PCBs and Dioxin in the Galveston Bay System

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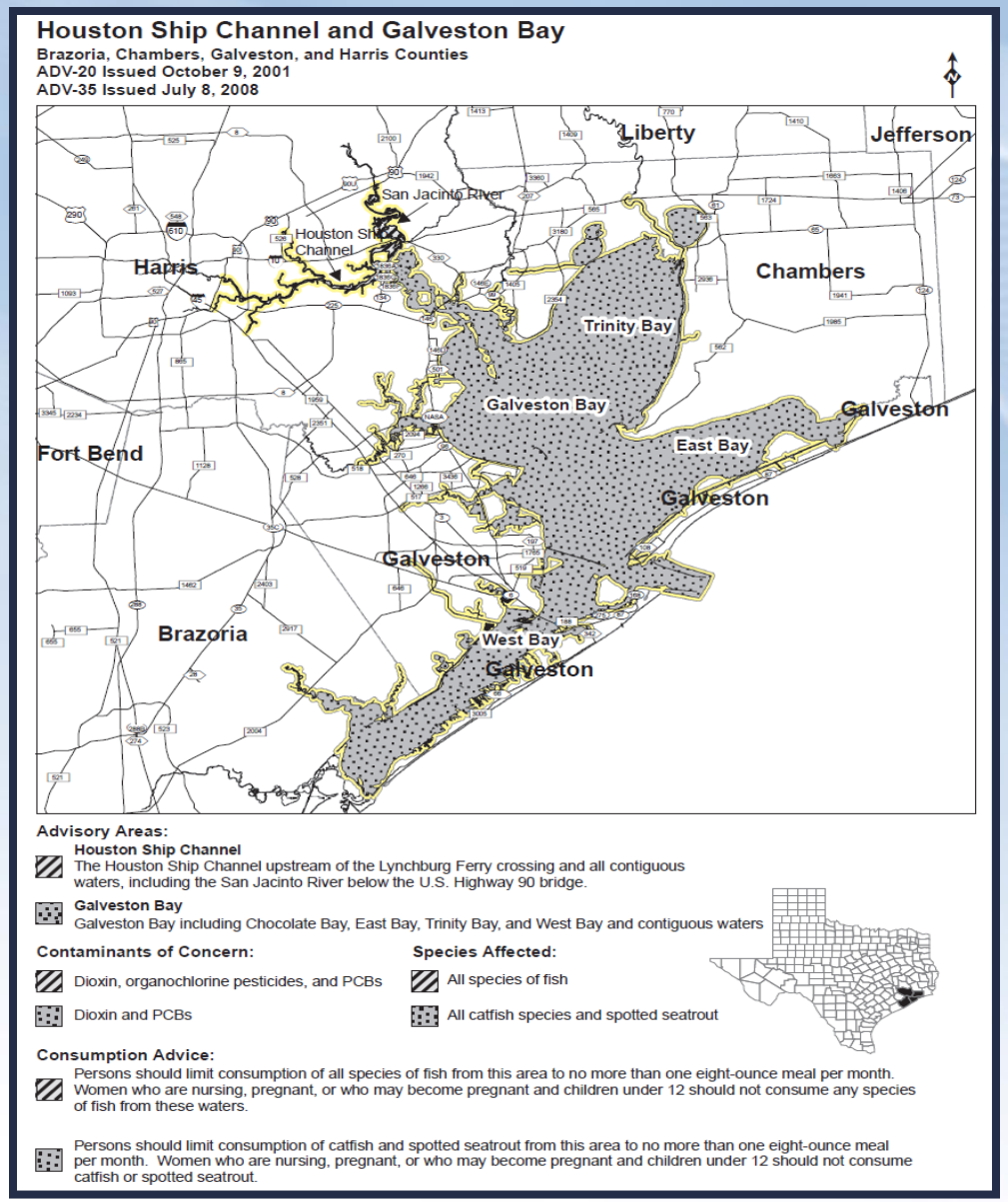
Advisories in HSC and Galveston Bay



- Consumption limited to 1-8 oz meal per month but none for women who are nursing or pregnant or who plan to be pregnant and children under 12
- All fish species in HSC and catfish/spotted seatrout in the Bay

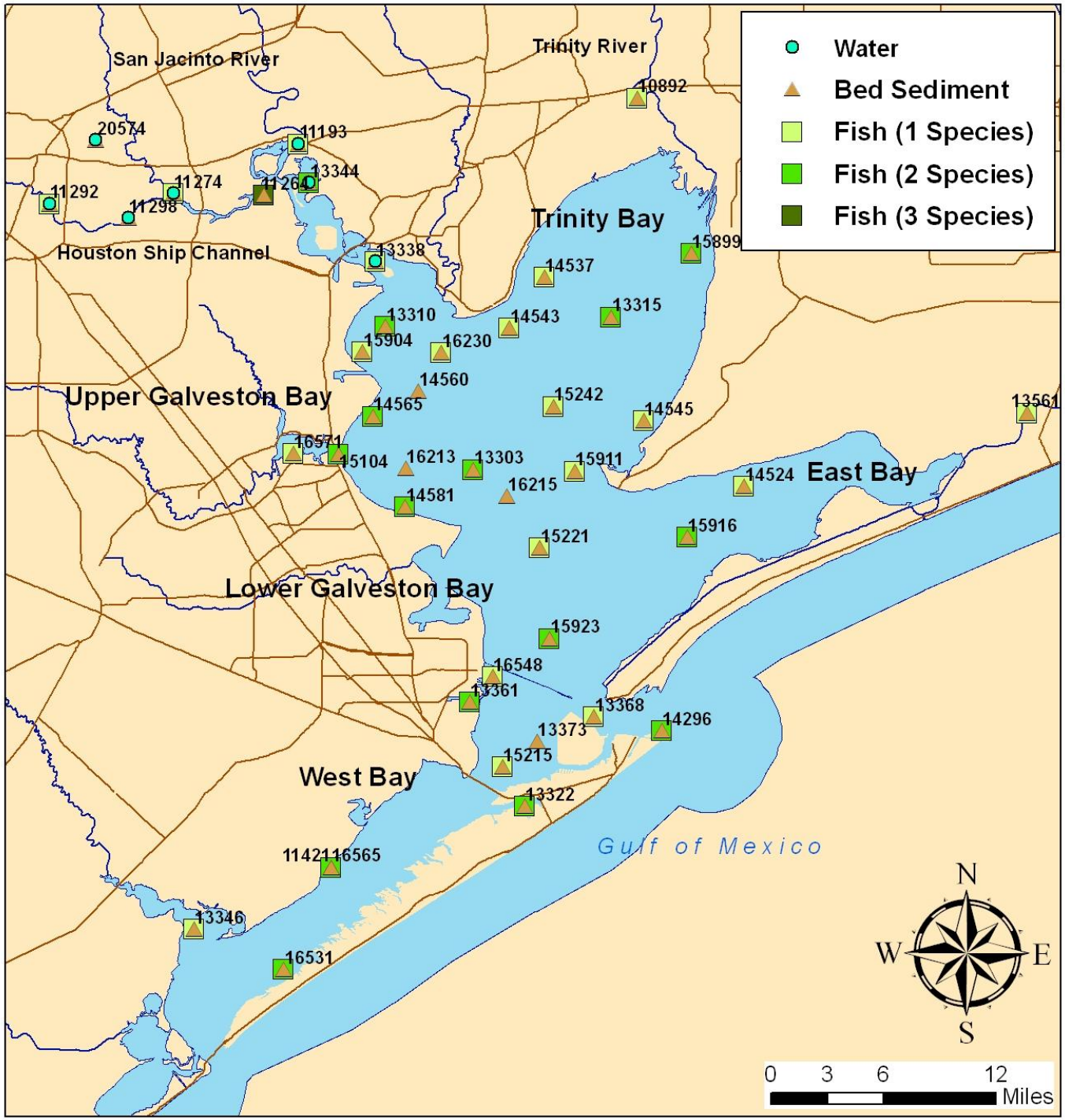
TMDL for Dioxins in HSC System

- Dioxin data collected in 2002-03, 2004-05, 2011 and 2012
- TMDL draft developed in 2006
- Internal TCEQ comments and standard revisions have occurred since 2006

TMDL for PCBs in HSC and Upper Galveston Bay

- PCB data collected in 2002-03, 2008, 2009, 2011, and 2012
- Model development and application
  - RMA2 + WASP used for dioxin TMDL
  - Calibration and validation with 02-03, 08, 09, 2011/2012 datasets

