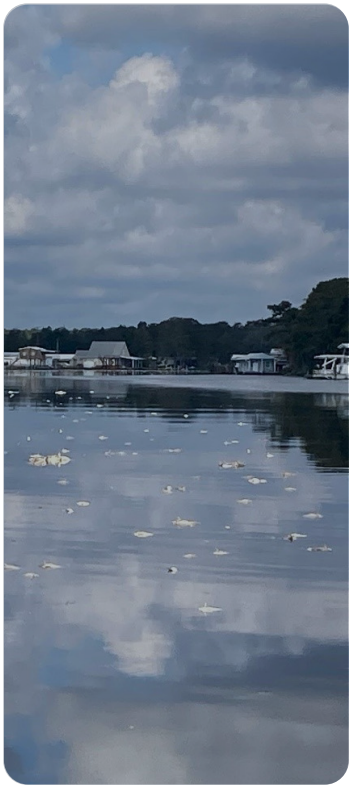
Louisiana Department of Wildlife and Fisheries



Hurricane Francine
INLAND FISH KILL REPORT

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Background

Hurricane Francine made landfall as a Category 2 hurricane at 5:00 pm CDT on September 11, 2024, in Terrebonne Parish, LA. Upon landfall, Francine rapidly weakened, followed a northwest trajectory, and was downgraded to a tropical storm within five hours. Fish kills were heaviest in the Terrebonne, Barataria, and Lake Maurepas basins, but also occurred in the lower Atchafalaya basin and Bayou Teche. In the days following Francine's landfall, LDWF responded to fish kill reports and investigated the impact area with visual inspections and water quality readings.

With the help of the public, LDWF documented 89 fish kills and collected 260 water quality readings throughout the impact area. Hypoxia and fish kills were scattered over two million acres, but ample refuge from hypoxia was observed in deeper and flowing waters.

Methods

Preparation

Prior to the storm, the Fish Kill Coordinator (FKC) informed Inland Fisheries District Management biologists ("staff") that the main goal of the hurricane response was to determine the extent and qualitative magnitude of the kill, since quantifying mortality over such a large area in the dynamic conditions following a tropical storm is fraught with error and uncertainty.

Staff and LDWF Enforcement Division Dispatch employees were prepared in advance to receive reports of fish kills from the public via phone, social media, traditional media, and any relevant source. These reports, along with local staff knowledge of the impact area and associated waterways, would later guide where in-person investigations would occur.

Staff were to gather only priority information (e.g. water quality, species impacted, and general observations) during their fish kill investigations due to large extent of the impact area and were to perform water quality patrols in the weeks following the storm.

On September 16, a press release alerted the public to the likelihood of fish kills, and provided guidance on how to report fish kills to LDWF.

Reporting

Reports of fish kills following Hurricane Francine came from various sources, including public phone calls and texts, reports from LDWF staff, and social media posts. The FKC returned calls from all phone reports forwarded from Dispatch, and contacted authors of social media posts and comments to collect relevant information. LDWF staff from four Inland Fisheries management districts (6, 7, 8, and 9, Figure 1) collected water quality readings across the impacted area, and investigated fish kills, reported and unreported, following the storm.

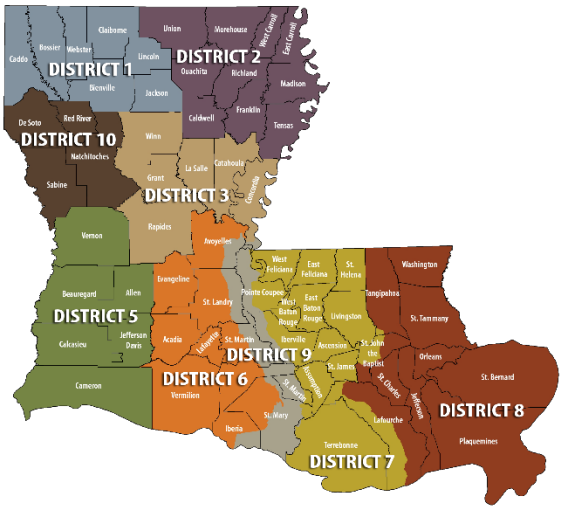

Figure 1. LDWF Inland Fisheries Districts.

