

Caernarvon Interagency Advisory Committee 2023 Meeting

What we will cover in this presentation:

- Purpose and goals of the project
- Why we are here
- 2022 diversion operations and basin conditions
- 2023 snapshot of operations
- Proposed 2024 operations Plan

Caernarvon Freshwater Diversion Project

Facts and Features

- **Authorized by U.S. Congress: Flood Control Act of 1965 and Water Resources Development Act of 1974, 1986, and 1996**
- **Constructed by the USACE; operated by CPRA**
- **Located on the east bank of the Mississippi River (mile 81.5) in Plaquemines Parish**
- **Five, 15-ft gated box culverts**
- **Maximum Discharge = 8,000 cfs**
- **Operations began August 1991 (32 years of operations)**



Caernarvon Freshwater Diversion Project

Goals:

1. Enhance emergent marsh vegetation growth
2. Reduce marsh loss
3. Increase productivity of commercial and recreational fish
4. Increase productivity of commercial and recreational wildlife

With multiple project goals and interests in different fish and wildlife species, it is challenging to operate without causing user group conflicts. Our general approach is to mimic the river – divert high when the river is high and low when low. That time of year addresses most of the goals and limits many negative impacts.

Caernarvon Interagency Advisory Committee

- Purpose:

- Advise the Executive Director of CPRA relative to an annual operations plan
 - Operational considerations include:
 - Times of year
 - Rate and duration of discharge through the structure
 - Emergency operations and shutdown triggers

- Sources of information to guide decisions:

- Annual Report written by CPRA (2022 data)
- Your agency or industry data
- Any other relevant information (e.g., research studies)
- Draft Operations Plan proposed by the Technical Workgroup (subcommittee of CIAC)
- Your expertise and experience

MAJOR FRESHWATER INPUTS

1. Mississippi River Discharge (main driver)
2. Rainfall (wet year 2021 vs. dry year 2023)
3. Diversions – only one we can control

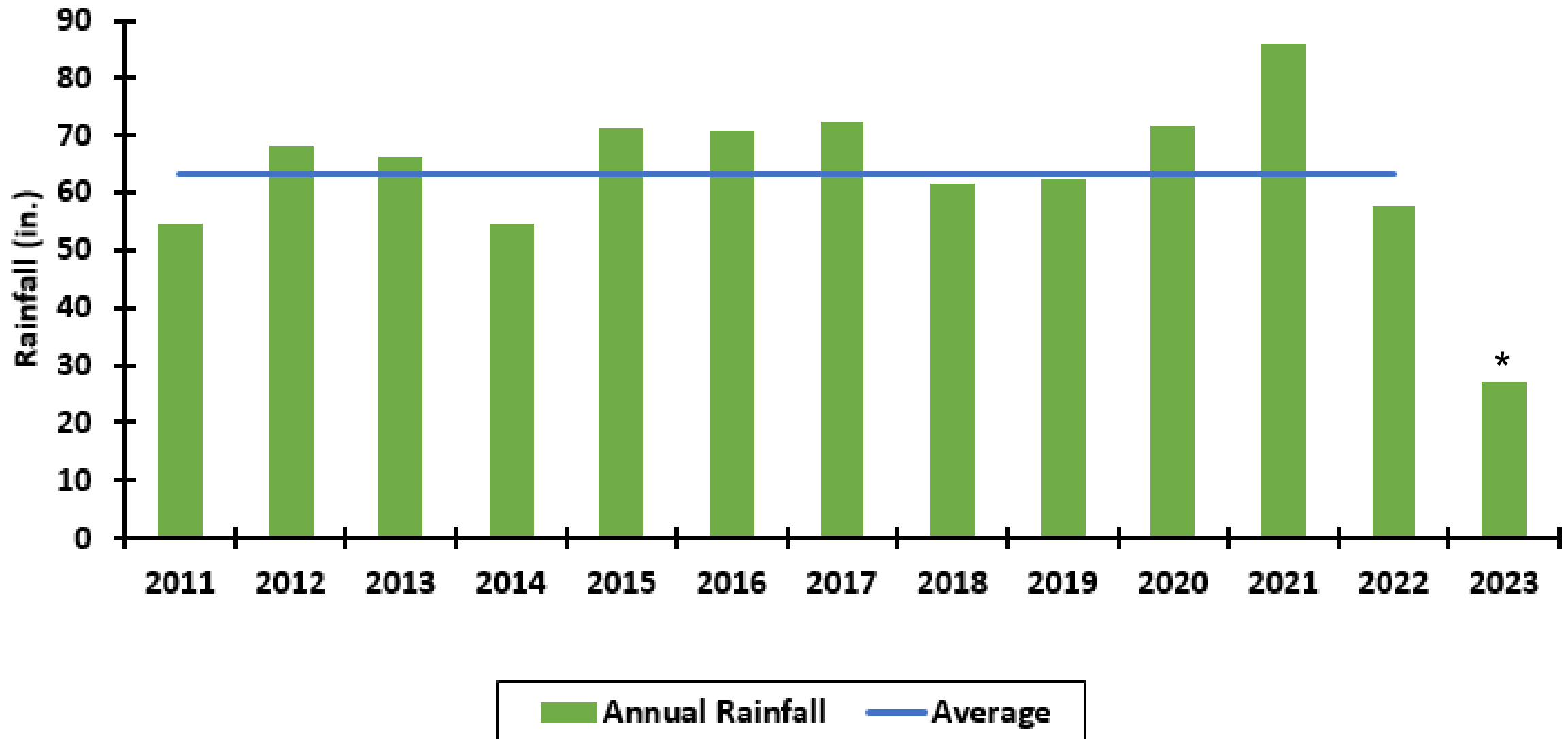
MODIS Satellite
March 13, 2020



2022 Mississippi River Stage (at Carrollton)

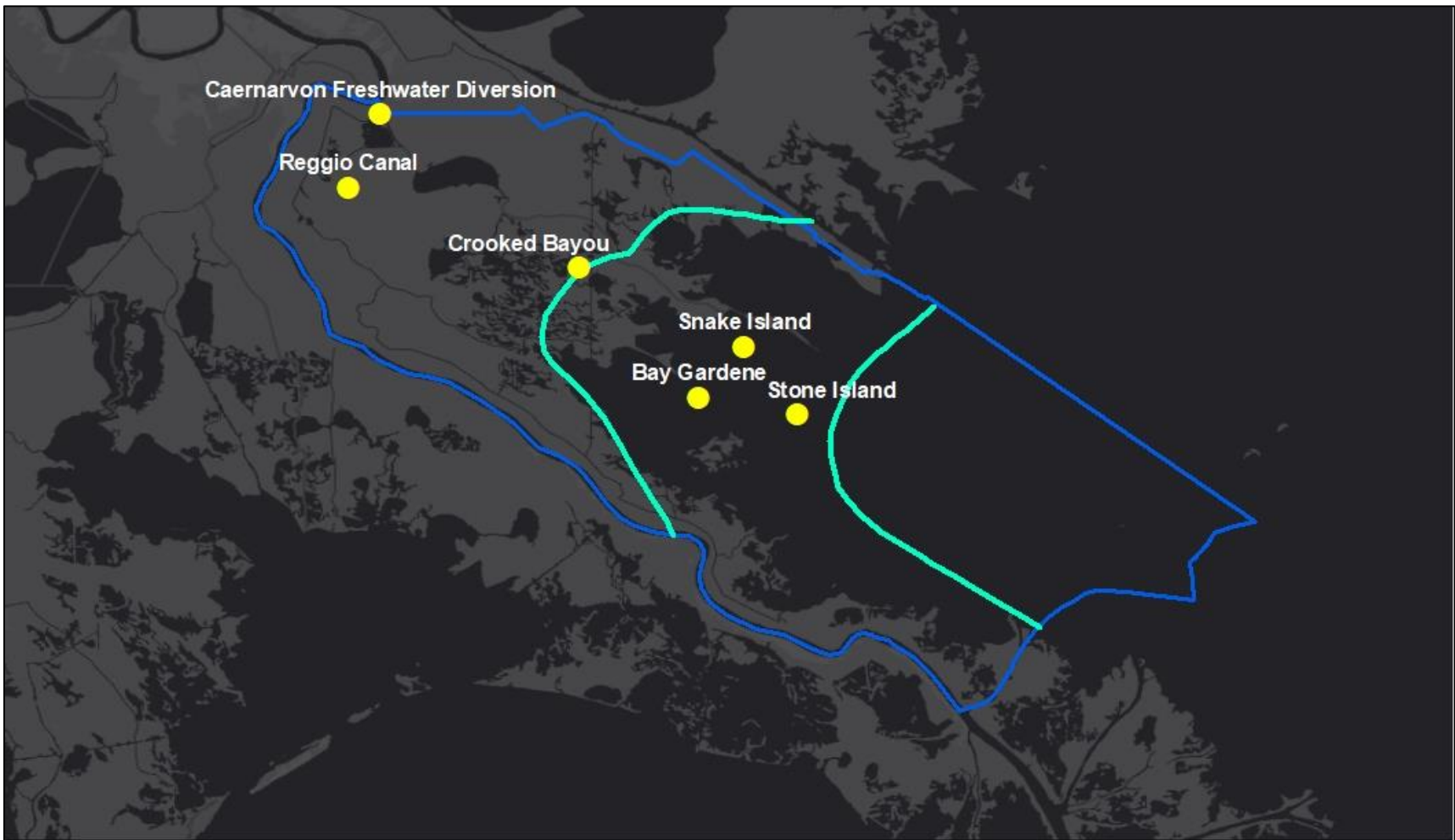


Precipitation at the New Orleans Airport



Caernarvon 2022 Operations



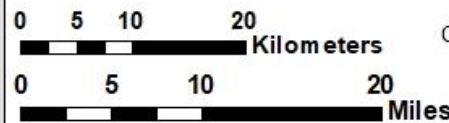


BS - 0008 Caernarvon Freshwater Diversion

Salinity Monitoring Stations and Isohalines for Breton Basin



- Operational Gauges
- Post-Project Isohaline
- Breton Sound Basin



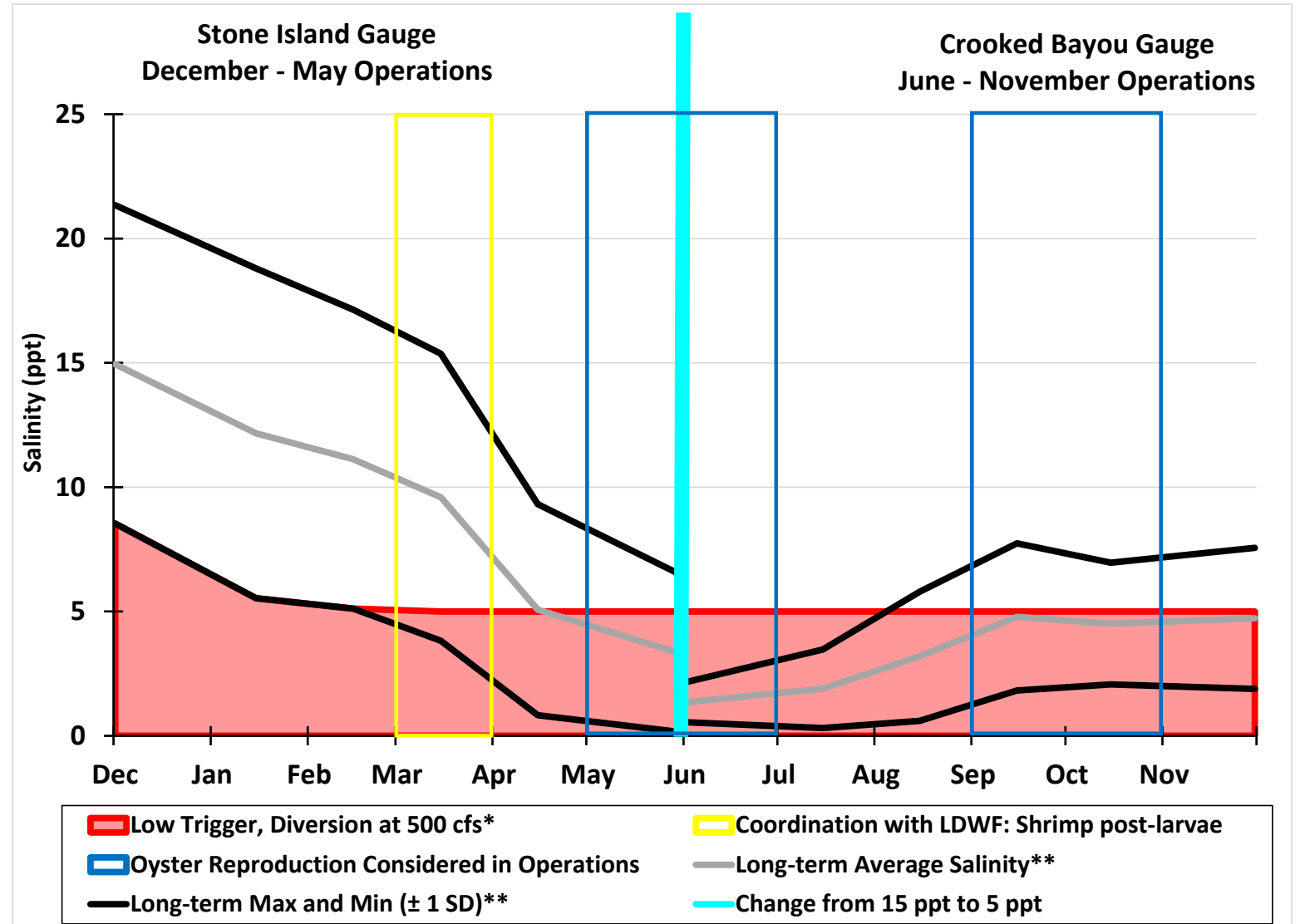
Source:
Coastal Protection and Restoration
Authority of Louisiana
Map Date:
November, 2020



2022 Operations Plan

Operational notes:

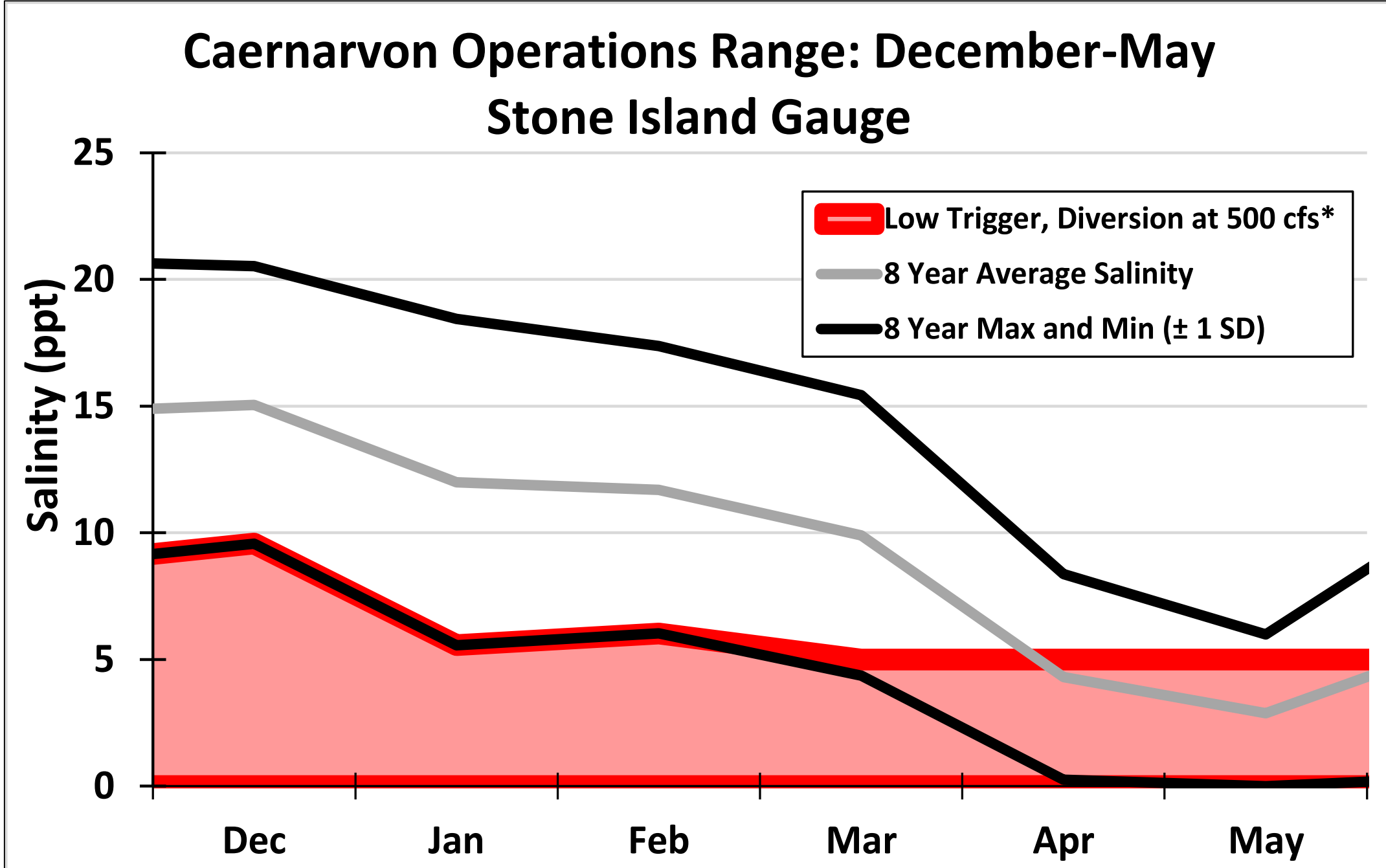
- Average conditions
- Seasonal operations (15 vs. 5 isohaline; mimic the river)
- Official fisheries consideration periods: post-larval shrimp recruitment and oyster spawns
- Minimum discharge (500 cfs)
- Low triggers = reduce to minimum