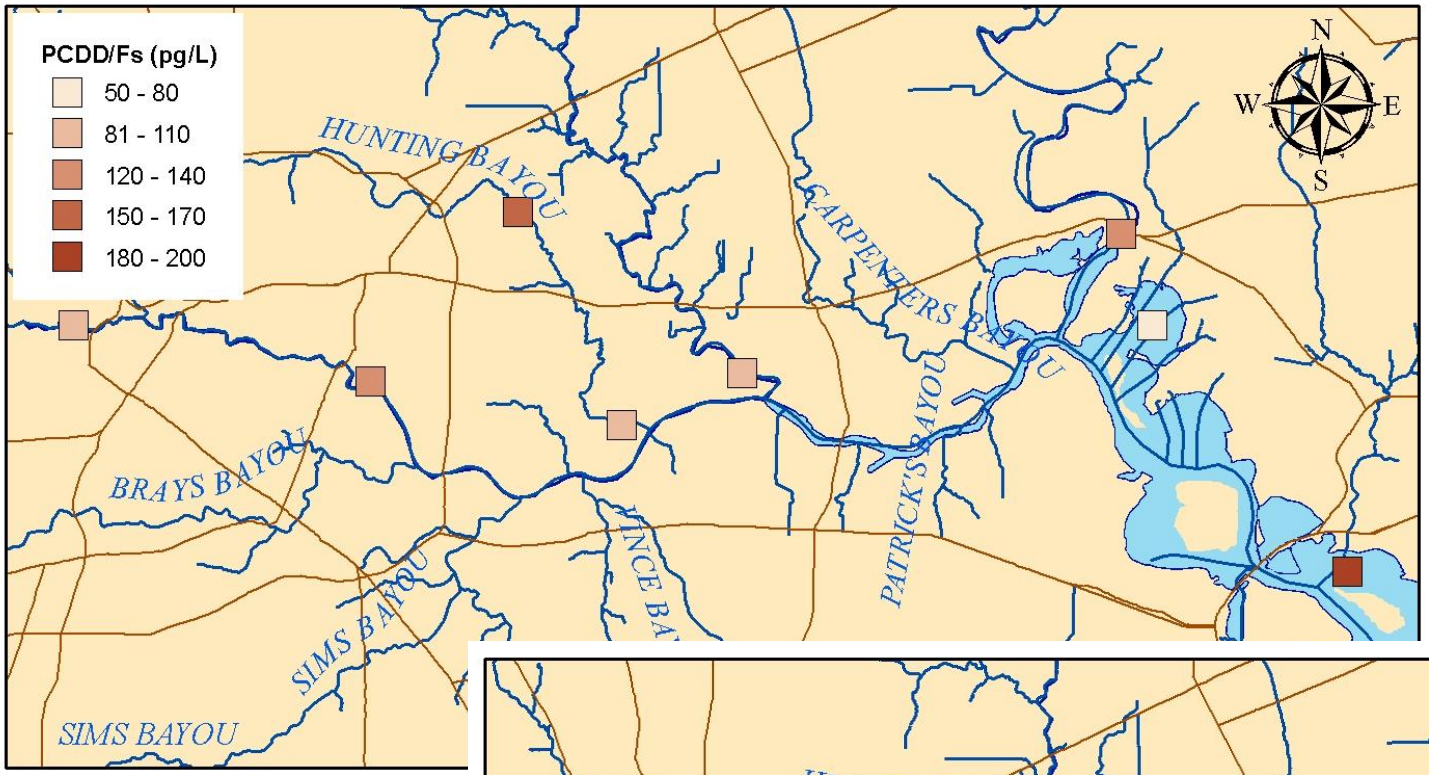
Dioxin and PCBs
2011 Sample Results



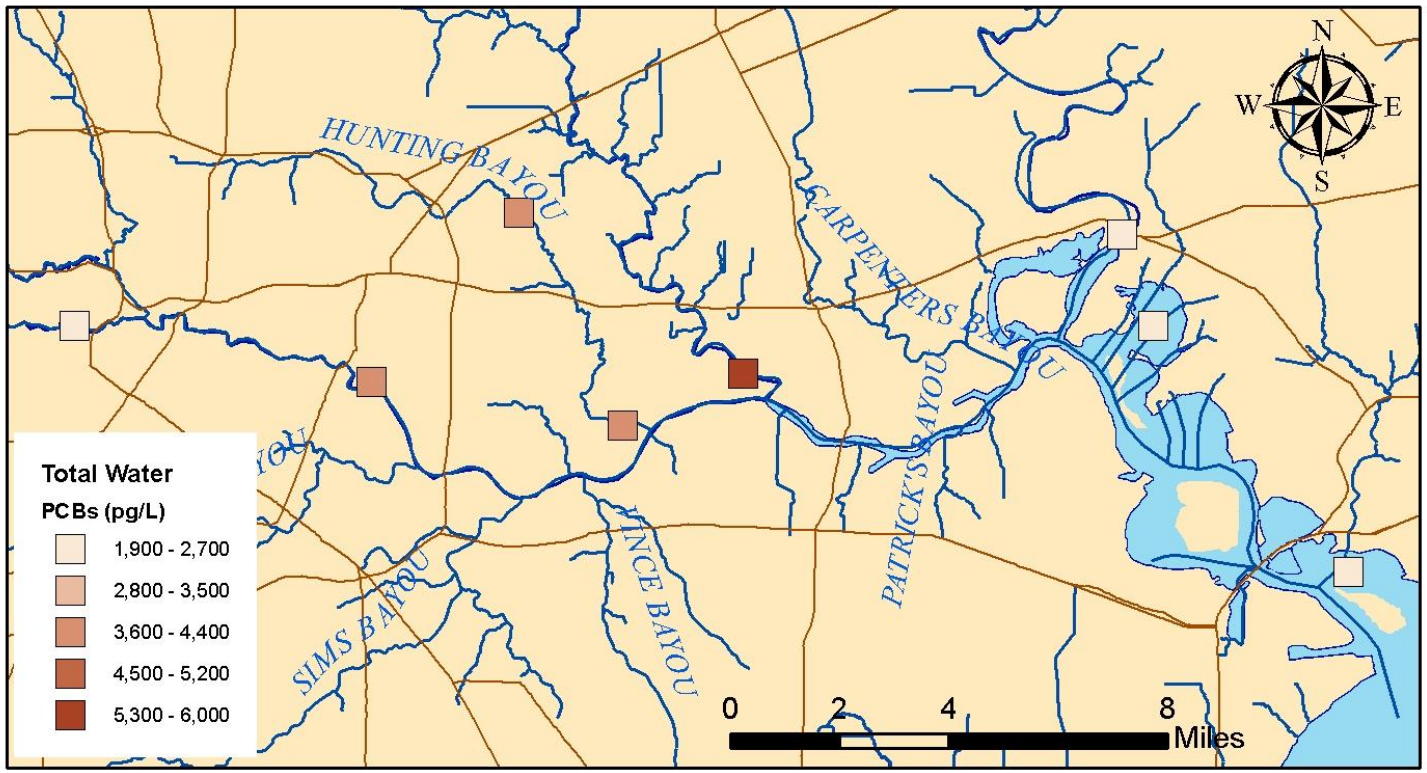
Summer 2011 HSC and Galveston Bay area sample collection activities

Field Sample Counts

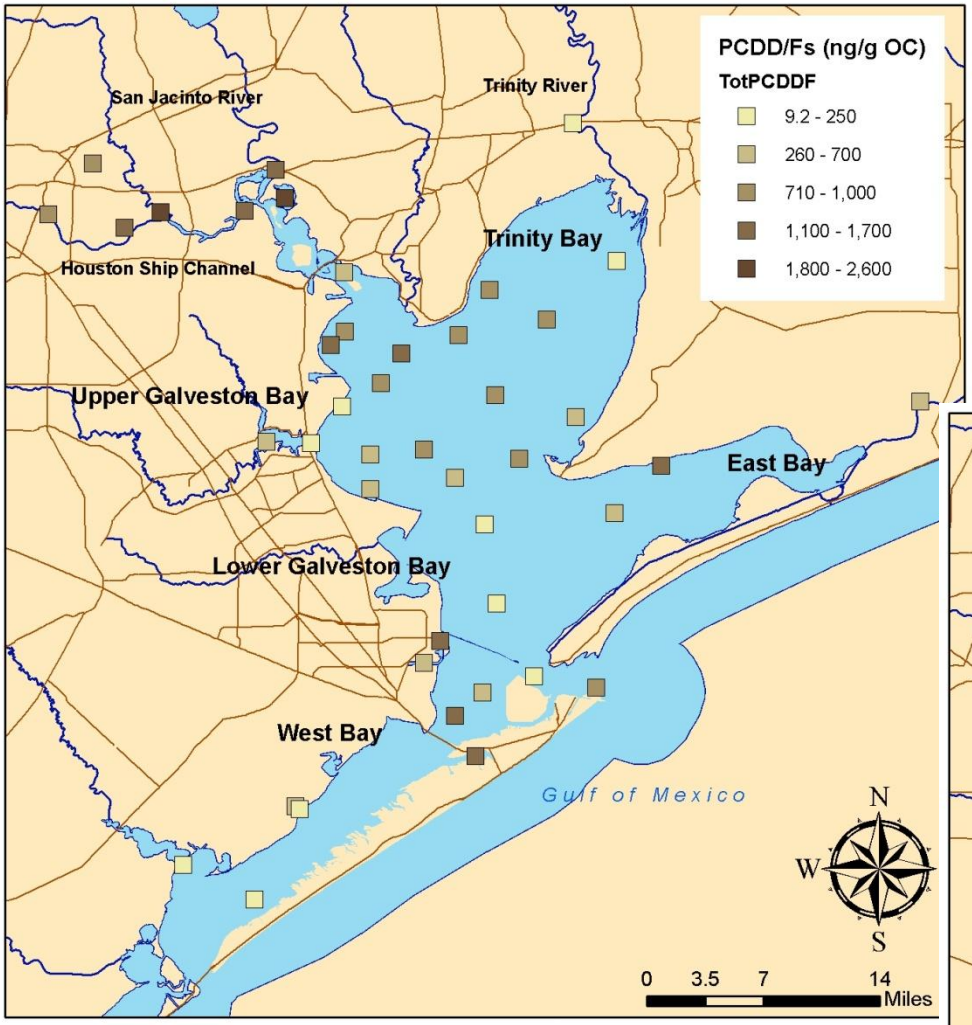
- 8 water samples
- 46 sediment samples
- 76 fish samples

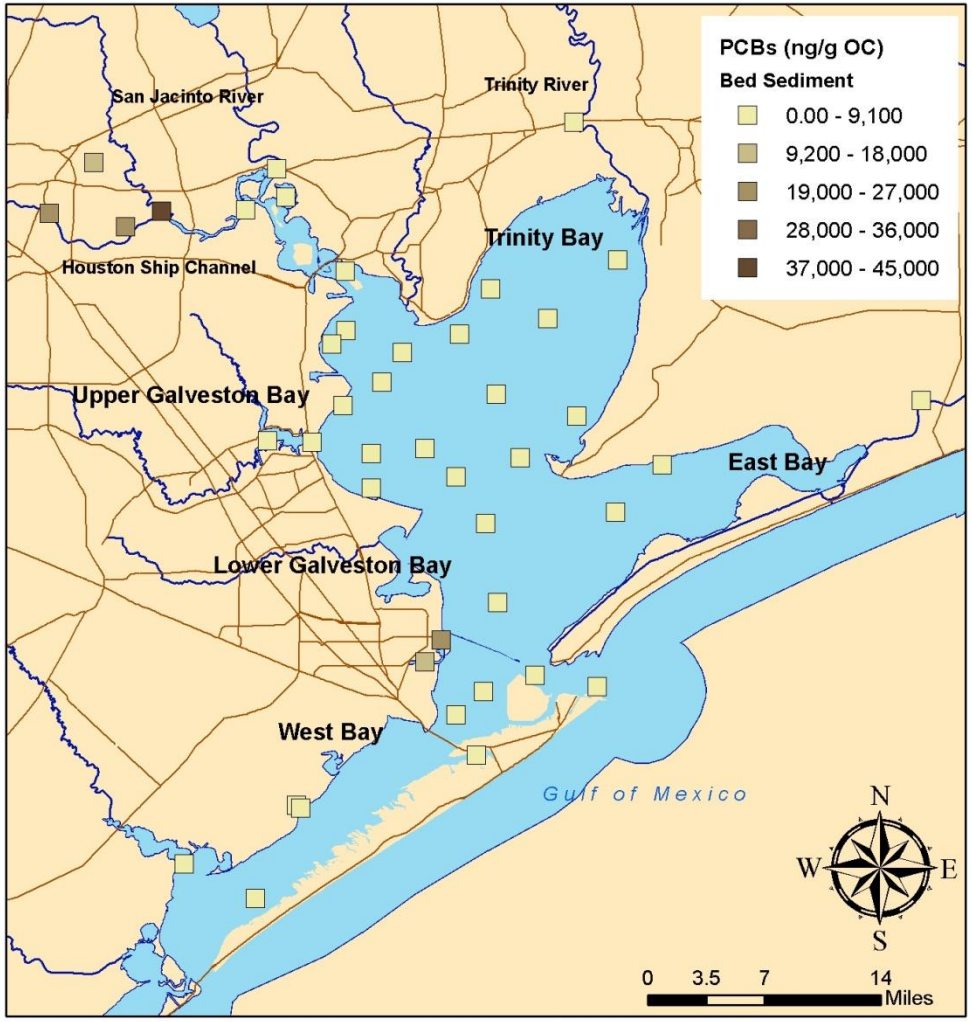


Total PCBs and total PCDD/Fs in 2011 HSC samples. All water results are suspended + dissolved.



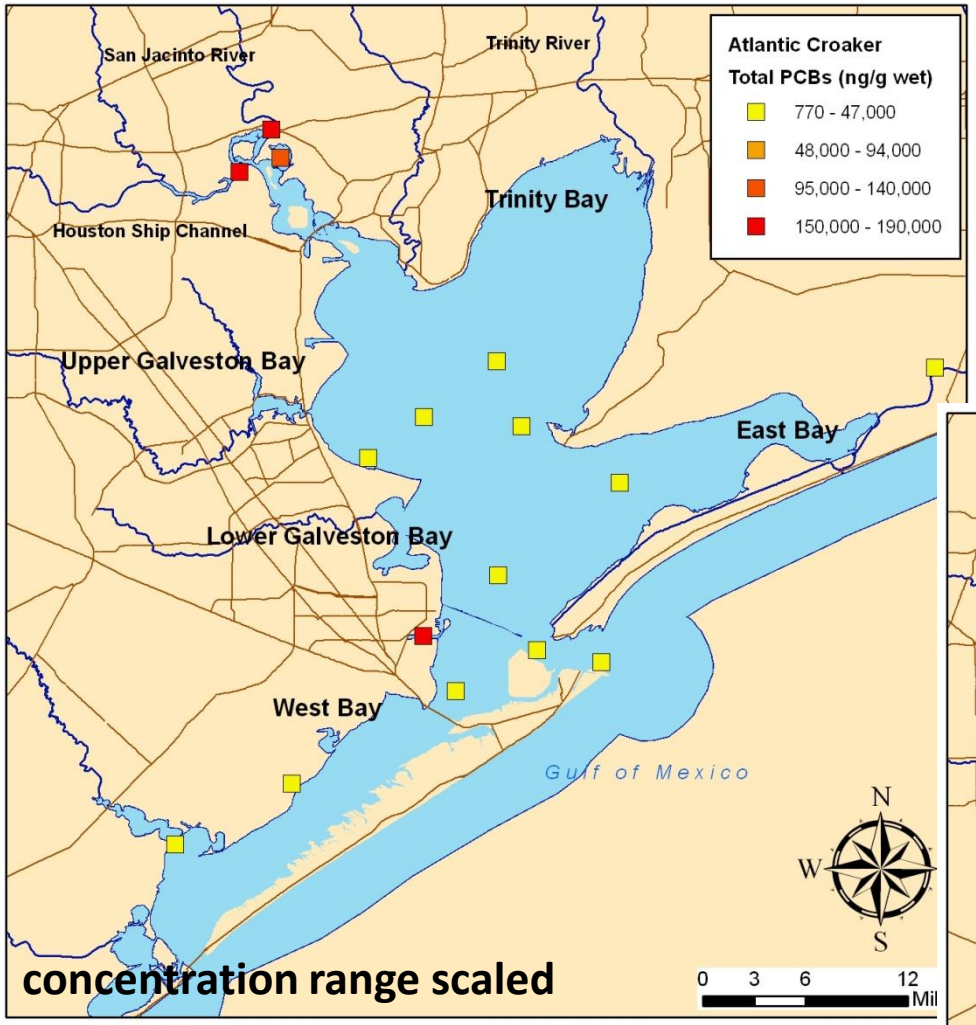
Total PCDD/Fs (Σ17) and Total PCBs (Σ209) ng/g organic carbon

