LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

OFFICE OF FISHERIES
INLAND FISHERIES SECTION

2018 AQUATIC VEGETATION CONTROL PLAN

Toledo Bend Reservoir

1. Waterbody type – Upland reservoir

2. Age and condition of control structure – The dam was completed in October 1966 and the current condition is good.

3. Type of control structure – The hydroelectric powerhouse has 2 units that use 16,000 cubic feet per second (cfs) and can lower the lake to elevation 162.2' MSL. The spillway has 11 gates 40 feet wide and 28 feet tall and has a total capacity of 290,000 cfs. In the bottom of the spillway there are two 20 inch pipes that bypass the sluiceway to provide constant flow to the river below at a rate of 144 cfs. The sluiceway measures 12.5 feet high and 8 feet wide and has a total capacity of 5,000 cfs.

4. Water level range – Pool stage is 172' MSL. High – 175' MSL. Low – the sluiceway is capable of reducing the level to 100' MSL. The lowest level recorded since impoundment was January 4, 2012 at 161.31' MSL and was due to drought.

5. Surface area range – At pool stage the reservoir covers 181,600 acres. The maximum acreage is 196,300 acres at 175' MSL.

6. Average depth – At pool stage – 24 feet.

7. Watershed ratio – 25.3:1

8. Drawdown potential of structure – The combination of all structures can eventually draw the reservoir down to 100' MSL. Through an agreement between Sabine River Authority of Texas (SRA/T) and Sabine River Authority of Louisiana (SRA/LA), the level of the reservoir is to operate between 168' and 172' MSL. Levels below this are possible for limited designated reasons. Hydroelectric power generation causes the largest lake fluctuation each year with prime power season running from May to October. The only drawdowns that have ever been scheduled are for maintenance and inspection of the dam.

9. Waterbody Board or Lake Commission – The reservoir is controlled by the Toledo Bend Project Joint Operation which receives operating guidelines from the Joint Operating Board and the Joint Technical Board. Both of these boards are comprised of representatives from the SRA of Texas, Board of Directors and the SRA of Louisiana, Board of Commissioners.

   Sabine River Authority, State of Louisiana was created by Act 261 in 1950 by the Louisiana legislature (RS 38:2321).
   CHAPTER 11. SABINE RIVER AUTHORITY §2321. Creation - All the territory in the parishes of De Soto, Sabine, Vernon, Beauregard, Calcasieu and Cameron, lying within the watershed of the Sabine River and its tributary streams, shall be embraced in the limits of and shall constitute a conservation and reclamation district to be known and styled "Sabine River Authority, State of Louisiana".
   Added by Acts 1950, No. 261, §1.

10. What significant stakeholders use the lake? SRA TX and SRA LA depend on revenue from power generation for their respective budgets. Shoreline property owners, recreational and

commercial fisherman, hunters, and water sports participants are the primary users of the reservoir. There are four water intakes on the Louisiana side of the reservoir: South Toledo Bend, Pendleton, Many and Mansfield.

11. What are their needs and concerns? Both the SRA TX and SRA LA need suitable water levels for power generation. Shoreline property owners and other recreational and commercial users want adequate access to the reservoir. Municipalities that use water for drinking are concerned with a continued supply based on lake level and pump elevation.

12. What is the history of aquatic vegetation complaints? Historically, the most problematic floating species was water hyacinth (*Eichhornia crassipes*) with hydrilla (*Hydrilla verticillata*) dominating the submersed habitat throughout much of the reservoir. However, in 1998 giant salvinia (*Salvinia molesta*) was found in the reservoir and has proven to be much more invasive in protected areas of the reservoir. A breakdown of the complaints during the 2014 calendar year are as follows: giant salvinia-80, American lotus (*Nelumbo lutea*) -13, alligator weed (*Alternanthera philoxeroides*) -9, torpedograss (*Panicum repens*) -4, water primrose (*Ludwigia spp*.) -3, water hyacinth-2, giant cutgrass (*Zizaniopsis miliacea*) -1, and duckweed (Lemna spp.) -1. More recently, reductions in submersed aquatic vegetation (SAV) and torpedo grass used as complex cover by gamefish have concerned recreational anglers. The reduction in vegetation is believed to be the result of higher water levels, wave action and increased turbidity mostly caused by natural weather events.

