PCBs and Dioxin in the Galveston Bay System

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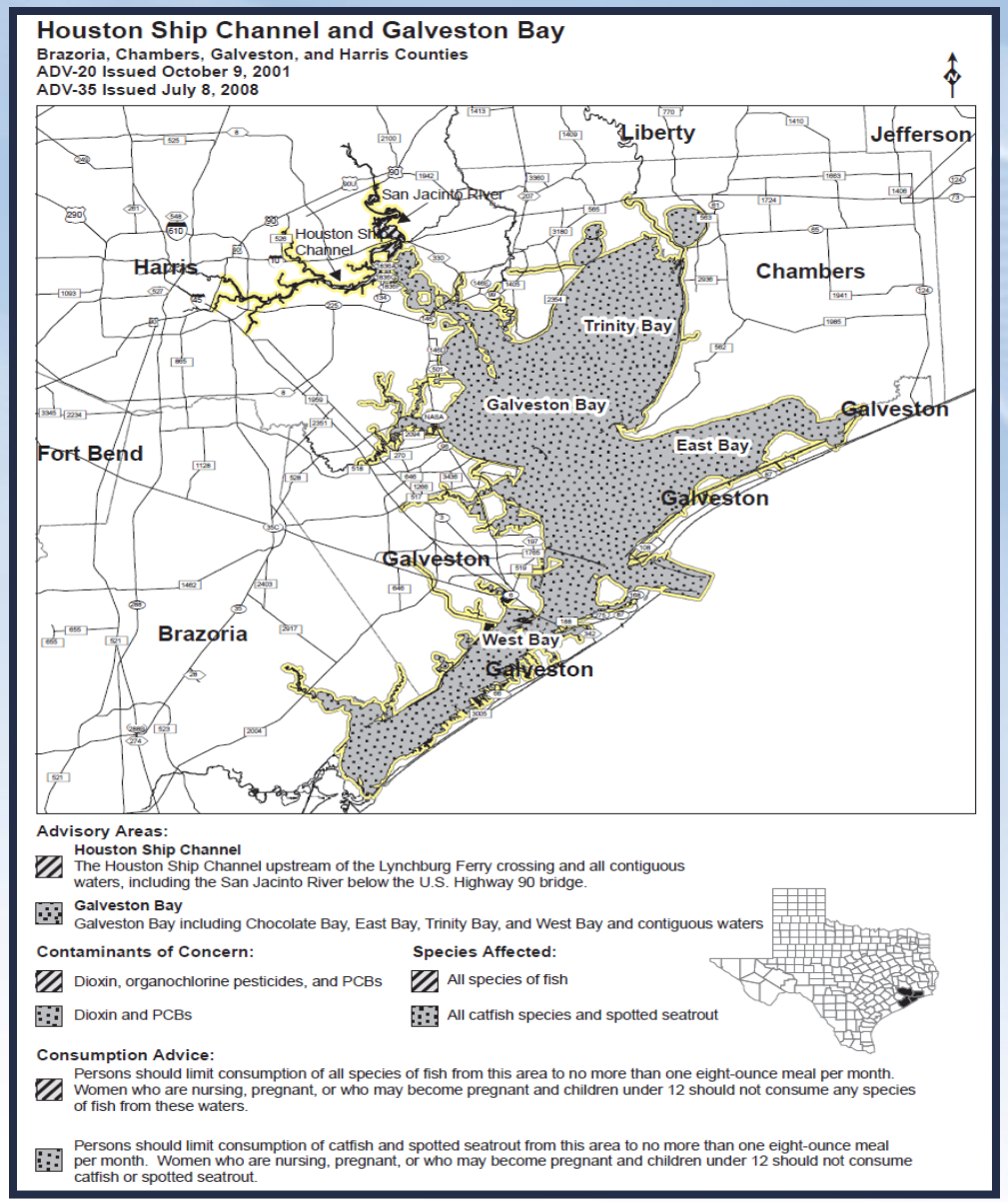
Advisories in HSC and Galveston Bay



- 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

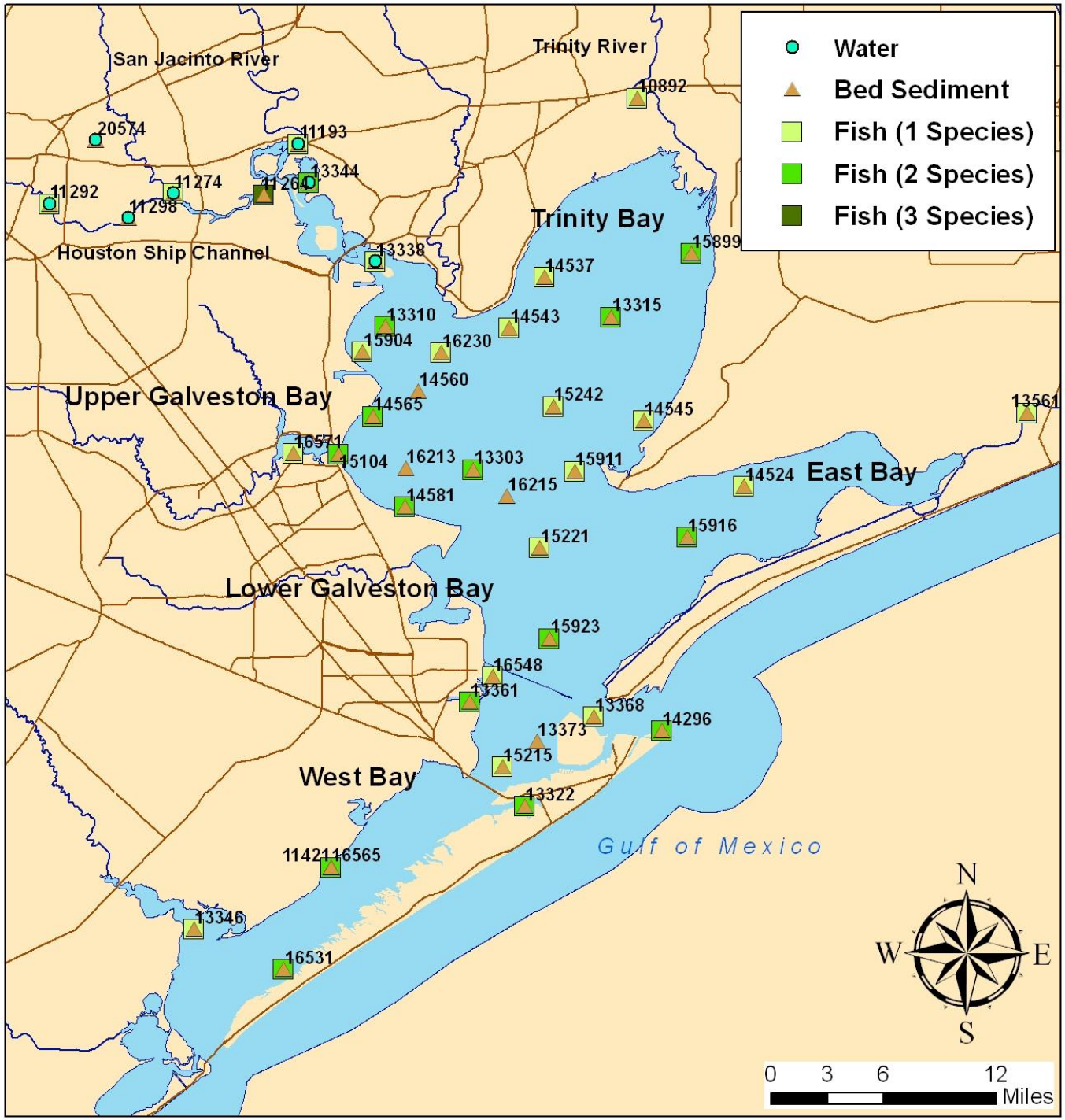
TMDL for Dioxins in HSC System

- Dioxin data collected in 2002-03, 2004-05, and 2011
- 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 and 2011
- 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