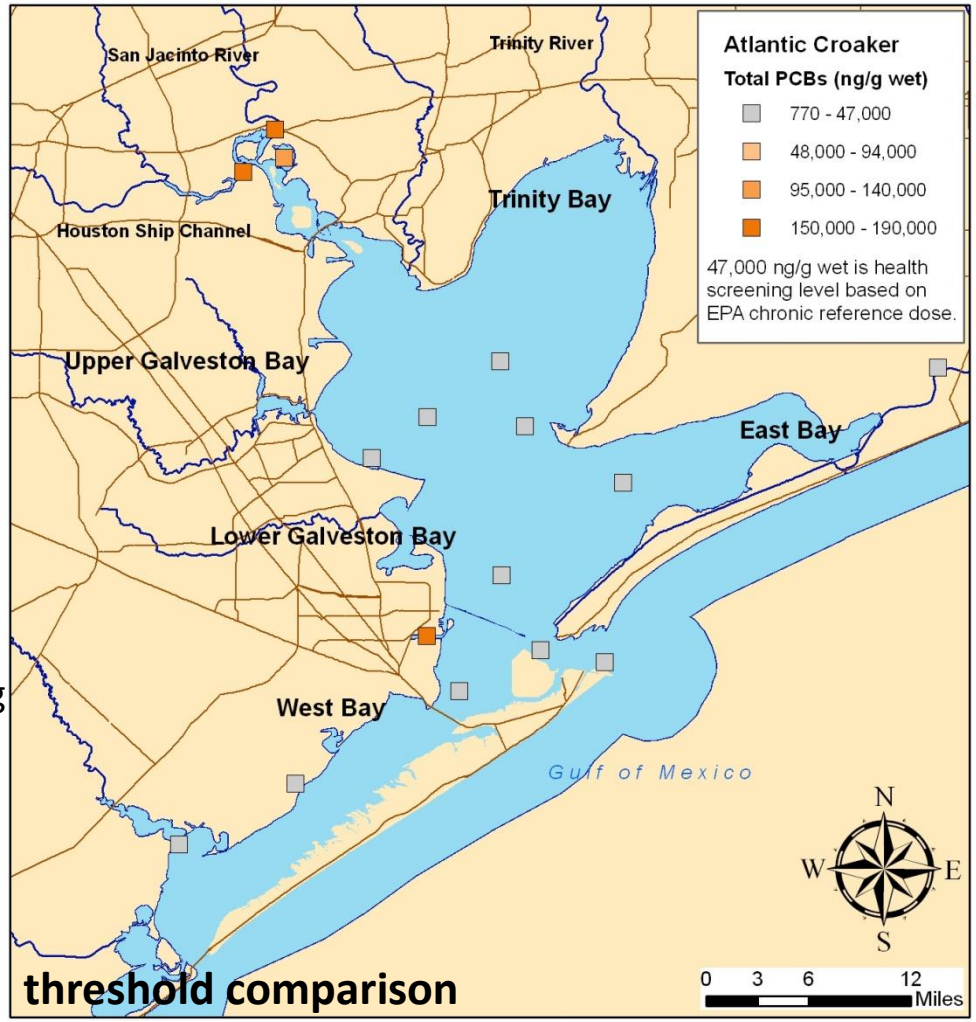




Atlantic Croaker Samples for Total PCBs Concentration (ng/g wet)

47,000 ng/g wet total PCBs represents the Texas Dept State Health Service non-cancer health screening level.

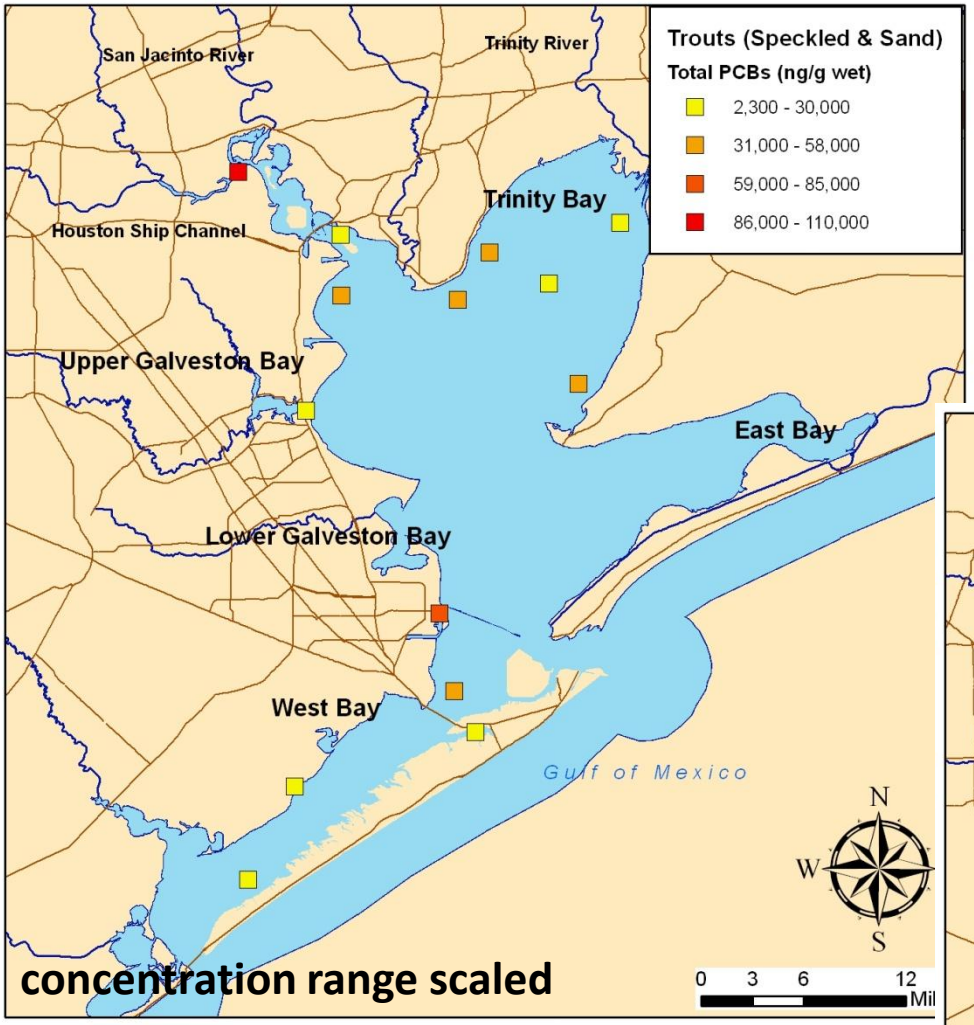




Grayed samples (lower right plot) represent samples nominally below the health screening level.

Trout (speckled, sand) Samples for Total PCBs Concentration (ng/g wet)

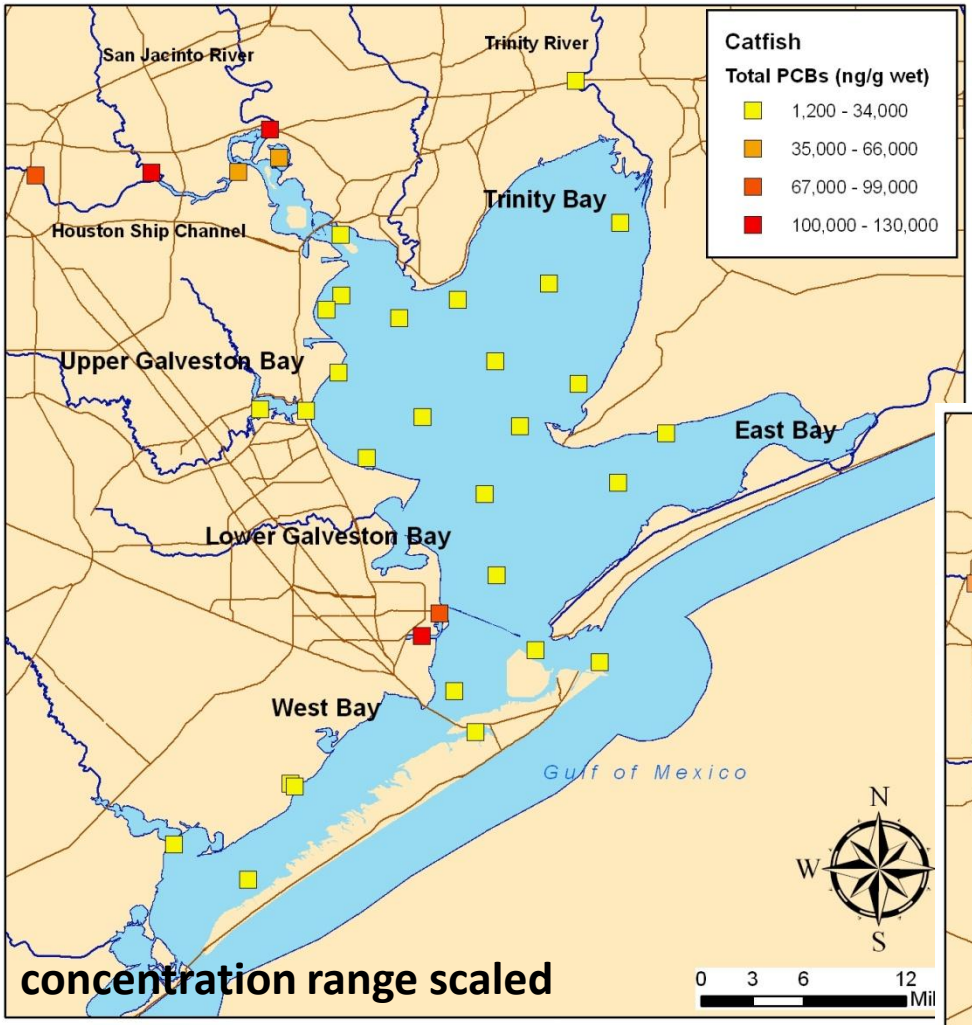
47,000 ng/g wet total PCBs represents the Texas Dept State Health Service non-cancer health screening level.

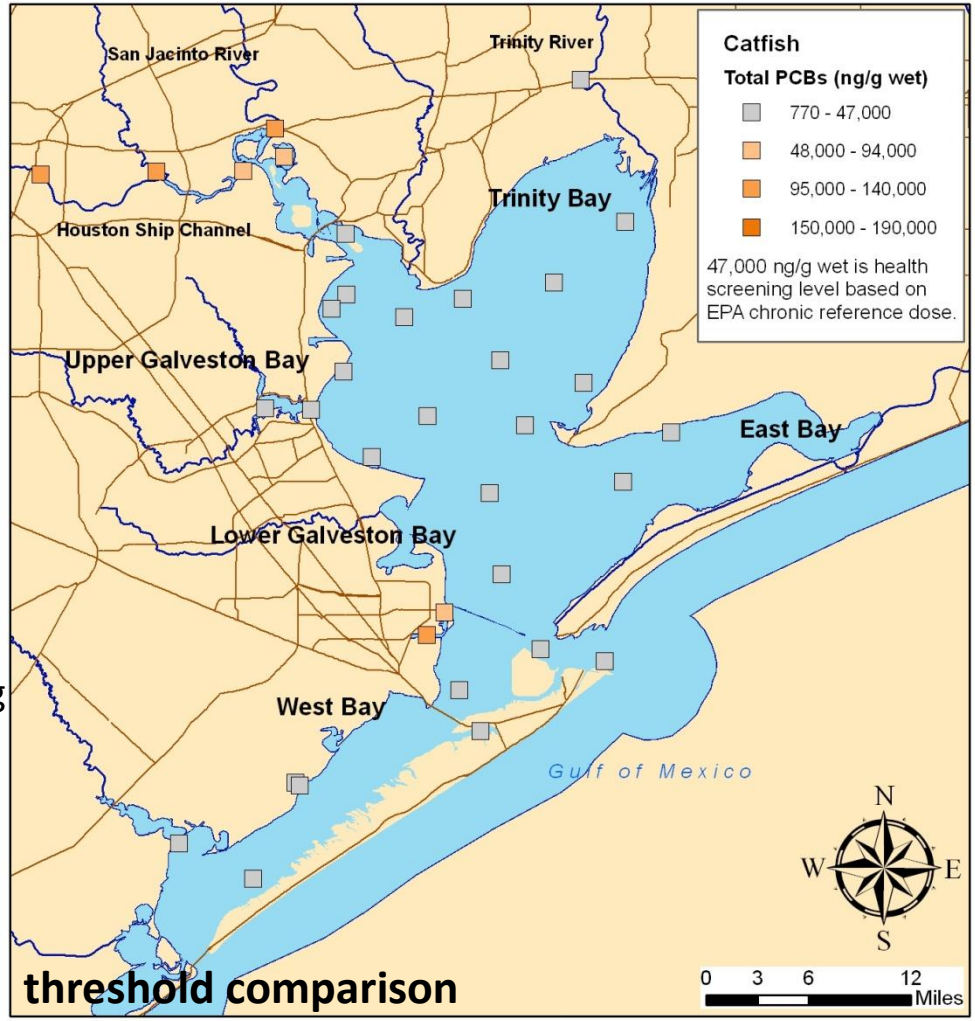


Grayed samples (lower right plot) represent samples nominally below the health screening level.

