

LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES



**OFFICE OF FISHERIES
INLAND FISHERIES DIVISION**

2021 AQUATIC VEGETATION CONTROL PLAN

CADDO LAKE

Date Lake Formed – Caddo Lake is a natural lake formed in 1811 when the New Madrid earthquake caused the land in this area to subside. U.S. Army Corps of Engineers (USACOE) built a spillway across Cypress Creek in 1914 and stabilized the boundary of Caddo Lake. In 1971, the USACOE completed a new dam just downstream from the old structure.

Waterbody Type – natural lake situated on gently rolling, poorly drained soils with minimum pool maintained by manmade spillway. Large areas of the lake are comprised of bald cypress (*Taxodium distichum*) forests.

Parish – Caddo Parish; the lake encompasses portions of Texas and Louisiana with the state line bisecting the lake into roughly equal portions.

Age and condition of control structure – no control structure; spillway is approximately 50 years old, good condition

Type of control structure – no drawdown capability; spillway of stepped design with 860 feet of the concrete spillway set at 168.5 MSL and 1,540 feet of the concrete spillway set at 170.5 MSL.

Water level (MSL) – 168.5 MSL at normal pool stage. Normal seasonal water level fluctuations from approximately 166.5 MSL to 171.5 MSL

Surface area – 25,400 acres at normal pool stage, ranges from 18,700 acres during normal seasonal low water levels up to 35,000 acres at normal seasonal high water levels. Approximately 13,000 acres in Louisiana.

Average depth – 5.5 feet at normal pool stage
Watershed ratio – 69:1

No Drawdown Capability

Lake Commission – Caddo Lake Watershed District Commission

This commission is inactive, has not met in approximately 12 years and was not active prior to that time.

Not to be confused with the Caddo Lake Institute or the Greater Caddo Lake Association – two separate groups of concerned citizens organized to support Caddo Lake.

Creation / Nomination – The Caddo Lake Watershed District Commission created by state statute. The Caddo Parish Commission appoints members.

PART XIX. CADDO LAKE WATERSHED DISTRICT

§3087.71. Creation; location

There is hereby created a recreation and water conservation district to be known as the "Caddo Lake Watershed District" to be comprised of all of Ward 1 of Caddo Parish.

Acts 1995, No. 345, §1.

Caddo Lake Watershed District Commission - INACTIVE

Name	Address	Phone #	Term Expires
Wes Wyche	P.O. Box 31109 Shreveport, LA 71130	(318) 673-6072	12-12-2012
J. B. “Bob” Roddey	12971 Highway 1 Oil City, LA 71061	(318) 995-6497	12-12-2012
Patsy Lee	6555 Northwood Lane Blanchard, LA 71009	(318) 929-4518	12-12-2012
Dale Nix, Jr. (Chairman)	P.O. Box 595 Mooringsport, LA 71060	(318) 996-7653	12-12-2012
Dr. Charles McCormick	P.O. Box 566 Vivian, LA 71082	(318) 221-3902	12-12-2012

Procedure for spillway openings – Not applicable as there is no drawdown capability.

What significant stakeholders use the lake?

Recreational use of Caddo Lake is primarily by anglers, duck hunters, lake residents, and non-consumptive nature observers.

Caddo Lake is unique in that offshore drilling for oil occurs on many areas of the lake, and the oil companies have a stake in maintaining boating access throughout the lake.

Several municipalities in Louisiana and Texas rely on Caddo Lake as a municipal water supply: Caddo Waterworks, Oil City Water System, Mooringsport Water System, Vivian Water System, East Cove Utilities Shreveport, Town of Greenwood, Blanchard Water System, and Blanchard.

The AEP/Swepco Lieberman Power Plant in Louisiana uses the water from Caddo Lake for cooling purposes.

What are their needs and concerns?

The primary concern of the majority of user groups is recreational fishing, boating and hunting access. The primary concern of shoreline residents is maintaining access to the lake from their homes and camps and the aesthetic quality of their lakeside home sites.

