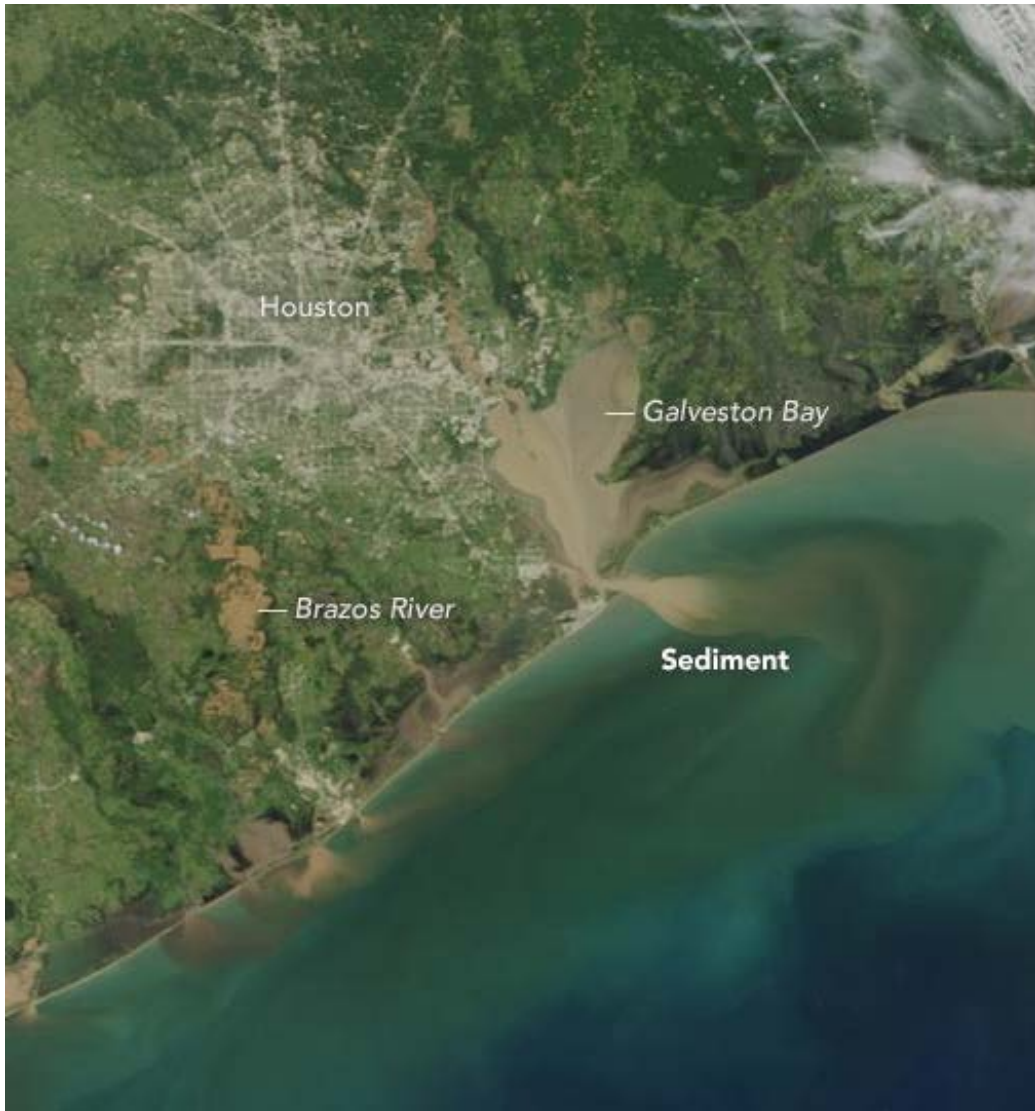


Hurricane Harvey's Impact on Galveston Bay

Sarah Gossett
Water Quality Manager



GALVESTON BAY
FOUNDATION



Mission:

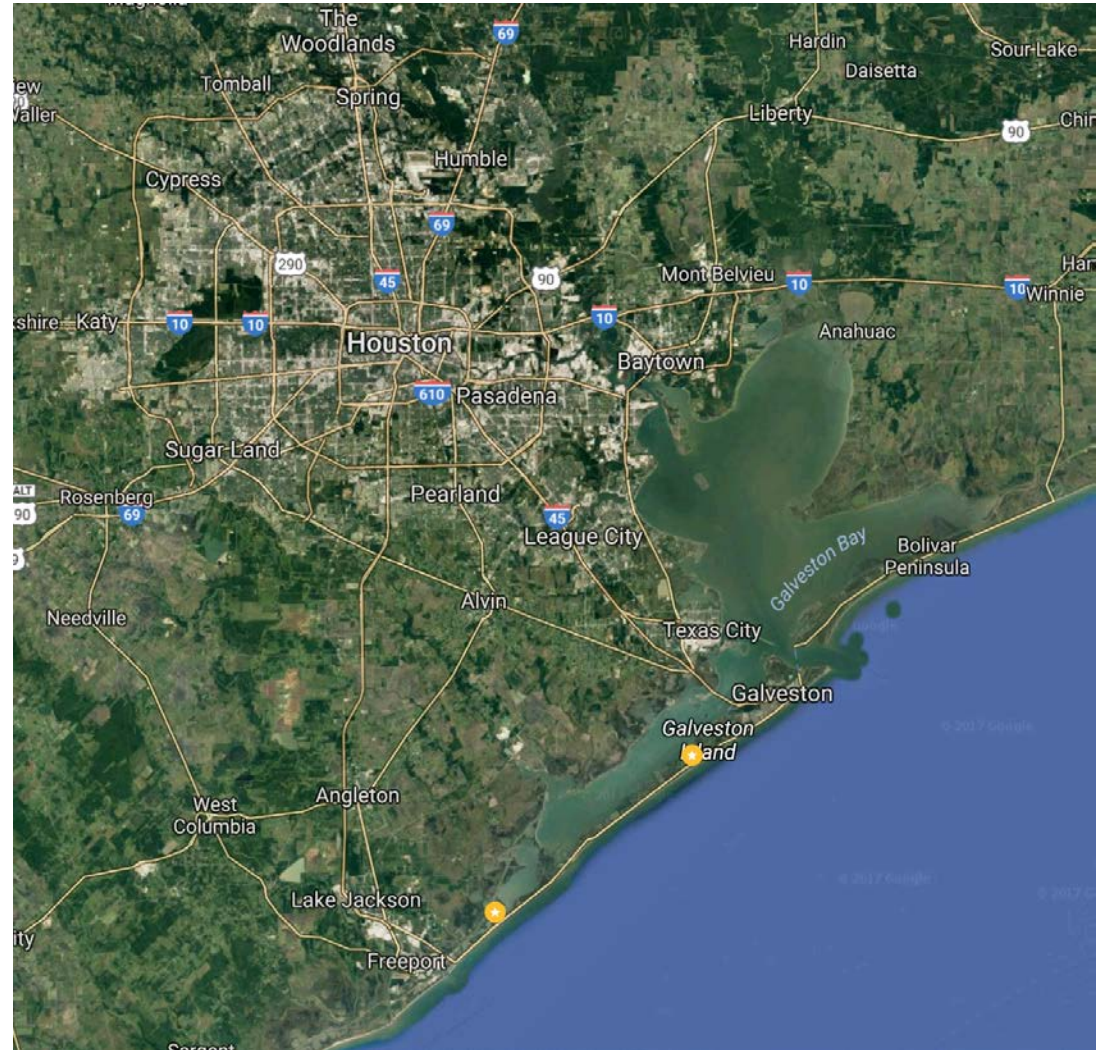
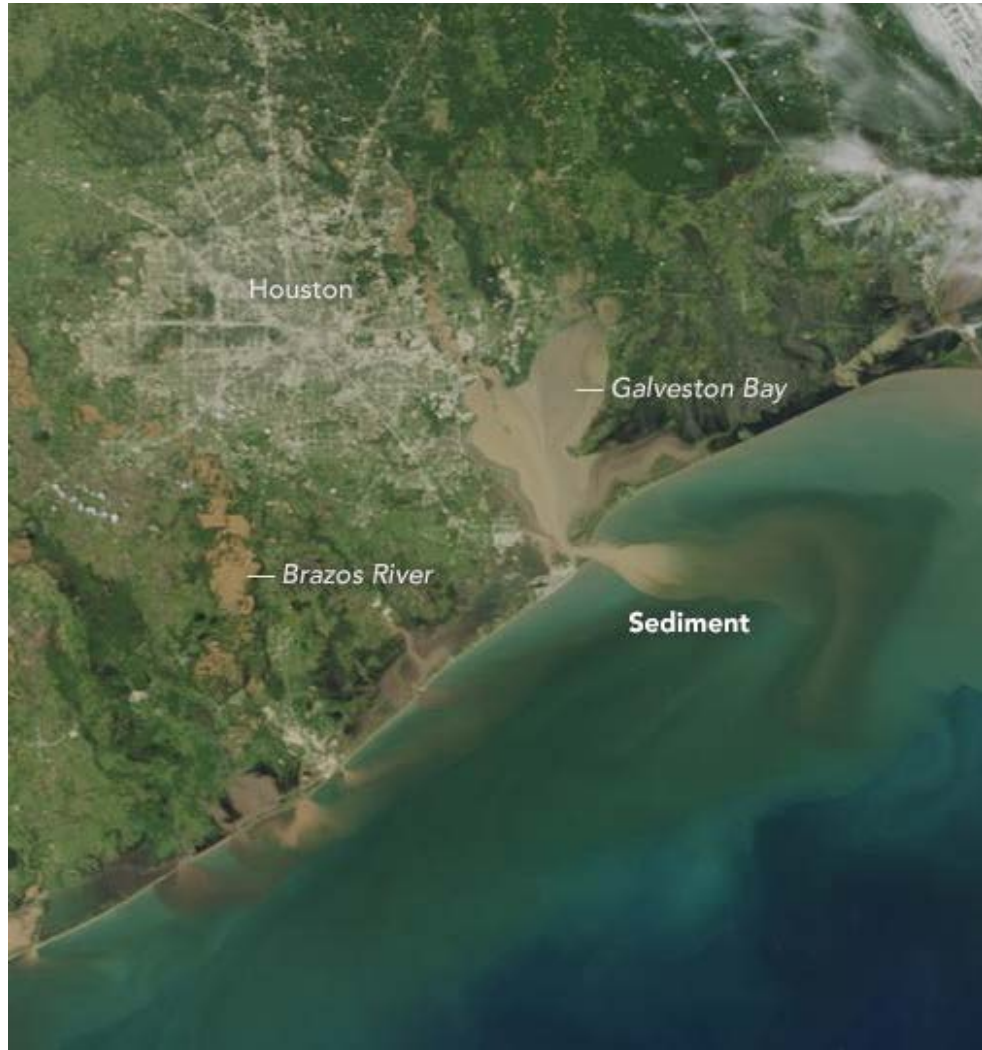
To preserve and enhance Galveston Bay as a beautiful and productive resource for generations to come.

