LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

OFFICE OF FISHERIES
INLAND FISHERIES SECTION

WATERBODY MANAGEMENT PLAN PART A

BARATARIA BASIN

LAKE HISTORY & MANAGEMENT ISSUES

CHRONOLOGY

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TABLE OF CONTENTS

WATERBODY HISTORY

GENERAL INFORMATION

The Barataria Basin is one of the nation's most significant estuaries. It is located between the Mississippi River and Bayou Lafourche in Southeast Louisiana (**APPENDIX I**). The basin is bounded on the north and east by the Mississippi River from Donaldsonville to Venice, on the south by the Gulf of Mexico and on the west by Bayou Lafourche. The basin contains approximately 1,565,000 acres. It was formed approximately 3,500-4,000 years ago as part of the Lafourche-Delta complex. The basin is an irregularly shaped area bounded on each side by a distributary ridge formed by the present and historical channels of the Mississippi River. A chain of barrier islands separates the basin from the Gulf of Mexico. In the northern half of the basin, which is transected by the Gulf Intracoastal Waterway (GIWW), several large lakes occupy the sump position approximately half way between the ridges. The southern half of the basin consists of tidally influenced marshes connected to a large bay system behind the barrier islands. The basin has undergone significant hydrological changes, both natural and anthropogenic. Freshwater and sediment input into the Barataria Basin was virtually eliminated with construction of the mainline Mississippi River levees and the closure of Bayou Lafourche at Donaldsonville in the 1930's. The Davis Pond Freshwater Diversion (DPFD), dedicated in March 2002, now introduces Mississippi River water back into the basin. The basin contains 152,120 acres of swamp, 173,320 acres of fresh marsh, 59,490 acres of intermediate marsh, 102,720 acres of brackish marsh, and 133,600 acres of saline marsh.

Major Waterbodies

Primary fresh and intermediate water bodies in the Barataria Basin include Lake Salvador (15,000 acres), Lake Des Allemands (12,000 acres), Lake Cataouatche (8,000 acres), The Pen (2,000 acres), Lake Boeuf (2,000 acres) Bayous Boeuf (8 miles), Des Allemands (20 miles), Chevreuil (10 miles), Grand (12 miles), Citamon (14 miles), Segnette (12 miles), and Bayou Verret (4 miles) (**APPENDIX I)**. Additionally, there are many miles of manmade canals throughout the basin including the GIWW and Barataria Waterway.

Location

The basin is located in portions of nine parishes: Assumption, Ascension, St. James, Lafourche, St. John the Baptist, St. Charles, Jefferson, Plaquemines and Orleans (Source: LaCoast.gov).

AUTHORITY

The state of Louisiana has authority over the state owned water bottoms of the Barataria Basin. However, manmade canals are considered private property of the landowner. In these instances, land owners did not give up land rights for canal construction purposes. Some, but not all, of these landowners still allow public access in their canals. This document does not attempt to delineate private / public canals nor suggest public access to private canals.

The basin is managed under the authority of at least three major programs:

Coastal Protection and Restoration Authority

The Coastal Protection and Restoration Authority (CPRA) of Louisiana is mandated to develop, implement, and enforce a comprehensive coastal protection and restoration master plan. This single state authority integrates coastal restoration and hurricane protection statewide. The Barataria Basin is located in CPRA's Southeast Region. Initially, CPRA was established as a board of directors by the 1st Extraordinary Session of the Louisiana Legislature of 2005. Act 545 of the 2008 Regular Session and Act 523 of the 2009 Regular Session provided the Board of Directors with an implementation arm. These Acts integrated the coastal restoration and flood protection division of the Department of Natural Resources (DNR) and the Department of Transportation and Development (DOTD), creating the Office of Coastal Protection and Restoration (OCPR) within the Executive Department. Act 604 of the 2012 Regular Session of the Louisiana Legislature formally changed the name from OCPR to CPRA. Complete details for CPRA, including the Louisiana 2023 Coastal Master Plan and specific plans for the Barataria Basin can be found by visiting the CPRA website at: https://coastal.la.gov/our-plan/2023-coastal-master-plan/ /.

Barataria Terrebonne National Estuary Program

The Barataria Terrebonne National Estuary Program (BTNEP) was formed in 1990 and includes many stakeholders such as local government, businesses, scientists, conservation organizations, and agricultural interests. The BTNEP is chartered with protection, development and study of the basins and is administered through the Louisiana Universities Marine Consortium (LUMCON). The Barataria and Terrebonne Basins were nominated for the National Estuary Program (NEP) in 1989. The NEP was established by Congress through section 320 of the Clean Water Act in 1987 and is administered by the Environmental Protection Agency (EPA). (Source: BTNEP.org) While BTNEP does not have legislative authority to enact specific management plans, it is considered an authority on management issues of the basin. Complete details for BTNEP can be found by visiting their website at: http://www.btnep.org .

Coastal Wetlands Planning, Protection, and Restoration Act

The Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) is federally mandated legislation enacted by the U.S. Congress in 1990 that is designed to identify, prepare, and fund construction of coastal wetlands restoration projects. These projects provide for the long-term conservation of wetlands and dependent fish and wildlife populations with cost-effective plans for creating, restoring, protecting, or enhancing coastal wetlands. In Louisiana, CWPPRA is often called the "Breaux Act" in honor of U.S. Senator John Breaux, who helped initiate the legislation. (Source: LaCoast.gov). Details for CWPPRA's Barataria Basin projects can be found by visiting the LaCoast website at: http://lacoast.gov.

ACCESS

There are numerous boat ramps and marinas located throughout the Barataria Basin. Table 1 lists the most popular access locations within the basin.

Table 1. List of popular boating access locations in the Barataria Basin, LA.

Boat Ramp Name	Map Coordinates
Bayou Chevreuil Launch	(29.911628°, -90.728780°)
Bayou Gauche Launch	(29.781829°; -90.394416°)
Sanchez Launch	(29.850045°, -90.678806°)
Bill Taylor Launch	(29.890434°, -90.78543°)
Des Allemands Launch	(29.821840°, -90.476315°)
LaRousse Launch	(29.868076°, -90.599839°)
Moll Canal Launch	(30.013824°, -90.543052°)
Theriot Canal Launch	(29.737554°, -90.647604°)
Fred’s Launch	(29.917525°, -90.625196°)
Pier 90 Launch	(29.913090°, -90.273356°)
Bayou Segnette Launch	(29.897209°, -90.158195°)
Rosethorne Launch	(29.760994°, -90.102538°)
Des Familles Launch	(29.769359°, -90.081755°)
Crowne Pointe Launch	(29.747879°, -90.137229°)
Cochiara’s Launch	(29.691940°, -90.096643°)
Joes Landing	(29.685085°, -90.101671°)
SeaWay Marina	(29.656523°, -90.108921°)
C&M Marina	(29.653279°, -90.106101°)
Clovelly Launch	(29.553033°, -90.275768°)
Larose GIWW Launch	(29.582617°, -90.375828°)
Myrtle Grove Marina	(29.633849°, -89.952094°)
Happy Jack Marina	(29.517968°, -89.736759°)
Port Sulphur Ramp	(29.473928°, -89.697220°)
Delta Marina	(29.385710°, -89.601379°)
Joshua’s Marina	(29.349747°, -89.537841°)
Cypress Cove Marina	(29.250318°, -89.360650°)
Venice Marina	(29.240064°, -89.364634°)
JJ’s Launch	(29.382376°, -90.258932°)
Bobby Lynn’s	(29.266080°, -90.218255°)
Boudreaux’s	(29.256427°, -90.215977°)
Watt’s	(29.252270°, -90.215977°)
Fourchon Public Launch	(29.115095°, -90.191122°)
Bridgeside Marina	(29.203790°, -90.040290°)
Caminada	(29.205409°, -90.039183°)
Sand Dollar	(29.262382°, -89.961519°)

Boat Docks

Small boat docks are associated with the boat ramps at all launches listed. However, these docks are for loading and boarding boats, not for extended vessel moorings. Vessel docking, fuel, and marina services may be available at the following marinas. Table 2 lists popular marinas and associated websites.

Table 2. List of marinas offering vessel services throughout Barataria Basin, LA.

Joes Landing Marina	https://www.facebook.com/joeslanding/
SeaWay Marina	http://www.seawaymarinalafitte.com/
C&M Marina	https://www.jeanlafitteharbor.com/
Bridgeside Marina	https://bridgesidegrandisle.com/
Delta Marina	https://www.facebook.com/DeltaMarinaEmpire/
Cypress Cove Marina	http://www.cypresscovevenice.com/
Venice Marina	http://www.venicemarina.com/
Bobby Lynn's Marina	http://www.bobbylynns.com/
Sand Dollar Marina	https://www.facebook.com/sanddollarmarina/

Piers

There is a small community fishing pier in Lafitte, LA. It is located on Jean Lafitte Blvd. between 2nd and 4th streets. Coordinates: 29. l667060̊ , -90.110127̊

There is a fishing pier accessing the Gulf of Mexico in Grand Isle State Park, Grand Isle, LA. Coordinates: 29.259917̊ , -89.950148̊

There is a Port Sulphur Civic Drive Fishing Pier in Plaquemines Parish, 410 Civic Drive, Port Sulphur:
Coordinates: 29.47398̊ , -89.697321̊

State/Federal Facilities

Lake Boeuf Wildlife Management Area

Lake Boeuf Wildlife Management Area (WMA) is located in the basin east of Hwy 308 north of Raceland, LA. The area includes approximately 800 acres of freshwater marsh and swamp, and is accessible only by boat via the Theriot Canal, Foret Canal, or Lake Boeuf. Hunting opportunities include archery, small game, waterfowl, and unmarked hogs. The area also hosts annual youth lottery gun deer hunts. More information is available at the following link: https://www.wlf.louisiana.gov/page/lake-boeuf

Salvador Wildlife Management Area

Salvador WMA is located in the basin in St. Charles Parish along the western shores of Lake Salvador and Lake Cataouatche. The area includes approximately 30,000 acres and is accessible only by boat via Bayous Verret, Segnette or Des Allemands. The area consists of freshwater marsh and swamp that is segmented and accessible by oil and gas canals. Hunting opportunities include archery, small game, and waterfowl. For more information including maps and special regulations please follow this link: https://www.wlf.louisiana.gov/page/salvador-timken

Timken Wildlife Management Area

Timken WMA is a 3,000-acre marsh island in the basin. The area is identified as Couba Island on maps and is leased to LDWF from the New Orleans City Park Commission. It is located immediately to the east of Salvador WMA and is accessible via the same waterways. The island consists of fresh to intermediate marsh and provides habitat for waterfowl, furbearers and alligators. For more information, including maps and special regulations, please follow

this link:
https://www.wlf.louisiana.gov/page/salvador-timken

Grand Isle Fisheries Research Lab
The Grand Isle Fisheries Research Lab is located on Grand Isle, in the Barataria Basin. The lab serves as a research hub for LDWF biologists, as well as universities and cooperative efforts with other states. For more information, please follow the link:
https://www.wlf.louisiana.gov/page/grand-isle-fisheries-research-lab

U.S. Coast Guard "Grand Isle Station"
The U.S. Coast Guard "Grand Isle Station" is located on Grand Isle, LA. It is considered one of the three priority "3" CONUS small boat stations in the Coast Guard. For more information please follow the link:
https://www.history.uscg.mil/Browse-by-Topic/Assets/Land/Stations-Units/Article/2650287/station-grand-isle-louisiana/

State/National Parks

Jean Lafitte National Historical Park and Preserve
Jean Lafitte National Historical Park and Preserve is located in the Barataria Basin. For more information please follow this link:
http://www.nps.gov/jela/index.htm

Bayou Segnette State Park
Bayou Segnette State Park is located in the Barataria Basin in Jefferson Parish. The park includes a popular, well maintained boat ramp providing access to the middle and upper portions of the basin. For more information, please follow the link below:
https://www.lastateparks.com/parks-preserves/bayou-segnette-state-park

Grand Isle State Park
Grand Isle State Park is located in the Barataria Basin on Grand Isle. The park is located on the gulf side of the island providing swimming, fishing, nature and bird watching opportunities. A fishing pier accessing the Gulf of Mexico is also available. For more information, please follow this link:
https://www.lastateparks.com/parks-preserves/grand-isle-state-park

Elmer's Island Refuge
Elmer's Island Refuge is located in the Barataria Basin. The refuge is owned and maintained by LDWF. The island refuge provides fishing, nature and bird watching opportunities. For more information, please follow the link below:
https://www.wlf.louisiana.gov/page/elmers-island

SHORELINE DEVELOPMENT

Industrial and urban development as well as recreational camps populate the Barataria Basin's shoreline. It is impacted by potable water intakes, drainage and sewer discharge points, and general urban runoff.

EVENTS / PROBLEMS

The Barataria Basin is a complex and dynamic ecosystem. For detailed descriptions of problems and comprehensive plans visit CPRA, BTNEP and CWPPRA websites at:
http://coastal.louisiana.gov/
http://www.btnep.org
http://lacoast.gov

2010 *Deepwater Horizon* Oil Spill

The 2010 *Deepwater Horizon* Oil Spill in the Gulf of Mexico was the nation's largest oil spill. The Barataria Basin was affected by direct oiling and response activities. The investigation into the impacts of the *Deepwater Horizon* oil spill on natural resources including fisheries, aquatic vegetation and wetlands began immediately and is still ongoing.

Hurricanes and Tropical Storms

Since 2005, multiple hurricanes have affected the Barataria basin; Hurricane Ida in 2021 (Appendix V), Hurricane Isaac in 2012, Tropical Storm Lee in 2011, Hurricane Gustav in 2008, Hurricane Ike in 2008, Hurricane Rita in 2005, and Hurricane Katrina in 2005. Salinity spikes (see Appendix II Figure 1) and loss of aquatic vegetation and wetlands due to wave action and bottom scour are associated with these events.

Natural mortality due to environmental disruptions may limit Largemouth Bass (LMB) populations in coastal areas. Periodic hurricanes and tropical storms often interrupt natural regimes and disturb aquatic habitats of the basin. Widespread fish kills are associated with such events (see fish kills section). Historically, a common LDWF response to such kills was to evaluate the extent of the kill and restock to enhance recovery of the fish population. Largemouth Bass were the most commonly stocked species in those efforts. The current approach includes an evaluation of natural recovery with restocking and/or harvest restrictions reserved for application on an as-needed basis. Coastal systems are generally adapted to periodic disturbance from tropical systems, and if allowed to function properly, prove to be resilient and show little to no benefit from resting after a fish kill.