13. Have there been any controversial issues on the lake? Water level was the largest issue to date and was solved in 2007 with an agreement between SRA/TX and SRA/LA. Since that time there has been interest in pumping drinking water from the reservoir to Dallas, TX. Although the total amount of water to be pumped was far less than that used during hydroelectric power generation the plan was stopped due to public objection.

Aquatic Vegetation Status:

In January 2013, the coverage of problematic plant species at Toledo Bend Reservoir was estimated to be:

Giant Salvinia – 1,200 acres.
Hydrilla – 7,000 acres.
Nutsedge, *(Cyperus ssp.)* - 200 acres.
Water hyacinth - 75 acres.

In January 2015, the coverage of problematic plants species at Toledo Bend Reservoir was estimated to be:

Giant Salvinia – 700 acres.
Hydrilla – 5,650 acres.
Torpedograss – 375 acres.

In January 2018, an estimate of the coverage of problematic plants was:

Giant salvinia – 750 acres
Hydrilla – 825 acres
Torpedograss – 220 acres

No aquatic plant is classified as beneficial in Toledo Bend Reservoir at this time. No effort is planned to establish or re-establish any aquatic species.

Limitations:

Physical Limitations

- A primary limitation at this waterbody is the scale of the lake. At 181,600 acres, Toledo Bend Reservoir is the largest manmade waterbody in the South. Wind in particular can limit both herbicide application and boat access at times. Whole waterbody treatments are impractical on a lake of this size.
- Muddy water is routinely encountered in upper reaches of the main lake and individual coves. This condition limits use of particular herbicides such as diquat dibromide.
- The upper lake area is shallow, as are the upper reaches of coves. This factor limits boat access when making herbicide applications.

Regulatory Limitations

- This lake is a border water with Texas. Cooperation between state agencies on either side is required to accomplish goals of all stakeholders.
- The lake is owned by the Sabine River Authority of Louisiana and the Sabine River Authority of Texas. These agencies must be included in management discussions for this lake.
- Three municipal water systems and numerous shoreline property owners withdraw water from the lake.
- This lake is a hydroelectric power source. Power generation greatly influences water levels throughout the year.

Past Control Measures:

Biological

The salvinia weevil (*Cyrtobagous salviniae*) is being used as a biological control for giant salvinia at Toledo Bend Reservoir. The weevils have shown an ability to reduce the amount of giant salvinia in areas where they have been established. To date, 68 weevil releases have been made. Many small scale releases were made by Sabine River Authority of Louisiana staff. These were accomplished by transporting small amounts of host plant material to various locations. Incomplete data for these releases include dates, amounts of material and source locations. However, it is known that the host plant material was collected from known weevil locations on the Louisiana side of the reservoir.
Data related to giant salvinia weevil releases are included in Appendix IV of MP-A.

Chemical

The Louisiana Department of Wildlife and Fisheries (LDWF) has an aquatic vegetation chemical control program in place on Toledo Bend Reservoir. This program is directed primarily at emergent and floating vegetation. Herbicide applications made on the lake since 1996 are included in Table 1.

Table 1. Area of aquatic vegetation treated by year by chemical and by species in Toledo Bend Reservoir, LA – 1996 to 2017.