Vision:

Galveston Bay as a Straight “A” Bay

- Natural Resources
- Public Outreach

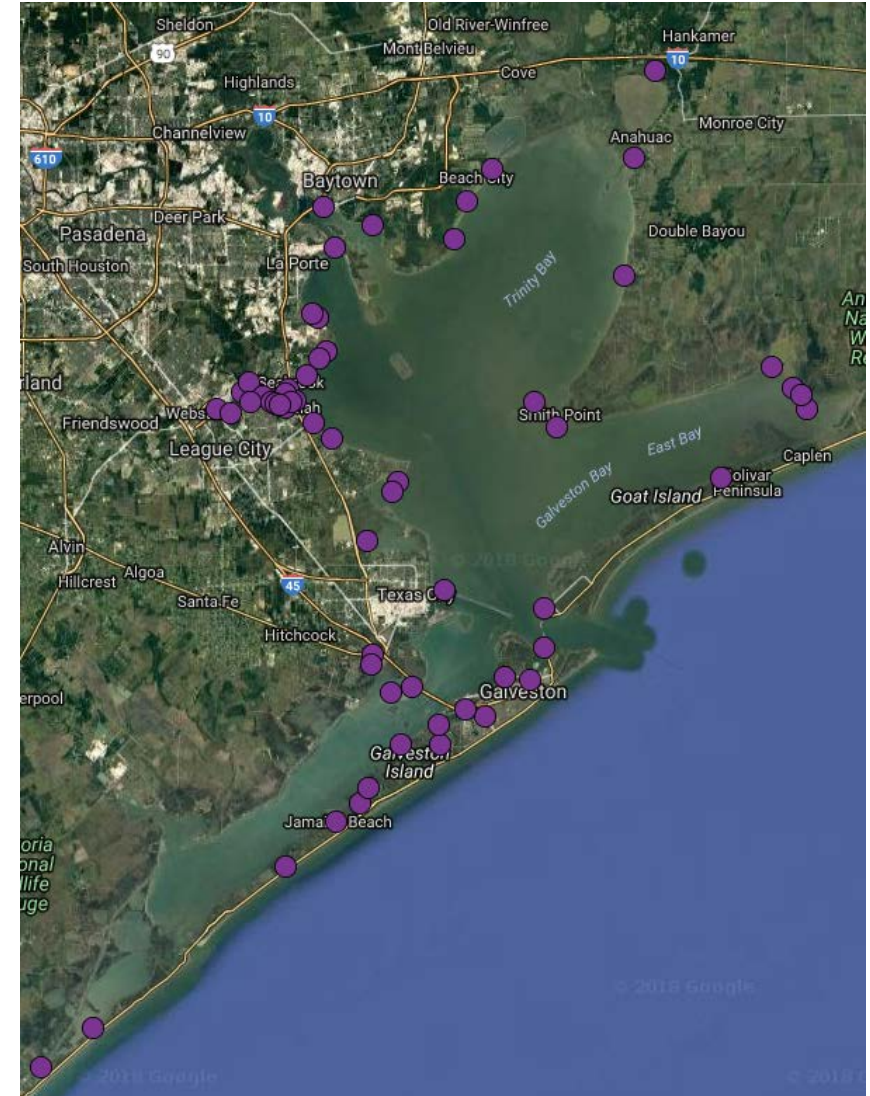




Left photo: NASA Satellite of brown rivers and Galveston Bay full of floodwater from Hurricane Harvey.
Right photo: Google Earth Imagery

Water Quality Monitoring

- **Started in 2012**
 - **67 Monitors @ 65 locations**
 - **24 bacteria sampling locations**



How Has Hurricane Harvey Impacted Water Quality?



Fecal Bacteria



While it is almost certain bacteria levels were high right after Harvey, over a week has passed since the storm hit and our volunteer water monitors' samples are showing low values of bacteria.



Salinity



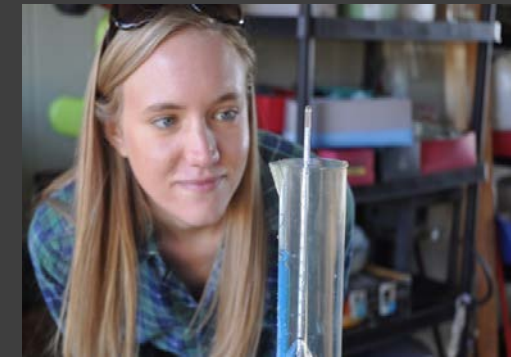
Galveston Bay's waters are currently much more fresh than they should be. Much of the rain that Harvey dumped on the region is finding its way into Galveston Bay, diluting any saltwater entering from the Gulf.



Turbidity/Debris

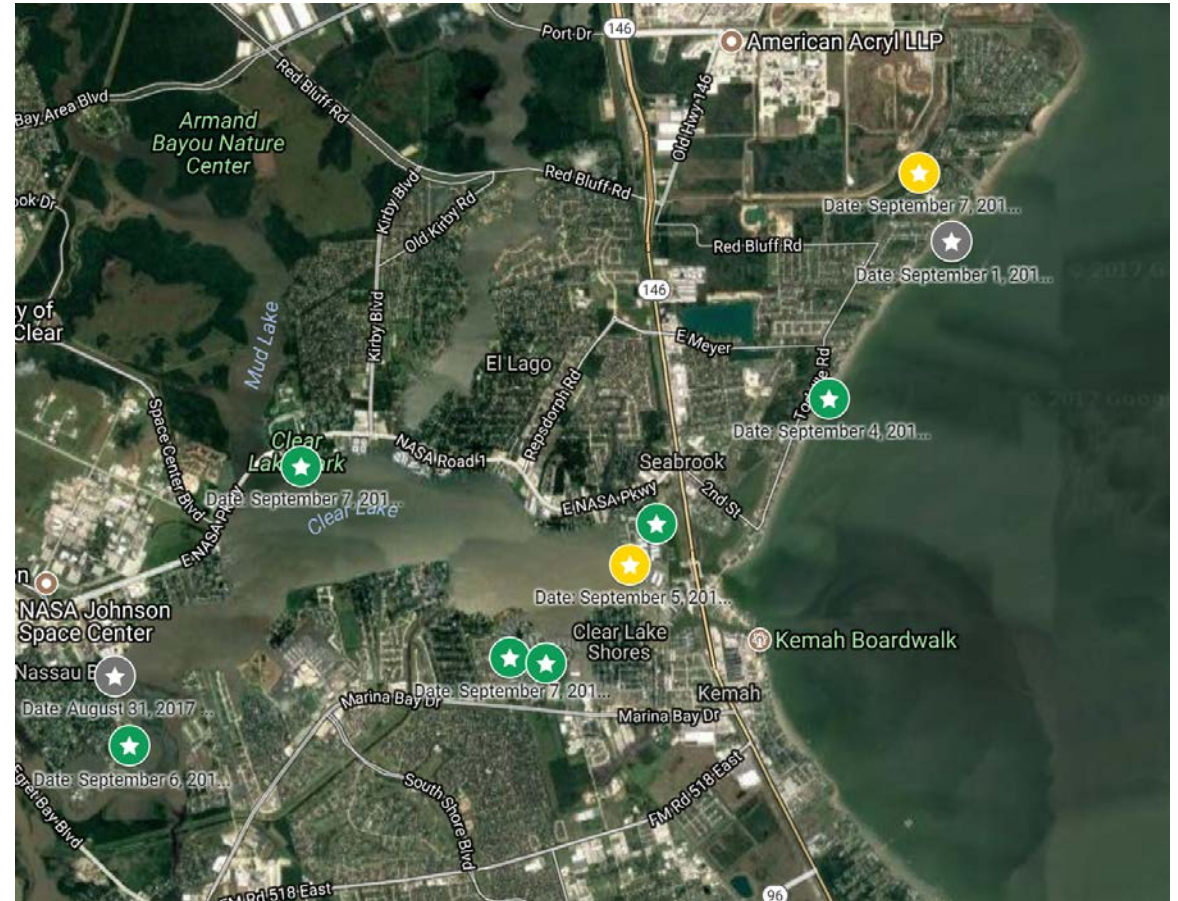
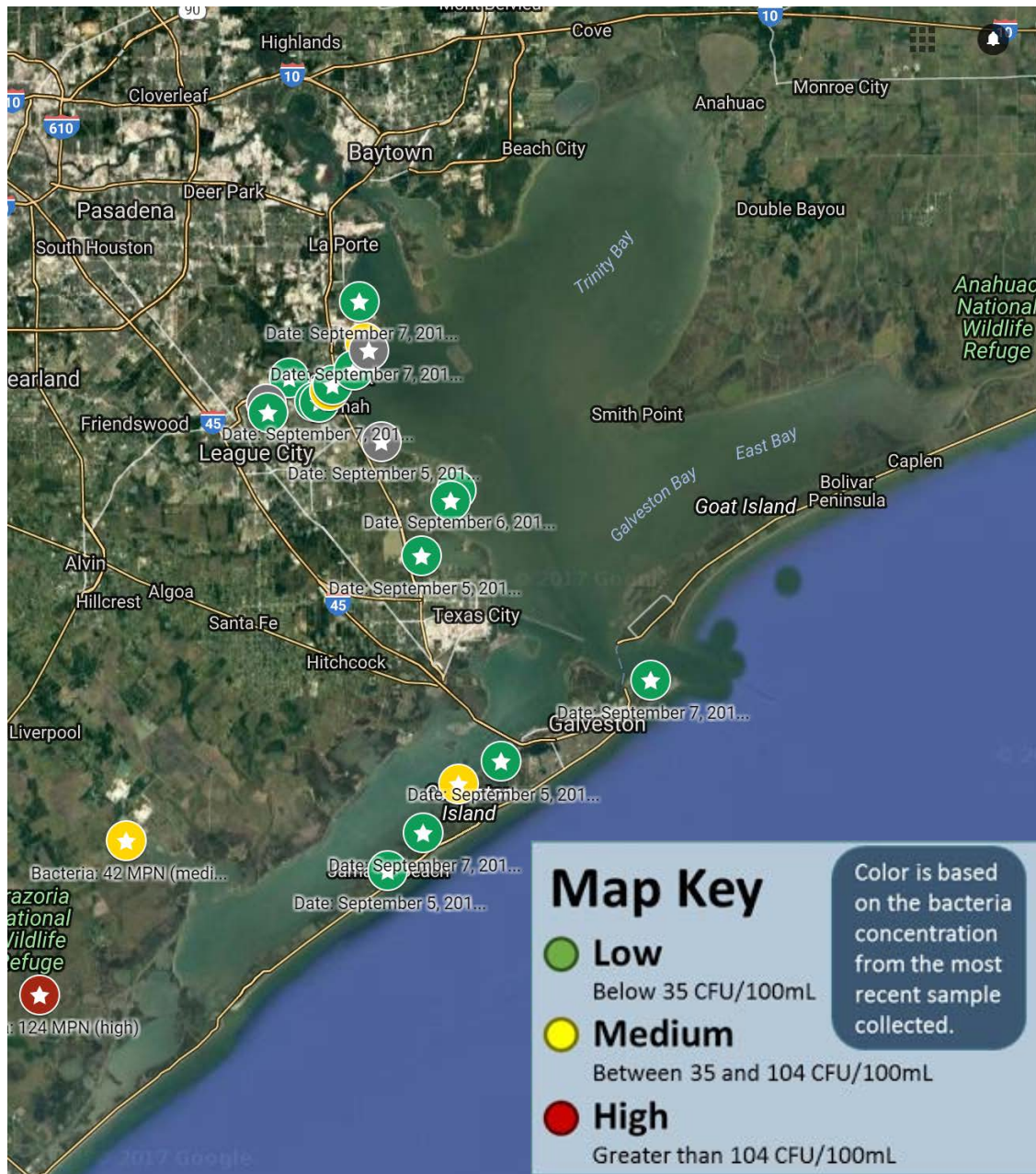


We are finding that an increase in particulate matter in the water is making the water less clear. Water levels are also higher than normal, and of course much more debris has been observed in the water.



