

MORE PRECISE ASSESSMENT OF BENTHIC CONDITIONS IN DELAWARE BAY

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Building a scientific foundation for sound environmental decisions

MORE PRECISE ASSESSMENT OF BENTHIC CONDITIONS IN DELAWARE BAY

Talk Outline:

- (1) National Coastal Assessment – Measurements
- (2) Delaware Bay Estuary Benthic Community Assessment and Mapping Project
- Very brief summary NCA results from 2000-2001 Baseline
- PCBs in Delaware River fish
 - Trends in body burdens (info from Delaware DNREC)
 - Some PCB Sources based on NCA data
- Plans to combine information from (1) & (2)



Combining probability survey data with acoustic habitat maps for more precise assessment of benthic conditions in Delaware Bay

Watershed Characteristics

- One of the longest un-dammed rivers in the U.S.
- Tributaries within NY, PA, DE, and NJ
- 15 Million people use the water for drinking
- World's largest freshwater port complex
- One of the Nation's largest oil/container ports
- Valued: Finfish, Shellfish, Horseshoe Crabs (largest breeding population)
- Internationally Migrating Shore Birds
- Use of the estuary for tertiary treatment (removal of nitrogen)

NCA / Assessment Endpoints

- Water column condition
- Sediment conditions
- Benthic community measures
- Contaminants in Fish

NCA: Measurement Endpoints

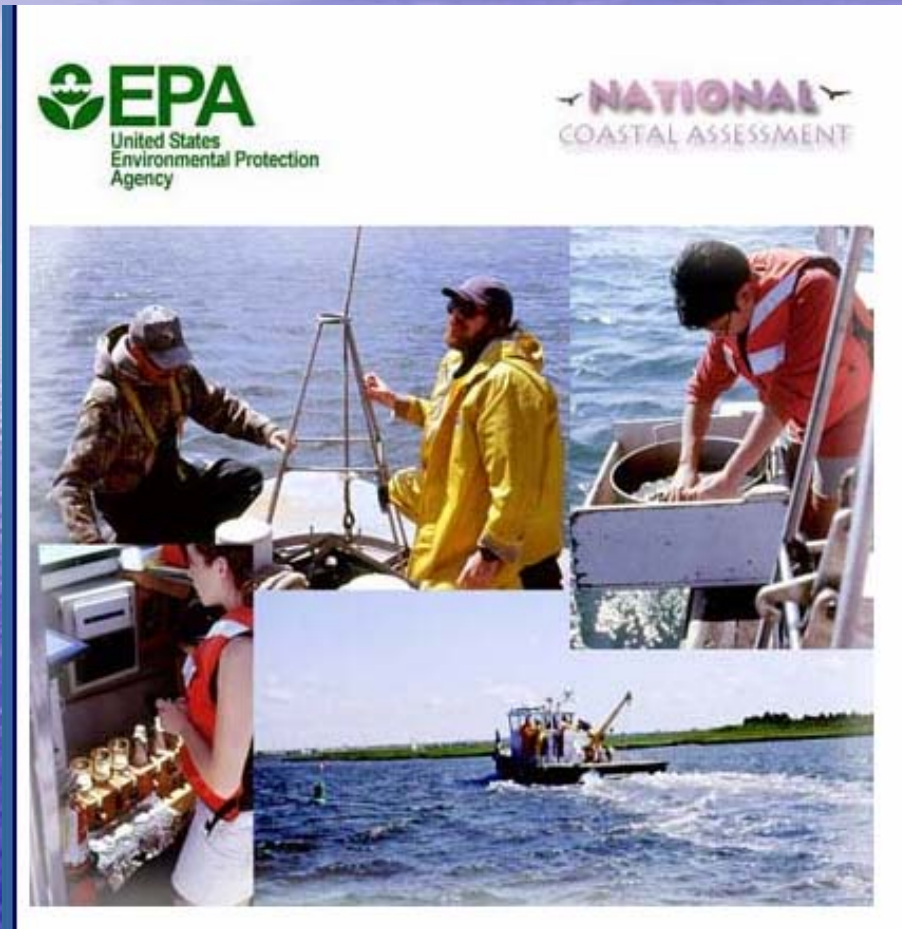
- Numerous

NCA Indices:

- Water Quality
- Sediment Quality
- Benthic Index
- Fish Tissue Contaminants

Assessments of Condition Management Decisions

Different techniques for assessing benthic conditions.



- Sediment samples at random locations
(blind sampling / by design)
- Advantages:
 - Comparable method for unbiased cross-system comparisons
 - Look at sediment triad : sediment chemistry, benthic biology and sediment toxicity.



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A different approach is being used by the Delaware Estuary Benthic Community Characterization and Mapping Project



