

# Sweetwater Reservoir

## 2018 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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## Survey and Management Summary

Fish populations in Sweetwater Reservoir were not surveyed in fall 2015 through spring 2019 because of drought conditions and golden alga fish kill events.

**Reservoir Description:** Sweetwater Reservoir is a 630-acre reservoir located in Sweetwater, Texas. The reservoir is in the Brazos River Basin on Bitter and Cottonwood creeks, tributaries of the Clear Fork. It is owned and operated by the City of Sweetwater and is used for municipal and recreational purposes. In July 2007, water level increased substantially and was nearly full. The water level dropped to 27.5 feet below conservation pool (CP) as of May 2015. In winter 2018, the reservoir filled to CP. A golden alga bloom caused major fish kill event in March 2003 and winter 2014. A mild fish kill event was caused by golden alga in winter 2015. Boat access consists of two public-use ramps, and bank access was limited to the boat ramp areas and the park.

**Management History:** Historically, important sport fish have included Channel Catfish, Largemouth Bass, and White Crappie. A 14- to 18-inch slot limit on Largemouth Bass was implemented in September 2001 but reverted to statewide regulations in September 2018. After the reservoir filled in November 2018, sport and forage fishes were reintroduced beginning in 2019. Fathead Minnows, Bluegill, Largemouth Bass, and Channel Catfish were stocked.

### Fish Community

- **Prey species:** No data were collected because of drought and golden alga fish kill events.
- **Catfishes:** No data were collected because of drought and golden alga fish kill events.
- **Largemouth Bass:** No data were collected because of drought and golden alga fish kill events.
- **White Crappie:** No data were collected because of drought and golden alga fish kill events.

**Management Strategies:** The reservoir should continue to be managed with existing regulations. If waterbody conditions allow for continued survival of fishes, additional stockings of Channel Catfish and Largemouth Bass will be requested as a part of the drought recovery plan. Survey of the fish populations will resume in 2019 and 2022 with exploratory, nighttime electrofishing and in 2022 with tandem-hoop nets and trap nets. Golden alga will be monitored annually during winter and early spring. Potential improvements to the public boat ramp will be discussed with the controlling authority. Discuss exotic salt cedar survey results with the controlling authority and work on developing potential strategies for control. Inform the public of the threats and impacts of golden alga and invasive species.

## Introduction

This document is a summary of conditions at Sweetwater Reservoir in 2018-2019. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. No fisheries data were collected during the 2015-2019 monitoring period because of prolonged drought conditions and fish kill events caused by golden alga blooms.

## Reservoir Description

Sweetwater Reservoir is a 630-acre impoundment constructed in 1930 on Bitter and Cottonwood creeks, located in Nolan County approximately 12 miles southeast of Sweetwater, Texas. It is owned and operated by the City of Sweetwater. Primary water use is water supply and recreation. Water level was 27.5 feet below conservation pool (CP) in May 2015. In November 2018 after heavy rains, the water level filled to CP (Figure 1). A fish kill caused by a golden alga bloom occurred in March 2003 and winter 2014. Species lost during the golden alga bloom in 2003 and 2014 included Gizzard Shad, sunfish, Largemouth Bass, Channel Catfish, crappie, and Common Carp. In 2015, Channel Catfish and Common Carp were lost during the golden alga bloom. Other fish species (e.g., Gizzard Shad, Largemouth Bass, and crappie) were likely not present in the reservoir after the golden alga fish kill in 2014. Significant golden alga blooms also occurred in 2016-2018. Habitat in 2010 consisted of mud shoreline and dead terrestrial brush but following the water level rise in 2018 the reservoir now has lots of flooded terrestrial habitat. Other descriptive characteristics for Sweetwater Reservoir are in Table 1.

## Angler Access

Sweetwater Reservoir has two public boat ramps and public bank access was limited to the boat ramp areas and the park. Both public boat ramps were out of the water and unusable until the reservoir refilled in 2018. Other boat ramp characteristics for Sweetwater Reservoir are shown in Table 2.

## Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Goldstrohm and Homer 2015) included:

1. Low water conditions and higher than normal conductivity level during winter months have allowed favorable conditions for golden alga blooms in Sweetwater Reservoir. Stockings were not recommended until there was a significant water level rise and adequate water quality conditions.
 

**Action:** No fish stockings occurred during low water conditions. After the water level was at CP, Fathead Minnows and Bluegill were stocked in spring 2019 to provide forage in the reservoir. Largemouth Bass and Channel Catfish were also stocked in 2019.
2. Periodically monitor the reservoir for presence of golden alga and alga blooms by collecting water samples and performing golden alga cell counts and fisheries toxicity tests.
 

**Action:** During winter months from 2014-2019, water samples were collected, and golden alga cell counts and fisheries toxicity tests were performed.
3. Meet with the City of Sweetwater and discuss the potential of ramp improvement projects.
 

**Action:** Discussions with the City of Sweetwater have been initiated and a meeting is being planned for 2019 to discuss needed improvements.
4. Inform the public of the impacts and threats of invasive species.
 

**Action:** Newspaper articles were written about the negative impacts of invasive species with emphasis on zebra mussels. Education efforts have been made to inform the public and local bass clubs about how they can prevent the spread of invasive species. Signage about invasive species is present at the reservoir.

**Harvest regulation history:** A 14- to 18-inch slot limit on Largemouth Bass was implemented from September 2001 to August 2018. In 2018, the Largemouth Bass slot limit was changed, and the regulations reverted to the statewide five-fish daily bag limit and 14-inch minimum length limit. All other sport fish in Sweetwater Reservoir are managed with statewide regulations (Table 3).

**Stocking history:** A major fish kill caused by a golden alga bloom occurred in 2003. Fish populations had to be reintroduced once water level increased and the threat of a golden alga bloom lessened. The stocking recovery began in 2007 and by the end of 2008, all major forage and sport fishes had been stocked at least once. During 2014 and 2015, golden alga blooms once again caused severe fish kill events, and all fish in the reservoir were thought to be lost. Once the reservoir refilled to CP in 2018, Fathead Minnows and Bluegill were stocked in spring 2019 as an attempt to re-establish forage for sport fish in the reservoir. Fingerling Florida Largemouth Bass and Channel Catfish were also stocked in 2019. The complete stocking history is shown in Table 4.

**Vegetation/habitat management history:** Sweetwater Reservoir has no vegetation or habitat management history.

**Water transfer:** No interbasin transfers are known to exist.

## Methods

No fisheries surveys were conducted in 2015 through 2019 because of extreme drought conditions and fish kill events.

Water samples were collected during the winter months (December- February) and were used to calculate golden alga cell density (cells/mL) as well as ichthyotoxic units (ITUs) then assigned a toxicity index score (Greenberg et. al. 1992).

In July 2015, a roving survey was conducted to determine salt cedar coverage at the reservoir. Water level was approximately 27.5 feet below conservation pool elevation at the time of the survey. The water body perimeter was circumnavigated, and salt cedar coverage at the reservoir was spatially recorded by using Global Positioning Systems (GPS) equipment and notations on satellite imagery. A digital map of salt cedar coverage was created by using Global Information Systems (GIS) software and satellite imagery. Salt cedar coverage in acres was calculated by using GIS software.

Source for water level data was the United States Geological Survey (USGS 2019).

## Results and Discussion

**Habitat:** No data on aquatic habitat were collected because of drought conditions and the fish kill events. Salt cedar observed in the July 2015 roving survey covered roughly 296.5 acres of the reservoir; most has since been inundated (Appendix A).