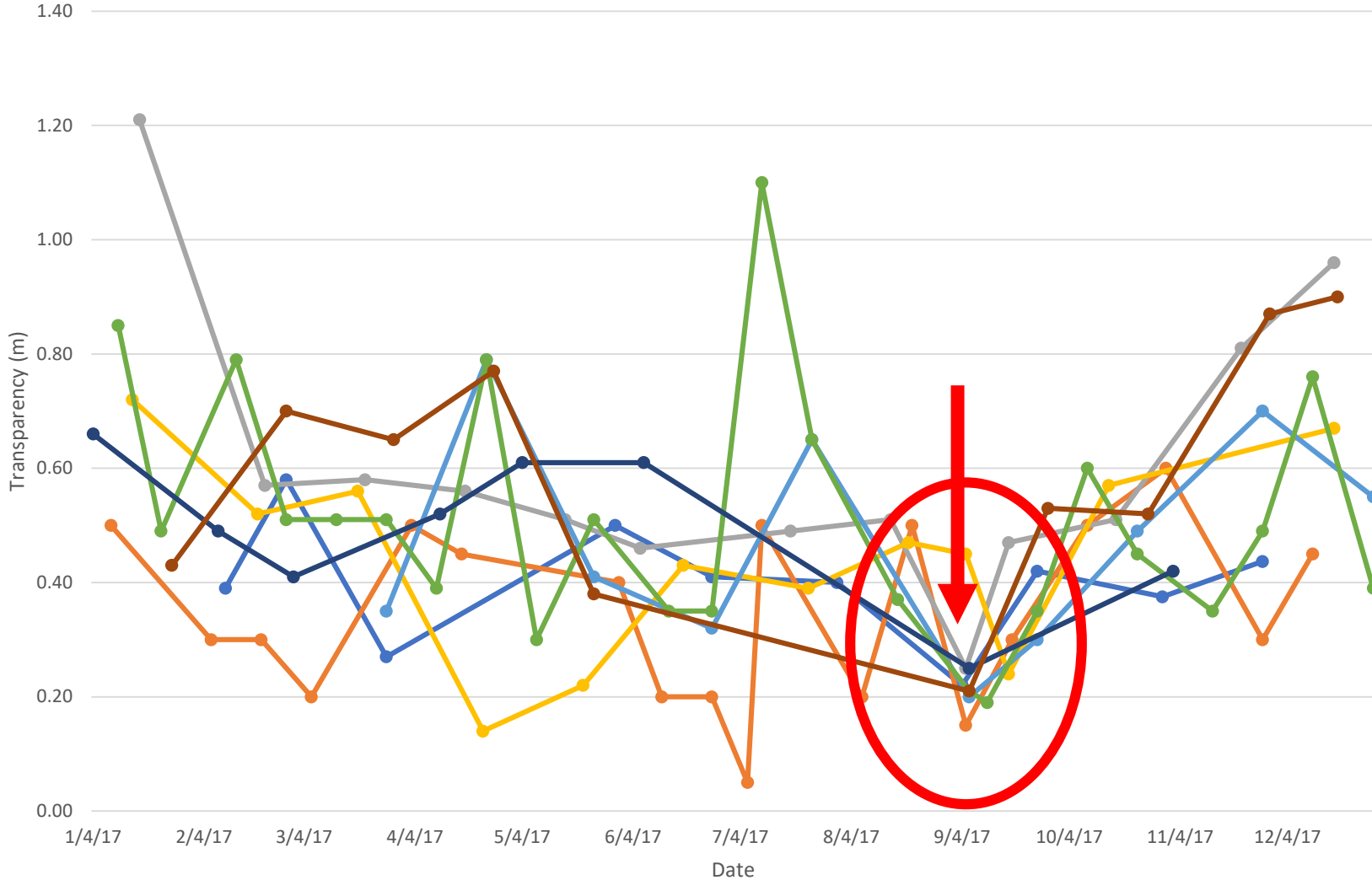
Post Harvey Water Monitoring

How Has Harvey Impacted Water Quality? Enterococci Bacteria



How Has Harvey Impacted Water Quality?

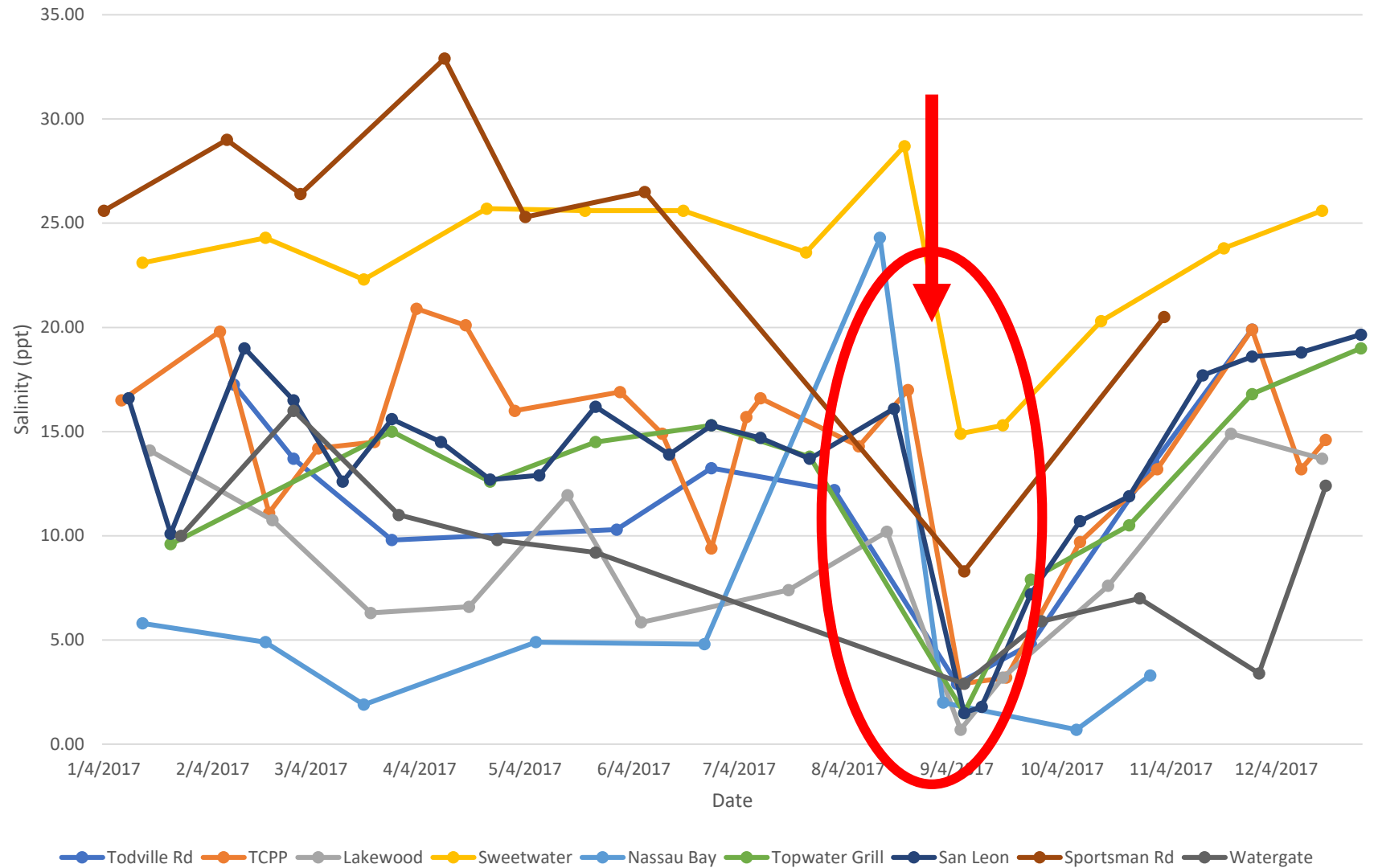
2017 Transparency



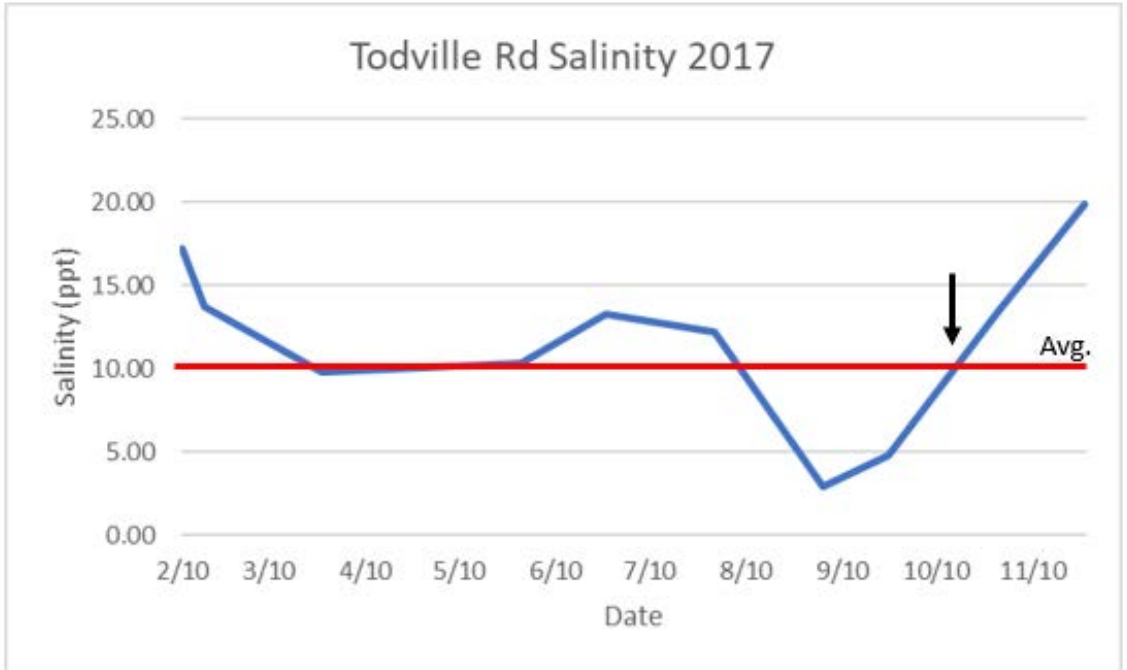
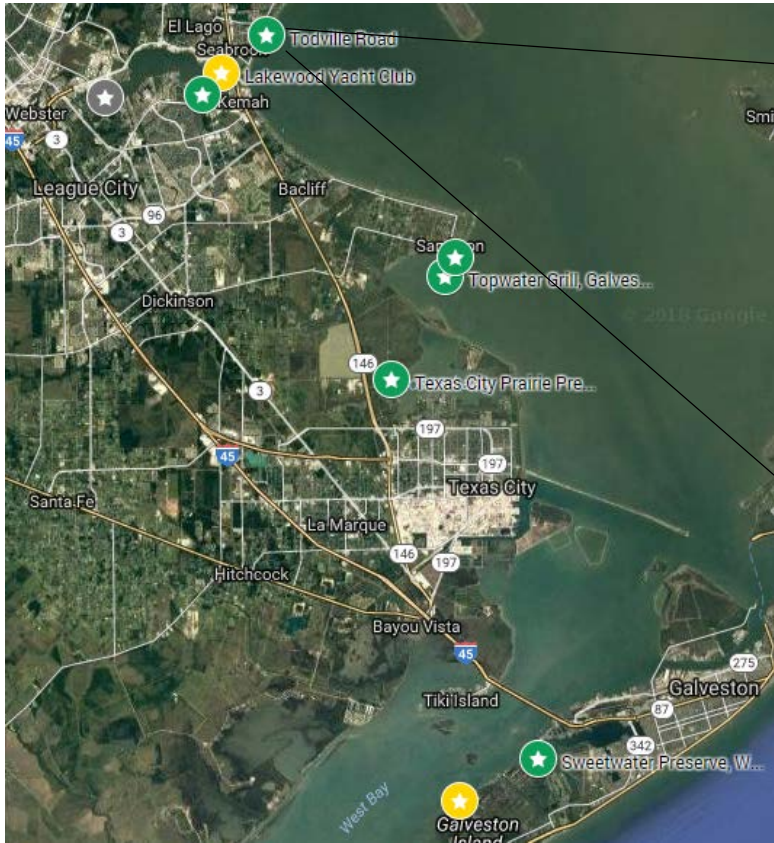
Levels back to "normal" by next month at most sites.