Hydrological Changes and Diversions

The Barataria Basin has undergone significant hydrological changes, both natural and anthropogenic. Historically, the Mississippi River was the source of freshwater, nutrients and sediment for the basin. The construction of Mississippi River mainline levees and the closure of Bayou Lafourche at Donaldsonville ceased the input of freshwater and sediment. Navigation canals like the Barataria Waterway, Wilkinson Canal, the GIWW and the hundreds of miles of oil field canals, plus natural processes such as subsidence and sea-level rise, have increased saltwater intrusion and shoreline erosion. To mitigate for these changes, siphons and diversions have been constructed.

The Naomi Freshwater siphon and the West Pointe a la Hache siphons were constructed in 1992 on the west side of the basin. These siphons are capable of a maximum discharge of 2,144 cubic feet per second (cfs) each. The Davis Pond Freshwater Diversion (DPFD) was dedicated as the Barataria's largest diversion in March 2002. It has the capacity to divert up to 10,650 cfs of freshwater from the Mississippi River, channeling it through an outflow canal, into a 9,200-acre ponding area, then out into Lake Cataouatche and into the Barataria Basin.

Several modifications were made after the construction of the DPFD (see Appendix II Figure 1). The ponding area did not drain properly, which caused the lower west guide levee (WGL) to be overtopped. Vinyl sheet piling was used in the low sections of the WGL that had subsided. Heavy marsh equipment was used to compact the Lake Cataouatche Shore Line protection (gabion weir) in areas where there were natural channels to entice the ponding area to drain.

2003 - During testing conducted at flow rates of 10,650 cfs, the WGL overtopped and the east guide levee (EGL) was being seriously undermined and came close to being overtopped in many locations. The Cypress canal levee was also being overtopped and came close to being breached in several locations.

2005 - The EGL was raised to its design grade, which is where it is currently. The gabions at the locations of the natural channels in the ponding area were removed to allow the area to better drain into Lake Cataouatche.

2005/2006 – The natural channels were deepened and widened well into the ponding area to connect to open areas and permit better drainage.

2006/2007 - More channels were built and more cuts in the gabions were made to assist in the drainage of the ponding area.

2008/2009 - Two large cuts (500') were made in the Cypress Canal Levee, in the vicinity of the WGL to allow additional drainage into the NW section of Lake Cataouatche. Vinyl sheet pilings were also placed in the gaps on the lower WGL.

The operation of the DPFD has been inconsistent in the past (Table 3). Its operation was influenced by natural and anthropogenic forces during that time, a drought year in 2006, followed by two wet years in 2008 and 2009, and then in 2010 when the diversion was operated at nearly continuous high discharge from April through August in response to the *Deepwater Horizon* oil spill. Davis Pond Freshwater Diversion gauge data can be found at the link below. http://waterdata.usgs.gov/usa/nwis/uv?295501090190400

Table 3. Davis Pond Freshwater Diversion mean annual discharge in cubic feet per second (cfs).

Year	Mean Annual Discharge (cfs)
2003	833
2004	683
2005	821
2006	3101
2007	2207
2008	3551
2009	3802
2010	3873
2011	2312
2012	2079
2013	2467
2014	735
2015	1217.1
2016	917.8
2017	1467.9
2018	1418.7
2019	1057
2020	1263
2021	1369
2022	1540

The current operation plan of the DPFD for 2023 is based on salinity ranges. From December through May, Davis Pond operations will be based on the monthly salinity range at the 15.0 ppt line specified by the map in the operations plan (see Appendix III). From June through November, Davis Pond operations will be based on the monthly salinity range at the 5.0 ppt line specified by the map in the operations plan (see Appendix III).

The DPFD has drastically changed the salinity regime, and has altered the aquatic habitat in Lake Cataouatche and into the Barataria Basin. The increase of Mississippi River water is associated with an increase in turbidity, nutrients, and invasive species in the system. Decreased water clarity, eutrophication, and excess algae have contributed to impacts to aquatic habitat in the Barataria Basin.

Aquatic Habitat Loss and Shifts

Submersed aquatic vegetation (SAV) is the most significant form of complex cover for aquatic animals in the Barataria Basin. Beginning in the 1950s, salt water intrusion contributed to SAV coverage declines in the middle and upper basin. In 2003, the U.S. Army Corps of Engineers Davis Pond Freshwater Diversion project began operation. Fresh water from the Mississippi River stimulated growth of submersed aquatic vegetation in the project outfall area. By 2007, Lake Cataouatche had an estimated 90% coverage of SAV. Species included eelgrass (*Vallisneria americana*), coontaiI (*Ceratophyllum demersum*), Eurasian watermilfoil (*Myriophyllum spicatum*), and hydrilla (*Hydrilla verticillata)*.

SAV began to decline throughout the upper and middle basin in 2008, and became essentially absent in and around Lake Cataouatche by 2012. Unfortunately, the quality sport fishery that had been associated with the SAV habitat has also declined. A combination of natural and anthropogenic influences is likely responsible.

1. Hurricanes, most notably Gustav and Ike in 2008, Isaac in 2012, and recently Ida in 2021, scoured the bottom of Lake Cataouatche and dislodged vegetation and existing root systems.
2. Salinity spikes associated with these events also damaged freshwater SAV species.
3. One of the main water quality changes associated with the operation and modifications of the DPFD was a decrease in water clarity. The availability of light is one of the most important factors affecting SAV persistence and survival (Dennison et al. 1993). Turbidity measurements have increased at three sample sites within Lake Cataouatche since 2006.

Table 4. Top and bottom turbidity measurements in Nephelometric Turbidity Units (NTU) at sample site 4001 (29.82611 , -90.2525).

Date	NTU Top	NTU Bottom
2/28/2003	14.1999	13.1999
5/5/2003	10.6999	35
8/21/2003	3.7999	4.5
10/16/2003	2.5	6.0999
2/3/2004	30.5	30
6/10/2004	4.6999	4.0999
8/5/2004	4.1999	4.1999
12/3/2004	1	1
2/15/2005	7.5999	7.5
4/25/2005	9.3999	9
8/18/2005	2.8999	4.6999
11/7/2005	3.3999	3.6999
3/6/2006	4.7999	5.2999
5/26/2006	1.5	0.5999
8/24/2006	0.6999	0.3999
2/14/2008	23.8999	23.5999
12/9/2010	51.0	56.7999

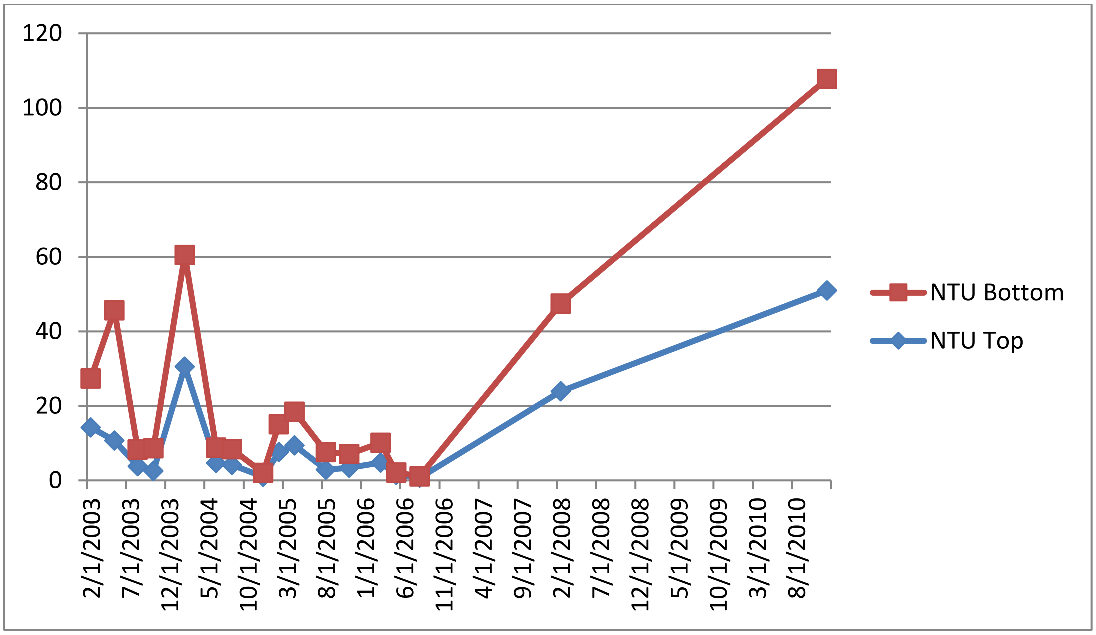

Figure 1. Top and bottom turbidity values in NTU's at sample site 4001 (29.82611, -90.2525).

Table 5. Top and bottom turbidity measurements in NTU's at sample site 4003 (29.84333, -90.27222).

Date	NTU Top	NTU Bottom
5/27/2003	11.6999	20.2999
12/2/2003	6.5999	8.2999
4/19/2004	3.2999	8.3999
12/16/2004	1	1
5/10/2005	13.7999	13.7999
12/19/2005	9.8999	12.0999
6/20/2006	0.2999	0.7999
6/2/2008	8.7999	14.5
12/1/2010	10.0999	36.0999
1/4/2011	22.6999	25.7999

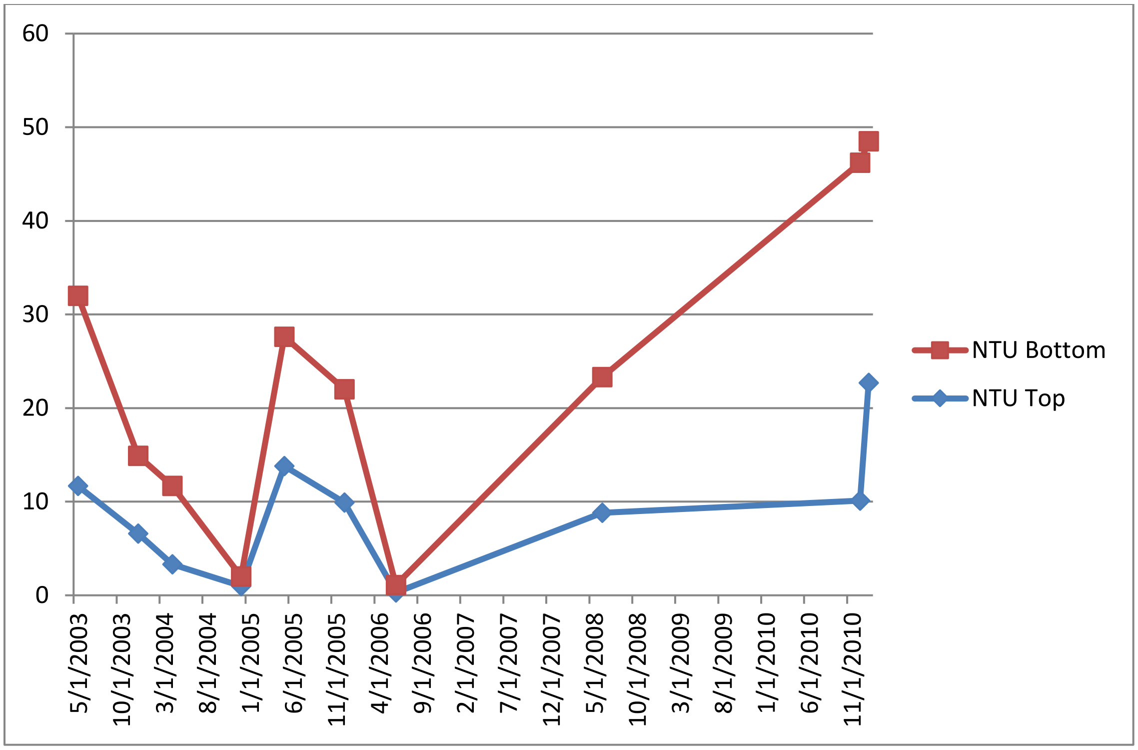

Figure 2. Top and bottom turbidity values in NTU's at sample site 4003 (29.84333, -90.27222).

Table 6. Top and bottom turbidity measurements in NTU's at sample site 4004 (29.86194, -90.22889).

Date	NTU Top	NTU Bottom
2/28/2003	31.1999	29.8999
5/19/2003	16.3999	22.2999
8/21/2003	4.2999	10.2999
10/16/2003	2.5999	3.3999
2/3/2004	25.8999	26.8999
6/10/2004	5.5999	5.3999
8/5/2004	3.1999	3.5999
12/3/2004	2.5	1.1999
2/15/2005	18	13.5
4/25/2005	35.7999	37.7999
8/18/2005	3.5999	5.8999
11/7/2005	9.6999	9.5999
3/6/2006	8.0999	12.7999
5/26/2006	2.1999	4.1999
8/24/2006	0.5	1.6999
2/14/2008	16.6999	20.0999
12/9/2010	15.5999	19

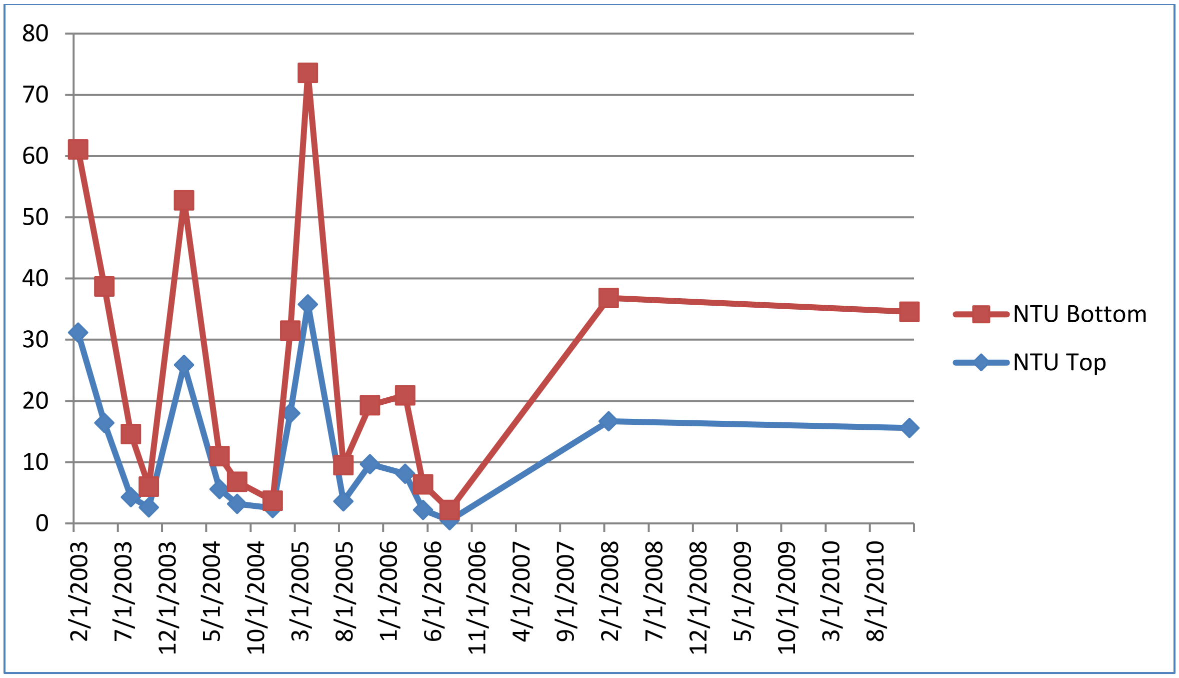

Figure 3. Top and bottom turbidity values in NTU's at sample site 4004 (29.86194, -90.22889).