**Golden alga:** The cell density ranged from 0-118,000 cells/mL (Table 5). Trends in cell density and ITUs begin low in December and increase in January and decrease again in February for most years. Often, cell counts over 25,000 cells/mL resulted in ITUs  $\geq 25$  with exceptions of those samples collected 1/13/2014 and on 3/4/2014 in the creek area. In general, if ITUs were  $\geq 25$ , golden alga was the dominant algal species in the sample. Conductivity ranged from 808-4,044  $\mu\text{S}/\text{cm}$  during the months when water samples were collected.

**Prey and Sportfish species:** No fisheries data were collected because of drought conditions and golden alga related fish kill events.

# Fisheries Management Plan for Sweetwater Reservoir, Texas

Prepared – July 2019

**ISSUE 1:** All fish populations in Sweetwater Reservoir were assumed to be lost because of multiple severe golden alga fish kill events beginning in 2014. A recovery stocking plan began in 2019 following an improvement in the water level and quality (e.g., conductivity, dissolved oxygen, etc.).

## MANAGEMENT STRATEGIES

1. Conduct an exploratory electrofishing survey in 2019 to determine stocking needs.
2. Request and stock Channel Catfish and Largemouth Bass fingerlings if needed and contingent upon water conditions.
3. Conduct management stockings of White Crappie and Gizzard Shad if needed and contingent upon water conditions.

**ISSUE 2:** Low water levels and periods of high conductivity during winter months have allowed favorable conditions for golden alga blooms to occur in Sweetwater Reservoir. Golden alga's blooms pose threats to fisheries at the reservoir.

## MANAGEMENT STRATEGIES

1. Periodically monitor the reservoir for presence of golden alga and toxicity by collecting monthly water samples during November-March and performing golden alga cell counts and toxicity tests.
2. If golden alga cell counts are high and toxicity is evident, stockings will be suspended until water quality conditions improve.
3. Educate the public about golden alga blooms and impacts to fishes by newspaper articles, television interviews, and social media posts.

**ISSUE 3:** The main boat ramp dock needs improvements after many years of being out of the water. Additionally, the City of Sweetwater has generated a parks master plan with suggested improvements at Sweetwater Reservoir.

## MANAGEMENT STRATEGIES

1. Meet with the City of Sweetwater to discuss improvement projects at the reservoir and collaborate on ways to accomplish some of the goals regarding Sweetwater Reservoir in the City of Sweetwater master parks plan.
2. Continue building and maintaining working relationships among program partners (e.g., anglers, fishing guides, local businesses, news media, etc.) that would be interested in fish habitat and angler access improvement projects at Sweetwater Reservoir.

**ISSUE 4:** Invasive salt cedar (*Tamarix* spp.) has become established at the reservoir and had dense coverage prior to the reservoir filling. Effects of salt cedar at the reservoir are not completely understood, but high density and extensive coverage may pose problems with water levels and chloride concentrations in the reservoir.

## MANAGEMENT STRATEGIES

1. Meet with the City of Sweetwater to discuss results of the 2015 survey.
2. Work with the TPWD Invasive Species Team and the controlling authority to develop potential strategies for controlling salt cedar in the reservoir and in the reservoir watershed.

**ISSUE 5:** 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 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 reservoir.
2. Educate the public about invasive species by 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) existing and future inter-basin water transfers to facilitate potential invasive species responses.



## Objective-Based Sampling Plan and Schedule (2019–2023)

Sport fish, forage fish, and other important fishes: Historically, sport fishes present in Sweetwater Reservoir included Channel Catfish, Largemouth Bass, and White Crappie. Important prey species included Gizzard Shad and Bluegill.

Low-density fisheries: Fish populations in Sweetwater Reservoir were not surveyed in fall 2015 through fall 2019 because of extreme low water level and consecutive fish kill events caused by golden alga blooms. After the water level rise to CP during fall 2018, all fish species were assumed to be lost or in low densities.