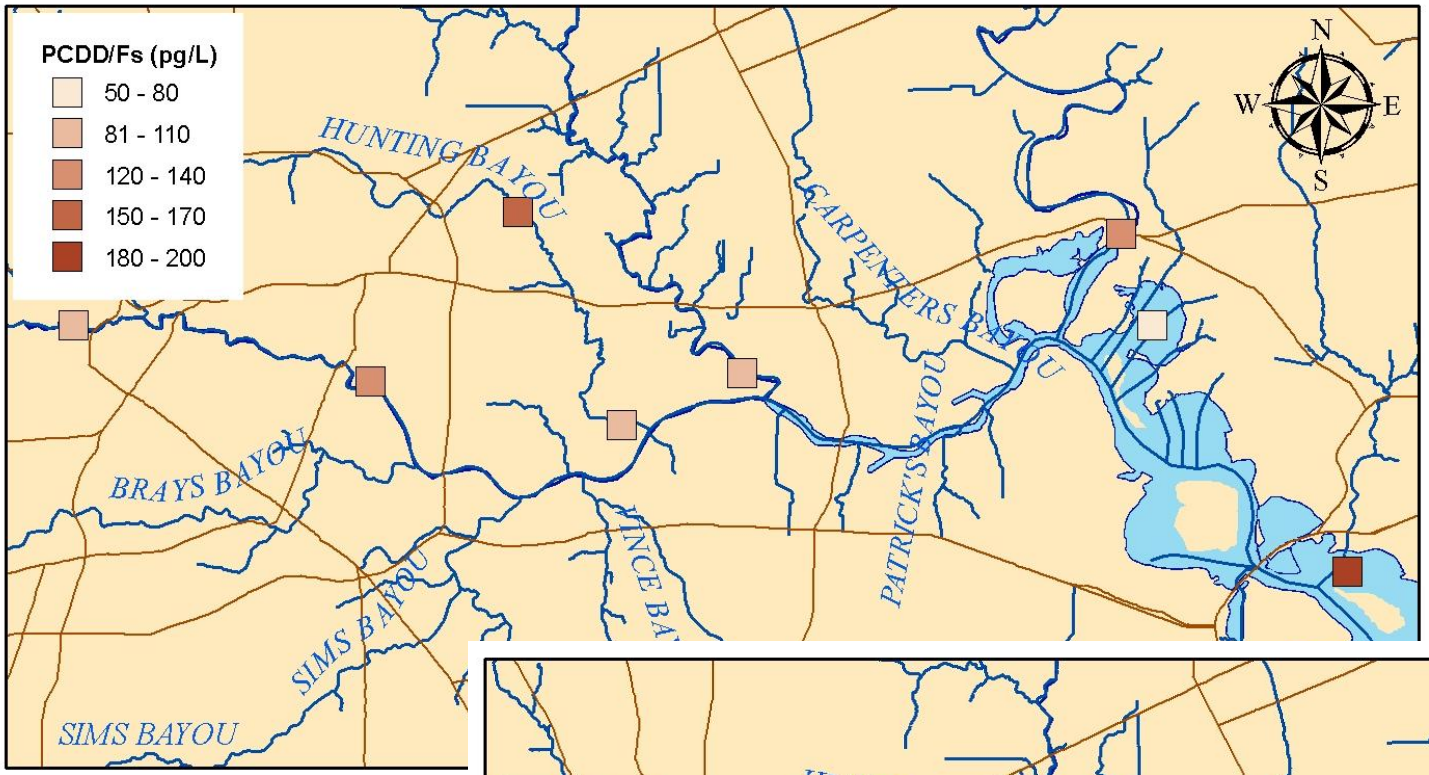


Summer 2011 HSC and Galveston Bay area sample collection activities

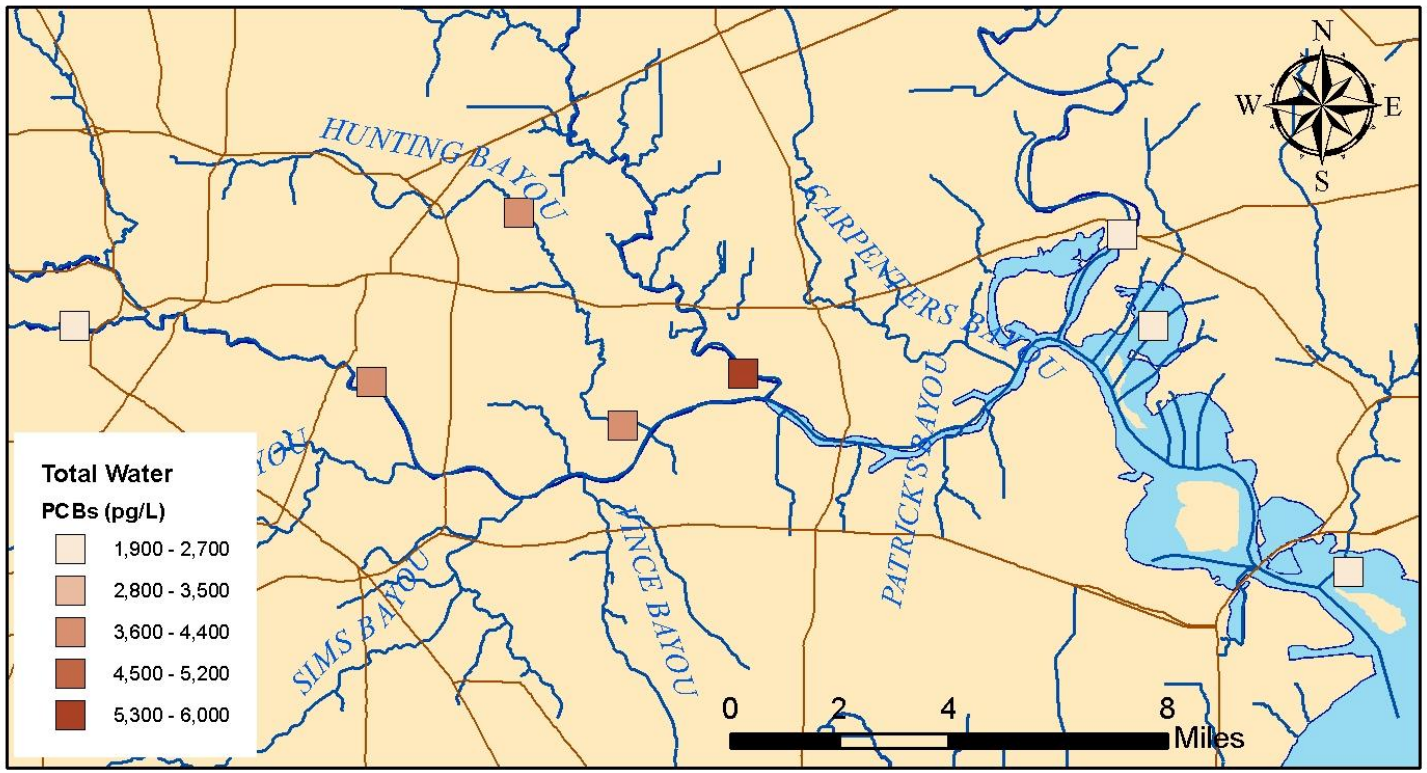
Field Sample Counts

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

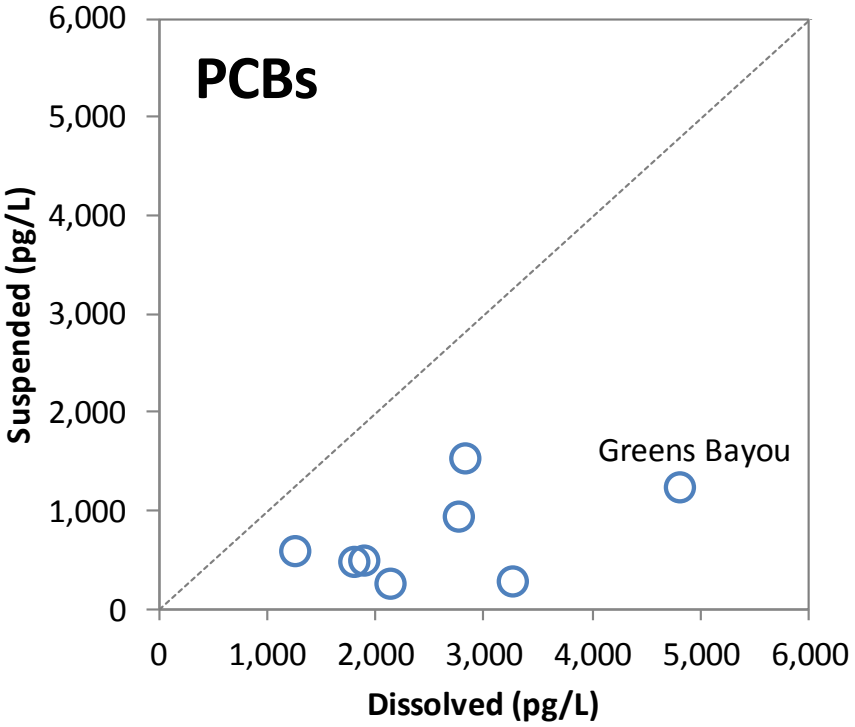
2011 WATER RESULTS

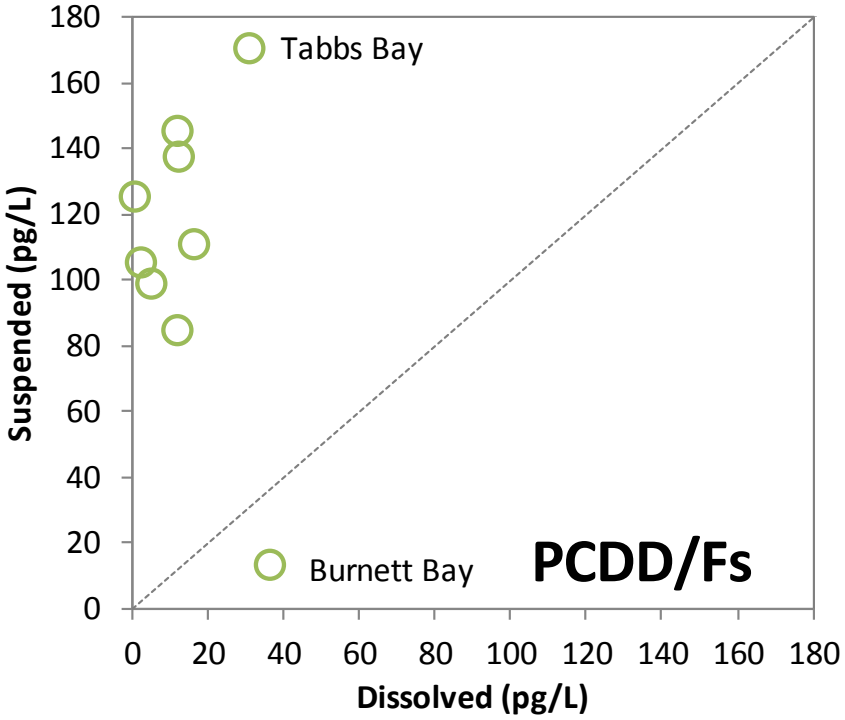


Total PCBs and total PCDD/Fs in 2011 HSC samples. All water results are suspended + dissolved.



Suspended and dissolved phase comparisons for total PCBs and total PCDD/Fs – HSC 2011 Samples