Recently, SAV has begun to repopulate portions of Lake Cataouatche, specifically in the Tank Ponds, the Netherlands, and near the banks and shallow areas around the lake. (**Appendix IV**, Figure 1**).** In an effort to quantify abiotic and biotic factors and their correlation to future shifts in the abundance of beneficial aquatic habitat in Lake Cataouatche, monthly water quality samples began in 2016, and will continue biennially, along with annual vegetative type maps. Water quality parameters were sampled in 2022 at five sites (Table 7. Appendix I Figure 4.).

Table 7. Lake Cataouatche water quality sites sampled in 2016, 2018, 2020 and 2022.

Station Code	**Station Name**	**Latitude**	**Longitude**
4355	WQ Cypress canal	29.855418	-90.258958
4356	WQ Tires	29.841125	-90.270349
4357	WQ Couba pass	29.811144	-90.237742
4358	WQ Bay Bardeaux	29.814127	-90.170161
4359	WQ Whiskey canal	29.854082	-90.204595

MANAGEMENT ISSUES

AQUATIC VEGETATION

Aquatic vegetation provides beneficial habitat for fish and wildlife throughout the fresh and intermediate wetland areas of the Barataria Basin. However, invasive plants such as water hyacinth (*Pontederia crassipes*), alligator weed (*Alternanthera philoxeroides*), common salvinia (*Salvinia minima*), and giant salvinia (*Salvinia molesta*) have become overly abundant and problematic. Water hyacinth and giant salvinia have been the most problematic in recent years. In the lower areas of the basin, freshwater plant species are restricted by salinity. Marsh grasses, *Spartina* spp. are the dominant plants.

<u>Aquatic Vegetation Status</u>
As of 12/31/2022, public waterways within the Barataria estuary contained approximately 17,100 acres of nuisance aquatic vegetation.

- 11,500 acres of water hyacinth
- 300 acres of hydrilla
- 2,000 acres of Eurasian watermilfoil
- 2,000 acres of giant salvinia
- 300 acres of common salvinia
- 1,250 acres of alligator weed

The lingering effects of Hurricane Ida (August 2021) were still evident throughout much of the growing season during 2022. Nuisance aquatic vegetation was significantly diminished; consequently, spray efforts were greatly reduced. However, before the end of 2022, it was apparent that aquatic vegetation was quickly rebounding to normal levels.

<u>Limitations</u>

- The Barataria estuary consists of over 100,000 acres of tidally influenced waterways. It is also connected to the Mississippi River via freshwater diversion projects. Prior to the introduction of freshwater from the river, salinities as high as 15 ppt limited the growth of aquatic plants in the estuary.
- Wind and tides cause movement of floating aquatic plants.
- Storm surge from hurricanes and tropical storms causes significant changes in water levels and salinity.
- Many of the infested canals and shallow ponds are private or restricted areas. Therefore, LDWF is prohibited from treating them.
- Shoreline erosion
- Shallow, silted canals
- The vast size and interconnectedness of waterways within the estuary force LDWF to prioritize and treat only the areas of highest public use.
- USACE only receives limited funding for their RAG program, thus leaving LDWF responsible for treating thousands of additional acres annually.
- Due to the remote locations of boat ramps, LDWF spray crews have long travel times, thus limiting time spent on the water applying herbicide.

The Aquatic Plant Control (APC) program underwent a significant overhaul in 2022. It will now function as a statewide, independent section within Inland Fisheries. Field operations (spraying, weevil harvest/stocking, boom deployment, etc.) will remain mostly unchanged, but oversight will be linear and better defined. This centralized decision making will lead to more efficient nuisance aquatic plant control management.

Type Maps

Nuisance aquatic plants are ubiquitous across the Barataria Basin. Efforts to estimate the abundance and species composition of aquatic vegetation in the Barataria Basin have been limited to localized efforts. A historical compendium of vegetative type map surveys for Lake Boeuf (1980 – 2001) is found in Barataria Basin MP-C. Appendix IV Figure 1 depicts Eurasian milfoil abundance in The Pen (20802) in 2011. In 2016, a survey of submersed aquatic vegetation was conducted on Lake Cataouatche in an effort to document the presence of beneficial aquatic habitat within the influence of the DPFD.

Surveys conducted in 2021 (Pre Hurricane Ida) of Lake Cataouatche illustrated an increase in total vegetation acreage of SAV communities from 34.86 acres to 577.7 acres. The Davis Pond Freshwater Diversion average discharge from 2016 to 2020 was 1,224.88 cfs. These lower discharge rates can contribute to a lower amount of suspended solids resulting in lower light attenuation. These causal factors tend to contribute to more robust SAV growth . This was a dramatic increase in aquatic habitat in Lake Cataouatche. A post Hurricane Ida survey, conducted in 2023 illustrated a decrease in total SAV communities to 370.4 acers **Appendix IV, Figure 1**.

Treatment History

Biological

Giant salvinia weevils (Cyrtobagous salviniae) have been introduced to control giant salvinia in the Barataria Basin. The Louisiana Department of Wildlife and Fisheries, the U.S. Fish and Wildlife Service (USFWS), the National Park Service (NPS), and private landowners continue to cooperate with the intent to establish weevils throughout the basin. Table 4 summarizes LDWF giant salvinia weevil releases since 2008. As a result of these efforts and conventional herbicide applications, dense aggregates of giant salvinia have diminished in the basin.

Table 4. Summary of giant salvinia weevil releases into the Barataria Basin from 2008 – 2013.

	2008	2009	2011	2012	2013	**TOTAL**
20101 Bayous Chevreuil, Grand and Verret				800		800
20102 Bayou Boeuf, Halpin and Theriot Canals			4000	12000	7200	23200
20201 Bayou Des Allemands above Hwy 90	3600	4800		2400		10800
20202 Lake Des Allemands				3200		3200
20301 Bayou Des Allemands below Hwy 90				14000	6480	20480
20302 Bayou Gauche	400	400		2000		2800
20304 Lake Salvador	800			14800	5760	21360
20701 Bayou Segnette				4800		4800
20801 Clovelly				2400		2400
20802 The Pen				4000		4000
TOTAL	4,800	5,200	4,000	60,400	19,440	**93,840**

Chemical

Historically, two LDWF spray crews operated in this area along with the occasional use of private contractors to supplement LDWF spray crew efforts. They've sprayed a combined 14,451 acres of nuisance vegetation over the past five years (Table 5). A summary of spray crew activity within District 8 can be found in Table 6. A total of 971 acres were sprayed in 2022. With only one aquatic plant control employee (one half of a LDWF spray crew) remaining in District 8, spray efforts were significantly reduced compared to previous years. Private contractors are utilized (when possible) to treat larger problem areas as funding allows. Giant salvinia was the focus in the Barataria Basin in recent years, but has recently been surpassed by water hyacinth. Spray crews use practices outlined in the LDWF approved Aquatic Herbicide Application Procedures (Table 4). Private contractors were mainly utilized on the lower half of the basin where aquatic vegetation problems tend to be larger and more spread out. Herbicide applications to control SAV in a dynamic open system are infrequent. Two herbicide treatments have been conducted within the Barataria Basin to control SAV in the past. In November 2007, LDWF contractors applied Aquathol K to 1,124 acres in Lake Cataouatche. This treatment was designed to create boat lanes and open areas for fishing access. Follow-up inspections showed that the herbicide application did not control SAV in the target area.

In 2011, Aquathol Super K was applied to boat lanes in The Pen to maintain boating access. Milfoil was the primary target species. A combined total area of 125 acres were treated in the 2000-acre lake. Within 90 days of the herbicide application, nearly all milfoil had disappeared from The Pen. Despite the apparent correlation, effects of that magnitude from the limited herbicide application are improbable. However, storm surge from Tropical Storm Lee occurred during the same time frame. The corresponding salinity spike is strongly suspected to be the primary cause of large scale damage to the freshwater plant species.

Table 5. Acres Sprayed in the Barataria Basin from 2018 – 2022.

Waterbody	2018	2019	2020	2021	2022	Total
20101 (Bayous Verret,Chevreuil,Citamon, and Grand)	0	0	0	20	44	64
20102 (Bayou Boeuf, Halpin and Theriot Canals)	1260	810	0	340	532	2942
20103 (Lake Boeuf)	2230	1080	1320	880	36	5546
20201 (Bayou des Allemands)	16	20	0	20	20	76
20202 (Lac des Allemands)	40	60	0	0	20	120
20301 (Bayou des Allemands)	318	66	20	60	36	500
20302 (Bayou Gauche)	0	30	40	420	80	570
20303 (Lake Cataouatche)	296	254	238	0	0	788
20304 (Lake Salvador)	474	224	276	120	0	1094
20401 (Bayou Lafourche)	0	0	0	0	0	0
20601 (Intracoastal Waterway)	0	0	0	0	0	0
20701 (Bayou Segnette)	448	382	126	320	203	1479
20801 (Intracoastal Waterway)	0	0	0	0	0	0
20802 (Bayou Barataria and Barataria Waterway)	0	0	0	0	0	0
20803 (Pen, The)	826	10	40	0	0	876

Waterbody	2018	2019	2020	2021	2022	Total
20903 (Barataria Waterway)	0	0	0	0	0	0
20904 (Wilkinson Canal and Wilkinson Bayou)	0	0	0	0	0	0
21102 (Barataria Basin coastal bays and Gulf waters)	0	0	0	0	0	0
20901 (Bayou Rigolettes and Perot)	134	262	0	0	0	396
Total	6042	3198	2060	2180	971	14451

Table 6. Aquatic Vegetation Treated in the Barataria Basin in 2022.

2022							
Crew	Waterbody code	Alligatorweed	Pennywort	Floaton	Water Hyacinth	Water Lettuce	Total
Baton Rouge 2	20101 (Bayou Chevreuil)				44		44
	20102 (Bayou Boeuf)				126		126
	20103 (Lake Boeuf)				36		36
	20701 (Bayou Segnette)				173		173
Lacombe 2	20102 (Bayou Boeuf)	8	82	28	280	8	406
	20201 (Bayou des Allemands)	6			14		20
	20202 (Lac Des Allemands)				20		20
	20301 (Bayou des Allemands)	4			16		20
	20302 (Bayou Gauche)		40	4	36		80
	20701 (Bayou Segnette)		8	10	12		30
Other (PA)	20301 (Bayou des Allemands)				16		16
Total		18	130	42	773	8	971

Table 3. LDWF approved Aquatic Herbicide Application Procedures

Plant Species	Herbicide	Surfactant
***Salvinia 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)
***Salvinia 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)
***Salvinia 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)
***Salvinia spp*. Alternative 4** Common/Giant Salvinia (November 1 to March 31)	Diquat (0.75 gal/acre)	Nonionic surfactant (0.25 gal/acre)
***Salvinia 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)
Alligatorweed/Giant Cut Grass (undeveloped areas)	Imazapyr (0.5 gal/acre)	Turbulence (or approved equivalent, 0.25 gal/acre)
Alligatorweed/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)

HISTORY OF REGULATIONS

Recreational

Recreational fishing regulations including size and creel limits of fresh and saltwater species can be found on the LDWF website at: http://www.wlf.louisiana.gov/regulations

Commercial

Commercial fishing regulations for fresh and saltwater species can be found on the LDWF website at: http://www.wlf.louisiana.gov/regulations

FISH KILLS / DISEASE HISTORY

Fish kills are fairly common in the upper area of the basin - usually as a result of hypoxic conditions. Fish kills following a tropical storm are generally caused by one, or a combination of up to three factors: churning and decomposition of organic sediments causing a drop in dissolved oxygen, decomposition of debris falling and flowing into waterways, and storm surge. Following the initial factors that led to hypoxic conditions, fish and other biota killed by the original hypoxia begin to decompose – prolonging the event. Fish have also been observed escaping hypoxic waters en masse, only to deplete the oxygen in the water they have crowded into, causing more fish kills. Hypoxia has been observed for a number of weeks following a storm, and conditions improve at variable rates depending on environmental circumstances. Although fish kill investigations are limited due to conditions in the aftermath of the storm, witnesses have reported widespread fish kills throughout the upper basin following Hurricanes Katrina and Rita in 2005, Hurricanes Gustav and Ike in 2008, Isaac in 2012 and Hurricane Ida in 2021. The Hurricane Ida Inland Fish Kill Report can be found in Appendix V

No samples for Largemouth Bass virus have been collected.

CONTAMINANTS / POLLUTION

Fish consumption and swimming advisories for waterbodies within the basin can be found on the Louisiana Department of Environmental Quality's website at:
http://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories

BIOLOGICAL

Fish Samples

Inland Fisheries Districts 7 and 8 sample fish in 14 LDEQ designated waterbodies in the Barataria Basin. Historical sampling data from 1990 to present is available through the LDWF data management system (DMS). Records prior to 1990 are on file in Districts 7 and 8 offices. Table 6 summarizes samples collected from 1990 to 2013. Samples listed below represent several gear types deployed for routine monitoring: the DPFD project, coastal monitoring, and special projects. Districts 7 and 8 collected standardized electrofishing samples and 1-day rotenone samples in the basin in 2011, 2012, and 2013 for a special coastal project. District 8 began basin wide standardized electrofishing samples at 17 stations biennially in 2016. Table 7 below shows samples conducted from 2016 to 2020. Table 8 and Appendix 1 Figure 4 depict District 8's current standardized electrofishing stations within the Barataria Basin.

Table 6. Historical fisheries sampling in the Barataria Basin, LA 1991 - 2013.