Treatment Year	Chemical	Vegetation	Acres Treated	Rate
1996			121	
1997			314	
1998			34	
1999			673	
2000			1,918	
2001			737	
2002			654	
2003			563	
2004			1,373	
2005	2, 4-D	Alligator Weed	10	0.5 gal./Acre
	2, 4-D	American Lotus	58	0.5 gal./Acre
	2, 4-D	Water Hyacinth	52	0.5 gal./Acre
	Aquastar	Alligator weed	3	0.75 gal./Acre
	Reward	Bladderwort (*Utricularia spp.*)	4	0.75 gal./Acre
	Reward	Hydrilla	3	0.75 gal./Acre
	Reward	Milfoil (*Myriophyllum spp.*)	2	0.75 gal./Acre
	Reward	Common Salvinia (*Salvinia minima*)	12	0.75 gal./Acre
	Reward	Giant Salvinia	106	0.75 gal./Acre
2006	2, 4-D	American Lotus	12	0.5 gal./Acre
	Aquastar	Torpedograss	2	0.75 gal./Acre
	Aquastar	Alligator Weed	0.5	0.75 gal./Acre
	Aquastar	Giant Salvinia	0.5	0.75 gal./Acre
	Renovate	Giant Salvinia	16	0.75 gal./Acre
	Reward	Alligator Weed	9	0.75 gal./Acre
	Reward	American Lotus	4	0.75 gal./Acre
	Reward	Giant Salvinia	364	0.75 gal./Acre
	Reward	Water Hyacinth	5	0.75 gal./Acre
	Sonar AS	Giant Salvinia	1	80ppb
2007	2, 4-D	Alligator Weed	45	0.5 gal./Acre
	2, 4-D	American Lotus	53	0.5 gal./Acre
	2, 4-D	Giant Salvinia	7	0.5 gal./Acre
	2, 4-D	Water Hyacinth	1,455	0.5 gal./Acre
	Aquamaster	Alligatorweed	131	0.75 gal./Acre
	Aquamaster	Common Salvinia	28	0.75 gal./Acre

	Aquamaster	Giant Salvinia	355	0.75 gal./Acre
	Aquamaster	Sawgrass (*Cladium spp*.)	1	0.75 gal./Acre
	Aquamaster	Smartweed (*Polygonum spp*.)	6	0.75 gal./Acre
	Aquamaster	Spadderdock (*Nuphar luteum*)	1	0.75 gal./Acre
	Aquamaster	Torpedograss	32	0.75 gal./Acre
	Aquamaster	Water Hyacinth	15	0.75 gal./Acre
	AquaKleen	Alligator Weed	1	0.75 gal./Acre
	Aquastar	Alligator Weed	94	0.75 gal./Acre
	Aquastar	Giant Salvinia	56	0.75 gal./Acre
	Aquastar	Torpedograss	3	0.75 gal./Acre
	Aquathol Super K	Hydrilla	1	17.6 lbs./Acre foot
	Cutrine Plus	Milfoil	1	1.75 gal./Acre
	Knockout	Giant Salvinia	17	0.75 gal./Acre
	Renovate	Giant Salvinia	3	0.75 gal./Acre
	Reward	Alligator Weed	85	0.75 gal./Acre
	Reward	Milfoil	1	0.75 gal./Acre
	Reward	Common Salvinia	1	0.75 gal./Acre
	Reward	Giant Salvinia	415	0.75 gal./Acre
	Reward	Smartweed	2	0.75 gal./Acre
	Reward	Torpedograss	12	0.75 gal./Acre
	Reward	Water Hyacinth	8	0.75 gal./Acre
	Reward	Water Shield (*Brasenia schreberi*)	1	0.75 gal./Acre
	Sonar AS	Alligator Weed	2	80ppb
	Sonar AS	Primrose	1	80ppb
	Sonar AS	Giant Salvinia	3	80ppb
2008	2, 4-D	Alligator Weed	36	0.5 gal./Acre
	2, 4-D	Water Hyacinth	379	0.5 gal./Acre
	Aquamaster	Alligator Weed	27	0.75 gal./Acre
	Aquamaster	American Lotus	27	0.75 gal./Acre
	Aquamaster	Cutgrass	1	0.75 gal./Acre
	Aquamaster	Common Salvinia	16	0.75 gal./Acre
	Aquamaster	Giant Salvinia	242	0.75 gal./Acre
	Aquamaster	Torpedograss	8	0.75 gal./Acre
	Aquamaster	Water Hyacinth	19	0.75 gal./Acre
	Aquathol Super K	Hydrilla	3	17.6 lbs./Acre-ft
	Habitat	Cutgrass	7	0.75 gal./Acre