Bart Wilson¹, Robert Scarborough¹, David Carter¹, Danielle Kreeger²,
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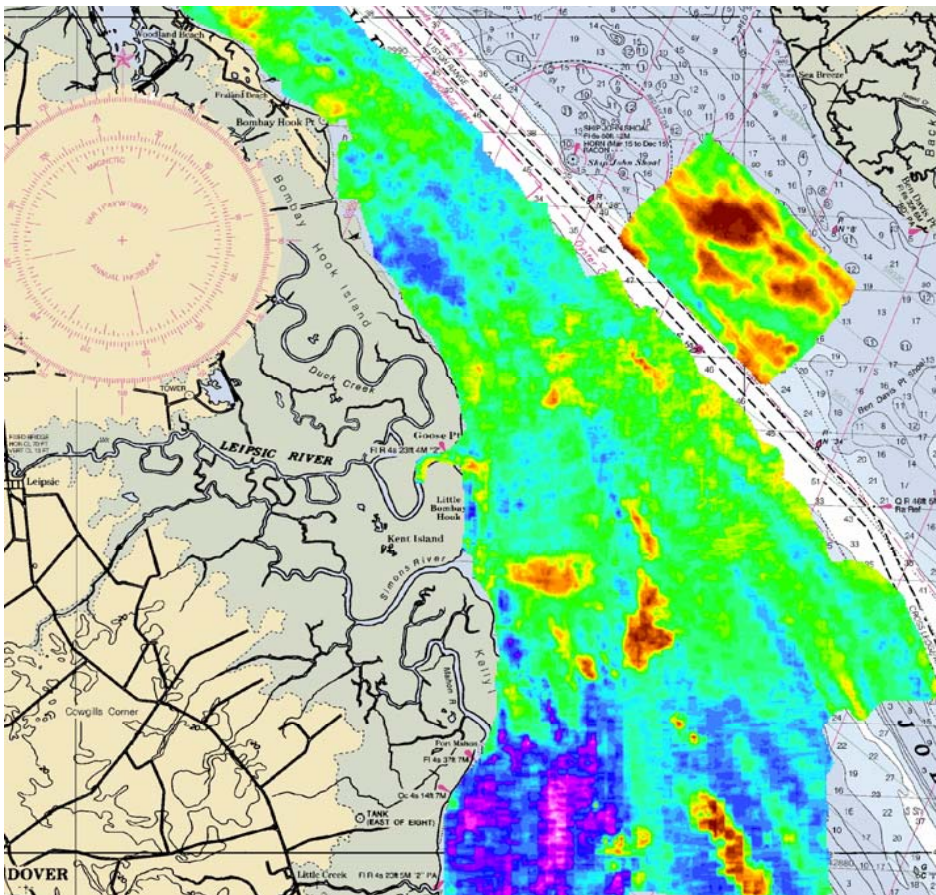
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One goal is to map benthic habitat types

Information useful for management efforts to restore oyster reefs (e.g. market value exceeds \$1.5 million annually), and identify and protect many other valued benthic habitat features



Legend

Bottom Sediment Distribution

- Peat
- Peaty Clay
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silts.
- Fine Sand
- Silty Fine to Medium Sand
- Silty Medium Sand
- Fine to Medium Sand
- Fine to Medium Sand, with abundant shell material and/or pebbles
- Medium to Coarse Sand
- Coarse Sand
- Coarse Sand, with varying amounts of pebbles and/or shell
- Moderate Shell Material
- Abundant Shell Material
- Dense Oyster Shell

Needs For Habitat Maps

Improve understanding of benthic communities

Assessment of Conditions

Dredging Permits

CWA 303d listing and delisting decisions

Marine Protection Areas

Management Decisions

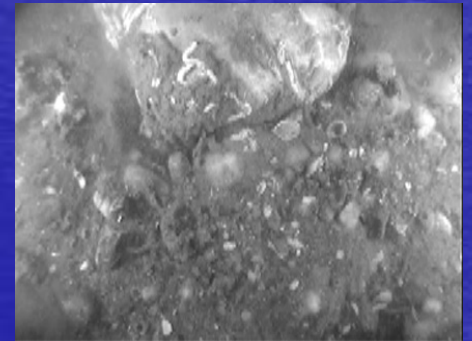


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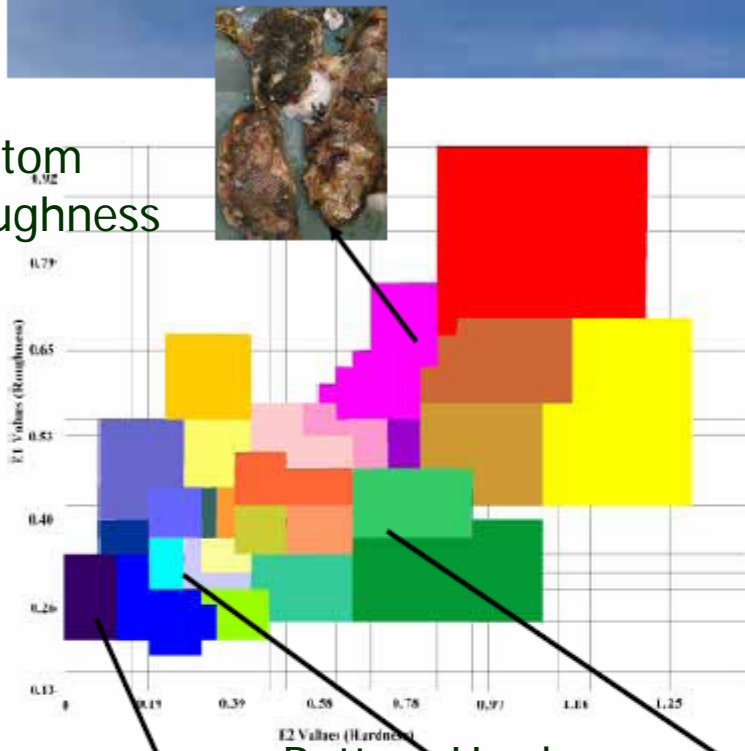
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Using acoustic technology to collect bathymetric and sediment classification data

- RoxAnn Seabed Classification
- Chirp Sub-bottom Profiler
- Multibeam bathymetry system
- Field verification (sediment and biology)