Catfish (blue, channel, hardhead) Samples for Total PCBs Concentration (ng/g wet)

47,000 ng/g wet total PCBs represents the Texas Dept State Health Service non-cancer health screening level.

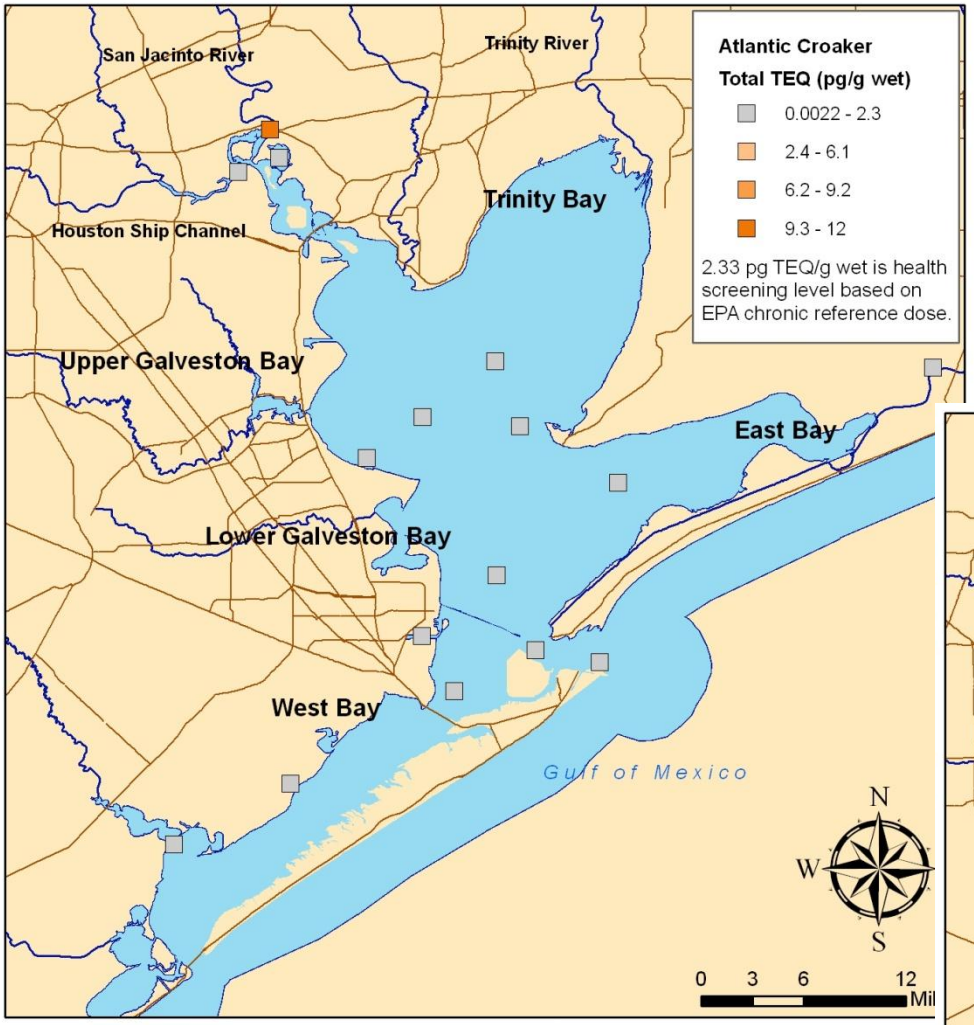




Grayed samples (lower right plot) represent samples nominally below the health screening level.

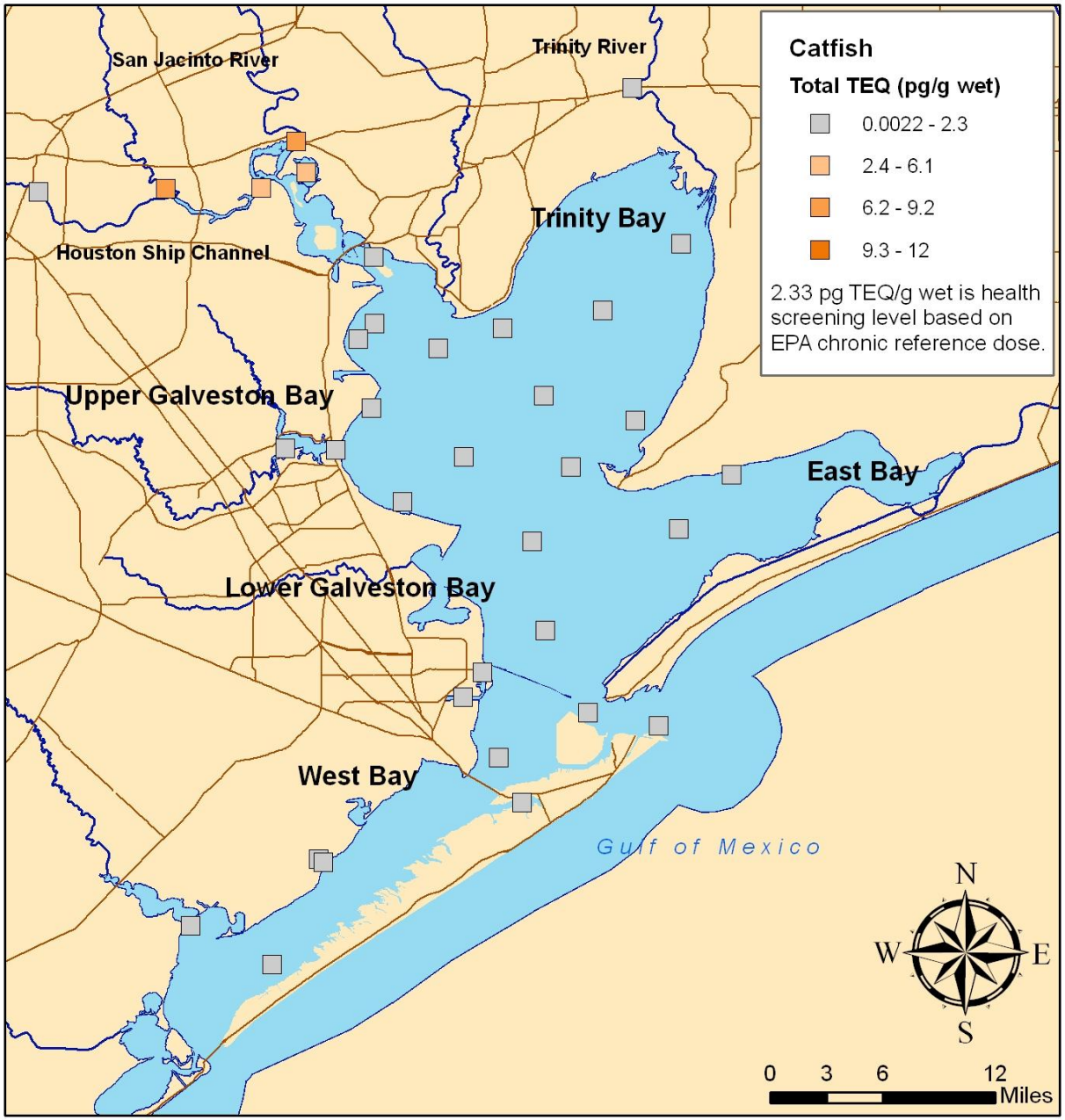
Atlantic Croaker and Trout Samples for 2378-TCDD Toxic Equivalency (TEQ) as pg/g wet

2.33 pg/g wet TEQ represents the Texas Dept State Health Service non-cancer health screening level.



Grayed samples (lower right plot) represent samples nominally below the health screening level.

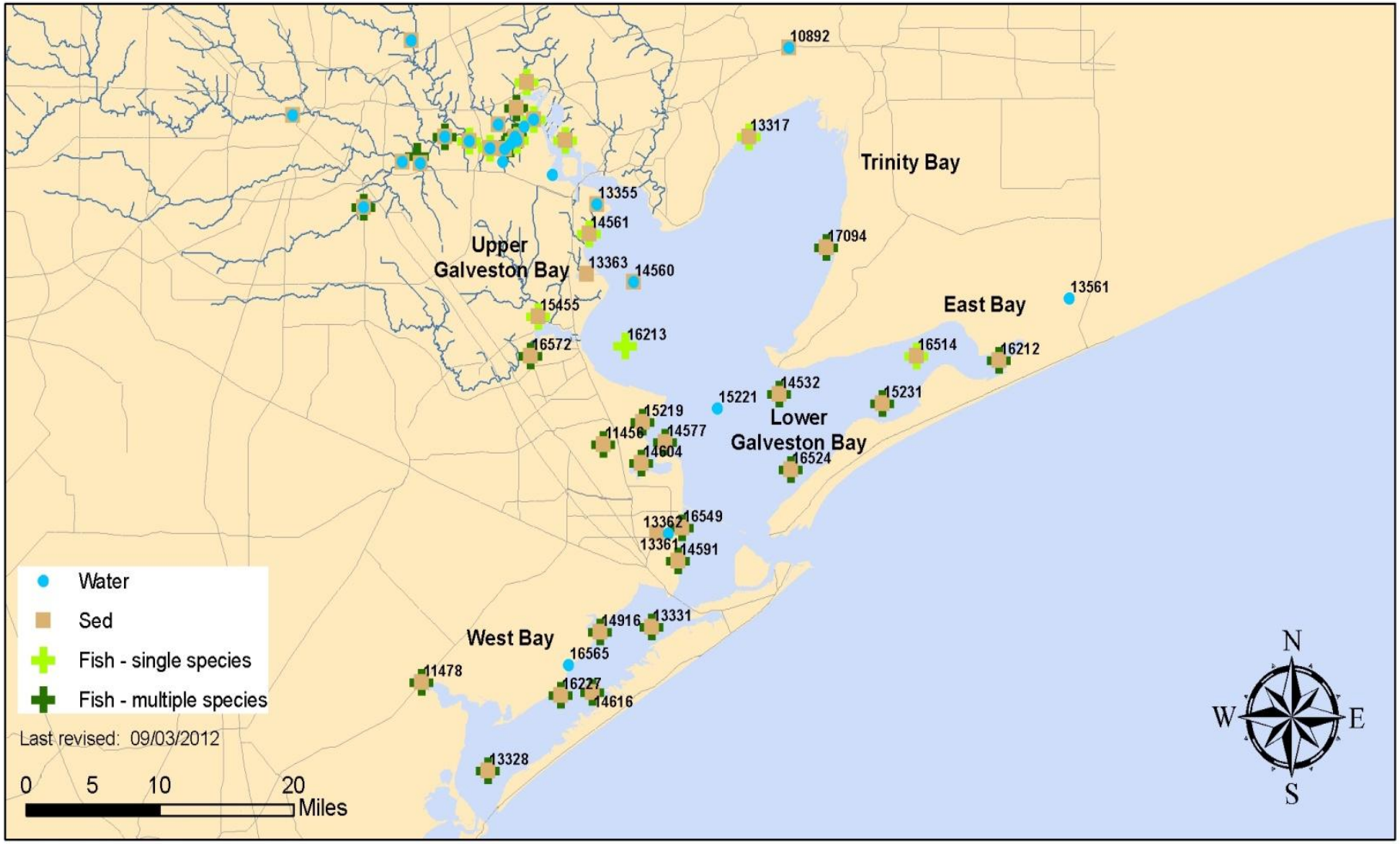
Catfish Samples for 2378-TCDD Toxic Equivalency (TEQ) as pg/g wet



2.33 pg/g wet TEQ represents the Texas Dept State Health Service non-cancer health screening level.