Staff reported time spent, expenses, area covered, and observations to the FKC by 3pm, daily, if possible. Each day of the response, the FKC sent a report covering the day's staff and resource use and observations, including updated maps of fish kills and water quality, up the chain of command by close of business.

Fisheries Sampling

Post-storm fisheries sampling, primarily sportfish electrofishing, was conducted as part of scheduled routine monitoring in much of the impact area in the fall following Hurricane Francine. Long-term fisheries datasets inform the overall health of a waterbody, and give insight to the impacts and recoveries related to various disturbances and environmental conditions, including hurricanes.

Results

LDWF District 9 staff observed the first fish kills following Francine's landfall on September 13 in the lower Atchafalaya basin. The first public reports of fish kills began on September 15. In total, 89 fish kills related to Hurricane Francine were reported by the public and LDWF staff between September 13 and September 27 (Figure 2), consisting of 39 public reports (Figure 3) and 50 LDWF observations. Staff received public fish kill reports via phone, text, email, and social media. The FKC responded to all public fish kill reports with either a phone call or an electronic communication. Fish kills were generally reported as scattered, with reports of live fish swimming amongst dead fish at various times. Hurricane Ida's (2021) impacts overlapped much of Francine's, and when questioned, all observers responded that fish kills following Ida, if present, were much more substantial. Photographic evidence and LDWF staff observations supported those observations (Figures 4 and 5).