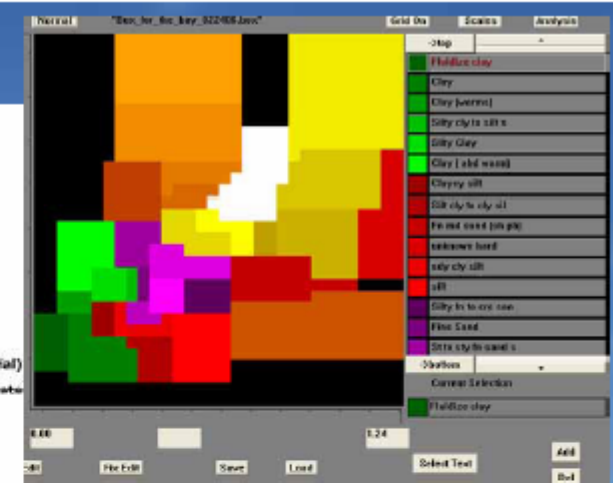


Bottom
Roughness



Bottom Hardness

- Fluidized clay
- Clay
- Clay (with random worm tubes)
- Clay (with abundant worm tubes)
- Clayey silt
- Silty clay (with random shells fragments)
- Silty clay to Clayey silty sand
- Firm Silty clay to Clayey silt
- Silt
- Sandy clayey silt
- Dense Sandy silt (with moderate shell material)
- Silt to Silty fine sand (with moderate shell material)
- Fine sand
- Silty fine to medium sand
- Silty medium sand
- Silty fine to coarse sand
- Fine to medium sand
- Medium to coarse sand (with coarse pebbles)
- Fine to medium sand (with moderate amount of shell material and pebbles)
- Coarse sand (with random pebbles)
- Very Coarse sand
- Medium sand (with moderate to abundant pebbles); or Dense Shell Material (Oyster) with Matrix
- Sandy coarse pebbles (with a coarse sand matrix); or Abundant Shell Material (Oyster Shell) with matrix
- Gravel (mix of pebbles and cobbles; with coarse sand matrix); or Dense Shell Material (Oysters)
- Gravel (dense mix of pebbles and cobbles); or Outcropping of Compacted Pre-Holocene Sediments
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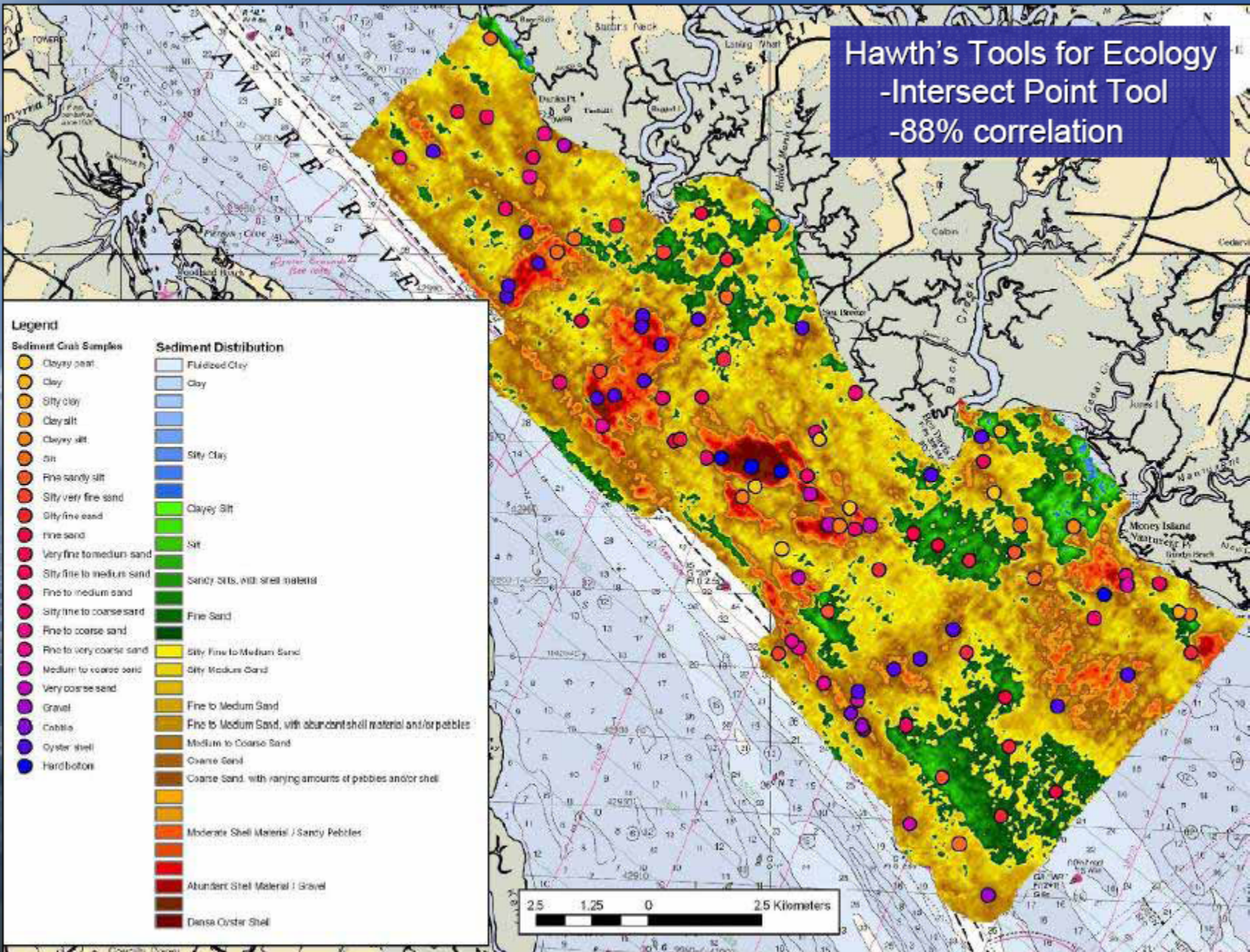
91% Correlation
on Hardness
and Roughness
values of grab
samples