	Polaris AQ	Cutgrass	23	0.75 gal./Acre
	Reward	Alligator Weed	142	0.75 gal./Acre
	Reward	American Lotus	36	0.75 gal./Acre
	Reward	Cutgrass	35	0.75 gal./Acre
	Reward	Common Salvinia	4	0.75 gal./Acre
	Reward	Giant Salvinia	1,282	0.75 gal./Acre
	Reward	Torpedograss	11	0.75 gal./Acre
	Reward	Water Hyacinth	256	0.75 gal./Acre
2009	Aquamaster	Alligator Weed	27	0.75 gal./Acre
	Aquamaster	Giant Salvinia	1,027	0.75 gal./Acre
	Aquamaster	Torpedograss	17	0.75 gal./Acre
	Aquamaster	Water Hyacinth	209	0.75 gal./Acre
	Diquat E Pro 2L	Alligator Weed	272	0.75 gal./Acre
	Diquat E Pro 2L	American Lotus	34	0.75 gal./Acre
	Diquat E Pro 2L	Cutgrass	3	0.75 gal./Acre
	Diquat E Pro 2L	Common Salvinia	12	0.75 gal./Acre
	Diquat E Pro 2L	Giant Salvinia	3,345	0.75 gal./Acre
	Diquat E Pro 2L	Torpedograss	10	0.75 gal./Acre
	Diquat E Pro 2L	Water Hyacinth	177	0.75 gal./Acre
	Platoon	Water Hyacinth	99	0.5 gal./Acre
	Platoon	Water Lily (*Nymphaea spp.*)	5	0.5 gal./Acre
	Reward	Alligatorweed	38	0.75 gal./Acre
	Reward	Cutgrass	8	0.75 gal./Acre
	Reward	Giant Salvinia	1,020	0.75 gal./Acre
	Reward	Water Hyacinth	2	0.75 gal./Acre
2010	Aquamaster	Alligator Weed	6	0.75 gal./Acre
	Aquamaster	Giant Salvinia	11	0.75 gal./Acre
	Aquamaster	Torpedograss	1	0.75 gal./Acre
	Aquamaster	Water Hyacinth	13	0.75 gal./Acre
	Diquat E Pro 2L	Alligator Weed	124	0.75 gal./Acre
	Diquat E Pro 2L	American Lotus	9	0.75 gal./Acre
	Diquat E Pro 2L	Duckweed	3	0.75 gal./Acre
	Diquat E Pro 2L	Common Salvinia	23	0.75 gal./Acre
	Diquat E Pro 2L	Giant Salvinia	477	0.75 gal./Acre
	Diquat E Pro 2L	Spadderdock	10	0.75 gal./Acre
	Diquat E Pro 2L	Torpedograss	5	0.75 gal./Acre
	Diquat E Pro 2L	Water Hyacinth	13	0.75 gal./Acre
	Platoon	Water Hyacinth	20	0.5 gal./Acre
2011	Aquamaster	Giant Salvinia	12	0.75 gal./Acre
	Diquat E Pro 2L	Pennywort	2	0.75 gal./Acre