Waterbody	Year(s)	Sampling Gear	Number of Samples
20101 Bayous Verret, Chevreuil, Citamon, Grand	1991-1995, 2000, 2007-2008	Electrofish/Forage	40/4
20102 Bayou Boeuf, Halpin and Theriot Canals	1991-1993, 2000, 2007-2010, 2012	Electrofish / Forage	42/3
	2009	Hoop nets	2
	2009	Leadnets	2
20103 Lake Boeuf	1990, 1993-1995, 2000, 2008	Electrofish/Forage	25/3
20201Bayou des Allemands Above Hwy 90	1996-1997, 2000, 2010	Electrofish/Forage	104/8
20202 Lake des Allemands	1990-1992, 2011	Electrofish/Forage	30/4
	1990-1994, 2001-2004	1 Acre Rotenone	20
20301 Bayou des Allemands Below Hwy 90	1996-1997, 2000-2010, 2013	Electrofish/Forage	41/2
20302 Bayou Gauche	1994	Electrofish/Forage	8/1
20303 Lake Cataouatche	1998-2013	Electrofish/Forage	268/26
	1998-2006	Gillnets	34
	1998-2006	1" Hoop nets	145
	1998-2006	1 Acre Rotenone	13
	2011-2012	Leadnets	4
	2011-2013	1 Day Rotenone	3
20304 Lake Salvador	1998-2010, 2011-2013	Electrofish/Forage	92/27
	1998-2010	Gillnets	52
	1998-2010	1" Hoop nets	297
	1998-2010	1 Acre Rotenone	16
	2011-2012	Leadnets	4
	2011-2013	1 Day Rotenone	3
20701Bayou	1991-1992, 2009	Electrofish/Forage	15/1

Waterbody	Year(s)	Sampling Gear	Number of Samples
Segnette			
20803 The Pen	1998-2010, 2011-2012	Electrofish/Forage	119/27
	1998-2010	1" Hoop nets	96
	2011-2012	Leadnets	12
	2011-2012	1 Day Rotenone	7
20801 Intracoastal Waterway	2011-2013	Electrofish	17
	2011-2012	Leadnets	22
	2011-2013	1 Day Rotenone	17
20901 Bayous Rigolets and Perot	1995, 1998-2013	Electrofish/Forage	125/38
	1998-2010	Gillnets	102
	1998-2010	1" Hoop nets	100
	2011-2012	Leadnets	4
	2011-2013	1 Day Rotenone	3
20902 Little Lake	1998-2010	Electrofish/Forage	132/35
	1998-2010	Gillnets	102
	1998-2010	1" Hoop nets	296
	1998-2009	1 Acre Rotenone	17

Table 7. Inland Fisheries biennial samples from 2016 to 2020 in the Barataria Basin, LA.

Year	Waterbody	Sampling Gear	Number of Samples
2016 2018 2020 2022	20202 Lake des Allemands	Electrofish / Forage	4 Electro/2 Forage
	20301 Bayou des Allemands Below Hwy 90	Electrofish / Forage	4 Electro/2 Forage
	20303 Lake Cataouatche	Electrofish/Forage	6 Electro/3 Forage
	20304 Lake Salvador	Electrofish/Forage	4 Electro /2 Forage
	20801 Intracoastal Waterway	Electrofish/Forage	6 Electro /3 Forage
	20803 The Pen	Electrofish/Forage	10 Electro /5 Forage
	020903 Barataria Waterway	Electrofish/Forage	2 Electro /1 Forage

Table 8. Inland Fisheries current biennial samples sites in the Barataria Basin, LA.

Station Code	Latitude	Longitude	Staton Name	BOW	BOW Name
4037	29.795	-90.61528	Old Station 4	20102	Bayou Boeuf, Halpin & Theriot Canals
4365	29.82247	-90.65154	Halpin Canal Camps	20102	Bayou Boeuf, Halpin & Theriot Canals
4364	29.76987	-90.59409	Boeuf Oilfield	20102	Bayou Boeuf, Halpin & Theriot Canals
4306	29.94028	-90.5425	Station 44	20202	Lac des Allemands
4271	29.88028	-90.595	Station 9	20202	Lac des Allemands
4057	29.86472	-90.52111	Bayou Des Allemand @ Lake	20301	Bayou des Allemands
4335	29.75259	-90.38914	Station 2	20301	Bayou des Allemands
4153	29.91222	-90.27417	Station 5	20303	Lake Cataouatche
4263	29.84611	-90.28694	Station 119	20303	Lake Cataouatche
4155	29.83306	-90.28389	Station 7	20303	Lake Cataouatche
4329	29.7727	-90.2903	Station 6	20304	Lake Salvador
4333	29.7684	-90.31422	Station 7	20304	Lake Salvador
4341	29.6944	-90.1158	Stump Canal	20801	Intracoastal Waterway
4342	29.721	-90.1412	Alan Adam's	20801	Intracoastal Waterway
4354	29.70607	-90.1785	Salvador Island Oil Field	20801	Intracoastal Waterway
4346	29.73808	-90.08451	California Canal	20803	Pen, The
4352	29.67673	-89.99921	Naomi	20803	Pen, The
4361	29.64132	-90.09068	South Pen Rocks	20803	Pen, The
4362	29.63369	-90.05054	Bayou Dupont	20803	Pen, The
4351	29.7377	-90.02355	Ollie Pump Station	20803	Pen, The
4363	29.56763	-90.02295	Spoonbill	20903	Barataria Waterway

Stocking History

Fish stockings in the Barataria Basin were initiated as a response to the effects of Hurricane Andrew in 1992. Species stocked include northern Largemouth Bass, Florida Largemouth Bass (FLMB), and Flathead Catfish. Table 8 summarizes LDWF fish stocking in the Barataria Basin from 1993 to 2013. To date, 3,255,463 Florida Largemouth Bass have been stocked at locations throughout the Basin. A majority of these fish were stocked post Hurricanes Katrina and Gustav. In the post storm absence of predation and competition, the stocked Florida Largemouth Bass should have become dominant in the coastal marshes. In actuality, the species did not even become established. Genetic testing conducted from 2010 – 2012 indicated the highest percentage of Florida genome in sample collections to be 4% (Table 9). The stocking of Florida Largemouth Bass in the nearby Amite, Blind, Tangipahoa and Tickfaw Rivers yielded similar results. This tenacity for recovery by native Largemouth Bass populations have also been noted in other coastal river systems including the Calcasieu, Mermentau, and Sabine Rivers following Hurricanes Rita (2005) and Ike (2008). These systems received no fish stockings after the hurricane related fish kills. However, subsequent LDWF sampling yielded record catch rates of bass within two years of the event. These observations confirm the resilience of native fish populations in simailar areas. LDWF's post Ida 2022 samples have demonstrated a positive rebound of LMB populations without post-hurricane stockings.

Table 8. LDWF fish stocking history for the Barataria Basin (1993 to present). Listings below are fingerling size unless otherwise noted.

Waterbody	**Year**	**Species**	**Number**
20101 Bayous Verret, Chevreuil, Citamon and Grand	2005	FLMB	500
20103 Lake Boeuf	1996	FLMB	53,768
	2009	FLMB	2,000
20202 Lake des Allemands	1993	Largemouth Bass	40,000
	1995	FLMB	12,180
	1996	FLMB	58,471
	1997	FLMB	22,981
	2000	FLMB	152,150
	2001	FLMB	223,638
	2001	Adult Flathead catfish	1,700
	2002	FLMB	265,736
	2003	FLMB	249,951
	2004	FLMB	223,365
	2005	FLMB	206,512
	2007	FLMB	198,298
	2008	FLMB	83,750
	2010	FLMB	7,620
	2011	FLMB	1,400
20303 Lake Cataouatche	2002	Phase II FLMB	1,472
	2003	Phase II FLMB	3,039
	2005	Phase II FLMB	10,000
	2010	Phase II FLMB	8,671
	2011	Phase II FLMB	9,448
	2012	Phase II FLMB	9,264
	2013	FLMB	10,634
	2018	Advanced Fry FLMB	1,389,000
20304 Lake Salvador	2002	Phase II FLMB	772
	2003	Phase II FLMB	86
20803 The Pen	2001	FLMB	8,139
	2006	FLMB	2,618
TOTAL			3,257,163

Largemouth Bass Genetics

Genetic analyses have been conducted to determine the extent of the Florida genome present in Barataria Basin Largemouth Bass. Results from Lake Cataouatche during 2010-2012 are provided in Table 9.

Table 9. Results of genetic analysis of LMB populations for Lake Des Allemands and Lake Cataouatche, LA, within the Barataria Basin, 2001-2012.

Water Body	Year	Sample Size	Northern	Florida	Hybrid	Florida Influence
Lake Des Allemands	2001	21	91.3%	0%	8.7%	8.7%
	2009	27	85%	0%	15%	15%
Lake Cataouatche	2010	256	89%	0%	11%	11%
	2011	131	81%	2.3%	16.7%	19%
	2012	119	82%	4 %	14%	18%

Species Profile

Conner and Day (1987) published an extensive species list for the Barataria Basin. The list was compiled by researchers B.A. Thompson and W. Forman and summarized 13 major studies spanning 14 years (Table 9).

Table 9. Fish species list of the Barataria Basin, Louisiana (Conner and Day 1987).

FRESHWATER (31 species)	
Family and scientific name	**Common Name**
Acipenseridae	
Acipenser oxyrinchus desotoi	Gulf Sturgeon
Lepisosteidae	
Atroctosteus spatula	Alligator Gar
Lepisosteus oculatus	Spotted Gar
L. osseus	Longnose Gar
Amiidae	
Amia calva	Bowfin
Alosidae	
Alosa alabamae	Alabama Shad
A. chrysochloris	Skipjack Herring
Dorosomatidae	
Dorosoma cepedianum	Gizzard Shad
D. petenense	Threadfin Shad
Esocidae	
Esox niger	Chain Pickerel
Leuciscidae	
Notemigonus crysoleucas	Golden Shiner
Ictaluridae	
Ictalurus furcatus	Blue Catfish
I. punctatus	Channel Catfish

Pylodictis olivaris	Flathead Catfish
Aphredoderidae	
Aphredoderus sayanus	Pirate Perch
Poeciliidae	
Gambusia affinis	Mosquitofish
Heterandria Formosa	Least Killifish
Poecilia latipinna	Sailfin Molly
Moronidae	
Morone chrysops	White Bass
M. mississippiensis	Yellow Bass
M. saxatilis	Striped Bass
Centrarchidae	
Elassoma zonatum	Banded Pygmy Sunfish
Lepomis gulosus	Warmouth
L. macrochirus	Bluegill
L. marginatus	Dollar Sunfish
L. microlophus	Redear Sunfish
L. punctatus	Spotted Sunfish
Micropterus salmoides	Largemouth Bass
Pomoxis annularis	White Crappie
P. nigromaculatus	Black Crappie
Sciaenidae	
Aplodinotus grunniens	Freshwater Drum
ESTUARINE (23 species)	
Cyprinodontidae	
Adinia xenica	Diamond Killifish
Cyprinodon variegates	Sheepshead Minnow
Fundulus grandis	Gulf Killifish
F. jenkinsi	Saltmarsh Killifish
F. pulverous	Bayou Killifish
F. similis	Longnose Killifish
Lucania parva	Rainwater Killifish
Atherinopsidae	
Membras martinica	Rough Silverside
Menidia beryline	Inland Silverside
Syngnathidae	
Syngnathus scovelli	Gulf Pipefish
Sparidae	
Lagodon rhomboids	Pinfish
Eleotridae	
Dormitator maculates	Fat Sleeper
Eleotris pisonis	Spinycheek Sleeper
Gobiidae	
Evorthodus lyricus	Lyre Goby
Gobioides broussonetii	Violet Goby
Gobionellus boleosoma	Darter Goby

G. hastatus	Sharptail Goby
G. shufeldti	Freshwater Goby
Gobiosoma bosci	Naked Goby
G. robustum	Code Goby
Microgobius gulosus	Clown Goby
M. thalassinus	Green Goby
Soleidae	
Trinectes maculates	Hogchoker
ESTUARINE-MARINE (26 species)	
Elopidae	
Elops saurus	Ladyfish
Megalops atlanticus	Tarpon
Clupeidae	
Brevoortia patronus	Gulf Menhaden
Engraulidae	
Anchoa mitchilli	Bay Anchovy
Ariidae	
Arius felis	Hardhead Catfish
Bagre marinus	Gafftopsail Catfish
Gobiesocidae	
Gobiesox strumosus	Skilletfish
Belonidae	
Strongylura marina	Atlantic Needlefish
Syngnathidae	
Syngnathus floridae	Dusky Pipefish
S. louisianae	Chain Pipefish
Carangidae	
Oligoplites saurus	Leatherjacket
Sparidae	
Eucinostomus argenteus	Sheepshead
Sciaenidae	
Bairdiella chrysoura	Silver Perch
Cynoscion arenarius	Sand Seatrout
C. nebulosus	Spotted Seatrout
Leiostomus xanthurus	Spot
Micropogonias undulates	Atlantic Croaker
Pogonias cromis	Black Drum
Sciaenops ocellatus	Red Drum
Stellifer lanceolatus	Star Drum
Ephippidae	
Chaetodipterus faber	Atlantic Spadefish
Mugilidae	
Mugil cephalus	Striped Mullet
Bothidae	
Citharichthys spilopterus	Bay Whiff
Paralichthys lethostigma	Southern Flounder

Soleidae	
Achirus lineatus	Lined Sole
MARINE (106 species)	
Carcharhinidae	
Carcharhinus leucas	Bull Shark
Rhizoprionodon terraenovae	Atlantic Sharpnose Shark
Pristidae	
Dasyatis americana	Southern Stingray
D. sabina	Atlantic Stingray
Albulidae	
Albula vulpes	Bonefish
Anguillidae	
Anguilla rostrata	American Eel
Congridae	
Hildebrandia flava	Yellow Conger
Paraconger caudilimbatus	Margintail Conger
Ophichthidae	
Gordiichthys irretitus	Horsehair Eel
Myrophis punctatus	Speckled Worm Eel
Ophichthus gomesii	Shrimp Eel
O. ocellatus	Palespotted Eel
Clupeidae	
Harengula jaguana	Scaled Sardine
Opisthonema oglinum	Atlantic Thread Herring
Engraulidae	
Anchoa cubana	Cuban Anchovy
A. hepsetus	Striped Anchovy
A. lyolepis	Dusky Anchovy
Synodontidae	
Synodus foetens	Inshore Lizardfish
Batrachoididae	
Opsanus beta	Gulf Toadfish
O. pardus	Leopard Toadfish
Porichthys plectrodon	Atlantic Midshipman
Antennariidae	
Antennarius radiates	Singlespot Frogfish
Histrio histrio	Sargassumfish
Ogcocephalus	
Ogcocephalus radiates	Polka-Dot Batfish
Gadidae	
Urophycis cirrata	Gulf Hake
U. floridana	Southern Hake
U. regia	Spotted Hake
Bythitidae	
Gunterichthys longipenis	Gold Brotula
Ophidiidae	