The oil companies engaged in offshore operations on the lake are interested in maintaining access for boats and barges to service the platforms.

Municipalities that withdraw water from the lake are interested in maintaining a sufficient lake level so that intakes draw water of good quality for purification, and intakes are not blocked by aquatic vegetation. They are also concerned about applications of herbicides, oil and chemical spills and other pollutants near the water intakes or in sufficient quantities to affect the potable water.

The primary concern of the electric power plant is maintaining a sufficient lake level and the intake being free of aquatic vegetation.

What is the history of aquatic vegetation complaints?

Aquatic vegetation complaints are common and have become chronic following the invasion of giant salvinia (*Salvinia molesta*) in 2006. Most complaints of giant salvinia and water hyacinth (*Pontederia crassipes*) originate from the Jeem's Bayou area, and those concerning American lotus (*Nelumbo lutea*) and occasionally alligator weed (*Alternanthera philoxeroides*) are from the lower end of the lake or the Buzzard Bay area.

Have there been any controversial issues on the lake?

As Caddo Lake is a border water shared with Texas, there have been many controversies over the years concerning fisheries management, recreational and commercial fishing regulations, aquatic vegetation control efforts, and enforcement efforts.

In 2018, Federal legislators from both Texas and Louisiana introduced legislation to include Caddo Lake and its surrounding area into a National Heritage Area. Local citizens were displeased with the concept and organized meetings and petitions against its formation. Without local support, the bill was withdrawn.

The issue that has had the greatest impact on Caddo Lake was altering the inflows to the lake following construction of the Lake of the Pines upstream on Big Cypress Bayou. This event greatly altered the water regime, which has now had many negative impacts on Caddo Lake, particularly on the Texas side of the lake. Without the flushing action that was historically present, organic build-up and sedimentation rates increased, contributing to the presence of hypoxic / anoxic zones in parts of the lake.

Aquatic Vegetation Status:

An aquatic vegetation type map was performed by Inland Fisheries biologist James Seales on the Louisiana side of Caddo Lake (Caddo Parish, LA) in late September and early October, 2020. The lake was approximately 5 inches above normal pool stage, and there was a moderate to heavy algae bloom present.

Caddo Lake had approximately 2,500 acres of aquatic plant coverage on the Louisiana side of the lake. This equates to approximately 22% of the Louisiana side of Caddo Lake containing aquatic vegetation. There was roughly 1,200 acres of giant salvinia observed during the survey. The majority of the giant salvinia was found in Jeem's Bayou, the Buzzard's Bay area and the state line area near Big Green Break. Large mats were occasionally found drifting throughout the lake and scattered along the shoreline. At least a fringe of giant salvinia was present along nearly all of the Louisiana shoreline.

The Buzzard Bay area had significant coverage of American lotus. A few patches of American lotus were also found in the Big Green Break area, and there were approximately 20 acres located near the power plant.

Crested floating heart (*Nymphoides cristata*) was observed for the first time on the Louisiana side of the lake during the 2019 typemap survey. All known infestations on the Louisiana side were treated after discovery. The small patches of crested floating heart not only persist, but expanded their coverage slightly on the east side of Big Green Break and on the south shoreline of the lake on the west side of LA Hwy 1. Another patch was found in Jeem's Bayou near Pelican Lodge this year. Total coverage remains at less than 0.1 acres.

Submersed vegetation coverage has changed since last year. Submersed vegetation, including hydrilla (*Hydrilla verticillata*), was found in most shallow areas less than three feet deep. Coverage was light to sparse in many of these areas. Hydrilla appeared to be much more widespread than what was noted last year, however it was not observed in thick mats or topped out in any area. In the area around Big Green Break, submersed vegetation including hydrilla was found out to depths of six feet, but coverage was not as dense as what was observed last year. Approximately 400 acres of hydrilla were observed during the survey.