		(*Hydrocotyle spp.)*		
	Diquat E Pro 2L	Common Salvinia	1	0.75 gal./Acre
	Diquat E Pro 2L	Giant Salvinia	143	0.75 gal./Acre
	Knockout	Alligator Weed	1	0.75 gal./Acre
	Knockout	Duckweed	1	0.75 gal./Acre
	Knockout	Pennywort	3	0.75 gal./Acre
	Knockout	Primrose	2	0.75 gal./Acre
	Knockout	Giant Salvinia	239	0.75 gal./Acre
	Knockout	Sedge (*Carex spp.)*	1	0.75 gal./Acre
	Sonar AS	Giant Salvinia	28	80ppb
2012	Aquamaster	Alligator Weed	20	0.75 gal./Acre
	Aquamaster	American Lotus	6	0.75 gal./Acre
	Aquamaster	Giant Salvinia	1,434	0.75 gal./Acre
	Aquamaster	Spadderdock	2	0.75 gal./Acre
	Aquamaster	Torpedograss	21	0.75 gal./Acre
	Aquamaster	Water Hyacinth	3	0.75 gal./Acre
	Knockout	Alligator Weed	29	0.75 gal./Acre
	Knockout	Giant Salvinia	221	0.75 gal./Acre
	Knockout	Torpedograss	1	0.75 gal./Acre
	Knockout	Water Hyacinth	14	0.75 gal./Acre
	Platoon	Alligator Weed	3	0.5 gal./Acre
	Platoon	Water Hyacinth	5	0.5 gal./Acre
	Tribune	Alligator Weed	30	0.75 gal./Acre
	Tribune	American Lotus	6	0.75 gal./Acre
	Tribune	Duckweed	2	0.75 gal./Acre
	Tribune	Primrose	7	0.75 gal./Acre
	Tribune	Giant Salvinia	2,595	0.75 gal./Acre
	Tribune	Sedge	529	0.75 gal./Acre
	Tribune	Spadderdock	2	0.75 gal./Acre
	Tribune	Torpedograss	1	0.75 gal./Acre
	Tribune	Water Hyacinth	1	0.75 gal./Acre
2013	Aquamaster	Giant Salvinia	5,221	0.75 gal./Acre
	Aquamaster	Primrose	2	0.75 gal./Acre
	Aquamaster	Spadderdock	13	0.75 gal./Acre
	Aquamaster	Torpedograss	44	0.75 gal./Acre
	Aquamaster	Water Hyacinth	15	0.75 gal./Acre
	Aquathol Super K	Hydrilla	4	17.6 lbs./Acre-ft
	Ecomazapyr	Primrose	6.66	0.75 gal./Acre
	Ecomazapyr	Torpedograss	6.66	0.75 gal./Acre
	Ecomazapyr	Alligator Weed	67	0.75 gal./Acre
	Diquat	Giant Salvinia	320	0.75 gal./Acre
	Diquat	Alligator Weed	13	0.75 gal./Acre