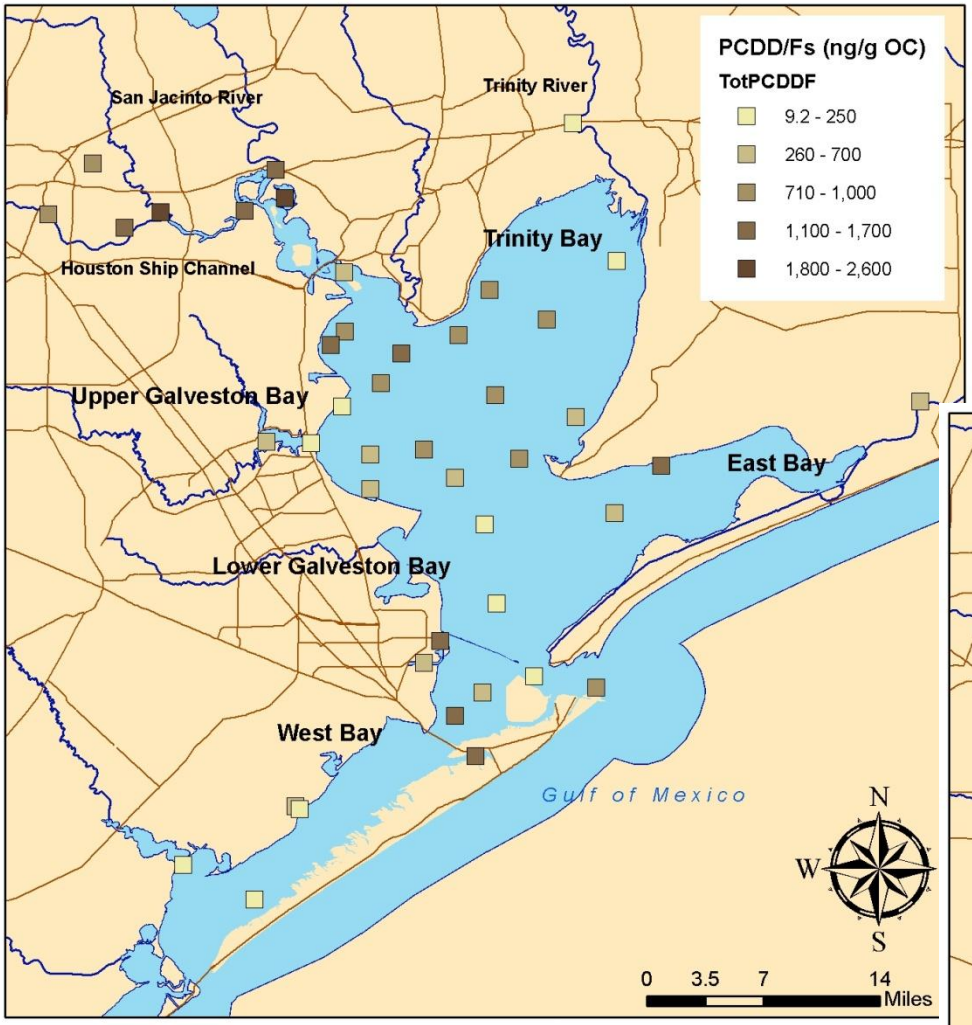


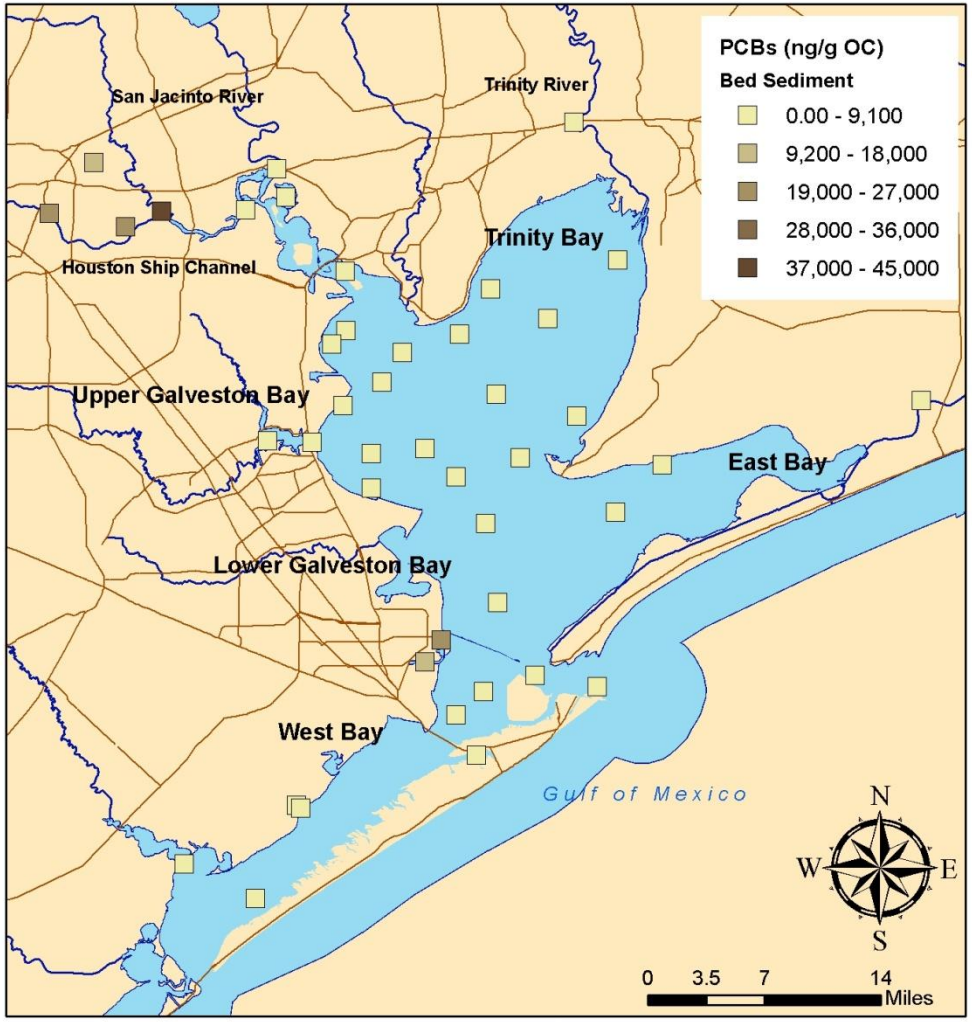


As seen in previous years, PCBs are predominantly in the operationally dissolved while PCDD/Fs are predominantly on larger particles. Explanations for the behavior are being investigated.

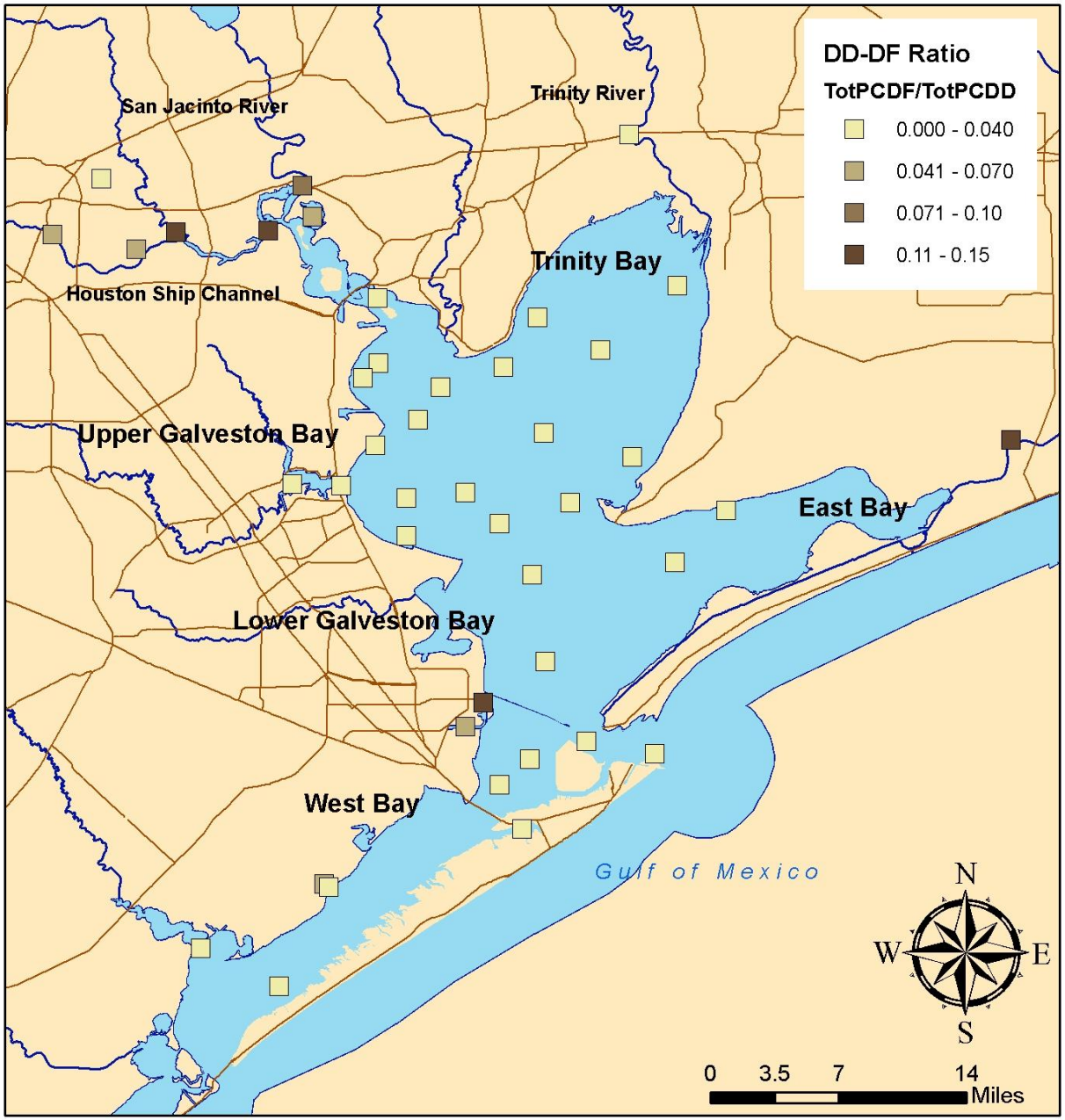
2011 SEDIMENT RESULTS

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

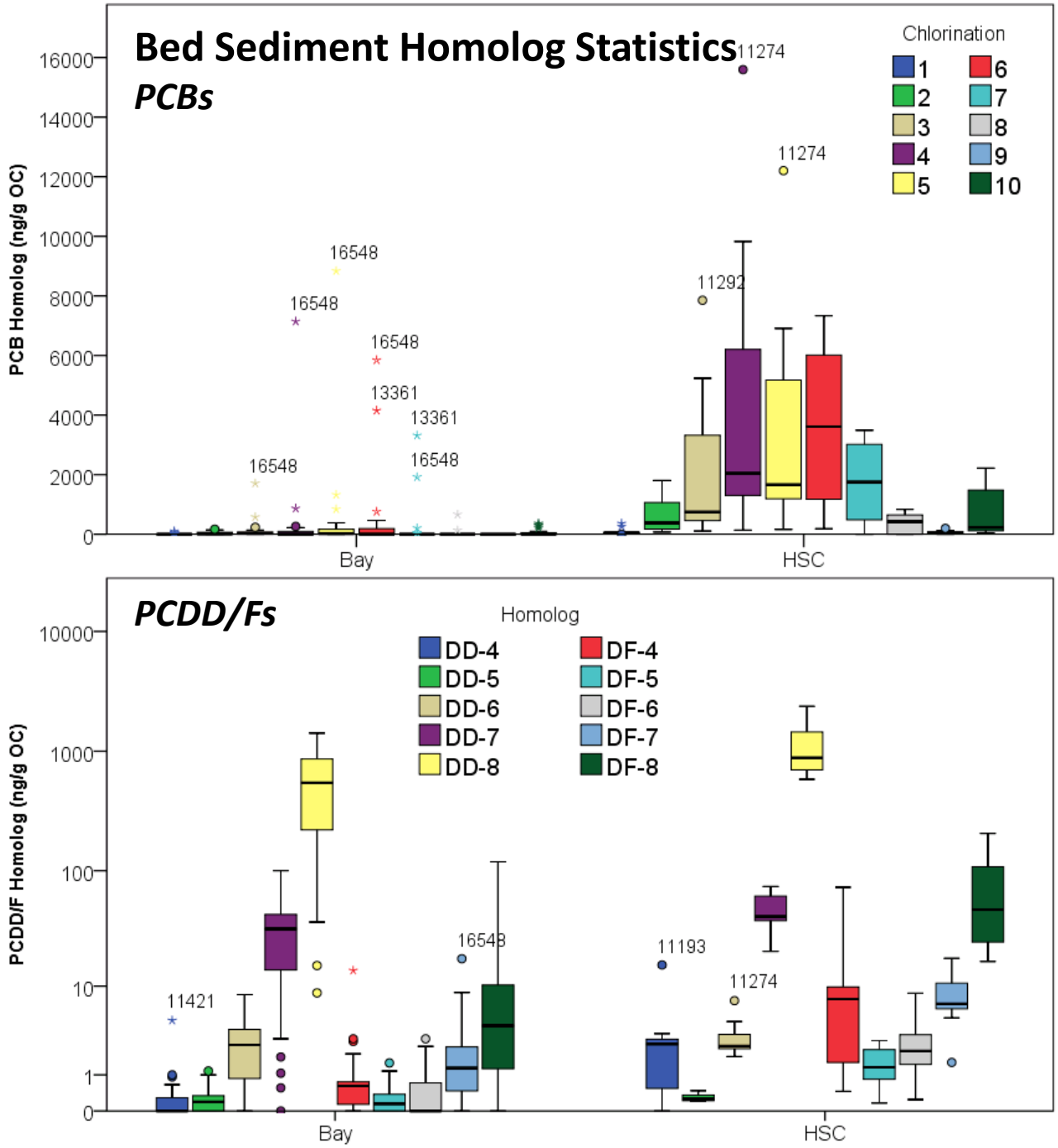




Ratio of PCDFs to PCDDs for 2378-substituted congeners



The ratio of furans to dioxins (PCDFs/PCDDs) is sometimes seen as an indicator of specific, local industrial PCDD/F influence as opposed to general wide-area exposure.