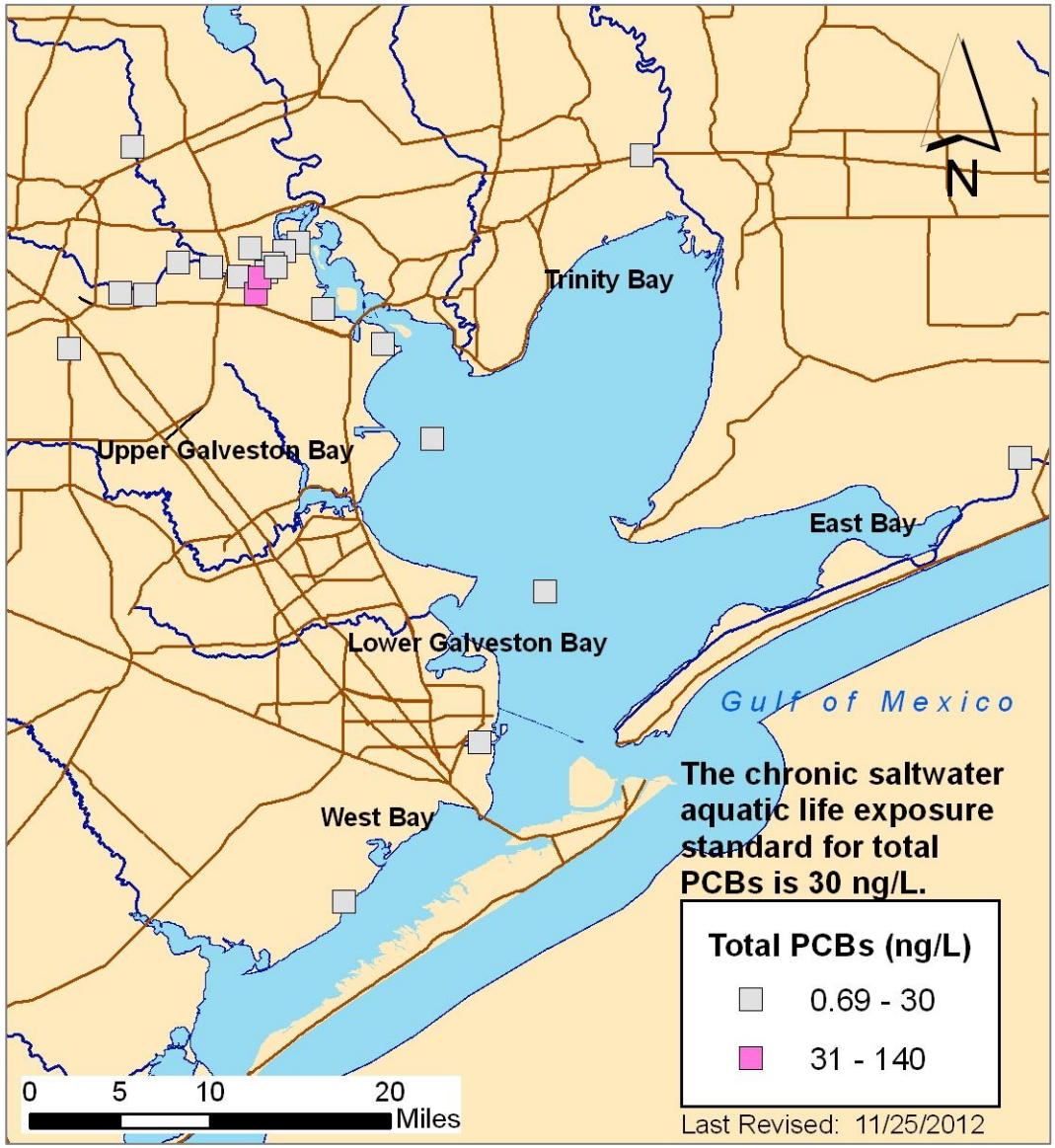
SUMMER 2012 PRELIMINARY RESULTS

Summer 2012 HSC and Galveston Bay area sample collection activities



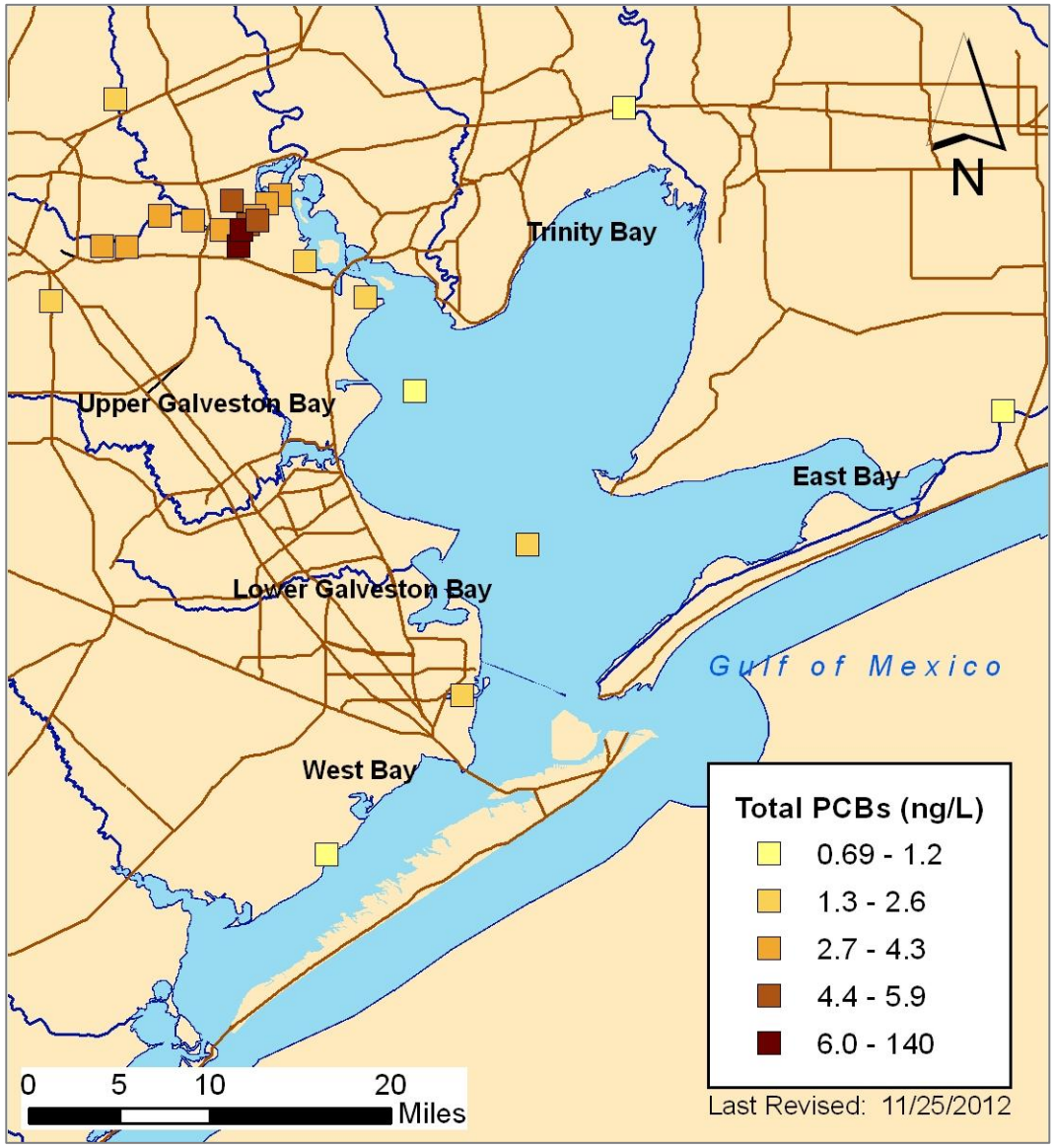
Total PCBs (Σ209) from summer 2012 WATER samples with respect to saltwater aquatic life standard

- Suspended and dissolved sampled fractions combined into a single value.
- The saltwater aquatic life standard is from TCEQ 2010 health standards. The freshwater standard is lower (14 ng/L).
- All samples were lower than the aquatic life protection in both salt and freshwater except for two locations in Patrick Bayou that were both approximately 135 ng/L (4.5 times higher than the standard).
- The mouth of Patrick Bayou was sampled and is 5 ng/L representing an immediate Patrick Bayou to HSC dilution ratio of (1:27).



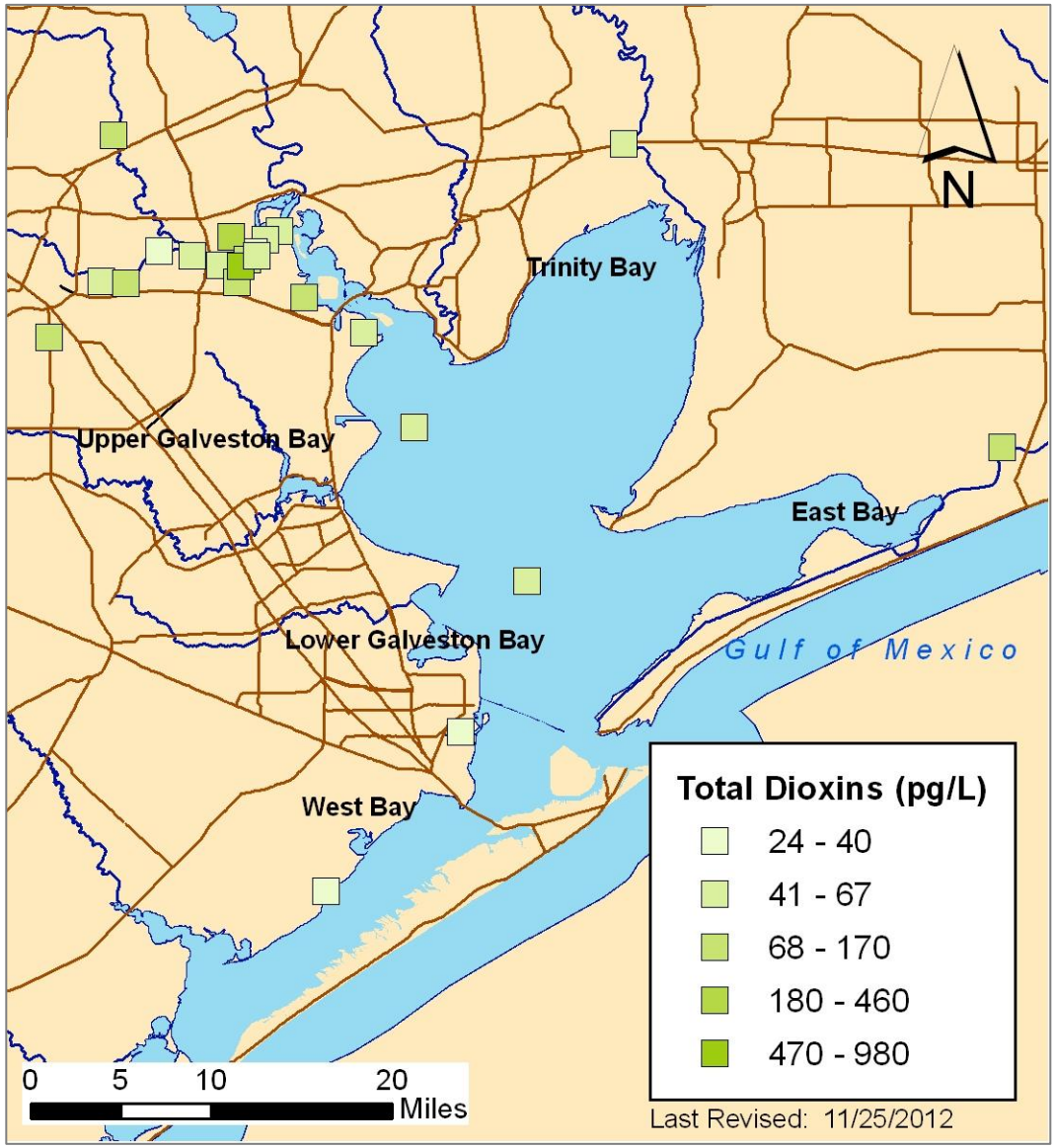
Total PCBs (Σ209) from summer 2012 WATER samples with darker color indicating higher concentration

- The mean total PCBs concentration above the SJR and below the SJR were 25±25 and 1.3±0.48 ng/L (mean±95% confidence), respectively.
- The mean±95% confidence for the supended fraction of total PCBs was 21±5.7% with only 2 samples of 26 with suspended PCBs > dissolved PCBs.