Caernarvon Operations Range: December-May

Stone Island Gauge

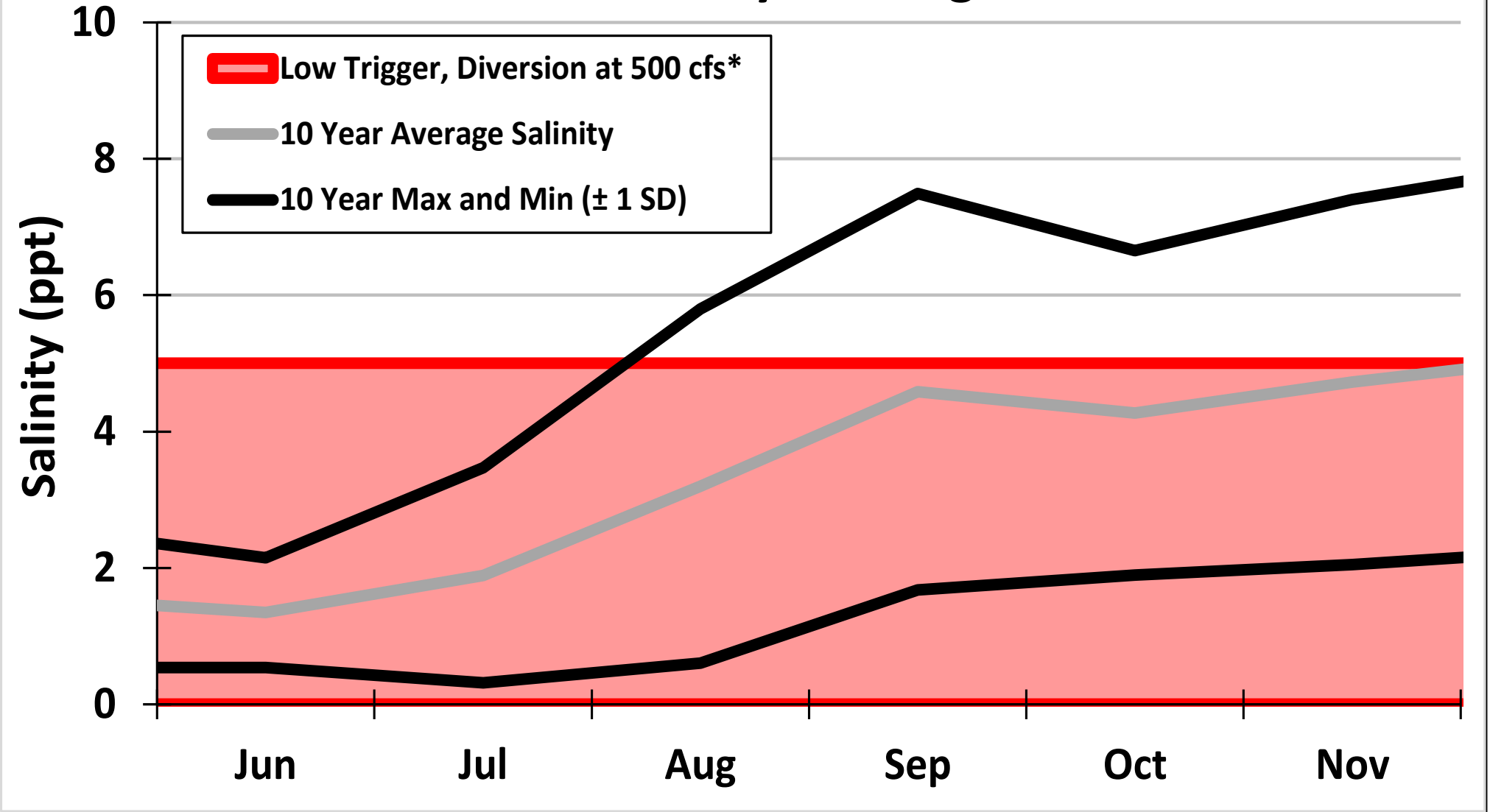
15 PPT
Isohaline



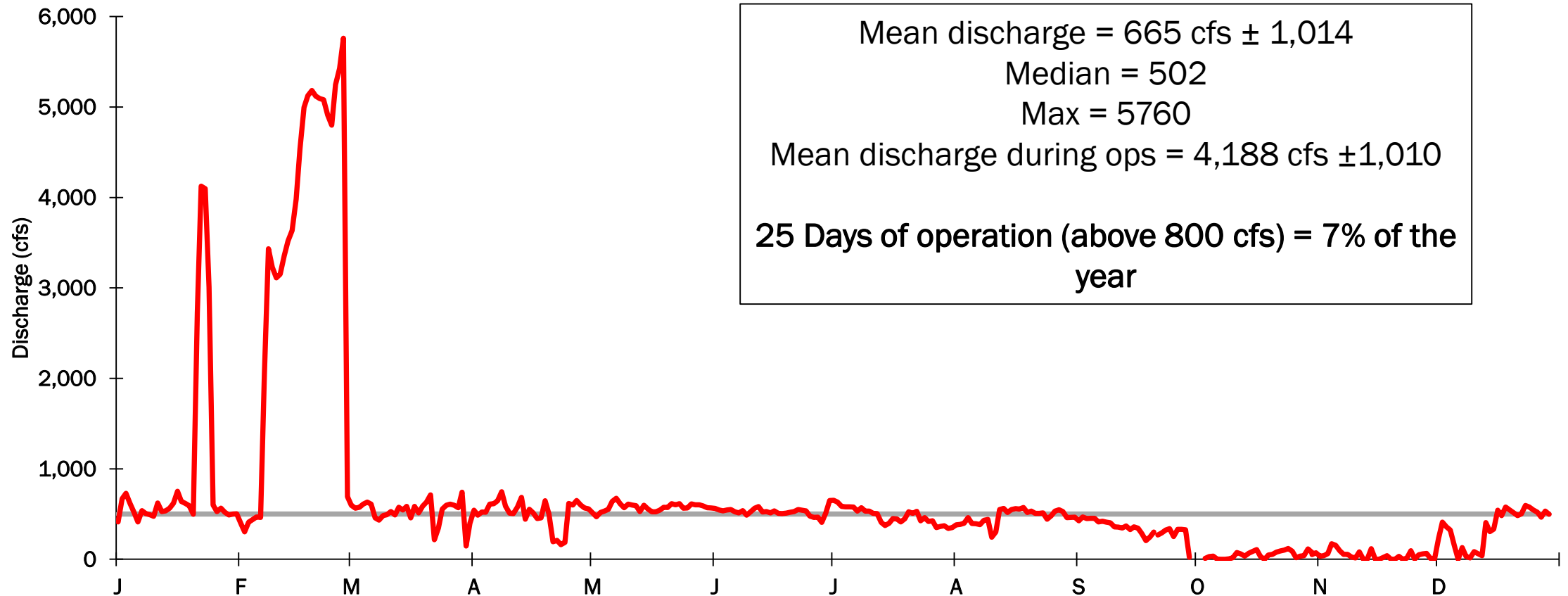
Caernarvon Operations Range: June - November

Crooked Bayou Gauge

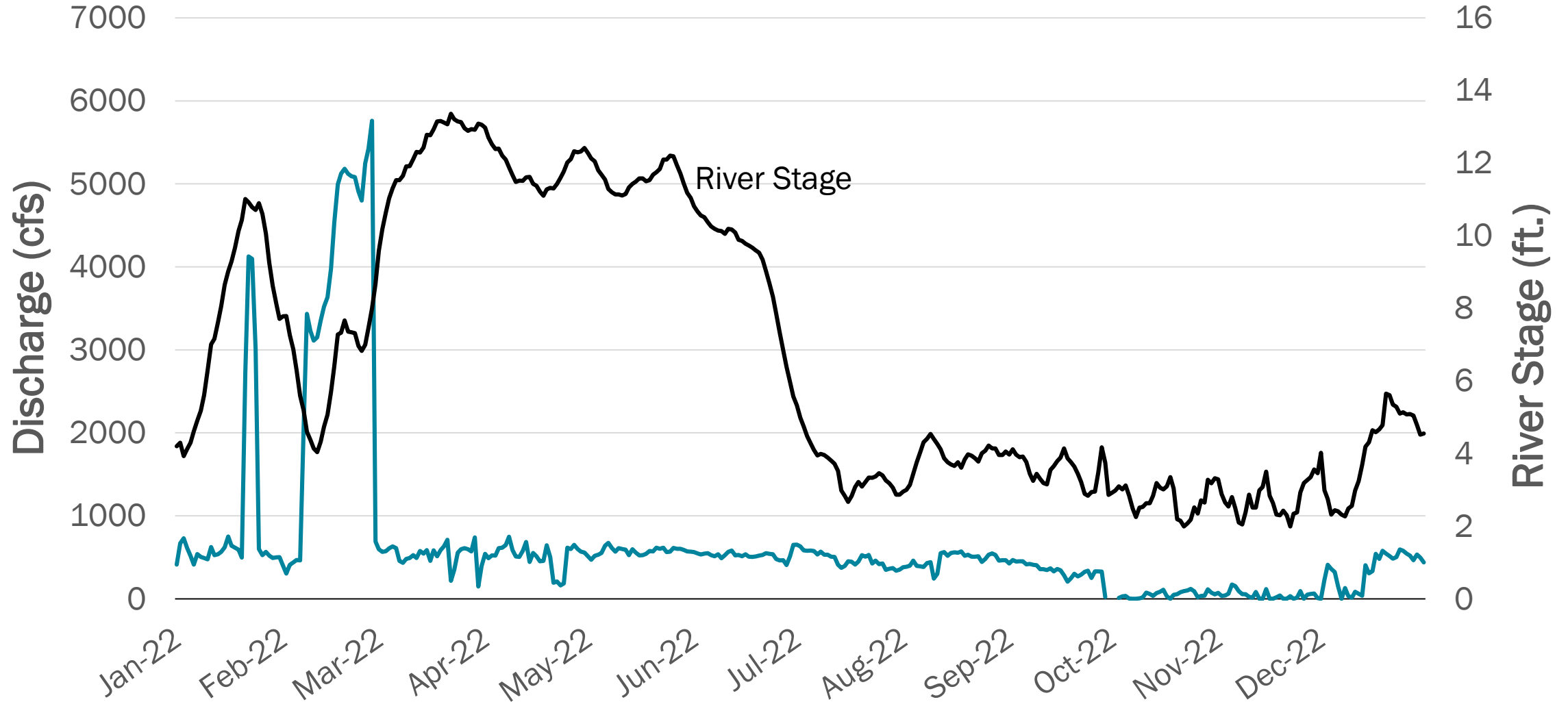
5 PPT
Isohaline



2022 Caernarvon Discharge



2022 Caernarvon Discharge and Mississippi River Stage

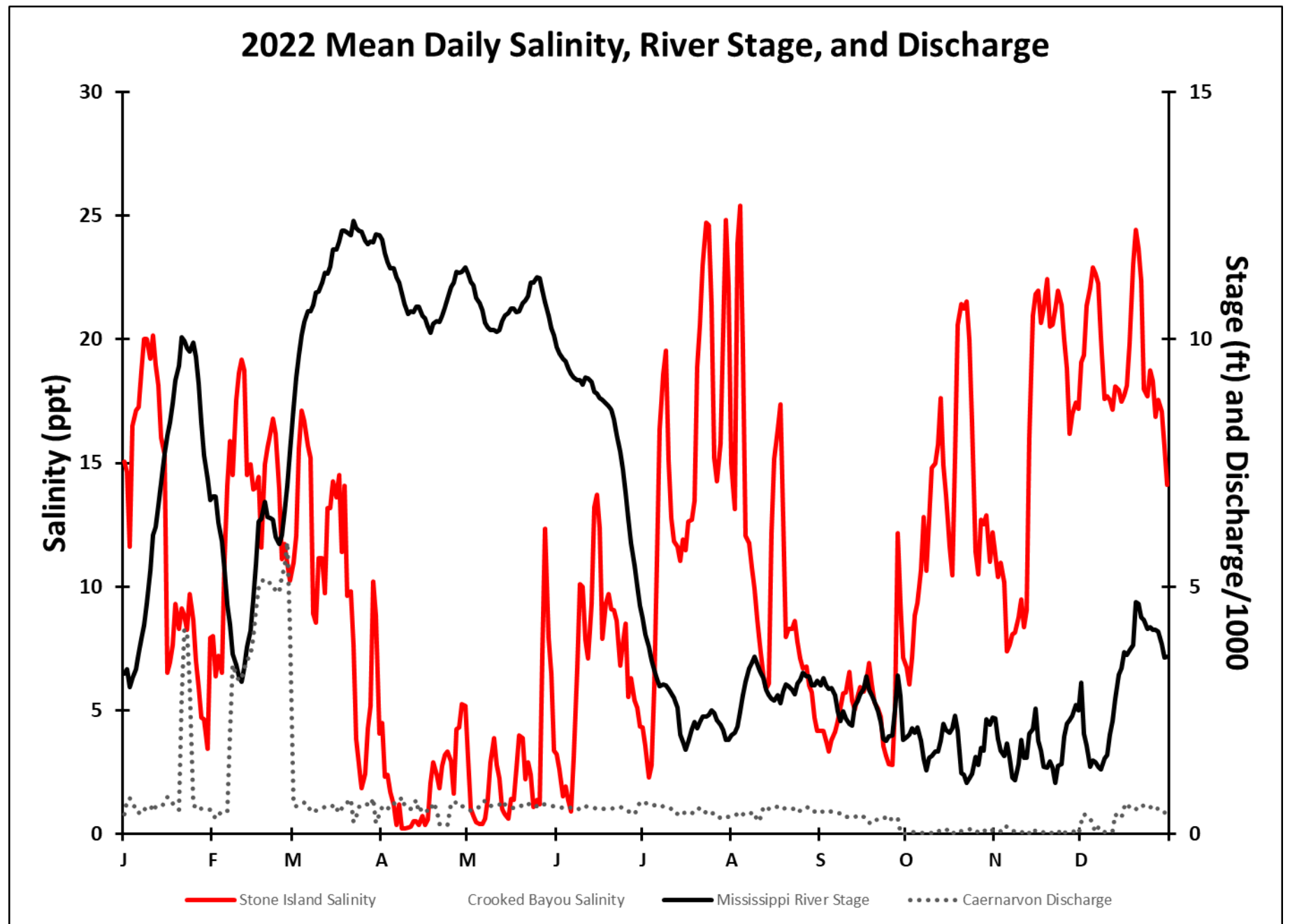


- **Stone Island gage at 15 PPT isohaline**

- Daily fluctuation can be large (e.g., tides for cold fronts)

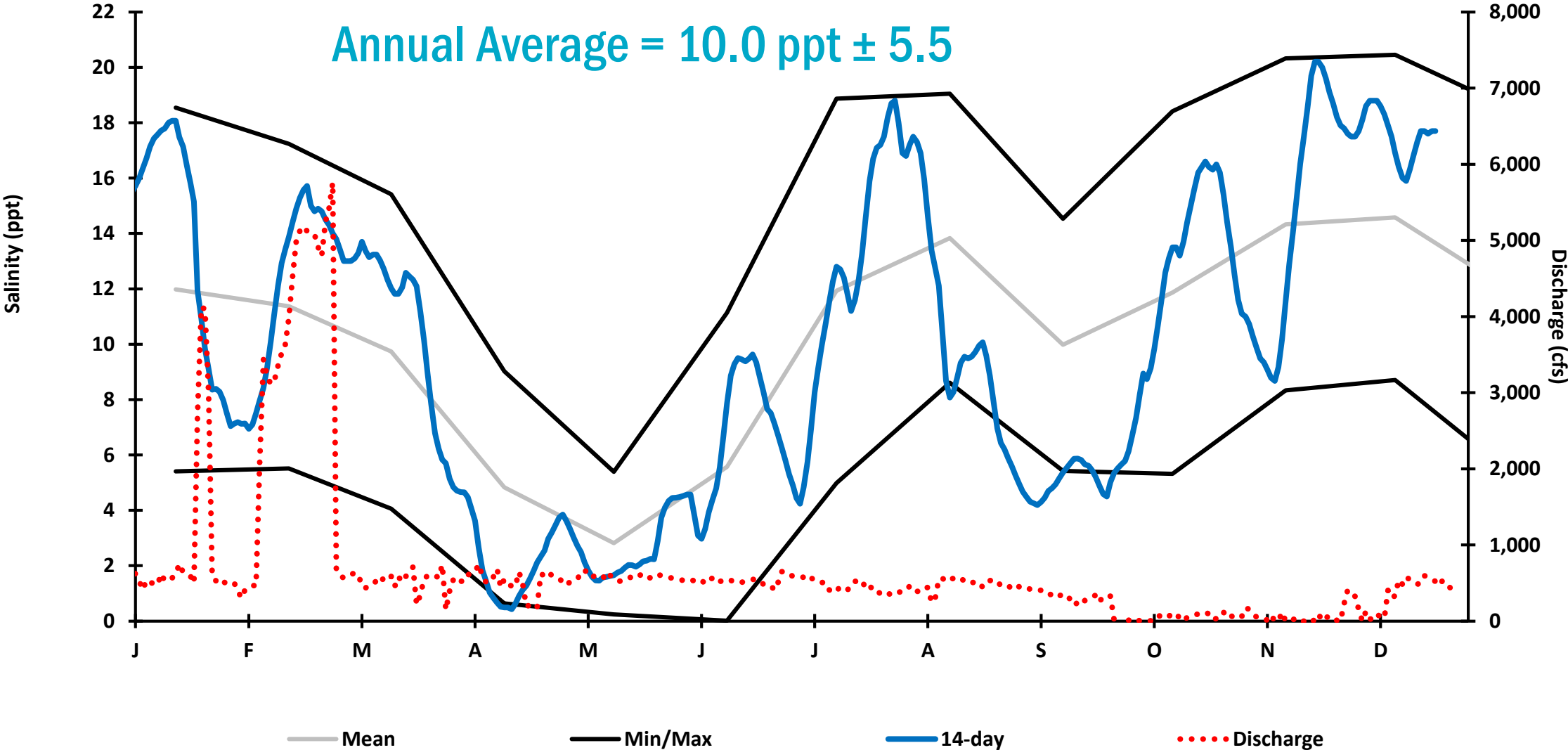
- Bigger pattern = when river discharge is high salinities are low (and opposite)