Lepophidium brevibarbe	Blackedge Cusk-Eel
Ophidion welshi	Crested Cusk-Eel
Exocoetidae	
Cypselurus melanurus	Atlantic Flyingfish
Hirundichthys affinis	Fourwing Flyingfish
H. rondeletii	Blackwing Flyingfish
Hyporhamphus unifasciatus	Halfbeak
Prognichthys gibbifrons	Bluntnose Flyingfish
Syngnathidae	
Hippocampus erectus	Lined Seahorse
H. zosterae	Dwarf Seahorse
Percichthyidae	
Centropristis philadelphica	Rock Sea Bass
Pomatomidae	
Pomatomus saltatrix	Bluefish
Rachycentridae	
Rachycentron canadum	Cobia
Echeneidae	
Remora remora	Remora
Carangidae	
Alectis ciliaris	African Pompano
Caranx crysos	Blue Runner
C. hippos	Crevalle Jack
C. latus	Horse-Eye Jack
Chloroscombrus chrysurus	Atlantic Bumper
Hemicaranx amblyrhynchus	Bluntnose Jack
Selene setapinnis	Atlantic Moonfish
S. vomer	Lookdown
Seriola zonata	Banded Rudderfish
Trachinotus carolinus	Florida Pompano
T. falcatus	Permit
Trachurus lathami	Rough Scad
Coryphaenidae	
Coryphaena hippurus	Dolphin
Lobotidae	
Lobotes surinamensis	Tripletail
Gerreidae	
Diapterus plumier	Striped Mojarra
Eucinostomus gula	Silver Jenny
E. melanopterus	Flagfin Mojarra
Gerres cinereus	Yellowfin Mojarra
Haemulidae	
Orthopristis chrysoptera	Pigfish
Sciaenidae	
Cynoscion nothus	Silver Seatrout
Larimus fasciatus	Banded Drum

Menticirrhus americanus	Southern Kingfish
M. littoralis	Gulf Kingfish
M. saxatilis	Northern Kingfish
Mugilidae	
Mugil curema	White Mullet
Sphyraenidae	
Sphyraena barracuda	Great Barracuda
S. borealis	Northern Sennet
S. guachancho	Guaguanche
Polynemidae	
Polydactylus octonemus	Atlantic Threadfin
Uranoscopidae	
Astroscopus y-graecum	Southern Stargazer
Blenniidae	
Chasmodes bosquianus	Striped Blenny
Hypleurochilus geminates	Crested Blenny
Hypsoblennius ionthas	Freckled Blenny
Eleotridae	
Erotelis	Emerald Sleeper
Gobiidae	
Bathygobius soporator	Frillfin Goby
Microdesmidae	
Microdesmus longipinnis	Pink Wormfish
Trichiuridae	
Trichiurus lepturus	Atlantic Cutlassfish
Scombridae	
Peprilus alepidotus	Harvestfish
P. burti	Gulf Butterfish
Triglidae	
Prionotus roseus	Bluespotted Searobin
P. rubio	Blackfin Searobin
P. salmonicolor	Blackwing Searobin
P. scitulus	Leopard Searobin
P. tribulus	Bighead Searobin
Bothidae	
Ancylopsetta dilecta	Three-Eye Flounder
A. quadrocellata	Ocellated Flounder
Citharichthys macrops	Spotted Whiff
Etropus crossotus	Fringed Flounder
Paralichthys squamilentus	Broad Flounder
Cynoglossidae	
Symphurus civitatus	Offshore Tonguefish
S. plagiusa	Blackcheek Tonguefish
Balistidae	
Aluterus schoepfii	Orange Filefish
A. scriptus	Scrawled Filefish

Canthidermis sufflamen	Ocean Triggerfish
Monacanthus hispidus	Planehead Filefish
Tetraodontidae	
Lagocephalus laevigatus	Smooth Puffer
Sphoeroides parvus	Least Puffer
Diodontidae	
Chilomycterus schoepfii	Striped Burrfish
Molidae	
Mola mola	Ocean Sunfish

Threatened/Endangered/Exotic species

Bighead Carp (*Hypophthalmichthys nobilis)* and Silver Carp (*Hypophthalmichthys molitrix)* are present in the Barataria Basin. Interagency efforts to collect data on Asian Carp intrabasin and interbasin movement are ongoing. . In 2013, channeled apple snails were found in Bayou Boeuf and the Pleasure Bend neighborhood on the western shore of Lake des Allemands. Today they are ubiquitous in the Barataria basin.

CREEL SURVEY

LDWF conducted a one year fixed point access creel survey at the Pier 90 and Bayou Segnette boat ramps in 2010. No creel surveys are currently being conducted within the basin. No creel surveys are currently scheduled within the basin.

WATER USE

Hunting

Hunting for big game, small game, and waterfowl is popular on both private lands and WMA's within the basin

Skiing

Skiing is not popular in the basin

Scuba Diving

Scuba diving is not popular in the basin

Swimming

Swimming is not popular in the basin. However, people do swim on the bay and gulf sides of Grand Isle.

Irrigation

Water withdrawals are prohibited, except for withdrawals made by an individual, adjacent property owner for residential purposes only (LAC Title 76: Part IX 117).

REFERENCES

Conner, W.H. and J. W. Day Jr., eds. 1987. The Ecology of Barataria Basin, Louisiana: An estuarine profile. U.S. Fish and Wildl. Serv. Biol. Rep 85 (7.13). 165pp.

Dennison, W. C., & Orth, R. J. (1993). Assessing water quality with submersed aquatic vegetation. (Cover story). Bioscience, 43(2), 86-94.

Meador, M.R. and W. E. Kelso. 1990. Growth of Largemouth Bass in Low Salinity Environments. Transactions of the American Fisheries Society 119: 545-552.

APPENDIX I

(return to text)

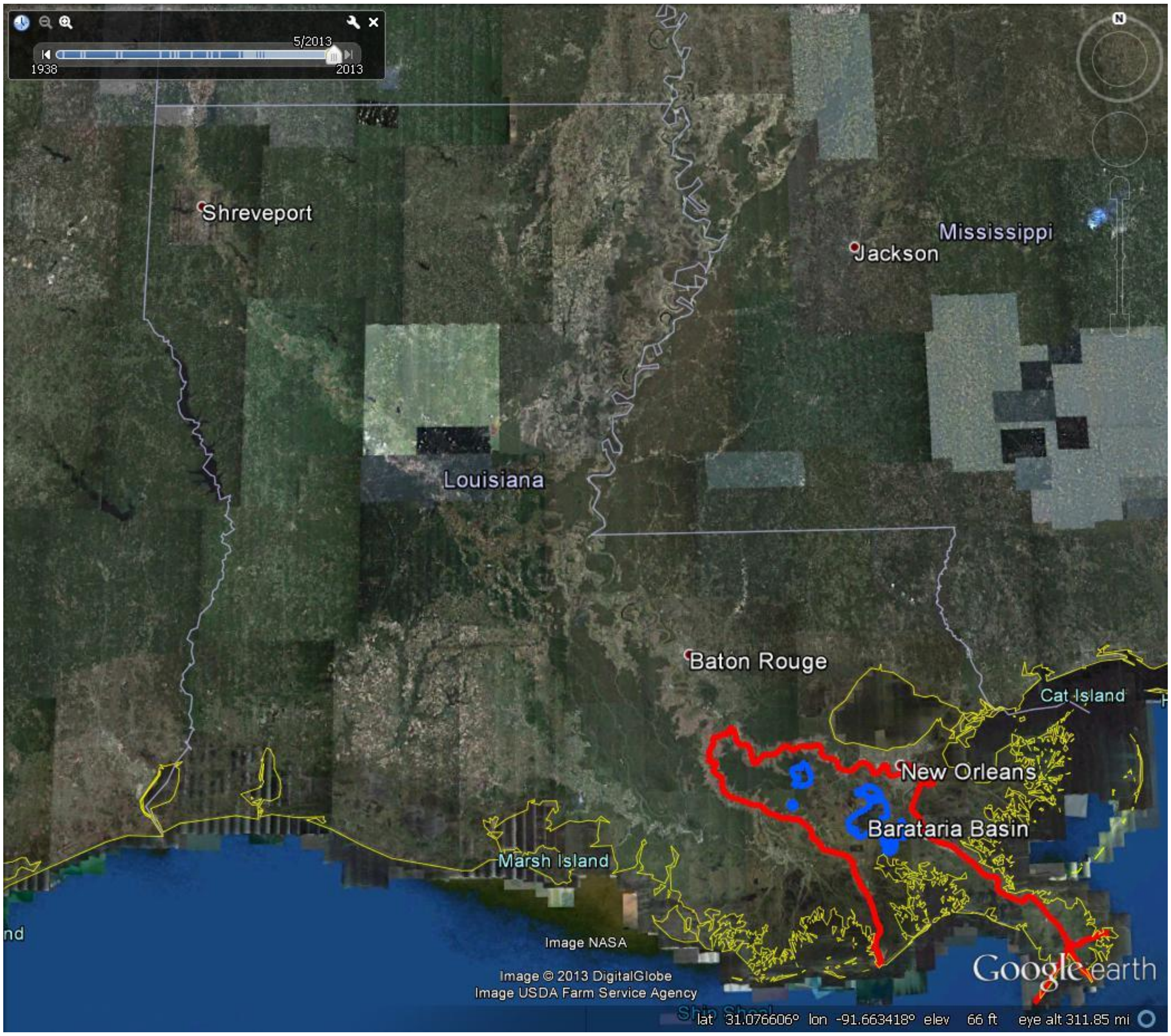

Figure 1. March 2013 Google Earth Image Depicting the Barataria Basin, Louisiana.

Figure 2. March 2013 Google Earth Image Depicting Major Fresh and Intermediate Streams and Lakes in the Barataria Basin, Louisiana.

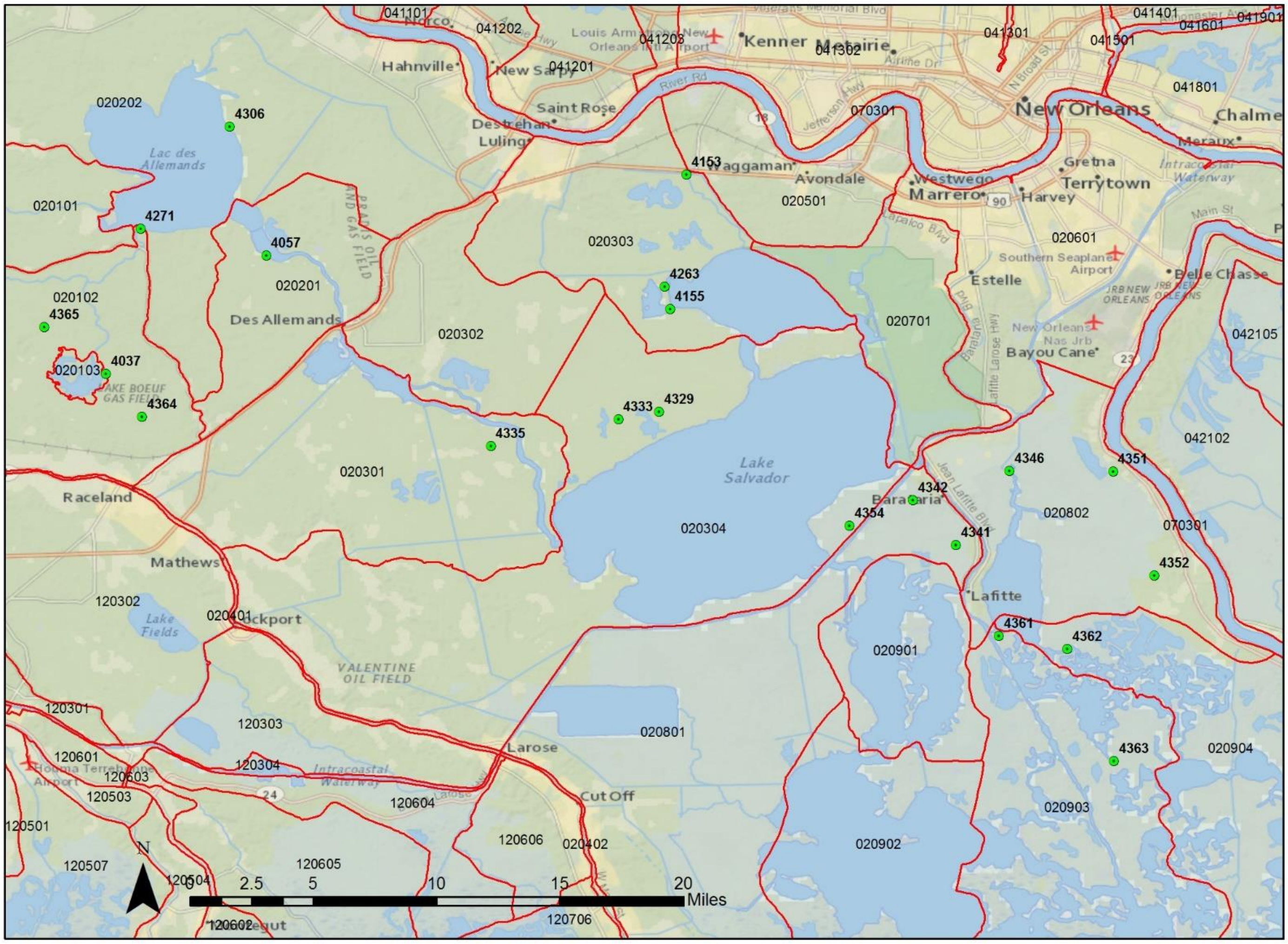

Figure 3. LDWF electrofishing sample stations and waterbody designations in the Barataria Basin sampled in 2020.