Total dioxins (Σ17 2378-substituted) from summer 2012 WATER samples with darker color indicating higher concentration

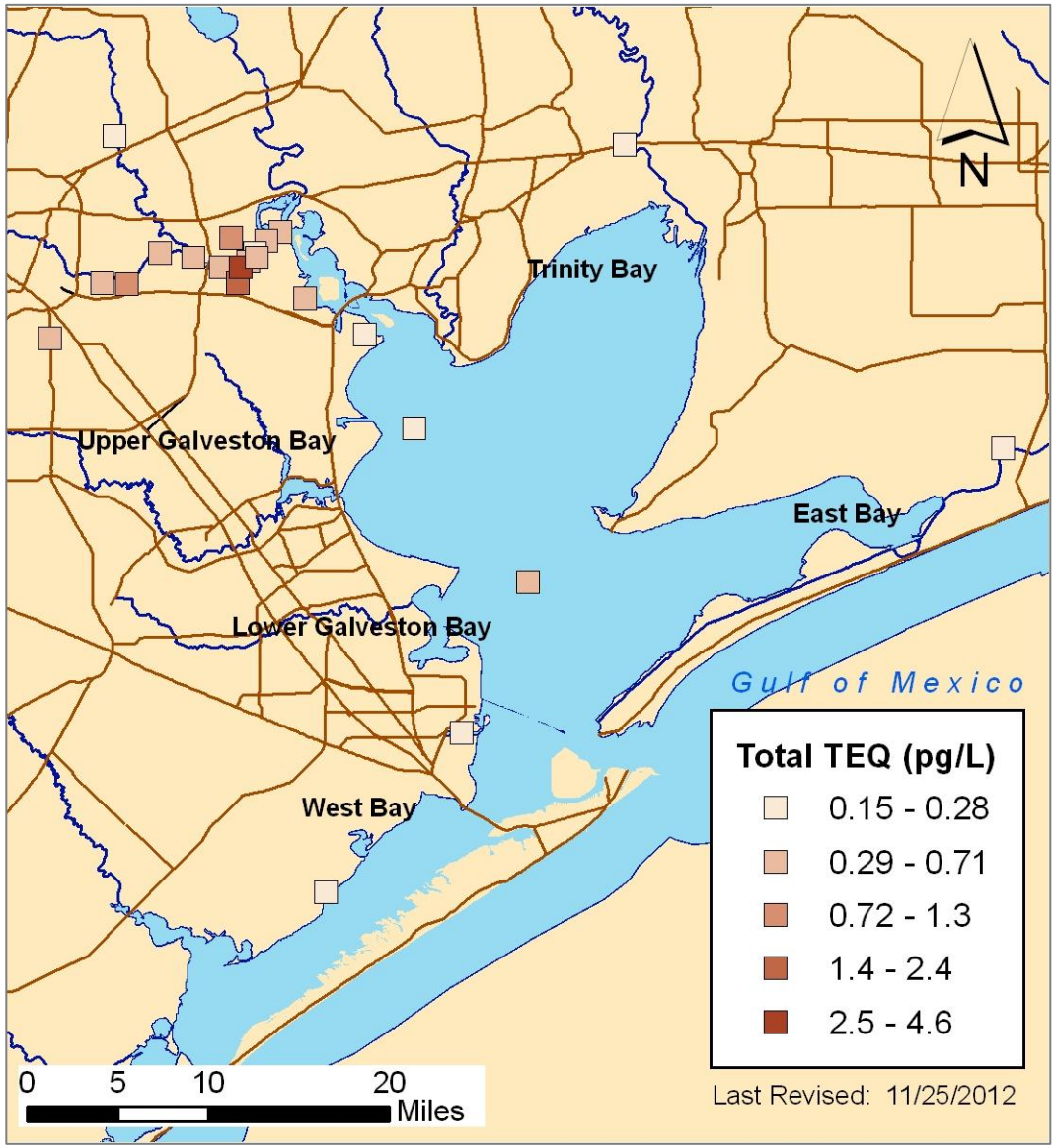
- The mean total PCDD/Fs concentration above the SJR and below the SJR were 190±150 and 62±36 pg/L (mean±95% confidence), respectively.
- The mean±95% confidence for the suspended fraction of total PCDD/Fs was 89±3.1% with all samples (26) that had suspended PCDD/Fs > dissolved PCDD/Fs.



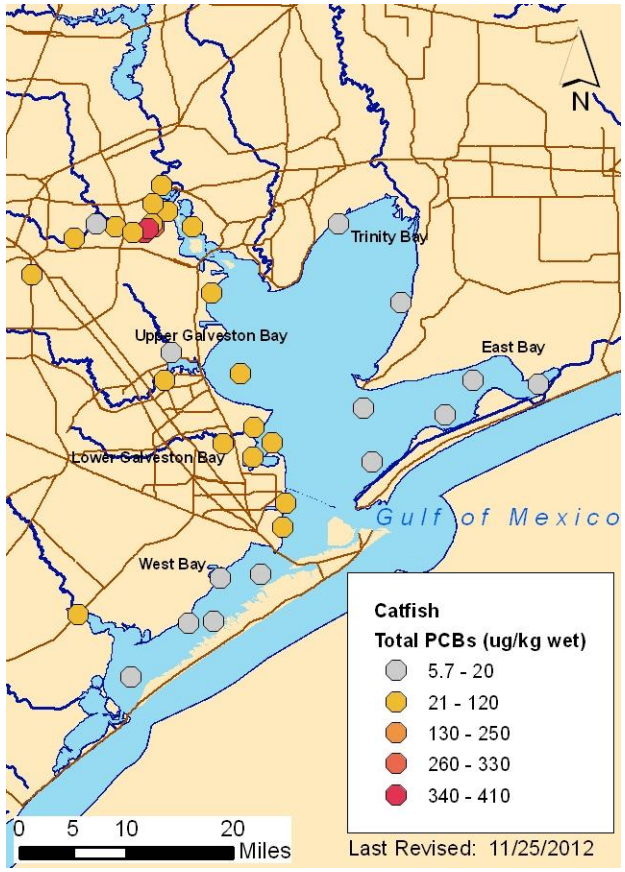
Total Texas TEQ (2378-TCDD equivalents) from summer 2012 WATER samples with darker color indicating higher concentration

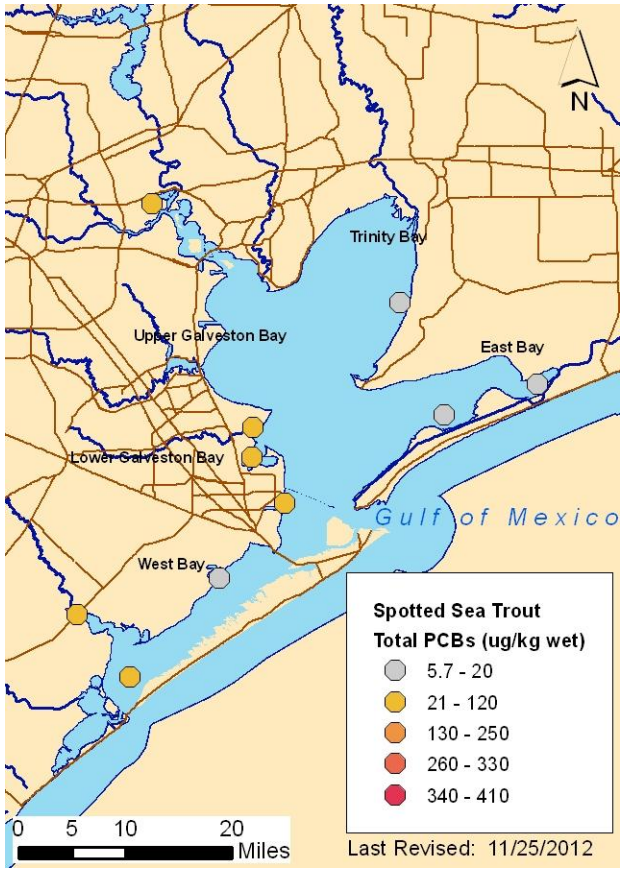
Using the water equivalent human health standard, all TEQ concentrations (dissolved+suspended) except one are HIGHER than the 0.08 pg TEQ/L and more than half are twice this value.

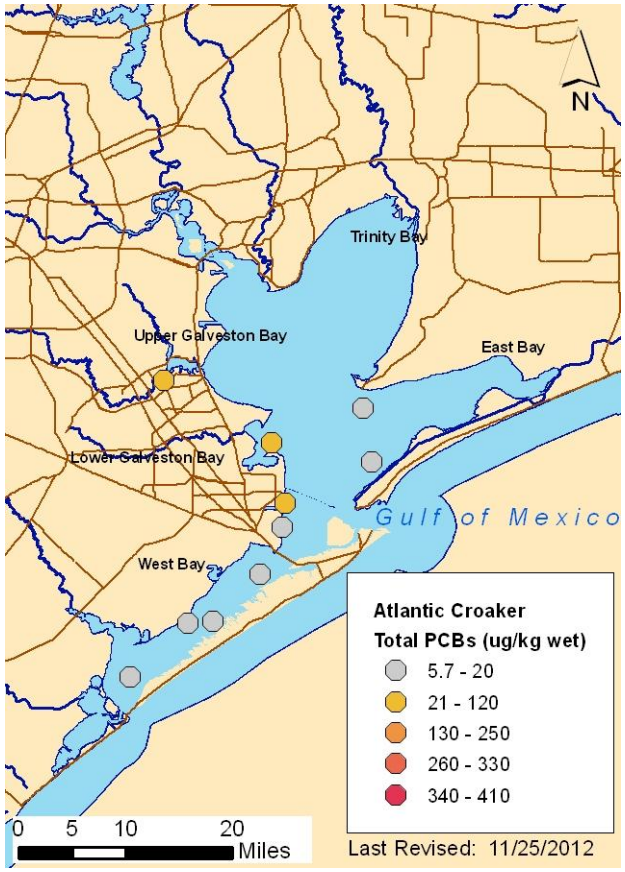
The 2010 human health tissue standards for TCDD equivalents (TEQ) is 0.4 ng TEQ/kg wet tissue. The BCF is 5000 kg wet tissue/L.



Total PCBs (Σ209) TISSUE concentrations from summer 2012 with reference to 19.96 µg/kg TCEQ human health standard

