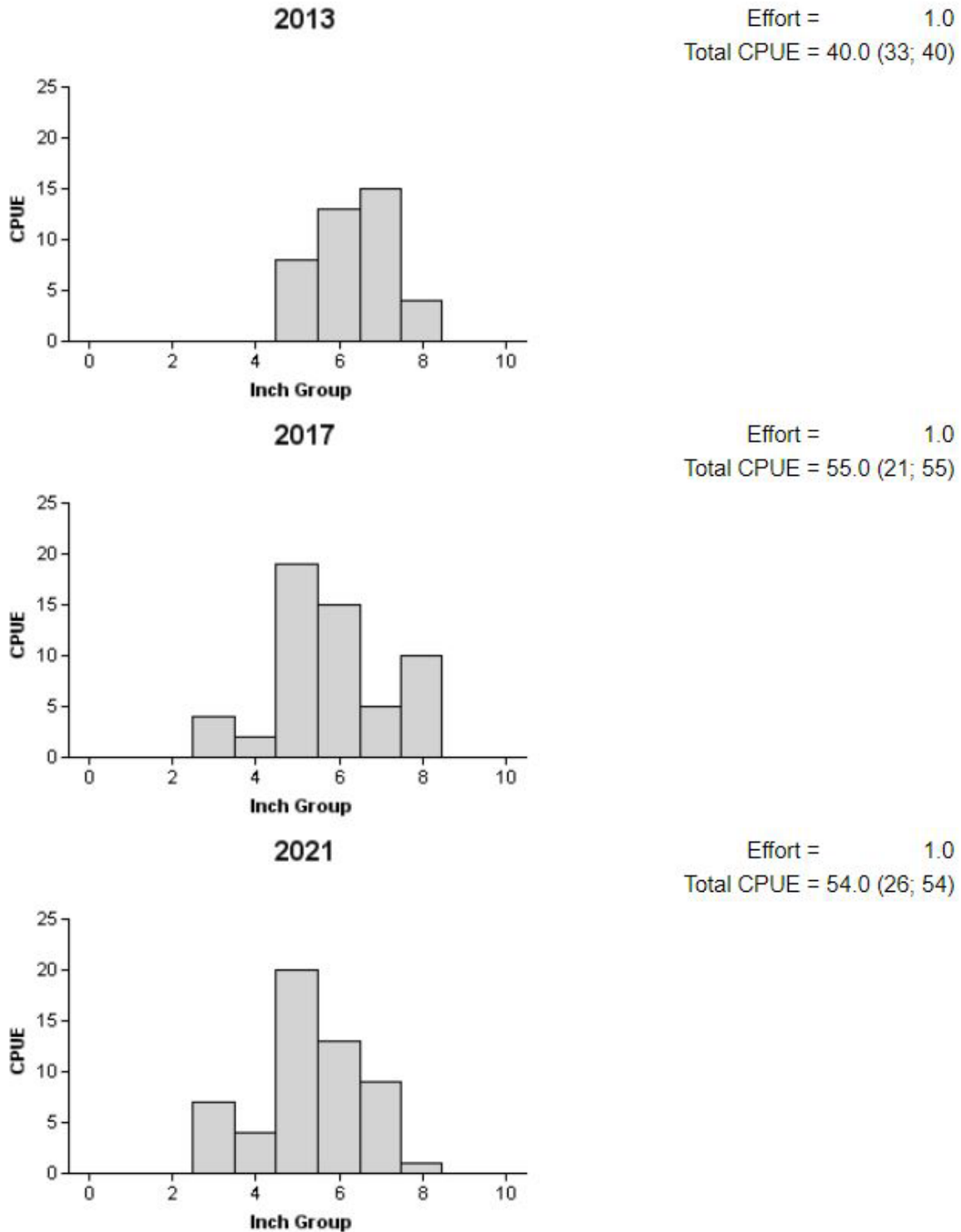


Figure 4. Number of Redear sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE) for fall electrofishing surveys, Lake Waxahachie, Texas, 2013, 2017 and 2021. Nighttime sampling occurred in 2013 and 2017, day-time sampling occurred in 2021.