How Has Harvey Impacted Water Quality?

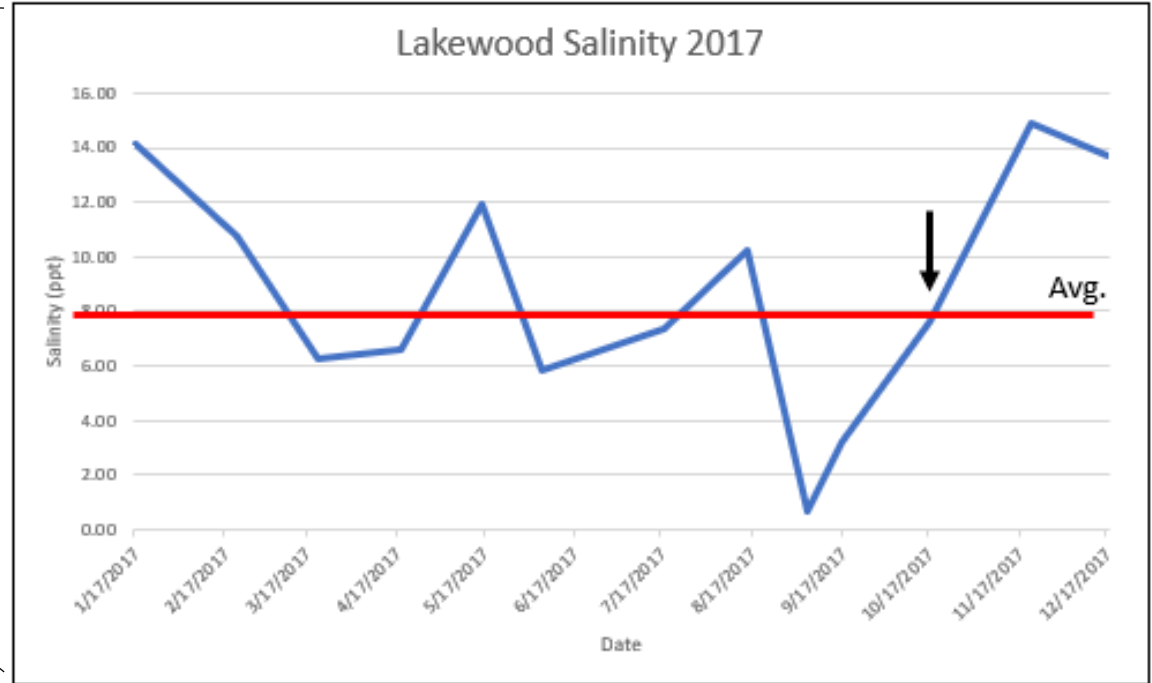
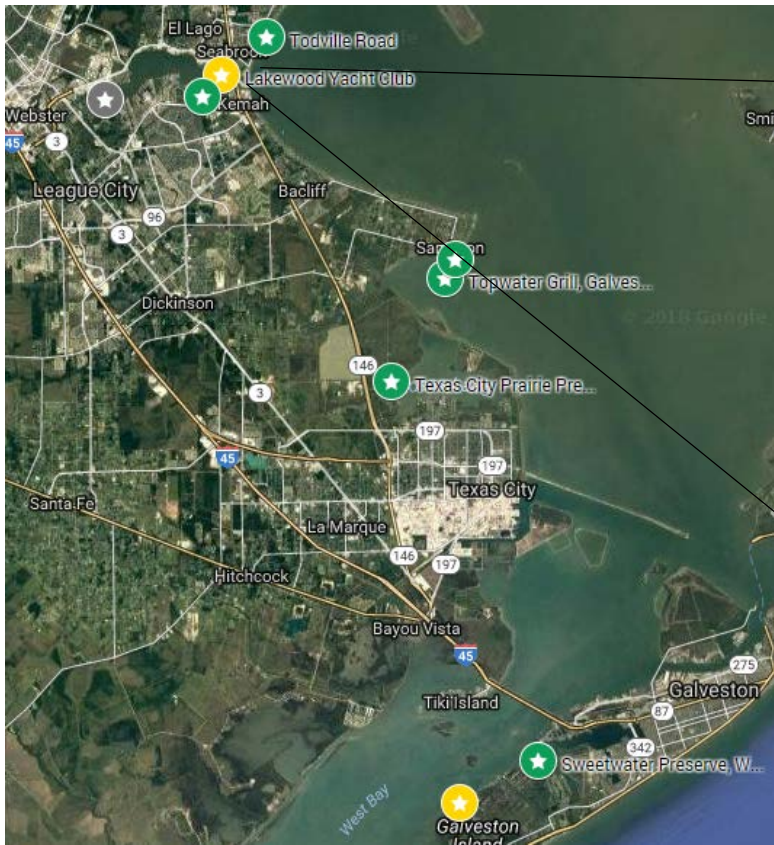
2017 Salinity Values



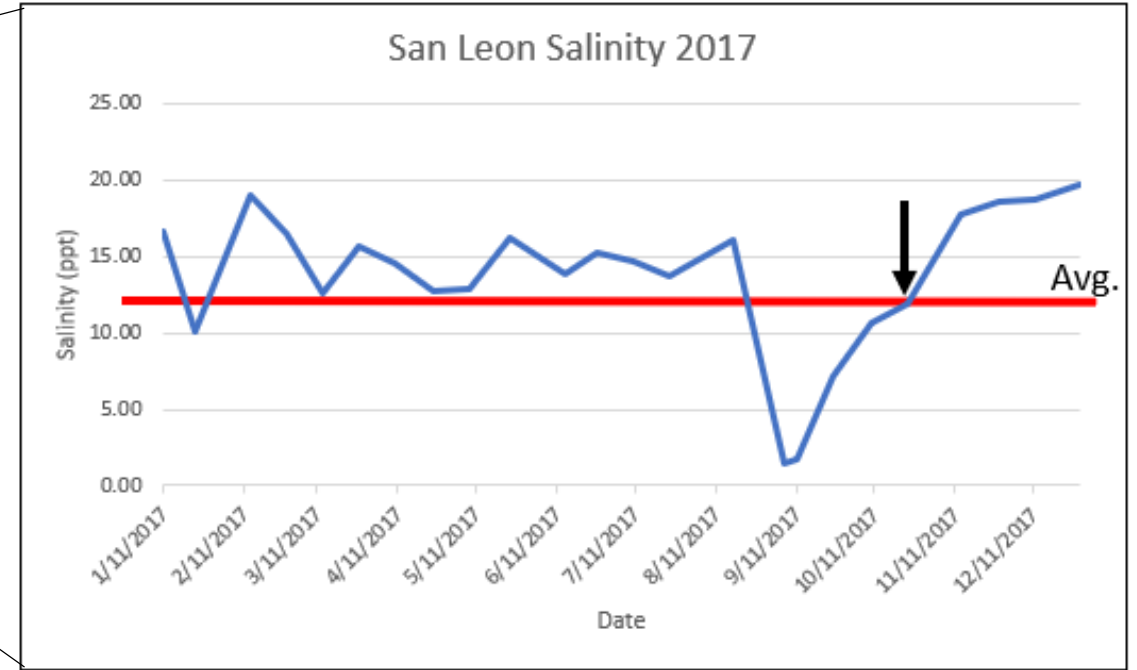
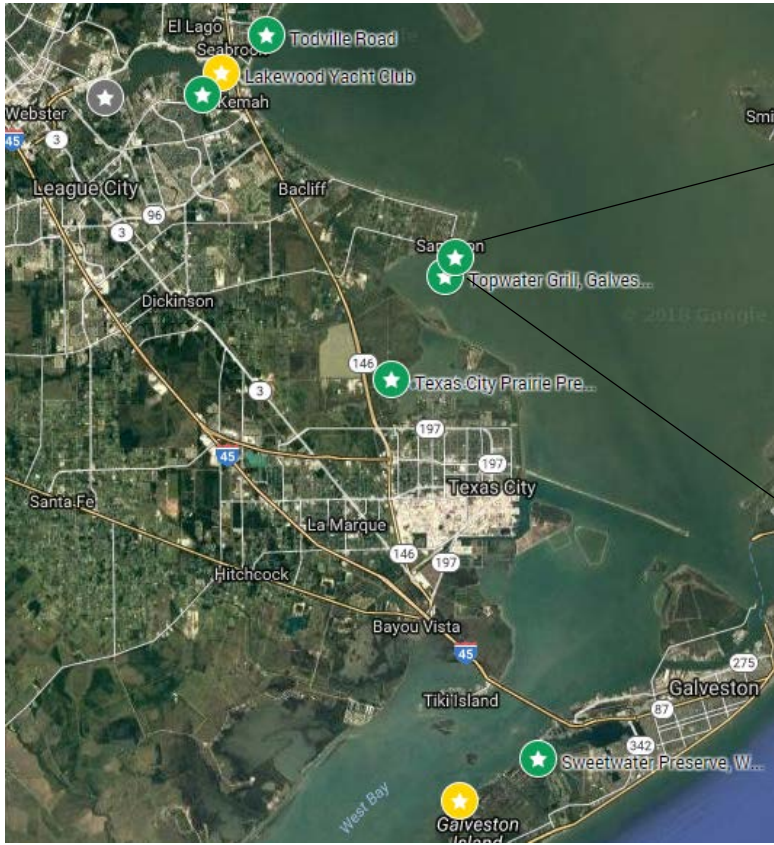
Levels took longer to return to "normal"