No large mats of water hyacinth were found during the survey. It was estimated that there was less than five acres present on the lake, with only the occasional plant seen mixed with other vegetation.

Giant cutgrass (*Zizaniopsis miliacea*) was the most prevalent species of marginal vegetation found around the lake, but it was mostly restricted to the immediate shoreline. Other marginal vegetation included lizard's tail (*Saururus cernuus*), wild taro (*Colocasia esculenta*), smartweed (*Polygonum spp.*), torpedo grass (*Panicum repens*), cattail (*Typha spp.*), spike rush (*Eleocharis spp.*) and duck potato (*Sagittaria lancifolia*).

Limitations:

The biggest limiting factor for aquatic vegetation control efforts on Caddo Lake is the lack of drawdown capability. Other issues are restrictions on herbicide applications near potable water intakes, dense cypress forests, and shallow backwater areas, which restrict access for spray boats.

Past Control Measures:

Historic aquatic plant control efforts have been primarily foliar herbicide applications consisting of either glyphosate or diquat with a non-ionic surfactant for emergent and floating vegetation as needed.

Recent aquatic plant control measures have primarily targeted giant salvinia with foliar herbicide applications of either diquat (0.75 gal/acre) mixed with a non-ionic surfactant (0.25 gal/acre) or a mixture of glyphosate (0.75 gal/acre) and diquat (0.25 gal/acre) with Turbulence (0.25 gal/acre) surfactant. Limited foliar herbicide applications for emergent vegetation have been made along the inhabited shoreline areas that included water hyacinth, alligator weed, American lotus, and fragrant water lily (*Nymphaea odorata*). These plants were treated with glyphosate and a non-ionic surfactant at 0.5 gallons and 1 quart per acre, respectively. A helicopter was used to treat 400 acres of American lotus on the lower portion

of the lake in 2015. Aerial applications used 0.5 gallons of triclopyr and 0.25 gallons of non-ionic surfactant to treat the lotus due to potable water intakes in the area.

Efforts to control giant salvinia have included large-scale herbicide applications by LDWF spray crews and the use of private applicators. However, in 2020 efforts were limited by budgetary concerns that limited contract applications on larger expanses of vegetation. The following aquatic plant species and acreages were treated by LDWF and contract applicators during 32 application efforts:

Giant salvinia- 791 acres

Alligator weed- 5 acres

Giant salvinia weevils (*Cyrtobagous salviniae*) were first introduced on the Louisiana side of Caddo Lake during 2007. Weevil-infested giant salvinia was transported from the Texas side of Toledo Bend and stocked in an enclosure that was located in Jeem's Bayou. This area was difficult to access with spray boats. Subsequent introductions were conducted in 2008 and 2009. These introductions were concentrated around potable water intakes in Jeem's Bayou and near Mooringsport. The weevil population in Caddo Lake was devastated by several days of subfreezing weather during January of 2010, followed by another hard freeze in January 2011.

Weevil introductions have continued since 2011 utilizing weevils reared in Lewisville, TX at the U.S. Army Corps of Engineers (USACE) Lewisville Aquatic Ecosystem Research Facility. From 2011-2015, these weevils were stocked in remote locations throughout the Big Green Brake area near the state line. The populations have been monitored annually by a USACE entomologist contracted by the LDWF. Each year, the population became established after initial stocking, slowly began to multiply reaching maximum densities by October, and then declined during the fall and winter becoming almost non-existent by the following spring. In more severe winters, the population would be eliminated. No quantifiable results or effects on the salvinia could be documented during this time.