- Diversion pulses = marginal impacts and confounded by river discharge

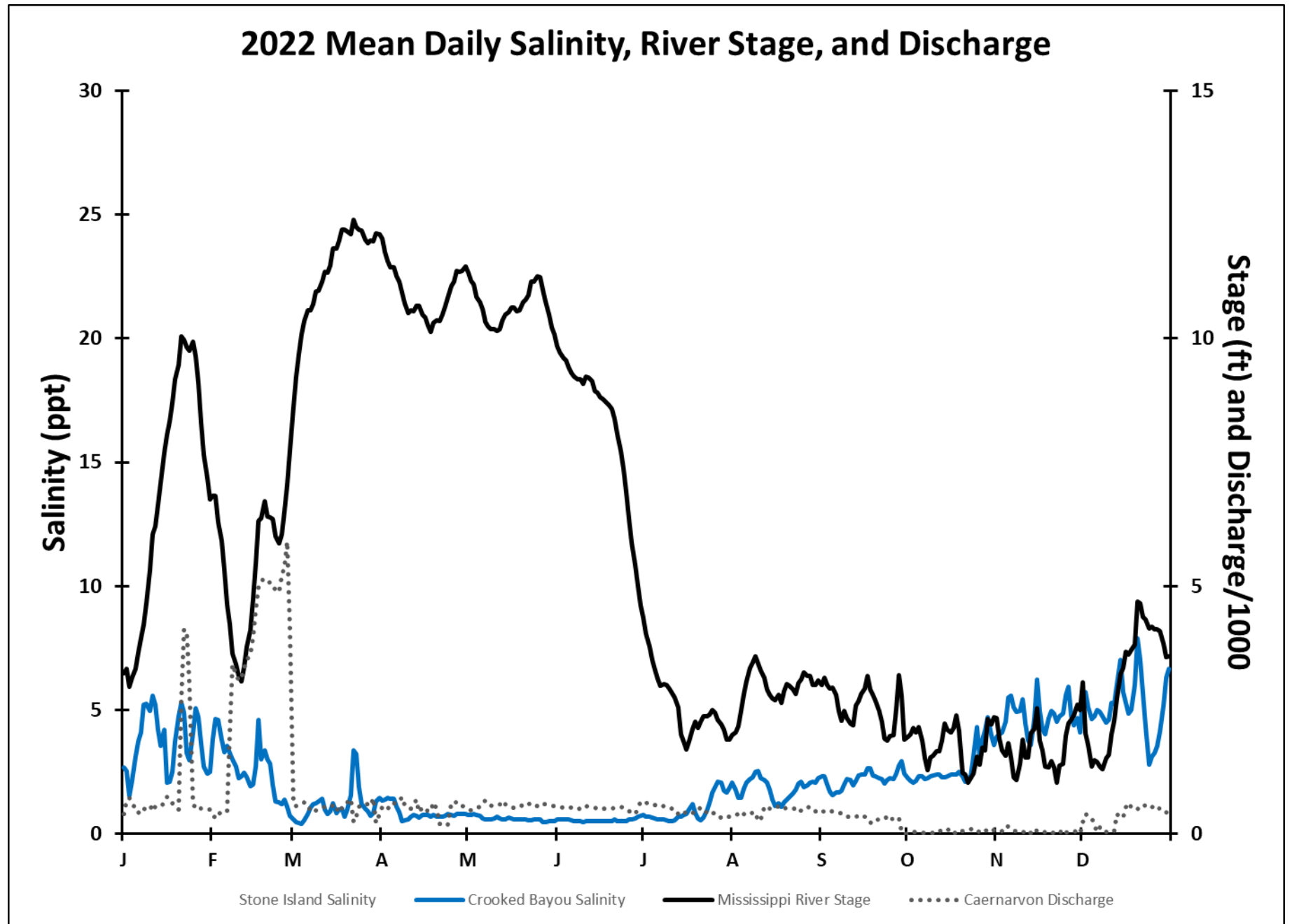


2022 Stone Island 14-Day Moving Average - 15 ppt

Annual Average = 10.0 ppt ± 5.5

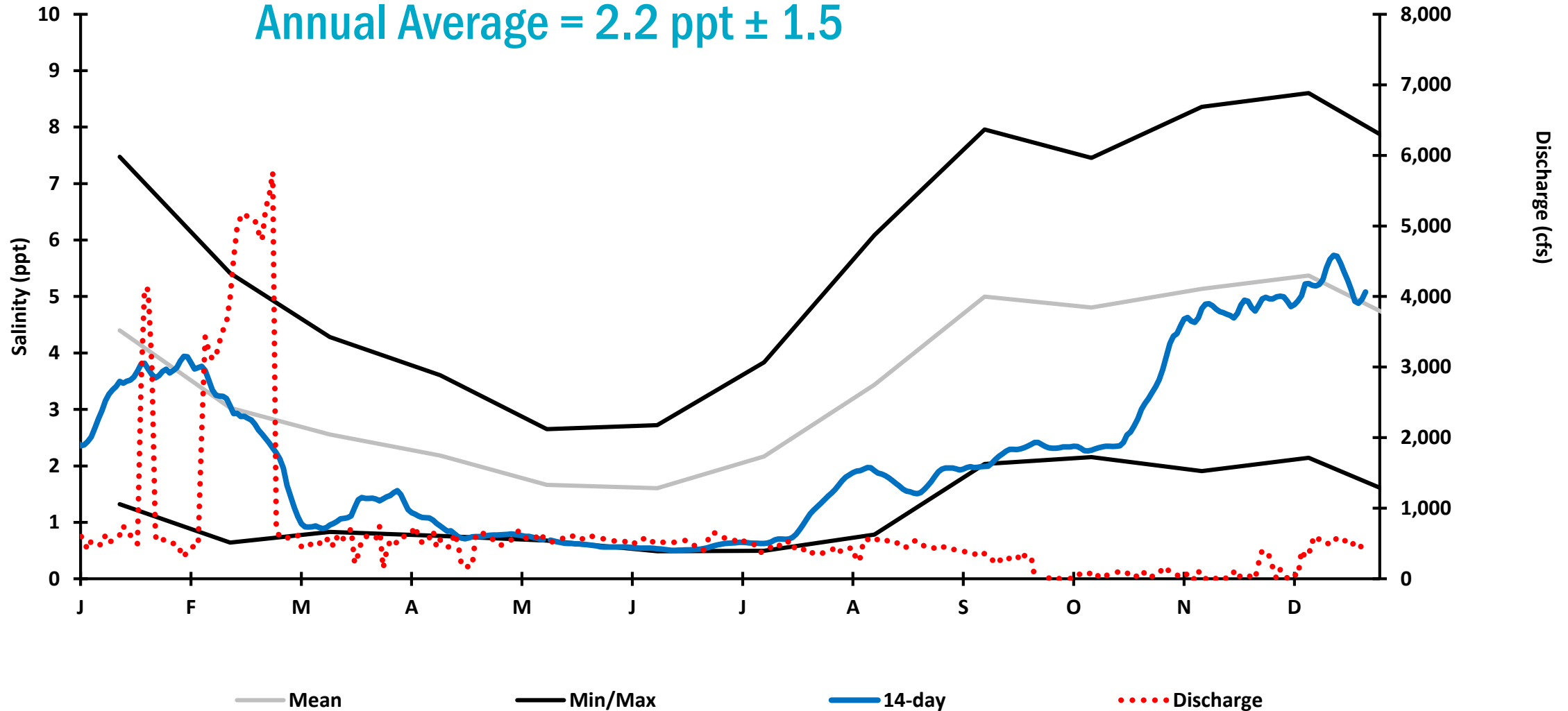


- **Crooked Bayou gage at 5 PPT isohaline**
- Daily fluctuations are more muted in upper basin (less tidally influenced)
- Similar big picture = when river discharge is high, salinities are low (and opposite)
- Diversion pulses = marginal impacts but more likely here than down basin



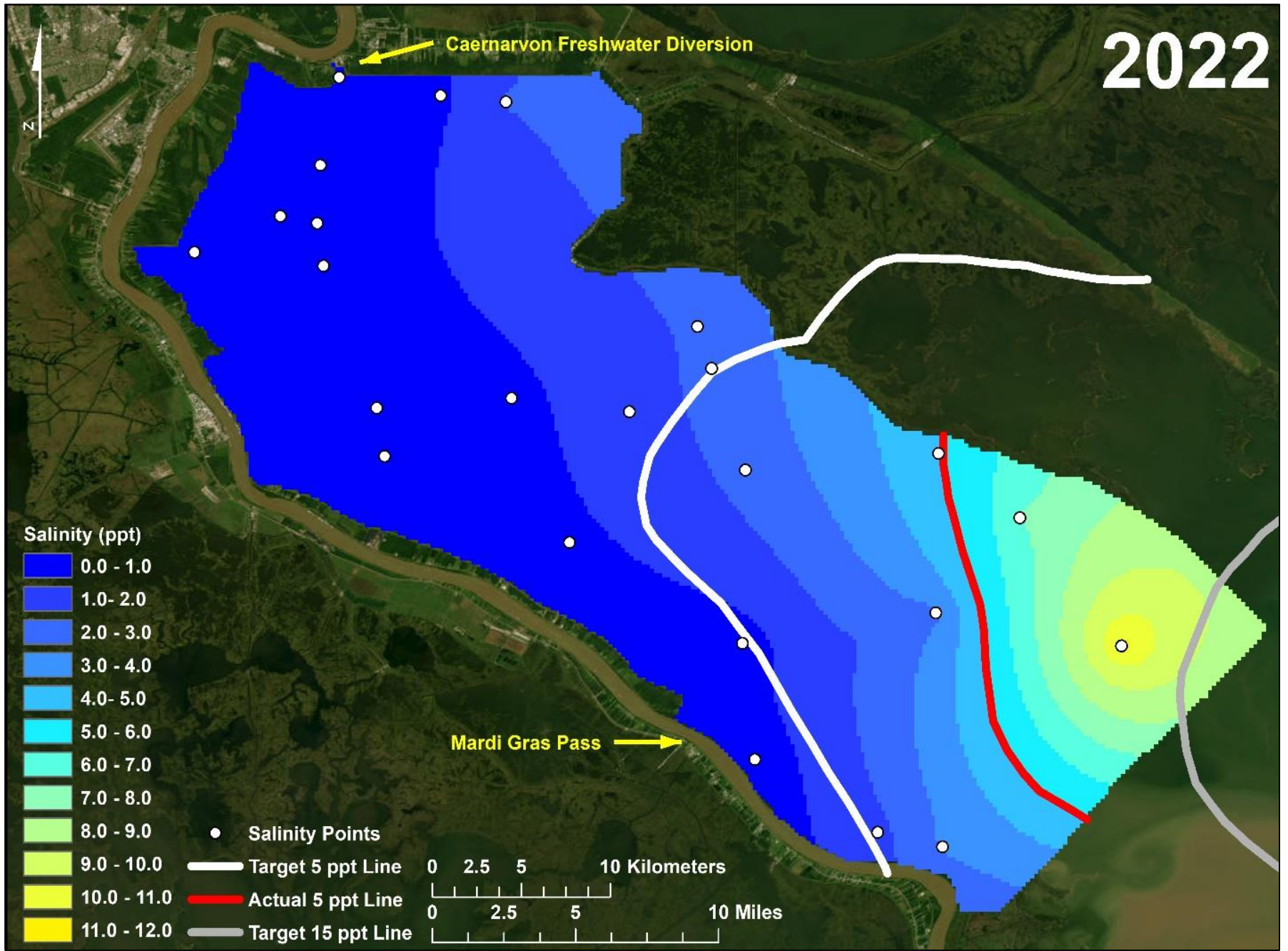
2022 Crooked Bayou 14-Day Moving Average - 5 ppt

Annual Average = 2.2 ppt ± 1.5

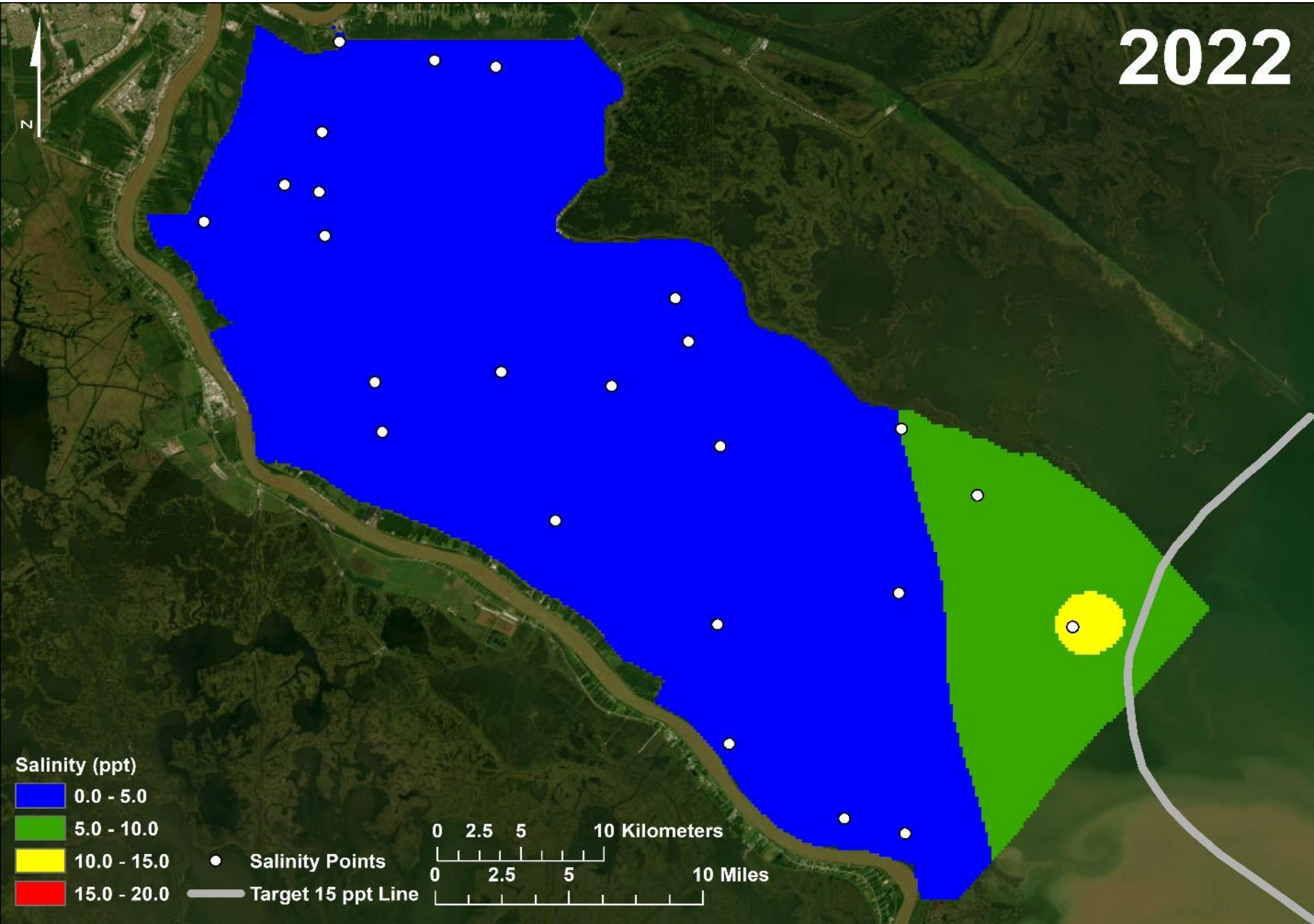


- 2022 Annual isohaline position vs. target

- Fresher than target > isohalines were farther down basin

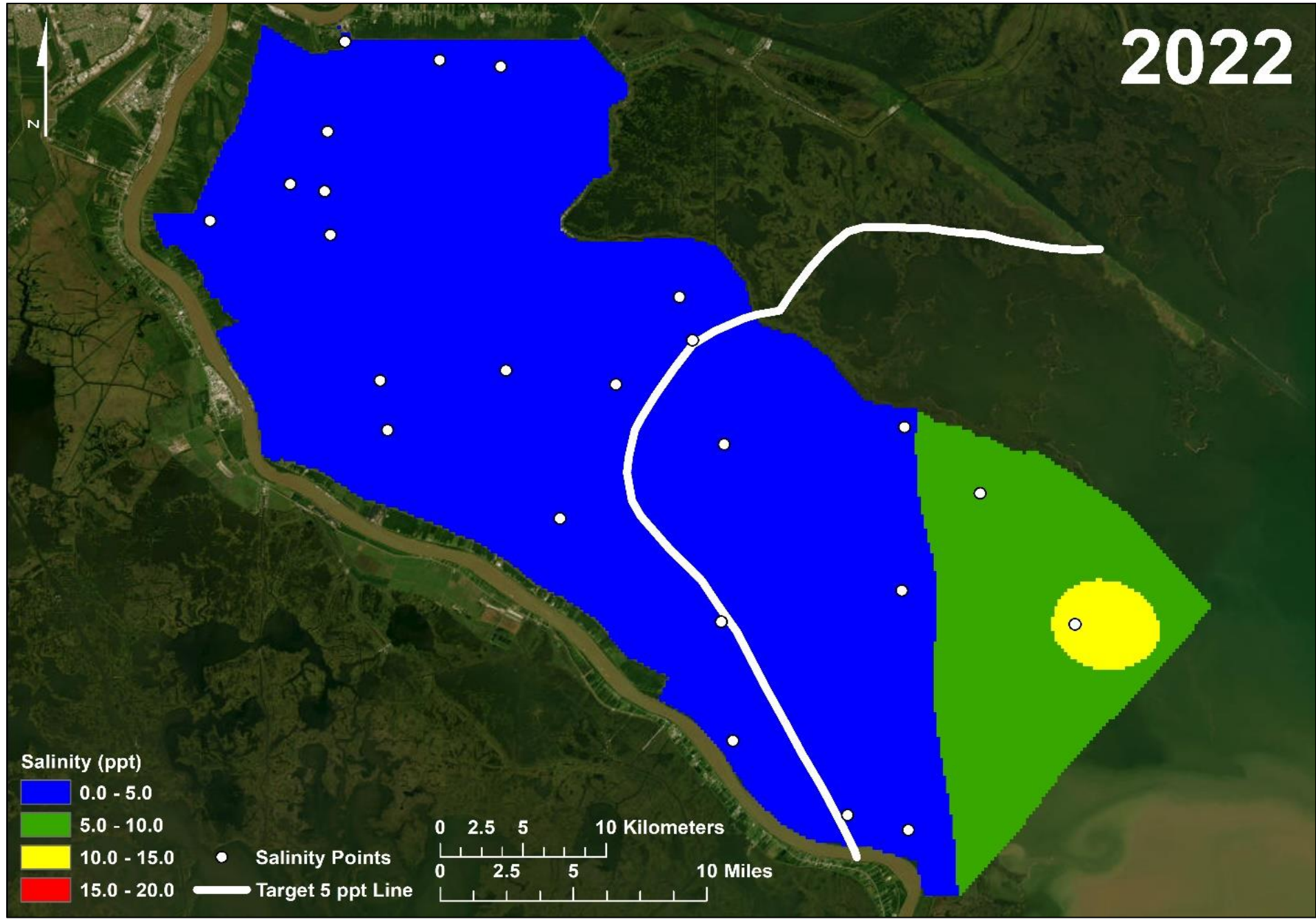


2022



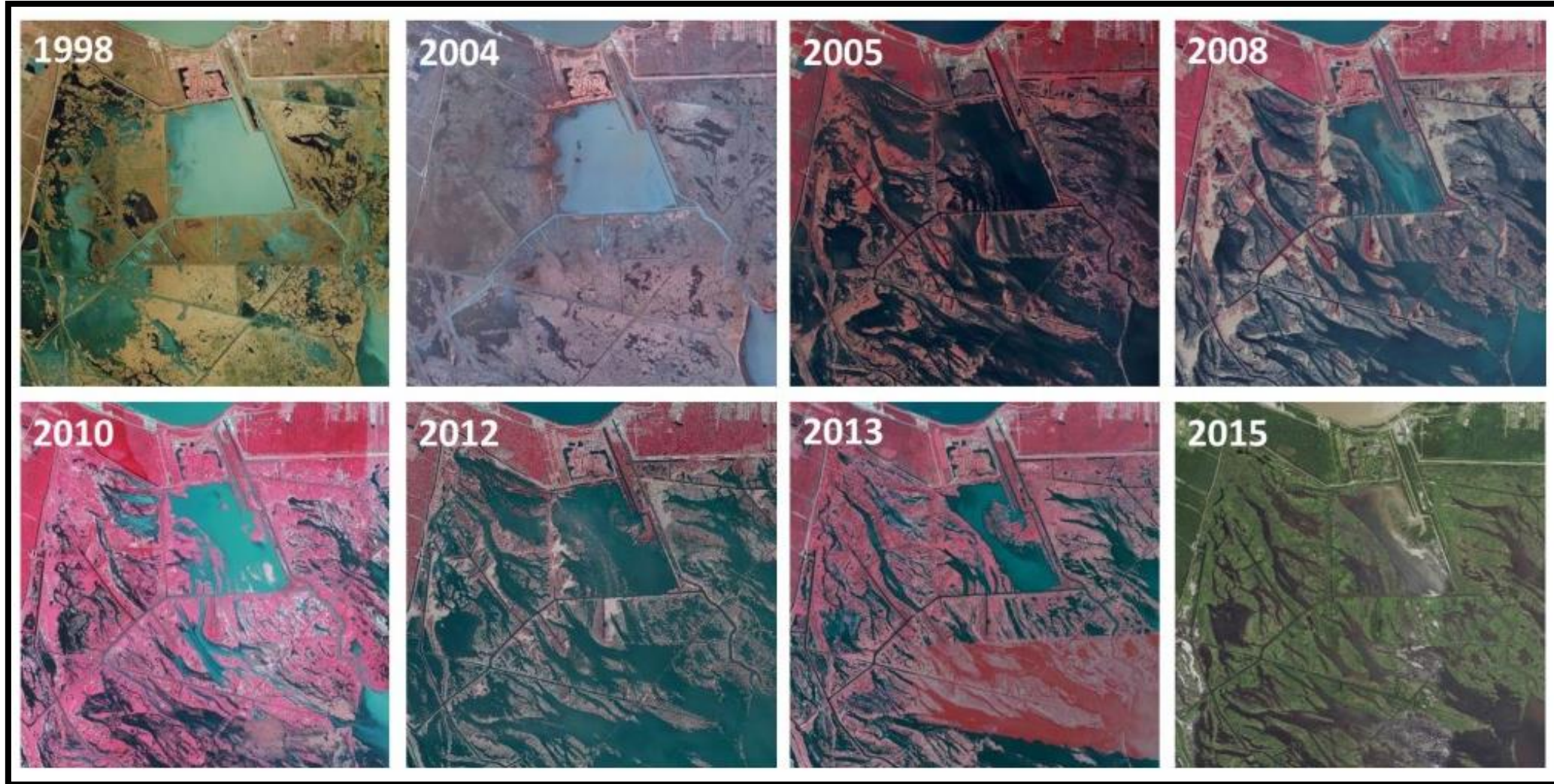
Seasonal Target
15 ppt isohaline
December – May

2022



Seasonal Target
5 ppt isohaline
June - November

Caernarvon: Land Area Change Upper Basin





Contents lists available at [ScienceDirect](#)