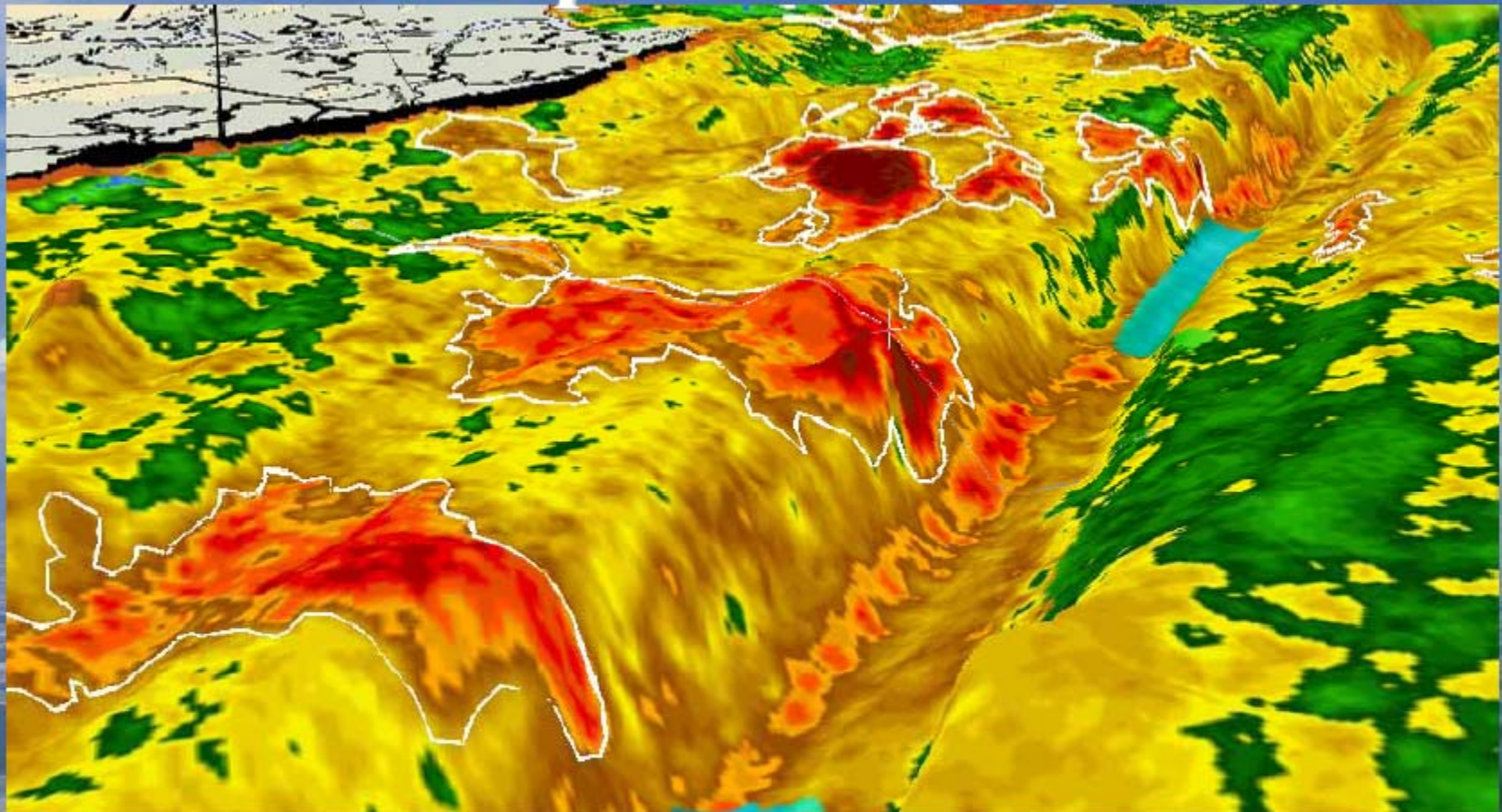
database - Notepad

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19	39.4565616	-75.5661433	-9.15	0.245	1.04
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19	39.4565550	-75.5661383	-9.15	0.267	1.15

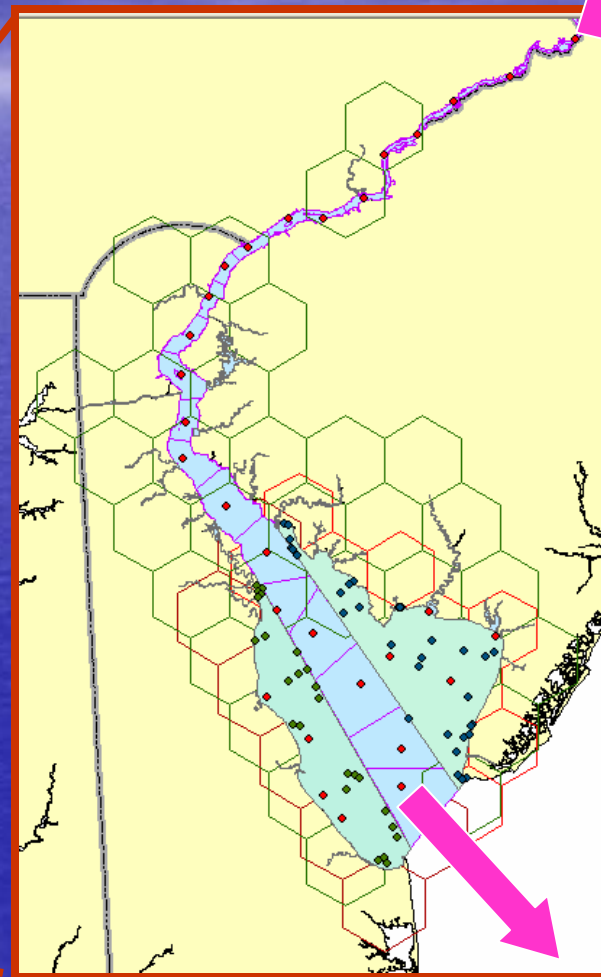
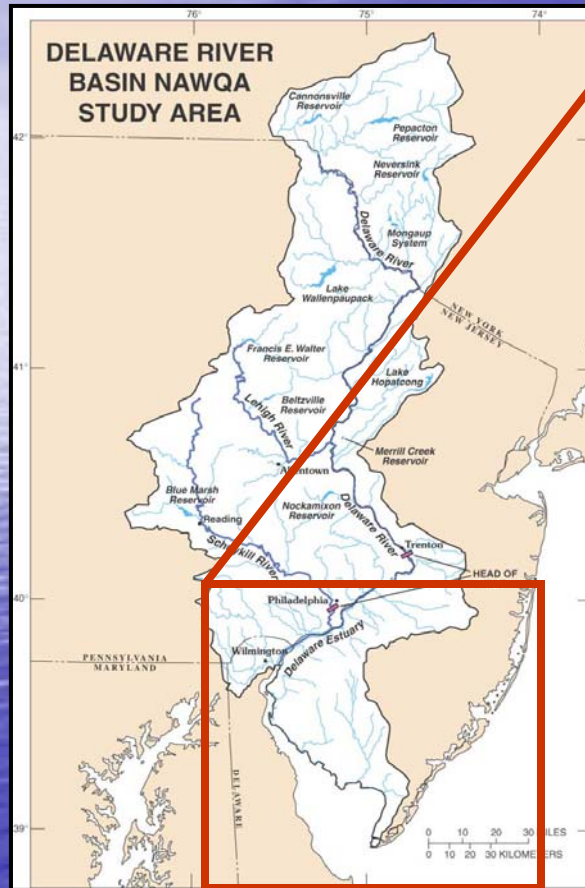
Hawth's Tools for Ecology
 -Intersect Point Tool
 -88% correlation