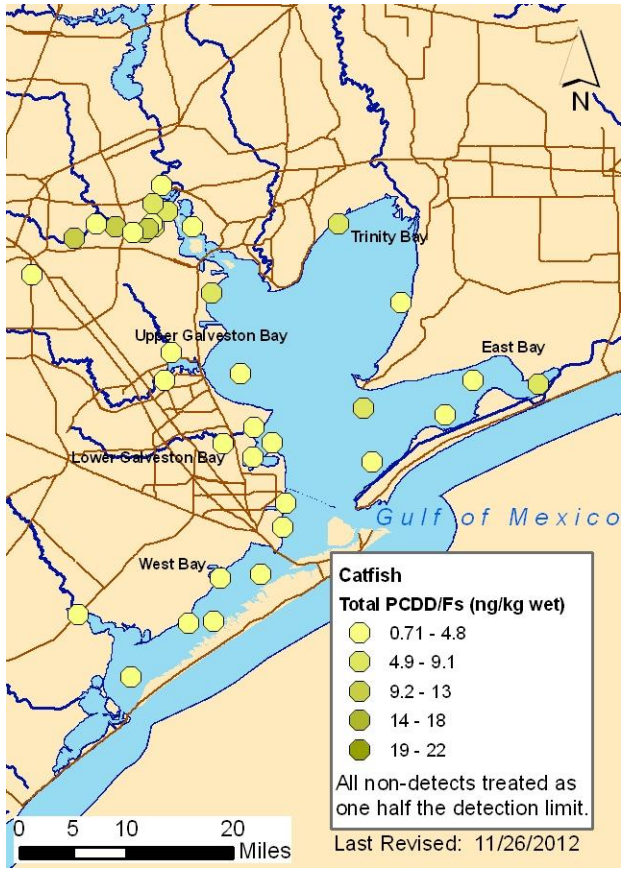


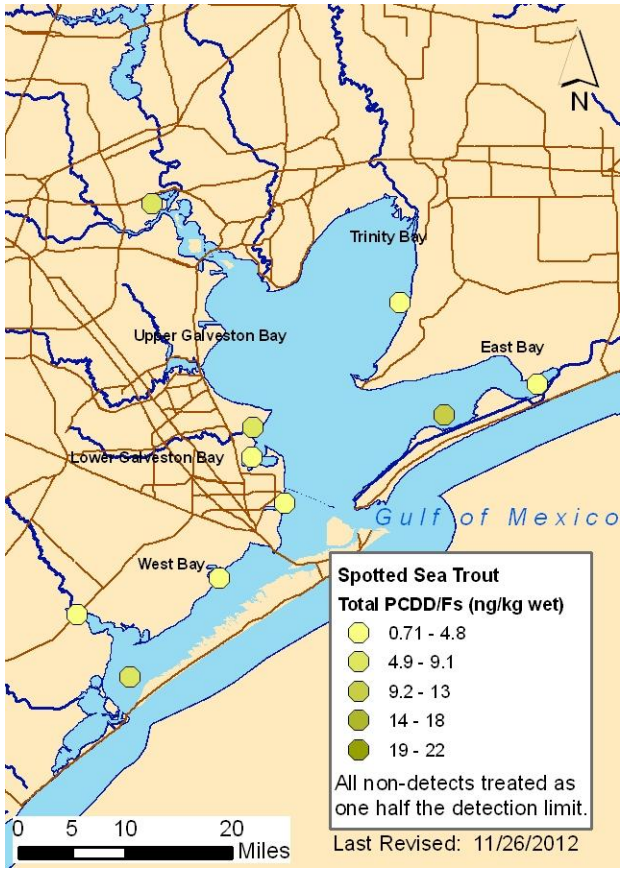


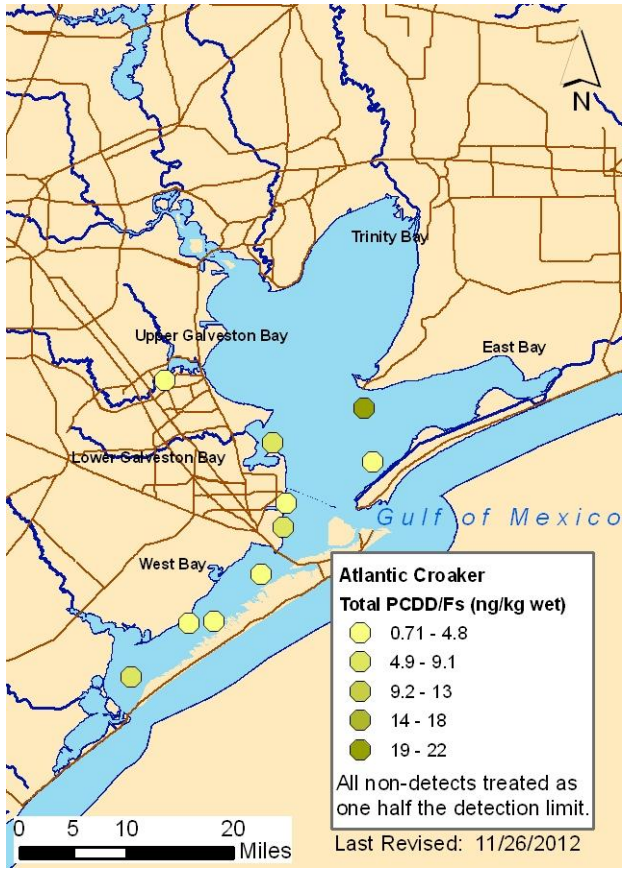


*Chapter 307 - Texas Surface Water Quality Standards, Rule Project No. 2007-002-307-PR, effective July 22, 2010. http://www.tceq.texas.gov/waterquality/standards/2010standards.html#the-2010-standards-

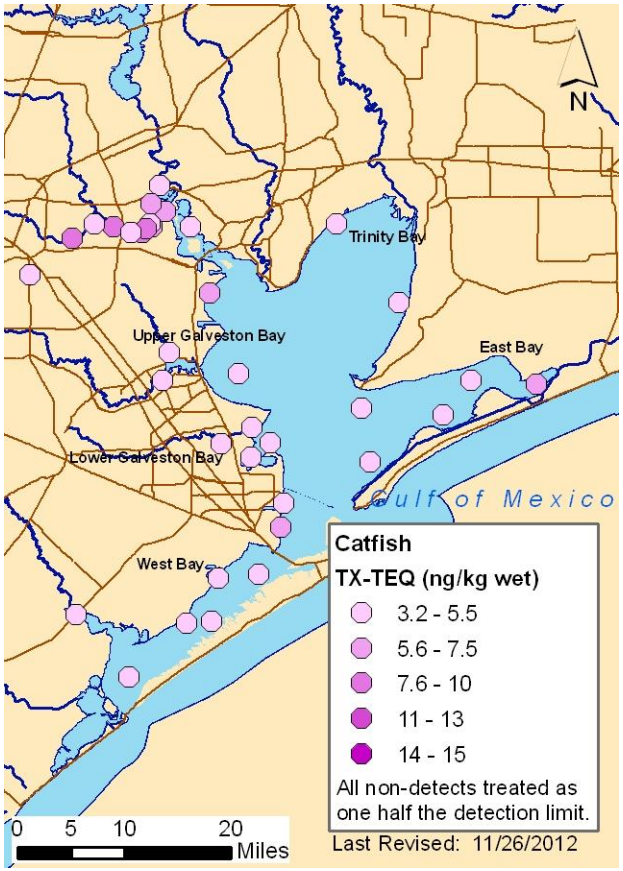
Total dioxins (Σ17 2378-substituted) TISSUE concentrations from summer 2012

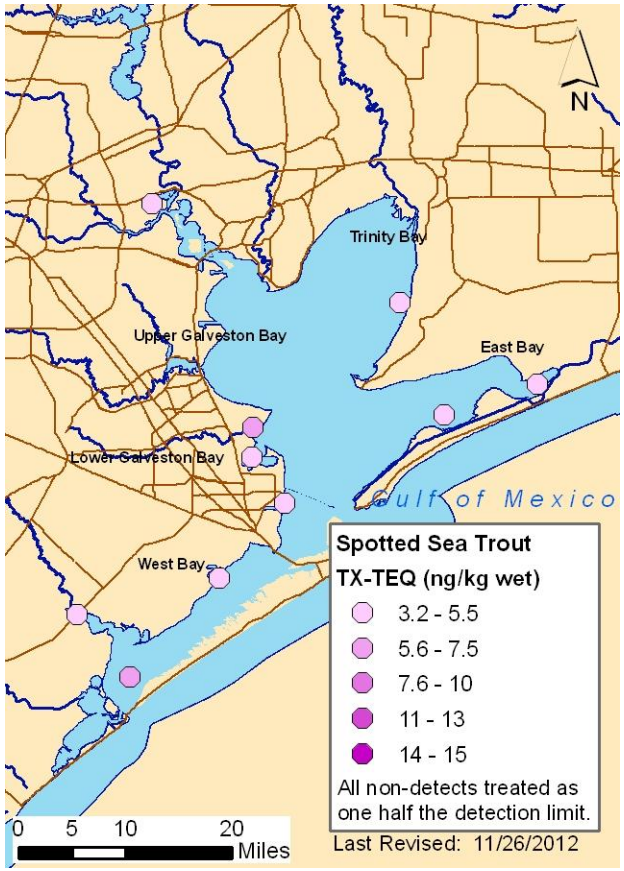


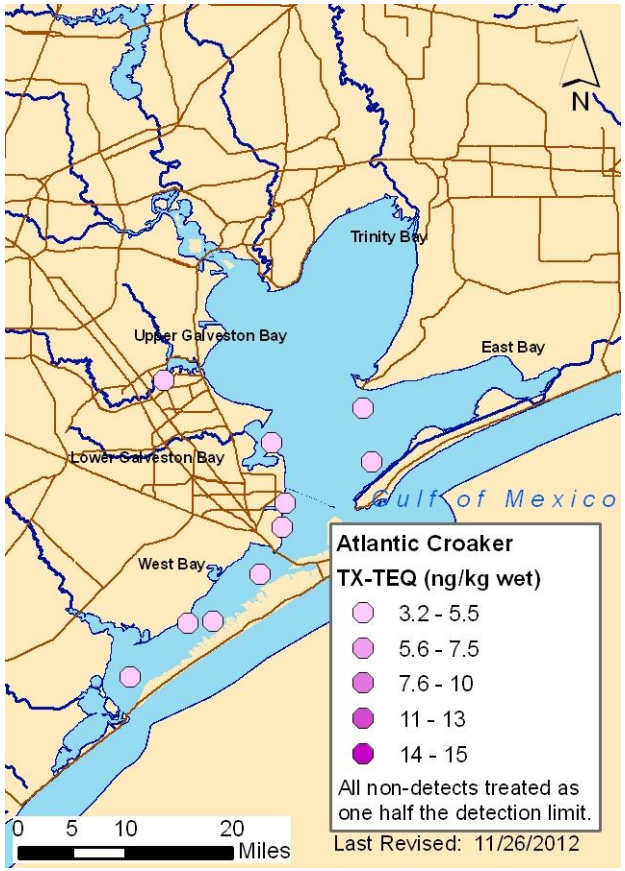




Total TX-TEQ (2378-TCDD equivalents) TISSUE concentrations from summer 2012 (human health TCEQ std = 0.4 ng/kg)

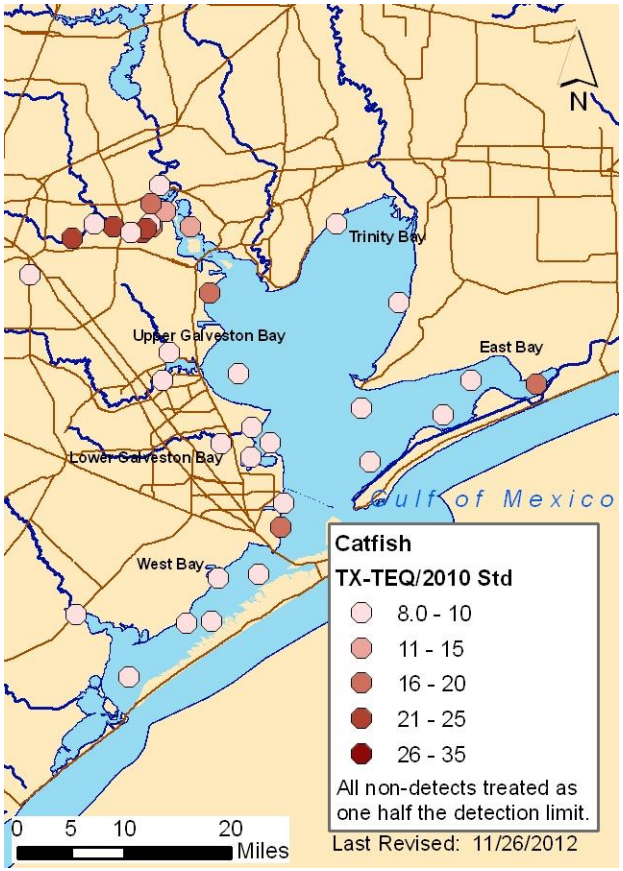


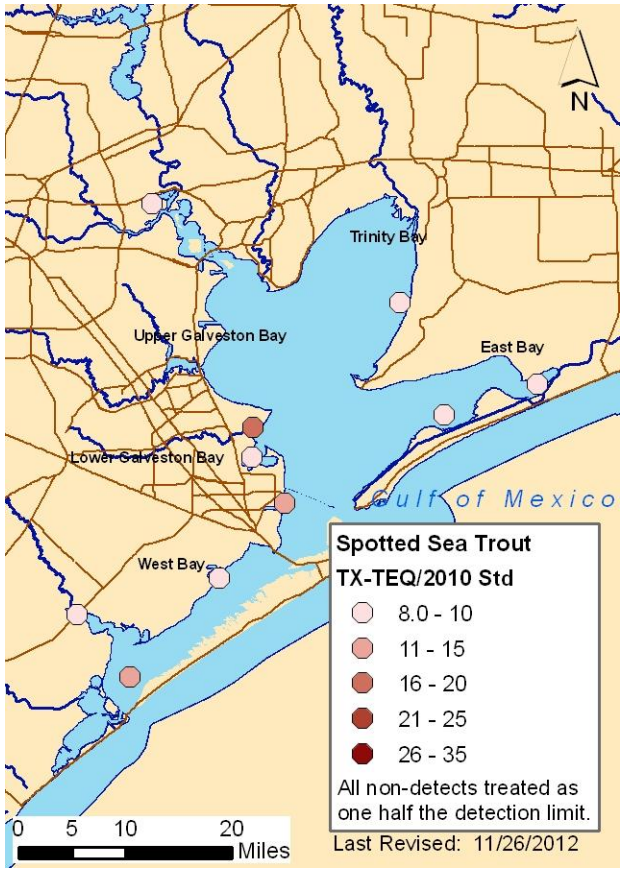


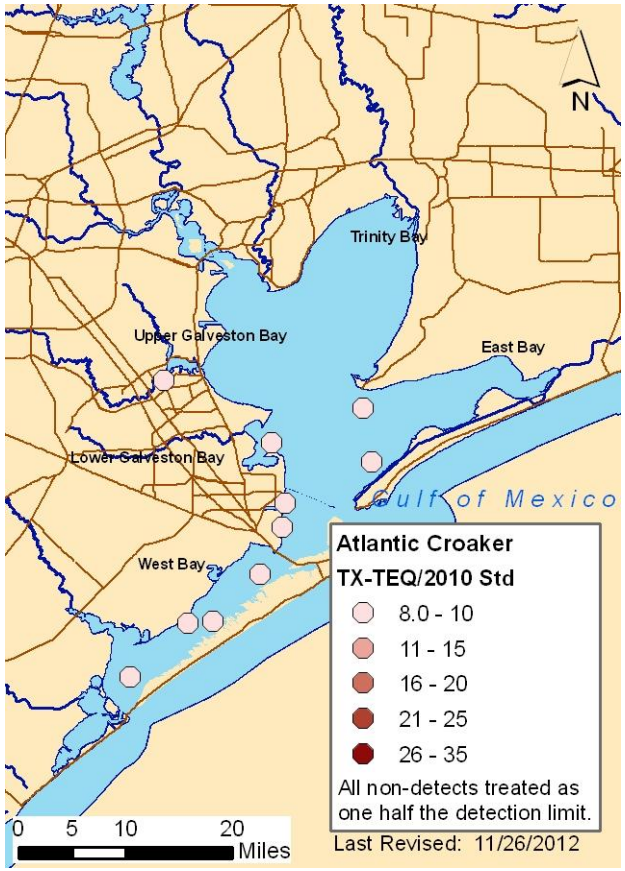


- The TX-TEQ is heavily influenced by non-detects, and the mean total detection rate for TX-TEQ congeners was only **19%**.
- With non-detect = ONE HALF of the detection limit in tissue, ALL 2012 fish tissue samples are above the human health standard, and the lowest sample is 8 times higher than the standard (3.2 ng/kg wet).