Ecological Engineering

journal homepage: www.elsevier.com/locate/ecoleng



Coastal wetland area change for two freshwater diversions in the Mississippi River Delta

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^b U.S. Geological Survey, Wetland and Aquatic Research Center, 700 Cajundome Blvd, Lafayette, LA 70506, USA

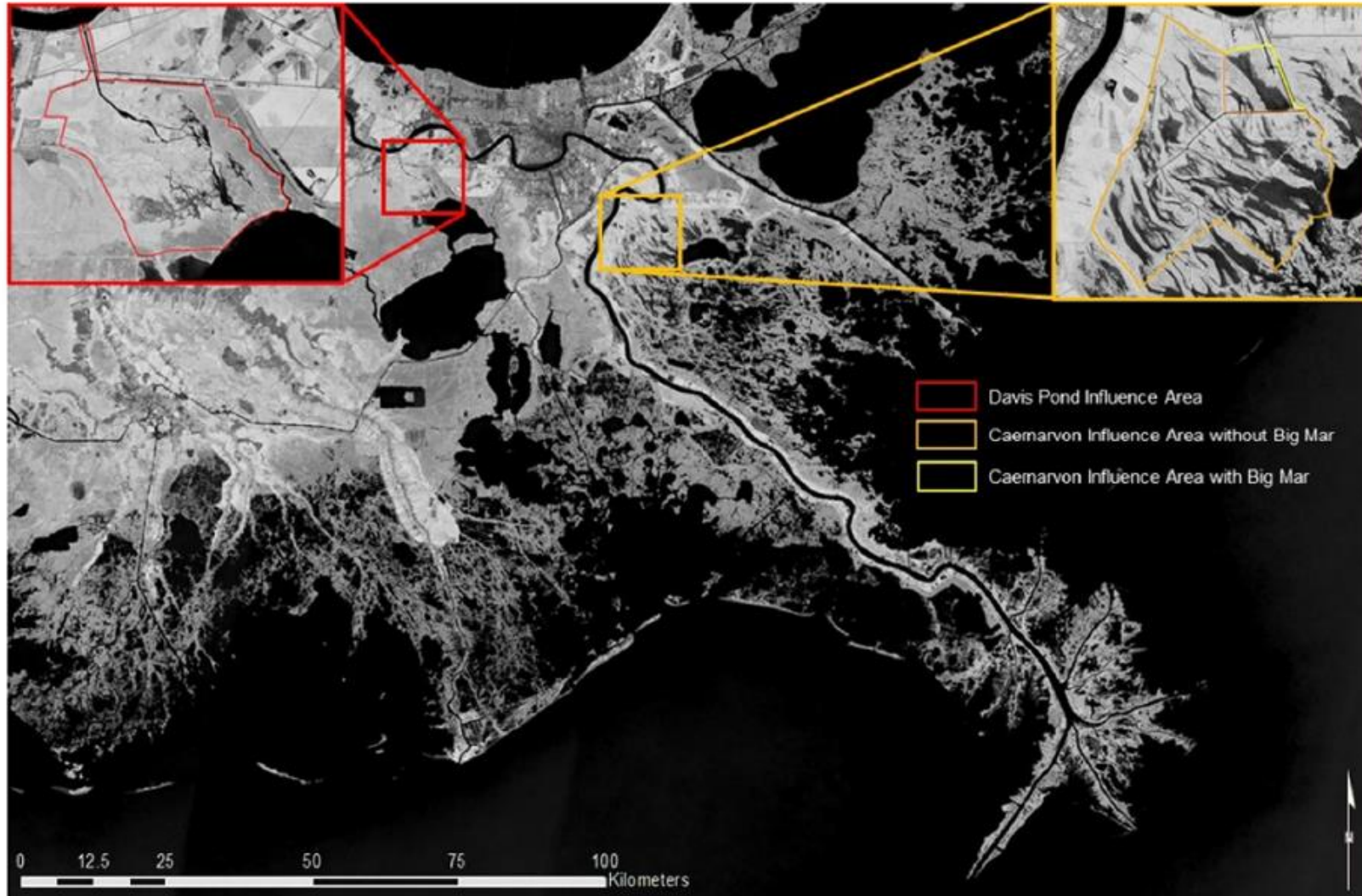
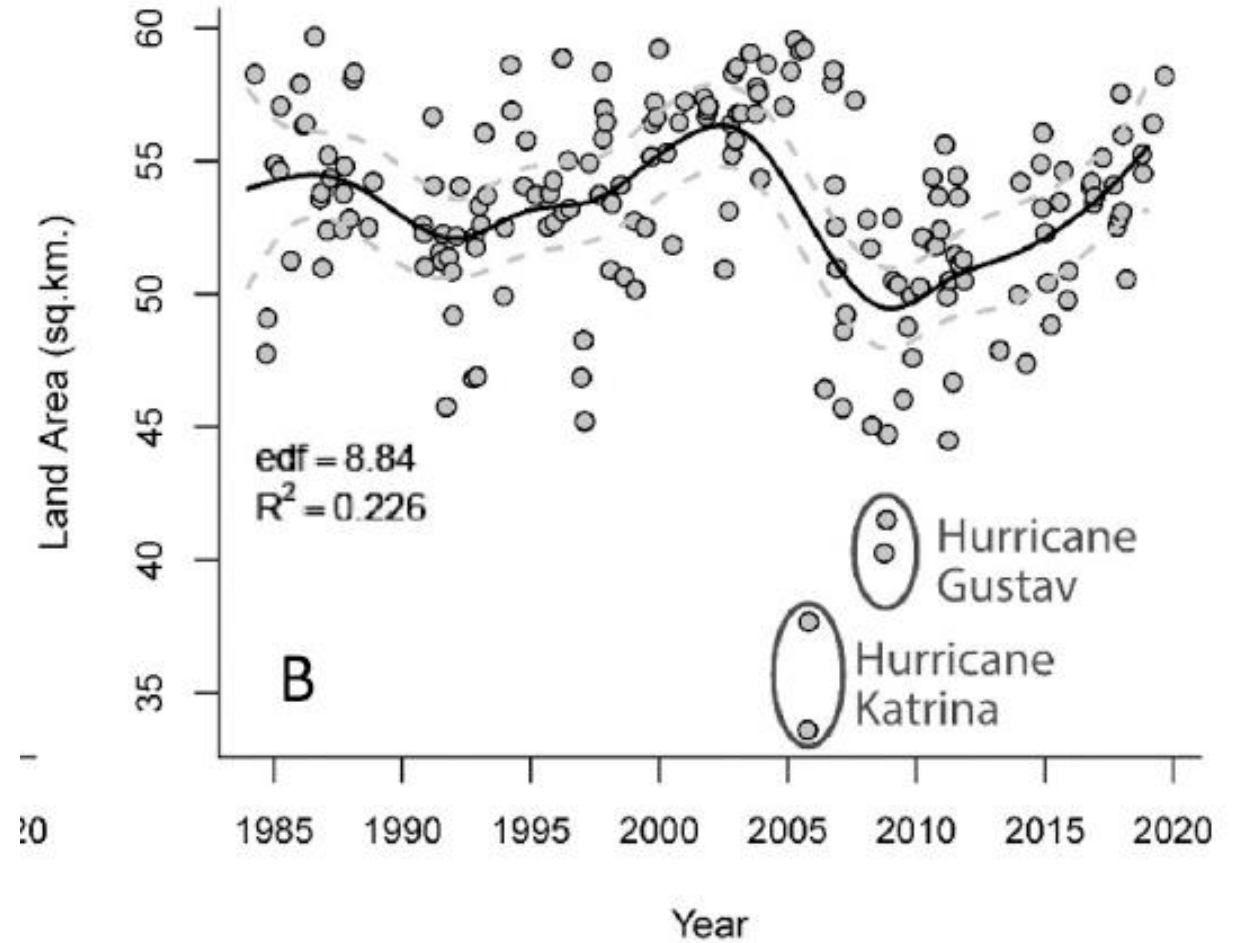


Fig. 1. Location of the Davis Pond diversion (red outline) and the Caernarvon diversion (yellow outline) in the Mississippi River delta. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

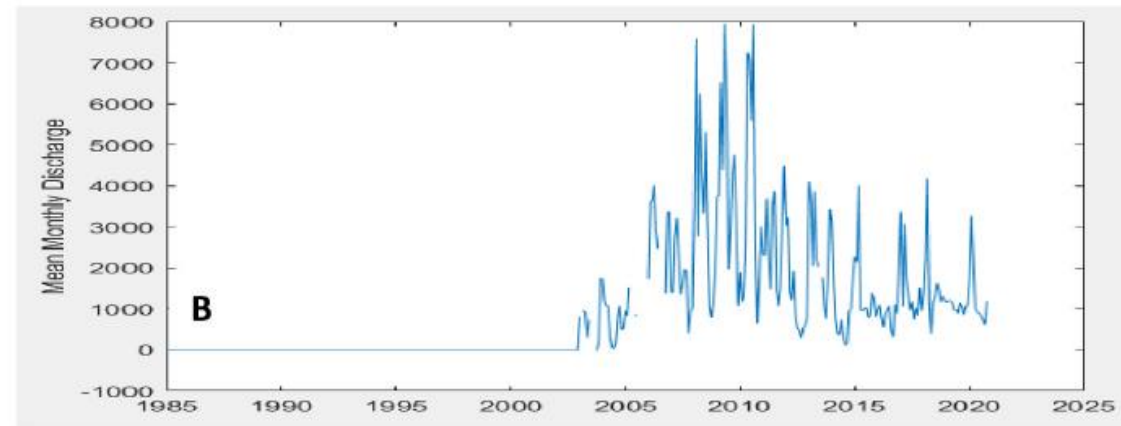
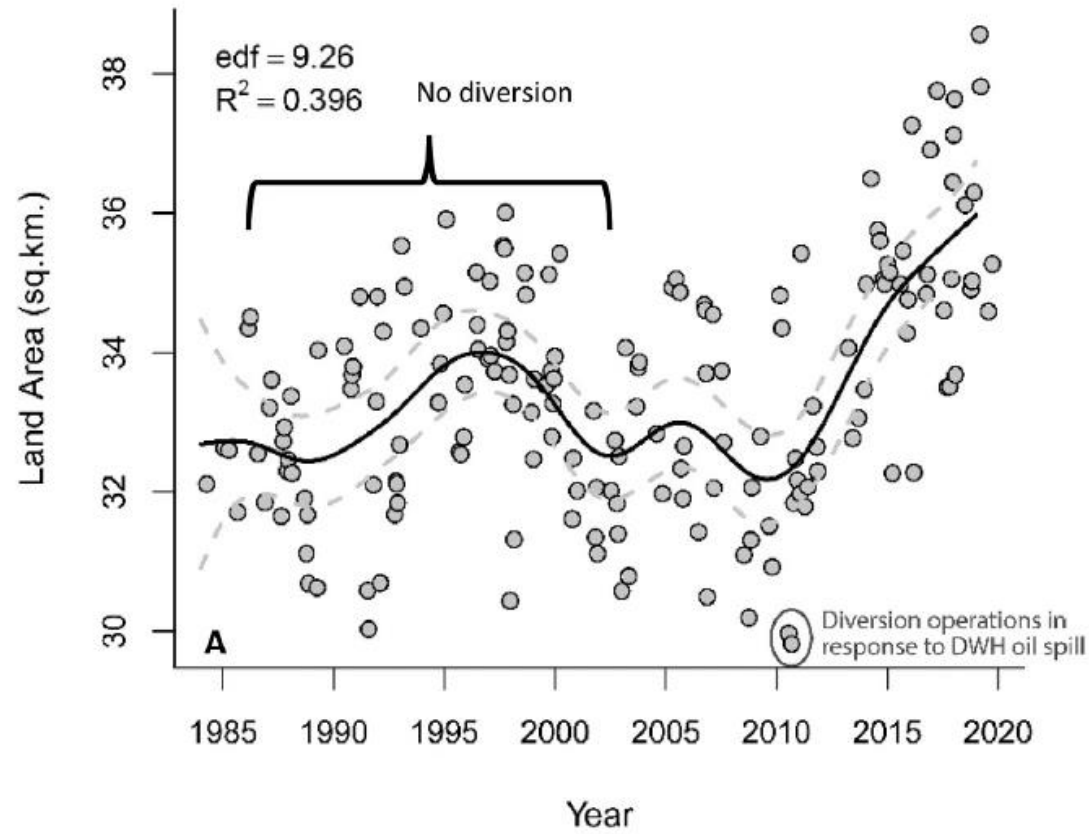
Land area (dots)
and change (trend line with confidence interval)
1992 - 2019 (includes Big Mar):
-111 to +1816 acres
**not statistically significant gain or loss

In a basin that continues to lose land overall, a
“break even” over 27 years is not bad,
especially given the significant hit from
Hurricanes Katrina and Gustav.



Davis Pond land area change
 2002 - 2019:
 494 to 998 acres
 (confidence interval)

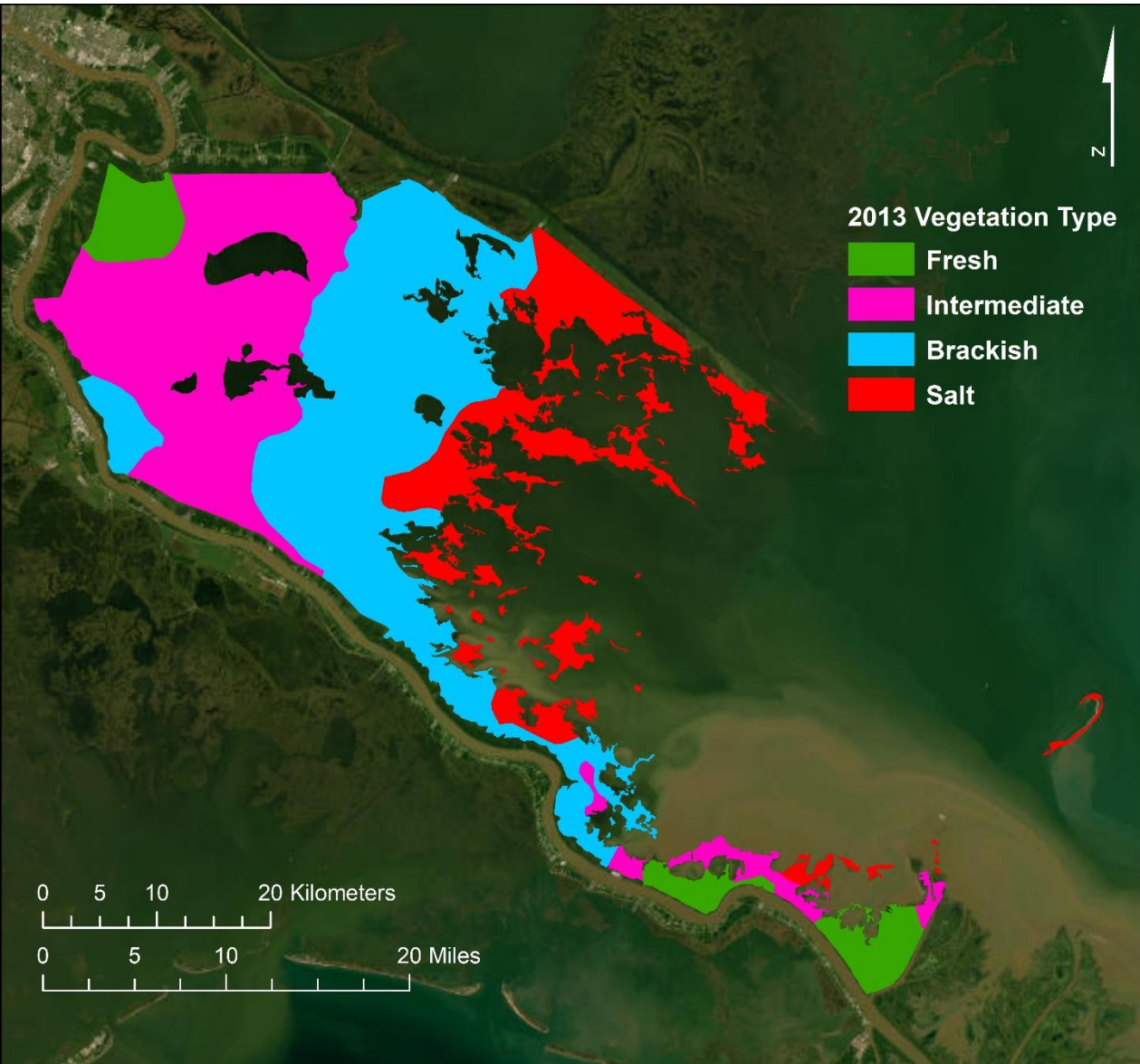
**statistically significant gain*



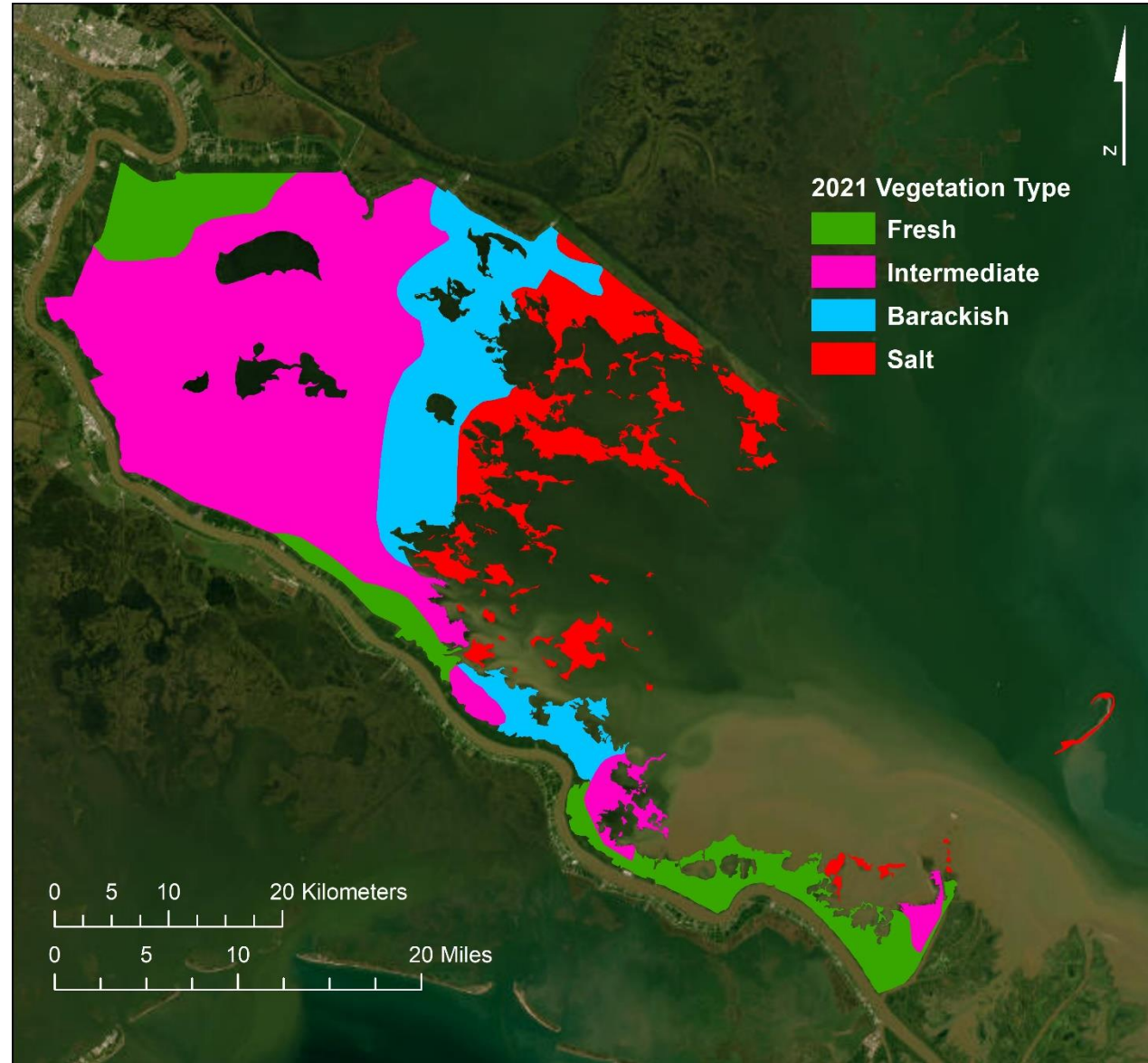
Diversions Operations – average
 monthly discharge

Fig. 4. A) Mean land area change in the influence area of Davis Pond Diversion with plotted uncertainty. The bracket indicates the land change prior to the operation of the diversion B) mean monthly discharge of the Mississippi River into the Davis Pond Diversion wetlands aligned with time axis for Fig. 4A.