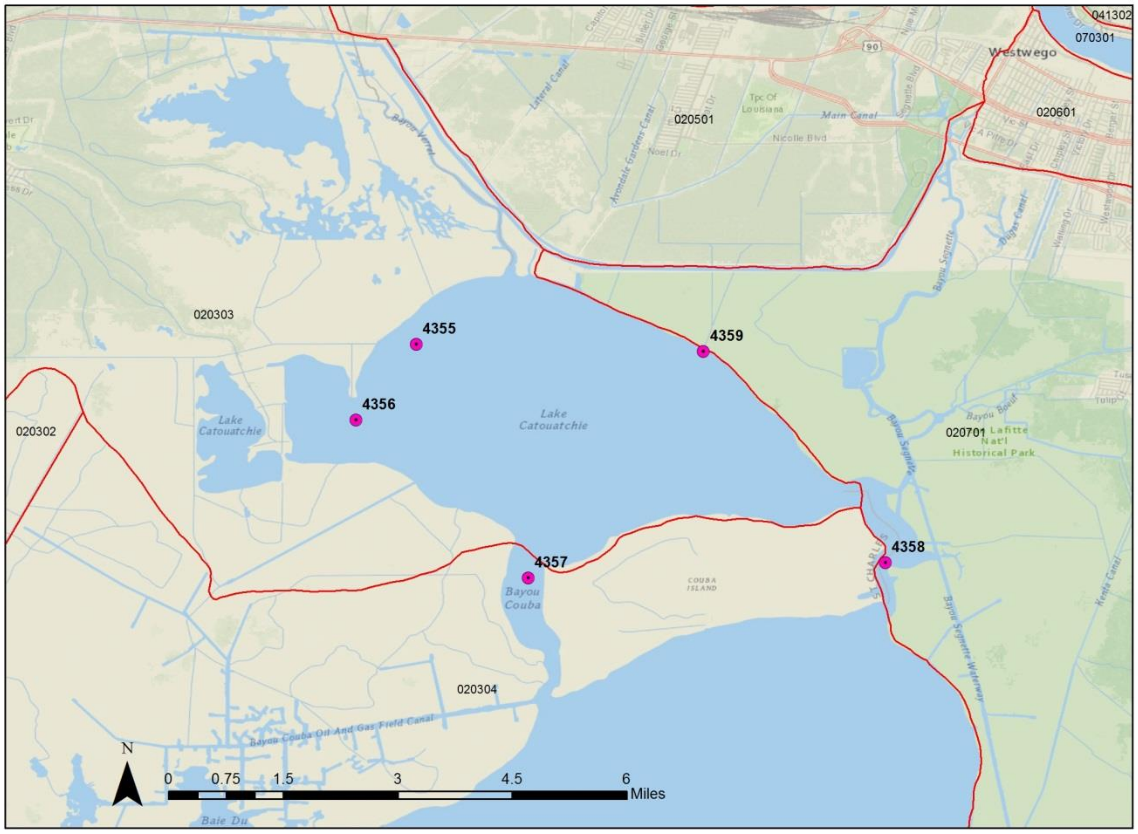

Figure 4. Lake Cataouatche water quality sites sampled in 2020.

APPENDIX II

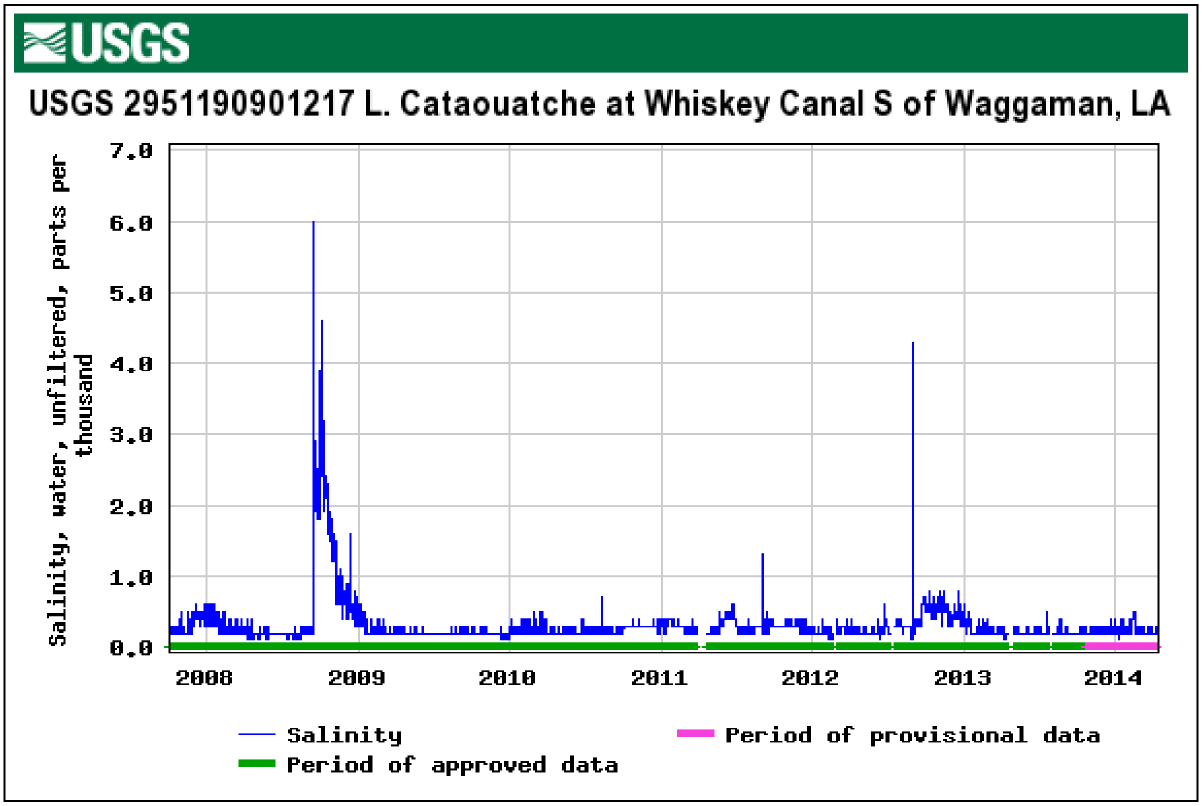

Figure 1. Salinity in Lake Cataouatche at Whiskey Canal from January 2008 to March 2014.

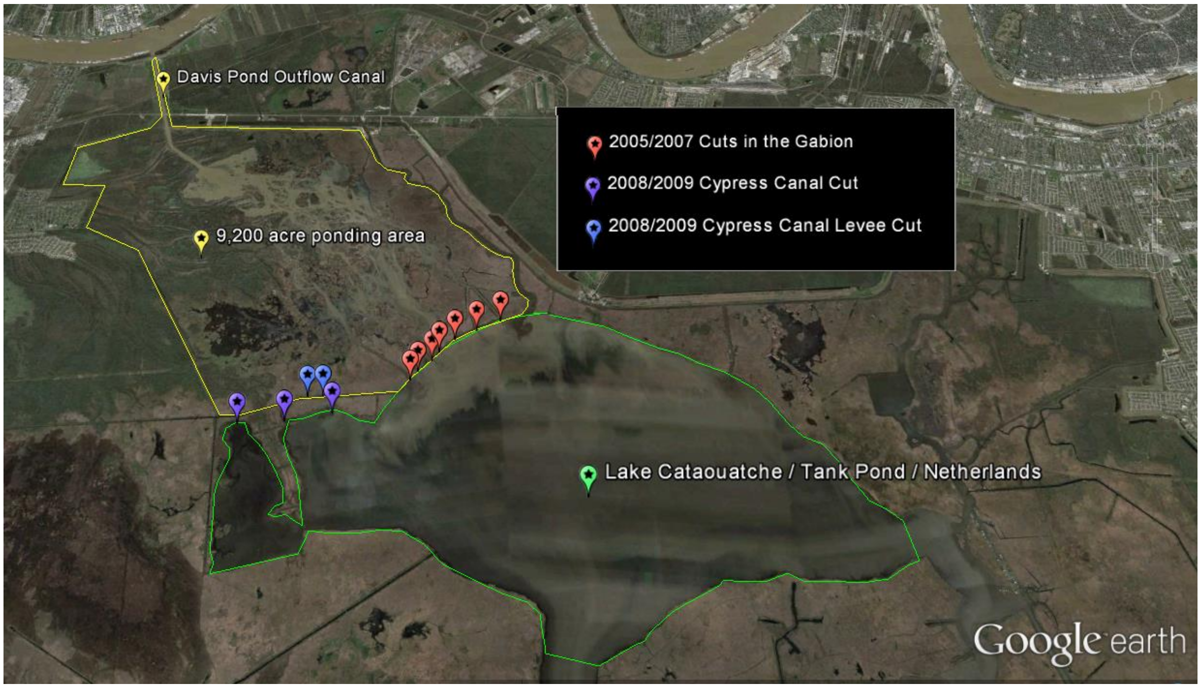

Figure 2. Map of the modifications made to the Davis Pond Freshwater Diversion ponding area.

Appendix III
(Return to typemaps)

DAVIS POND OPERATIONAL PLAN 2023

From December through May, the intent is to operate the diversion to maintain the seasonal average salinity at the 15 ppt line illustrated in the map below (Figure 1). December- May operations will be based on data from the Barataria Bay N Grand Terre gauge specified by the map (Figure 1) and graph below (Figure 2). From June through November, operations will be based on the monthly salinity range at the 5 ppt line specified by the map (Figure 1) and graph (Figure 3) below, utilizing the Little Lake Bay Dos Gris gauge as the primary gauge. Barataria Waterway at Mud Lake S of Lafitte will also be monitored, and utilized as a secondary gauge for the 5ppt line. The structure will be operated when the 14-day moving average salinity is within or above the long term data range for the gauge(s) in use. When the moving average drops below the low trigger (the greater of the long term average minus 1 SD or 5ppt) the diversion operations will be maintained at the minimum of 1,000cfs until the moving average re-enters the operational range.* Operational settings are not to exceed 10,000 cfs.

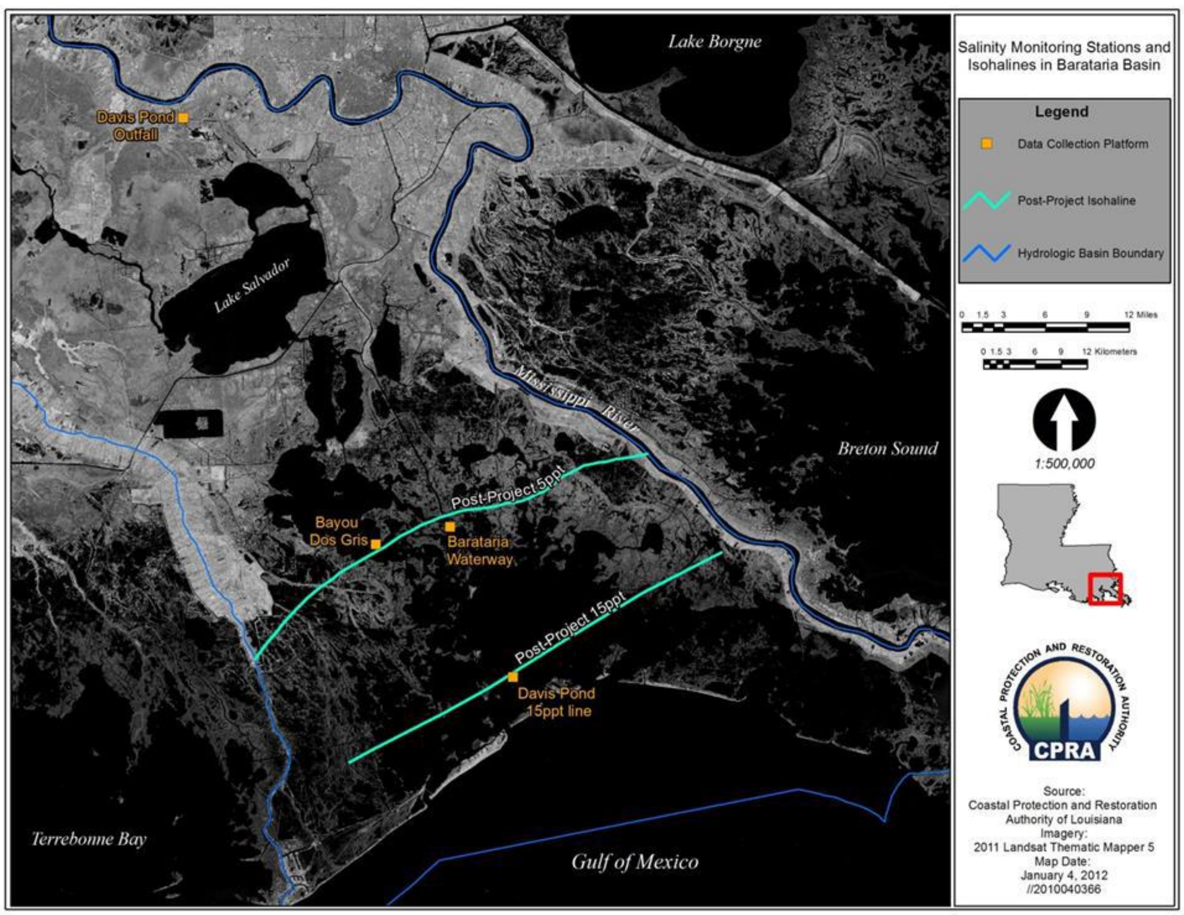

Figure 1. Map of salinity gauges and isohaline lines in Barataria Basin to be used for guidance and operation of the Davis Pond Freshwater Diversion.