To better document weevil success, a second site was added in 2016 near Bonham's Arm. Both stocking locations were encircled using oil spill containment boom, the area photographed, and the weevil populations monitored. The two sites represent the best results of weevils controlling salvinia recorded by LDWF in northwest Louisiana. During 2016-2017, the weevils became established and overwintered at high numbers. No additional weevils were added to the sites in 2017 so as not to skew the results. It is important to note that both winters were very mild and could be viewed as an anomaly for the area. However, the weevils were able to crash the salvinia population within the booms and create open water for short periods. Over the 2-year period, the booms were cleared of salvinia by the weevils 2-3 times. Unfortunately, salvinia quickly rebounded and covered the entire boomed area within weeks. Weevils were able to spread beyond the boom, and the population was on the rise prior to the winter of 2017/2018. Although some weevils were documented to survive the freeze events, the population numbers were extremely low to nearly non-existent after the cold weather.

From 2011-2014, The Center for Invasive Species Eradication (CISE) of the Texas A&M Agrilife Extension Service, Texas A&M Agrilife Research and the Texas Water Resources

Institute operated the Salvinia Weevil-Rearing Facility at the Caddo Lake National Wildlife Refuge. The facility was located on the decommissioned Longhorn Army Ammunition Plant in Harrison County, TX near Caddo Lake. The facility was funded for three years and was able to produce many weevils along with documenting/refining the production process. Additional research was conducted on weevils, but little effort was made in documenting salvinia control by the insect. The facility was closed after funding expired. The TPWD took over the site and made upgrades to the facility in 2017.

Additionally, TPWD has contracted with the Caddo Biocontrol Alliance (CBA). CBA is a non-profit group that is a break-off from the Greater Caddo Lake Association. The CBA has collected monies and built a green house facility on the shores of Caddo Lake at Shady Glade Resort in Uncertain, TX. The facility began operation in 2014. TPWD contracted with the group to buy weevils in 2016.

Due to the lack of success with salvinia weevils on Caddo Lake and the surrounding area, LDWF decided to discontinue stockings of the weevils in the area until a more cold-tolerant strain is available. If such a strain is identified, the weevils will be stocked into Caddo Lake and closely monitored for population establishment and plant control success.

Louisiana Department of Wildlife and Fisheries (LDWF) and TPWD stockings of salvinia weevils on Caddo Lake, 2007-2020.

Year	# Weevils	Source
2007	489	Toledo Bend (TPWD assistance)
2008	200	LSU (Gheens)
2009	500 (approximate)	LSU (Gheens)
2011	830 (approximate)	USACE (Lewisville)
2012	42,392	USACE (Lewisville)
2013	25,713	USACE (Lewisville)
2014	182,100	USACE (Lewisville)
2015	54,030	USACE (Lewisville), Red River Waterway Commission (Colfax)
2016	52,315	USACE (Lewisville)
	263,400	TPWD

	146,500	Caddo Biocontrol Alliance
2017	140,819	TPWD
	232,952	Caddo Biocontrol Alliance
2018	177,864	Caddo Biocontrol Alliance
2019	15,088	Caddo Biocontrol Alliance
2020	_____	_____

Recommendations:

Continue an integrated management approach to control invasive aquatic vegetation. Vegetation control efforts will be conducted in coordination with the Texas Parks and Wildlife Department.

Chemical Control

LDWF will combine aggressive herbicide applications and biological control measures to achieve combined benefits. Foliar herbicide applications will be conducted in accordance with the approved LDWF Aquatic Herbicide Application Procedures:

Plant Species	Herbicide	Surfactant
<i>Salvinia</i> spp. Alternative 1 Common/Giant Salvinia (April 1 to October 31)	Glyphosate (0.75 gal/acre) Diquat (0.25 gal/acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
<i>Salvinia</i> spp. Alternative 2 Common/Giant Salvinia (April 1 to October 31)	Glyphosate (0.75 gal/acre) Flumioxazin (2 oz./acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
<i>Salvinia</i> spp. Alternative 3 Common/Giant Salvinia (April 1 to October 31)	MSM (1 oz./acre) Flumioxazin (1 oz./acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
<i>Salvinia</i> spp. Alternative 4 Common/Giant Salvinia (November 1 to March 31)	Diquat (0.75 gal/acre)	Nonionic surfactant (0.25 gal/acre)
<i>Salvinia</i> spp. Alternative 5 Common/Giant Salvinia (November 1 to March 31)	Flumioxazin (12 oz./acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
Water Hyacinth	2, 4-D (0.5 gal/acre)	Nonionic surfactant (1 pint/acre)
Water Hyacinth in waiver areas (March 15 to September 15)	Glyphosate (0.75 gal/acre)	Nonionic surfactant (0.25 gal/acre)
Alligator Weed/Giant Cut Grass (undeveloped areas)	Imazapyr (0.5 gal/acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
Alligator Weed/Giant Cut Grass (developed areas)	Imazamox (0.5 gal/acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
American Lotus	2, 4-D (0.5 gal/acre)	Nonionic surfactant (1 pint/acre)
American Lotus in waiver areas (March 15 to September 15)	Glyphosate (0.5 gal/acre)	Nonionic surfactant (0.25 gal/acre)
American Lotus in waiver areas with potable water intakes (March 15 to September 15)	Triclopyr (0.5gal/acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
Duckweed	Diquat (1.0 gal/acre) or Flumioxazin (8 oz./acre)	Nonionic surfactant (0.25 gal/acre) or Turbulence (or approved equivalent, 0.25 gal/acre)
Cuban Bulrush (sedge)	2, 4-D (0.5 gal/acre)	Nonionic surfactant (1 pint/acre)
Cuban Bulrush (sedge) in waiver areas (March 15 to September 15)	Glyphosate (0.75 gal/acre)	Nonionic surfactant (0.25 gal/acre)
Water Lettuce	Diquat (1.0 gal/acre) or Flumioxazin (6 oz./acre)	Nonionic surfactant (0.25 gal/acre) or Turbulence (or approved equivalent, 0.25 gal/acre)

Biological Control

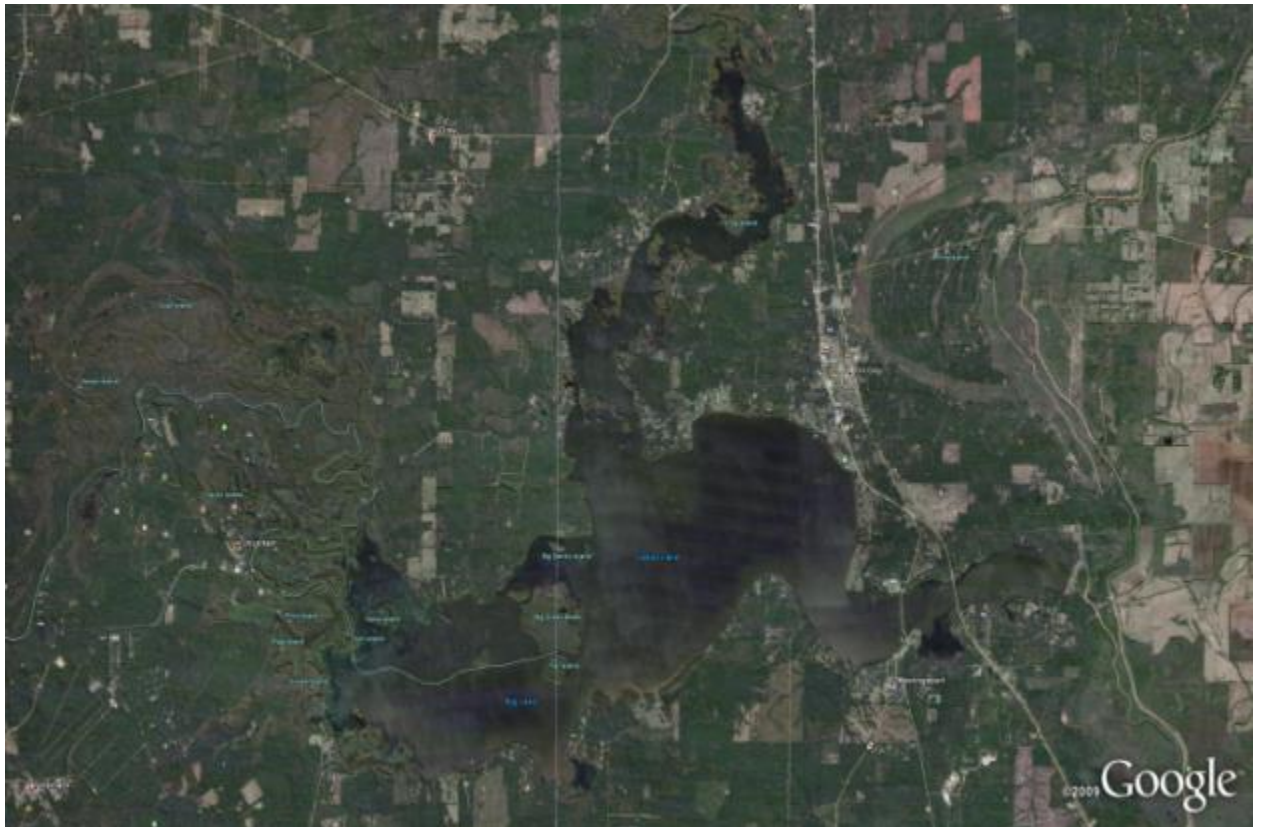
Salvinia weevil introductions will continue once a more cold-tolerant ecotype of the weevils is available. Weevil survival and stocking success will be monitored. Salvinia weevils will be stocked in areas that are difficult to access for foliar herbicide applications. Potential sites include the water intake area on the upper end of Jeem's Bayou and Green Brake.