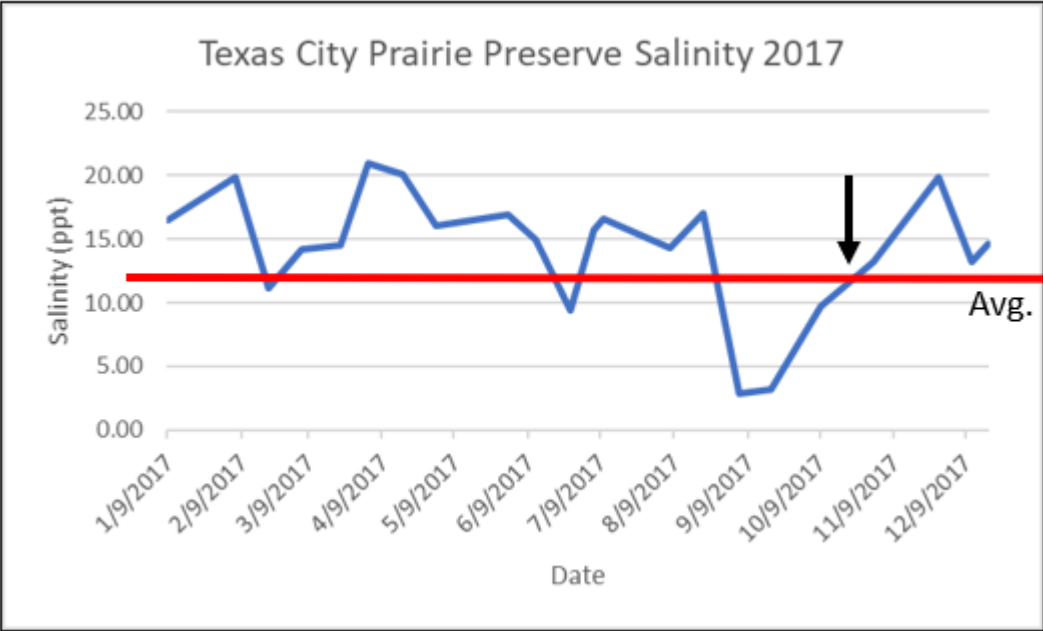
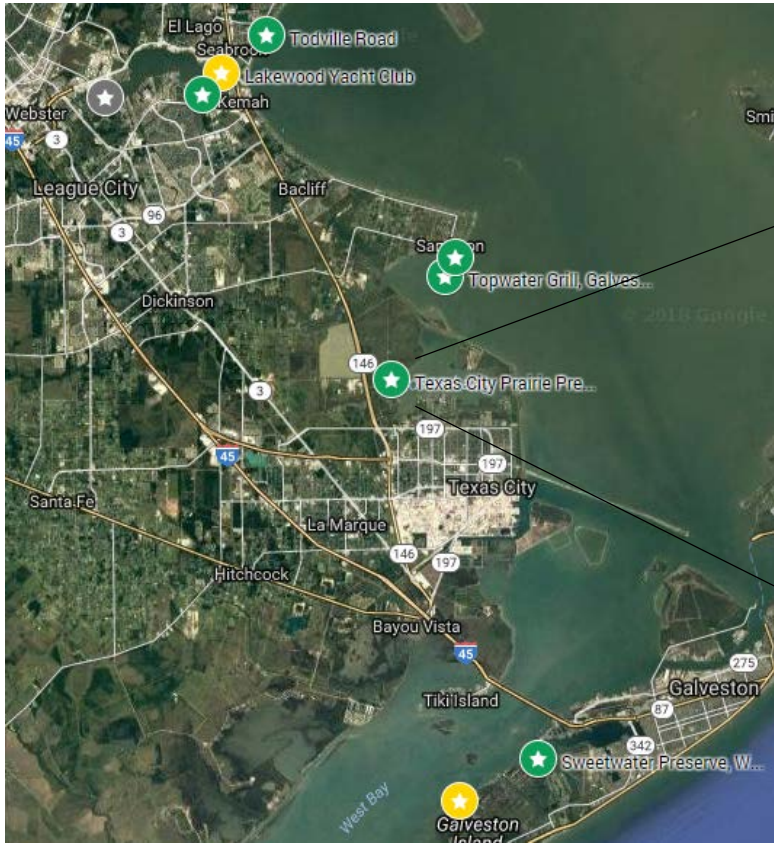
Salinity



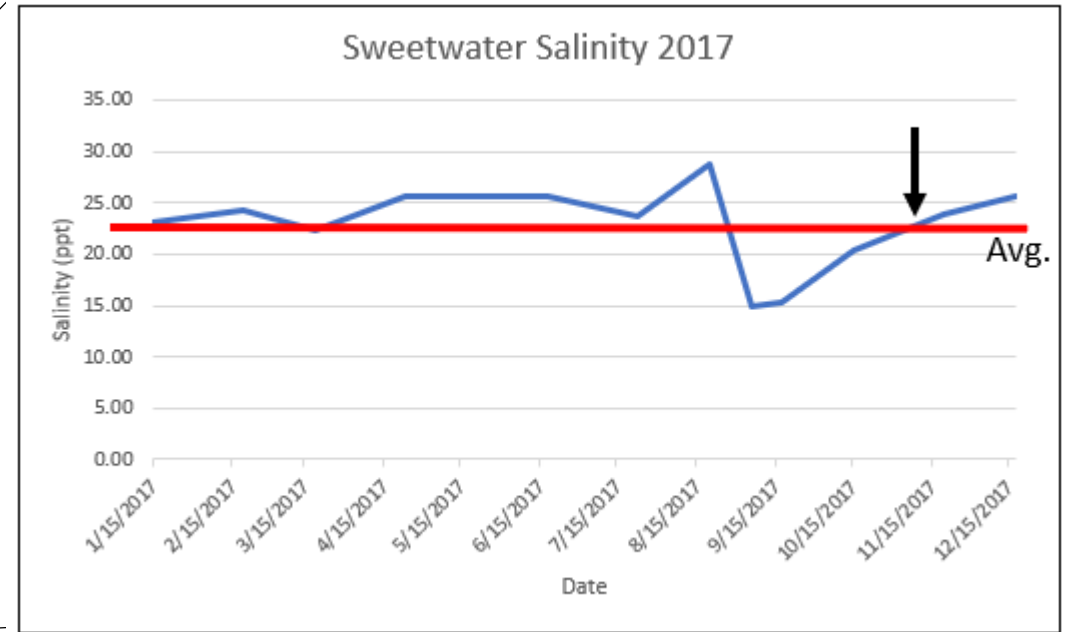
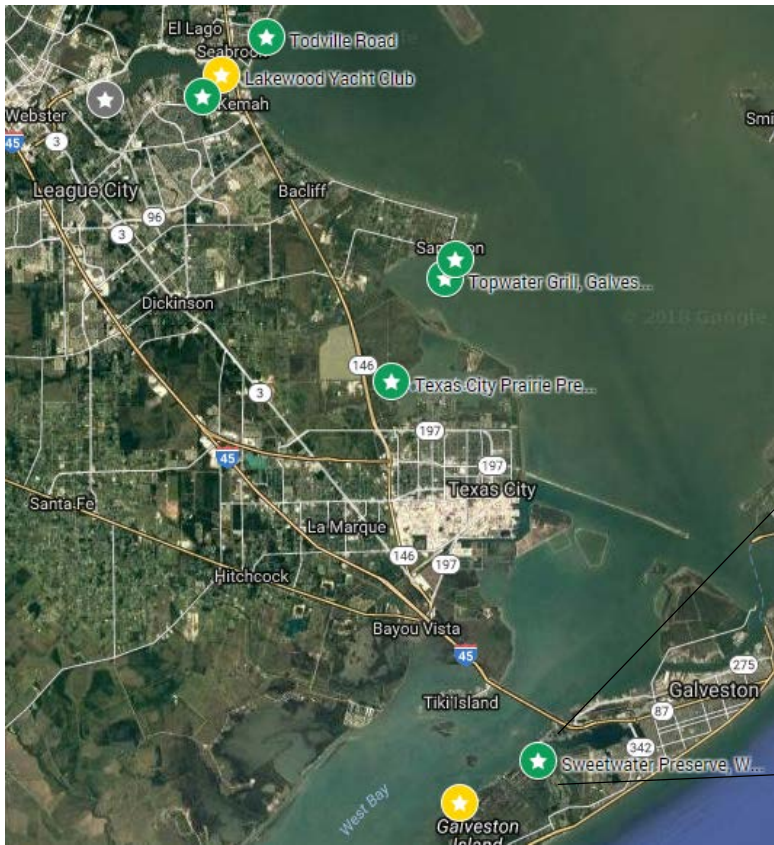
Salinity



Salinity



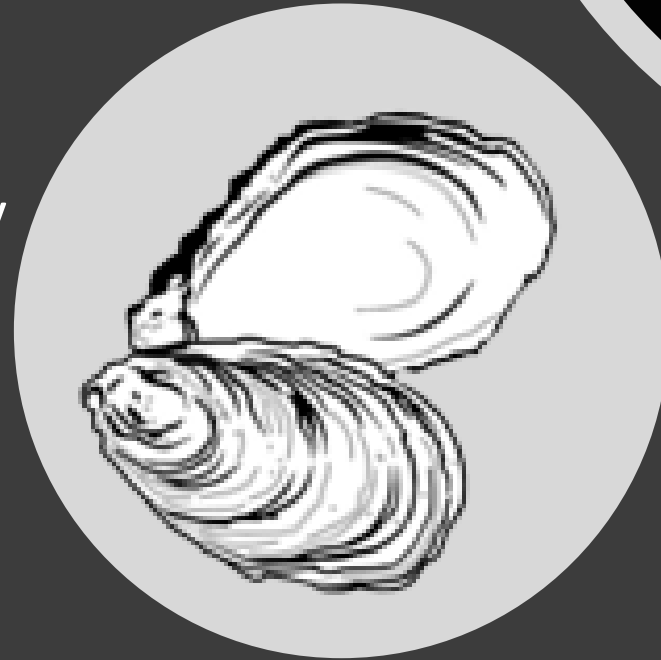
Salinity



Salinity

Impacts of Low Salinity

- Impacts species growth and development
 - Oysters
 - Dolphins
- Increases harmful pathogenic survivability



Galveston Bay Dolphin Dolphin Research & Monitoring



Figure 1. Skin lesions on bottlenose dolphins in Galveston Bay likely caused by exposure to freshwater runoff after Hurricane Harvey, September 5th, 2017. Click photos to expand.