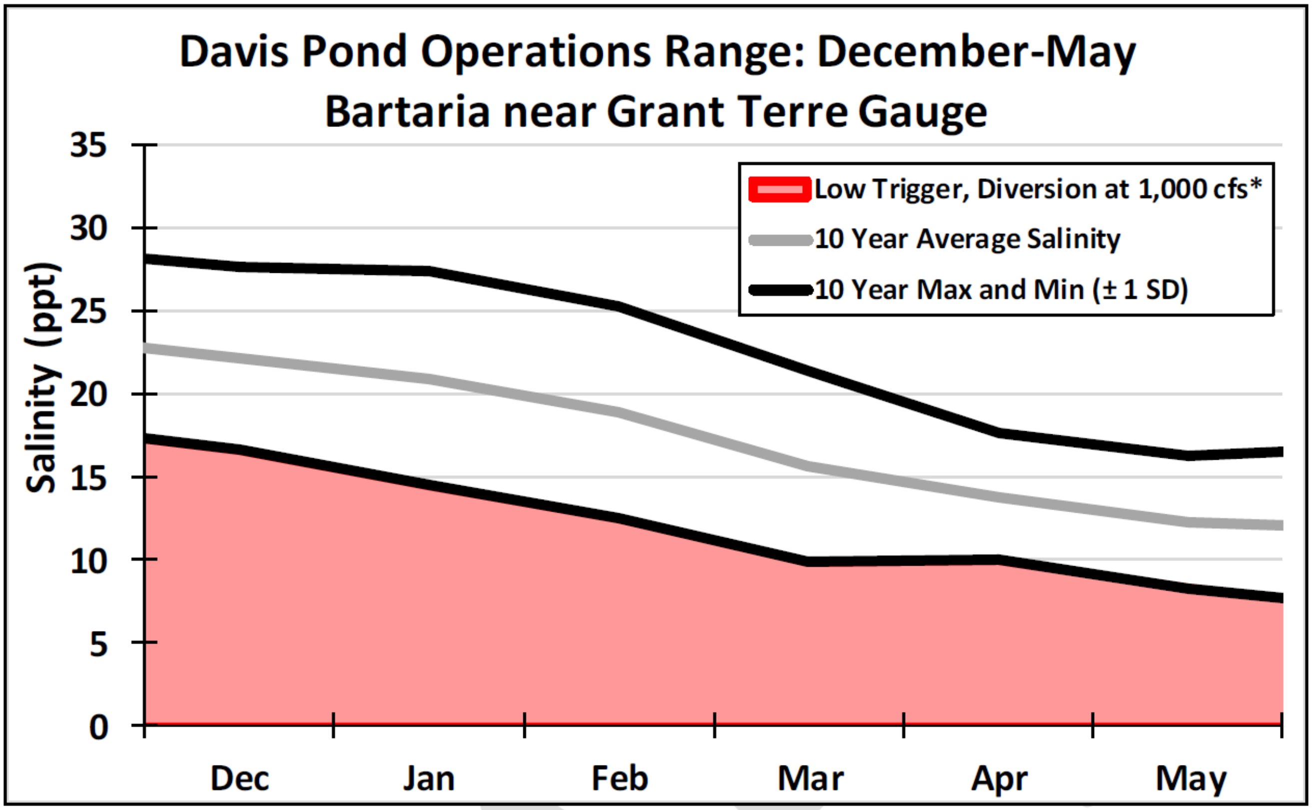

Figure 2. Ten year average (±1 standard deviation) salinities from the Barataria Bay N of Grand Terre Gauge (USGS site 291929089562600). From December through May the Davis Pond Freshwater Diversion structure may be operated when the 14-day moving average salinity is within or above the data range. Operations will be decreased to the minimum of 1,000cfs if the moving average drops below the low trigger.*

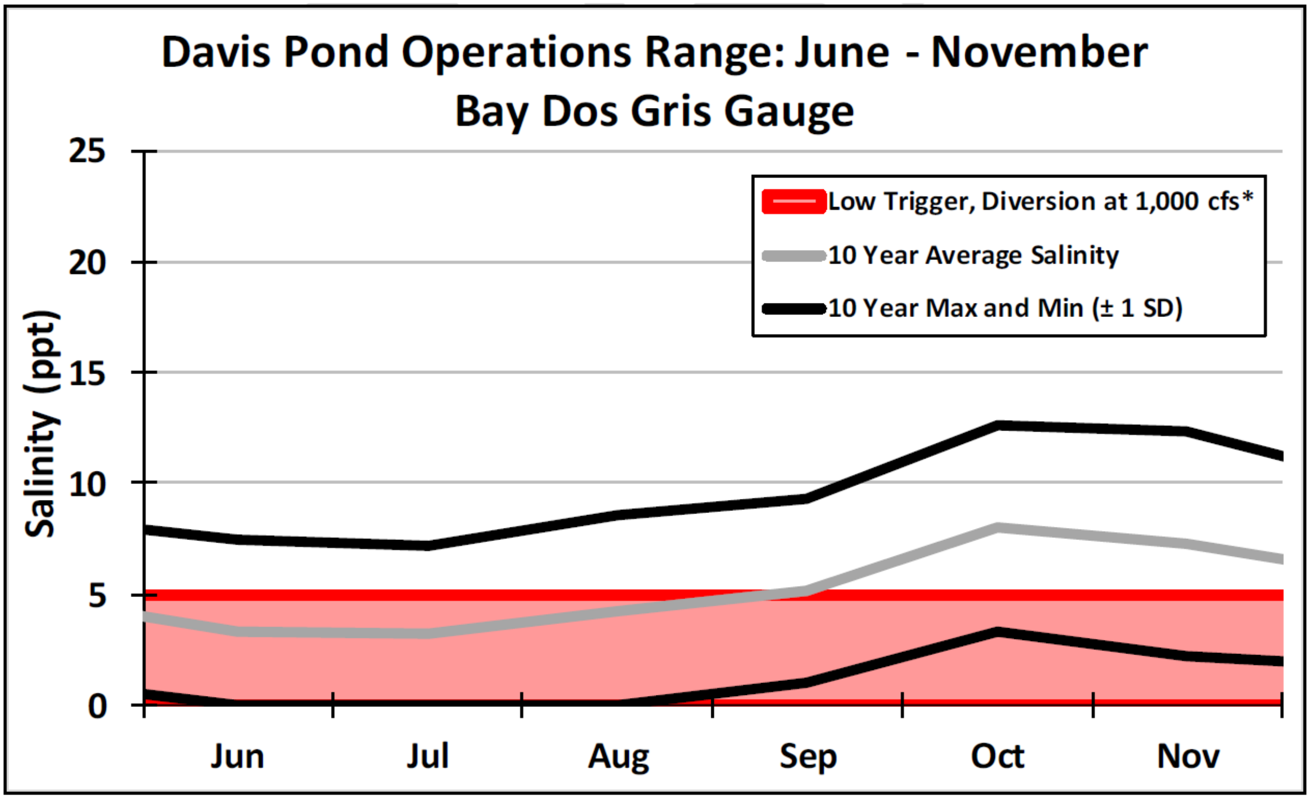

Figure 3. Long term average (+/- 1 standard deviation) salinities from the Little Lake Bay Dos Gris (USGS site 292800090060000). From June through November the Davis Pond Freshwater Diversion structure may be operated when the 14-day moving average salinity is within or above the data range. Operations will be decreased to the 1000cfs minimum if the moving average drops below 5ppt.*

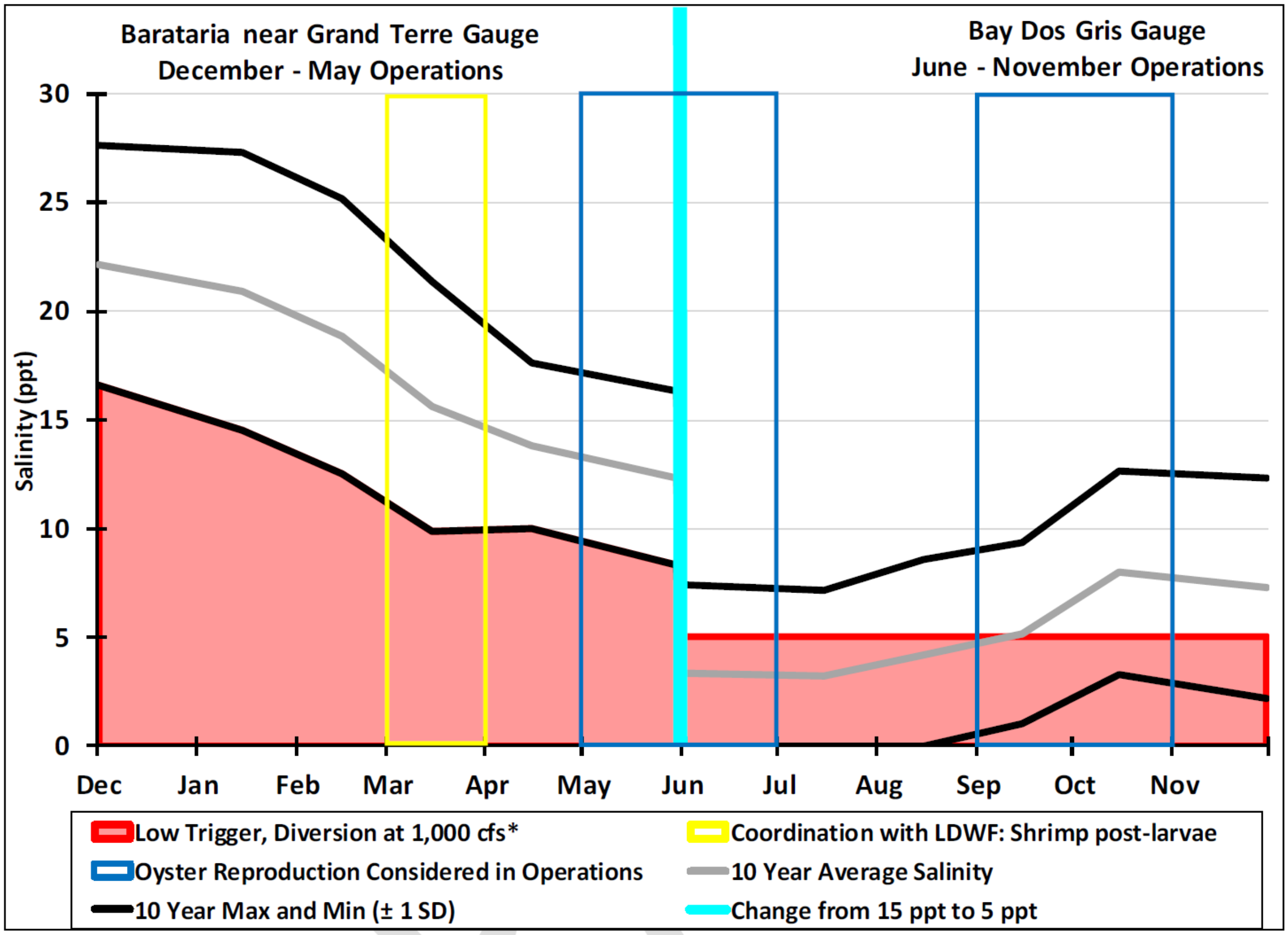

Figure 4. Ten Year average (±1 standard deviation) salinities from the Barataria Bay N Grand Terre Gauge (USGS site 291929089562600) from December through May, and the Little Lake Bay Dos Gris (USGS site 292800090060000) gauge from June through November. The Davis Pond Freshwater Diversion structure may be operated when the 14-day moving average salinity is within or above the data range. Operations will decrease to the minimum of 1000 cfs if the moving average drops below the low trigger. *

* Discharges may deviate from operational plan as outlined below:

- Emergency, maintenance and local parish situations will be evaluated on a case-by-case basis to determine operational needs. The Davis Pond Interagency Advisory Committee shall be notified if operations outside of the plan are required.

- Structure may be operated for public relations and/or educational purposes, though output is not to exceed 5,000 cfs for a duration of no longer than 2 hours.

- Coordination with LDWF during post-larval brown shrimp migration period and oyster reproductive seasons to assist in operational decisions/adjustments to maximize benefit.

Appendix IV
(Return to typemaps)

Figure 1. 2023 SAV survey map of Lake Cataouatche.

Table 1. 2023 SAV survey results from Lake Cataouatche.

Polygon	Polygon Area	Polygon Acreage	Percent Vegetation Coverage	Total Vegetation Acreage
A	Netherlands	694	40%	277.6
B	Tank Ponds	232	40%	92.8
Entire Lake		8,000	4.6%	370.4

Table 2. 2023 SAV survey details from Lake Cataouatche.

Polygon A			
Vegetation	Milfoil	Coontail	
Percent of Vegetation	95%	5%	
Acreage of Vegetation	263.72	13.88	
Polygon B			
Vegetation	Milfoil	Coontail	Nymphaea
Percent of Vegetation	70%	25%	5%
Acreage of Vegetation	64.96	23.2	4.64

Figure 2. 2011 SAV survey results from the Pen (20803).

Appendix V

Hurricane Ida Inland Fish Kill Report

Robby Maxwell
12/1/21

Methods

Reporting
Fish kills following Hurricane Ida were logged from various sources including reports from the public, reports from LDWF staff, Facebook posts, and Youtube videos. Authors of social media posts were contacted to gather relevant information, if necessary. LDWF staff took water quality readings across the impacted area and looked for signs of fish kills following the storm.

Fish Kill Estimates
National Wetlands Inventory data were used to calculate the acres of open water within the area of reported fish kills and hypoxic conditions. Lake Pontchartrain and much of New Orleans were eliminated from the calculation due to the lack of fish kill reports in a highly populated area.

For calculations of fish mortality, 1/3 of lacustrine habitat was used based on observations of limited fish kills in the lakes. Three-quarters of riverine habitat (including bayous and canals) was used in the calculation for fish mortality based on widespread observed kills and anoxia observed in those waters. Rotenone data from coastal marsh sampling conducted in 2011-2013 was used in calculations with habitat areas to estimate fish mortality.

Results
The first reported fish kill following Ida's landfall was made on September 2 for a kill on Bedico Creek that began on August 30. Twenty fish kills were reported between September 2 and September 16, most being reported as significant or total (Figure 1). Reported inland kills and measured hypoxia (Figure 2) spanned an area of over 1.8 million acres. All reported kills, except for one reported in Gibson, LA, occurred within the path of hurricane-force winds

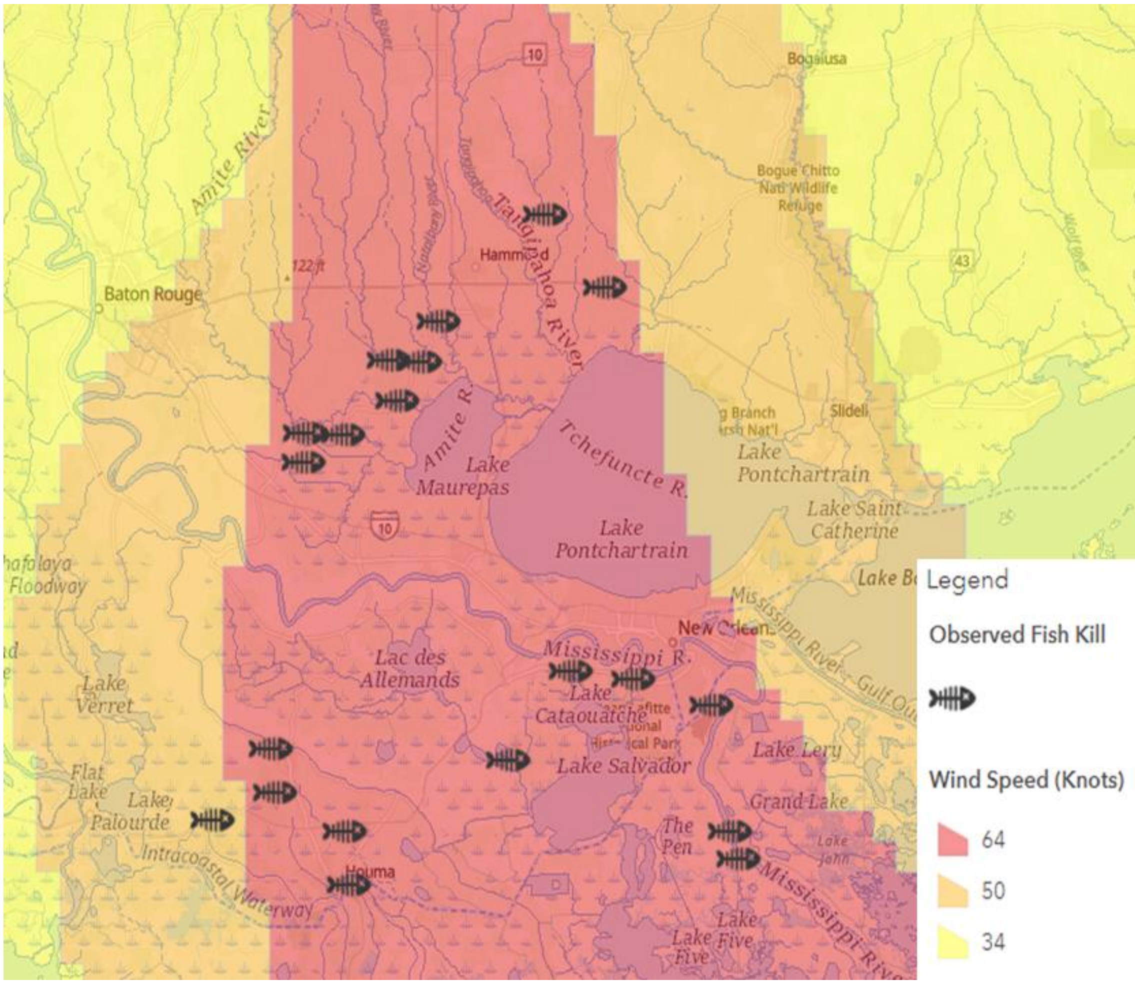

Figure 1. Observed fish kills following Hurricane Ida with hurricane-force winds in red.