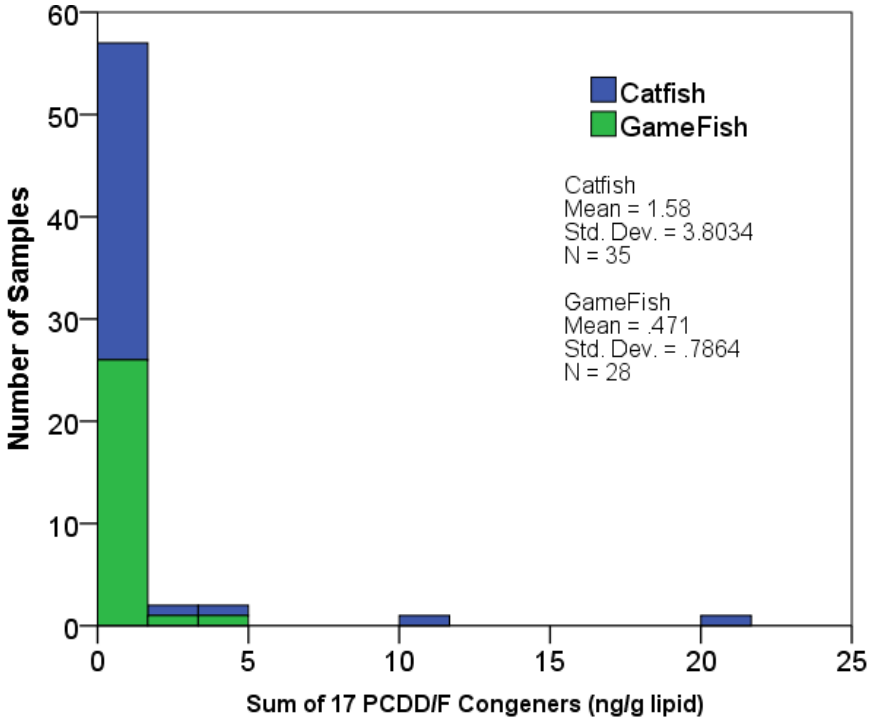


HSC (right box plot series) represents any sample at Morgan's Point or upstream. Bay samples (left plot series) are all other samples.

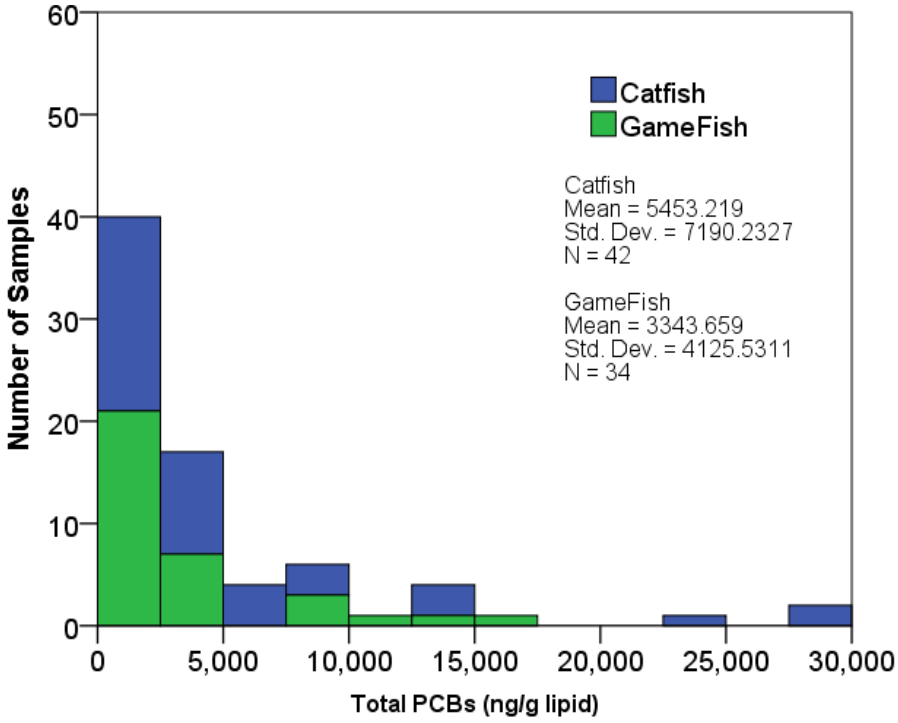
2011 FISH TISSUE RESULTS

Fish Tissue Total POPs Concentrations by Contaminant Type (lipid basis)

Total PCDD/Fs (17 2378-substituted)



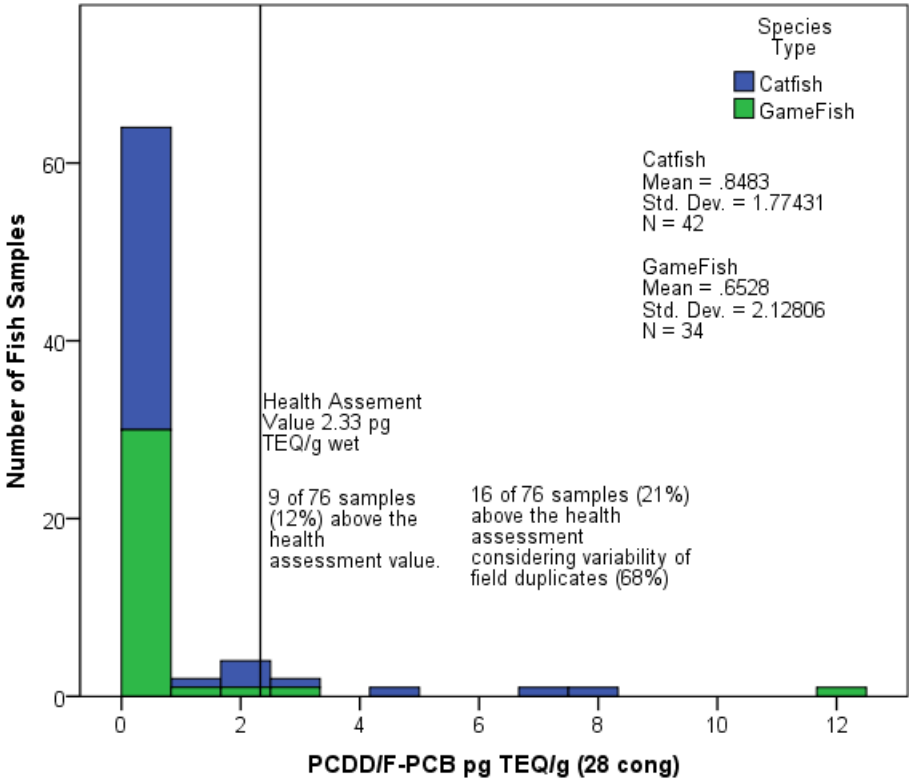
Total PCBs (209 congeners)



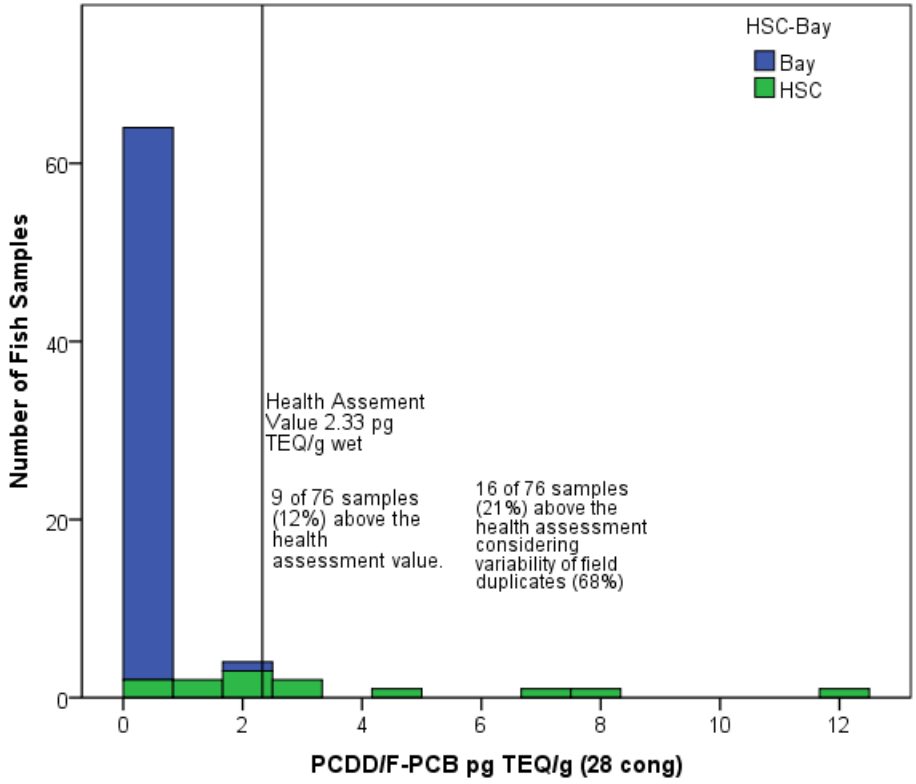
- Note that game fish (trout, croaker) are substantially higher in lipid content in their fillets with average values of 1.7%, 1.1%, and 0.81% for croaker, trout, and catfish, respectively.
- Thus, on a wet weight basis (most important for risk assessment), their concentrations for either POP is higher. But on a lipid weight basis (most important for bioaccumulation analysis), catfish are higher. Catfish generally exhibit greater bioaccumulative potential.

Fish Tissue 2378-TCDD Equivalents (WHO 2005) by Species and Area (wet weight basis)

