

Restoring One of America's Greatest Rivers

-Elizabeth River -

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The Elizabeth River Project

Mission: Restore the Elizabeth River to the highest practical level of environmental quality through government, business, & community partnerships.

- 2,000 **citizen** members
- 114 **River Star** facilities
- **Government** projects with US Navy, NOAA, US Army Corps of Engineers, US EPA, VA DEQ, VA DCR, Norfolk, Portsmouth, Virginia Beach, & Chesapeake.



Elizabeth River Watershed

- 200 sq. mile watershed
- 4 Cities
- Great Dismal Swamp freshwater source
- Trapped Estuary



Action Plan for Restoring Elizabeth

Action 1 – Goo Must Go! Cleanup contaminated sediments

Action 2 – Greener shores

Action 3 – Reduce bacteria

Action 4 – Reduce nutrients

Action 5 – Business ethic

Action 6 – Protective policies

Action 7 – Engage 25,000 citizen soldiers



Elizabeth River Sediments

**Contamination from PAH - highest in
the Chesapeake Bay**
(463 times average for bay)

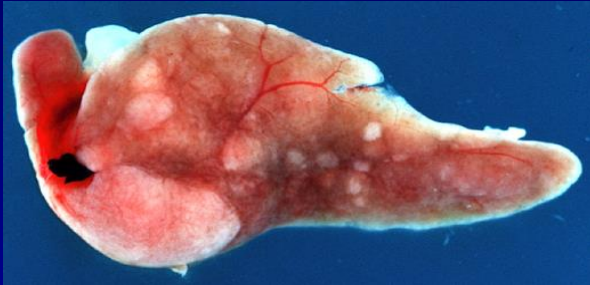


Cancer in the Mummichog

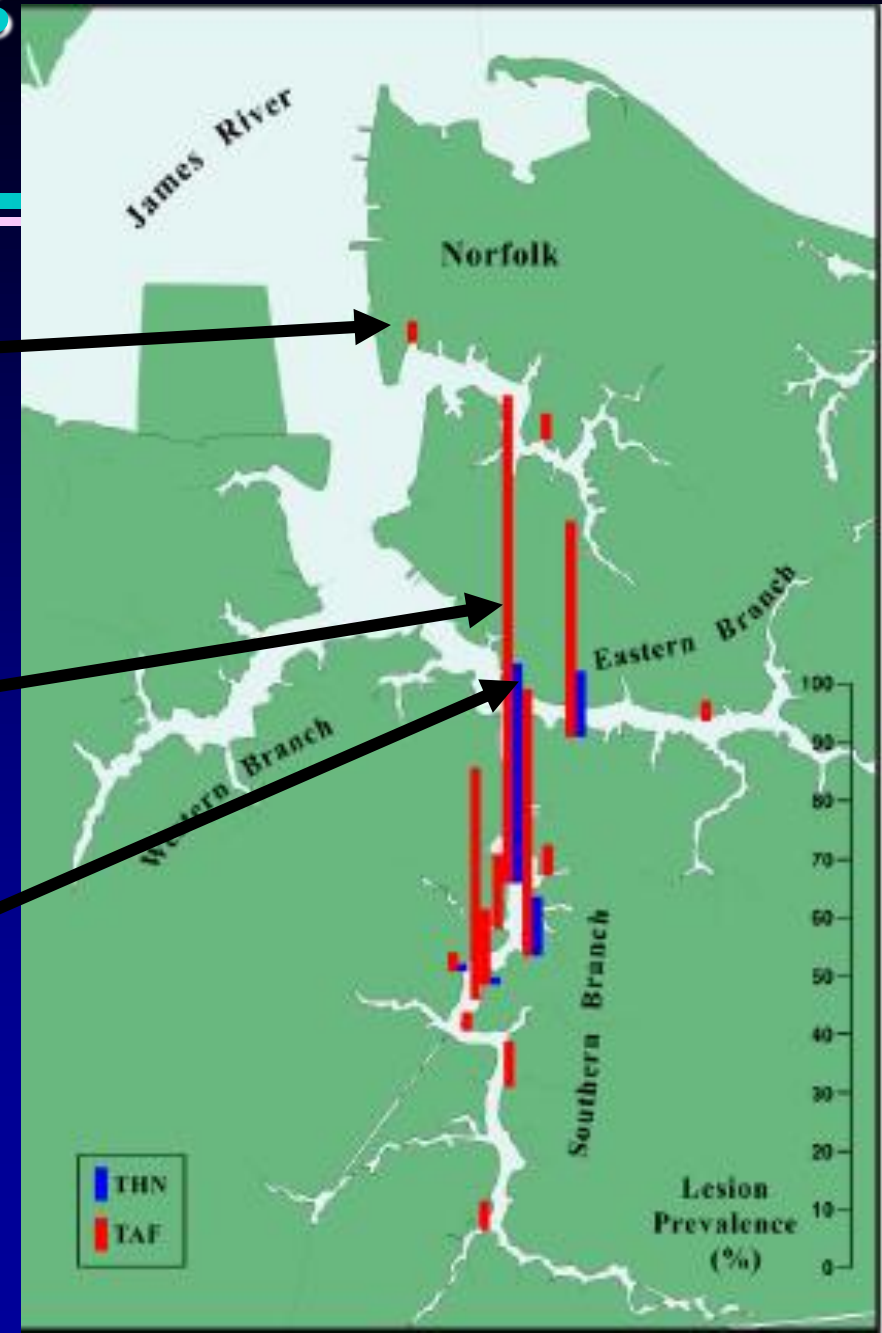
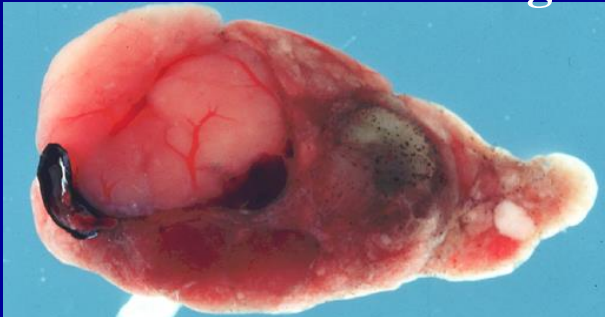
Healthy Mummichog Liver