Ship John Shoal



Some of the basics related to the probability survey design.



Boat Run Stations

Sampling design for 2000-2001 includes:

- (1) Boat Run stations,
- (2) Delaware Bay, and
- (3) Minor tributaries

Additional Info from earlier EMAP Virginia Province, MAIA, and subsequent NCA surveys thru 2006.

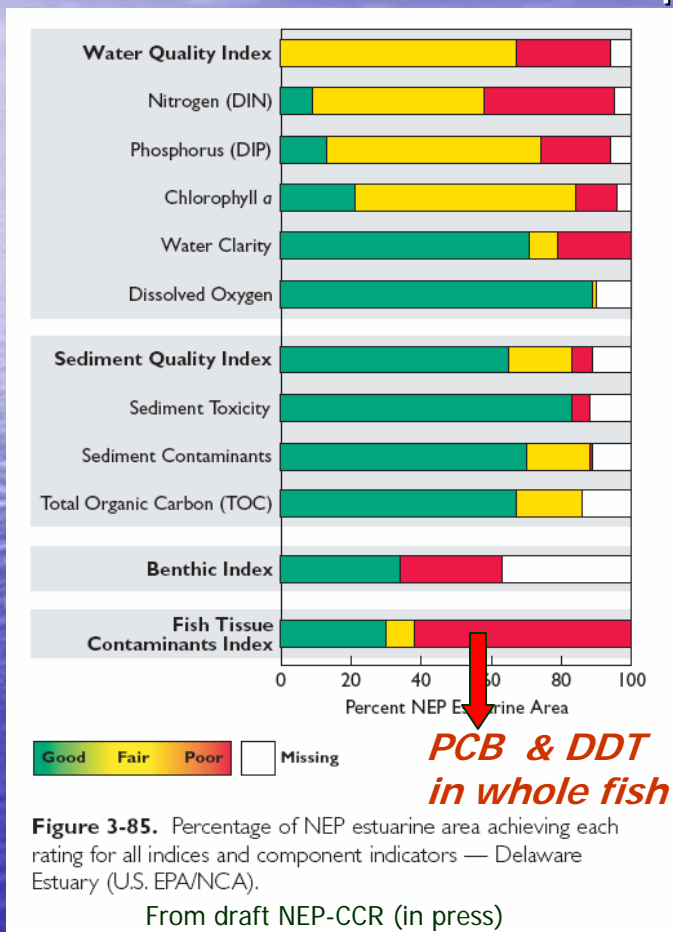


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National Estuary Program Coastal Condition Report Assessment for the Delaware River Estuary (data from 2000, 2001)

About 60 % of the fish have contaminant concentrations based on whole fish analysis that exceed FDA consumption advisories, primarily due to PCB & DDT