Survey objectives, fisheries metrics, and sampling objectives:

Stockings of Bluegill, Largemouth Bass, and Channel Catfish were conducted in 2019 as part of the fisheries recovery plan to re-establish sport fish populations. Additional Largemouth Bass and Channel Catfish will be requested in 2020 should water quality conditions be suitable and golden alga blooms do not occur. Sampling for sport fish and prey species is necessary to assess if species had moved into the reservoir from surrounding water bodies within the watershed as well as to assess stocking efforts. Sampling will be conducted using exploratory electrofishing in fall 2019 and 2022. Sampling will also be conducted by using exploratory tandem-hoop netting and trap netting in 2022 (Table 6). Relative abundance will be determined for species sampled without a target level of precision. Data will be used to determine what species are present and to ascertain additional stocking needs. During both electrofishing surveys in 2019 and 2022, fin clips from 30 random Largemouth Bass will be collected and used for genetic analysis to assess allele frequencies for Florida and Northern Largemouth Bass.

### Literature Cited

- Greenberg, A. E., L. S. Clescerl, and A. D. Eaton. 1992. Standard methods for the examination of water and wastewater, 18th ed. American Public Health Association, American Water Works Association, and Water Environment Federation, Washington D.C.
- Goldstrohm, N. and M. Homer Jr. 2015. Sweetwater Reservoir, 2014 fisheries management survey report. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-3, Austin.
- United States Geological Society (USGS). 2019. National water information system: Web interface. Available: <http://waterdata.usgs.gov/tx/nwis> (July 2019).