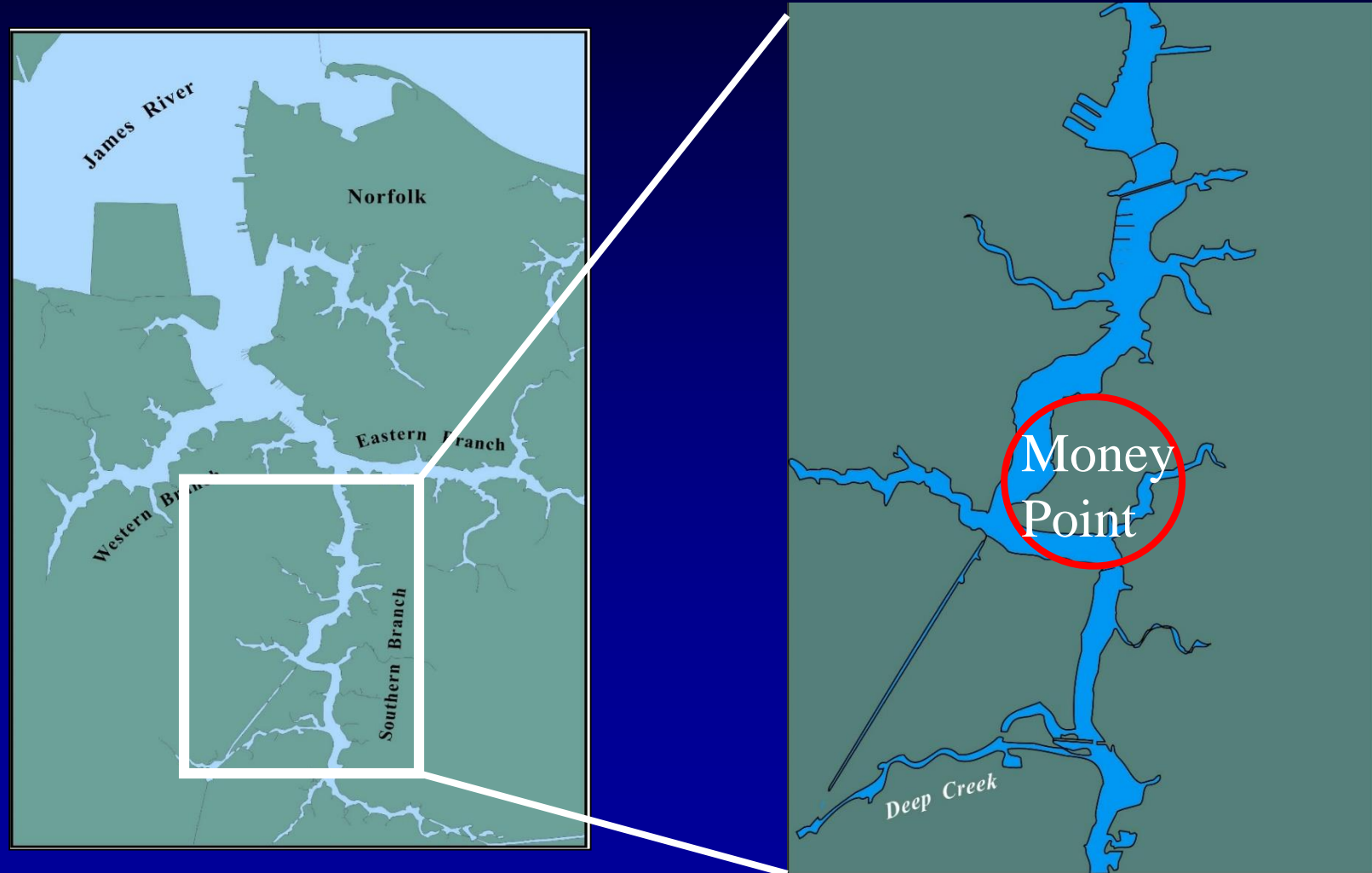
Pre-Cancerous Mummichog



Cancerous Mummichog Liver