Physical Control

None at this time.

Typemap:

Inland Fisheries personnel conducted vegetation type map surveys in 2006, 2007, 2009, 2014, and 2017-2020.



Caddo Lake (including TX/LA state line)

CADDO LAKE CADDO PARISH, LA VEGETATION TYPE MAP 2020

An aquatic vegetation survey was performed by Inland Fisheries biologist James Seales on the Louisiana side of Caddo Lake (Caddo Parish, LA) during late September and October 2020. The lake was approximately 5 inches above normal pool stage and there was a moderate to heavy algae bloom present.

Species Present

<u>Common Name</u>	<u>Scientific Name</u>
Alligator-weed	<i>Alternanthera philoxeroides</i>
American lotus	<i>Nelumbo lutea</i>
Bladderwort	<i>Utricularia</i> spp.
Bulrush	<i>Scirpus</i> spp.
Buttonbush	<i>Cephalanthus occidentalis</i>
Cattail	<i>Typha</i> spp.
Coontail	<i>Ceratophyllum demersum</i>
Crested floating heart	<i>Nymphoides cristata</i>
Cuban bulrush	<i>Oxycaryum cubense</i>
Duck potato	<i>Sagittaria latifolia</i>
Duckweed	<i>Lemna</i> spp.
Fanwort	<i>Cabomba caroliniana</i>
Filamentous algae	
Fragrant water lily	<i>Nymphaea odorata</i>
Giant cutgrass	<i>Zizaniopsis miliacea</i>
Giant salvinia	<i>Salvinia molesta</i>
Hydrilla	<i>Hydrilla verticillata</i>
Lizard's tail	<i>Saururus cernuus</i>
Muskgrass	<i>Chara</i> spp.
Pondweed	<i>Potamogeton</i> spp.
Slender spike rush	<i>Eleocharis baldwinii</i>
Smartweed	<i>Polygonum</i> spp.
Spatterdock	<i>Nuphar luteum</i>
Stonewort	<i>Nitella</i> spp.
Torpedo grass	<i>Panicum repens</i>
Water hyacinth	<i>Eichhornia crassipes</i>
Water pennywort	<i>Hydrocotyle umbellata</i>
Water primrose	<i>Ludwigia</i> spp.
Water shield	<i>Brasenia schreberi</i>
Wild taro	<i>Colocasia esculenta</i>