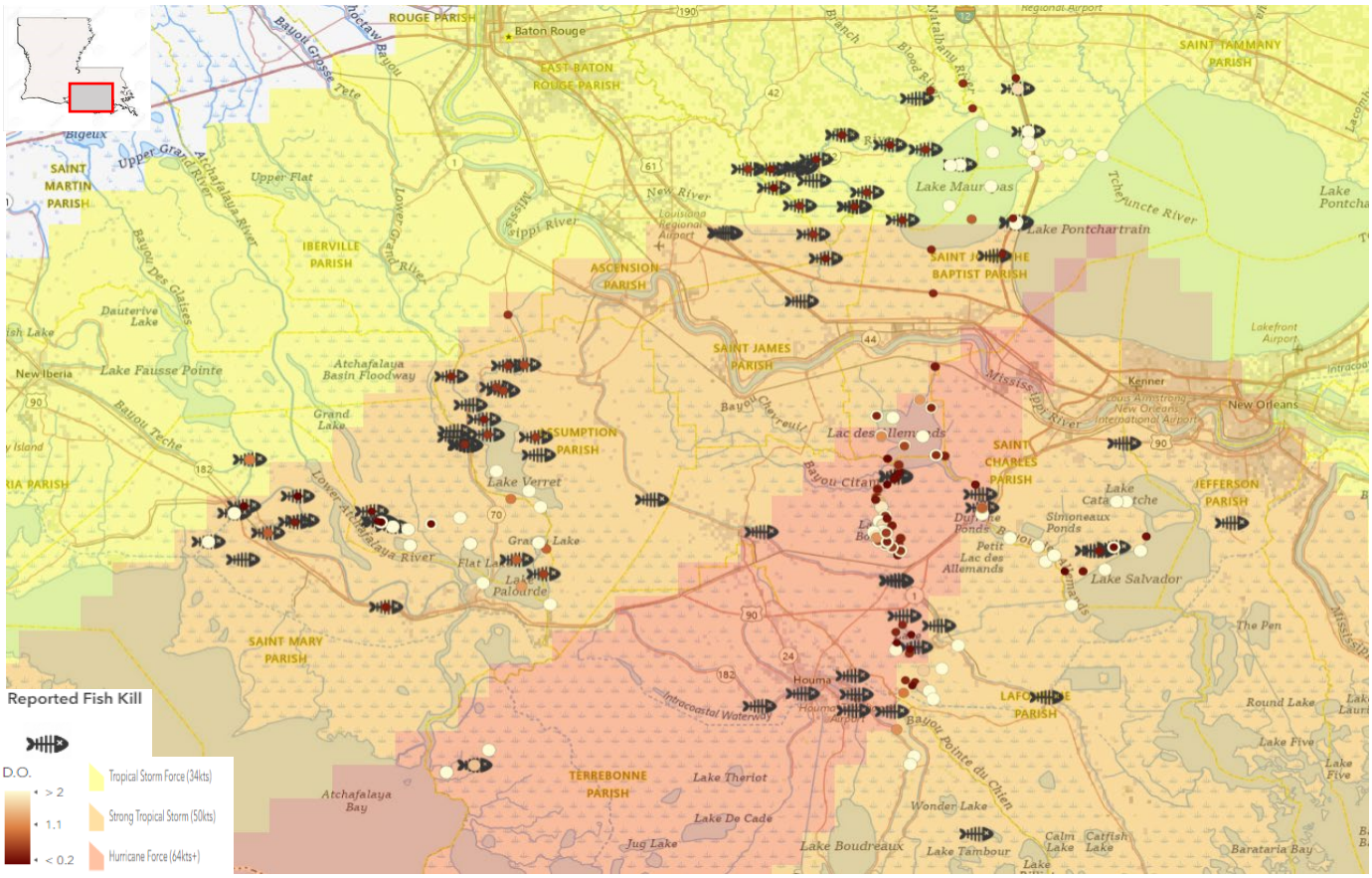

Figure 2. Combined fish kill observations and water quality readings following Hurricane Francine. Hypoxic (< 2 mg/L) readings are red dots, and white dots represent oxygen levels > 2 mg/L. Areas where the surface was oxygenated, but the bottom was hypoxic are denoted by red dots surrounded by white rings.

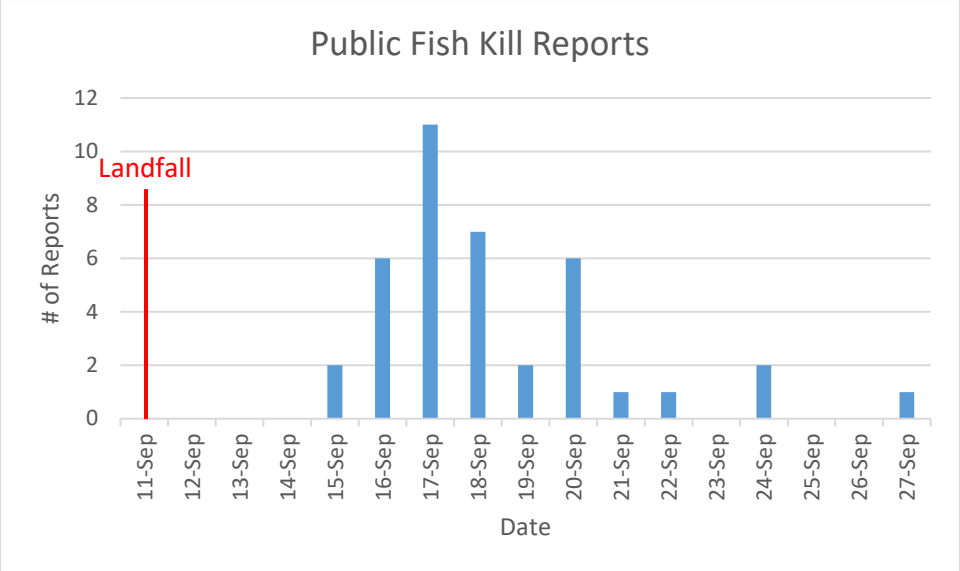

Figure 3. Fish kills reported by the public via phone, text, email, and social media following Hurricane Francine.

Figure 4. Hurricane Francine fish kill at Bell River, September 18, 2024.


Figure 5. Hurricane Francine fish kill at Amite River September 19, 2024.