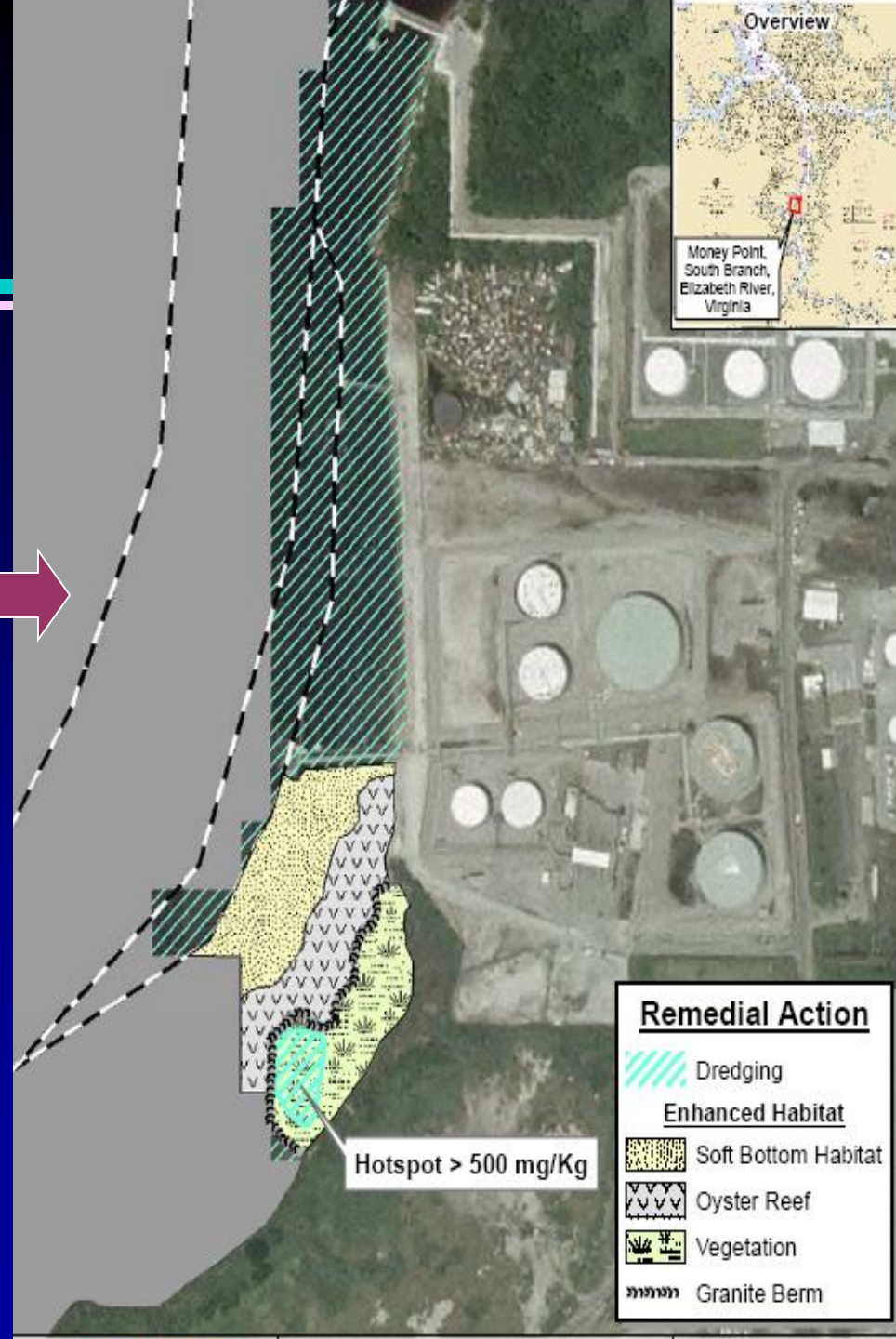
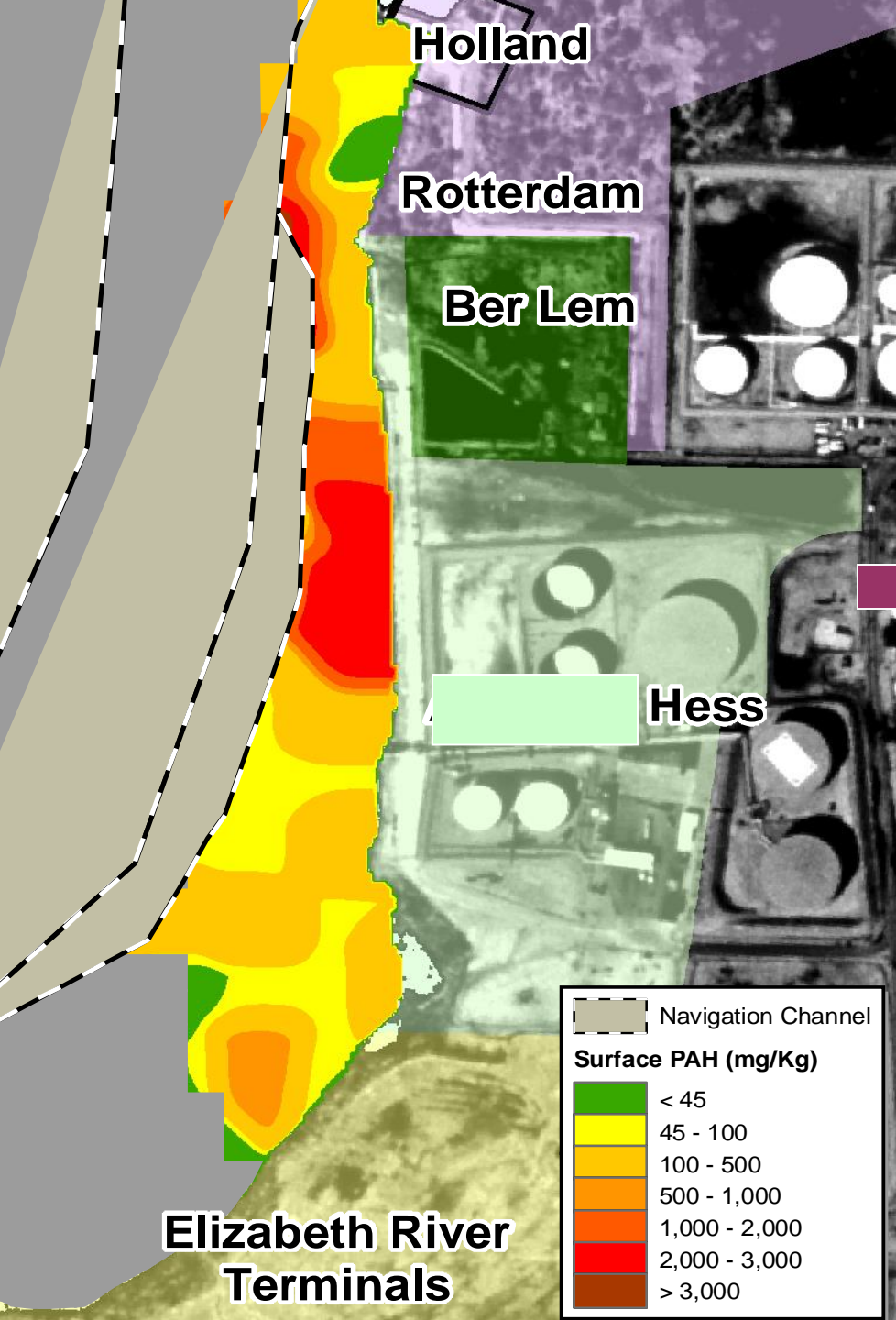