Galveston Bay Dolphin Research & Monitoring

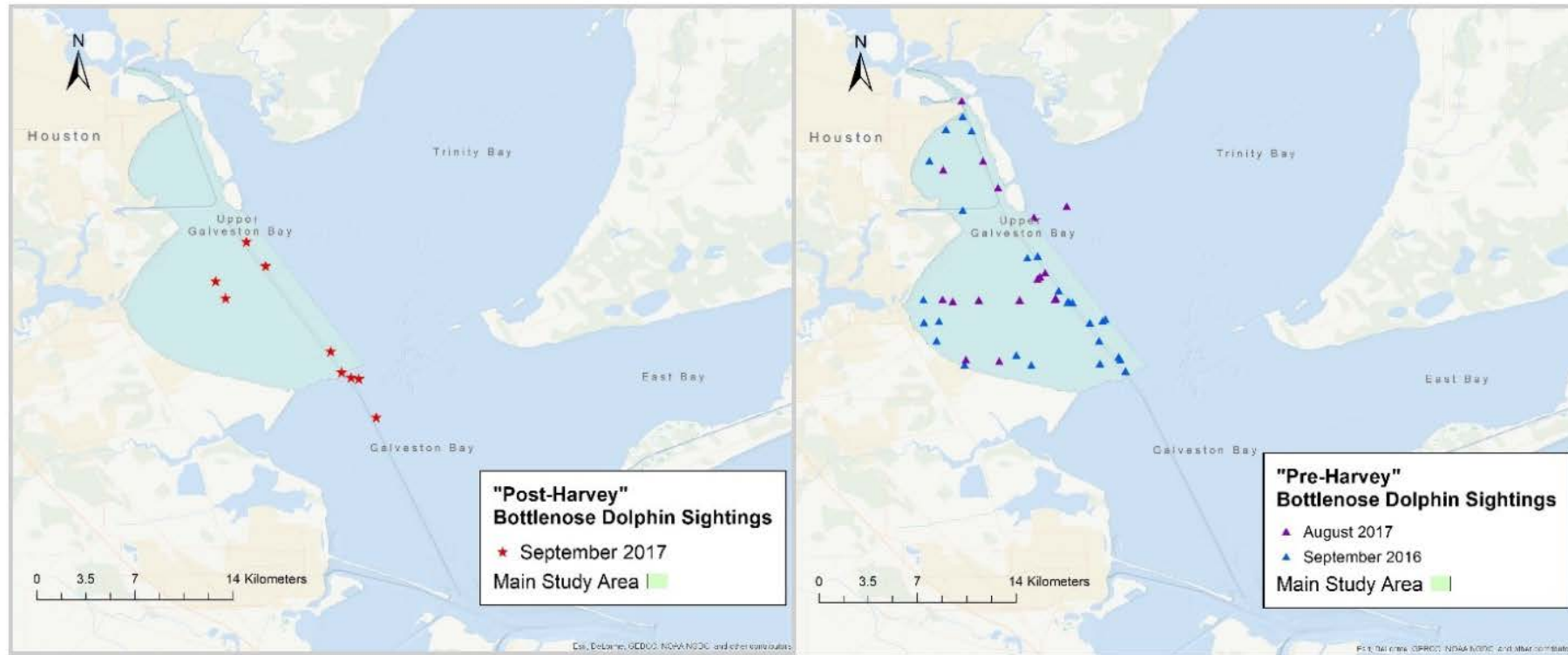


Figure 2. Pre-Harvey (September 2016 and August 2017) and post-Harvey (September 2017) sightings of bottlenose dolphins in Galveston Bay. Click photos to expand.

Stepping Back: The Big Picture

- 2017 Avg Salinity: 14.4 ppt
- 2016 Avg Salinity: 11.9 ppt
- 2015 Avg Salinity: 12.45 ppt
- 2014 Avg Salinity: 19.11 ppt

Annual Avg. Precipitation

2014: 38 inches

2015: 74.64 inches

2016: 57.2 inches

2017: 80.26 inches

Data from Harris County Flood Warning System – Kemah gauge (Location 100)



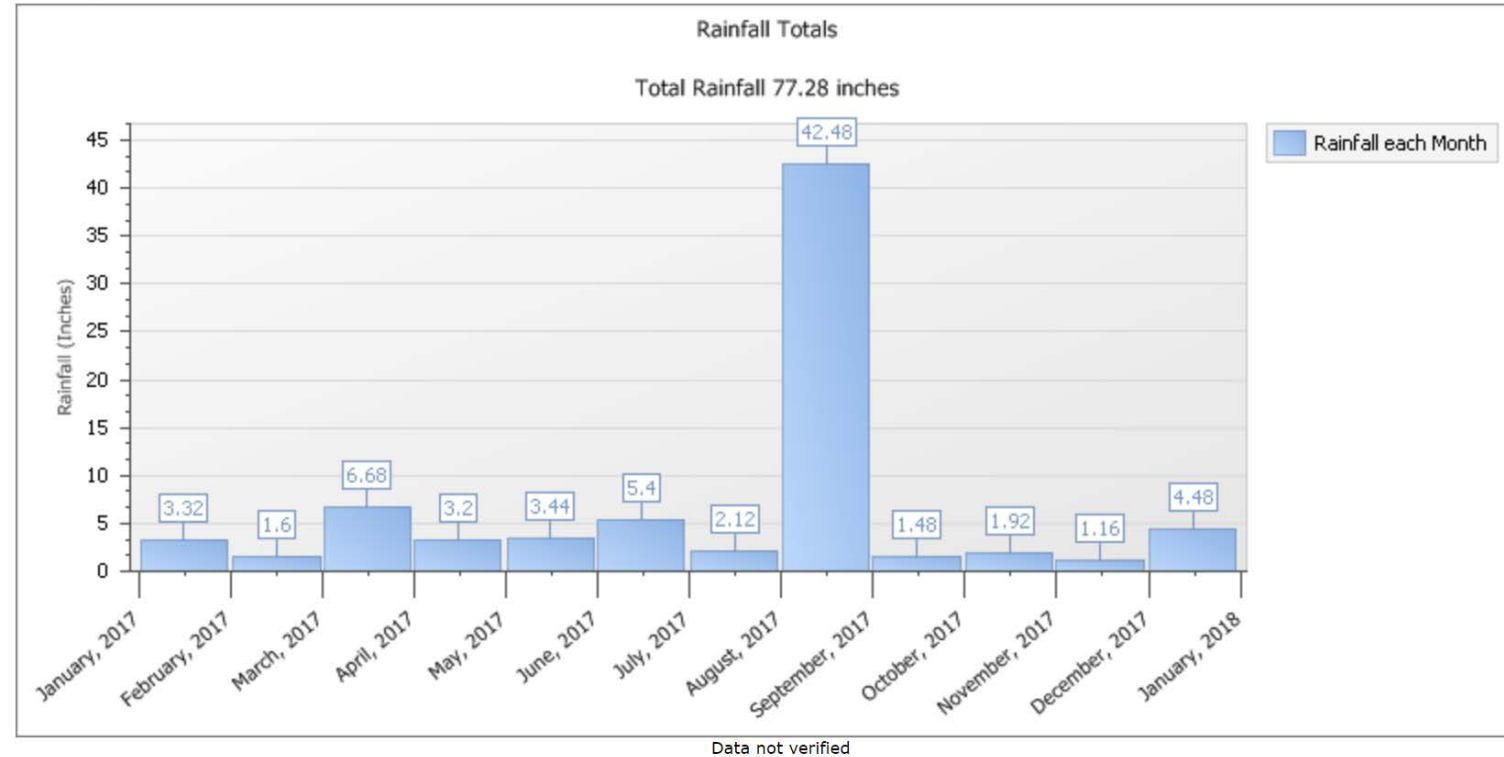
Zooming Back: The Big Picture

2017 Avg Salinity: 14.4 ppt
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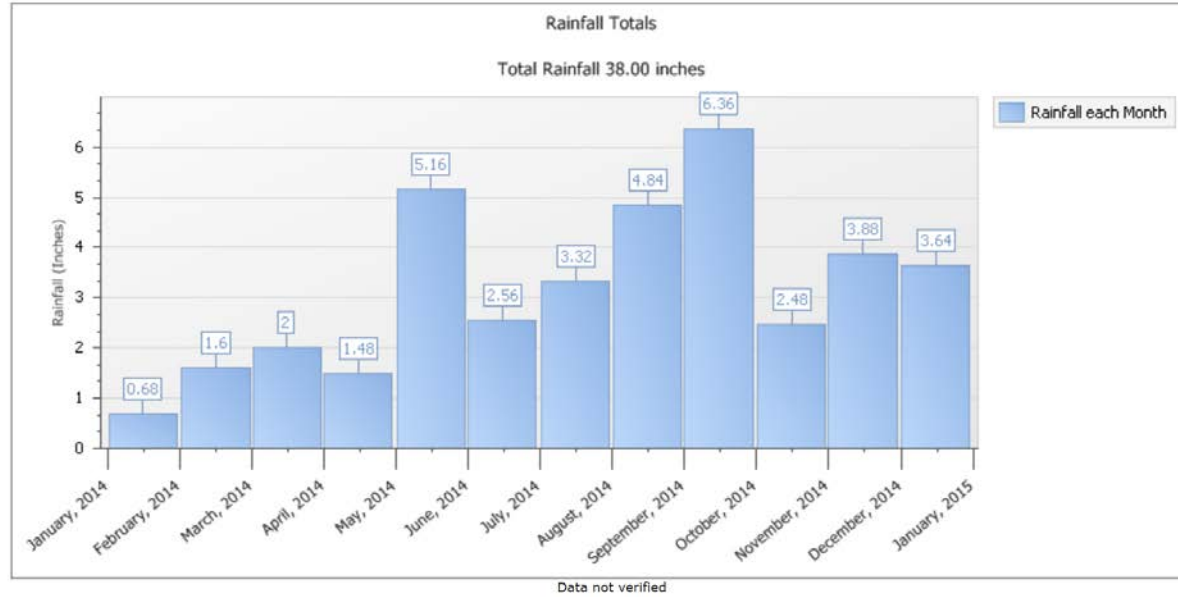
Annual Avg. Precipitation

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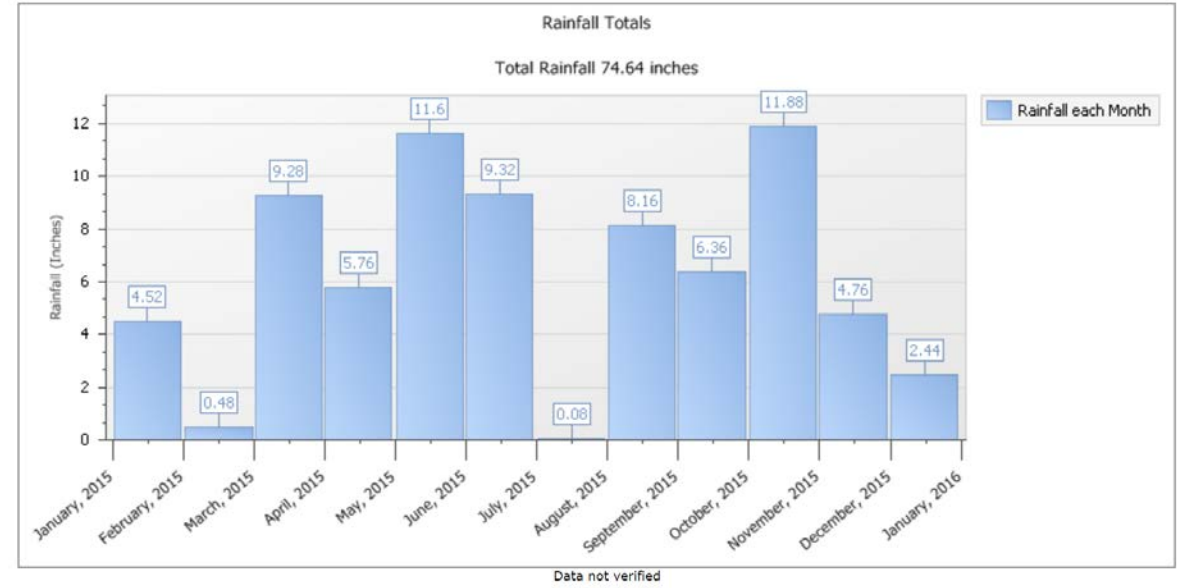
*Data from Harris County Flood Warning System –
Kemah gauge (Location 100)*