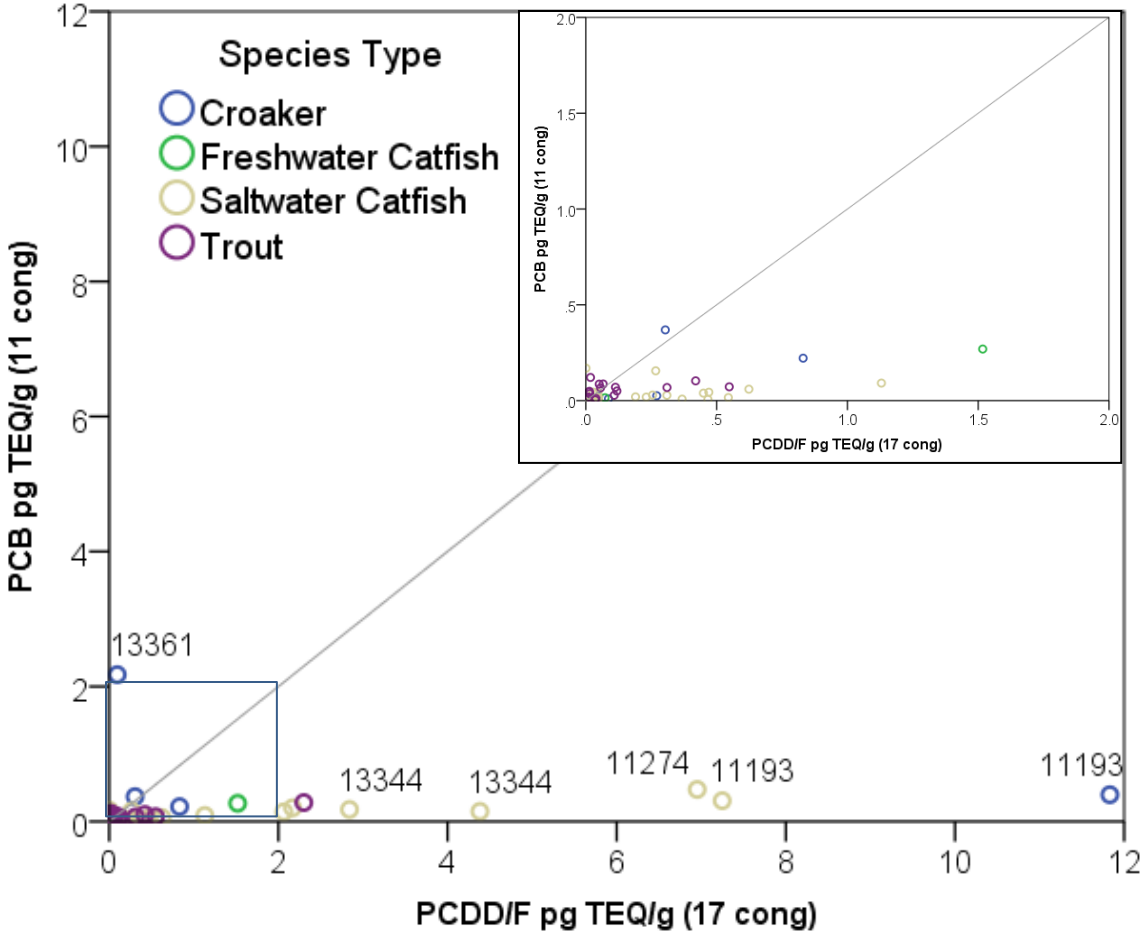
TEQ by major species type



TEQ by general area



Fish Tissue 2378-TCDD Equivalents (WHO 2005) by Contaminant Type (PCB vs. PCDD/F)



- PCB fraction of TEQ 48±9% (mean±95% confidence).
- Only one sample, an Atlantic Croaker in the Texas City Ship Channel, was above the TEQ health threshold withOUT including PCBs.
- The highest single PCB contribution (mean 30%) was PCB-118 (5 Cl) and for PCDD/Fs OCDD (mean 12%). (non-detects considered 0% in statistics)

11193 – San Jacinto river waste pits

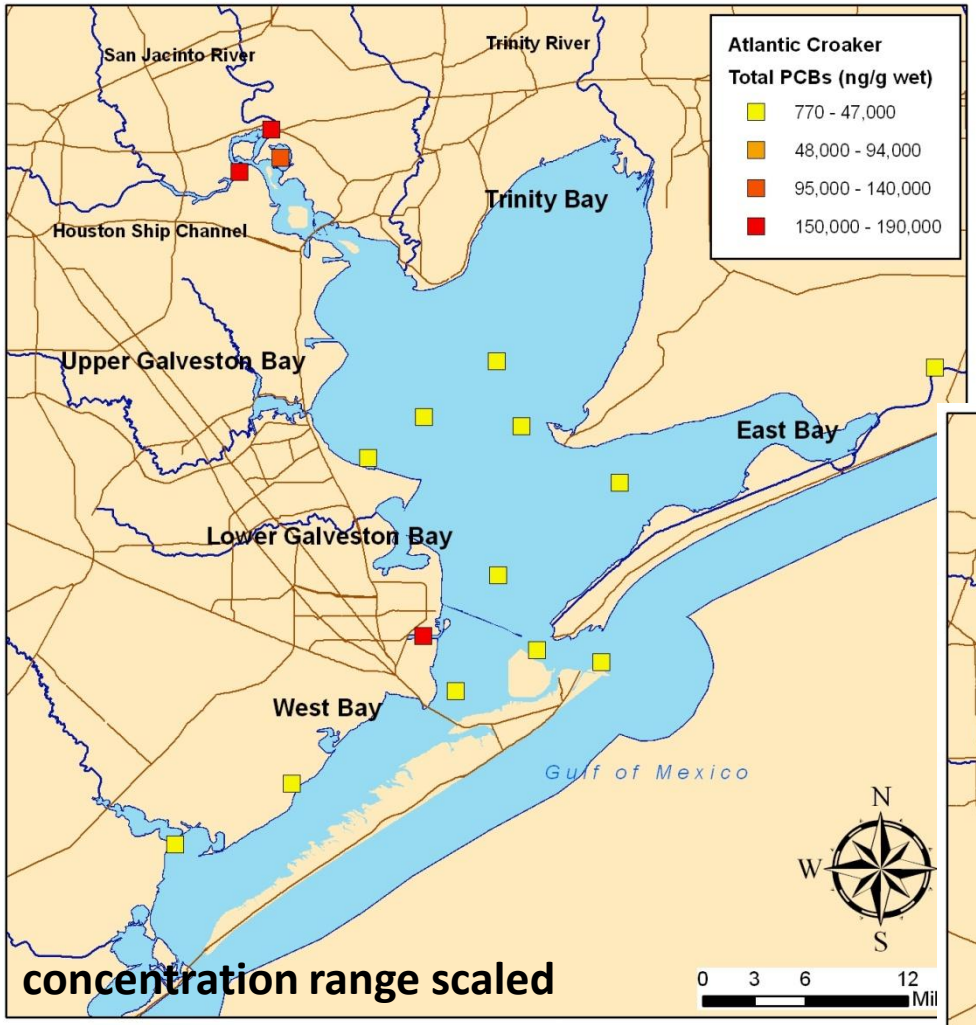
11274 – Greens Bayou

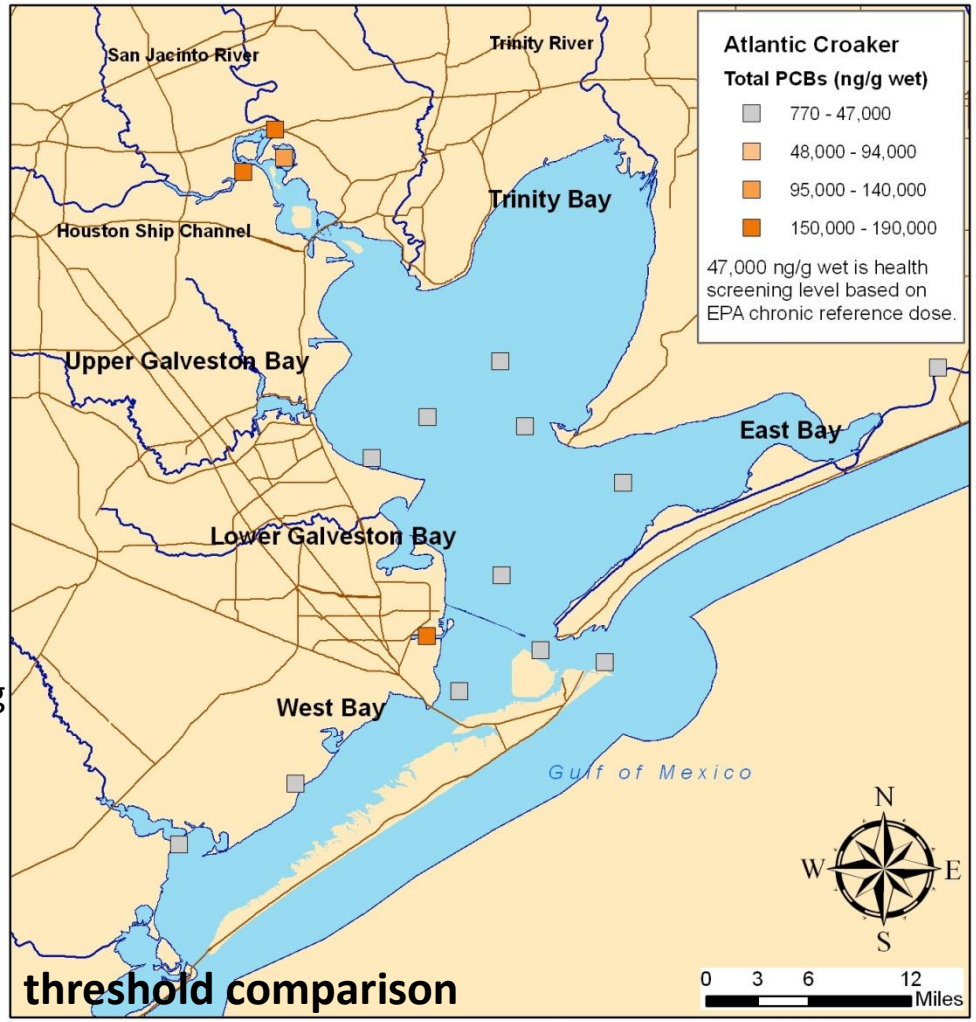
13344 – Burnett Bay

13361 – Texas City Ship Channel

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.

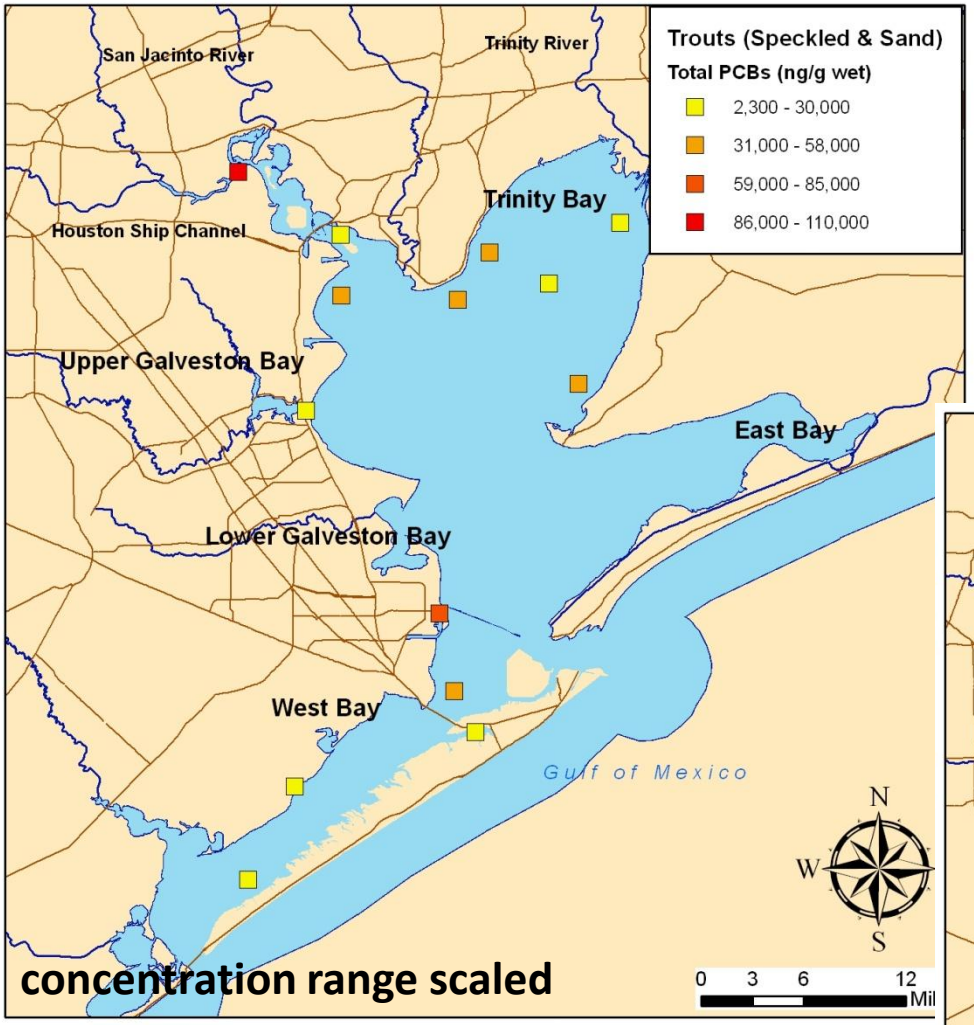




Grayed samples (lower right plot) represent samples nominally below the health screening level.