Money Point – A Story of Environmental Restoration

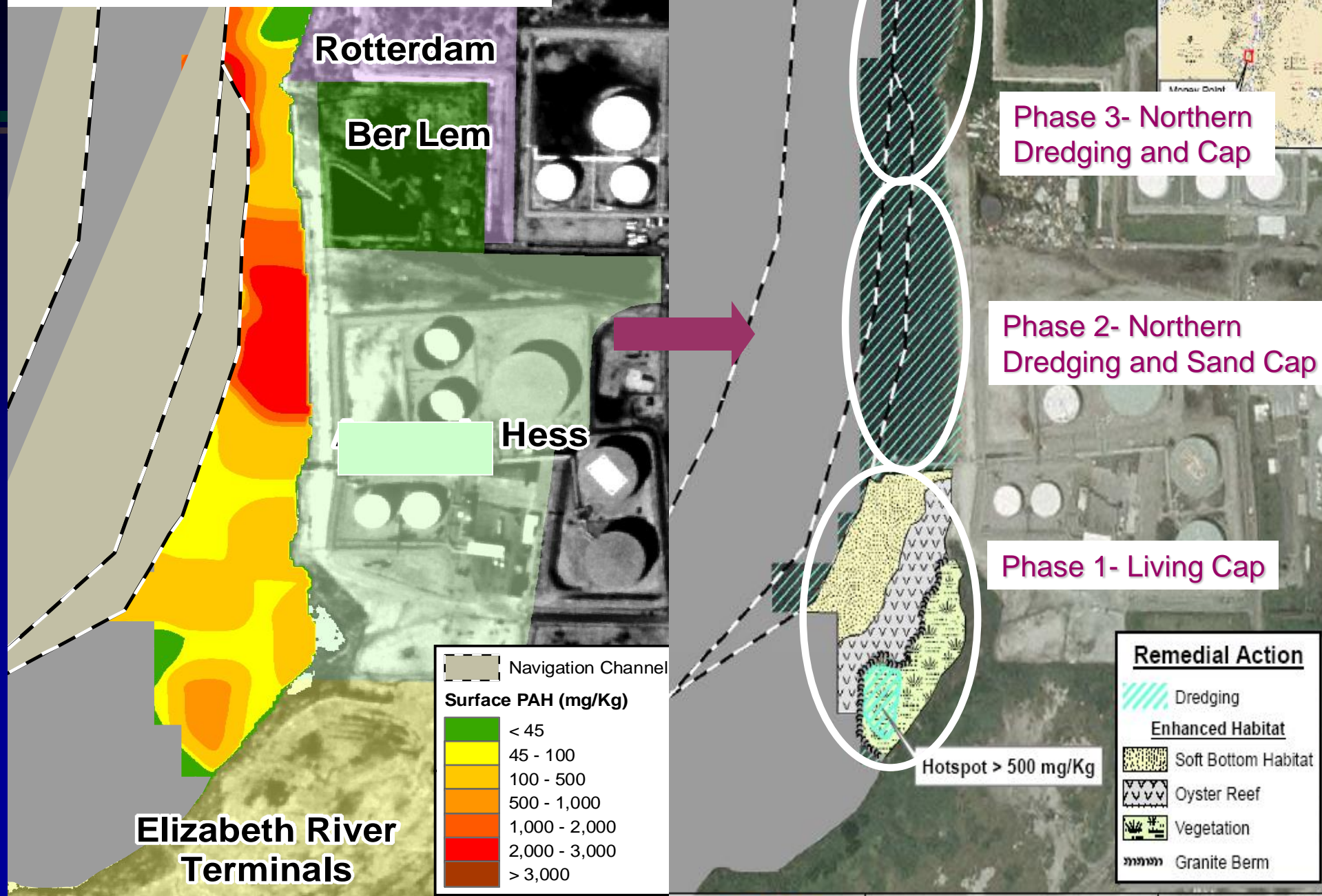


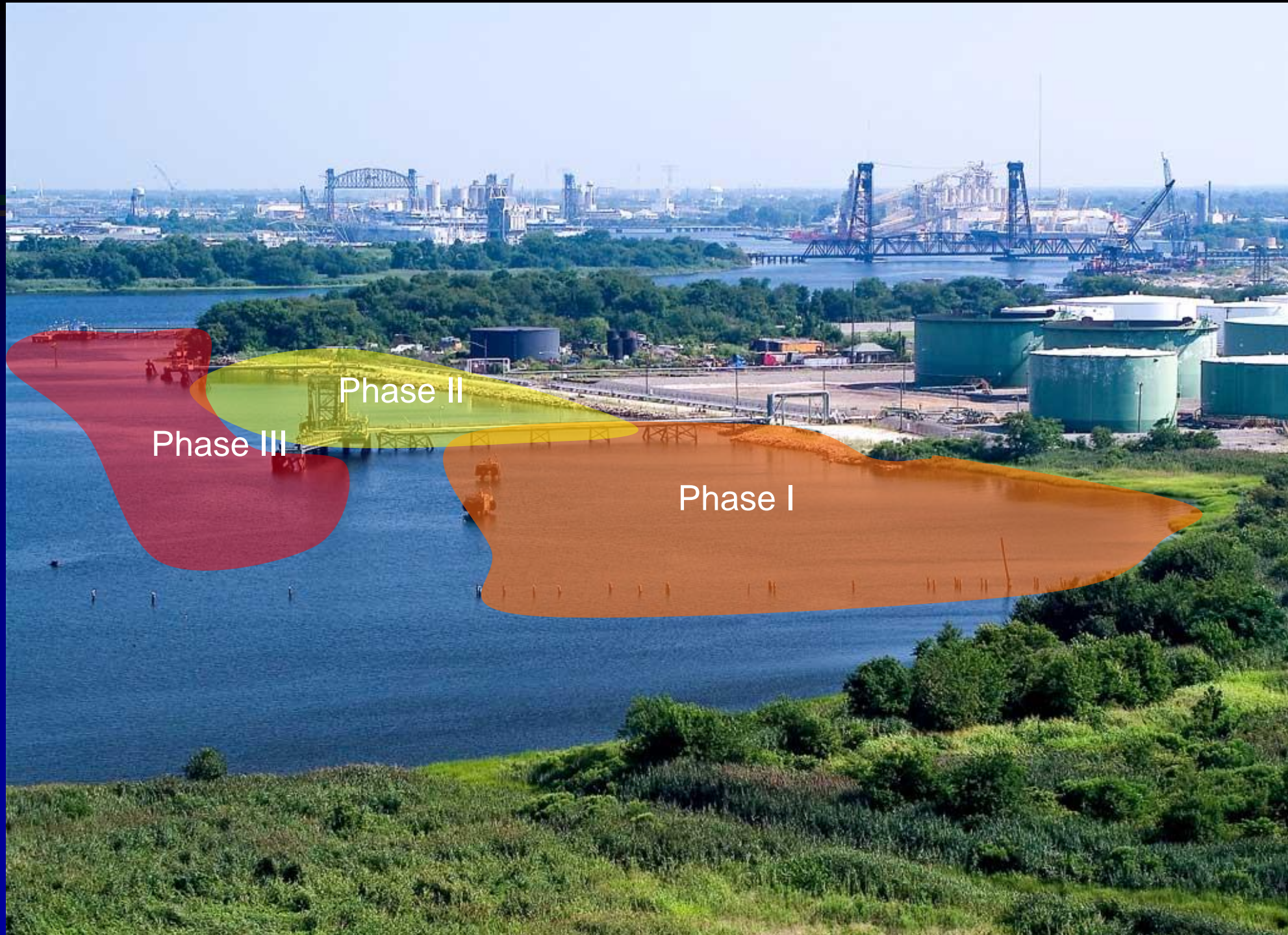
Money Point History & Legacy Impacts





Phased Approach





Phase III

Phase II

Phase I

Phase I - Dredging



Phase I - Living Cap and Wetlands Restoration



Living Cap

ERT Wetlands

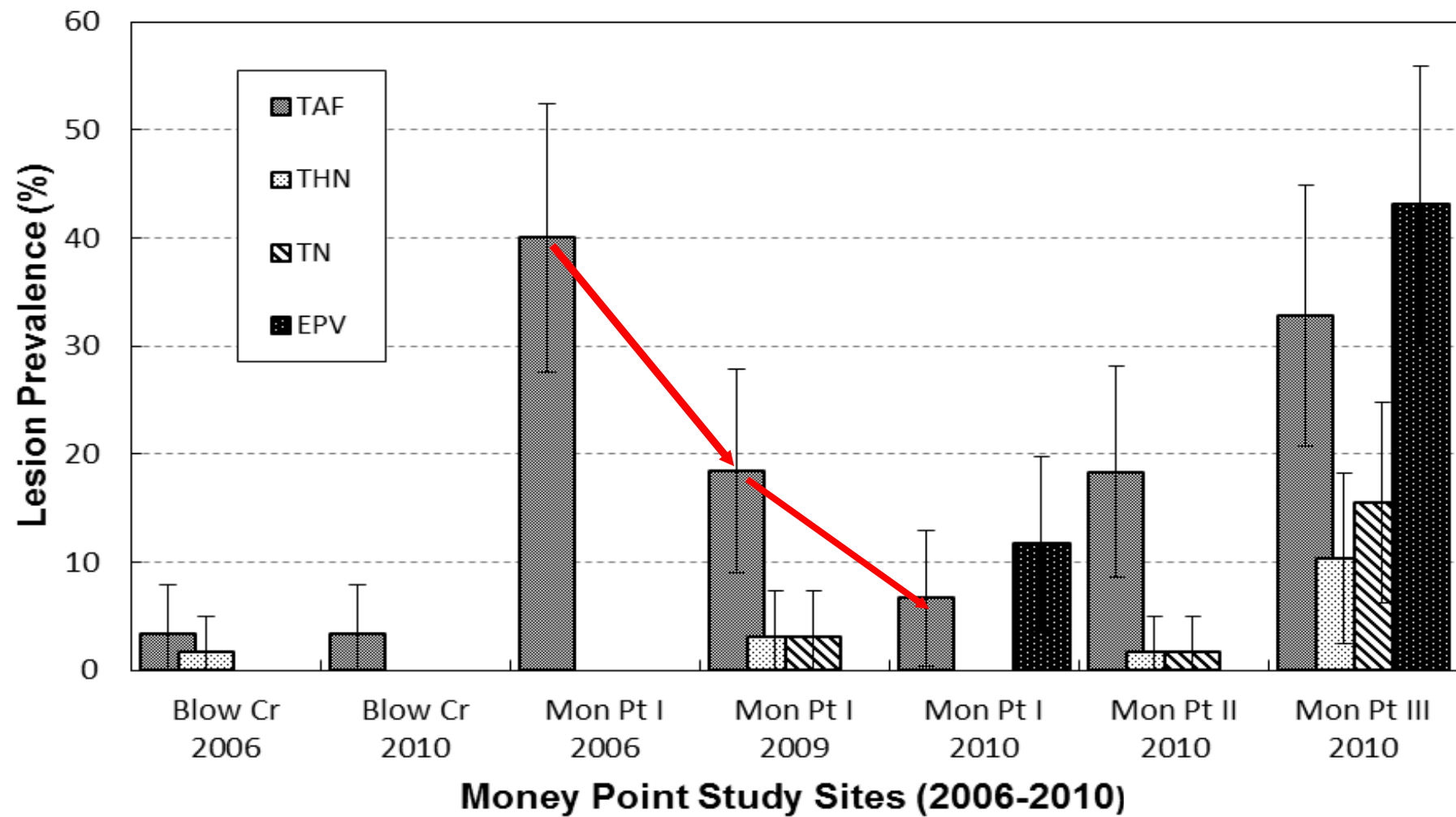