## Tables and Figures

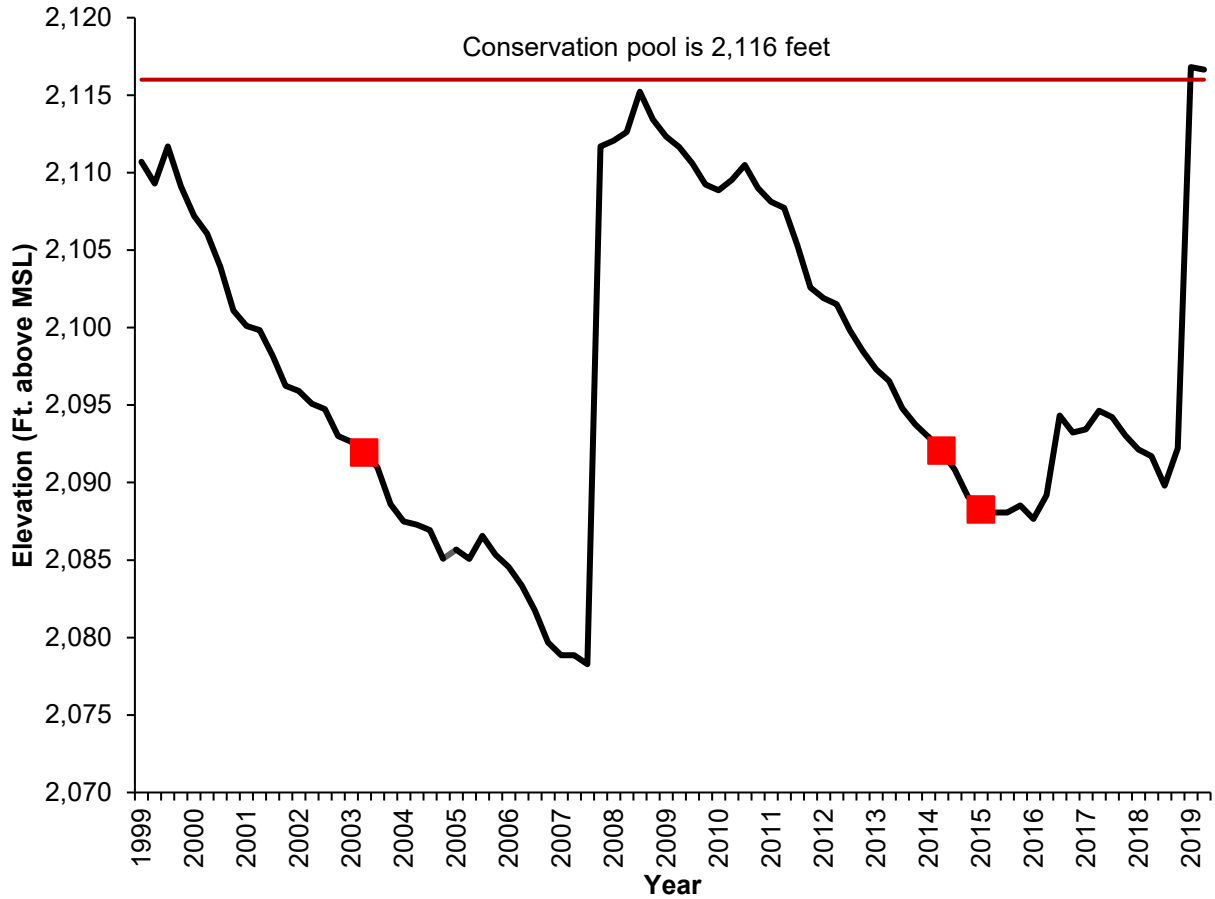


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Sweetwater Reservoir, Texas. Conservation pool is 2,116 feet above mean sea level, shown as the red line. Reservoir maximum depth is approximately at 2,070 feet above mean sea level. Dates of fish kill events occurring in March 2003, January 2014, and January 2015 with corresponding water level are shown as red boxes.

Table 1. Characteristics of Sweetwater Reservoir, Texas.

Characteristic	Description
Year constructed	1930
Conservation pool (CP)	2,116 feet above mean sea level
Maximum depth	2,070 feet above mean sea level
Controlling authority	City of Sweetwater
County	Nolan
Reservoir type	Tributary
River basin	Brazos River Basin
Shoreline Development Index (SDI)	4.62
USGS 8-Digit HUC Watershed	12060102 (Upper Clear Fork Brazos)
Conductivity	979-4,053 $\mu\text{S}/\text{cm}$

Table 2. Boat ramp characteristics for Sweetwater Reservoir, Texas, March 2019. Reservoir elevation at time of survey was 2,116 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Main Ramp	32.437541 -100.300439	Y	20	2,093	Accessible
Golf Course Ramp	32.435750 -100.308438	Y	5	2,102	Accessible

Table 3. Harvest regulations for Sweetwater Reservoir, 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	14-inch minimum
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Sweetwater Reservoir, Texas. FRY = fry; FGL = fingerling; ADL = adults; UNK=Unknown.

Species	Year	Number	Size
Fathead Minnow	2007	12,500	ADL
	2019	8,980	ADL
	Total	21,480	
Golden Shiner	2007	1,000	ADL
Inland Silverside	2008	500	ADL
Gizzard Shad	2008	500	ADL
Bluegill	2007	64,545	FGL
	2008	64,601	FGL
	2009	86,421	FGL
	2019	2,976	ADL
Total	218,543		
Channel Catfish	2008	62,973	FGL
	2009	63,441	FGL
	2019	64,446	FGL
	Total	190,860	
Flathead Catfish	1973	1,600	UNK
Florida Largemouth Bass	1996	1,169	FGL
	1997	2,412	FGL
	1998	25,000	FGL
	1999	15,998	FGL
	2000	12,821	FGL
	2008	63,338	FGL
	2009	72,257	FGL
	2019	524,906	FRY
Total	717,901		
Largemouth Bass	1966	70,000	FGL
ShareLunker Largemouth Bass	2008	39,970	FGL
Walleye	1984	3,512,500	FRY
	1977	122,000	FRY
	1976	8,000	FGL
	Total	3,642,500	
White Crappie	2007	50	ADL

Table 5: Water samples were used to calculate golden alga (*Prymnesium parvum*) cell density (cells/mL) and Ichthyotoxic Units (ITUs) for Sweetwater Reservoir 2014-2019. Algae community were noted in the comments. For samples without golden alga present (i.e., below detectible limit [BDL]), toxicity was not conducted; these samples are indicated by NC for Ichthyotoxic Units (ITUs). N/A = Not Available.