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

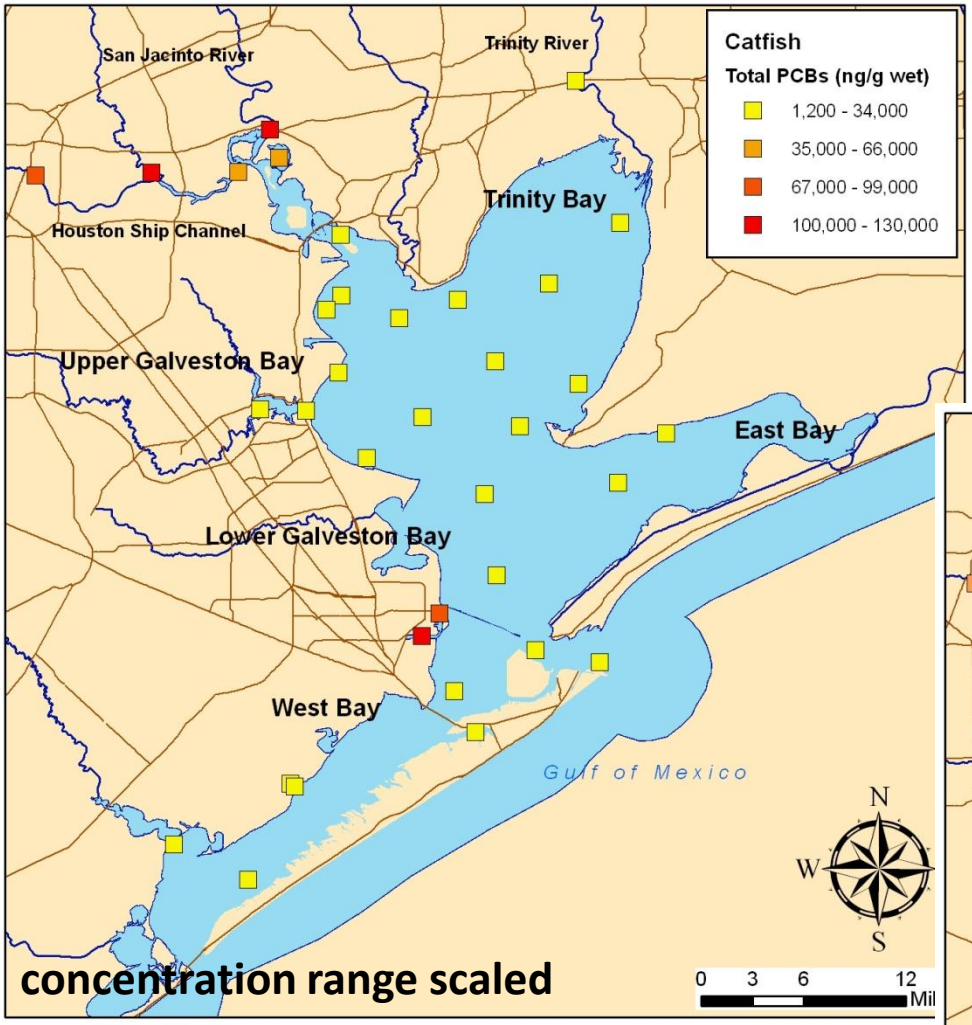
47,000 ng/g wet total PCBs represents the Texas Dept State Health Service non-cancer health screening level.

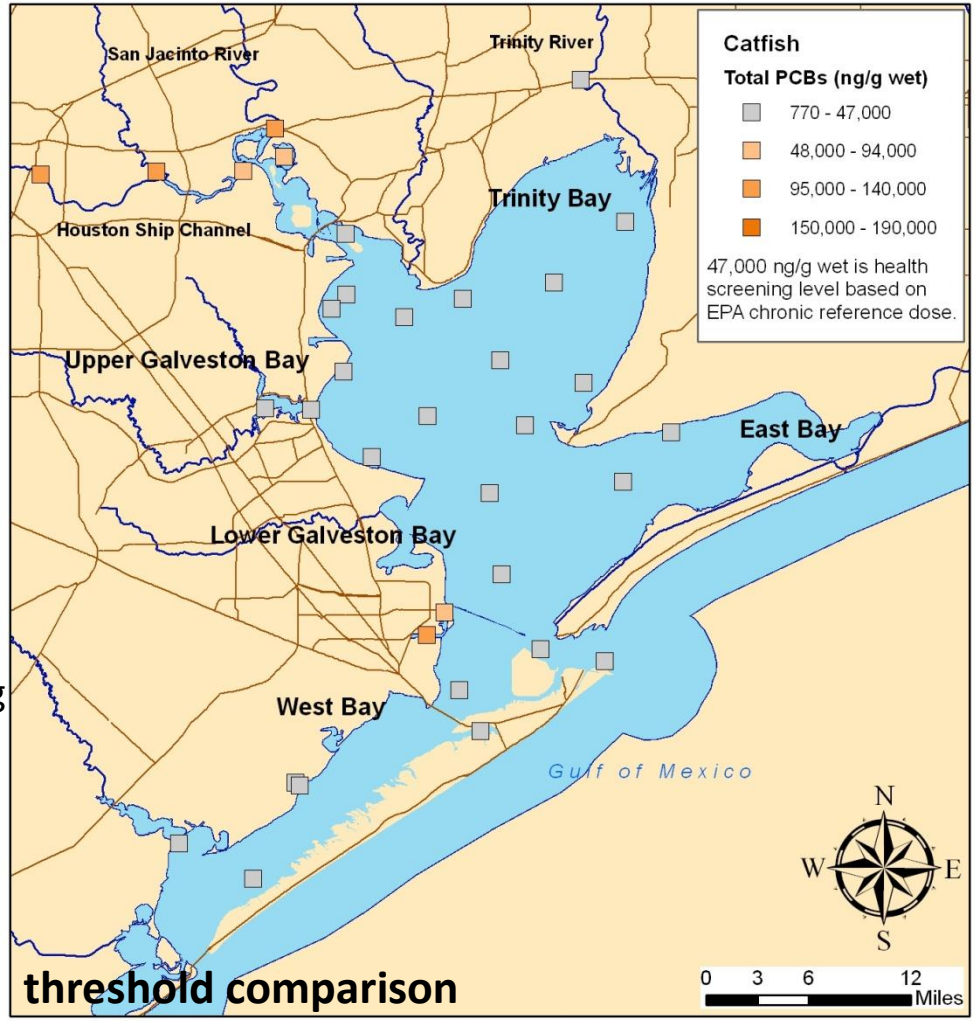


Grayed samples (lower right plot) represent samples nominally below the health screening level.

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

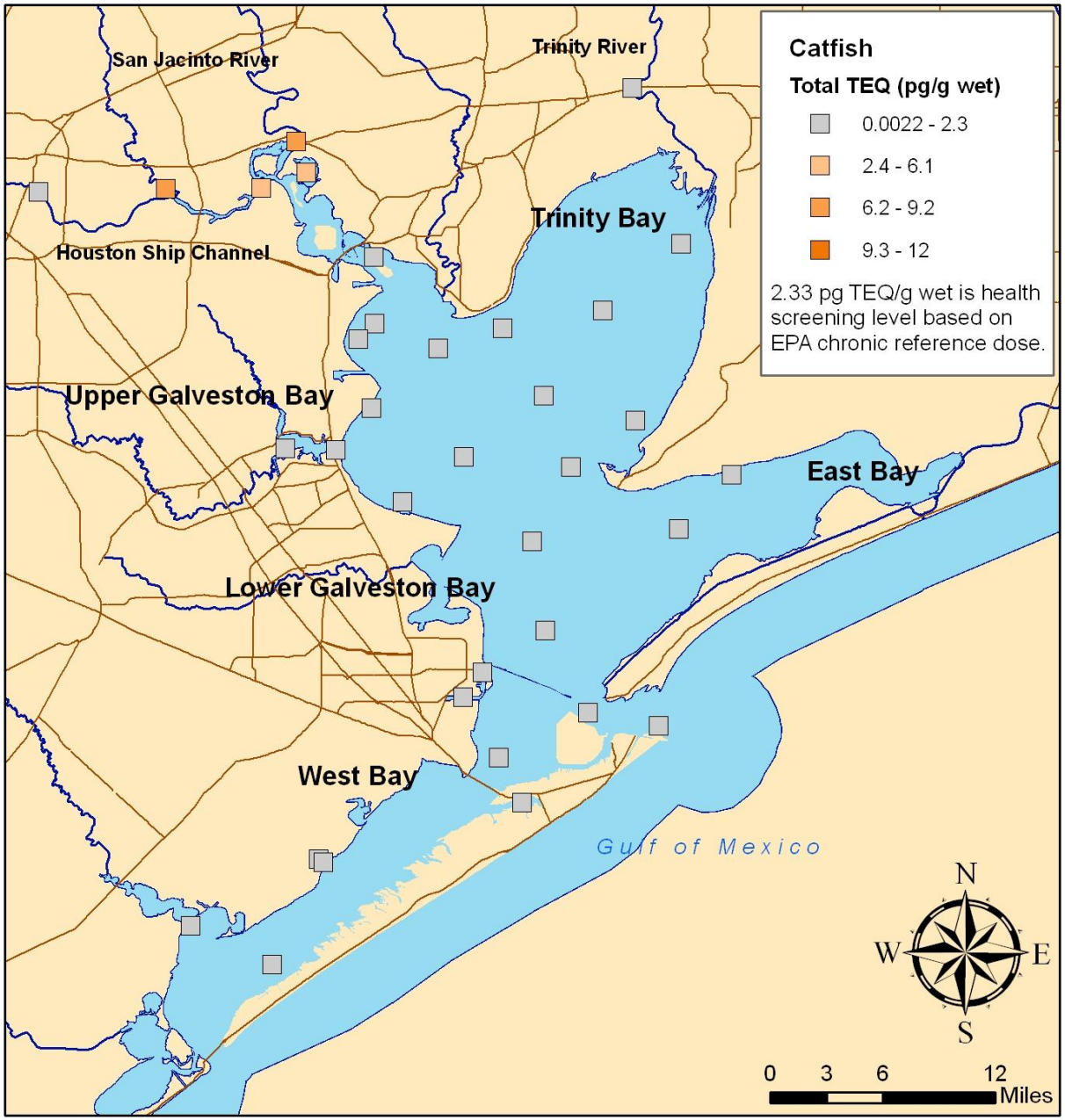
47,000 ng/g wet total PCBs represents the Texas Dept State Health Service non-cancer health screening level.