After Construction

Sand Cap With Oyster Reef



Results



Phase II Dredging of 15,000 cy



Phase II - Clean Sand Placed



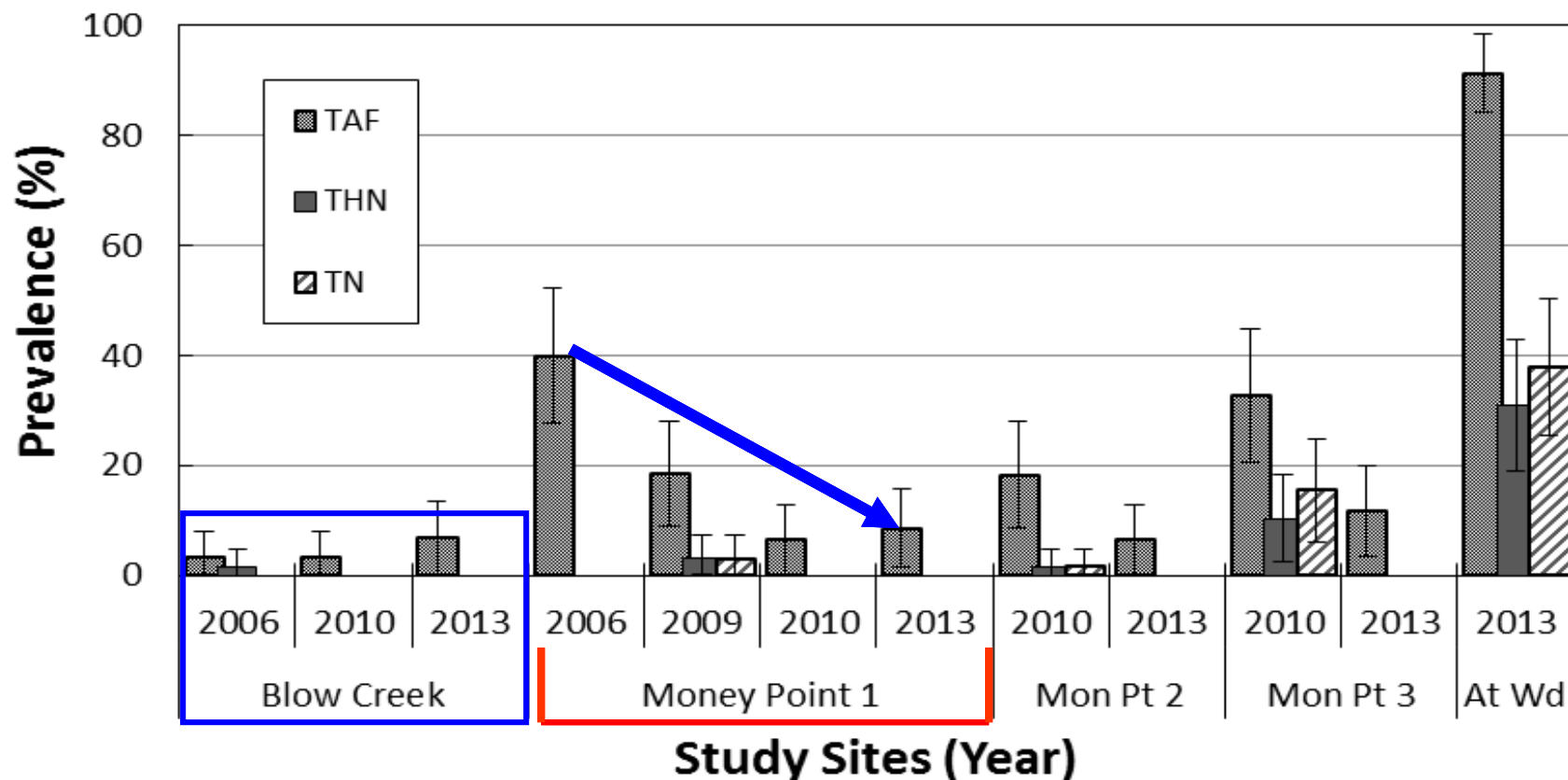
Mummichog Sampling

2013



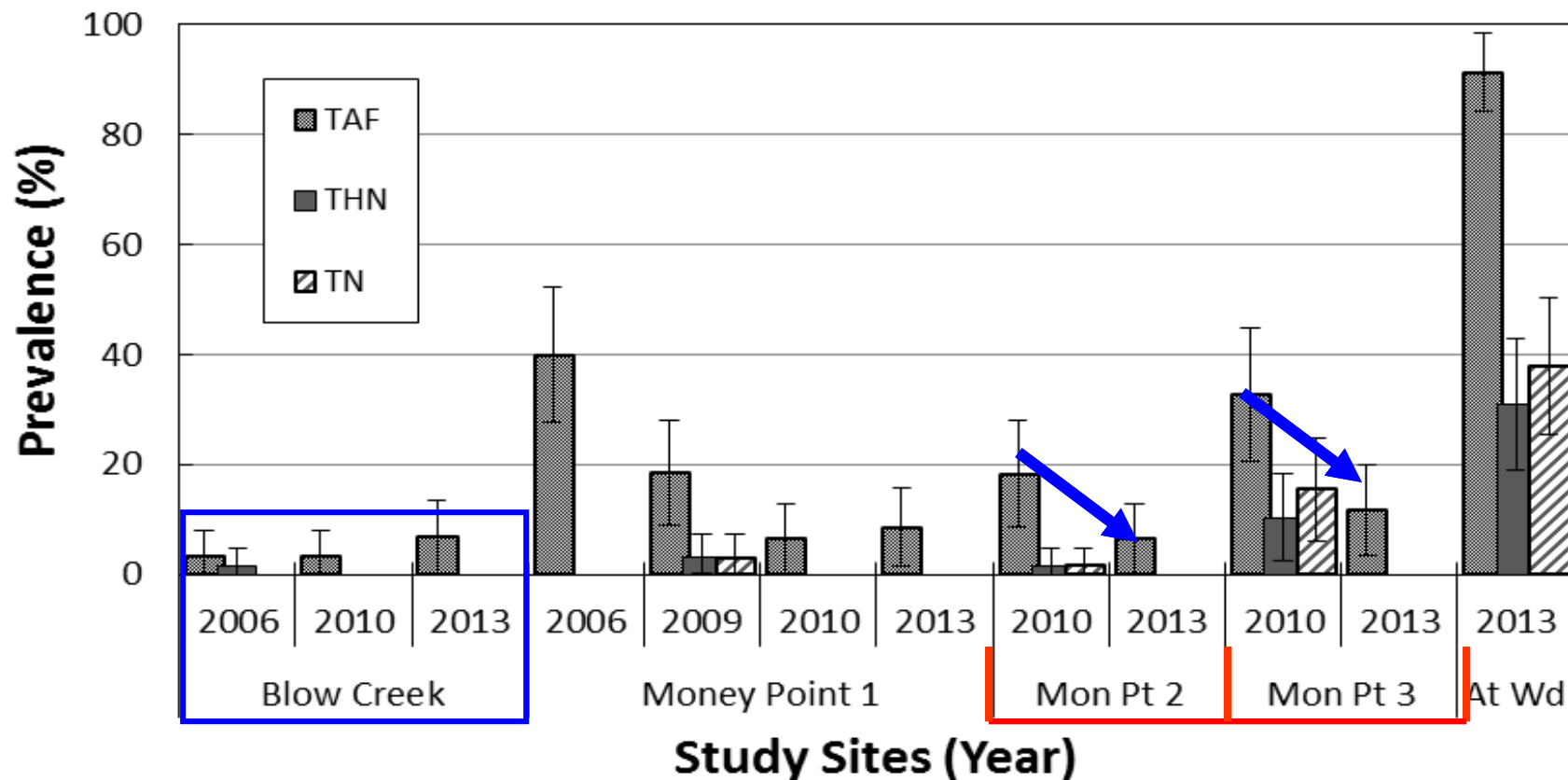
Mummichog Monitoring Results

Liver Lesion Prevalence: Money Point



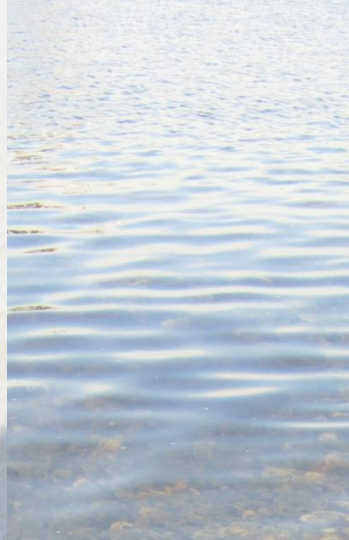
Mummichog Monitoring Results