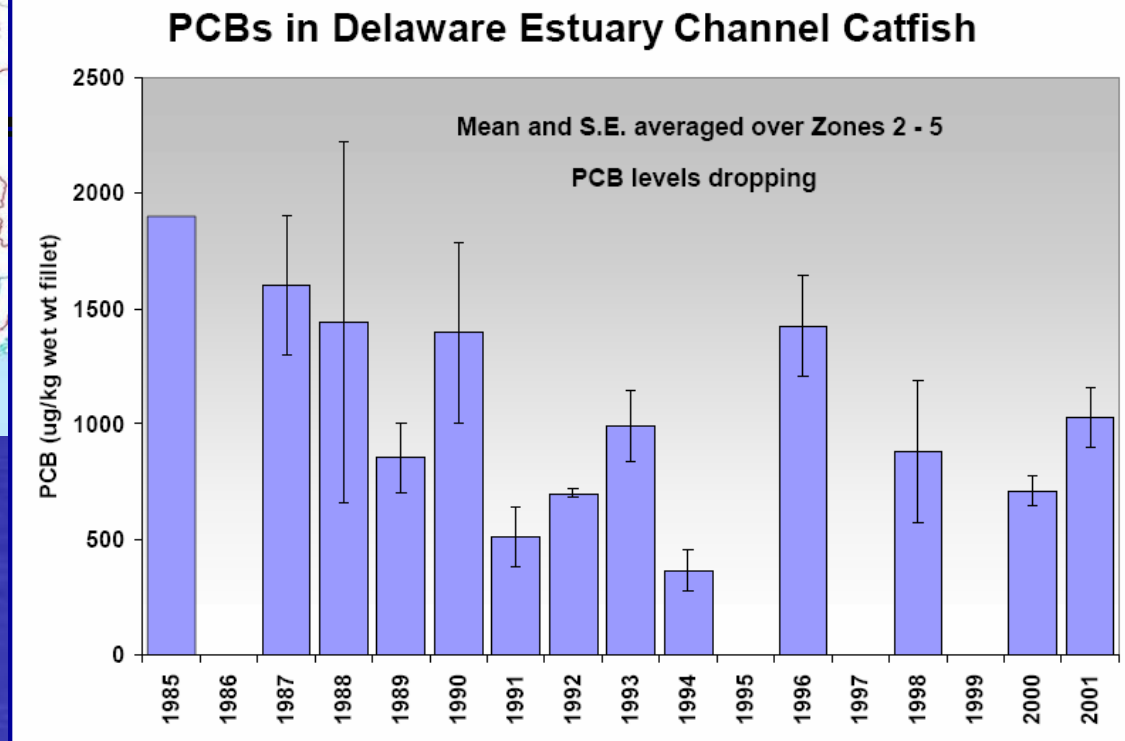
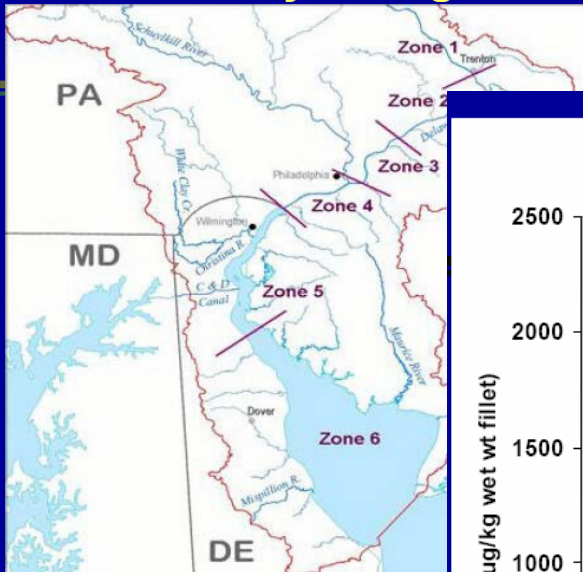


- Species Caught in Bottom Trawls associated with bottom feeding:
 - Channel Catfish
 - White Perch
 - Weakfish
 - Blue Crab
 - Summer Flounder
- Can high concentrations of PCBs and DDT be detected in NCA sediment samples?
- Are there other contaminant signatures at these sites?



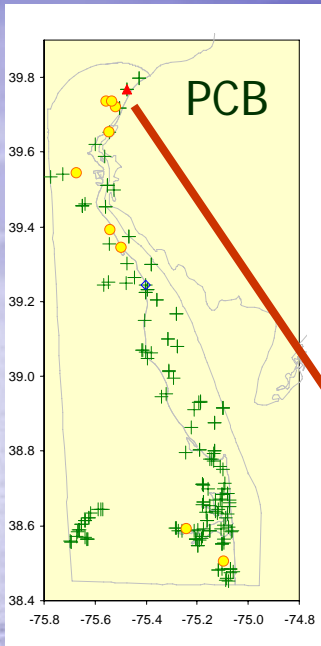
PCB Levels have fallen for a number of species , but rate of decline is slowing.

Delaware Estuary Management



From Rick Greene, Delaware DNREC April 5, 2007

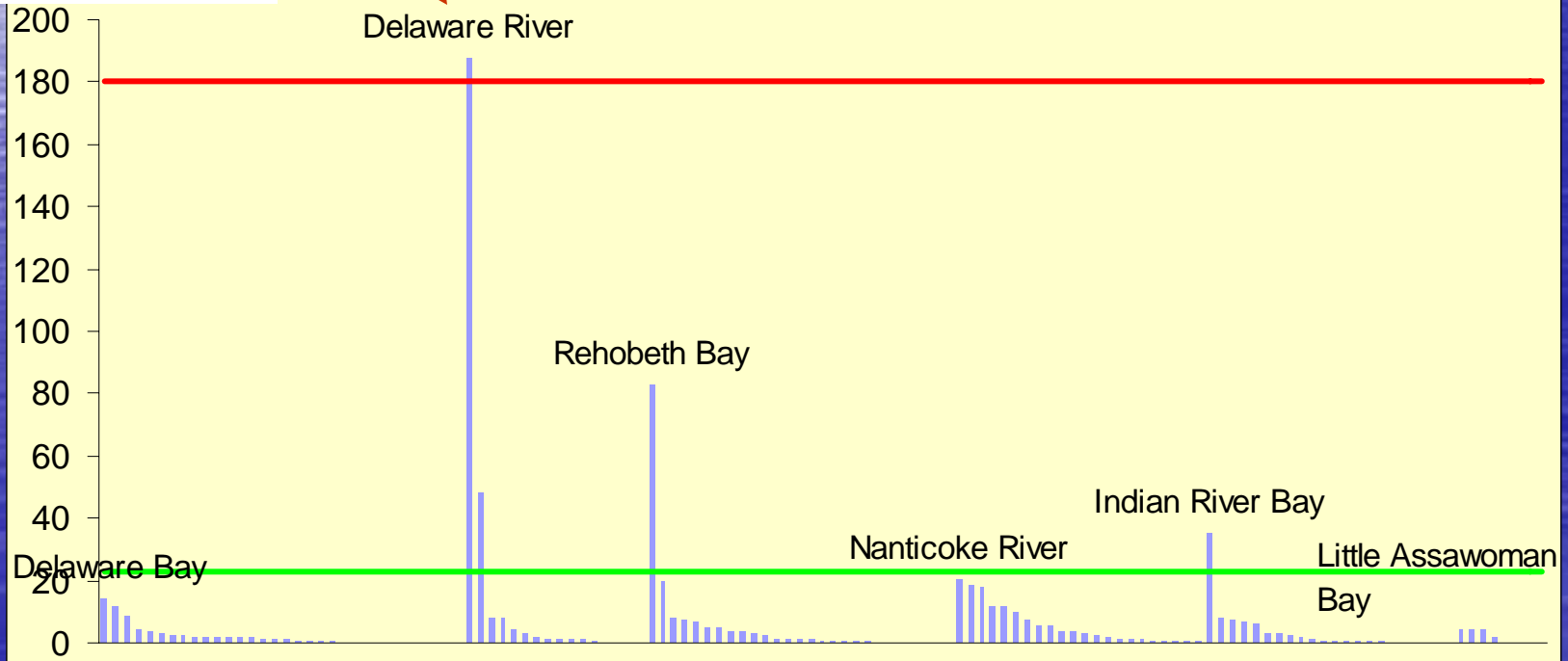
DE00-0047 Delaware River 2000 Long -75.47 Lat 39.767