2013 Vegetation Type



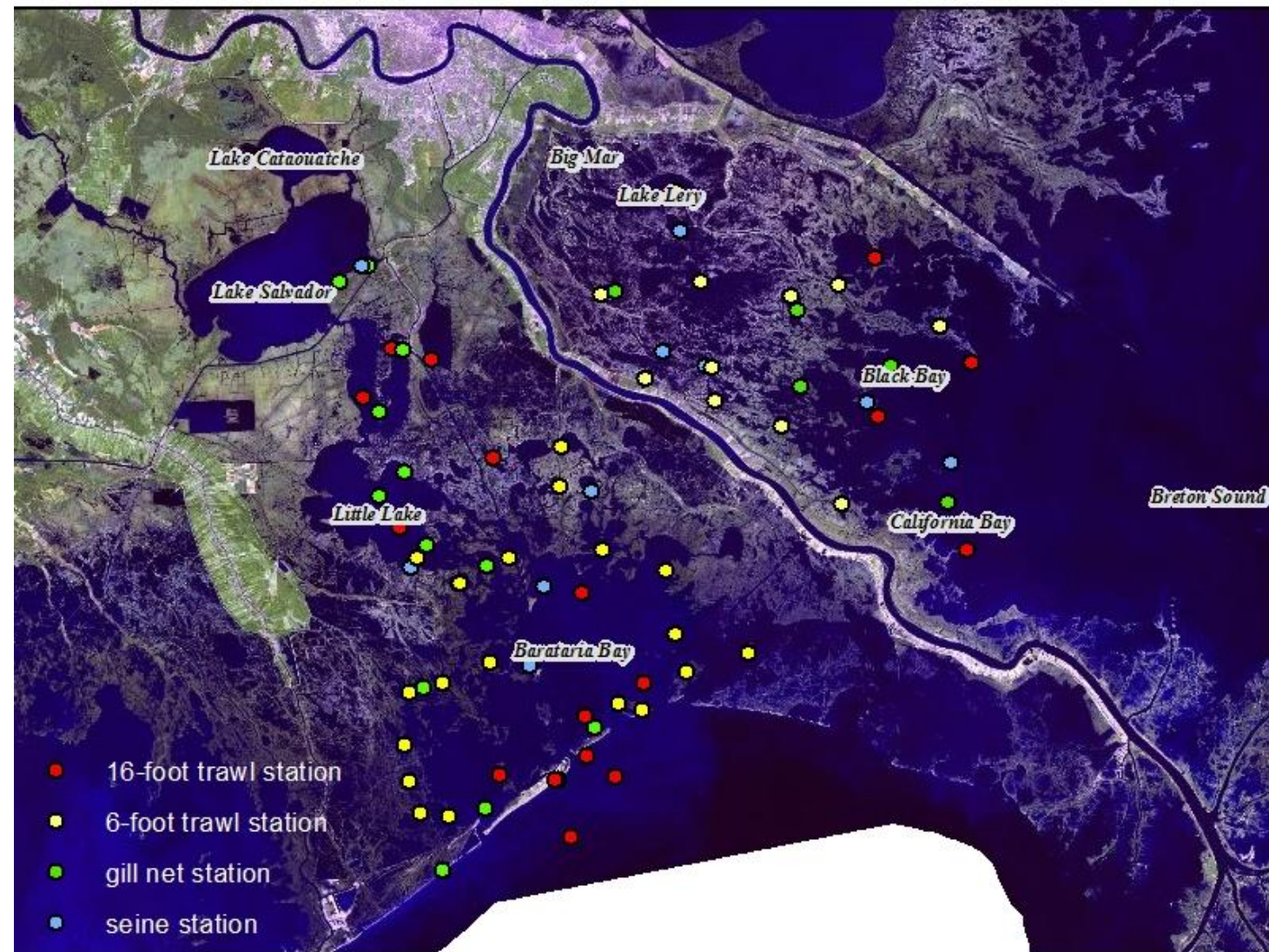
2021 Vegetation Type



Wildlife and Fish

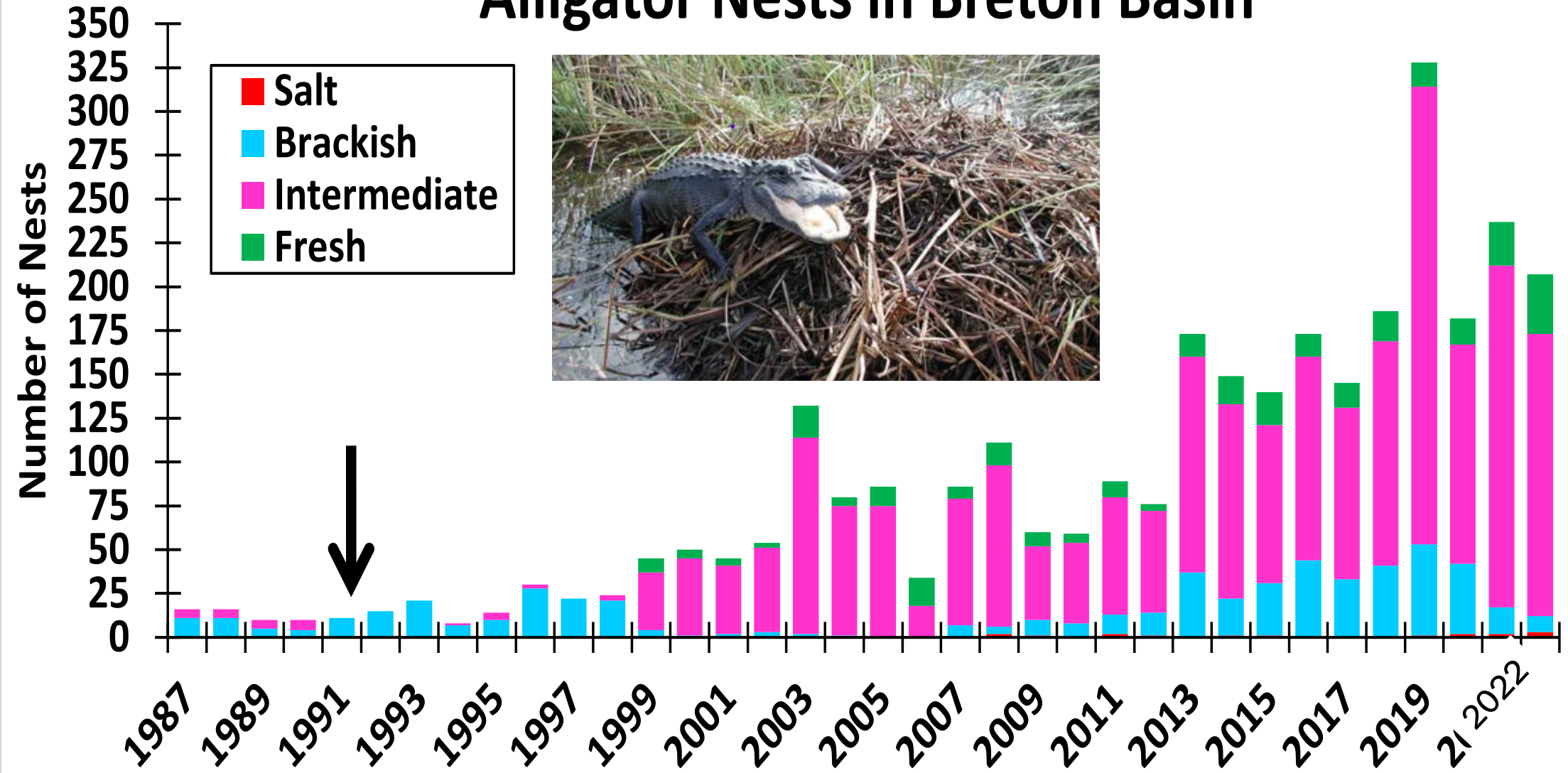


Wildlife and Fisheries-independent Monitoring

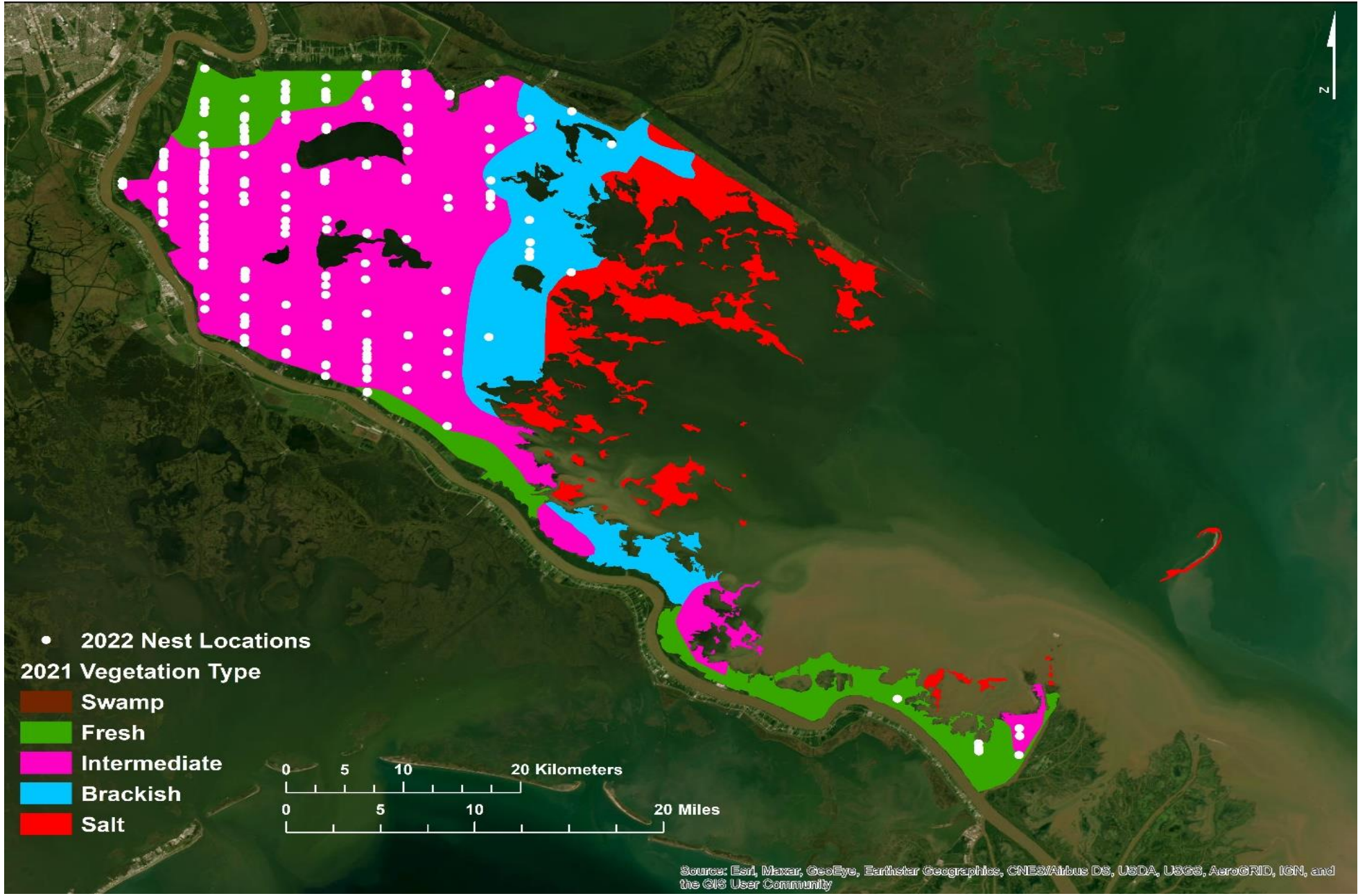


- Monitoring relative to diversions began:
 - 1988 in Breton Sound estuary
 - 1998 in Barataria estuary
- Marine Finfish and Shrimp sampling occurs along the salinity gradient using a variety of gear types
- Freshwater Finfish sampling in upper basins
- Oyster monitoring (locations not shown)
 - Black Bay/California Bay in Breton Sound
 - Upper Barataria Bay
- Aerial surveys for alligator nests and ducks

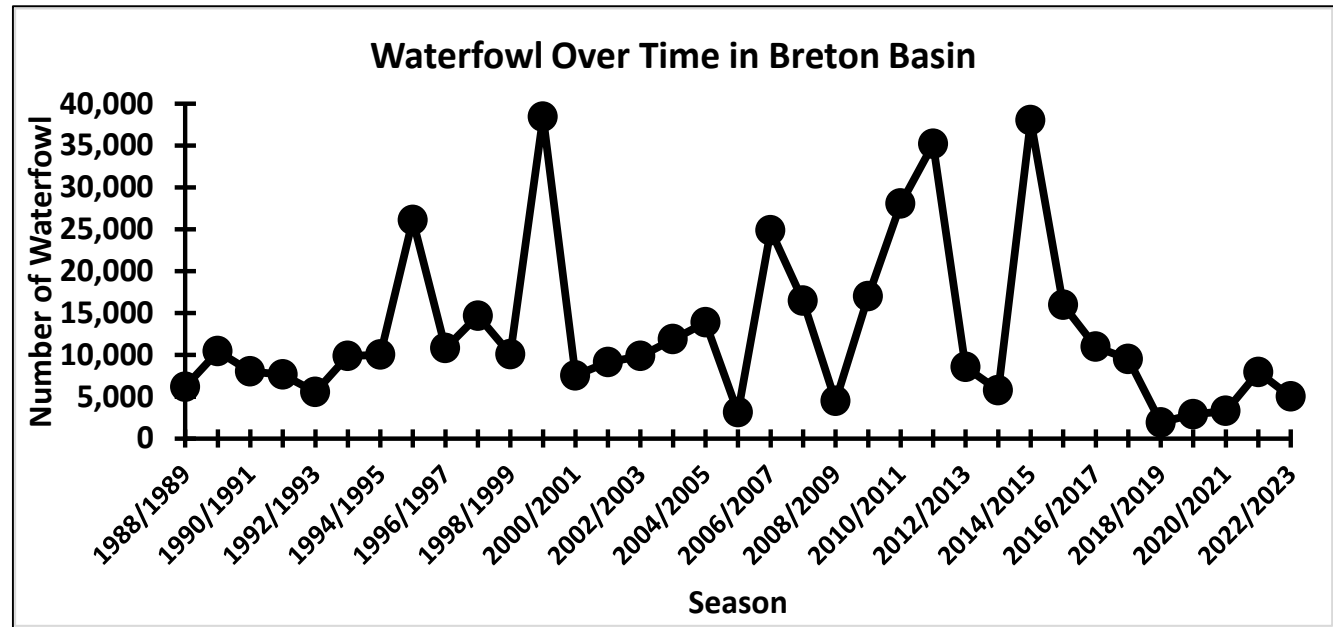
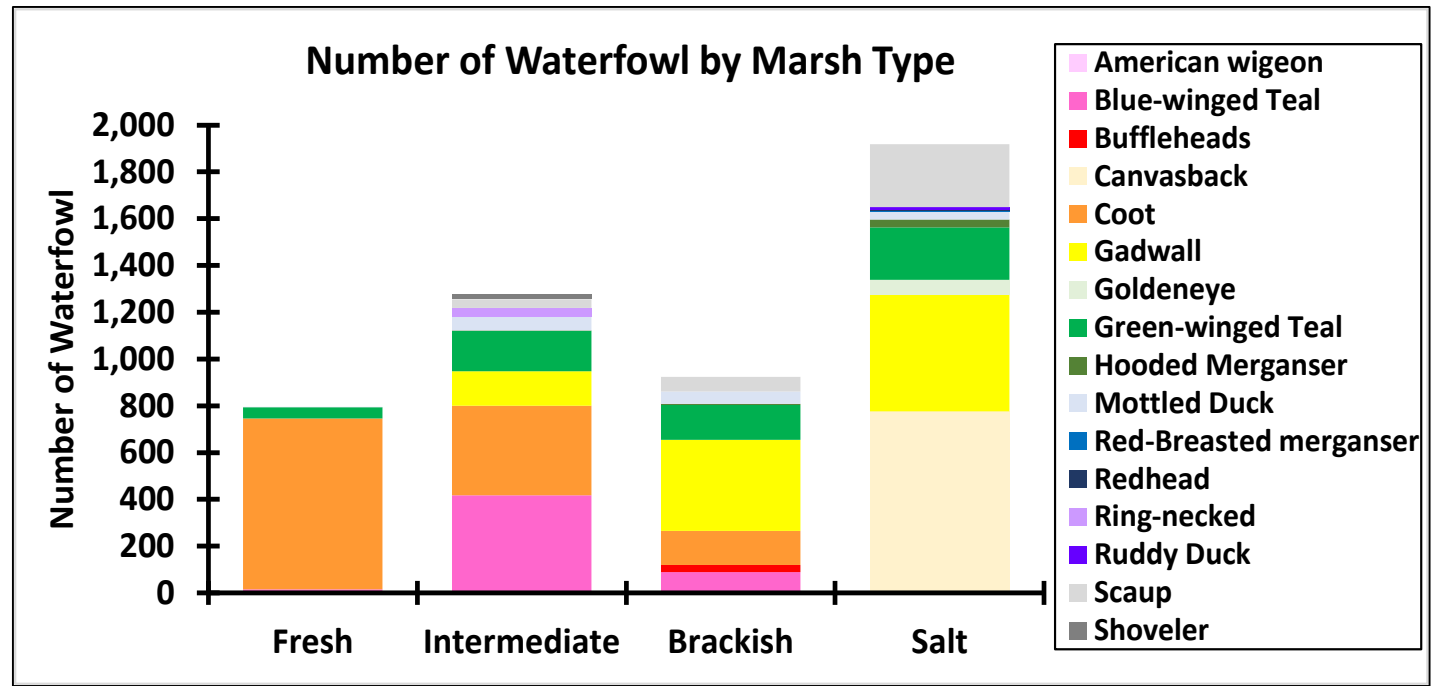
Alligator Nests in Breton Basin