LDWF staff collected 260 water quality samples between September 13 and September 25 (Figure 2). Ninety-eight samples were hypoxic, with dissolved oxygen readings < 2 mg/L, and 162 had dissolved oxygen levels > 2 mg/L. Water quality readings indicated a general trend of water having sufficient oxygen in lakes and some large tributaries, while bayous, canals, and other tributaries experienced hypoxia.

Observed fish kills and hypoxia covered an area of approximately two million acres (Figure 2). Every watershed experiencing hypoxia also had significant areas of oxygenated water within.

Fall Fisheries Sampling

Largemouth Bass were sampled using standard electrofishing methods within Francine's impact area in the fall of 2024. Changes in catch rates in the fall of 2024 were variable, with five of ten waterbodies showing reductions from the previous sampling event (either fall of 2023 or spring of 2024, Figures 6 and 7). In a comparison of fall 2023 and fall 2024 samples, the Verrett/Grassy/Palourde complex showed the largest drop in CPUE with a reduction of 70.5%, and Blind River had a CPUE reduction of 68.4%. In contrast, the Amite River fall 2024 samples increased 31.4% compared to fall 2023 samples.

For comparison, much of Francine's impact area also experienced significant fish kills following Hurricane Ida in 2021, and those losses to the population were apparent in the results from biological sampling the following fall and spring (Figures 6 and 7). Following Ida, there were zero or near-zero CPUEs in Blind River, Amite River, and Lakes Fields and Long. Following Francine, there were almost

no zero-catch samples, suggesting a lower magnitude of fish kills, with the one exception being the South of Lafitte Area where bass CPUEs have been near-zero or zero since 2020.

CPUE data are meant to inform long-term datasets, and many variables can impact any single sampling event's results. However, given the significant impacts of a mass mortality event and subsequent recovery on fish populations, it is safe to assume that the differences between catch rates of sampling events can be largely attributed to the events.