	Diquat	Parrot Feather (*Myriophyllum aquaticum*)	1.3	0.75 gal./Acre
	Diquat	Water Hyacinth	15	0.75 gal./Acre
	Diquat	Torpedograss	4.72	0.75 gal./Acre
	Platoon	American Lotus	35	0.5 gal./Acre
	Platoon	Water Hyacinth	61	0.5 gal./Acre
	Clear cast	Water Shield	18.66	0.75 gal./Acre
	Sonar AS	Giant Salvinia	1	80ppb
2014	Glyphosate	Giant Salvinia	3935	0.75 gal./Acre
	Glyphosate	Alligator Weed	127	0.75 gal./Acre
	Glyphosate	American Lotus	57	0.75 gal./Acre
	Glyphosate	Torpedograss	5	0.75 gal./Acre
	Glyphosate	Water Hyacinth	30	0.75 gal./Acre
	Glyphosate	Yellow Floating Heart (*Nymphoides peltata*)	16	0.75 gal./Acre
	Glyphosate	Water Primrose	36	0.75 gal./Acre
	Glyphosate	Duckweed	0.5	0.75 gal./Acre
	Glyphosate	Giant Cutgrass	1	0.75 gal./Acre
	Glyphosate	Parrot Feather	10	0.75 gal./Acre
	Clear Cast	Alligator Weed/Water Primrose	7.3	0.75 gal./Acre
	Ecomazapyr	Alligator Weed/Water Primrose	7.6	0.75 gal./Acre
	2, 4-D	American Lotus	5	0.5 gal./Acre
	Diquat	Giant Salvinia	79	0.75 gal./Acre
2015	Clipper	Yellow Floating Heart	8.0	12 oz./Acre
	Round-Up Custom	Giant Salvinia	1,472.0	0.75 gal./Acre
	Diquat	Giant Salvinia	117.0	0.75 gal./Acre
2016	Ecomazapyr 2SL	Alligator Weed	14.0	0.75 gal./Acre
	Rodeo	Giant Salvinia	3.0	0.75 gal./Acre
	Round-Up Custom	Giant Salvinia	384.0	0.75 gal./Acre
	Diquat	Giant Salvinia	13.0	0.75 gal./Acre
2017	Aquaneat	Giant Salvinia	70.0	0.75 gal./Acre
	Clipper	Yellow Floating Heart	4.0	12 oz./Acre
	Ecomazapyr 2SL	Alligator Weed/Water Primrose	1.0	0.75 gal./Acre
	Round-Up Custom	Giant Salvinia	267.75	0.75 gal./Acre

	Tribune	Giant Salvinia	33.0	0.75 gal./Acre

Reduced spray efforts of 2010,2011, 2016 and 2017 due to:

1) Cold weather periods of 2009 & 2010 that provided associated reductions in emergent plant coverage.

2) The drought of 2011 that resulted in record low water levels and additional control of aquatic vegetation.

3) High water events followed by spillway releases in 2016 and 2017 resulted in significant salvinia reduction by stranding vegetation.

Physical

Physical control features that exist in Toledo Bend Reservoir include:

1) Hydroelectric power generation results in water level fluctuation and reasonably effective submerged vegetation control along the reservoir shoreline.
2) The reservoir has ample wind and wave action to strand floating aquatic vegetation along the shoreline.

Typemap

Table 2. Total acreage of plant species found in Toledo Bend Reservoir, Louisiana during annual plant surveys from 2003 – 2013.

YEAR	HYDRILLA	COONTAIL	PONDWEED	GIANT SALVINIA
2003	1,600 acres	20 acres	60 acres	~
2004	1,900 acres	30 acres	90 acres	240 acres
2005	Not surveyed	Not surveyed	Not surveyed	2,150 acres
2006	Not surveyed	Not surveyed	Not surveyed	250 acres
2011	Not surveyed	Not surveyed	Not surveyed	25 acres
2012	Not surveyed	Not surveyed	Not surveyed	Not surveyed
2013	1,700 acres	Not surveyed	110 acres	925 acres

Recommendations:

Continue foliar herbicide applications at boat ramps and in areas where vegetation hampers boating access. LDWF crews should continue herbicide applications in response to complaints from the public. These applications will be principally directed toward control of giant salvinia and water hyacinth, but will also include control of other floating or emergent vegetation as needed. Water hyacinth will be treated by foliar application of 2,4-D herbicide at a rate of 0.5 gallons per acre. Giant salvinia will be treated with a mixture of glyphosate (0.75gal/acre), diquat (0.25gal/acre) with Turbulence (or approved equivalent, 0.25 gal/acre) surfactant from April 1 to October 31. Diquat (0.75 gal/acre) and a non-ionic surfactant (0.25gal/acre) will be used outside of that period. Yellow Floating Heart will be treated with a mixture of glyphosate (0.75gal/acre), Clipper (12 oz./acre) and Breeze (0.50gal/acre). All foliar applications should include a surfactant at 0.25 gallons per acre and should be made to the greatest extent possible within manpower and equipment limitations.

Continue release of giant salvinia weevils in areas that are more conducive to establishment and survival when necessary and available.