Severity

Caddo Lake has approximately 2,500 acres on the Louisiana side of the lake, which has some degree of aquatic vegetation coverage. This equates to approximately 22% of the Louisiana side with aquatic vegetation. There was roughly 1200 acres of giant salvinia observed during the survey. The majority of the giant salvinia was found in Jeem's Bayou, the Buzzard's Bay area and the state line area near Big Green Break. In these areas, giant salvinia was commonly interspersed with moderate to severe infestations of American Lotus, spatterdock, alligator weed, and primrose. Salvinia could be found in all stages of growth, including dense mats with terrestrial vegetation on growing on top in many areas. Large mats were occasionally found drifting throughout the lake and scattered along the shoreline. At least a fringe of giant salvinia was present along nearly all of the Louisiana shoreline.

The Buzzard Bay area had significant coverage of American lotus. A few patches of lotus were also found in the Big Green Break area and there were approximately 20 acres located near the power plant.

Crested floating heart was observed for the first time on the Louisiana side of the lake during the 2019 typemap survey. All known infestations on the Louisiana side were treated after discovery. The small patches of crested floating heart not only persist, but expanded their coverage slightly on the east side of Big Green Break and on the south shore line of the lake on the west side of LA Hwy 1. Another patch was found in Jeem's Bayou near Pelican Lodge this year. Total coverage remains at less than 0.1 acres.

The area around the state line had a mixture of aquatic vegetation including hydrilla, spatterdock, primrose, alligator weed, giant salvinia, American lotus and a few small patches of crested floating heart. The majority of the vegetation in this part of the lake was in the Big Green Break area. Coverage ranged from moderate to severe in this area. Coverage increased in the area around Big Sandy Island to the northern shoreline on the west side of Jeem's Bayou from what was observed last year.

Submerged vegetation coverage has changed since last year. Submersed vegetation including hydrilla was found in most shallow areas less than 3 feet deep. Coverage was light to sparse in many of these areas. Hydrilla appeared to be much more widespread than what was noted last year, however it was not observed in thick mats or topped out in any area. Hydrilla was found scattered throughout the shoreline areas on the Louisiana side of the lake, as opposed to last year's survey where it was only observed in two locations. In the area around Big Green Break, submersed vegetation including hydrilla was found out to depths of 6 feet but coverage was not as dense as what was observed last year. Approximately 400 acres of hydrilla was observed during the survey. This is an increase from the hydrilla coverage noted during last year's survey.

No large mats of water hyacinth were found during the survey. It is estimated that there is less than 5 acres present on the lake with only the occasional plant seen mixed with other vegetation.

Giant cutgrass was the most prevalent species of marginal vegetation found around the lake, but it was mostly restricted to the immediate shoreline. Other marginal vegetation included lizard's tail,

wild taro, smartweed, torpedo grass, cattail, spike rush and duck potato.

Discussion

The aquatic vegetation coverage on the Louisiana side of Caddo Lake is impacting many shoreline residents and users of the lake. Many shoreline property owners are experiencing problems, at least occasional problems, with giant salvinia and quite a few have not been able to access the lake for months. Giant salvinia is affecting boating and fishing access in many areas, especially in Jeem's Bayou. The submersed vegetation coverage changed since the survey conducted last year. Hydrilla was not observed to be topped out or growing in thick mats like was observed in a few areas last year, but was found widely scattered with light to sparse coverage in many of the shallow areas of the lake. American lotus remains a problem in Buzzard Bay. Crested floating heart increased in coverage slightly since last year, despite focused herbicide applications. LDWF crews have treated 796 acres of aquatic vegetation thus far in 2020, the vast majority of this being giant salvinia.

Aquatic Vegetation Typemap - 2020

Aquatic Vegetation Typemap - 2020

 Light
 Moderate
 Severe

Light

Moderate

Severe