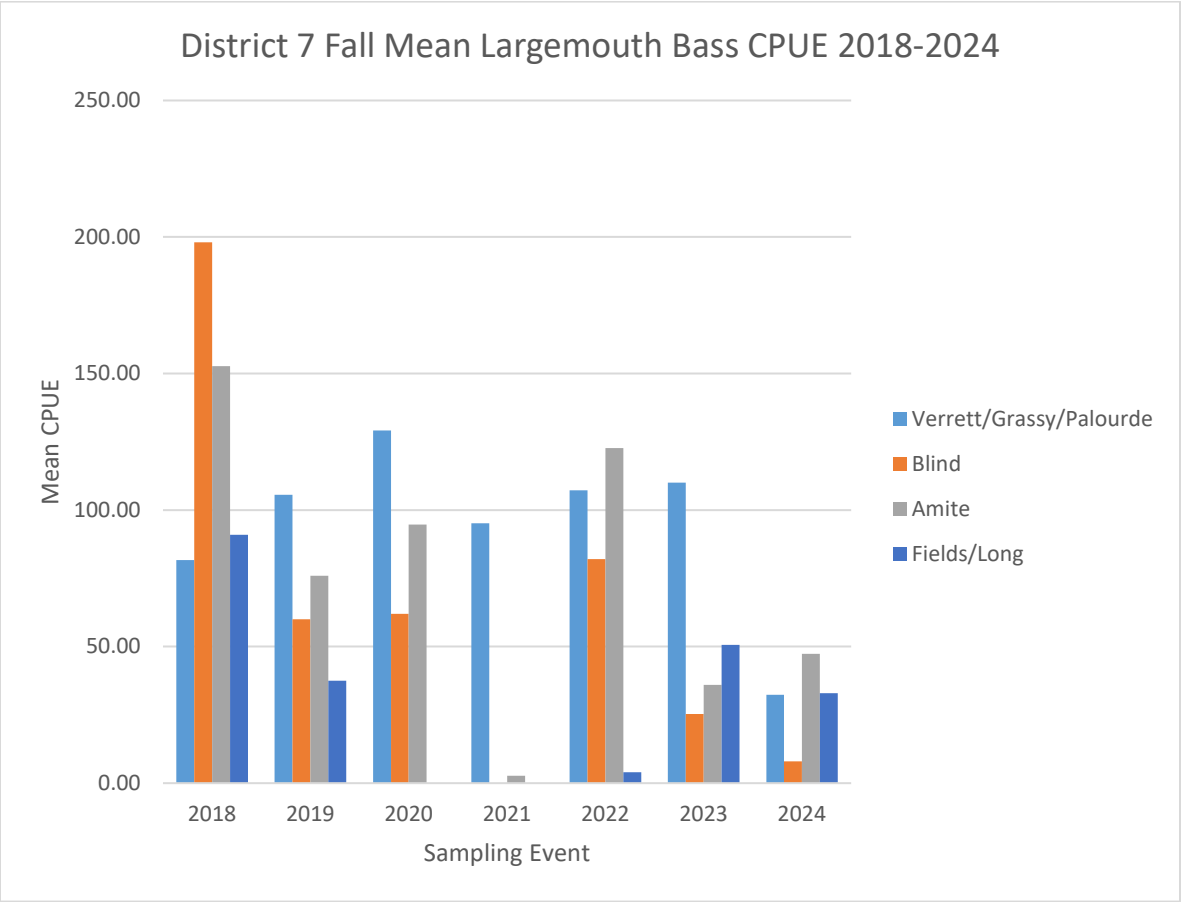

Figure 6. District 7 Largemouth Bass catch per unit effort (CPUE) in the fall of 2018-2024 in areas impacted by Hurricanes Ida (2021) and Francine (2024). Lake Fields and Lake Long were not sampled in 2020 or 2021.