Liver Lesion Prevalence: Money Point



Benthic Sampling





Increase in Fin Fish Diversity

- Four species found prior to restoration
- 26 species now recorded

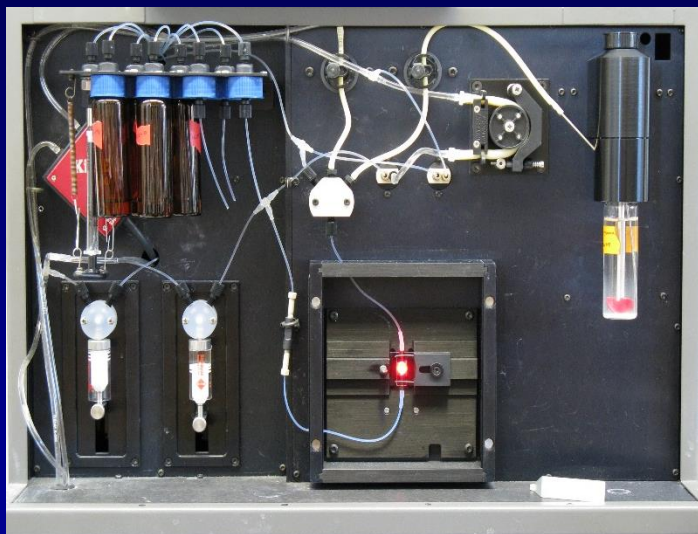


Ongoing Partnerships



Real-time prediction of PAH analysis of sediment pore water

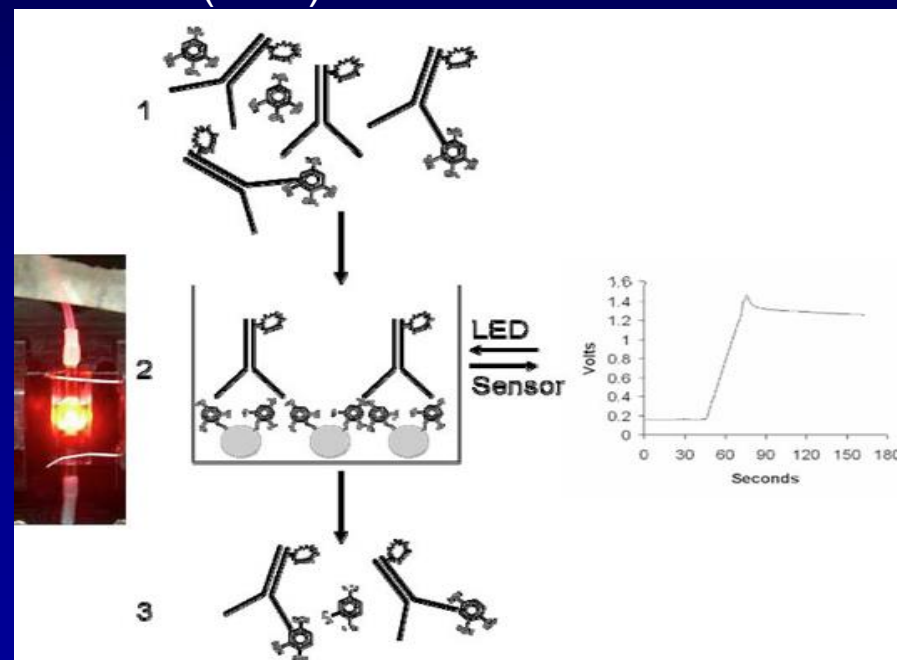
Sapidyne
Instruments Inc.