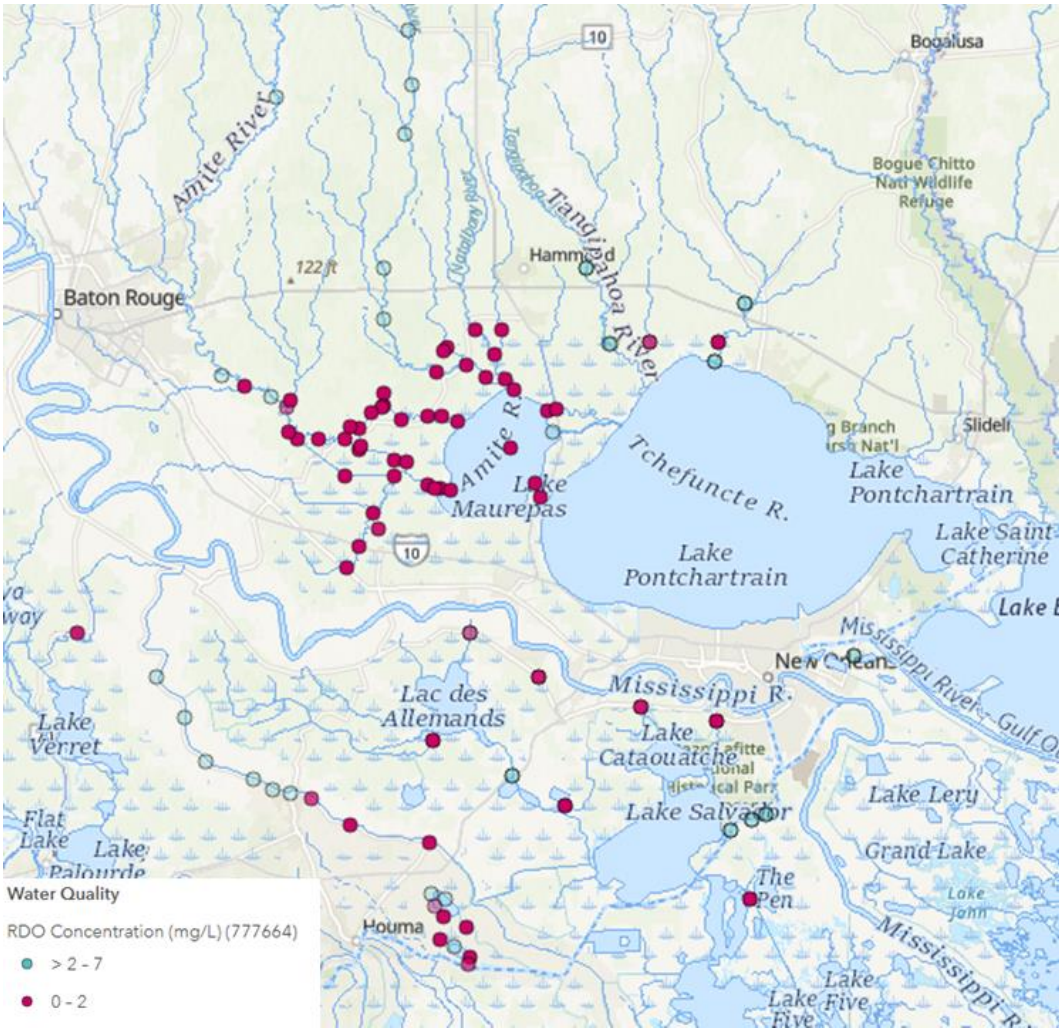

Figure 2. Dissolved oxygen following Hurricane measured between September 7 and September 16, 2021. Hypoxia (< 2 mg/L) is in red, and transparency of points increases as oxygen concentration increases. Blue dots represent oxygen levels > 2 mg/L, and increase in transparency as oxygen concentration increases.

Using National Wetlands Inventory data, it was determined that 114,500 acres of lacustrine habitat and 225,619 acres of riverine (including canals and bayous) habitat was present in the zone of observed fish kills.

The total fish kill estimate calculated from rotenone data is 277,857,419 individuals (Table 1). Notable estimates of fish mortality include 2.74 million Largemouth Bass, 8 million Channel Catfish, and 12.75 million Striped Mullet.

Table 1. Estimated mortality of fishes following Hurricane Ida based on coastal marsh rotenone data.

Species	Number in 1 acre	Lacustrine Kill (1/3 of area calculated)	Riverine Kill (3/4 of area calculated)	Total
Alligator Gar	0.061795149	2,358.52	10,456.60	12,815
Atlantic Croaker	21.13394099	806,612.15	3,576,158.69	4,382,771
Atlantic Needlefish	2.224625367	84,906.54	376,437.76	461,344
Atlantic Stingray	0.123590298	4,717.03	20,913.21	25,630
Bay Anchovy	396.4158814	15,129,874.13	67,079,116.95	82,208,991
Bay Whiff	1.853854472	70,755.45	313,698.13	384,454
Bighead Carp	0.123590298	4,717.03	20,913.21	25,630
Bigmouth Buffalo	0.803336938	30,660.70	135,935.86	166,597
Black Crappie	1.235902982	47,170.30	209,132.09	256,302
Black Drum	1.235902982	47,170.30	209,132.09	256,302
Blackcheek Tonguefish	0.061795149	2,358.52	10,456.60	12,815
Blue Catfish	8.898501468	339,626.17	1,505,751.03	1,845,377
Bluegill	47.0879036	1,797,188.48	7,967,932.52	9,765,121
Carp	0.370770894	14,151.09	62,739.63	76,891
Channel Catfish	38.93094392	1,485,864.49	6,587,660.74	8,073,525
Clown Goby	0.185385447	7,075.55	31,369.81	38,445
Crevalle Jack	0.061795149	2,358.52	10,456.60	12,815
Darter Goby	0.494361193	18,868.12	83,652.83	102,521
Flathead Catfish	0.617951491	23,585.15	104,566.04	128,151
Freshwater Drum	3.769504094	143,869.42	637,852.87	781,722
Freshwater Goby	0.123590298	4,717.03	20,913.21	25,630
Gafftopsail Catfish	4.572841032	174,530.11	773,788.72	948,319
Gizzard Shad	44.67789279	1,705,206.39	7,560,124.95	9,265,331
Golden Shiner	0.123590298	4,717.03	20,913.21	25,630
Gulf Killifish	0.803336938	30,660.70	135,935.86	166,597
Gulf Menhaden	533.044956	20,344,550.93	90,198,669.18	110,543,220
Gulf Pipefish	1.297698131	49,528.82	219,588.69	269,118
Hogchoker	1.174107833	44,811.79	198,675.48	243,487
Inland Silverside	6.982851846	266,512.20	1,181,596.29	1,448,108
Ladyfish	6.488490653	247,644.08	1,097,943.46	1,345,588
Largemouth Bass	13.2241619	504,722.22	2,237,713.33	2,742,436
Least Puffer	0.123590298	4,717.03	20,913.21	25,630
Leatherjacket	0.061795149	2,358.52	10,456.60	12,815
Longear Sunfish	0.865132087	33,019.21	146,392.46	179,412
Longnose Gar	0.061795149	2,358.52	10,456.60	12,815
Madtoms	0.123590298	4,717.03	20,913.21	25,630
Naked Goby	2.966167156	113,208.72	501,917.01	615,126
Pinfish	0.617951491	23,585.15	104,566.04	128,151
Pirate Perch	0.061795149	2,358.52	10,456.60	12,815

Species	Number in 1 acre	Lacustrine Kill (1/3 of area calculated)	Riverine Kill (3/4 of area calculated)	Total
Rainwater Killifish	5.932334312	226,417.45	1,003,834.02	1,230,251
Red Drum	3.213347752	122,642.78	543,743.43	666,386
Redear Sunfish	41.58813533	1,587,280.64	7,037,294.73	8,624,575
Redspotted Sunfish	11.74107833	448,117.86	1,986,754.83	2,434,873
Sailfin Molly	0.123590298	4,717.03	20,913.21	25,630
Sand Seatrout	4.202070137	160,379.02	711,049.10	871,428
Sea Catfish	8.09516453	308,965.47	1,369,815.17	1,678,781
Sharptail Goby	0.308975745	11,792.58	52,283.02	64,076
Sheepshead	0.741541789	28,302.18	125,479.25	153,781
Sheepshead Minnow	0.185385447	7,075.55	31,369.81	38,445
Shrimp Eel	0.061795149	2,358.52	10,456.60	12,815
Silver Carp	0.741541789	28,302.18	125,479.25	153,781
Silver Perch	4.758226479	181,605.66	805,158.54	986,764
Skilletfish	1.112312683	42,453.27	188,218.88	230,672
Skipjack Herring	0.123590298	4,717.03	20,913.21	25,630
Smallmouth Buffalo	3.213347752	122,642.78	543,743.43	666,386
Southern Flounder	3.707708945	141,510.90	627,396.26	768,907
Speckled Worm Eel	1.112312683	42,453.27	188,218.88	230,672
Spot	14.39826974	549,534.01	2,436,388.82	2,985,923
Spotted Gar	3.831299243	146,227.93	648,309.47	794,537
Spotfin Mojarra	0.061795149	2,358.52	10,456.60	12,815
Star Drum	0.123590298	4,717.03	20,913.21	25,630
Spotted Seatrout	8.465935424	323,116.56	1,432,554.80	1,755,671
Striped Mullet	61.48617334	2,346,722.49	10,404,321.33	12,751,044
Threadfin Shad	7.230032442	275,946.26	1,223,422.71	1,499,369
Violet Goby	0.370770894	14,151.09	62,739.63	76,891
Warmouth	7.353622741	280,663.29	1,244,335.92	1,524,999
Western Mosquitofish	1.606673876	61,321.39	271,871.71	333,193
Whit Mullet	0.061795149	2,358.52	10,456.60	12,815
White Bass	0.247180596	9,434.06	41,826.42	51,260
Yellow Bass	0.432566044	16,509.61	73,196.23	89,706
Yellow Bullhead	0.123590298	4,717.03	20,913.21	25,630

Discussion

Fish kills following a tropical storm are generally caused by one, or a combination of up to three factors: churning and decomposition of organic sediments causing a drop in dissolved oxygen, decomposition of debris falling and flowing into waterways, and storm surge. Following the initial factors that led to hypoxic conditions, rotting fish and other biota killed by the original hypoxia caused by the storm caused prolonged hypoxic conditions as they decomposed. Fish have also been observed escaping hypoxic waters en masse, only to deplete the oxygen in the water they have crowded into, causing more fish kills. Hypoxia was observed for a number of weeks following the storm, and conditions improved at variable rates depending on environmental conditions.

Estimating fish kills on such a large scale following a major natural disaster is a difficult task. Destruction was widespread following Hurricane Ida, and communications were down in many areas. The public, who we largely depend on to report fish kills, was largely displaced or occupied with cleanup efforts. Our staff, who we rely on to respond to reported fish kills, were in a similar situation.

When possible, people did begin to report fish kills by phone, and we recorded each report and responded in person where it was deemed necessary and possible. Mining social media for fish kill reports proved to be a very useful method to track the extent of fish kills. Many posts and comment threads had pictures, videos, and/or geographic descriptions of mortality events. Authors of posts and comments were easy to contact and usually generous with information. I recommend this method become standard for tracking the extent of mortality events following major hurricanes or other widespread events.

Even with an expanded monitoring network thanks to modern communications, many fish kills were not reported in lightly populated areas and coastal areas that were prone to storm surge and evacuated. It can probably be safely assumed that there were fish kills south of the area reported here, following the pattern of mortality being primarily confined to the path of hurricane-force winds. Only one fish kill was reported north of Interstate 12, and that is probably because it is lightly populated and the substrates are sandier with higher relief (and flow) than the habitat to the south, and less prone to hypoxia.

The rotenone data available covers freshwater coastal marsh habitat, and the variety of habitats impacted by Ida are populated by different fish communities. Rotenone sampling provides a fairly complete sample of fishes, but has limitations, especially in a one-day set. The estimate provided here is likely low for freshwater species, in numbers and species, and high for brackish and saltwater species, in the area covered in this report. The estimates can, however, inform the possibilities of the magnitude of an event similar to Hurricane Ida.

Following hurricane-caused fish kills of comparable magnitude, fish populations have been observed to bounce back naturally in the following years. It can be safely assumed that coastal populations of fishes in Louisiana have evolved to persist through tropical storm events with life history strategy and physiological adaptations. Because of the resilient nature of the local fish populations, introducing genetics from outside of the impacted area in an effort to restock fish populations is not advised. If a restocking effort with non-local genetics is successful at all, it will likely only dilute the genetics that have evolved in local populations to help survive and rebound from these events.