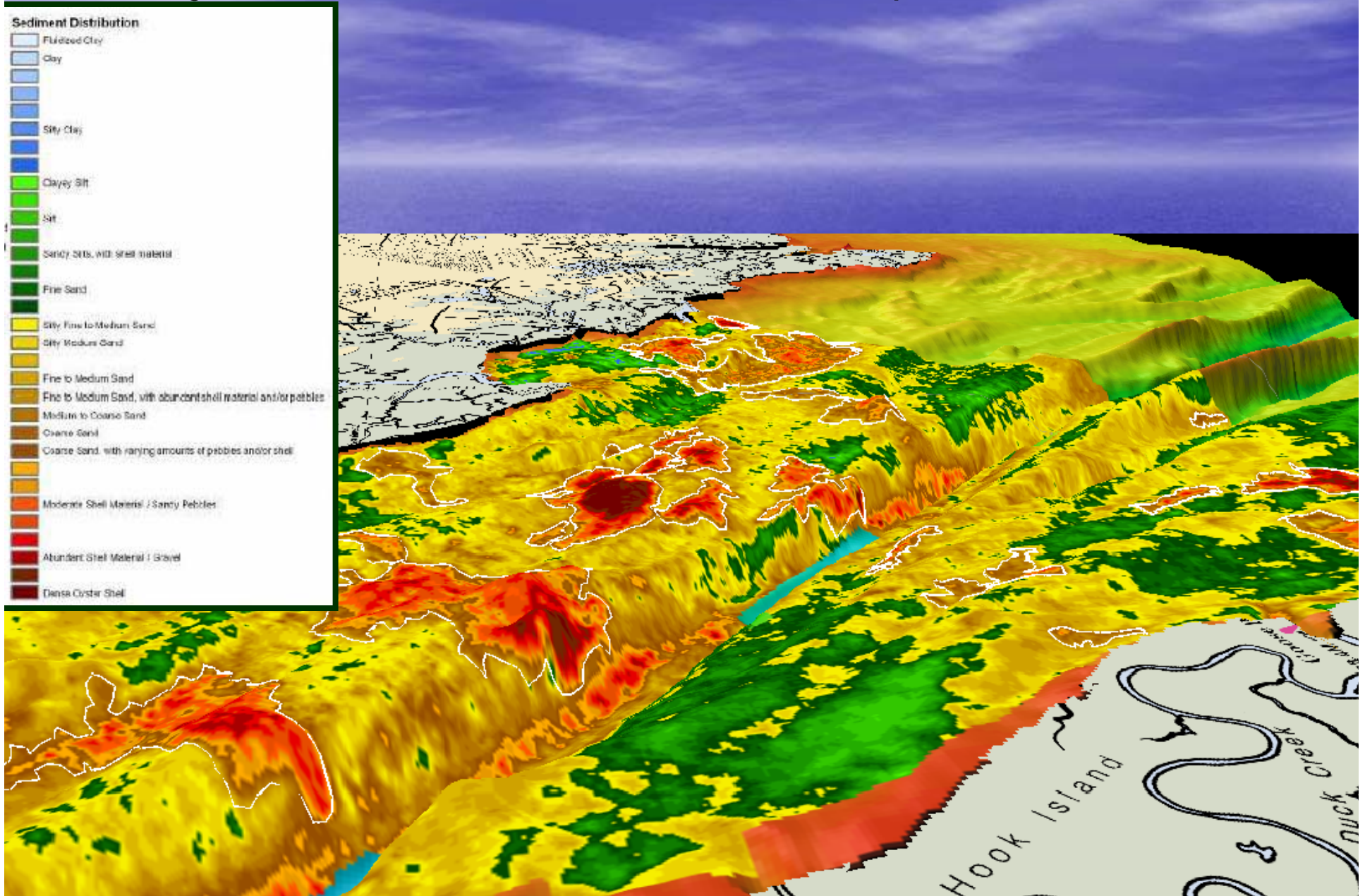
A significant source of PCBs at the AMTRAK Former Refueling Facility, and a remedial investigation study is in process.

The other source is the DuPont Edge Moor TiO₂ plant with a unique byproduct (IUPAC 209 deca-PCB)