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

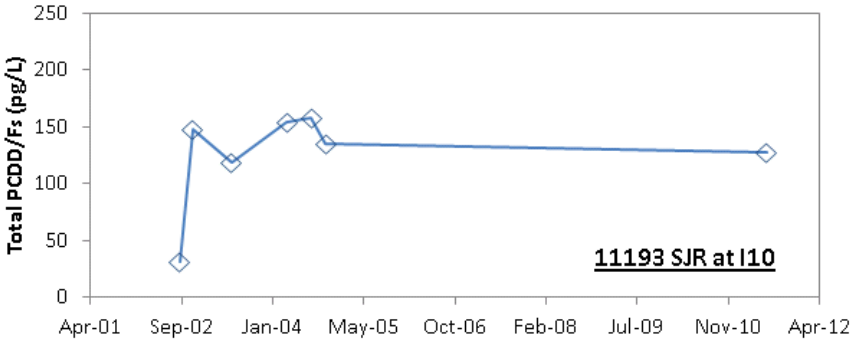
Catfish Samples for 2378-TCDD Toxic Equivalency (TEQ) as pg/g wet

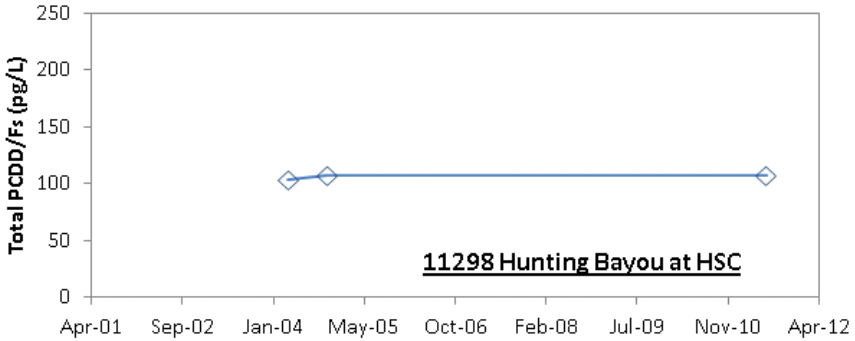


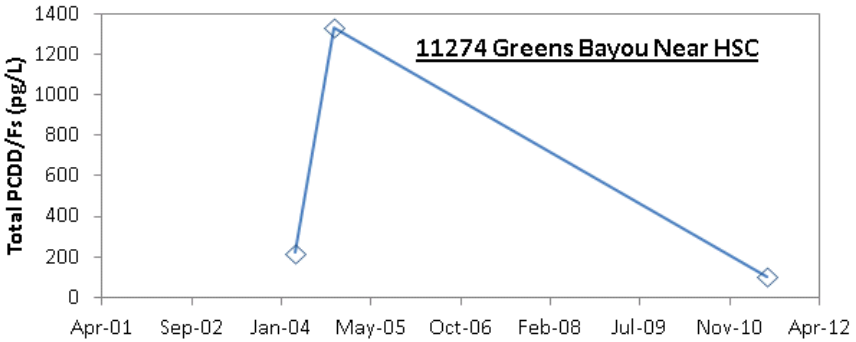
2.33 pg/g wet TEQ represents the Texas Dept State Health Service non-cancer health screening level.

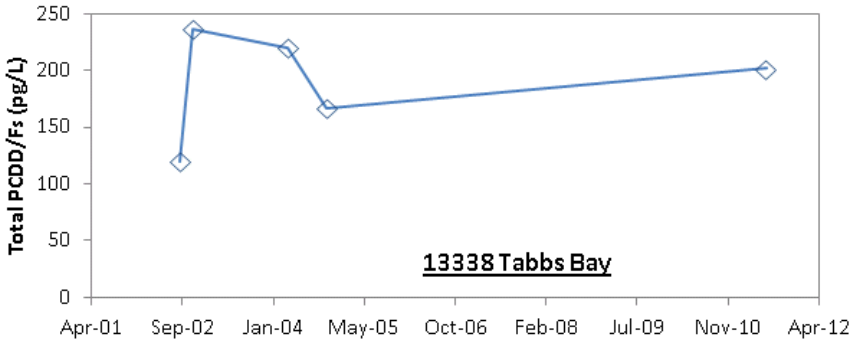
CONCENTRATION TIME SERIES 2002-2011

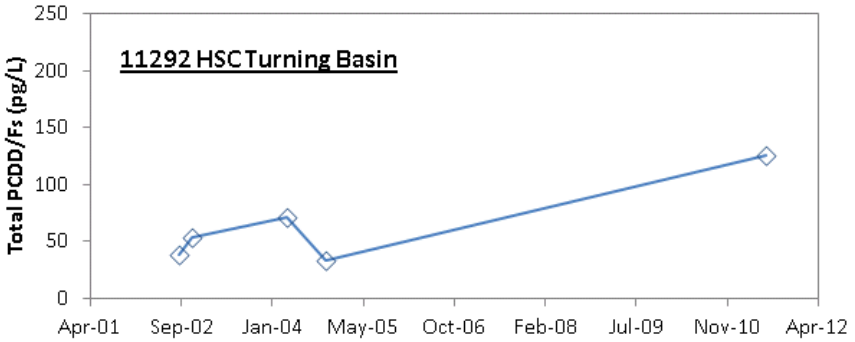
Total PCDD/Fs pg/L total water (suspended + dissolved) 2002-2011

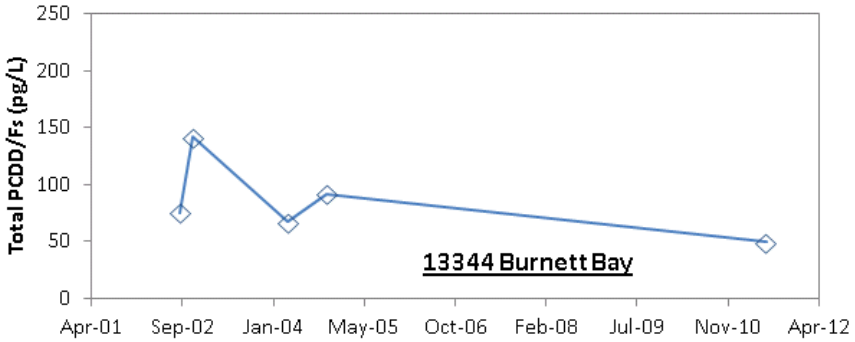






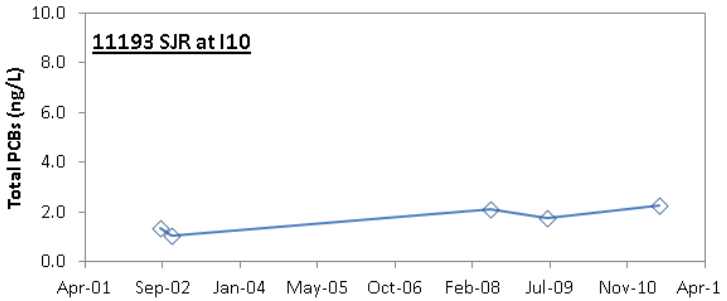


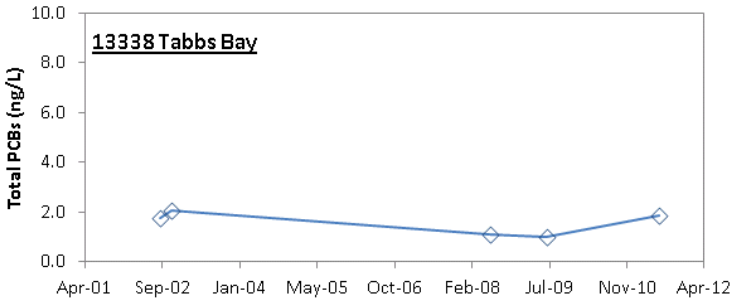


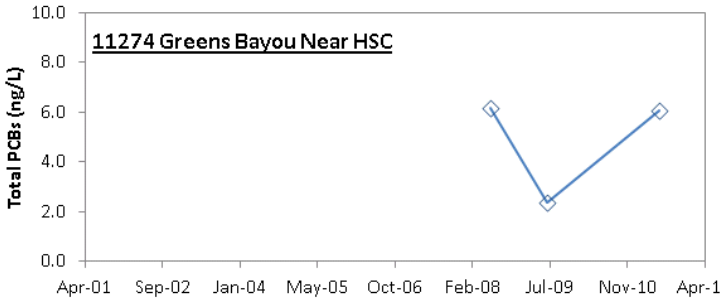


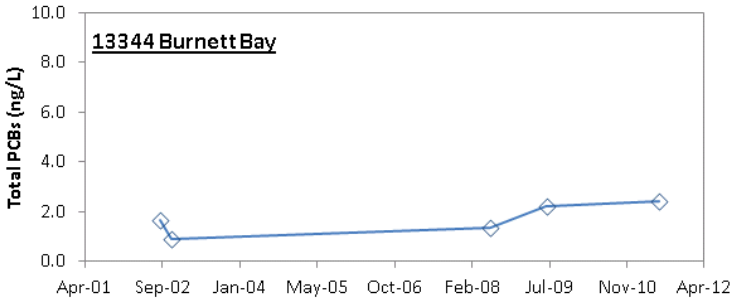
Note the 11274 Greens Bayou has an exaggerated scale to accommodate the very high spring 2004 ~1300 pg/L PCDD/Fs

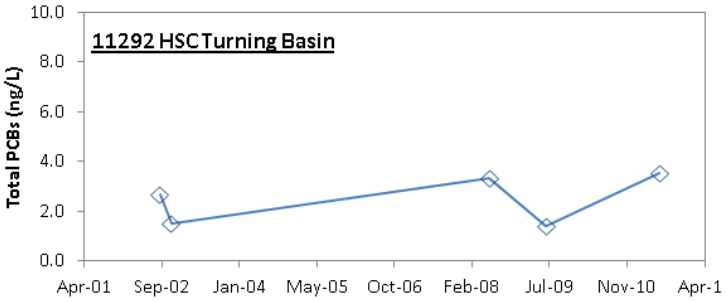
Total PCBs ng/L total water (suspended + dissolved) 2002-2011