Alligator nest locations 2022

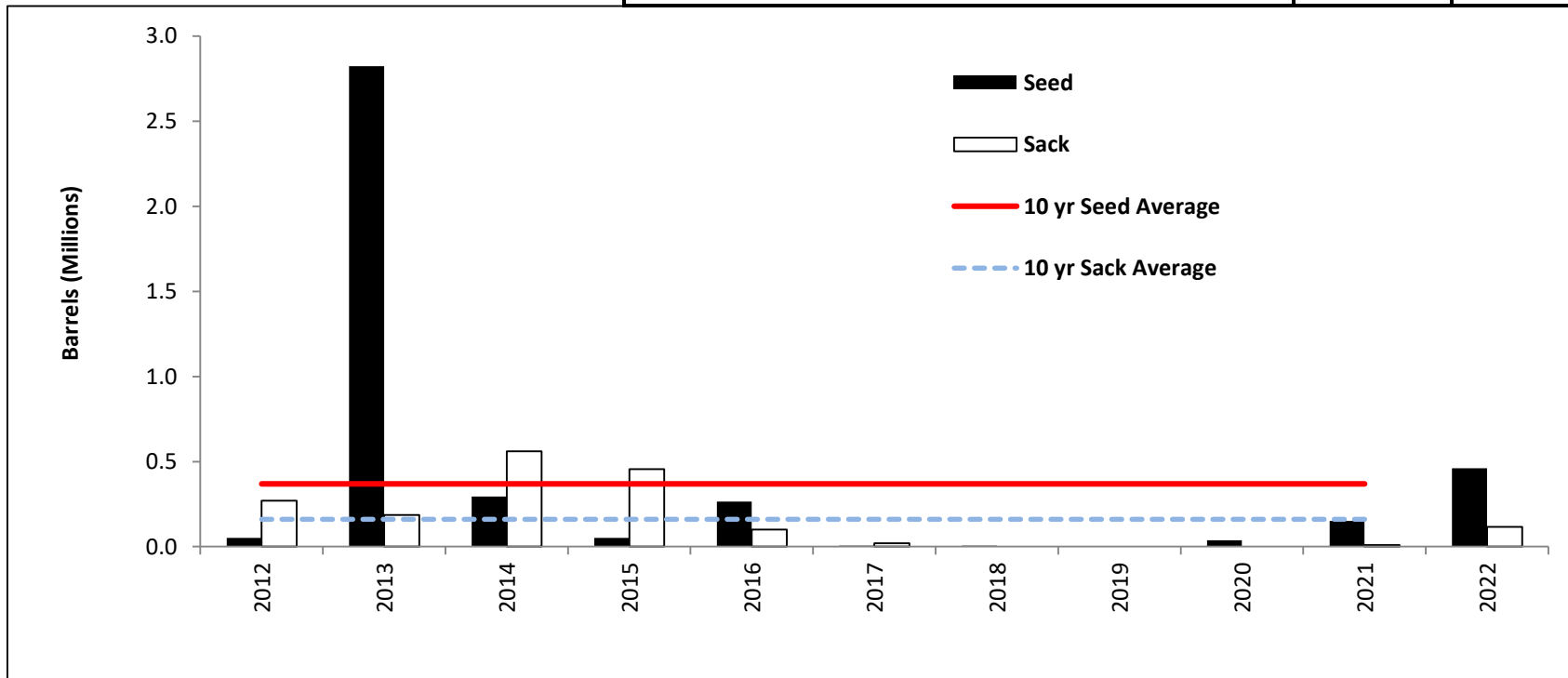


Waterfowl Winter 2022/2023

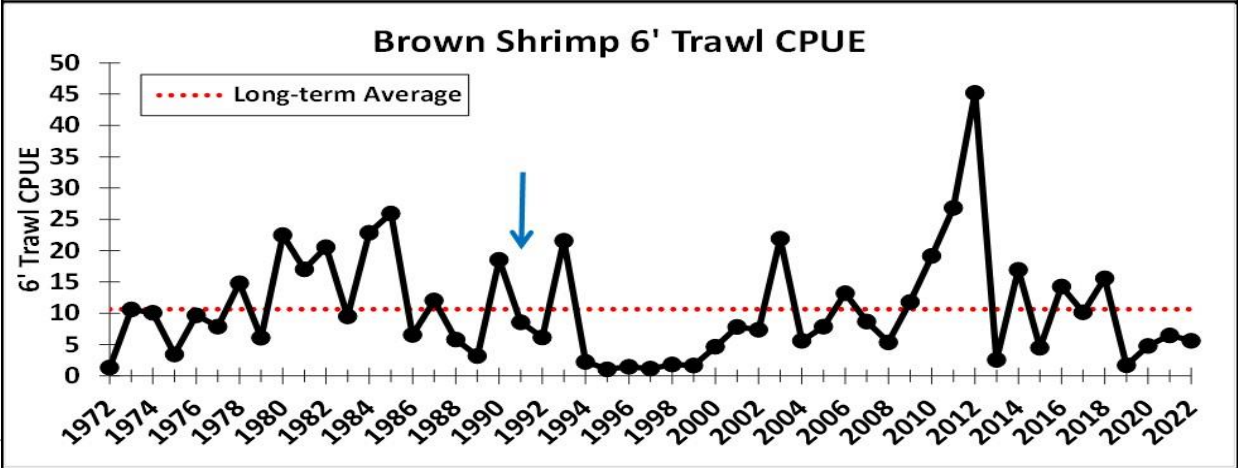
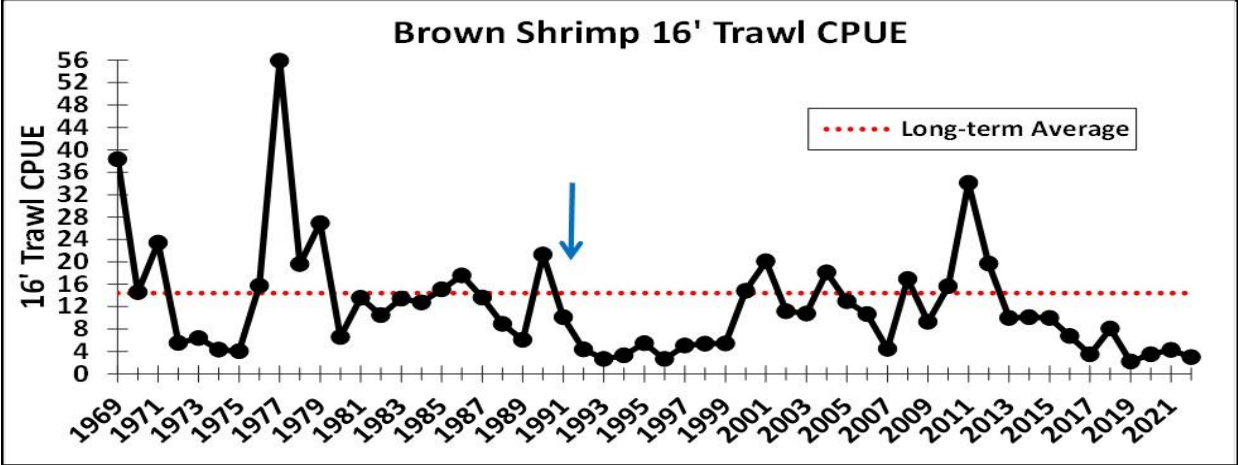
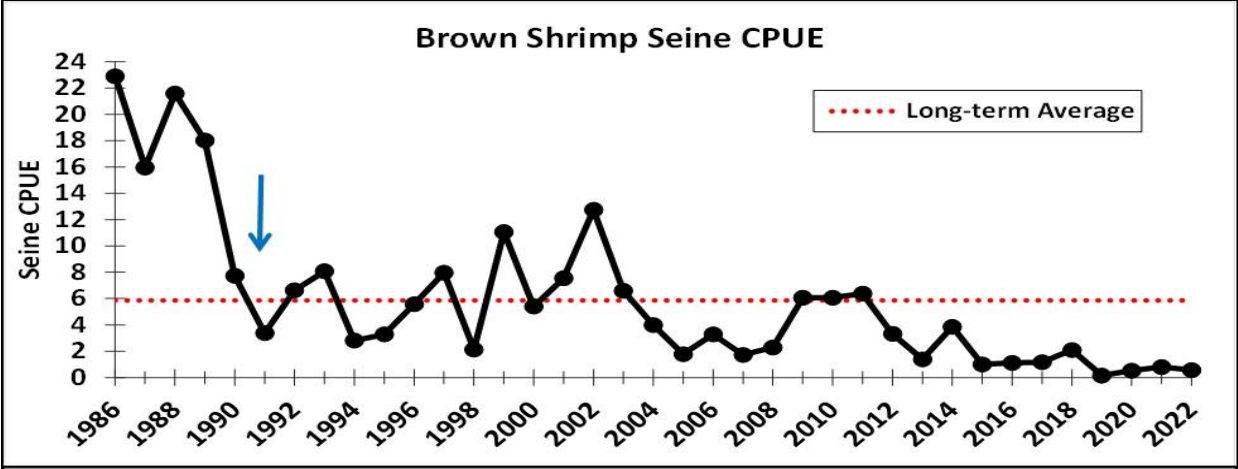


Oysters

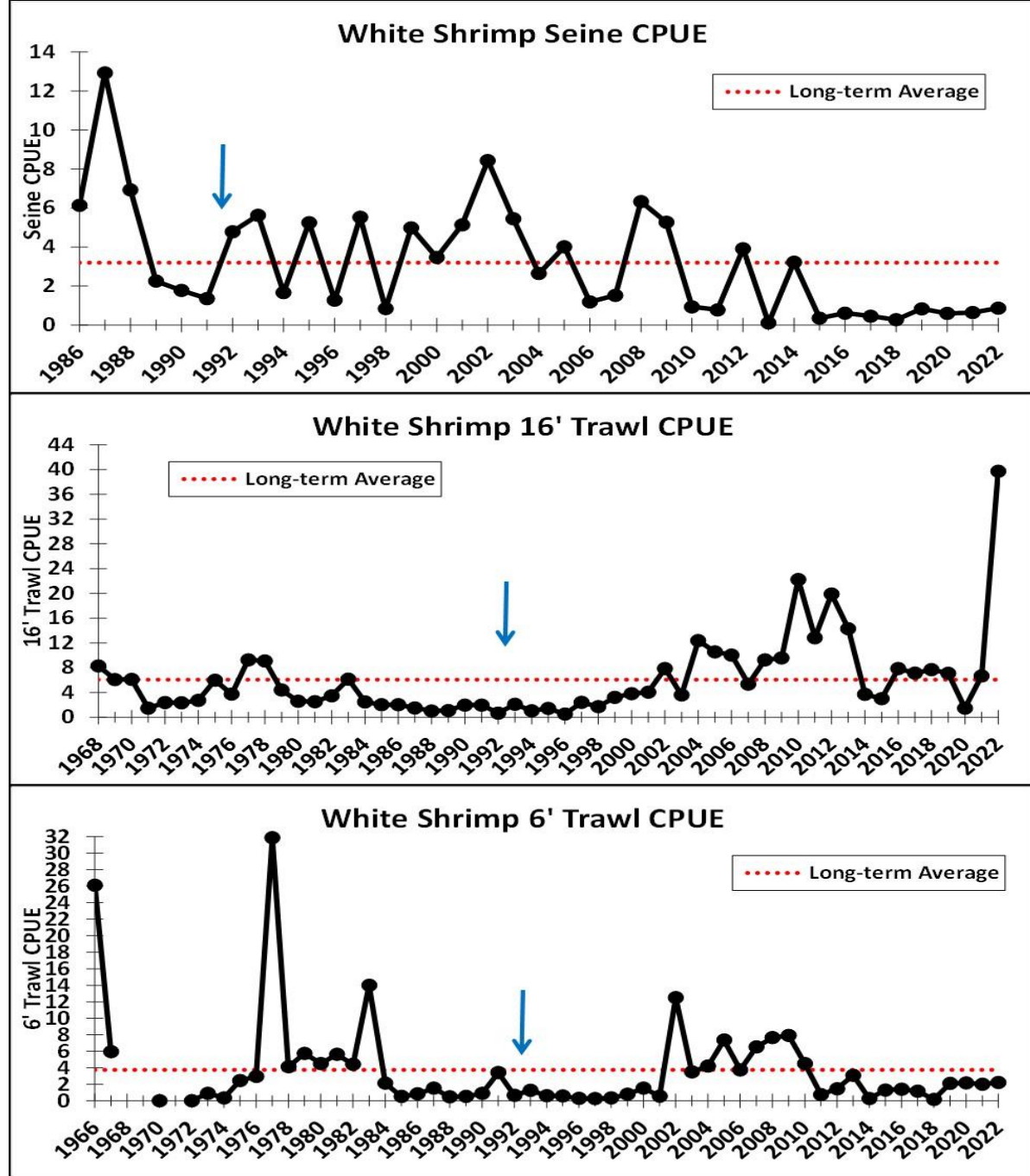
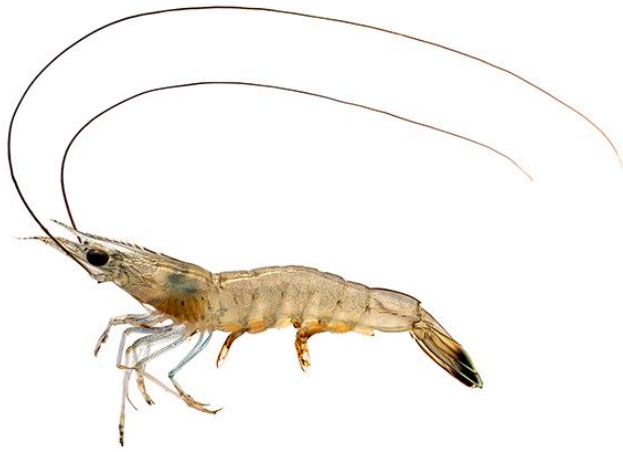
*CSA	Basin	Seed	Market-sized	Total Stock	Total % Change
1 – North	Lake Borgne/MS Sound	25,175	7,960	33,135	-40.4
1 – South	East of MS River, South of MRGO	46,144	11,648	57,792	+260
3	Hackberry Bay	14,558	2,698	17,256	+427
5 – East	Lake Chien/Felicity	0	0	0	n/a
5 – West	Sister Lake/Bay Junop	72,385	30,873	103,258	-29
7	Calcasieu - East Side	15,034	12,296	27,330	+35.5
7	Calcasieu - West Cove	29,716	203,894	233,610	+76.7
Statewide Totals		203,011	269,368	472,381	+27.6



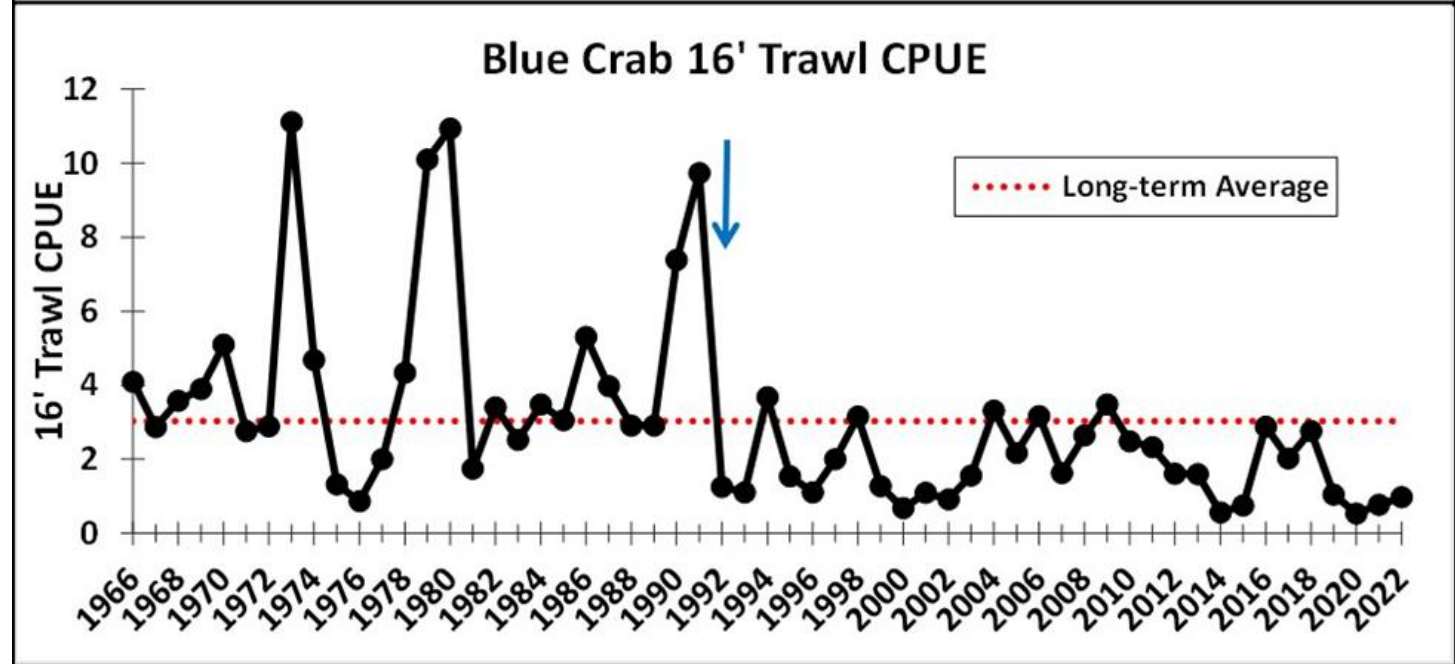
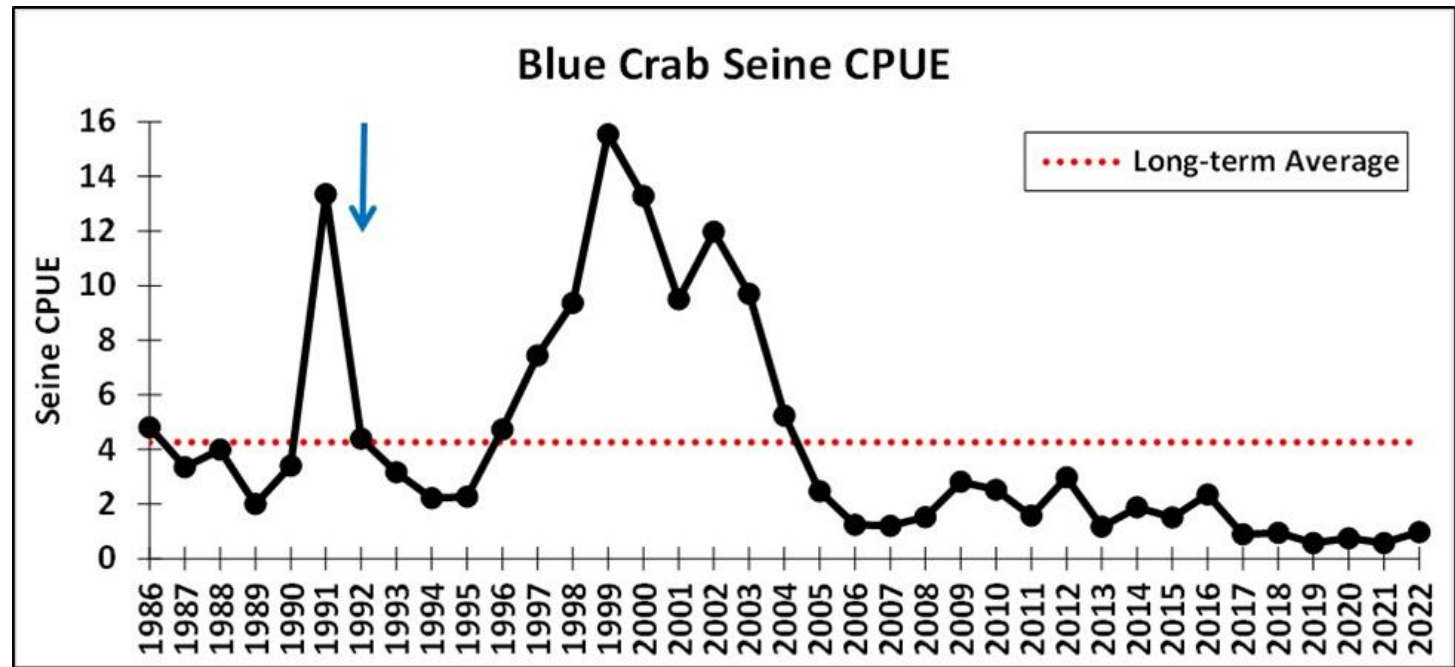
Brown Shrimp