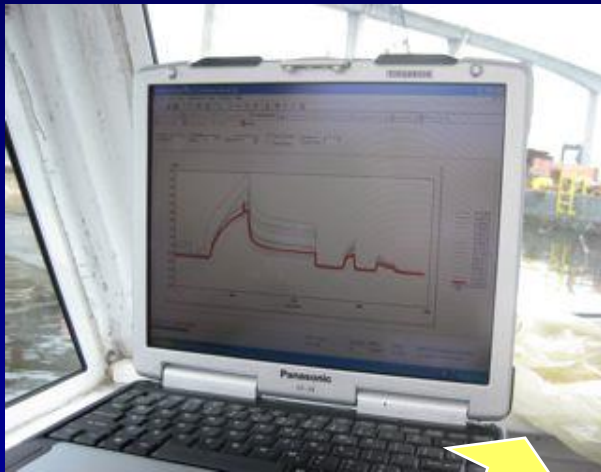
Inline Sensor

KinExA Inline Sensor

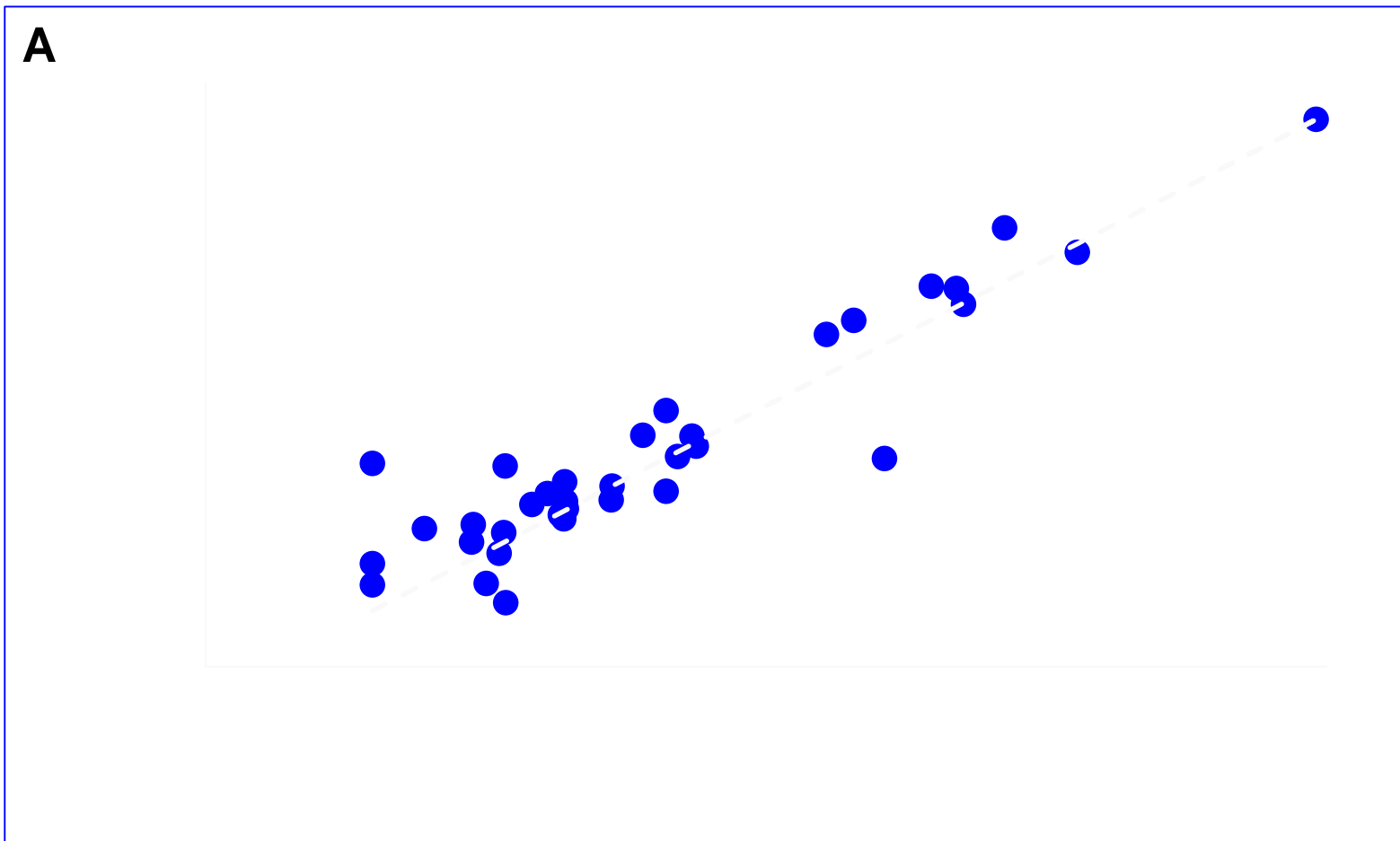
Fluorescence detection, rapid (minutes), quantitative, sub-ppb from small sample volume (1mL)



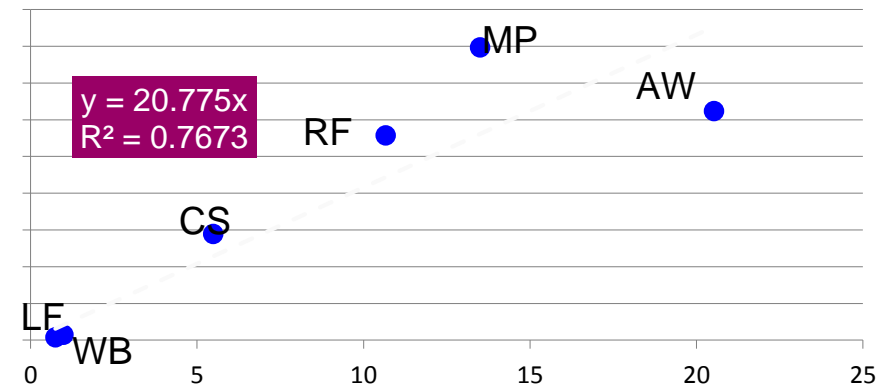
How Easy is it?



Results



How is the Technology Being Applied?



PAHs in Groundwater

Seepage meters at 6 recommended locations

Seepage Meter	Position	
Station Id	Latitude	Longitude
MPF-1	36°47' 7.77"N	76°18' 5.58"W
MPF-2	36°47' 11.90"N	76°18' 5.82"W
MPF-3	36°47' 15.25"N	76°18' 5.95"W
MPF-4	36°47' 17.07"N	76°18' 6.09"W
MPF-5	36°47' 18.62"N	76°18' 5.40"W
MPF-6	36°47' 20.68"N	76°18' 4.63"W