Total TX-TEQ (2378-TCDD equivalents) TISSUE concentrations from summer 2012 normalized by the human health TCEQ std (0.4 ng TEQ/kg wet)







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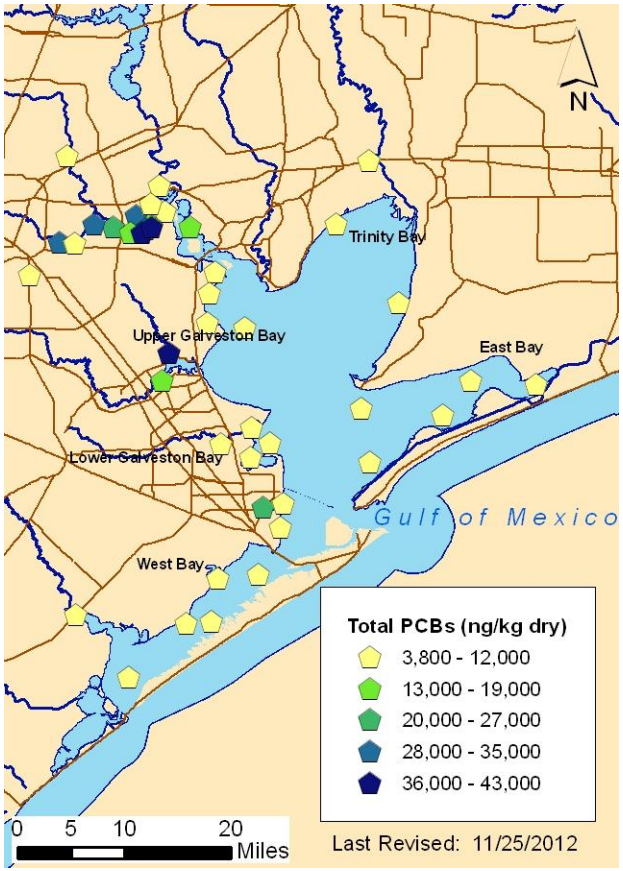
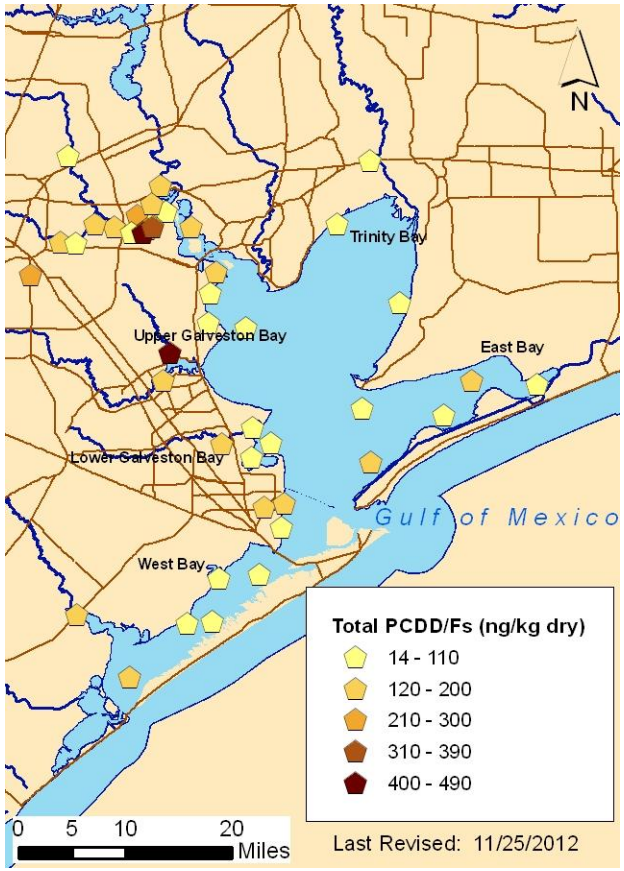
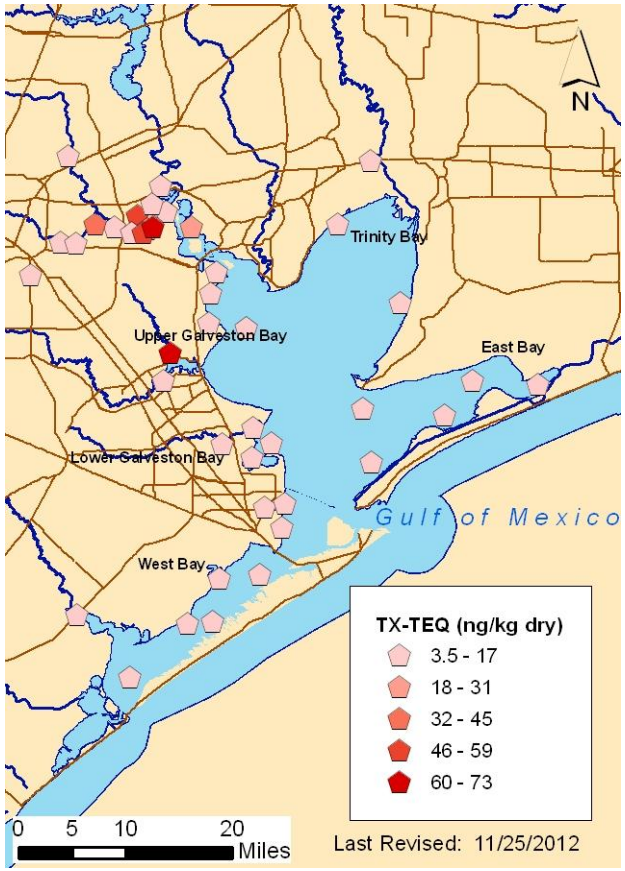
SEDIMENT persistent organic pollutant results from summer 2012

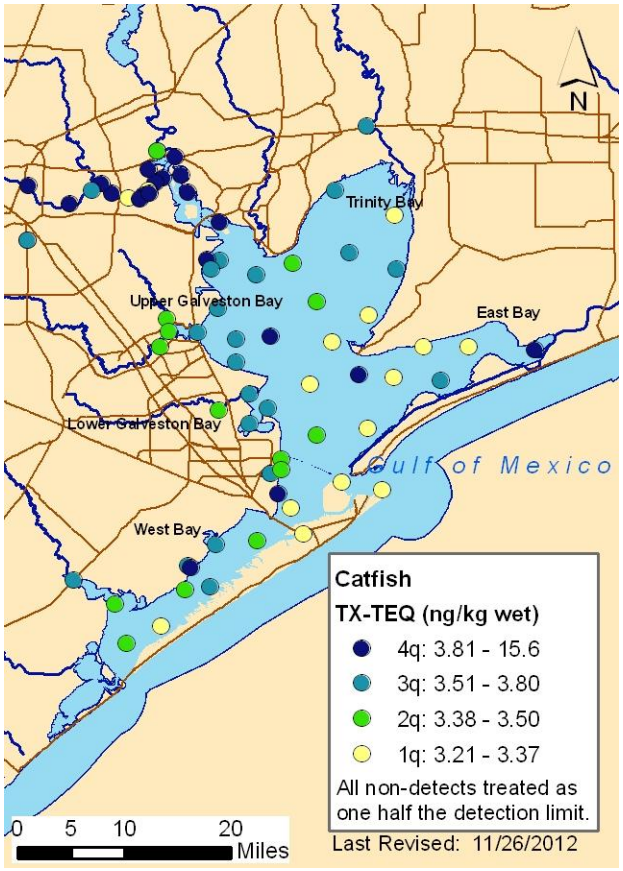


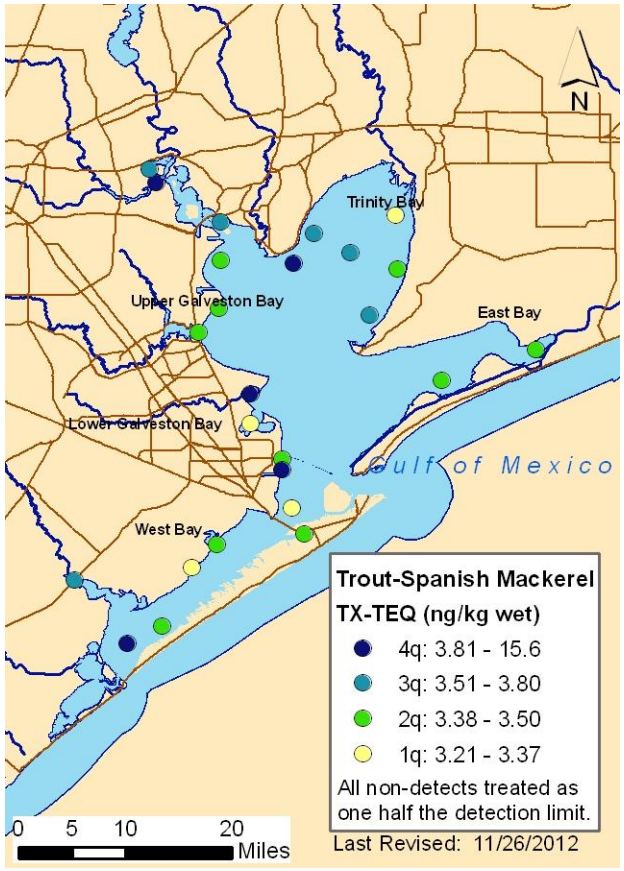


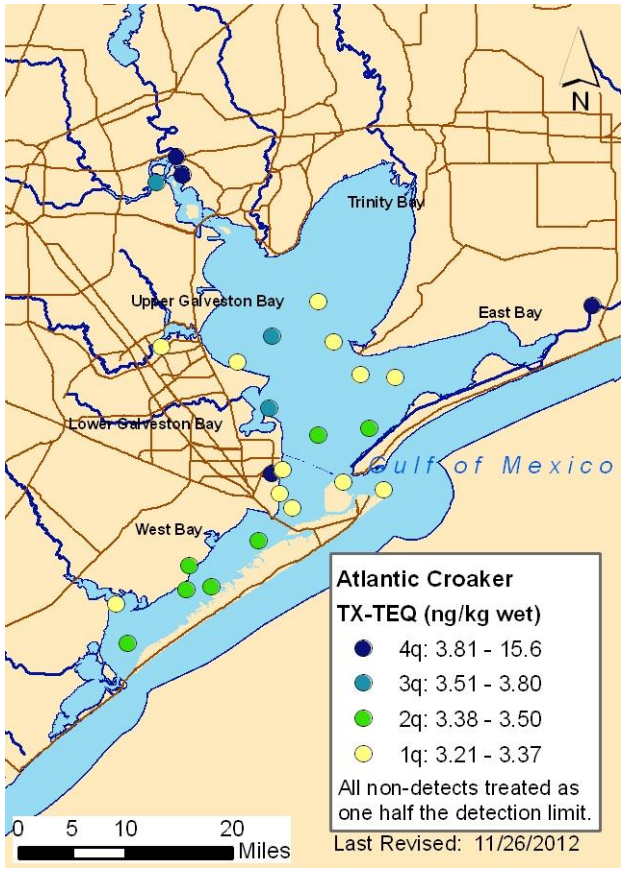


- The sediment sample in Armand Bayou (15455) had the 5th highest concentration of TCDD and the 6th highest concentration of 12378-PeCDD which helped to give it the second highest TX-TEQ of all samples (44) collected in summer 2012. The only sample with a higher TEQ was found at the mouth of Tucker Bayou.

Total TX-TEQ (2378-TCDD equivalents) TISSUE concentrations from summers 2011 & 2012 colored by quartiles of all tissue data







- **Using a one-half detection limit value for non-detects, ALL samples (124) from 2011 and 2012 are above TX-TEQ = 0.4 ng/g wet.**