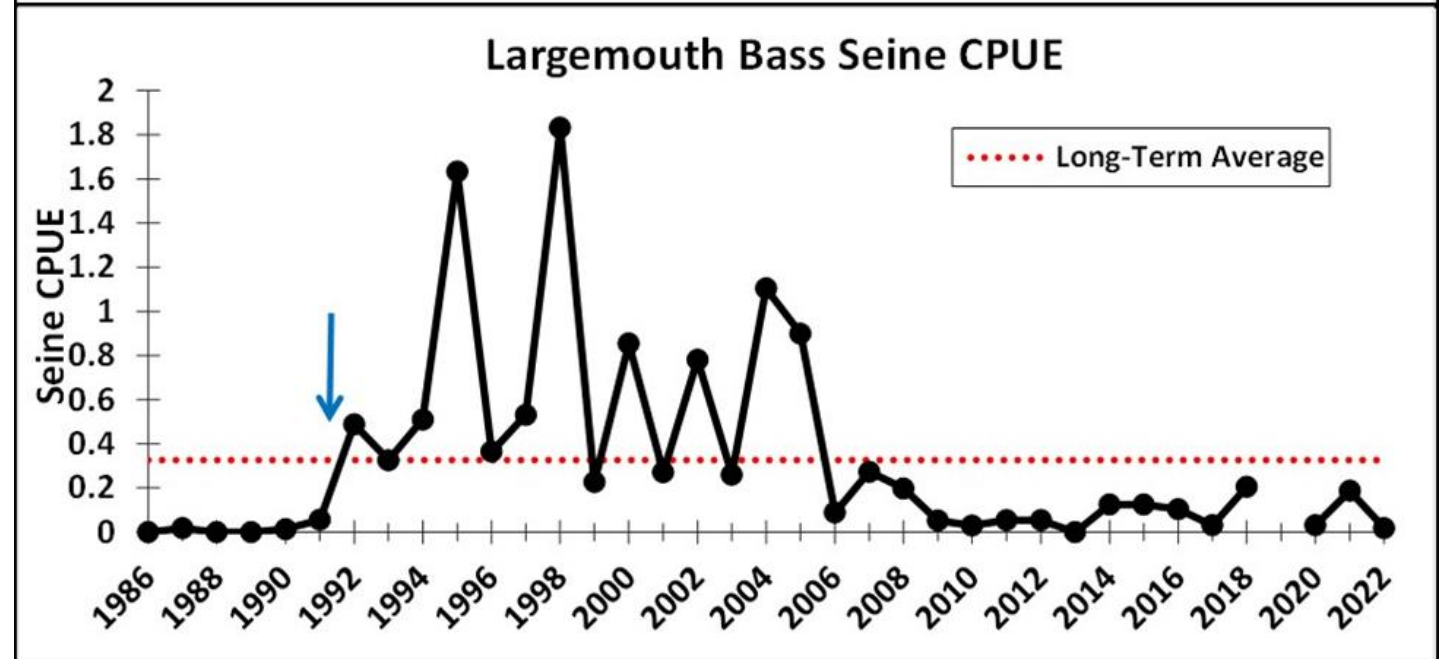
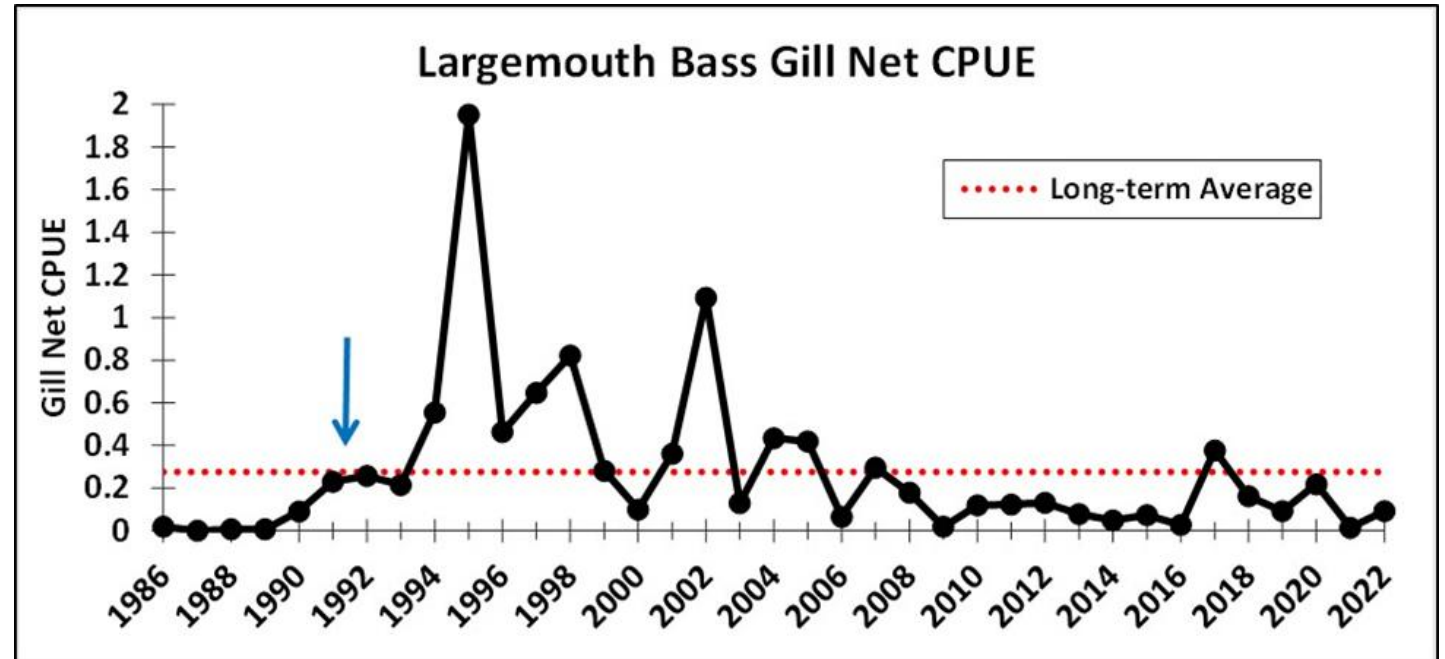
White Shrimp



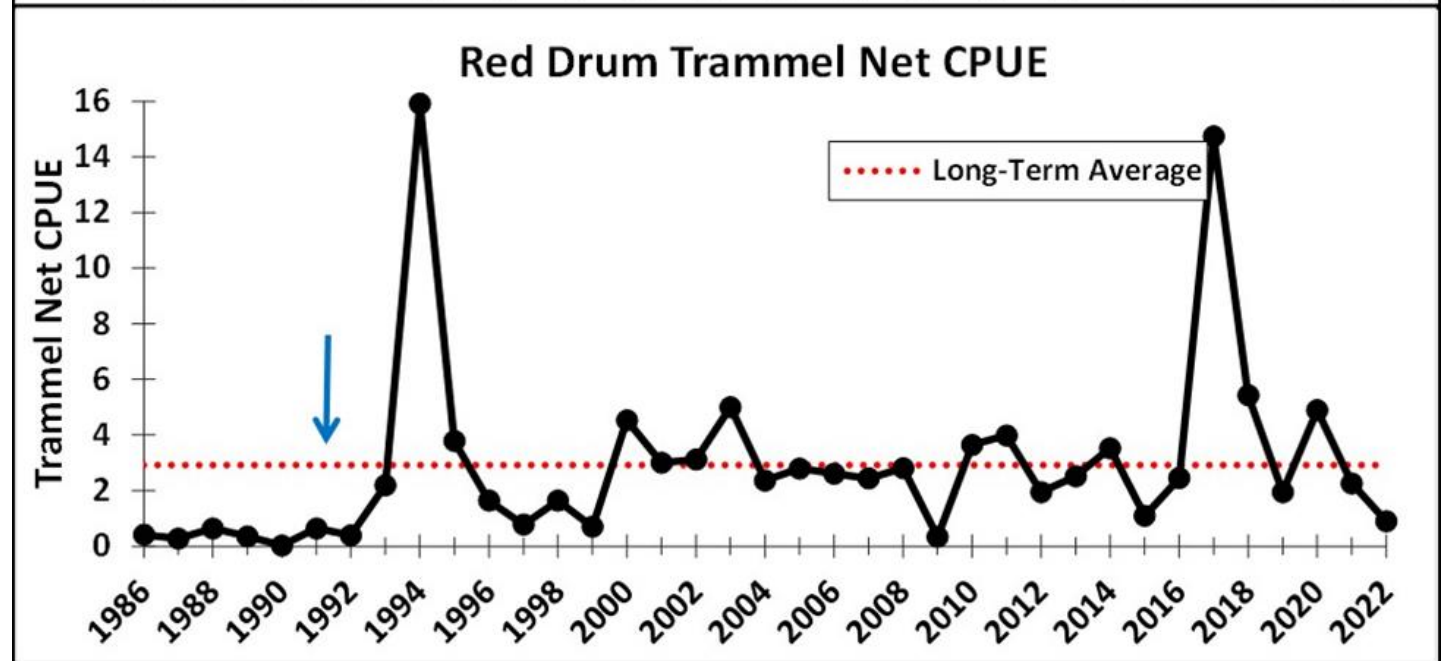
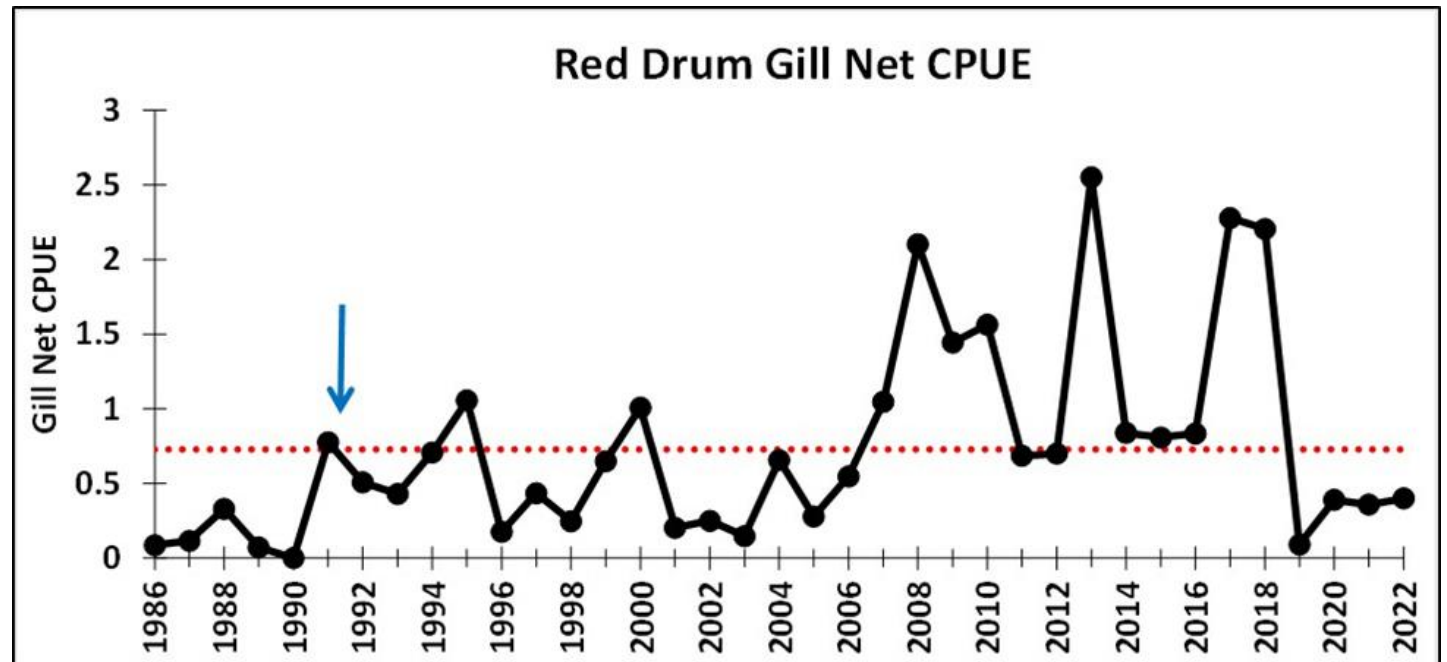
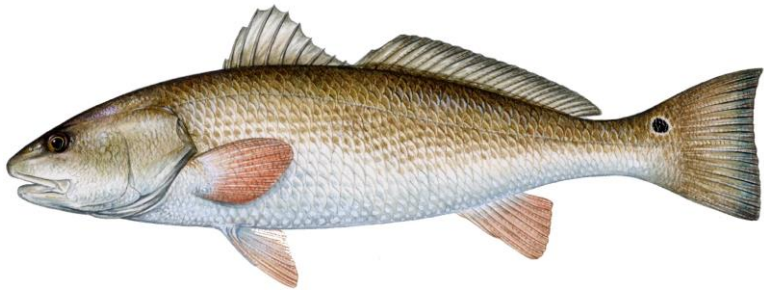
Blue Crab



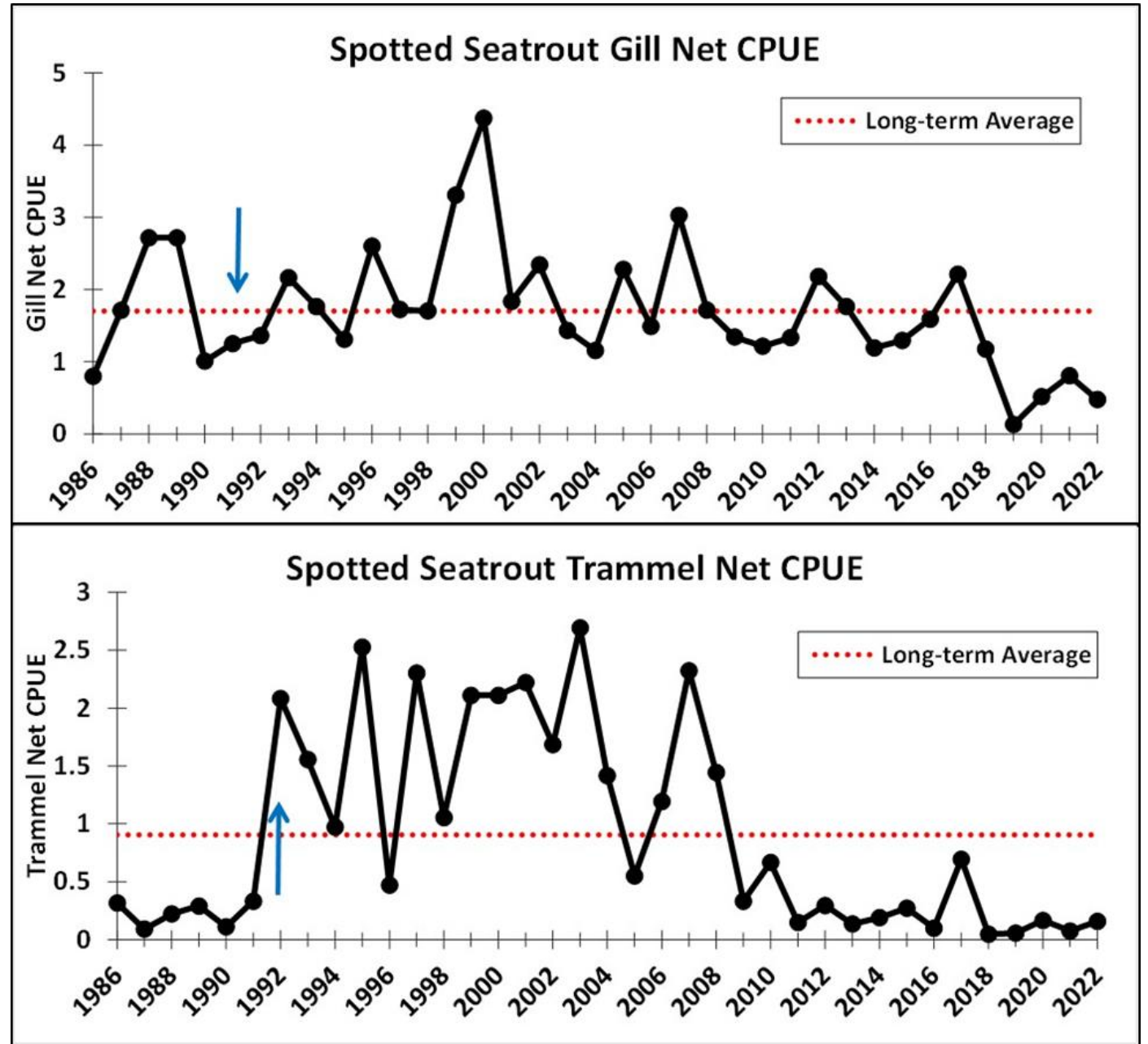
Largemouth Bass



Red Drum



Spotted Seatrout



NEW REGULATIONS



NOVEMBER

20



NEW Spotted Seatrout Regulations

A "slot" limit,
13-20 inches for
"keeper" trout

An allowance of two fish
over 20 inches total length
within the daily limit

A 15-fish
daily limit per
fisherman

Charter guides and/or deckhands may not
keep a bag limit of spotted seatrout while
conducting a for-hire trip, but may engage in
fishing activity to assist passengers

For more information visit wlf.louisiana.gov

2022 Summary

- Mississippi River: typical flow year with a late winter rise, lasting through the spring, and dropping quickly in July. Max stage = 14 feet.
- Rainfall totaled 57.6 inches, 9% below the annual average
- Caernarvon was operated twice above base flow: one week in January and most of February

- Overall, salinity in the basin was lower than the project targets (i.e., fresher)
- Given the magnitude and duration of depressed salinities, it appears the river was the major driver.
- 2022 two week moving average was within the ten year moving average

Relating long term trends in the data to project goals

1. Enhance emergent vegetation and
2. Reduce marsh loss
 - obvious land building in Big Mar
 - 2023 research study concluded no significant change over long term (1991-2019)
 - Lots of loss from hurricanes but obvious recovery
3. Wildlife
 - continued trend of increasing alligator nesting
 - waterfowl counts were within the long term variation but since 2018/19 at the bottom of range
4. Fisheries
 - Clearly Oysters at historical lows. For 2022 oysters seed was slightly above the 10 yr avg and sack sized oysters below.
 - Clearly Spotted sea trout has trended lower
 - Brown & white shrimp, crabs, redfish and largemouth bass: no discernable positive or negative impacts from the diversion; lots of inter-annual variation.