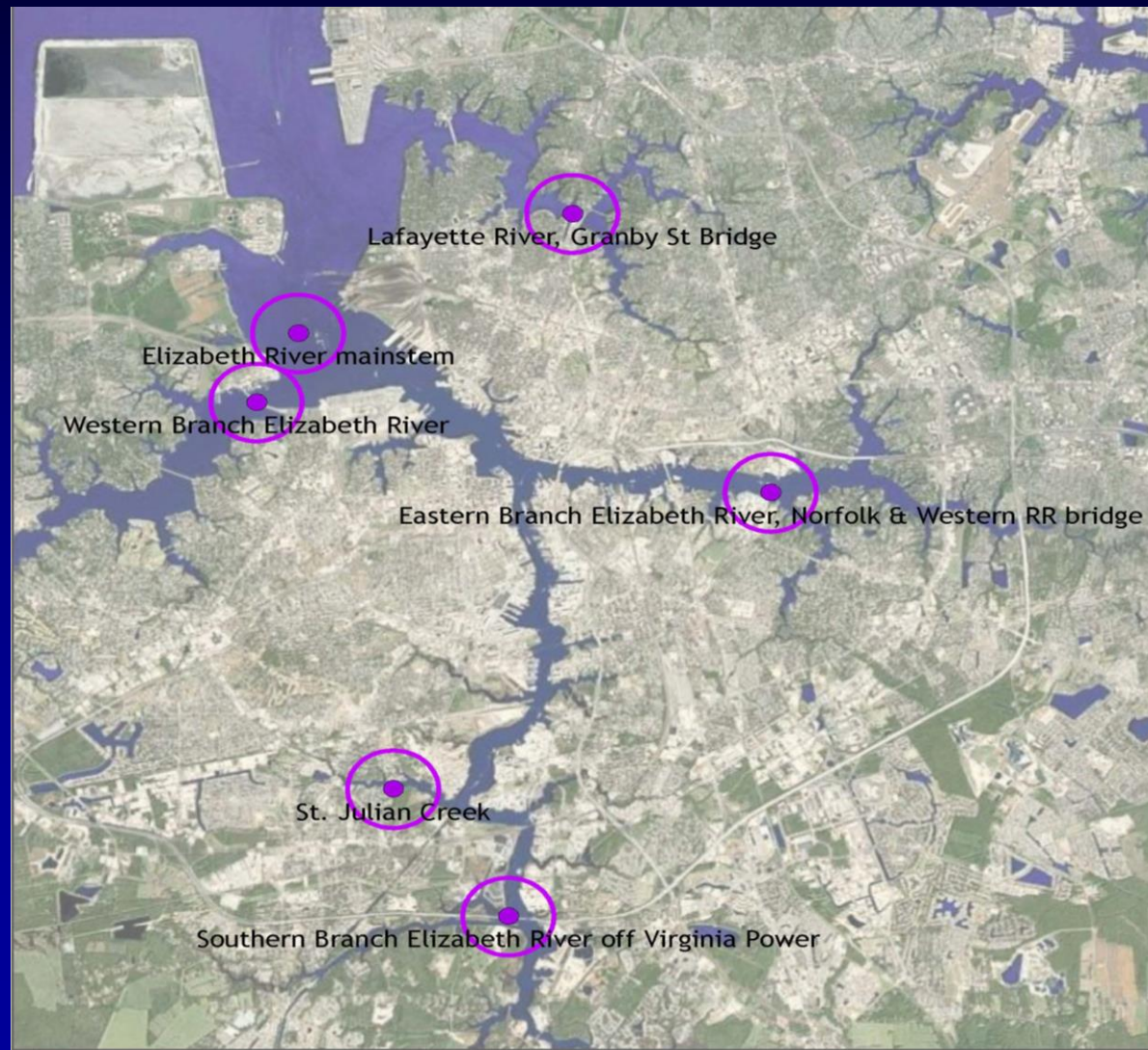


PCBs in Red Drum and Speckled Trout

- **PCBs in fish**
 - Used in electrical equip., banned 1979
 - Correlated with cancer
 - Difficult to identify and address sources
 - ERP conducting study with Duke



Sample Locations



Above DEQ screening value (20 ppb)
Above VDH lower limit of concern (50 ppb)
Above VDH upper limit of concern (500 ppb)

Speckled Trout and Red Drum PCB Study

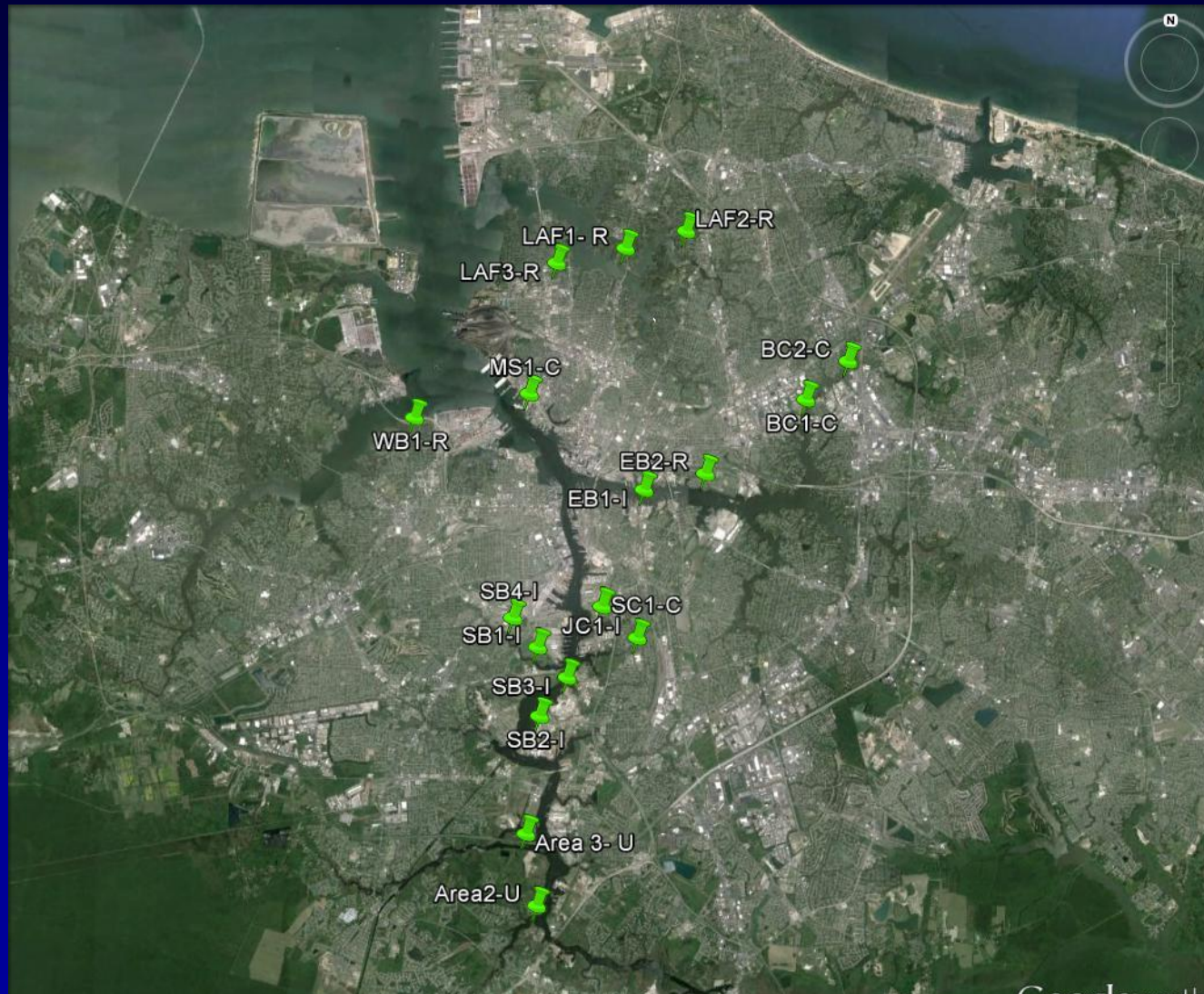
SPECKLED TROUT

Lafayette River – Granby St. Bridge	75.01
Elizabeth River - Western Branch	30.47
Elizabeth River - Main stem	23.38
Elizabeth River - St. Julien's Creek	28.70
Elizabeth River – S. Branch, Hot Ditch	24.94
Elizabeth River - Eastern Branch	15.92
Lynnhaven River - Lynnhaven River	1.60

PCBs, Mummichogs, and Land use



18 Mummichog Sample Locations



Land Types

Undeveloped



Residential



Commercial



Industrial



Questions??