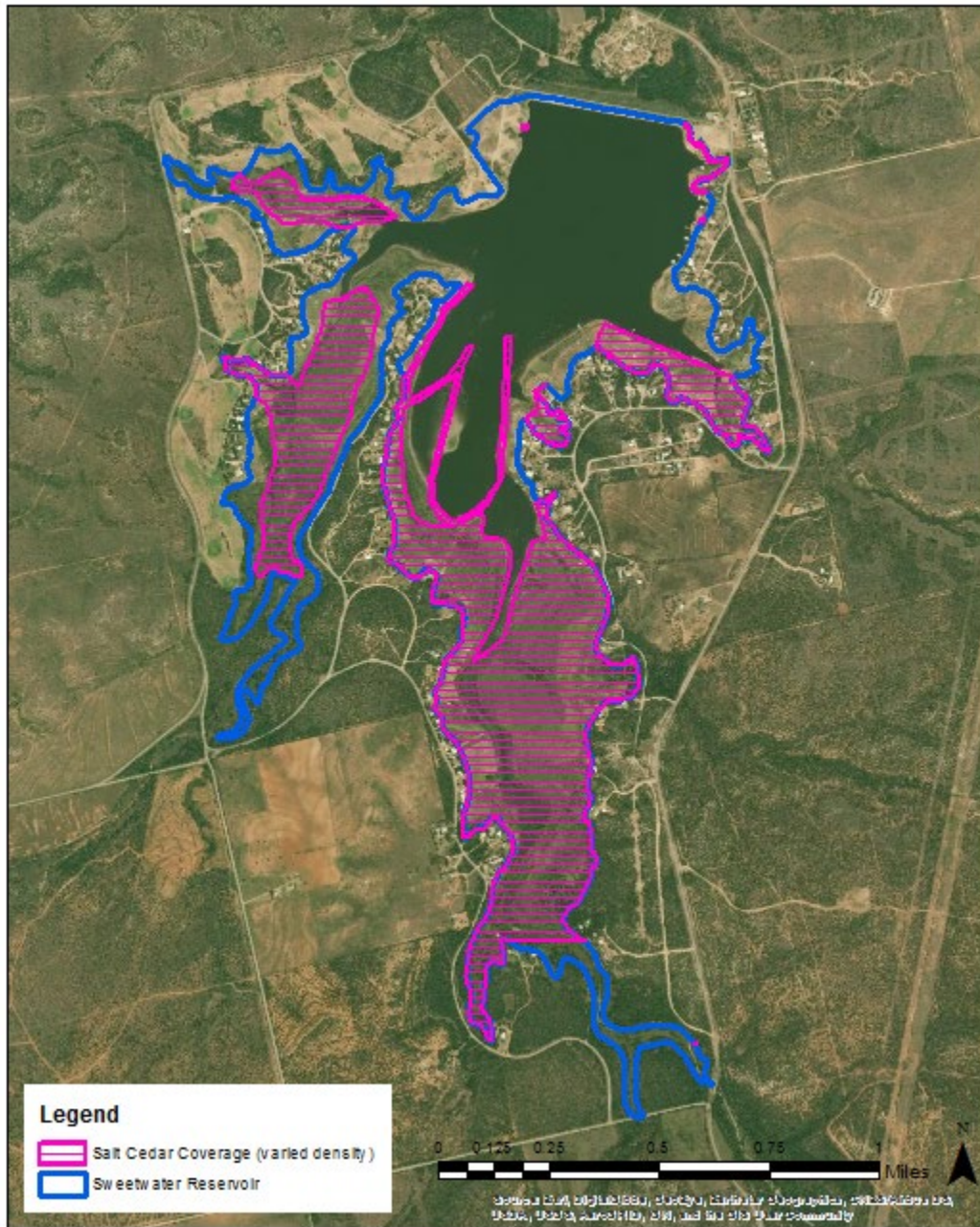
Sampling Date	Density (cells/mL)	ITUs	Comments	Conductivity (µS/cm)
1/13/2014	18,000	0	Mixed algal community	N/A
1/13/2014	28,000	≥25	<i>P. parvum</i> dominant	N/A
1/13/2014	29,000	0	Mixed algal community	N/A
1/28/2014	57,000	≥25	<i>P. parvum</i> dominant	N/A
1/28/2014	63,000	≥25	<i>P. parvum</i> dominant	N/A
1/28/2014	59,000	≥25	<i>P. parvum</i> dominant	N/A
1/28/2014	72,000	≥25	<i>P. parvum</i> dominant	N/A
3/4/2014	100,000	5	Mixed algal community	N/A
3/4/2014	53,000	≥25	Mixed algal community	N/A
3/4/2014	63,000	≥25	Mixed algal community	N/A
3/4/2014	62,000	≥25	Mixed algal community	N/A
4/15/2014	0 / <i>P. parvum</i> ID	0	Mixed algal community	N/A
4/15/2014	3,000	0	Mixed algal community	N/A
4/15/2014	2,000	0	Mixed algal community	N/A
12/9/2014	3,000	0	Mixed algal community	N/A
1/30/2015	118,000	≥25	<i>P. parvum</i> dominant	2,623
1/30/2015	111,000	≥25	<i>P. parvum</i> dominant	2,622
1/30/2015	118,000	≥25	<i>P. parvum</i> dominant	2,549
12/7/2015	25,000	≥25	Mixed algal community	4,017
1/11/2016	3,000	0	Mixed algal community	4,044
2/15/2016	5,000	0	Mixed algal community	3,950
1/9/2017	37,000	≥25	<i>P. parvum</i> dominant	3,402
2/7/2017	7,000	1	Mixed algal community	3,320
12/13/2017	18,000	5	Mixed algal community	3,919
1/9/2018	5,000	1	Mixed algal community	4,030
2/26/2018	1,000	0	Mixed algal community	4,053