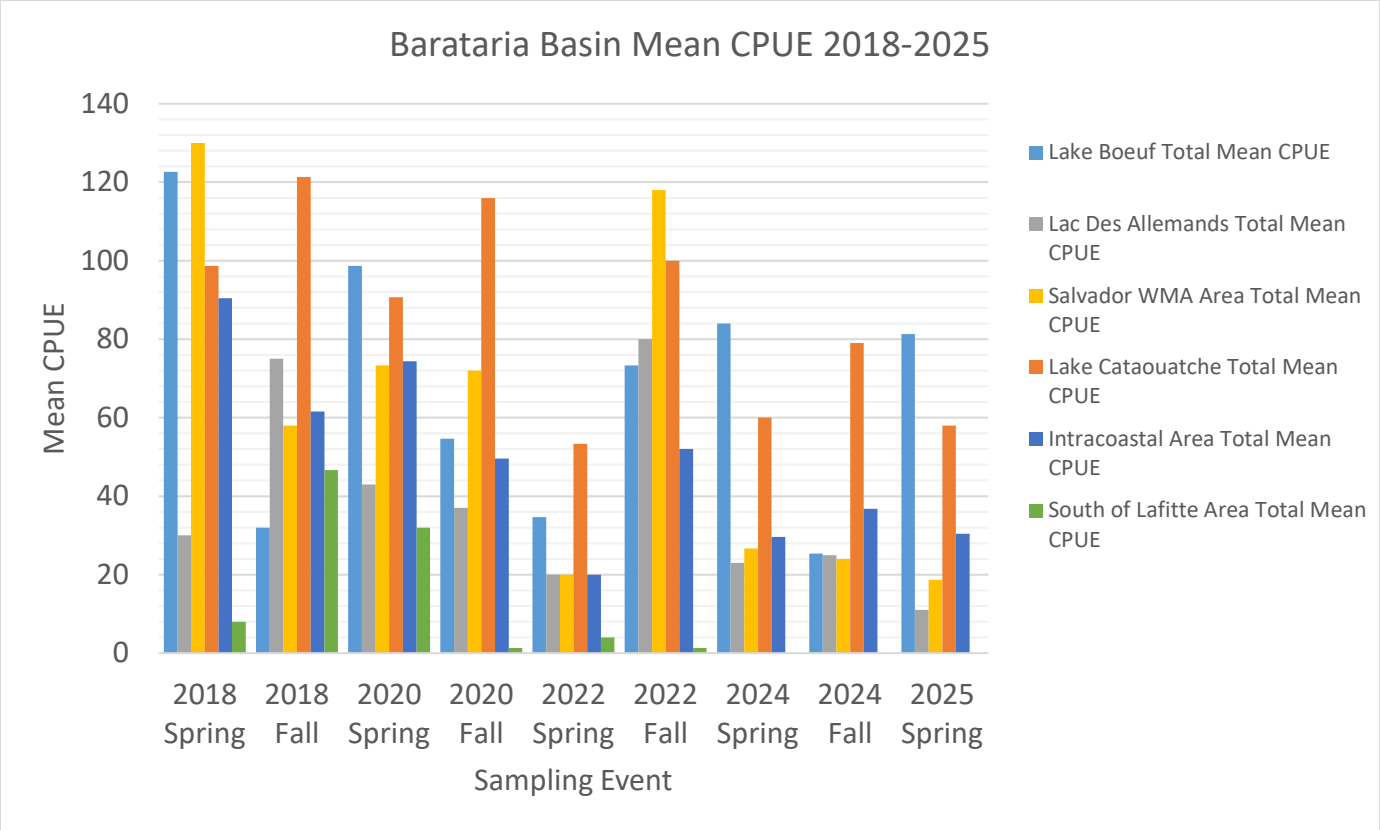

Figure 7. District 8 Largemouth Bass catch per unit effort (CPUE) in the spring and fall of 2018-2025 in areas impacted by Hurricane Francine.

Discussion

Fish kills following a tropical storm are generally due to hypoxia, and caused by one, or a combination of up to three factors: churning and decomposition of organic sediments, decomposition of debris falling and flowing into waterways, and storm surge. In addition to causing hypoxia by pushing organic matter inland, storm surge can also kill freshwater organisms with a sudden increase of salinity. Following the initial factors that led to hypoxic conditions, rotting fish and other dead biota may cause prolonged hypoxic conditions as they decompose. 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.

Hurricane Francine was a relatively minor hurricane, and damage to property and displacement of people was minimal. Many people did not evacuate, or were able to return to their homes soon after the storm. There were numerous public notifications regarding fish kill reporting through press releases and social media. Public reports of fish kills were prompt and extensive due to people being able to continue with their normal activities rather than dealing with immediate personal needs following a major or devastating storm. Furthermore, staff were not personally impacted by the storm, and offices were opened back up soon after the storm, which led to a thorough response by LDWF that not only followed up on reported kills, but also located unreported mortalities while taking water quality readings.

Though fish kills were widespread following Francine, covering two million acres, they were reported using terms like “spotty” or “scattered,” and were often observed with fish swimming in the area soon

before or after the kill, and often amongst floating dead fish. LDWF observations and photographic evidence support those reports. Water quality data collected following the storm also shows a mix of hypoxia and oxygenated water, showing refugia vertically in the water column and often in larger, deeper, and windblown waterbodies.

Standard sampling data following Francine confirms the moderate impacts observed in the field by biologists and the public that were not as severe as Hurricane Ida, notably in Amite River and Lakes Fields and Long. Fish populations impacted by large fish kills generally experience highly successful spawns and substantial recruitment in the first year or two following the event. However, since 2021, Francine's impact area has been affected by many harsh events, including record-setting Hurricane Ida in 2021, an extreme summer drought in 2023, Hurricane Francine in 2024, and extreme cold in January 2025. Because of annual extreme weather events in recent years, the expected population rebound appears to be muted for Largemouth Bass. This is evident in LDWF's standard samples for Largemouth Bass as well as in angler observations.

South Louisiana fisheries are generally resilient, and show very strong rebounds, with age-classes of fish hatched following major disturbances being distinctly large in numbers and individual sizes. However, conditions must remain favorable for a few years following to see the full potential of the rebound in fisheries stocks and aquatic communities. The LDWF will continue to monitor impact areas and base management decisions on the best fisheries science available.