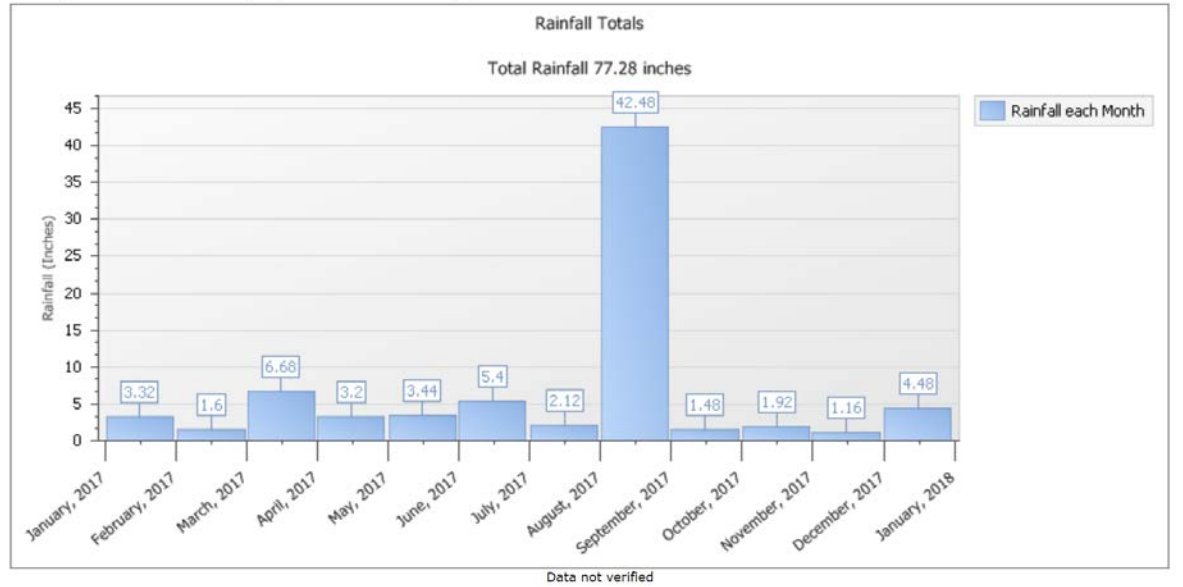
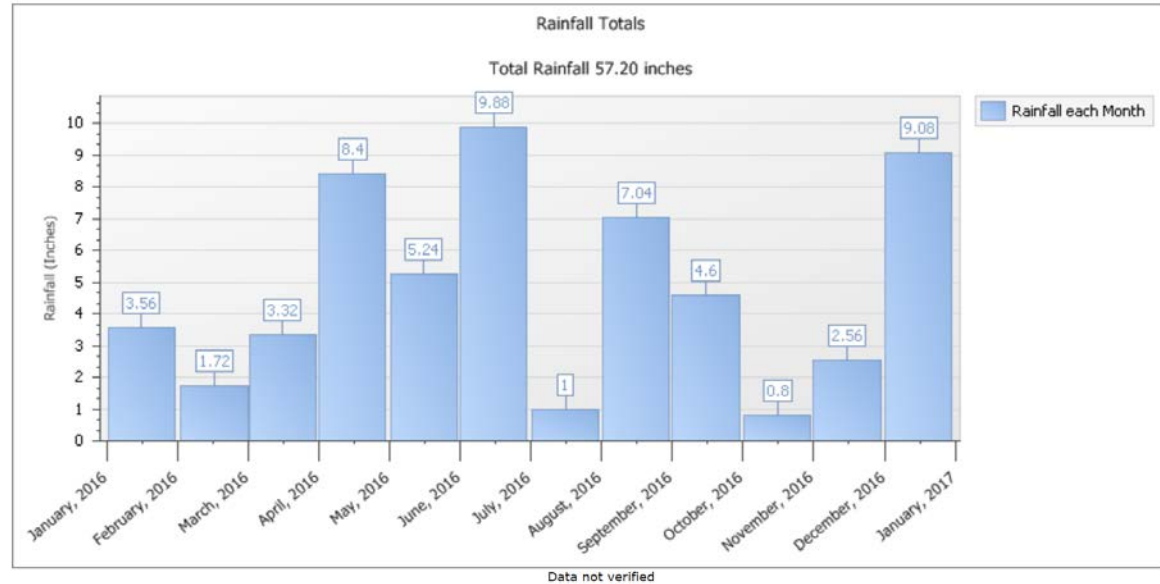
Showing rainfall totals from 12/31/2013 11:59 PM to 12/31/2014 11:59 PM CST



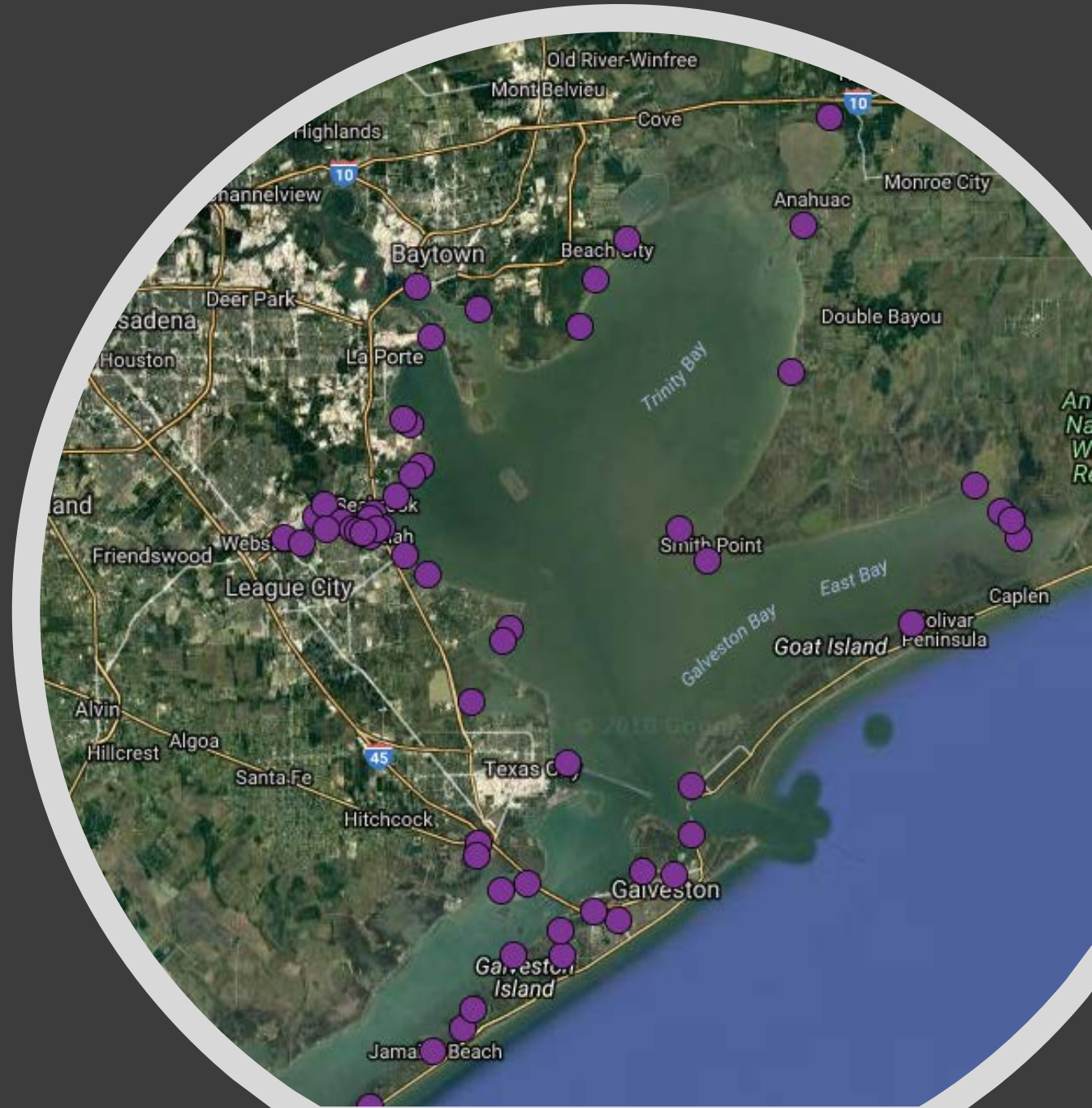
Showing rainfall totals from 12/31/2014 11:59 PM to 12/31/2015 11:59 PM CST



Showing rainfall totals from 12/31/2015 11:59 PM to 12/31/2016 11:59 PM CST

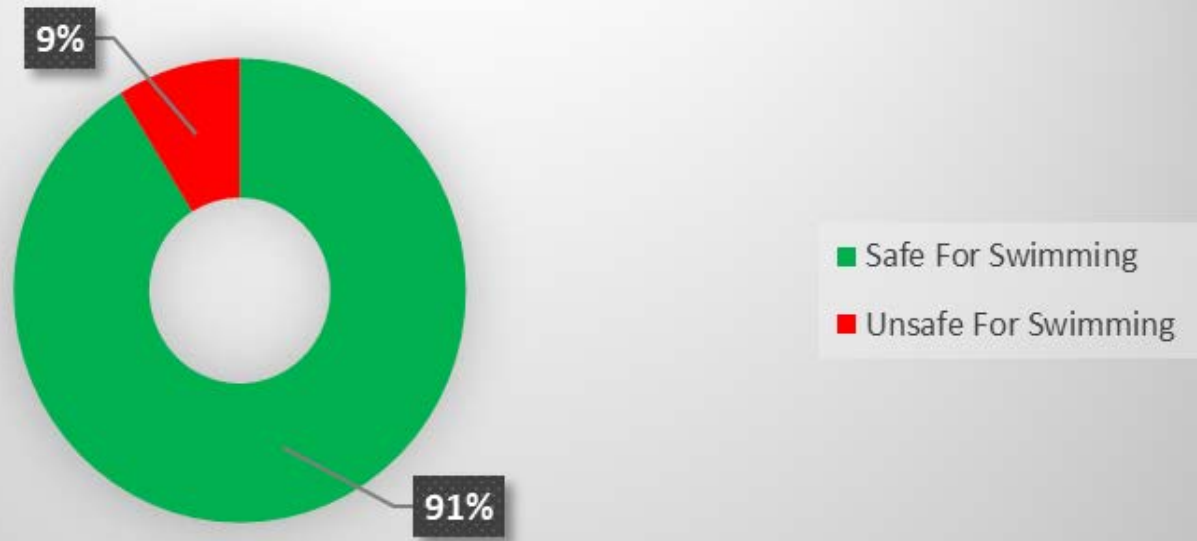


2017 Overview



Enterococci Bacteria

Enterococci (Bacteria) Values 2017 Galveston Bay & Clear Lake



Enterococci Bacteria: Geometric Mean of **8 MPN** in 2017

This is considered **SAFE** for swimming by the EPA (<35 MPN is safe to swim)