Largemouth Bass

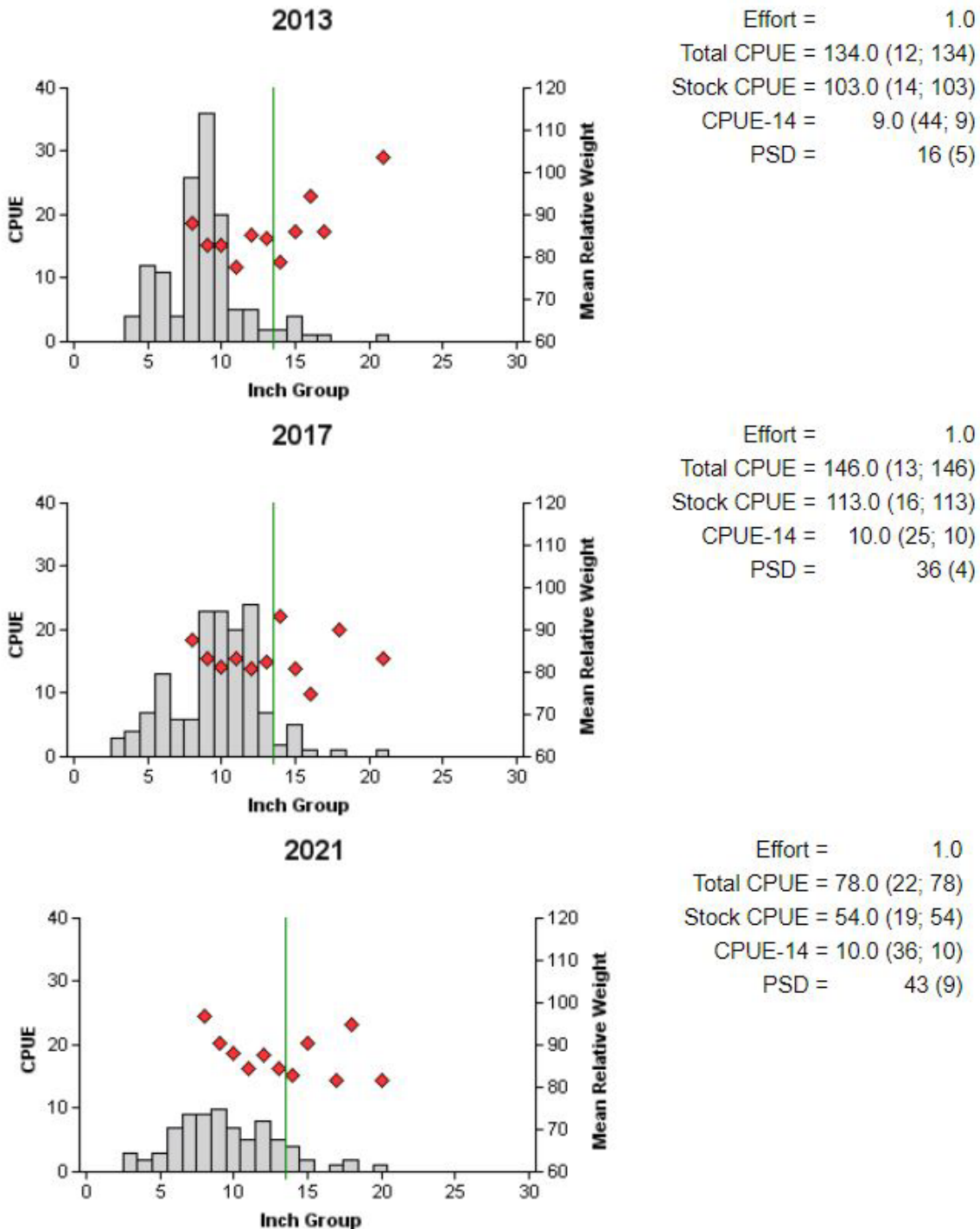


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall nighttime electrofishing surveys, Lake Waxahachie, Texas, 2013, 2017 and 2021. Nighttime sampling occurred in 2013 and 2017, day-time sampling occurred in 2021. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Lake Waxahachie, 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.

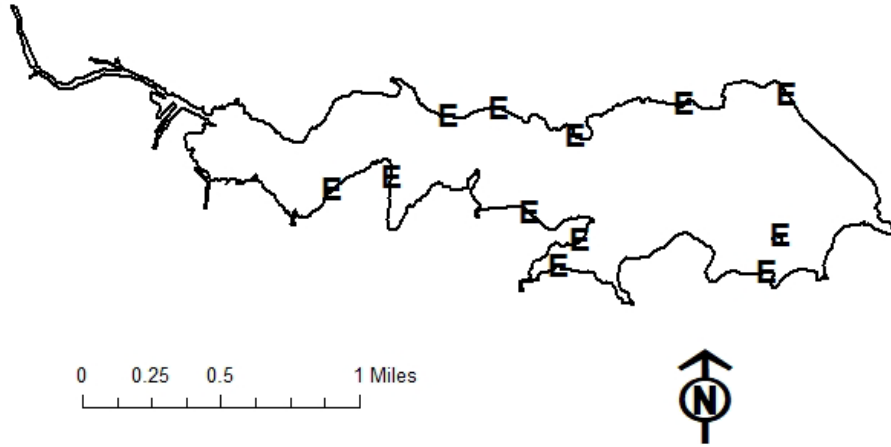
	Survey year			
	2022-2023	2023-2024	2024-2025	2025-2026
Angler Access				X
Vegetation				X
Electrofishing – Fall				X
Trap netting				X
Gill netting				X
Report				X

APPENDIX A – Catch rates for all species from electrofishing

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from electrofishing from Lake Waxahachie, Texas, 2021. Sampling effort was 1 hour for electrofishing.

Species	Electrofishing	
	N	CPUE
Gizzard Shad	197	197 (19)
Threadfin Shad	660	660 (34)
Warmouth	1	1 (100)
Bluegill	45	45 (41)
Longear Sunfish	30	30 (51)
Redear Sunfish	54	54 (26)
Largemouth Bass	78	78 (22)

APPENDIX B – Map of sampling locations



Location of sampling sites, Lake Waxahachie, Texas, 2021. Electrofishing stations are indicated by E. Water level was near full pool at time of sampling.



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