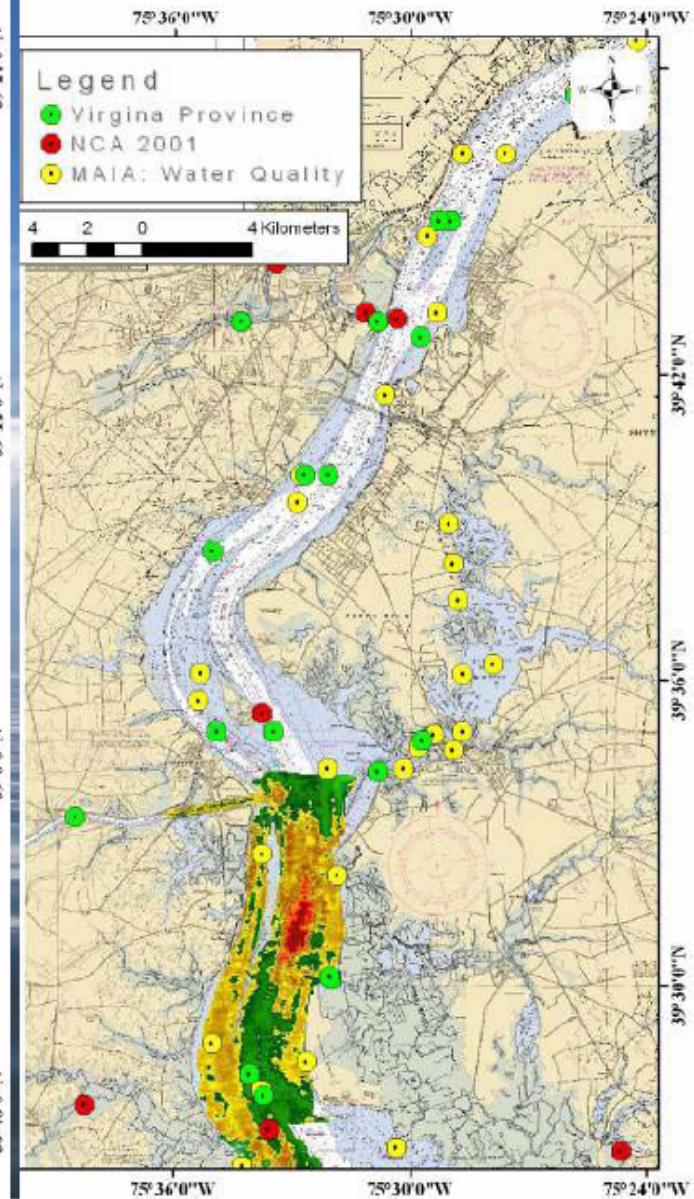
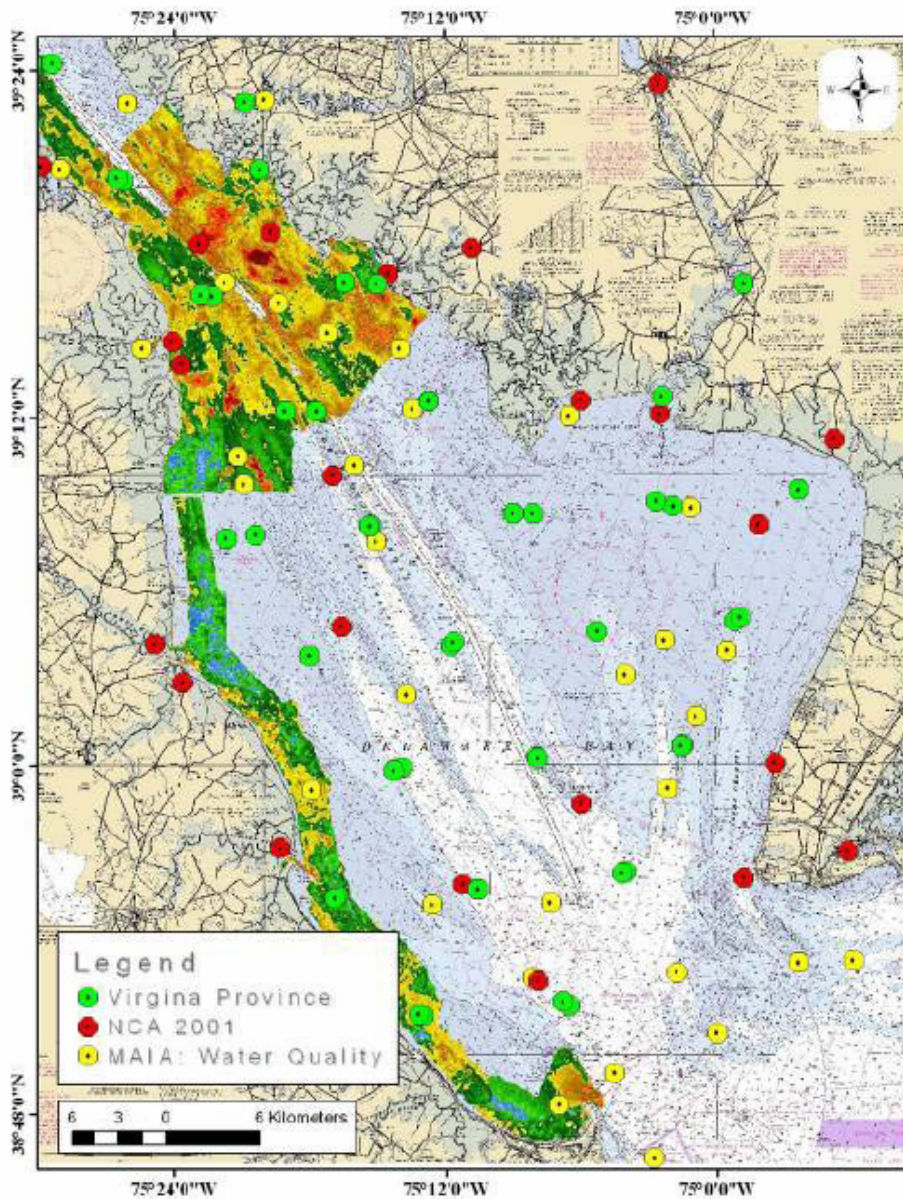
Total PCB NCA 2000-2004 DE



Detailed information on benthic communities, and sediment chemistry can be combined with habitat maps



Re-analysis of information on benthic conditions from probability surveys and habitat maps. Additional sampling in 2008.



Conclusions:

- (1) Probability based sampling can help provide estimates of overall condition
 - % area statistics, diagnostics
- (2) Detailed benthic habitat maps for natural resource management
- Information from both approaches can be combined (forensics / diagnostics), in support of a variety of management decisions

We will be doing more work, including additional field sampling in the summer of 2008 (EPA Region 3 – RARE Project).