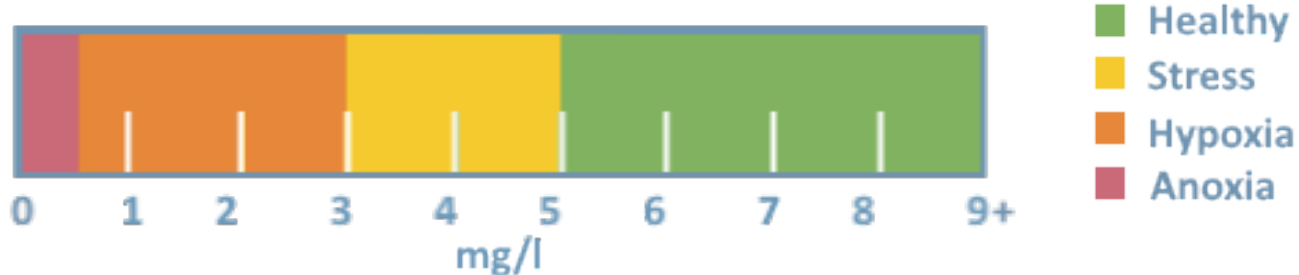
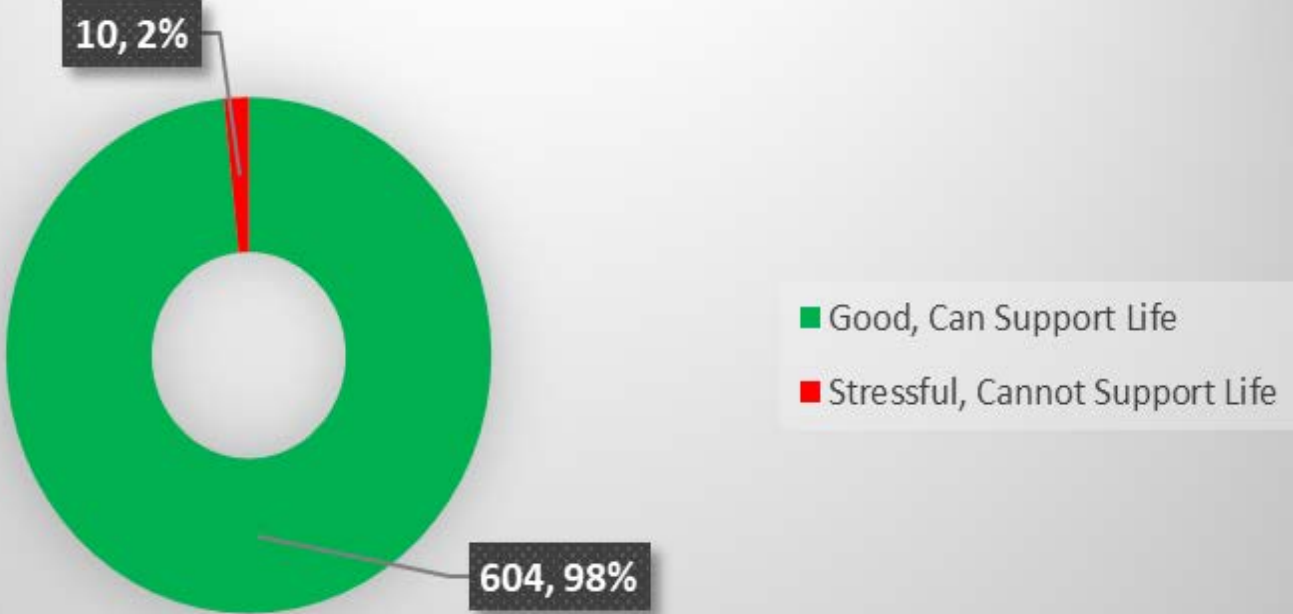
This level is **THE SAME** as in than previous years

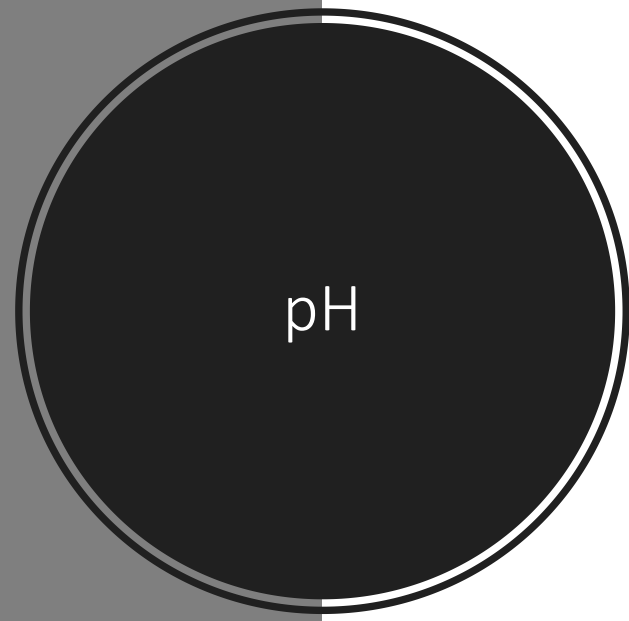
2014 geomean: **7.8 MPN**, 2015 geomean: **12.8 MPN**, 2016 geomean: **6.5 MPN**

Dissolved Oxygen

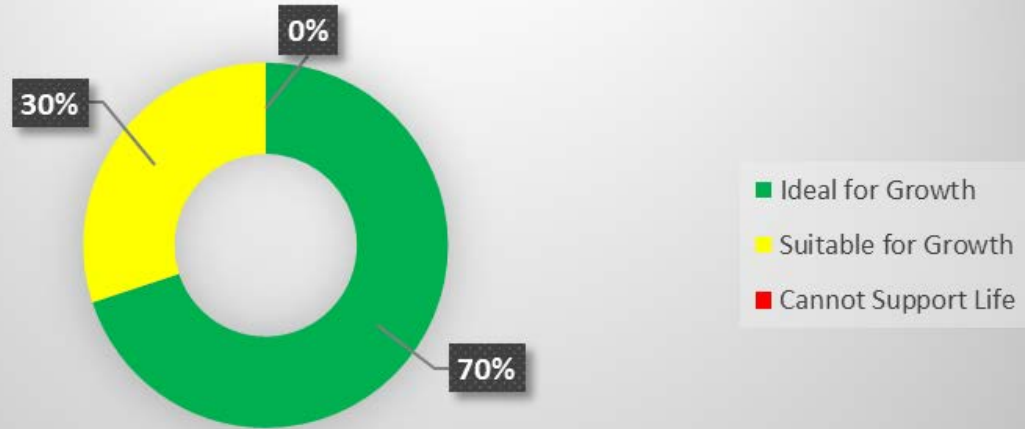
Dissolved Oxygen Values 2017

Galveston Bay & Clear Lake

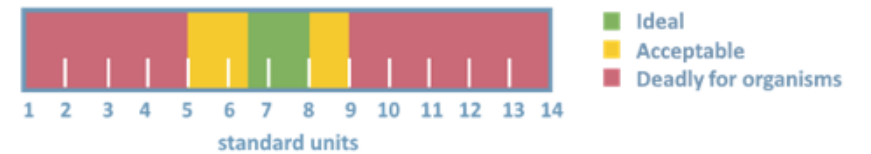




pH Values, 2017 Galveston Bay & Clear Lake



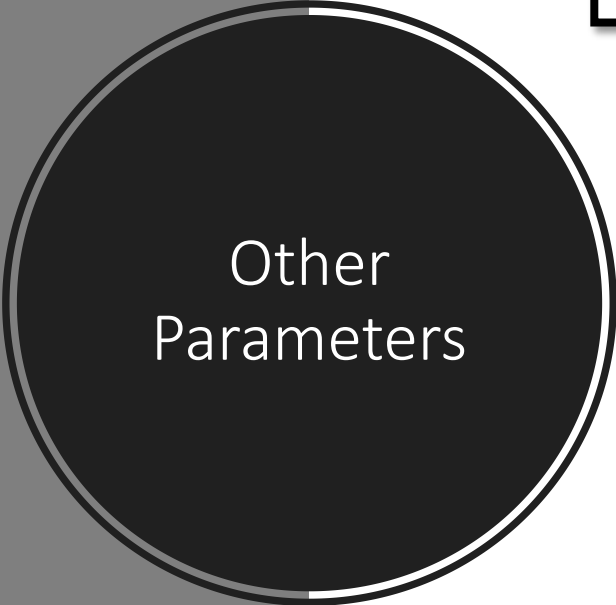
pH: average of **7.9** in 2017



This is **IDEAL** to support life

This is **THE SAME** as in previous years

2014 average: **8.1**, 2015 average: **7.9**, 2016 average: **7.9**



Other
Parameters

Water Transparency: average of **0.5 meters** in 2017

This is **THE SAME** as in previous years

2014 average: **0.55m**, 2015 average: **0.46m**, 2016 average **0.5m**

Air Temperature: average of **23.5°C** in 2017

This is **THE SAME** than in previous years

2014 average: **22.4°C**, 2015 average: **23.1°C**, 2016 average: **24.0°C**

Water Temperature: average of **23°C** in 2017

This is **Higher** than in previous years

2014 average: **21.9°C**, 2015 average: **22.8°C**, 2016 average **22.8°C**



Additional Impacts from
Hurricane Harvey

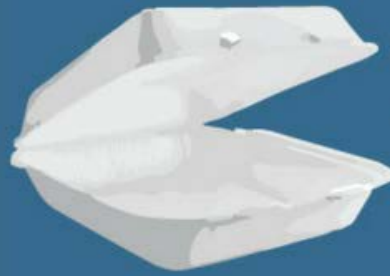
Trash & Debris Pileups

- **140 volunteers** removed **7,125 pounds of trash** and recyclables at 3 sites -- Kemah, Morgan's Point, and Texas City Prairie Preserve
- Galveston Island State Park: beach access and structure damage



Texas City
Prairie
Preserve
Cleanup

At Our First Post-Harvey Cleanup
Volunteers Removed:



**270 STYROFOAM
TAKE OUT
CONTAINERS**



**103
PLASTIC
BAGS**



**583
PLASTIC
BAGS**



**28 YARDS
OF FISHING LINE**



**GALVESTON BAY
FOUNDATION**

Texas City
Prairie
Preserve
Cleanup



Morgan's
Point:
Harvey
Aftermath



San Jacinto Superfund Site



Post-Harvey dioxin levels in sediment 2,300 times “safe” standards.

Moving Forward

01

Coordinated
sampling with UHD
and Bayou City
Waterkeeper

02

Ongoing water
quality monitoring
at all sites

03

Trash Bash 2018

Questions?

Sarah Gossett

Water Quality Manager

sgossett@galvbay.org

Resilient: (*adjective*) able to withstand or recover quickly from difficult conditions



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