11/14/2018	7,000	5	Mixed algal community	N/A
12/10/2018	40,000	≥25	<i>P. parvum</i> dominant	931
12/10/2018	0 / BDL	NC	Low algal densities	808
1/15/2019	4,000	0	Mixed algal community	1,360
1/15/2019	0 / BDL	NC	Low algal densities	1,633
2/20/2019	0 / <i>P. parvum</i> ID	NC	Mixed algal community	1,415
2/20/2019	0 / BDL	NC	Low algal densities	1,804
3/25/2019	0 / <i>P. parvum</i> ID	NC	Mixed algal community	1,267
3/25/2019	0 / BDL	NC	Mixed algal community	1,277
3/25/2019	0 / BDL	NC	Mixed algal community	1,306

## Proposed Sampling Schedule

Table 6. Proposed sampling schedule for Sweetwater Reservoir, Texas. Survey period is June through May. Electrofishing are conducted in the fall and baited tandem hoop netting surveys are conducted in early summer. Standard survey denoted by S and additional survey denoted by A.

	Survey year			
	2019-2020	2020-2021	2021-2022	2022-2023
Angler Access				S
Structural Habitat				S
Vegetation				S
Baited tandem hoop netting				S
Electrofishing – Fall	A			S
Trap netting				S
Report				S

## Appendix A



Aerial photograph and observed salt cedar coverage (pink lines) during a roving survey conducted during summer 2015, Sweetwater Reservoir, Texas. Water level was approximately 27.5 ft. below conservation pool at the time of the survey. Reservoir water level at conservation pool shown in blue.





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