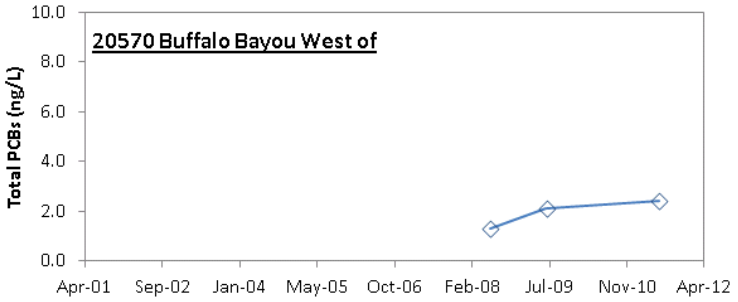


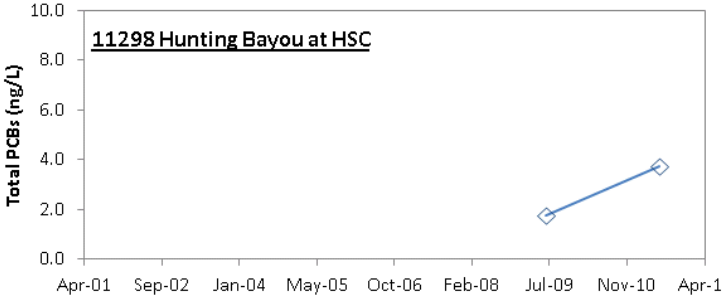


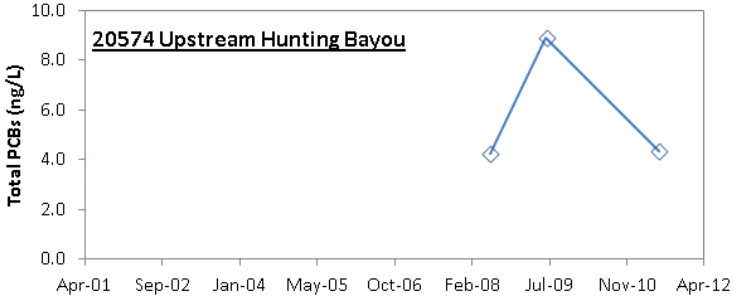




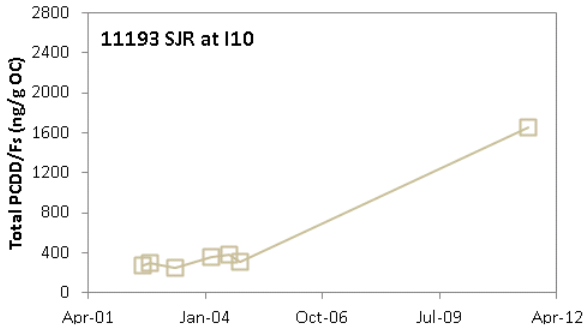


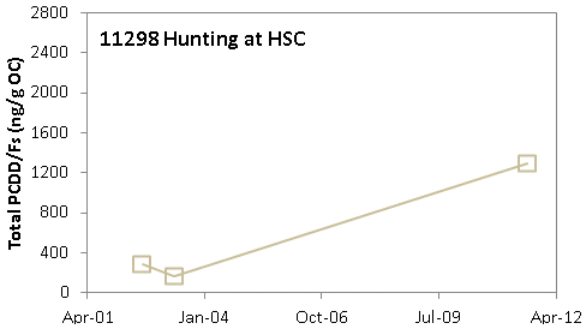


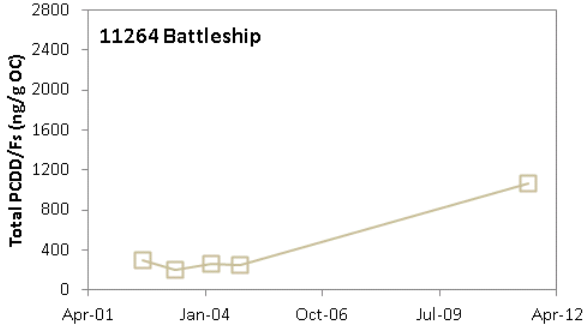


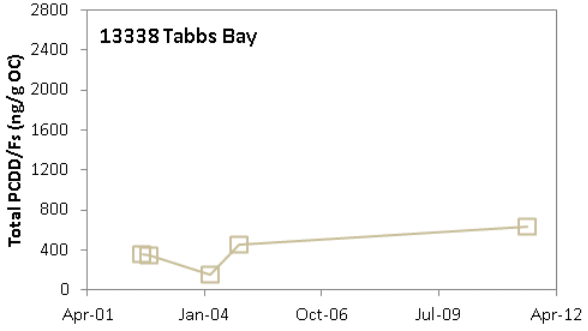


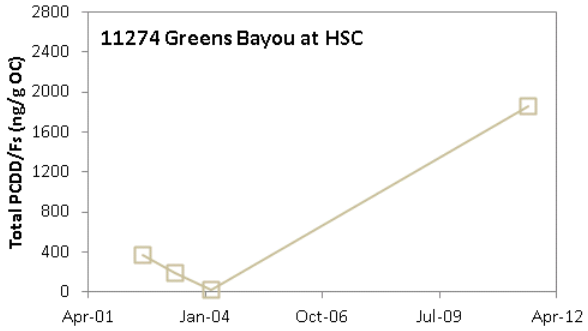
Note: Hurricane Ike struck Galveston Bay on September 13, 2008.

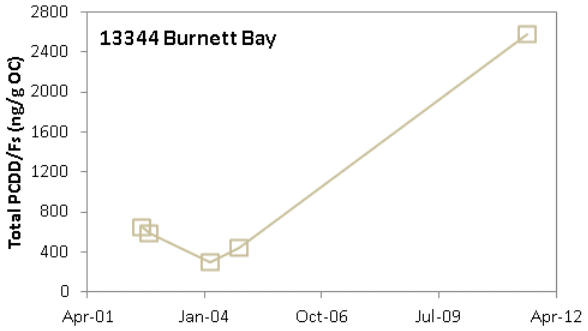


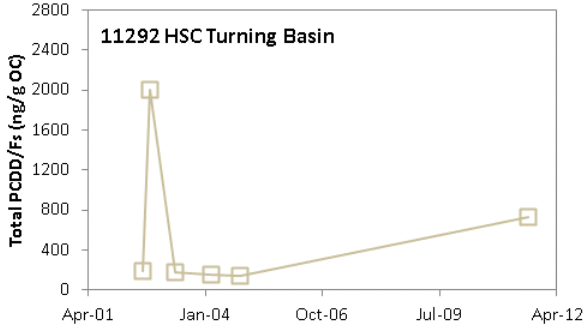






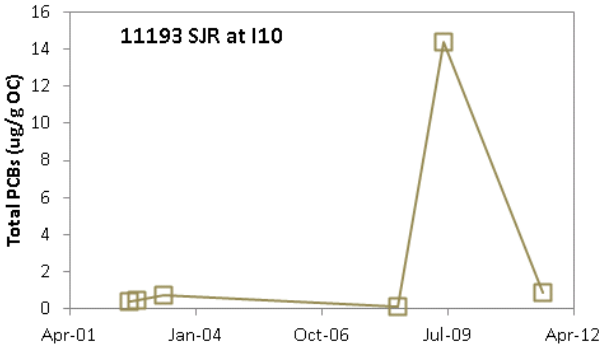


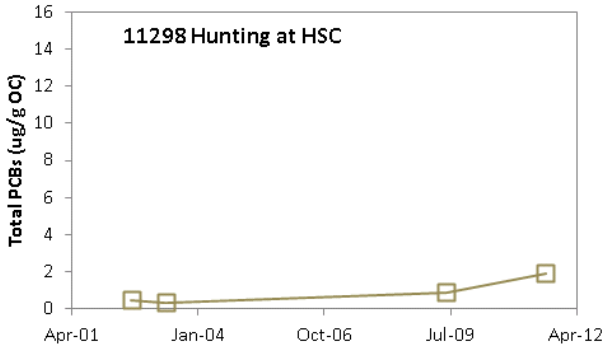


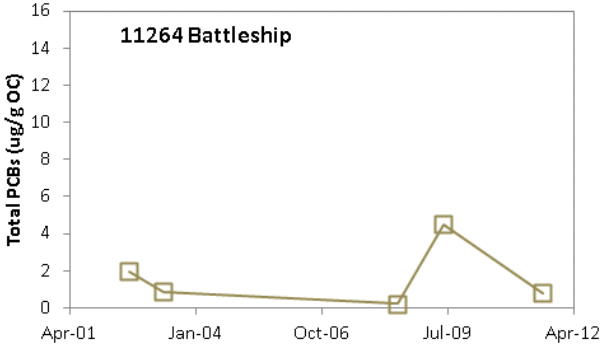


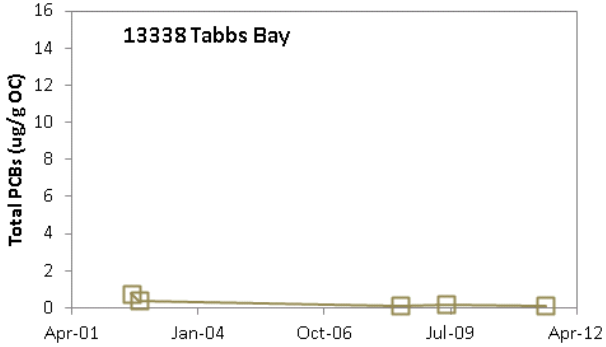
Total PCDD/Fs ng/g OC in bed sediment at selected locations 2002-2011

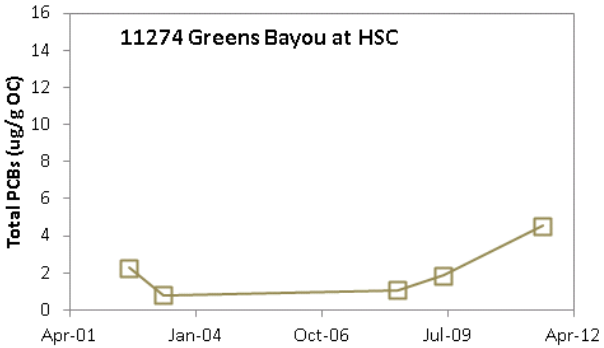
Note: Hurricane Ike struck Galveston Bay on September 13, 2008.

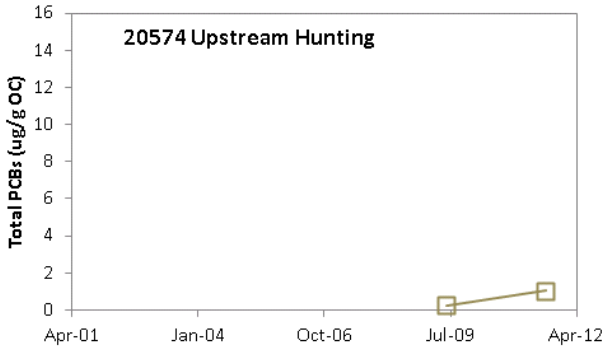


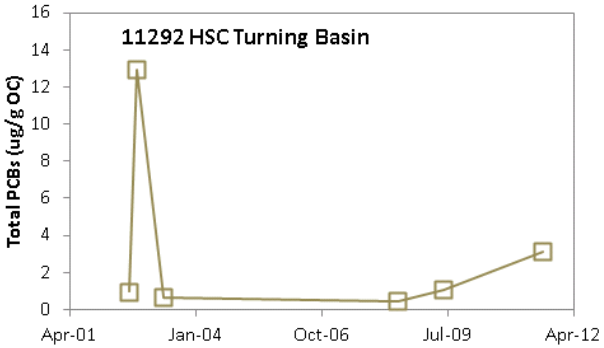












Total PCBs µg/g OC in bed sediment at selected locations 2002-2011

Note: Hurricane Ike struck Galveston Bay on September 13, 2008.

Future Plans

- Summer 2012 sampling planned
- Revisions to dioxin TMDL with new standards
- For dioxin, develop sediment screening levels using tissue standards
- For PCB, complete sampling and begin model development for TMDL
- For baywide, update listing status of project segments and develop plans for Phase 2
- Initiate dioxin and PCB sediment remediation pilot testing study