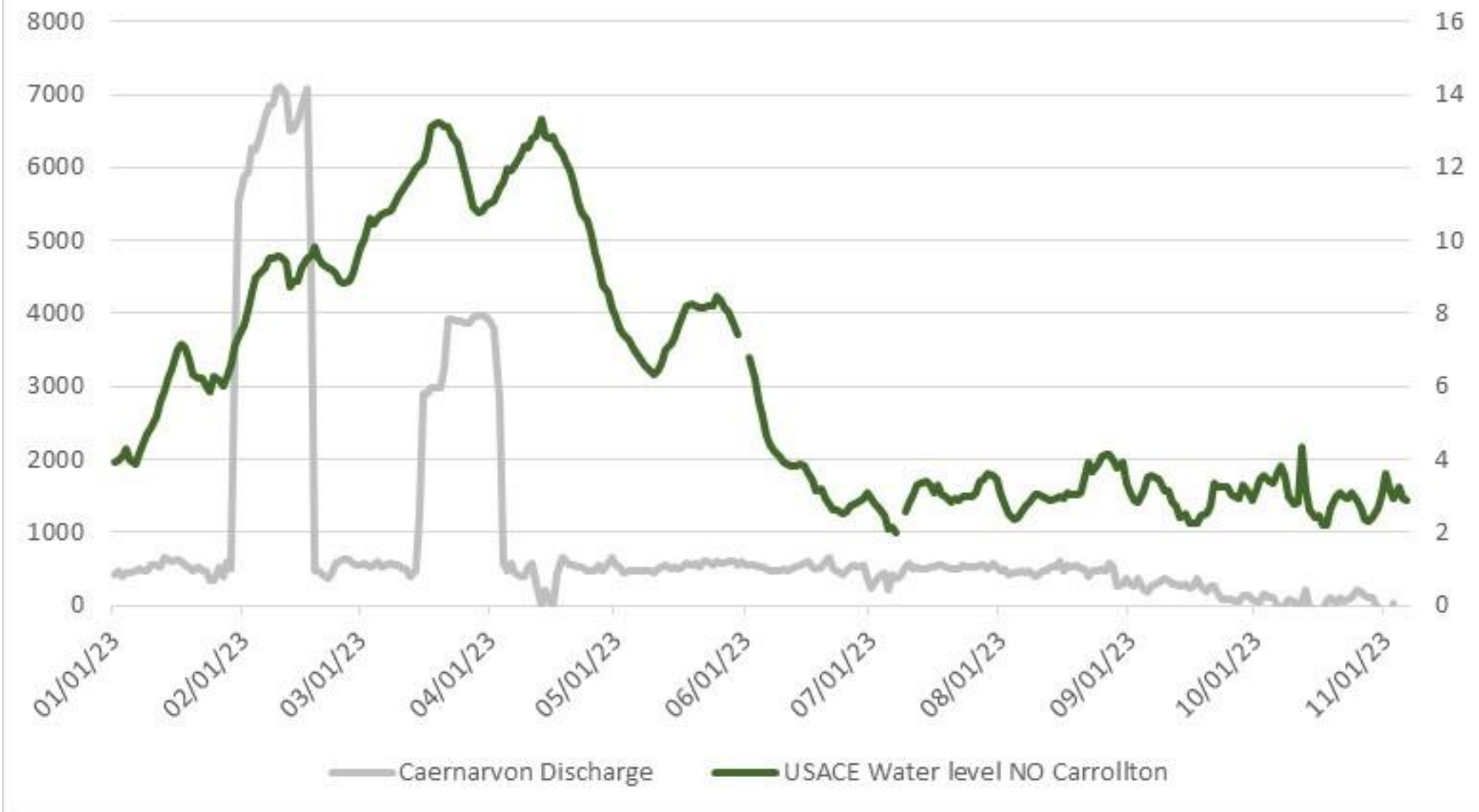
The hard part is attributing the observed changes to the diversion when the river dominates the basin.

2023 Snapshot

Drought Year (88% of state experienced extreme or exceptional drought)

- **Very low river stage in second half of the year**
- **With low head differential not able to operate much above minimum or even reach the minimum with gates wide open (more so at Caernarvon)**
- **Potential for backflow (from marsh into river) during high coastal tides at Caernarvon**
- **The saltwater wedge in the river affected drinking water intakes in lower Plaquemines Parish and threatened St. Bernard, Orleans and Jefferson.**
- **The diversions were shut down in September to “keep every drop of freshwater in the river”**

Caernarvon Discharge and River Stage



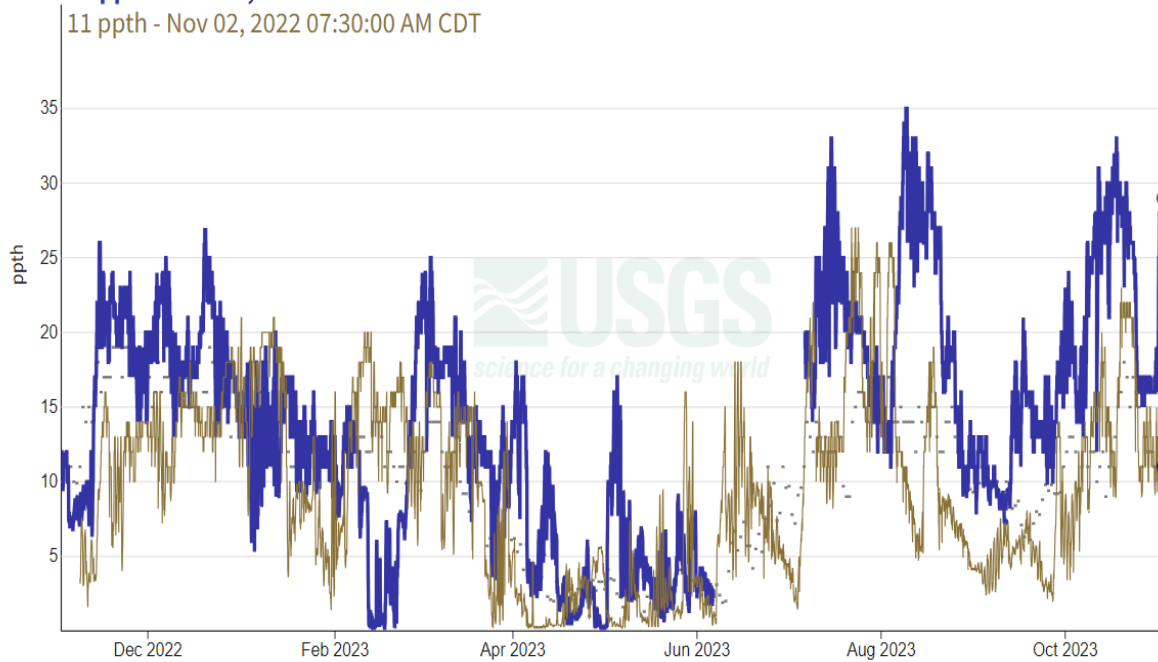
Black Bay nr Stone Island nr Pointe-A-La-Hache, LA - 073745275

November 2, 2022 - November 2, 2023

Salinity, water, unfiltered, parts per thousand

29 ppt - Nov 02, 2023 07:00:00 AM CDT

11 ppt - Nov 02, 2022 07:30:00 AM CDT



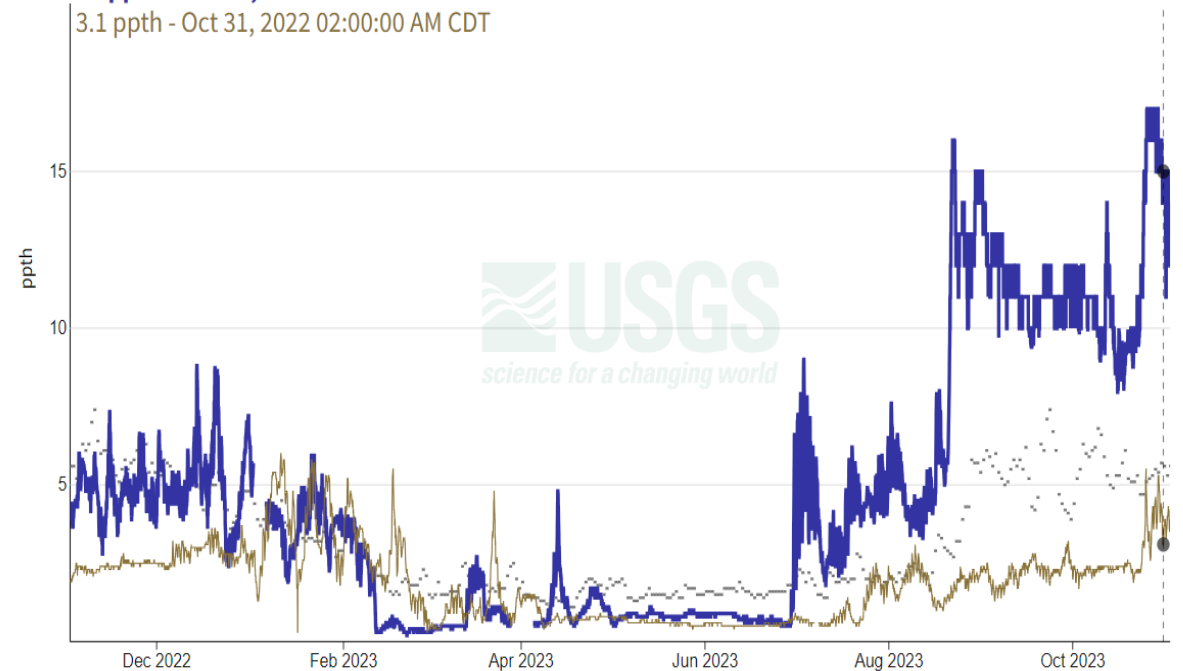
Crooked B. NW of L. Cuatro Caballo Near Delacroix - 073745257

November 2, 2022 - November 2, 2023

Salinity, water, unfiltered, parts per thousand

15 ppt - Oct 31, 2023 02:00:00 AM CDT

3.1 ppt - Oct 31, 2022 02:00:00 AM CDT



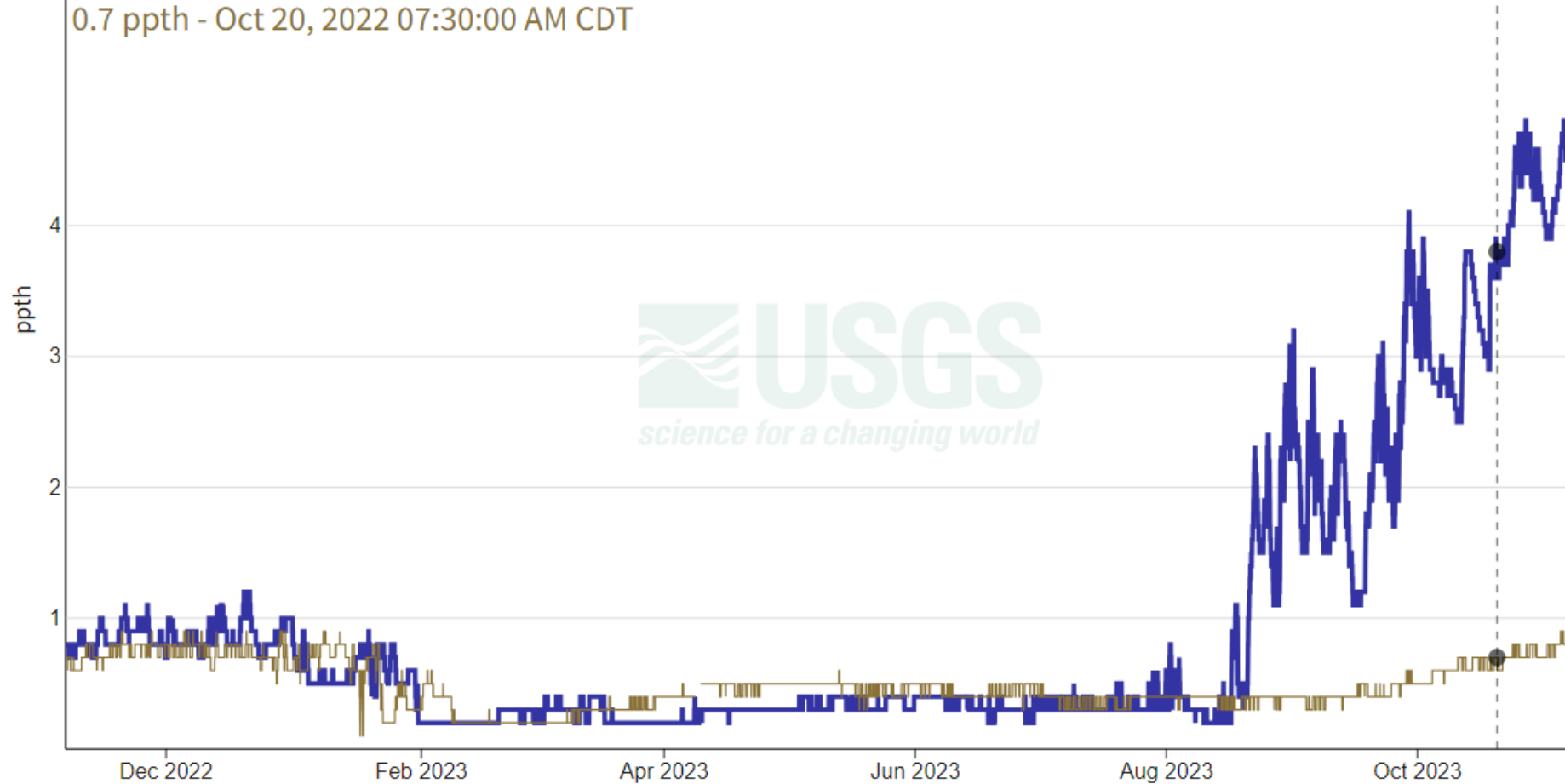
Reggio Canal Near Wills Point, LA - 073745253

November 6, 2022 - November 6, 2023

Salinity, water, unfiltered, parts per thousand

3.8 ppth - Oct 20, 2023 07:30:00 AM CDT

0.7 ppth - Oct 20, 2022 07:30:00 AM CDT



IMPORTANT Data may be [provisional](#)

2024 Operations Plan (proposed by TWG)

CAERNARVON OPERATIONAL PLAN 2024

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. December- May operations will be primarily based on data from the Black Bay nr Stone Island gauge specified by the map (Figure 1) and graph below (Figure 2). From June through November, Caernarvon 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 Crooked Bayou gauge. 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 1SD or 5ppt) the diversion operations will be maintained at a minimum flow of 500cfs until the moving average re-enters the operational range.* Operational settings are not to exceed 7,500 cfs.

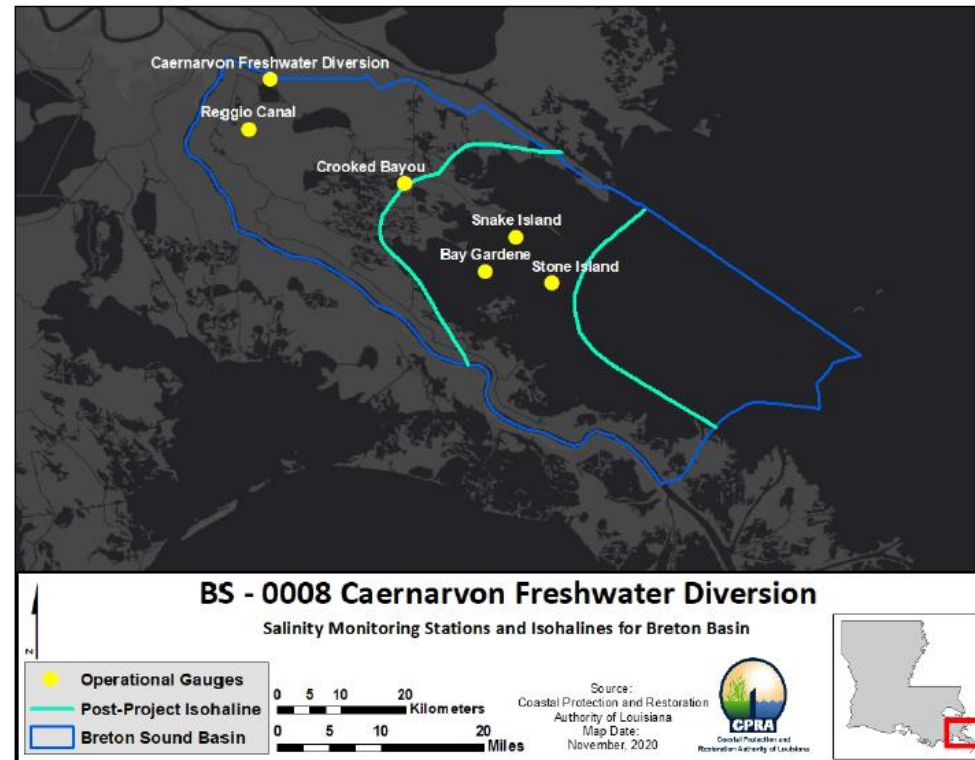


Figure 1. Map of salinity gauges and isohaline lines in Breton Sound basin to be used for guidance and operation of the Caernarvon Freshwater Diversion.

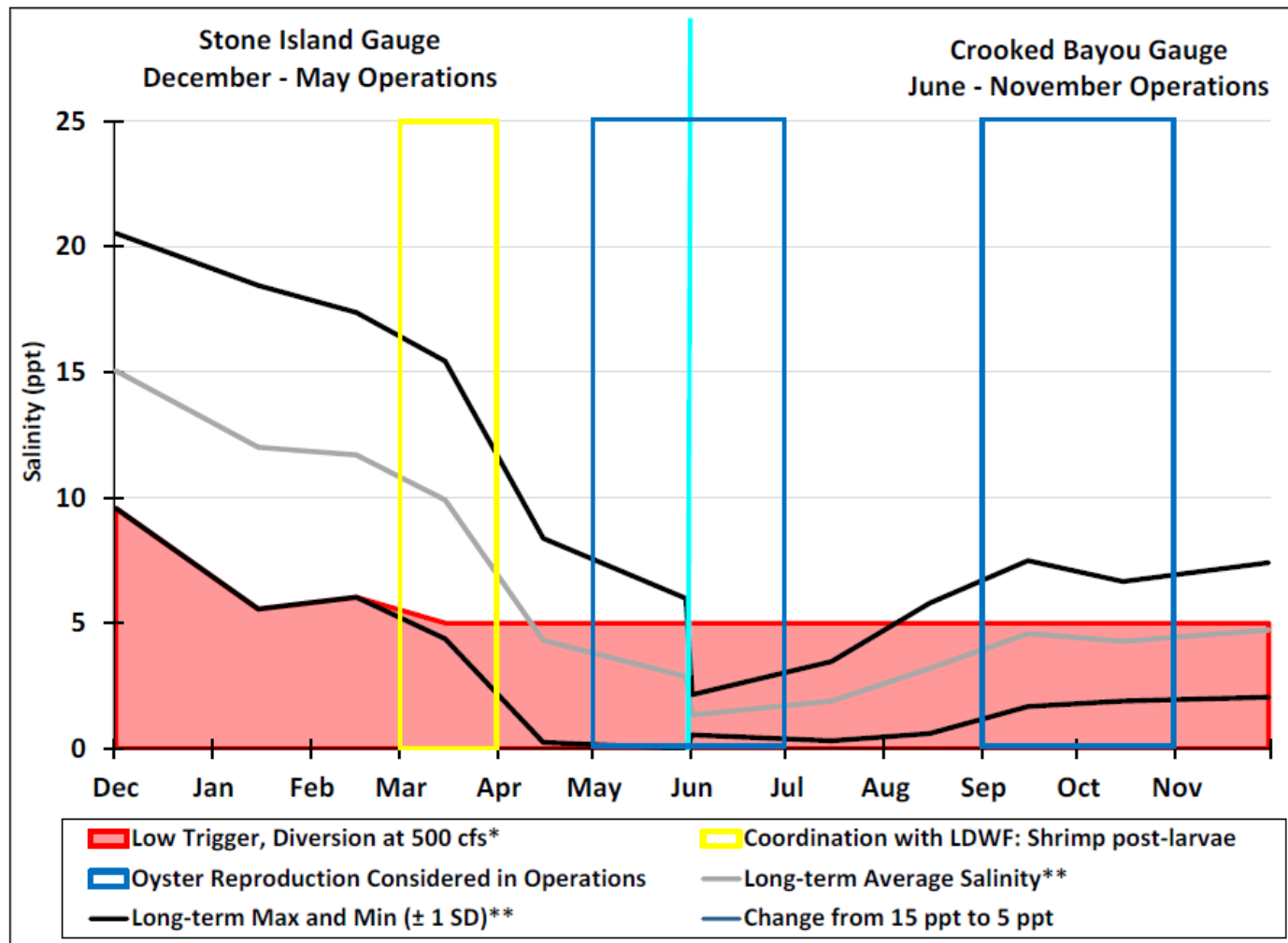


Figure 4. Long-term average (+1 standard deviation) salinities from the Black Bay nr Stone Island Gauge (USGS site 073745275) from December through May, and the Crooked Bayou Gauge (USGS site 073745257) from June through November. The Caernarvon Freshwater Diversion structure may be operated when the 14-day moving average salinity is within or above the data range. Operations will be decreased to the 500 cfs minimum if the moving average drops below the low trigger*. Species specific considerations are shown in yellow and blue. ** Long-term salinity average and standard deviation at Stone Island Gauges include six years of data (all that is available), at the Crooked Bayou gauge it includes the previous 10 years of data.